Energy Tidbits

NOV Q1 Call: "*Growing Confidence that US Unconventional Growth is Slowing Significantly*"

Produced by: Dan Tsubouchi

April 30, 2023

Dan Tsubouchi
Chief Market Strategist
dtsubouchi@safgroup.ca

Ryan Dunfield
CEO
rdunfield@safgroup.ca

Aaron Bunting
COO, CFO
abunting@safgroup.ca

Ryan Haughn
Managing Director
rhaughn@safgroup.ca

Table 1. Summary of natural gas supply and disposition in the United States, 2018-2023

billion cubic feet

Year and month	Gross withdrawals	Marketed production	NGPL production[a]	Dry gas production[b]	Supplemental gaseous fuels[c]	Net imports	Net storage withdrawals[d]	Balancing item[e]	Consumption[f]
2018 total	**37,326**	**33,009**	**2,235**	**30,774**	**69**	**-719**	**314**	**-300**	**30,139**
2019 total	**40,780**	**36,447**	**2,548**	**33,899**	**61**	**-1,916**	**-503**	**-408**	**31,132**
2020 total	**40,614**	**36,202**	**2,710**	**33,493**	**63**	**-2,734**	**-180**	**-129**	**30,513**
2021									
January	3,517	3,118	235	2,884	6	-279	719	16	3,344
February	2,950	2,609	196	2,412	5	-152	795	40	3,099
March	3,518	3,144	237	2,907	6	-357	64	30	2,649
April	3,438	3,069	231	2,838	5	-356	-180	-42	2,265
May	3,535	3,168	239	2,930	6	-373	-424	-21	2,117
June	3,400	3,056	230	2,826	5	-331	-254	-8	2,238
July	3,514	3,182	240	2,943	6	-338	-175	-23	2,412
August	3,545	3,196	241	2,956	6	-343	-164	-20	2,434
September	3,423	3,087	232	2,854	5	-315	-398	-4	2,142
October	3,600	3,245	244	3,001	6	-317	-368	-60	2,263
November	3,545	3,170	239	2,931	6	-315	137	-66	2,693
December	3,680	3,284	247	3,037	6	-368	330	3	3,007
Total	**41,666**	**37,328**	**2,811**	**34,518**	**66**	**-3,845**	**82**	**-157**	**30,665**
2022									
January	E3,591	E3,199	246	E2,953	7	-315	994	-47	3,592
February	E3,227	E2,870	223	E2,647	6	R-288	658	38	3,061
March	E3,614	E3,225	267	E2,958	6	-380	163	33	2,781
April	E3,520	E3,152	257	E2,895	6	R-342	-214	23	2,367
May	E3,667	E3,296	266	E3,030	6	-386	-403	R-5	2,242
June	E3,557	E3,215	259	E2,956	4	-324	-324	R5	2,318
July	E3,690	E3,330	276	E3,055	6	-301	-180	4	2,583
August	E3,699	E3,349	270	E3,079	6	-321	-206	1	2,560
September	E3,638	E3,281	265	E3,016	4	-293	-436	R-4	2,289
October	E3,769	E3,394	275	E3,119	5	-315	-422	-21	2,366
November	E3,683	E3,297	269	E3,029	4	-308	71	-23	2,773
December	RE3,729	RE3,328	249	RE3,079	5	R-304	573	R29	3,382
Total	**RE43,385**	**RE38,936**	**3,120**	**RE35,816**	**65**	**R-3,875**	**275**	**R33**	**32,314**
2023									
January	RE3,805	RE3,405	264	RE3,141	6	-328	R455	R37	3,311
February	E3,447	E3,085	242	E2,842	5	-329	399	42	2,959
2023 2-month YTD	**E7,252**	**E6,489**	**506**	**E5,984**	**12**	**-658**	**854**	**79**	**6,271**
2022 2-month YTD	**E6,818**	**E6,069**	**469**	**E5,600**	**12**	**-603**	**1,652**	**-9**	**6,653**
2021 2-month YTD	**6,467**	**5,727**	**431**	**5,296**	**10**	**-432**	**1,514**	**55**	**6,443**

[a] We derive monthly natural gas plant liquid (NGPL) production, gaseous equivalent, from sample data reported by gas processing plants on Form EIA-816, *Monthly Natural Gas Liquids Report*, and Form EIA-64A, *Annual Report of the Origin of Natural Gas Liquids Production*.

[b] Equal to marketed production minus NGPL production.

[c] We only collect supplemental gaseous fuels data on an annual basis except for the Dakota Gasification Co. coal gasification facility, which provides data each month. We calculate the ratio of annual supplemental fuels (excluding Dakota Gasification Co.) to the sum of dry gas production, net imports, and net withdrawals from storage. We apply this ratio to the monthly sum of these three elements. We add the Dakota Gasification Co. monthly value to the result to produce the monthly supplemental fuels estimate.

[d] Monthly and annual data for 2018 through 2020 include underground storage and liquefied natural gas storage. Data for January 2021 forward include underground storage only. Appendix A, Explanatory Note 5, contains a discussion of computation procedures.

[e] Represents quantities lost and imbalances in data due to differences among data sources. Net imports and balancing item excludes net intransit deliveries. These net intransit deliveries were (in billion cubic feet): 212 for 2021; 209 for 2020; -8 for 2019; and -12 for 2018. Appendix A, Explanatory Note 7, contains a full discussion of balancing item calculations.

[f] Consists of pipeline fuel use, lease and plant fuel use, vehicle fuel, and deliveries to consuming sectors as shown in Table 2.

R Revised data.

E Estimated data.

RE Revised estimated data.

Source: 2018-2021: U.S. Energy Information Administration (EIA), *Natural Gas Annual 2021*. January 2022 through current month: Form EIA-914, *Monthly Crude Oil and Lease Condensate, and Natural Gas Production Report*; Form EIA-857, *Monthly Report of Natural Gas Purchases and Deliveries to Consumers*; Form EIA-191, *Monthly Underground Gas Storage Report*; EIA computations and estimates; and Office of Fossil Energy and Carbon Management, *Natural Gas Imports and Exports*. Table 7 includes detailed source notes for Marketed Production. Appendix A, Notes 3 and 4, includes discussion of computation and estimation procedures and revision policies.

Note: Data for 2018 through 2020 are final. All other data are preliminary unless otherwise indicated. Geographic coverage is the 50 states and the District of Columbia. Totals may not equal sum of components because of independent rounding.

Table 2. Natural gas consumption in the United States, 2018-2023

billion cubic feet, or as indicated

Year and month	Lease and plant fuel[a]	Pipeline and distribution use[b]	Delivered to consumers: Residential	Commercial	Industrial	Electric power	Vehicle fuel	Total	Total consumption	Heating value[c] (Btu per cubic foot)
2018 total	**1,694**	**877**	**4,998**	**3,514**	**8,417**	**10,589**	**50**	**27,568**	**30,139**	**1,036**
2019 total	**1,823**	**1,018**	**5,019**	**3,515**	**8,417**	**11,288**	**53**	**28,291**	**31,132**	**1,038**
2020 total	**1,809**	**1,018**	**4,674**	**3,170**	**8,161**	**11,632**	**49**	**27,686**	**30,513**	**1,037**
2021										
January	159	125	895	497	791	872	5	3,060	3,344	1,038
February	133	116	876	497	686	787	4	2,850	3,099	1,041
March	160	98	574	358	703	752	5	2,392	2,649	1,038
April	156	83	342	248	676	756	4	2,026	2,265	1,036
May	161	77	218	183	658	816	5	1,879	2,117	1,035
June	156	82	130	144	638	1,085	4	2,001	2,238	1,034
July	162	88	113	143	666	1,235	5	2,162	2,412	1,035
August	163	89	106	142	669	1,261	5	2,182	2,434	1,034
September	157	78	118	150	639	995	4	1,907	2,142	1,035
October	165	82	193	197	677	944	5	2,015	2,263	1,035
November	161	99	482	338	726	882	4	2,432	2,693	1,037
December	167	112	669	402	767	886	5	2,729	3,007	1,038
Total	**1,901**	**1,130**	**4,716**	**3,298**	**8,295**	**11,271**	**54**	**27,634**	**30,665**	**1,037**
2022										
January	E163	E132	961	553	817	961	E5	3,296	3,592	1,038
February	E146	E113	796	465	722	815	E4	2,802	3,061	1,038
March	E164	E102	591	387	753	779	E5	2,515	2,781	1,036
April	E161	E87	390	277	700	748	E4	2,120	2,367	1,035
May	E168	E83	201	183	677	925	E5	1,992	2,242	1,034
June	E164	E85	124	147	648	1,146	E4	2,069	2,318	1,033
July	E170	E95	110	145	658	1,400	E5	2,318	2,583	1,033
August	E171	E94	103	141	670	1,375	E5	2,295	2,560	1,035
September	E167	E84	114	150	646	1,122	E4	2,037	2,289	1,036
October	E173	E87	242	224	686	950	E5	2,106	2,366	1,036
November	E168	E102	516	356	723	903	E4	2,503	2,773	1,036
December	E169	E125	840	496	754	993	E5	3,088	3,382	1,041
Total	**E1,983**	**E1,190**	**4,990**	**3,525**	**8,455**	**12,118**	**E53**	**29,140**	**32,314**	**1,036**
2023										
January	RE173	E122	800	476	767	968	E5	3,016	3,311	1,039
February	E157	E109	688	426	703	872	E4	2,693	2,959	1,038
2023 2-month YTD	**E331**	**E231**	**1,489**	**902**	**1,470**	**1,840**	**E9**	**5,709**	**6,271**	**1,039**
2022 2-month YTD	**E309**	**E245**	**1,757**	**1,018**	**1,539**	**1,776**	**E9**	**6,099**	**6,653**	**1,038**
2021 2-month YTD	**292**	**242**	**1,771**	**995**	**1,476**	**1,659**	**9**	**5,910**	**6,443**	**1,041**

[a] We only collect plant fuel data and lease fuel data annually. We estimate monthly lease and plant fuel use from monthly marketed production by assuming that the preceding annual percentage remains constant for the next 12 months.

[b] We base published pipeline and distribution use data on reports collected on an annual basis. We estimate monthly pipeline and distribution use data from monthly total consumption (excluding pipeline and distribution use) by assuming that the preceding annual percentage remains constant for the next 12 months. Pipeline and distribution use volumes include line loss, defined as known volumes of natural gas that were the result of leaks, damage, accidents, migration, and/or blow downs, as well as fuel used in liquefaction and regasification.

[c] Heating value is the average number of British thermal units per cubic foot of natural gas as reported on EIA-857 and EIA-176. Appendix A, Explanatory Note 11, contains further information.

E Estimated data.

RE Revised estimated data.

Source: 2018-2021: U.S. Energy Information Administration (EIA): Form EIA-857, *Monthly Report of Natural Gas Purchases and Deliveries to Consumers*; state and federal agencies; EIA estimates based on historical data; and *Natural Gas Annual 2021*. January 2022 through current month: Form EIA-914, *Monthly Crude Oil and Lease Condensate, and Natural Gas Production Report*; Form EIA-857; Form EIA-923, *Power Plant Operations Report*. Appendix A, Explanatory Note 6, contains an explanation of computation procedures and revision policy.

Note: Data for 2018 through 2020 are final. All other data are preliminary unless otherwise indicated. Geographic coverage is the 50 states and the District of Columbia. Totals may not equal sum of components because of independent rounding. Appendix A, Explanatory Note 6, contains a definition of sectors.

Table 5. U.S. natural gas exports, 2021-2023

volumes in million cubic feet; prices in dollars per thousand cubic feet

	2023 2-month YTD	2022 2-month YTD	2021 2-month YTD	2023		2022	
				February	January	Total	December
Exports							
Volume (million cubic feet)							
Pipeline							
Canada	198,928	156,207	163,125	94,530	104,399	959,630	98,718
Mexico	314,403	330,499	310,741	152,318	162,085	2,074,340	158,638
Total pipeline exports	**513,331**	**486,706**	**473,866**	**246,848**	**266,483**	**3,033,970**	**257,355**
LNG							
Exports							
By vessel							
Antigua and Barbuda	5	2	0	2	4	22	1
Argentina	2,287	0	0	2,287	0	66,939	0
Bahamas	69	65	57	27	42	489	42
Bangladesh	3,369	5,896	3,148	0	3,369	12,663	0
Barbados	0	59	36	0	0	93	0
Belgium	10,963	21,478	0	7,322	3,640	80,245	3,274
Brazil	0	27,981	34,250	0	0	71,998	0
Chile	3,307	3,162	16,309	0	3,307	30,131	0
China	20,461	3,357	42,355	2,565	17,896	96,659	6,992
Colombia	0	486	0	0	0	5,703	0
Croatia	8,919	14,953	0	6,006	2,913	77,286	6,204
Dominican Republic	7,157	6,647	12,584	3,514	3,643	50,824	6,644
Egypt	0	0	0	0	0	0	0
Finland	0	0	0	0	0	329	329
France	73,581	89,731	18,439	39,457	34,124	571,399	38,311
Germany	22,543	0	0	8,229	14,314	7,113	7,112
Greece	9,988	9,896	600	6,781	3,207	69,031	2,869
Haiti	19	36	23	11	8	115	9
India	21,021	14,075	34,143	14,064	6,956	122,518	14,139
Indonesia	805	717	0	0	805	6,579	3,256
Israel	0	0	0	0	0	0	0
Italy	27,637	20,666	0	17,555	10,082	116,034	6,992
Jamaica	268	197	6,073	161	107	1,516	147
Japan	31,755	31,741	82,603	14,058	17,696	209,220	20,535
Jordan	0	0	0	0	0	0	0
Kuwait	0	5,277	0	0	0	57,018	0
Lithuania	6,713	6,649	6,851	0	6,713	77,212	3,281
Malaysia	0	0	0	0	0	0	0
Malta	2,592	2,345	0	0	2,592	5,273	0
Mexico	3,219	0	13,354	0	3,219	3,832	539
Netherlands	75,754	47,869	25,726	39,301	36,453	378,329	39,893
Nicaragua	0	0	0	0	0	0	0
Pakistan	0	0	3,682	0	0	3,074	0
Panama	2,718	6,324	516	0	2,718	13,759	249
Poland	21,885	11,170	7,099	10,347	11,538	127,404	13,885
Portugal	12,953	6,571	3,360	6,138	6,816	69,583	10,025
Singapore	0	0	3,688	0	0	22,980	0
South Korea	47,180	49,313	74,030	22,672	24,507	292,732	24,700
Spain	46,125	88,738	11,110	32,138	13,987	426,657	33,847
Taiwan	10,028	12,326	10,319	6,557	3,471	106,738	9,203
Thailand	5,567	8,370	0	1,829	3,738	25,988	0
Turkiye	49,569	88,778	47,310	13,444	36,126	192,067	17,979
United Arab Emirates	0	0	0	0	0	0	0
United Kingdom	134,734	85,361	55,779	71,702	63,032	464,462	69,332
By truck							
Canada	0	17	0	0	0	76	8
Mexico	239	304	146	106	133	1,552	160
Re-exports							
By vessel							
Argentina	0	0	0	0	0	0	0
Brazil	0	0	0	0	0	0	0
Japan	0	0	0	0	0	0	0
South Korea	0	0	0	0	0	0	0
United Kingdom	0	0	0	0	0	0	0
Total LNG exports	**663,430**	**670,557**	**513,589**	**326,275**	**337,155**	**3,865,643**	**339,960**
CNG							
Canada	*	0	64	*	*	2	0
Total CNG exports	*****	**0**	**64**	*****	*****	**2**	**0**
Total exports	**1,176,761**	**1,157,263**	**987,520**	**573,123**	**603,639**	**6,899,616**	**597,316**

See footnotes at end of table.

Table 5. U.S. natural gas exports, 2021-2023

volumes in million cubic feet; prices in dollars per thousand cubic feet – continued

	2022						
	November	October	September	August	July	June	May
Exports							
Volume (million cubic feet)							
Pipeline							
Canada	90,179	72,738	61,926	75,220	69,774	70,105	79,214
Mexico	160,986	171,766	169,159	181,124	188,178	181,700	185,965
Total pipeline exports	**251,165**	**244,505**	**231,086**	**256,344**	**257,951**	**251,805**	**265,179**
LNG							
Exports							
By vessel							
Antigua and Barbuda	2	2	3	2	2	3	2
Argentina	0	0	0	2,202	9,448	25,246	20,111
Bahamas	35	40	43	53	45	47	42
Bangladesh	0	0	0	0	0	0	3,346
Barbados	1	0	0	0	0	0	0
Belgium	0	7,190	9,165	3,589	0	7,023	3,441
Brazil	0	3,439	0	10,542	5,192	3,857	15,303
Chile	0	0	3,365	0	6,917	0	9,943
China	17,308	22,598	10,275	10,272	784	7,329	0
Colombia	0	3,699	0	606	0	912	0
Croatia	5,122	2,922	9,073	7,824	4,600	7,925	8,543
Dominican Republic	0	3,469	3,196	3,357	6,532	5,838	4,964
Egypt	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0
France	50,655	41,959	57,943	33,885	53,443	37,564	47,150
Germany	1	0	0	0	0	0	0
Greece	421	4,424	0	10,763	12,922	9,633	12,650
Haiti	0	0	8	11	8	13	9
India	10,138	7,005	10,528	10,265	13,902	10,653	7,152
Indonesia	505	625	509	967	0	0	0
Israel	0	0	0	0	0	0	0
Italy	3,205	0	8,355	15,462	9,914	7,137	21,696
Jamaica	137	144	240	110	121	48	144
Japan	24,396	10,684	7,005	20,156	18,189	21,561	24,024
Jordan	0	0	0	0	0	0	0
Kuwait	0	3,299	7,038	6,415	5,382	8,105	14,204
Lithuania	3,708	7,072	3,541	7,579	7,947	6,729	11,237
Malaysia	0	0	0	0	0	0	0
Malta	2,928	0	0	0	0	0	0
Mexico	0	0	0	0	0	3,292	0
Netherlands	20,645	39,703	30,924	50,020	32,637	34,420	28,902
Nicaragua	0	0	0	0	0	0	0
Pakistan	0	0	0	0	0	0	0
Panama	3,833	0	0	0	0	623	1,192
Poland	3,453	7,095	16,917	6,885	17,780	14,282	18,224
Portugal	3,732	7,005	5,806	3,202	6,412	5,582	3,888
Singapore	0	6,628	0	0	6,275	3,352	0
South Korea	14,069	38,844	19,736	36,033	34,342	25,054	17,538
Spain	26,445	26,369	21,263	26,140	34,396	29,639	40,337
Taiwan	3,592	9,041	9,753	8,901	9,353	6,892	15,975
Thailand	0	0	3,673	3,607	0	6,920	3,419
Turkiye	31,430	10,333	5,458	0	0	7,542	7,281
United Arab Emirates	0	0	0	0	0	0	0
United Kingdom	76,693	46,040	51,467	21,263	3,797	3,326	10,608
By truck							
Canada	0	19	0	0	0	8	8
Mexico	153	175	94	103	76	105	115
Re-exports							
By vessel							
Argentina	0	0	0	0	0	0	0
Brazil	0	0	0	0	0	0	0
Japan	0	0	0	0	0	0	0
South Korea	0	0	0	0	0	0	0
United Kingdom	0	0	0	0	0	0	0
Total LNG exports	**302,608**	**309,823**	**295,379**	**300,215**	**300,415**	**300,659**	**351,448**
CNG							
Canada	*	1	*	*	1	*	0
Total CNG exports	*****	**1**	*****	*****	**1**	*****	**0**
Total exports	**553,774**	**554,328**	**526,465**	**556,559**	**558,367**	**552,464**	**616,627**

See footnotes at end of table.

Table 5. U.S. natural gas exports, 2021-2023

volumes in million cubic feet; prices in dollars per thousand cubic feet – continued

	2022					2021	
	April	March	February	January	Total	December	November
Exports							
Volume (million cubic feet)							
Pipeline							
Canada	80,475	105,074	74,630	81,577	937,124	108,568	85,136
Mexico	176,440	169,885	155,032	175,467	2,154,457	166,956	165,449
Total pipeline exports	**256,916**	**274,958**	**229,662**	**257,045**	**3,091,580**	**275,524**	**250,585**
LNG							
Exports							
By vessel							
Antigua and Barbuda	3	2	0	2	8	3	2
Argentina	9,933	0	0	0	83,449	2,077	0
Bahamas	34	43	31	34	486	36	34
Bangladesh	0	3,421	5,896	0	37,734	0	0
Barbados	0	34	31	28	297	34	27
Belgium	7,341	17,743	7,691	13,786	5,584	0	0
Brazil	3,448	2,236	10,660	17,322	307,714	24,246	10,715
Chile	3,530	3,214	0	3,162	121,881	2,938	2,956
China	10,217	7,527	3,357	0	453,304	17,050	50,228
Colombia	0	0	0	486	2,247	0	0
Croatia	6,763	3,358	5,870	9,084	36,133	3,117	9,416
Dominican Republic	3,645	6,530	0	6,647	53,095	5,969	2,780
Egypt	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0
France	56,343	64,415	39,646	50,084	170,780	33,892	10,021
Germany	0	0	0	0	0	0	0
Greece	1,336	4,116	8,094	1,802	39,708	5,305	7,629
Haiti	11	10	16	20	137	4	8
India	14,223	10,438	7,210	6,866	196,218	3,203	14,807
Indonesia	0	0	717	0	3,269	1,218	456
Israel	0	0	0	0	8,906	0	0
Italy	15,519	7,088	13,629	7,037	34,210	0	0
Jamaica	135	92	111	86	25,276	113	715
Japan	13,231	17,697	10,214	21,527	354,948	24,297	33,947
Jordan	0	0	0	0	0	0	0
Kuwait	7,298	0	5,277	0	34,476	0	0
Lithuania	13,770	5,700	3,131	3,518	30,919	0	0
Malaysia	0	0	0	0	0	0	0
Malta	0	0	2,345	0	5,427	0	0
Mexico	0	0	0	0	15,200	0	0
Netherlands	28,395	24,922	31,591	16,279	174,339	23,354	8,829
Nicaragua	0	0	0	0	1	0	0
Pakistan	3,074	0	0	0	45,818	0	2,490
Panama	1,536	0	3,069	3,255	8,436	0	0
Poland	13,882	3,831	7,475	3,695	56,320	7,159	7,068
Portugal	6,632	10,728	3,703	2,868	65,865	9,630	5,380
Singapore	0	6,725	0	0	20,918	0	3,728
South Korea	13,813	19,289	27,489	21,824	453,483	38,201	30,787
Spain	40,259	59,224	39,359	49,379	215,062	32,579	22,821
Taiwan	9,541	12,161	6,115	6,211	99,350	12,034	3,404
Thailand	0	0	4,880	3,490	14,548	0	0
Turkiye	6,637	16,629	43,697	45,081	188,849	38,420	47,330
United Arab Emirates	0	0	0	0	0	0	0
United Kingdom	39,775	56,799	25,301	60,060	195,046	60,315	30,648
By truck							
Canada	15	0	4	13	128	20	8
Mexico	122	144	157	148	1,250	148	160
Re-exports							
By vessel							
Argentina	0	0	0	0	0	0	0
Brazil	0	0	0	0	0	0	0
Japan	0	0	0	0	0	0	0
South Korea	0	0	0	0	0	0	0
United Kingdom	0	0	0	0	0	0	0
Total LNG exports	**330,463**	**364,116**	**316,766**	**353,791**	**3,560,818**	**345,363**	**306,397**
CNG							
Canada	0	*	0	0	211	0	0
Total CNG exports	**0**	*	**0**	**0**	**211**	**0**	**0**
Total exports	**587,378**	**639,074**	**546,428**	**610,836**	**6,652,609**	**620,886**	**556,982**

See footnotes at end of table.

Table 5. U.S. natural gas exports, 2021-2023

volumes in million cubic feet; prices in dollars per thousand cubic feet – continued

	2021						
	October	September	August	July	June	May	April
Exports							
Volume (million cubic feet)							
Pipeline							
Canada	62,464	72,023	71,586	68,264	69,528	70,561	74,567
Mexico	184,472	178,746	193,710	197,623	198,242	192,549	182,918
Total pipeline exports	**246,936**	**250,769**	**265,296**	**265,887**	**267,770**	**263,110**	**257,485**
LNG							
Exports							
By vessel							
Antigua and Barbuda	0	3	0	0	0	0	0
Argentina	0	1,950	14,363	22,798	19,312	16,226	4,485
Bahamas	36	43	56	46	48	45	46
Bangladesh	0	3,276	7,085	0	3,493	6,948	10,219
Barbados	25	33	27	31	22	19	30
Belgium	0	0	0	0	0	2,100	0
Brazil	40,769	38,282	34,204	39,637	32,293	19,726	11,615
Chile	6,364	7,929	16,262	19,913	0	17,598	10,293
China	42,202	48,584	51,662	42,222	42,319	37,731	50,474
Colombia	0	436	919	0	0	0	892
Croatia	0	0	2,980	3,299	2,923	3,364	3,666
Dominican Republic	5,619	0	5,901	1,806	4,670	5,283	2,905
Egypt	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0
France	9,333	6,578	7,111	0	3,683	11,926	36,120
Germany	0	0	0	0	0	0	0
Greece	1,515	799	3,607	6,651	0	6,796	0
Haiti	17	10	24	8	18	12	3
India	10,548	23,941	20,592	13,090	16,503	28,259	13,752
Indonesia	477	1,118	0	0	0	0	0
Israel	0	2,855	0	0	0	0	3,225
Italy	0	0	3,401	6,826	3,425	2,923	6,896
Jamaica	1,858	2,931	2,907	0	2,927	2,925	2,370
Japan	37,666	10,290	19,979	24,895	39,783	25,058	28,756
Jordan	0	0	0	0	0	0	0
Kuwait	6,193	10,333	3,298	0	7,126	0	3,705
Lithuania	0	3,282	1,677	6,469	3,285	3,049	3,078
Malaysia	0	0	0	0	0	0	0
Malta	0	2,498	0	0	0	0	2,928
Mexico	1,088	0	0	758	0	0	0
Netherlands	17,157	10,424	7,347	10,597	3,030	26,611	17,060
Nicaragua	0	0	0	1	0	0	0
Pakistan	3,138	9,642	3,319	13,428	3,376	0	3,323
Panama	911	0	1,390	0	0	2,341	0
Poland	3,270	0	0	6,619	10,635	3,581	7,382
Portugal	10,459	3,696	6,382	3,296	5,538	10,765	7,358
Singapore	0	0	0	3,449	0	3,089	3,660
South Korea	33,836	31,375	50,101	39,314	55,918	46,033	21,683
Spain	35,638	31,274	23,068	8,630	7,833	5,234	22,974
Taiwan	7,123	5,789	6,728	20,653	3,097	10,157	6,594
Thailand	0	0	3,707	0	0	3,453	7,388
Turkiye	19,385	24,176	0	5,591	0	3,017	0
United Arab Emirates	0	0	0	0	0	0	0
United Kingdom	3,302	3,099	0	0	0	10,586	13,877
By truck							
Canada	8	19	18	16	7	18	15
Mexico	182	150	147	97	105	48	48
Re-exports							
By vessel							
Argentina	0	0	0	0	0	0	0
Brazil	0	0	0	0	0	0	0
Japan	0	0	0	0	0	0	0
South Korea	0	0	0	0	0	0	0
United Kingdom	0	0	0	0	0	0	0
Total LNG exports	**298,119**	**284,813**	**298,262**	**300,143**	**271,368**	**314,922**	**306,818**
CNG							
Canada	0	0	14	16	27	25	29
Total CNG exports	**0**	**0**	**14**	**16**	**27**	**25**	**29**
Total exports	**545,055**	**535,583**	**563,572**	**566,046**	**539,165**	**578,056**	**564,333**

See footnotes at end of table.

Table 5. U.S. natural gas exports, 2021-2023

volumes in million cubic feet; prices in dollars per thousand cubic feet – continued

	2021		
	March	February	January
Exports			
Volume (million cubic feet)			
Pipeline			
Canada	91,301	78,198	84,927
Mexico	183,051	137,381	173,360
Total pipeline exports	**274,352**	**215,579**	**258,287**
LNG			
Exports			
By vessel			
Antigua and Barbuda	0	0	0
Argentina	2,238	0	0
Bahamas	39	29	28
Bangladesh	3,566	0	3,148
Barbados	14	19	17
Belgium	3,484	0	0
Brazil	21,977	13,118	21,132
Chile	21,320	6,524	9,784
China	28,476	3,415	38,940
Colombia	0	0	0
Croatia	7,367	0	0
Dominican Republic	5,577	5,689	6,895
Egypt	0	0	0
Finland	0	0	0
France	33,678	14,851	3,587
Germany	0	0	0
Greece	6,805	0	600
Haiti	10	11	12
India	17,381	13,776	20,367
Indonesia	0	0	0
Israel	2,826	0	0
Italy	10,739	0	0
Jamaica	2,458	2,365	3,708
Japan	27,673	18,271	64,331
Jordan	0	0	0
Kuwait	3,821	0	0
Lithuania	3,228	6,851	0
Malaysia	0	0	0
Malta	0	0	0
Mexico	0	13,354	0
Netherlands	24,204	22,777	2,949
Nicaragua	0	0	0
Pakistan	3,421	0	3,682
Panama	3,279	0	516
Poland	3,507	7,099	0
Portugal	0	3,360	0
Singapore	3,303	0	3,688
South Korea	32,203	18,094	55,936
Spain	13,900	3,733	7,377
Taiwan	13,450	0	10,319
Thailand	0	0	0
Turkiye	3,619	20,652	26,659
United Arab Emirates	0	0	0
United Kingdom	17,440	34,343	21,436
By truck			
Canada	0	0	0
Mexico	19	63	83
Re-exports			
By vessel			
Argentina	0	0	0
Brazil	0	0	0
Japan	0	0	0
South Korea	0	0	0
United Kingdom	0	0	0
Total LNG exports	**321,023**	**208,394**	**305,196**
CNG			
Canada	36	32	32
Total CNG exports	**36**	**32**	**32**
Total exports	**595,411**	**424,004**	**563,515**

See footnotes at end of table.

Table 7. Marketed production of natural gas in selected states and the Federal Gulf of Mexico, 2018-2023

million cubic feet

Year and month	Alaska	Arkansas	California	Colorado	Kansas	Louisiana	Montana	New Mexico	North Dakota	Ohio
2018 total	**341,315**	**589,985**	**202,617**	**1,847,402**	**201,391**	**2,832,404**	**43,530**	**1,493,082**	**706,552**	**2,403,382**
2019 total	**329,361**	**524,757**	**196,823**	**1,986,916**	**183,087**	**3,212,318**	**43,534**	**1,769,086**	**850,826**	**2,651,631**
2020 total	**338,329**	**480,982**	**170,579**	**1,990,462**	**163,356**	**3,206,163**	**37,963**	**1,948,168**	**882,443**	**2,378,902**
2021										
January	31,667	39,285	11,467	160,766	12,900	276,873	3,292	173,929	83,193	193,911
February	28,365	30,183	10,846	143,192	10,142	223,268	2,859	144,804	70,129	175,146
March	31,483	42,466	12,136	157,254	13,251	282,668	3,299	180,669	83,243	193,911
April	29,514	37,756	11,791	156,092	12,842	273,643	3,078	178,912	82,917	185,964
May	29,005	38,563	12,342	162,416	13,063	283,576	3,328	187,994	85,384	192,163
June	27,715	36,918	11,885	154,617	12,716	276,142	2,975	184,732	82,520	185,964
July	26,280	38,045	12,141	160,287	13,215	299,939	3,321	195,904	80,072	189,515
August	27,864	37,753	12,076	158,586	13,224	292,784	3,343	199,365	84,297	189,515
September	28,534	36,508	11,617	153,270	12,769	290,606	3,283	194,290	85,041	183,401
October	30,458	37,626	11,655	160,291	13,213	307,744	3,460	200,567	87,446	199,379
November	30,735	36,079	11,279	155,653	12,722	310,363	3,291	195,365	87,089	192,947
December	33,039	37,006	11,371	157,031	12,928	313,823	3,163	201,176	87,692	199,379
Total	**354,660**	**448,187**	**140,604**	**1,879,457**	**152,986**	**3,431,429**	**38,693**	**2,237,706**	**999,025**	**2,281,193**
2022										
January	32,865	E37,302	E11,186	E151,815	E12,255	E311,786	E3,092	E196,780	E81,699	E196,005
February	30,014	E33,465	E9,336	E138,369	E10,930	E284,177	E2,801	E183,345	E74,429	E172,829
March	32,473	E37,518	E11,388	E155,246	E12,194	E313,229	E3,214	E219,028	E86,190	E187,872
April	30,910	E36,247	E11,212	E151,319	E12,037	E313,229	E3,042	E215,953	E68,484	E179,444
May	31,677	E37,042	E11,489	E155,982	E12,469	E340,363	E3,152	E223,843	E80,563	E189,214
June	28,644	E35,573	E11,057	E150,046	E12,037	E335,290	E3,464	E214,602	E86,013	E190,021
July	29,654	E36,446	E11,651	E153,067	E12,457	E345,647	E3,465	E227,099	E89,572	E193,519
August	29,380	E36,659	E11,970	E154,806	E12,526	E355,454	E3,634	E230,690	E88,700	E196,604
September	29,288	E34,405	E11,100	E151,415	E11,565	E346,479	E3,572	E233,548	E88,797	E189,795
October	31,122	E35,354	E11,358	E155,354	E12,749	E363,490	E3,540	E247,855	E90,617	E195,926
November	30,934	E33,777	E10,905	E151,562	E12,036	E354,732	E3,342	E237,280	E84,563	E195,571
December	36,181	RE33,198	RE11,167	RE150,545	RE11,556	RE355,671	RE3,277	RE249,384	RE76,094	RE186,258
Total	**373,141**	**RE426,986**	**RE133,818**	**RE1,819,526**	**RE144,811**	**RE4,019,547**	**RE39,595**	**RE2,679,408**	**RE995,720**	**RE2,273,058**
2023										
January	33,391	RE34,791	RE11,053	RE151,941	RE11,773	RE363,104	RE3,506	RE252,649	RE82,292	RE198,191
February	30,726	E31,084	E10,039	E136,397	E10,513	E353,158	E3,211	E232,437	E79,695	E174,486
2023 2-month YTD	**64,117**	**E65,875**	**E21,091**	**E288,338**	**E22,286**	**E716,262**	**E6,718**	**E485,086**	**E161,987**	**E372,677**
2022 2-month YTD	**62,879**	**E70,767**	**E20,522**	**E290,184**	**E23,186**	**E595,963**	**E5,893**	**E380,125**	**E156,128**	**E368,835**
2021 2-month YTD	**60,032**	**69,469**	**22,313**	**303,958**	**23,042**	**500,141**	**6,152**	**318,732**	**153,322**	**369,057**

See footnotes at end of table.

Table 7. Marketed production of natural gas in selected states and the Federal Gulf of Mexico, 2018-2023

million cubic feet – continued

Year and month	Oklahoma	Pennsylvania	Texas	Utah	West Virginia	Wyoming	Other states	Federal Gulf of Mexico	U.S. total
2018 total	**2,875,787**	**6,264,832**	**8,041,010**	**295,826**	**1,771,698**	**1,637,517**	**485,675**	**974,863**	**33,008,867**
2019 total	**3,036,052**	**6,896,792**	**9,378,489**	**271,808**	**2,155,214**	**1,488,854**	**456,024**	**1,015,343**	**36,446,918**
2020 total	**2,786,366**	**7,148,295**	**9,336,110**	**241,989**	**2,592,319**	**1,306,368**	**404,391**	**789,262**	**36,202,446**
2021									
January	221,544	652,640	798,426	19,392	234,432	97,657	35,223	71,772	3,118,370
February	163,094	585,371	609,757	18,126	208,571	89,337	31,366	64,024	2,608,580
March	220,130	645,407	826,381	20,404	227,218	95,164	34,671	74,200	3,143,955
April	214,334	615,899	820,570	19,783	229,075	92,340	34,427	69,762	3,068,700
May	223,372	635,584	844,723	20,313	234,118	94,341	35,868	72,053	3,168,206
June	213,314	616,270	815,947	19,502	227,987	90,259	29,234	67,429	3,056,126
July	221,002	638,200	858,526	20,601	229,376	93,644	30,467	71,744	3,182,278
August	222,329	646,169	863,509	20,347	241,373	89,749	32,659	61,377	3,196,320
September	216,455	622,275	855,425	19,928	216,452	91,662	30,611	34,559	3,086,687
October	223,093	645,126	873,479	20,457	240,446	93,162	37,663	60,037	3,245,301
November	214,361	646,233	836,104	20,014	229,812	90,176	32,023	65,610	3,169,856
December	218,805	677,331	872,543	20,538	241,569	91,741	36,962	67,903	3,283,998
Total	**2,571,834**	**7,626,504**	**9,875,390**	**239,405**	**2,760,429**	**1,109,232**	**401,172**	**780,471**	**37,328,378**
2022									
January	E213,419	E660,345	E853,214	E20,789	E234,795	E85,192	E31,292	E65,454	E3,199,287
February	E192,596	E581,432	E766,441	E18,966	E209,707	E76,605	E28,839	E55,884	E2,870,165
March	E219,732	E635,076	E871,961	E21,315	E239,344	E84,319	E31,519	E63,547	E3,225,163
April	E223,078	E616,181	E856,759	E21,254	E235,580	E81,405	E29,705	E65,810	E3,151,649
May	E237,032	E640,189	E887,465	E22,840	E247,179	E82,036	E31,011	E62,326	E3,295,871
June	E230,337	E616,632	E862,817	E22,278	E240,568	E80,395	E31,237	E63,627	E3,214,637
July	E239,295	E641,726	E887,919	E23,066	E251,625	E85,506	E32,355	E66,393	E3,330,463
August	E238,265	E632,014	E897,401	E23,500	E255,603	E81,633	E32,294	E68,280	E3,349,415
September	E236,726	E613,657	E882,979	E22,110	E245,734	E81,528	E31,485	E66,585	E3,280,768
October	E241,688	E629,461	E915,309	E22,164	E251,647	E87,030	E31,961	E67,352	E3,393,976
November	E235,873	E605,505	E885,128	E21,326	E255,298	E84,565	E30,838	E63,917	E3,297,153
December	RE236,429	RE611,037	RE914,687	RE22,688	RE253,533	RE81,550	E30,737	RE63,662	RE3,327,655
Total	**RE2,744,470**	**RE7,483,257**	**RE10,482,08**	**RE262,297**	**RE2,920,613**	**RE991,764**	**E373,272**	**RE772,838**	**RE38,936,202**
2023									
January	RE241,319	RE633,182	RE927,538	RE22,369	RE256,931	RE80,690	RE31,512	RE68,315	RE3,404,546
February	E217,674	E561,066	E833,019	E20,098	E231,527	E72,158	E27,571	E60,053	E3,084,913
2023 2-month YTD	**E458,993**	**E1,194,248**	**E1,760,557**	**E42,467**	**E488,458**	**E152,848**	**E59,083**	**E128,368**	**E6,489,459**
2022 2-month YTD	**E406,015**	**E1,241,777**	**E1,619,655**	**E39,756**	**E444,503**	**E161,797**	**E60,132**	**E121,338**	**E6,069,452**
2021 2-month YTD	**384,639**	**1,238,010**	**1,408,183**	**37,518**	**443,003**	**186,995**	**66,589**	**135,796**	**5,726,950**

E Estimated data.

RE Revised estimated data.

Source: 2018-2021: U.S. Energy Information Administration (EIA), *Natural Gas Annual 2021*, Bureau of Safety and Environmental Enforcement (BSEE), IHS Markit, and Enverus. January 2022 through current month: Form EIA-914, *Monthly Crude Oil and Lease Condensate, and Natural Gas Production Report*; and EIA computations.

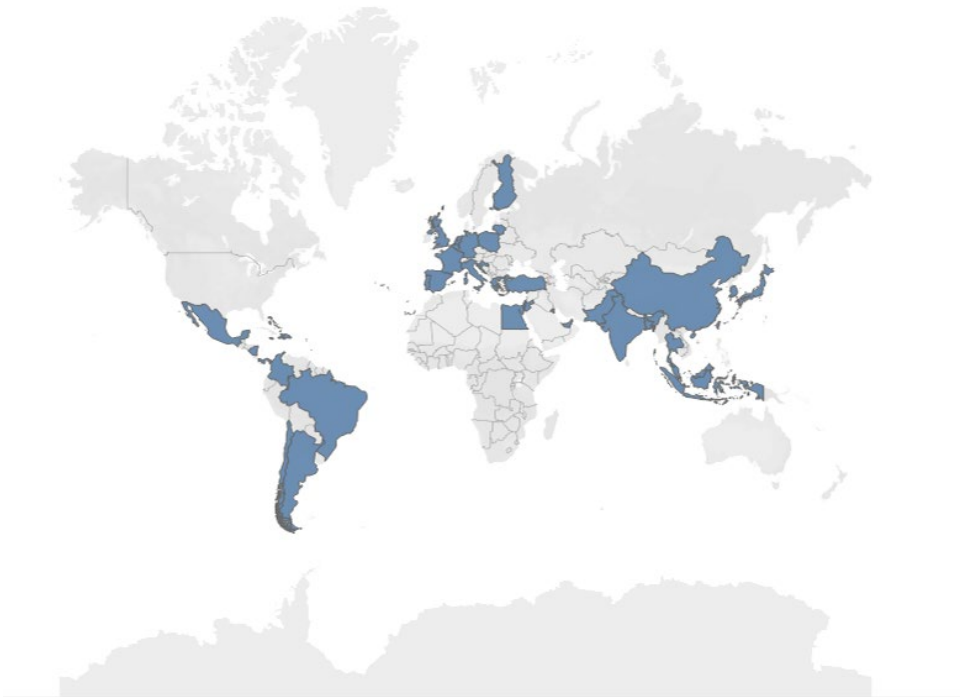
Note: For 2022 forward, we estimate state monthly marketed production from gross withdrawals using historical relationships between the two. We collect data for Arkansas, California, Colorado, Kansas, Louisiana, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Pennsylvania, Texas, Utah, West Virginia, Wyoming, and federal offshore Gulf of Mexico individually on the EIA-914 report. The "other states" category comprises states/areas not individually collected on the EIA-914 report (Alabama, Arizona, Federal Offshore Pacific, Florida, Idaho, Illinois, Indiana, Kentucky, Maryland, Michigan, Mississippi, Missouri, Nebraska, Nevada, New York, Oregon, South Dakota, Tennessee, and Virginia). Before 2022, Federal Offshore Pacific is included in California. We obtain all data for Alaska directly from the state. Monthly preliminary state-level data for all states not collected individually on the EIA-914 report are available after the final annual reports for these series are collected and processed. Final annual data are generally available in the third quarter of the following year. The sum of individual states may not equal total U.S. volumes because of independent rounding.

U.S. DEPARTMENT OF ENERGY | Fossil Energy and Carbon Management

OFFICE OF RESOURCE SUSTAINABILITY

LNG Monthly

Published April 2023



Map shows Countries of Destination of Exports of Domestically-Produced LNG
(February 2016 through February 2023)

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Summary

Overview of Activity for February 2023

- **Top five countries of destination, representing 63.0% of total U.S. LNG exports in February 2023**
  - United Kingdom (71.7 Bcf), France (39.5 Bcf), Netherlands (39.3 Bcf), Spain (32.1 Bcf), and South Korea (22.7 Bcf)
- **326.0 Bcf of exports in February 2023**
  - 3.2% decrease from January 2023
  - 3.0% more than February 2022
- **100 cargos shipped in February 2023**
  - Sabine Pass (34), Cameron (33), Corpus Christi (18), Cove Point (6), Freeport (6), and Elba (3)
  - 102 cargos in January 2023
  - 93 cargos in February 2022

1a. Table of Exports of Domestically-Produced LNG Delivered by Region (Cumulative from February 2016 through February 2023)

Region	Number of Countries Receiving Per Region	Volume Exported (Bcf)	Percentage Receipts of Total Volume Exported (%)	Number of Cargos*
East Asia and Pacific	8	4,589.9	32.2%	1358
Europe and Central Asia	15	6,294.0	44.1%	1969
Latin America and the Caribbean**	13	2,154.9	15.1%	769
Middle East and North Africa	5	376.6	2.6%	110
South Asia	3	847.8	5.9%	252
Sub-Saharan Africa	0	0.0	0.0%	0
Total LNG Exports	**44**	**14,263.3**	**100.0%**	**4,458**

*Split cargos counted as both individual cargos and countries

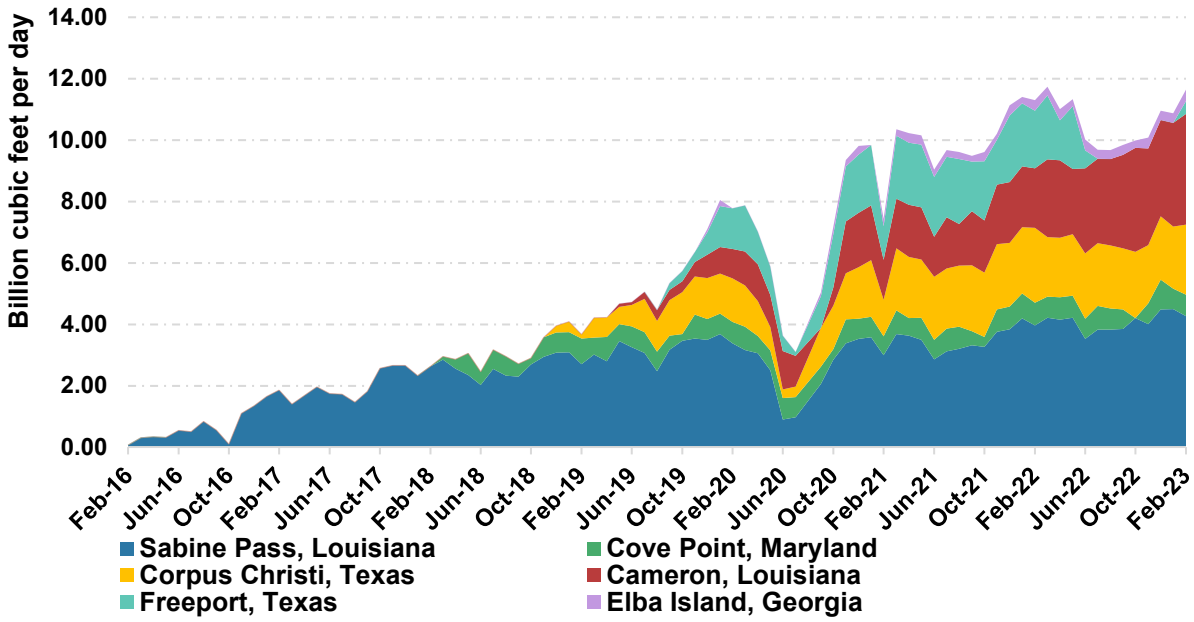
**Number of cargos does not include the shipments by ISO container

1b. Shipments of Domestically-Produced LNG Delivered – by Country
(Cumulative from February 2016 through February 2023)

	Country of Destination	Region	Number of Cargos	Volume (Bcf of Natural Gas)	Percentage of Total U.S LNG Exports (%)
1.	South Korea*	East Asia and Pacific	509	1,769.0	12.4%
2.	Japan*	East Asia and Pacific	373	1,274.3	8.9%
3.	United Kingdom*	Europe and Central Asia	339	1,124.0	7.9%
4.	Spain*	Europe and Central Asia	349	1,097.0	7.7%
5.	France*	Europe and Central Asia	321	1,045.3	7.3%
6.	China*	East Asia and Pacific	294	1,002.8	7.0%
7.	Netherlands*	Europe and Central Asia	242	810.6	5.7%
8.	India*	South Asia	192	651.1	4.6%
9.	Turkiye*	Europe and Central Asia	201	645.0	4.5%
10.	Brazil*	Latin America and the Caribbean	217	608.3	4.3%
11.	Mexico*	Latin America and the Caribbean	165	550.1	3.9%
12.	Chile*	Latin America and the Caribbean	133	422.6	3.0%
13.	Italy*	Europe and Central Asia	106	339.0	2.4%
14.	Taiwan*	East Asia and Pacific	106	333.6	2.3%
15.	Poland*	Europe and Central Asia	88	290.7	2.0%
16.	Portugal*	Europe and Central Asia	86	274.4	1.9%
17.	Argentina*	Latin America and the Caribbean	111	267.4	1.9%
18.	Greece*	Europe and Central Asia	77	185.5	1.3%
19.	Dominican Republic*	Latin America and the Caribbean	68	164.9	1.2%
20.	Kuwait	Middle East and North Africa	45	156.4	1.1%
21.	Lithuania	Europe and Central Asia	50	154.0	1.1%
22.	Belgium*	Europe and Central Asia	47	152.6	1.1%
23.	Pakistan*	South Asia	40	128.9	0.9%
24.	Croatia	Europe and Central Asia	42	125.6	0.9%
25.	Jordan*	Middle East and North Africa	36	124.2	0.9%
26.	Singapore*	East Asia and Pacific	33	107.4	0.8%
27.	Thailand*	East Asia and Pacific	26	88.5	0.6%
28.	Bangladesh*	South Asia	20	67.8	0.5%
29.	Jamaica*	Latin America and the Caribbean	26	57.4	0.4%
30.	Panama*	Latin America and the Caribbean	31	54.7	0.4%
31.	United Arab Emirates	Middle East and North Africa	15	51.1	0.4%
32.	Germany	Europe and Central Asia	9	29.7	0.2%
33.	Israel*	Middle East and North Africa	9	28.0	0.2%
34.	Colombia*	Latin America and the Caribbean	18	24.2	0.2%
35.	Malta*	Europe and Central Asia	11	20.1	0.1%
36.	Egypt*	Middle East and North Africa	5	16.9	0.1%
37.	Indonesia*	East Asia and Pacific	16	10.7	0.1%
38.	Malaysia	East Asia and Pacific	1	3.7	0.0%
39.	Finland	Europe and Central Asia	1	0.3	0.0%
	Total Exports by Vessel		**4,458**	**14,258.1**	
	Germany	Europe and Central Asia	1	0.0	0.0%
40.	Antigua and Barbuda	Latin America and the Caribbean	40	0.0	0.0%
41.	Nicaragua	Latin America and the Caribbean	1	0.0	0.0%
42.	Haiti	Latin America and the Caribbean	134	0.4	0.0%
43.	Barbados	Latin America and the Caribbean	305	1.3	0.0%
	Jamaica	Latin America and the Caribbean	161	1.6	0.0%
44.	Bahamas	Latin America and the Caribbean	686	1.9	0.0%
	Total Exports by ISO		**1328**	**5.2**	
	Total Exports by Vessel and ISO		**5,786**	**14,263.3**	

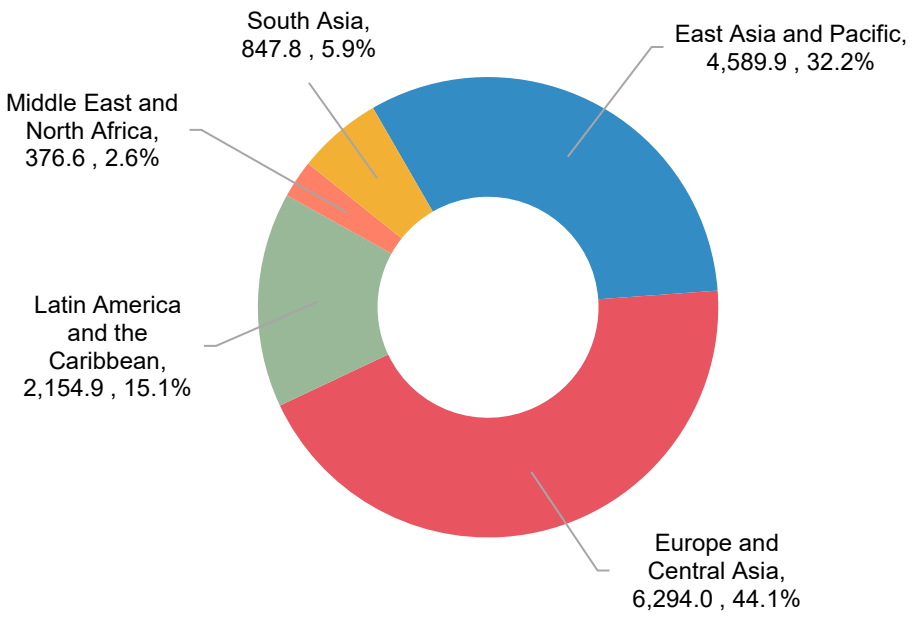
Note:
Volume and Number of Cargos are the cumulative totals of each individual Country of Destination by Region starting from February 2016.
Jamaica has received U.S. LNG exports by both vessel and ISO container. The volumes are totaled separately
* Split cargos counted as both individual cargos and countries.
Vessel = LNG Exports by Vessel and ISO container = LNG Exports by Vessel in ISO Containers.
Does not include re-exports of previously-imported LNG. See table 2c for re-exports data.
Totals may not equal sum of components because of independent rounding.

1c. Domestically-Produced LNG Exported by Point of Exit
(February 2016 through February 2023)



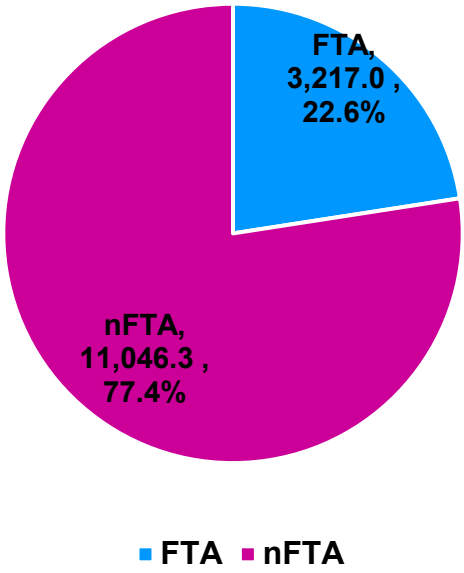
The Cameron, LA point of exit includes exports from Cameron LNG and Venture Global Calcasieu Pass.

1d. Domestically-Produced LNG Exported by Region
(Cumulative from February 2016 through February 2023)
(Bcf, %)



1e. Volumes and Percentages of FTA and nFTA Shipments of Domestically-Produced LNG Delivered
(Cumulative from February 2016 through February 2023)

Volume (Bcf)		Percentage of Total Volume	Number of Countries
FTA	3,217.0	22.6%	8
nFTA	11,046.3	77.4%	36
Total LNG Exports	**14,263.3**	**100.0%**	**44**



Spot cargos total 616.4 Bcf - or 4.3 percent - of the 14,263.3 Bcf total volume of shipments.

These totals are cumulative starting from February 2016 through February 2023 - a cumulative listing of cargos and regions in Table 1b and a cumulative list of FTAs and nFTAs in Table 1h.

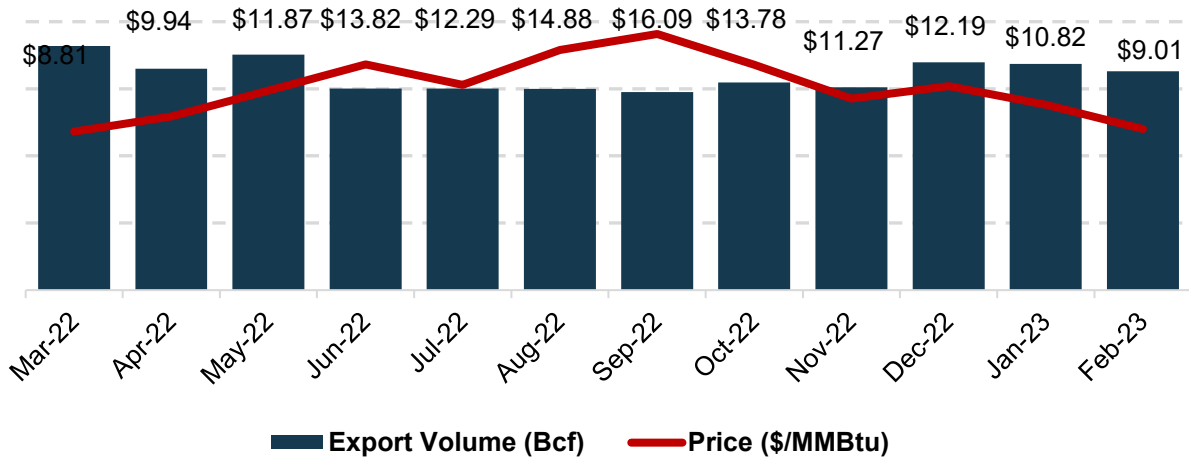
FTA Countries that Require National Treatment for Trade in Natural Gas -As of October 31, 2012, the United States has FTAs that require national treatment for trade in natural gas with Australia, Bahrain, Canada, Chile, Colombia, Dominican Republic, El Salvador, Guatemala, Honduras, Jordan, Mexico, Morocco, Nicaragua, Oman, Panama, Peru, Republic of Korea and Singapore. Panama is the most recent country with which the United States has entered into a FTA that requires national treatment for trade in natural gas, effective October 31, 2012. Not all countries that have a FTA with the United States require national treatment for trade in natural gas (i.e. Costa Rica and Israel). A list of all countries with which the United States has a FTA can be found at: http://www.ustr.gov/trade-agreements/free-trade-agreements.

More information can be found on DOE's website - https://energy.gov/fe/services/natural-gas-regulation/how-obtain-authorization-import-andor-export-natural-gas-and-lng

Totals may not equal sum of components because of independent rounding.

1f. Domestically-Produced LNG Exported – Volume (Bcf) and Weighted Average price ($/MMBtu) by Point of Exit per month

	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Total
Sabine Pass, LA	130.5	124.6	130.7	105.7	118.5	118.7	115.6	130.4	120.1	139.2	139.2	119.5	**1,603.6**
	$7.92	$8.80	$10.93	$12.90	$10.50	$12.71	$13.71	$10.85	$9.26	$10.43	$8.67	$6.72	**$10.19**
Cove Point, MD	21.4	21.8	22.2	19.7	24.2	21.4	18.8	0	20.4	29.8	20.8	19.4	**260.9**
	$8.57	$9.32	$10.85	$12.33	$11.28	$12.36	$13. 61	0	$10.10	$10.98	$8.67	$8.35	**$10.52**
Corpus Christi, TX	60.1	58.3	62.0	63.7	63.1	63.4	59.8	66.8	57.0	64.1	62.6	64.1	**813.2**
	$9.81	$10.48	$11.95	$13. 57	$12.17	$14.70	$15.99	$12.42	$10.36	$10.60	$10.74	$7.06	**$11.58**
Cameron, LA	78.6	75.4	65.8	83.3	85.2	87.2	91.1	104.9	94.1	97.1	104.8	100.8	**1122.7**
	$9.76	$12.33	$14.85	$16.05	$15.15	$18.92	$19.89	$18.38	$14.82	$16.34	$14.33	$12.99	**$15.10**
Freeport, TX	64.5	39.3	63.5	17.3	0	0	0	0	0	0	0	11.6	**248.6**
	$8.42	$9.07	$11.23	$12.83	0	0	0	0	0	0	0	8.23	**$9.79**
Elba Island, GA	8.7	10.8	6.9	10.7	9.1	9.2	9.7	7.4	10.6	9.4	9.4	10.6	**122.2**
	$10.12	$7.93	$9.66	$11.40	$12.20	$11.58	$14.31	$12.53	$9.62	$10.14	$8.81	$10.72	**$10.69**
Total	**363.8**	**330.1**	**351.1**	**300.4**	**300.2**	**299.9**	**295.1**	**309.4**	**302.3**	**339.6**	**336.9**	**326.0**	**4,171.3**
	$8.81	**$9.94**	**$11.87**	**$13.82**	**$12.29**	**$14.88**	**$16.09**	**$13.78**	**$11.27**	**$12.19**	**$10.82**	**$9.01**	**$11.79**



Notes:

Prices are free on board (FOB) and are inclusive of all costs of the LNG up to the point of export, including commodity costs and liquefaction fees.

Does not include re-exports of previously-imported LNG. See table 2c for re-exports data.

Totals may not equal sum of components because of independent rounding.

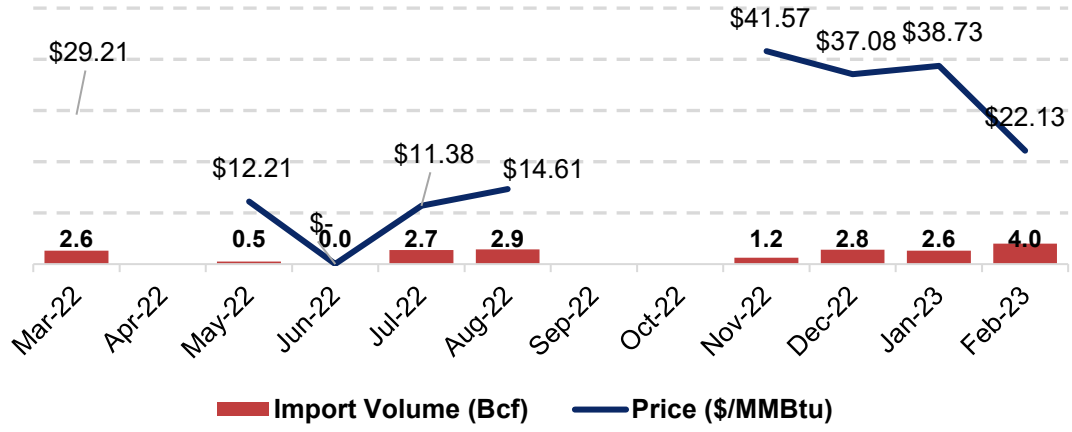
The Cameron, LA point of exit includes exports from Cameron LNG and Venture Global Calcasieu Pass.

W - Withheld to avoid disclosure of individual company data.

DOE has a confidentiality policy for certain data elements collected on Form FE-746R that allows DOE to publish a monthly volume-weighted average price for each point of LNG import or export, but not a price for each individual imported or exported LNG cargo. For additional information, please see the Federal Register Notice concerning this Information Collection Extension at https://www.federalregister.gov/documents/2018/08/30/2018-18829/information-collection-extension.

1g(i). Vessel-Borne Imports of LNG – Volume (Bcf) and Weighted Average price ($/MMBtu) by Point of Entry per month

	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Total
Elba Island, GA	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
Everett, MA	2.6	-	0.5	-	2.7	2.9	-	-	1.2	2.8	2.6	4.0	**19.3**
	$29.21	-	W	-	W	W	-	-	W	W	W	W	**$25.83**
Northeast Gateway, MA	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
Cove Point, MD	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2.6**	-	**0.5**	-	2.7	2.7	-	-	-	-	-	-	**19.3**
	$29.21	-	W	-	W	W	-	-	-	-	-	-	**$25.29**



Notes:

Import prices are landed and include the price of the LNG, the transportation cost to the U.S. terminal, and the cost of offloading the LNG. Landed prices do not include regasification fees.

Totals may not equal sum of components because of independent rounding.

W – Withheld to avoid disclosure of individual company data.

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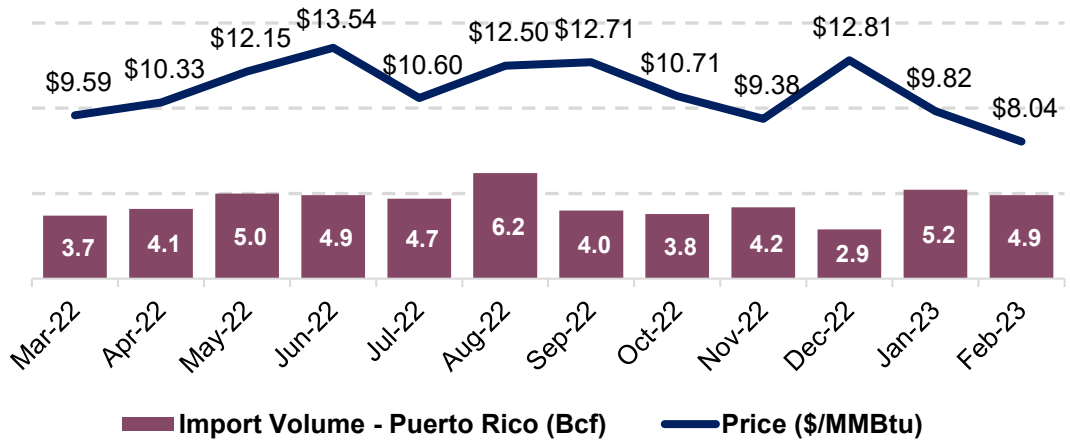
1g(ii). Vessel-Borne Imports of LNG to Puerto Rico – Volume (Bcf) and Weighted Average price ($/MMBtu) per month

	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Total
Puerto Rico	3.7	4.1	5.0	4.9	4.7	6.2	4.0	3.8	4.2	2.9	5.2	4.9	**53.7**
	$9.59	$10.33	$12.15	$13.54	$10.60	$12.50	$12.71	$10.71	$9.38	$12.81	$9.82	$8.04	**$11.02**



Notes:

Import prices are landed and include the price of the LNG, the transportation cost to the U.S. terminal, and the cost of offloading the LNG. Landed prices do not include regasification fees.

Totals may not equal sum of components because of independent rounding.

W - Withheld to avoid disclosure of individual company data.

DOE has a confidentiality policy for certain data elements collected on Form FE-746R that allows DOE to publish a monthly volume-weighted average price for each point of LNG import or export, but not a price for each individual imported or exported LNG cargo. For additional information, please see the Federal Register Notice concerning this Information Collection Extension at https://www.federalregister.gov/documents/2018/08/30/2018-18829/information-collection-extension.

1h. Destination of Domestically-Produced LNG Delivered by Country and Region with Trade Agreement Status (February 2016 through February 2023)

Country of Destination	Region	FTA or nFTA	Type of FTA	Name of FTA
Antigua and Barbuda	Latin America and the Caribbean	nFTA		
Argentina	Latin America and the Caribbean	nFTA		
Bahamas (ISO)	Latin America and the Caribbean	nFTA		
Bangladesh	South Asia	nFTA		
Barbados (ISO)	Latin America and the Caribbean	nFTA		
Belgium	Europe and Central Asia	nFTA		
Brazil	Latin America and the Caribbean	nFTA		
Chile	Latin America and the Caribbean	FTA	Bilateral	United States-Chile Free Trade Agreement
China	East Asia and Pacific	nFTA		
Colombia	Latin America and the Caribbean	FTA	Bilateral	United States- Colombia Trade Promotion Agreement
Croatia	Europe and Central Asia	nFTA		
Dominican Republic	Latin America and the Caribbean	FTA	Multilateral	CAFTA-DR
Egypt	Middle East and North Africa	nFTA		
Finland	Europe and Central Asia	nFTA		
France	Europe and Central Asia	nFTA		
Germany	Europe and Central Asia	nFTA		
Greece	Europe and Central Asia	nFTA		
Haiti	Latin America and the Caribbean	nFTA		
India	South Asia	nFTA		
Indonesia	East Asia and Pacific	nFTA		
Israel[4]	Middle East and North Africa	FTA	Bilateral	United States-Israel Free Trade Agreement
Italy	Europe and Central Asia	nFTA		
Jamaica	Latin America and the Caribbean	nFTA		
Japan	East Asia and Pacific	nFTA		
Jordan	Middle East and North Africa	FTA	Bilateral	United States-Jordan Free Trade Agreement
Kuwait	Middle East and North Africa	nFTA		
Lithuania	Europe and Central Asia	nFTA		
Malaysia	East Asia and Pacific	nFTA		
Malta[1]	Europe and Central Asia	nFTA		
Mexico[2]	Latin America and the Caribbean	FTA	Multilateral	USMCA - United States-Mexico-Canada Agreement[3]
Netherlands	Europe and Central Asia	nFTA		
Nicaragua	Latin America and the Caribbean	FTA		CAFTA-DR
Pakistan	South Asia	nFTA		
Panama	Latin America and the Caribbean	FTA	Bilateral	U.S.- Panama Trade Promotion Agreement
Poland	Europe and Central Asia	nFTA		
Portugal	Europe and Central Asia	nFTA		
Singapore	East Asia and Pacific	FTA	Bilateral	Singapore FTA
South Korea	East Asia and Pacific	FTA	Bilateral	KORUS - U.S.-Korea Free Trade Agreement
Spain	Europe and Central Asia	nFTA		
Taiwan	East Asia and Pacific	nFTA		
Thailand	East Asia and Pacific	nFTA		
Turkey	Europe and Central Asia	nFTA		
United Arab Emirates	Middle East and North Africa	nFTA		
United Kingdom	Europe and Central Asia	nFTA		

Source: Office of the United States Trade Representative and the World Bank

[1]For classification purposes, Malta is included in the Europe and Central Asia region.
[2]For classification purposes, Mexico is included in the Latin America and the Caribbean region.
[3]USMCA entered into force on 1 July 2020. These data previously attributed to the North American Free Trade Agreement (NAFTA).
[4]For classification purposes, the U.S. FTA with Israel does not require national treatment for natural gas, meaning natural gas is not covered as a good or service under the FTA.

Office of Fossil Energy and Carbon Management
Office of Resource Sustainability
Office of Regulation, Analysis, and Engagement
Division of Natural Gas Regulation
Phone: 202-586-7991
Email: ngreports@hq.doe.gov

U.S. DEPARTMENT OF ENERGY | Fossil Energy and Carbon Management
OFFICE OF RESOURCE SUSTAINABILITY

VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(i)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/3/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	ORION SEA	Sabine Pass, Louisiana	3,334,763	
1/3/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Poland	ARISTARCHOS	Sabine Pass, Louisiana	3,390,179	
1/3/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Poland	ARISTARCHOS	Sabine Pass, Louisiana	312,630	
1/4/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	Seapeak Catalunya	Sabine Pass, Louisiana	2,935,893	
1/5/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	China	Transgas Power	Sabine Pass, Louisiana	3,568,977	
1/5/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	LNGShips Athena	Sabine Pass, Louisiana	3,314,567	
1/6/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Seapeak Bahrain	Sabine Pass, Louisiana	3,638,238	
1/7/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Seapeak Vancouver	Sabine Pass, Louisiana	3,590,330	
1/7/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	SM Seahawk	Sabine Pass, Louisiana	3,669,389	
1/8/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Italy	Minerva Limnos	Sabine Pass, Louisiana	3,427,691	
1/8/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Taiwan	Gaslog Wellington	Sabine Pass, Louisiana	3,470,652	
1/9/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Castillo De Merida	Sabine Pass, Louisiana	3,281,713	
1/10/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Kool Orca	Sabine Pass, Louisiana	3,697,138	
1/10/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	BW Paris	Sabine Pass, Louisiana	3,282,140	
1/11/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Maran Gas Ulysses	Sabine Pass, Louisiana	3,686,565	
1/12/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Lithuania	Golar Seal	Sabine Pass, Louisiana	3,401,713	
1/12/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Stena Crystal Sky	Sabine Pass, Louisiana	3,679,996	
1/13/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Global Sealine	Sabine Pass, Louisiana	3,554,815	
1/14/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Ribera del Duero Knutsen	Sabine Pass, Louisiana	3,423,260	
1/14/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Celsius Carolina	Sabine Pass, Louisiana	3,474,186	
1/15/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Maran Gas Spetses	Sabine Pass, Louisiana	3,626,497	
1/16/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Minerva Amorgos	Sabine Pass, Louisiana	3,544,241	
1/18/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Japan	Mu Lan	Sabine Pass, Louisiana	3,674,282	
1/18/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Adam LNG	Sabine Pass, Louisiana	3,288,368	
1/19/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Thailand	Celsius Canberra	Sabine Pass, Louisiana	3,738,448	
1/20/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Croatia	BW Magnolia	Sabine Pass, Louisiana	2,913,046	
1/20/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Pan Asia	Sabine Pass, Louisiana	3,671,050	
1/22/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	NFE Grand	Sabine Pass, Louisiana	2,991,183	
1/22/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Dorado LNG	Sabine Pass, Louisiana	3,699,831	
1/22/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	Golar Arctic	Sabine Pass, Louisiana	2,971,489	
1/23/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	China	Sevilla Knutsen	Sabine Pass, Louisiana	3,643,717	
1/25/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Portugal	Gaslog Sydney	Sabine Pass, Louisiana	3,295,236	
1/25/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Global Sea Spirit	Sabine Pass, Louisiana	3,591,830	
1/26/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Clean Copano	Sabine Pass, Louisiana	4,252,061	
1/27/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Gaslog Westminster	Sabine Pass, Louisiana	3,191,309	
1/27/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	Hyundai Peacepia	Sabine Pass, Louisiana	3,684,501	
1/28/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	Hyundai Ecopia	Sabine Pass, Louisiana	3,140,451	
1/29/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Gaslog Hong Kong	Sabine Pass, Louisiana	3,485,095	
1/31/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Gaslog Gladstone	Sabine Pass, Louisiana	3,289,809	
1/31/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Germany	LNG Schneeweisschen	Sabine Pass, Louisiana	3,738,701	
1/31/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	Grace Freesia	Sabine Pass, Louisiana	3,676,342	
2/2/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Belgium	Flex Volunteer	Sabine Pass, Louisiana	3,663,927	
2/3/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Maran Gas Agamemnon	Sabine Pass, Louisiana	3,593,495	
2/4/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	Asklipios	Sabine Pass, Louisiana	3,569,622	
2/4/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Cool Rider	Sabine Pass, Louisiana	3,291,438	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(i)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
2/5/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	Castillo De Merida	Sabine Pass, Louisiana	3,786,966	
2/6/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Flex Aurora	Sabine Pass, Louisiana	3,658,392	
2/6/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	SM Eagle	Sabine Pass, Louisiana	3,670,866	
2/7/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	Castillo De Caldelas	Sabine Pass, Louisiana	3,199,305	
2/8/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Isabella	Sabine Pass, Louisiana	3,590,033	
2/8/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Global Star	Sabine Pass, Louisiana	3,565,751	
2/9/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	MOL Hestia	Sabine Pass, Louisiana	3,496,629	
2/10/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	Gaslog Geneva	Sabine Pass, Louisiana	3,663,923	
2/10/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Gaslog Windsor	Sabine Pass, Louisiana	3,183,247	
2/11/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Poland	Cool Explorer	Sabine Pass, Louisiana	3,411,536	
2/12/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	ORION SEA	Sabine Pass, Louisiana	3,372,881	
2/13/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Turkiye	Clean Cajun	Sabine Pass, Louisiana	4,173,874	
2/14/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Germany	Seapeak Meridian	Sabine Pass, Louisiana	3,253,699	
2/14/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	Hyundai Princepia	Sabine Pass, Louisiana	3,672,530	
2/15/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	SM Bluebird	Sabine Pass, Louisiana	3,673,727	
2/16/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	Shaolin	Sabine Pass, Louisiana	3,664,044	
2/17/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	France	Stena Crystal Sky	Sabine Pass, Louisiana	3,691,387	
2/18/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Poland	Lech Kaczynski	Sabine Pass, Louisiana	3,518,417	
2/18/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Spain	La Mancha Knutsen	Sabine Pass, Louisiana	3,723,340	
2/19/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	LNGShips Athena	Sabine Pass, Louisiana	3,549,972	
2/20/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Wilforce	Sabine Pass, Louisiana	3,277,459	
2/21/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Croatia	Gaslog Sydney	Sabine Pass, Louisiana	2,887,607	
2/21/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	India	Energy Endeavour	Sabine Pass, Louisiana	3,685,972	
2/22/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Netherlands	Global Sealine	Sabine Pass, Louisiana	3,473,691	
2/23/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Belgium	Gaslog Galveston	Sabine Pass, Louisiana	3,658,345	
2/24/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Italy	Adam LNG	Sabine Pass, Louisiana	3,434,342	
2/25/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Global Sea Spirit	Sabine Pass, Louisiana	3,663,647	
2/27/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	Portugal	Iberica Knutsen	Sabine Pass, Louisiana	2,945,426	
2/27/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-85-LNG	Long-Term	South Korea	K. Mugungwha	Sabine Pass, Louisiana	3,217,937	
2/28/2023	Sabine Pass Liquefaction, LLC	Sabine Pass Liquefaction, LLC	2010-111-LNG	Long-Term	United Kingdom	Gui Ying	Sabine Pass, Louisiana	3,571,510	
TOTAL Exports of LNG from Sabine Pass								**258,697,259**	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

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[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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Email: ngreports@hq.doe.gov

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(ii)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/6/2023	Cove Point LNG, LP	ST Cove Point LLC	2011-128-LNG	Long-Term	Japan	Energy Liberty	Cove Point, Maryland	3,486,034	
1/11/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-128-LNG	Long-Term	Greece	Maran Gas Mystras	Cove Point, Maryland	3,206,942	
1/19/2023	Cove Point LNG, LP	ST Cove Point LLC	2011-128-LNG	Long-Term	Netherlands	Energy Universe	Cove Point, Maryland	3,440,802	
1/22/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-128-LNG	Long-Term	India	Gail Bhuwan	Cove Point, Maryland	3,797,069	
1/27/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-115-LNG	Long-Term	Mexico	Golar Ice	Cove Point, Maryland	3,219,055	
1/28/2023	Cove Point LNG, LP	ST Cove Point LLC	2011-128-LNG	Long-Term	Germany	BW Pavilion Aranthera	Cove Point, Maryland	3,641,378	
2/5/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-128-LNG	Long-Term	Turkiye	BW Lesmes	Cove Point, Maryland	3,215,017	
2/6/2023	Cove Point LNG, LP	ST Cove Point LLC	2011-128-LNG	Long-Term	Japan	LNG Fukurokuju	Cove Point, Maryland	3,442,532	
2/15/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-128-LNG	Long-Term	India	Castillo de Santisteban	Cove Point, Maryland	3,656,600	
2/16/2023	Cove Point LNG, LP	ST Cove Point LLC	2011-128-LNG	Long-Term	Japan	Energy Glory	Cove Point, Maryland	3,470,739	
2/24/2023	Cove Point LNG, LP	GAIL Global (USA) LNG LLC	2011-128-LNG	Long-Term	Netherlands	Dorado LNG	Cove Point, Maryland	3,357,401	
2/27/2023	Cove Point LNG, LP	BP Energy Company	2011-128-LNG	Short-Term	Argentina	Golar Ice	Cove Point, Maryland	2,287,060	
TOTAL Exports of LNG from Cove Point								**40,220,629**	

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(iii)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/3/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Spain	Adriano Knutsen	Corpus Christi, Texas	3,735,782	
1/4/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	France	Gaslog Wales	Corpus Christi, Texas	3,694,319	
1/5/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Portugal	Cool Discoverer	Corpus Christi, Texas	3,520,445	
1/7/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Turkiye	Gaslog Galveston	Corpus Christi, Texas	3,596,931	
1/9/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	China	Celsius Charlotte	Corpus Christi, Texas	3,805,754	
1/10/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Poland	Flex Endeavor	Corpus Christi, Texas	2,718,618	
1/12/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-99-LNG	Long-Term	Dominican Republic	Point Fortin	Corpus Christi, Texas	668,202	[*]
1/12/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-99-LNG	Long-Term	Panama	Point Fortin	Corpus Christi, Texas	2,575,338	[*]
1/13/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Netherlands	La Mancha Knutsen	Corpus Christi, Texas	3,677,040	
1/14/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Belgium	Adamastos	Corpus Christi, Texas	3,640,426	
1/16/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Italy	Traiano Knutsen	Corpus Christi, Texas	3,497,340	
1/18/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-99-LNG	Long-Term	South Korea	Maran Gas Amorgos	Corpus Christi, Texas	3,535,353	
1/19/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Netherlands	Woodside Rees Withers	Corpus Christi, Texas	3,684,715	
1/21/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	China	BW Pavilion Leeara	Corpus Christi, Texas	3,428,237	
1/23/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	China	Bonito LNG	Corpus Christi, Texas	3,449,218	
1/24/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	LNG Endurance	Corpus Christi, Texas	3,201,649	
1/25/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Lithuania	Cobia LNG	Corpus Christi, Texas	3,311,616	
1/27/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Netherlands	Rioja Knutsen	Corpus Christi, Texas	3,096,858	
1/29/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Spain	Gaslog Warsaw	Corpus Christi, Texas	3,730,278	
2/2/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Croatia	Stena Blue Sky	Corpus Christi, Texas	3,118,104	
2/3/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	Maran Gas Posidonia	Corpus Christi, Texas	3,451,317	
2/4/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	LNG Abuja II	Corpus Christi, Texas	3,704,048	
2/4/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-99-LNG	Long-Term	South Korea	Al Safliya	Corpus Christi, Texas	4,454,489	
2/6/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Portugal	Energy Atlantic	Corpus Christi, Texas	3,192,347	
2/7/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	France	Elisa Larus	Corpus Christi, Texas	3,691,054	

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Email: ngreports@hq.doe.gov

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(iii)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
2/9/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Spain	BW Tulip	Corpus Christi, Texas	3,198,145	
2/11/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Netherlands	Adriano Knutsen	Corpus Christi, Texas	3,721,946	
2/13/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Taiwan	Flex Endeavor	Corpus Christi, Texas	3,540,663	
2/15/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	Ribera del Duero Knutsen	Corpus Christi, Texas	3,629,721	
2/17/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	France	Rias Baixas Knutsen	Corpus Christi, Texas	3,688,652	
2/18/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	Woodside Rees Withers	Corpus Christi, Texas	3,685,752	
2/20/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Taiwan	Fuji LNG	Corpus Christi, Texas	3,016,353	
2/21/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Netherlands	Adamastos	Corpus Christi, Texas	3,588,188	
2/22/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	France	Maran Gas Alexandria	Corpus Christi, Texas	3,189,376	
2/24/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	Celsius Carolina	Corpus Christi, Texas	3,858,705	
2/26/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	United Kingdom	Hellas Athina	Corpus Christi, Texas	3,699,101	
2/28/2023	Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC	Corpus Christi Liquefaction, LLC	2012-97-LNG	Long-Term	Italy	Amberjack LNG	Corpus Christi, Texas	3,685,990	
TOTAL Exports of LNG from Corpus Christi								**126,682,070**	

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Table 2a(iv)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/2/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Netherlands	Transgas Force	Cameron, Louisiana	3,680,931	
1/3/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	France	Marvel Heron	Cameron, Louisiana	3,521,495	
1/5/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	France	Diamond Gas Rose	Cameron, Louisiana	3,508,767	
1/7/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Germany	Diamond Gas Victoria	Cameron, Louisiana	3,511,252	
1/8/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Japan	Diamond Gas Metropolis	Cameron, Louisiana	3,672,597	
1/10/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Japan	Marvel Eagle	Cameron, Louisiana	3,274,810	
1/12/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Indonesia	SK Resolute	Cameron, Louisiana	804,827	[*]
1/12/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Turkiye	SK Resolute	Cameron, Louisiana	3,018,174	[*]
1/14/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Netherlands	Marvel Swan	Cameron, Louisiana	3,020,210	
1/15/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	United Kingdom	BW Pavilion Aranda	Cameron, Louisiana	3,307,785	
1/18/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Poland	Maran Gas Apollonia	Cameron, Louisiana	3,420,652	
1/19/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Japan	Marvel Kite	Cameron, Louisiana	3,588,307	
1/20/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	India	Ob River	Cameron, Louisiana	3,159,424	
1/22/2023	Cameron LNG, LLC	Various Suppliers	2011-145-LNG	Long-Term	Chile	Maran Gas Alexandria	Cameron, Louisiana	3,307,114	
1/24/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	United Kingdom	Marvel Pelican	Cameron, Louisiana	3,242,210	
1/25/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Netherlands	Hoegh Galleon	Cameron, Louisiana	1,830,034	[*]
1/25/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Poland	Hoegh Galleon	Cameron, Louisiana	1,695,841	[*]
1/27/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Turkiye	LNG Adventure	Cameron, Louisiana	3,691,433	
1/28/2023	Cameron LNG, LLC	Various Suppliers	2011-145-LNG	Long-Term	Dominican Republic	Point Fortin	Cameron, Louisiana	2,975,045	[*]
1/28/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-145-LNG	Long-Term	Panama	Point Fortin	Cameron, Louisiana	142,857	[*]
1/31/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Turkiye	Flex Artemis	Cameron, Louisiana	3,704,225	
2/1/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	France	Solaris	Cameron, Louisiana	349,004	[*]
2/1/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Turkiye	Solaris	Cameron, Louisiana	2,953,127	[*]
2/4/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	France	Diamond Gas Orchid	Cameron, Louisiana	3,511,644	LI
2/5/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	United Kingdom	La Seine	Cameron, Louisiana	3,617,269	[*]
2/5/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	United Kingdom	La Seine	Cameron, Louisiana	54,037	[*]
2/7/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Japan	Diamond Gas Sakura	Cameron, Louisiana	3,455,124	
2/8/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Japan	Marvel Heron	Cameron, Louisiana	3,690,104	
2/10/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	France	Minerva Limnos	Cameron, Louisiana	459,810	[*]
2/10/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Greece	Minerva Limnos	Cameron, Louisiana	3,105,702	[*]
2/12/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-145-LNG	Long-Term	South Korea	Marvel Falcon	Cameron, Louisiana	2,949,606	
2/13/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	Italy	Wilpride	Cameron, Louisiana	3,274,659	
2/15/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	United Kingdom	BW Pavilion Aranda	Cameron, Louisiana	3,536,653	
2/17/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	United Kingdom	Minerva Chios	Cameron, Louisiana	3,416,458	
2/19/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-162-LNG	Long-Term	United Kingdom	Marvel Crane	Cameron, Louisiana	3,685,604	
2/20/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	India	Maran Gas Leto	Cameron, Louisiana	3,524,173	
2/23/2023	Cameron LNG, LLC	Mitsui & Co. Energy Marketing	2011-145-LNG	Long-Term	South Korea	Marvel Hawk	Cameron, Louisiana	3,492,975	
2/25/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Greece	LNG Enterprise	Cameron, Louisiana	3,675,457	
2/27/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Spain	BW Lilac	Cameron, Louisiana	3,698,935	
2/28/2023	Cameron LNG, LLC	Various	2011-162-LNG	Long-Term	Poland	Maran Gas Apollonia	Cameron, Louisiana	3,417,397	
TOTAL Exports of LNG from Cameron								**117,945,728**	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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Office of Resource Sustainability
Office of Regulation, Analysis, and Engagement
Division of Natural Gas Regulation
Phone: 202-586-7991
Email: ngreports@hq.doe.gov

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(v)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
2/12/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	Thailand	Kmarin Diamond	Freeport, Texas	1,828,817	
2/14/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	China	Prism Agility	Freeport, Texas	2,565,229	
2/15/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	Germany	LNG Rosenrot	Freeport, Texas	1,486,997	
2/18/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	France	Nohshu Maru	Freeport, Texas	1,422,952	
2/23/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	United Kingdom	Corcovado LNG	Freeport, Texas	1,264,428	
2/26/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-160-LNG	Long-Term	South Korea	Diamond Gas Victoria	Freeport, Texas	1,213,862	
2/28/2023	Freeport LNG Expansion, L.P.	Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC	2010-161-LNG	Long-Term	Spain	BW Cassia	Freeport, Texas	3,196,783	
TOTAL Exports of LNG from Freeport								**12,979,068**	

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[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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Email: ngreports@hq.doe.gov

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(vi)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/7/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	United Kingdom	Magdala	Elba Island, Georgia	3,672,665	
1/25/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	Turkiye	Alicante Knutsen	Elba Island, Georgia	3,157,205	
1/29/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	Malta	Methane Princess	Elba Island, Georgia	2,592,034	
2/3/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	Italy	Gaslog Gibraltar	Elba Island, Georgia	3,710,697	
2/9/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	Netherlands	Kool Orca	Elba Island, Georgia	3,612,475	
2/23/2023	Southern LNG Company, L.L.C.	Shell NA LNG LLC	2012-100-LNG	Long-Term	United Kingdom	Golar Penguin	Elba Island, Georgia	3,253,988	
TOTAL Exports of LNG from Elba Island								**19,999,064**	

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG)

Table 2a(vi)

Date of Departure	Name of Exporter	Supplier	Docket Number	Docket Term	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/3/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	United Kingdom	Flex Aurora	Cameron, Louisiana	3,543,141	[C]
1/6/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2013-69-LNG	Long-Term	South Korea	Seapeak Creole	Cameron, Louisiana	3,661,661	[C]
1/9/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2013-69-LNG	Long-Term	South Korea	Gaslog Winchester	Cameron, Louisiana	3,844,586	[C]
1/12/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	United Kingdom	Vivirt City LNG	Cameron, Louisiana	3,694,736	[C]
1/13/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Netherlands	LNG Rosenrot	Cameron, Louisiana	3,688,604	[C]
1/15/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Germany	Cool Voyager	Cameron, Louisiana	3,422,232	[C]
1/18/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Bangladesh	Seapeak Magellan	Cameron, Louisiana	3,369,499	[C]
1/20/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Spain	Maran Gas Leto	Cameron, Louisiana	3,584,860	[C]
1/22/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	France	Seapeak Marib	Cameron, Louisiana	3,398,483	[C]
1/25/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	France	Maran Gas Vergina	Cameron, Louisiana	3,485,008	[S][C]
1/27/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	United Kingdom	Prism Diversity	Cameron, Louisiana	3,745,613	[C]
1/29/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Netherlands	Gaslog Seattle	Cameron, Louisiana	3,322,384	[C]
2/1/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Netherlands	Vivit Arabia	Cameron, Louisiana	3,484,092	[C]
2/2/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Italy	BW Brussels	Cameron, Louisiana	3,449,029	[C]
2/7/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	France	Qogir	Cameron, Louisiana	3,705,804	[C]
2/11/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Spain	Cool Discoverer	Cameron, Louisiana	579,798	[*],[S],[C]
2/11/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Turkiye	Cool Discoverer	Cameron, Louisiana	3,101,665	[*],[S],[C]
2/12/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Netherlands	Maran Gas Ithaca	Cameron, Louisiana	3,691,356	[C]
2/14/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	India	Clean Energy	Cameron, Louisiana	3,197,637	[S],[C]
2/15/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Netherlands	Gaslog Georgetown	Cameron, Louisiana	3,484,371	[S],[C]
2/17/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	France	Seapeak Arwa	Cameron, Louisiana	2,864,923	[S],[C]
2/19/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Germany	Maran Gas Olympias	Cameron, Louisiana	3,488,545	[S],[C]
2/22/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	United Kingdom	Minerva Amorgos	Cameron, Louisiana	3,395,084	[S],[C]
2/24/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	Spain	Energy Universe	Cameron, Louisiana	3,520,894	[C]
2/26/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2015-25-LNG	Long-Term	France	Maran Gas Andros	Cameron, Louisiana	3,491,396	[S],[C]
2/28/2023	Venture Global Calcasieu Pass, LLC	Venture Global Calcasieu Pass, LLC	2013-69-LNG	Long-Term	Dominican Republic	LNG Endurance	Cameron, Louisiana	3,513,928	[C]
TOTAL Exports of LNG from Calcasieu Pass								**87,729,329**	

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Email: ngreports@hq.doe.gov

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG) SHIPPED BY ISO CONTAINER

Table 2b

Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Ocean Going Vessel	ISO Conatainer Loading Facility & Location	U.S. Export Port or Terminal	Volume (Mcf of Natural Gas)	Notes
1/4/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Sea Express	Ft. Lauderdale, Florida	2,544	
1/4/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Vi-Nais	Ft. Lauderdale, Florida	1,696	
1/5/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	848	
1/6/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	Contship Pax	Ft. Lauderdale, Florida	8,480	
1/7/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
1/9/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	2,544	
1/9/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Haiti	BBC Hong Kong	Ft. Lauderdale, Florida	6,784	
1/10/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Grand Express	Ft. Lauderdale, Florida	2,544	
1/13/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	5,936	
1/13/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	5,936	
1/15/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
1/16/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Cape Express	Ft. Lauderdale, Florida	2,544	
1/18/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	2,544	
1/20/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Vi-Nais	Ft. Lauderdale, Florida	1,696	
1/20/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	Tampa Trader	Ft. Lauderdale, Florida	12,720	
1/22/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Haiti	BBC Hong Kong	Ft. Lauderdale, Florida	848	
1/23/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	2,544	
1/24/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
1/25/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	1,696	
1/27/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Emerald Express	Ft. Lauderdale, Florida	3,392	
1/27/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	Corona J	Ft. Lauderdale, Florida	3,392	
1/30/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	5,088	
2/1/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	1,696	
2/1/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Haiti	Artemis	Ft. Lauderdale, Florida	6,784	
2/1/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
2/3/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Bahamas Express	Ft. Lauderdale, Florida	3,392	
2/3/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	AS Savanna	Ft. Lauderdale, Florida	8,480	
2/6/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	1,696	
2/9/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	1,696	
2/9/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
2/10/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Cape Express	Ft. Lauderdale, Florida	1,696	
2/10/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	AS Sabrina	Ft. Lauderdale, Florida	8,480	
2/10/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	CMA CGM Callao	Ft. Lauderdale, Florida	5,088	
2/11/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Haiti	Artemis	Ft. Lauderdale, Florida	1,696	
2/15/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	1,696	
2/15/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Vi-Nais	Ft. Lauderdale, Florida	3,392	
2/17/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	AS Savanna	Ft. Lauderdale, Florida	8,480	
2/17/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	Corona J	Ft. Lauderdale, Florida	8,480	
2/18/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Bahamas Express	Ft. Lauderdale, Florida	5,088	
2/18/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
2/20/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Haiti	JSP BORA	Ft. Lauderdale, Florida	2,544	
2/22/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Eastwind	Ft. Lauderdale, Florida	1,696	
2/24/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Sea Express	Ft. Lauderdale, Florida	2,544	
2/24/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	AS Sabrina	Ft. Lauderdale, Florida	8,480	
2/24/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	CMA CGM Callao	Ft. Lauderdale, Florida	4,240	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

Countries of destination are current as of publication date. Any updates to countries of destination reported will be published in the next scheduled *LNG Monthly*.

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG) SHIPPED BY ISO CONTAINER

Table 2b

Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Ocean Going Vessel	ISO Conatainer Loading Facility & Location	U.S. Export Port or Terminal	Volume (Mcf of Natural Gas)	Notes
2/26/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Jamaica	NFE Clean Energy	Ft. Lauderdale, Florida	27,136	
2/27/2023	American LNG Marketing LLC	Peninsula Energy Services Co	2014-209-LNG	Long-Term	Bahamas	Caribbean Express	Ft. Lauderdale, Florida	2,544	
TOTAL Exports of LNG (ISO)								**353,616**	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG) SHIPPED BY ISO CONTAINER

Table 2b

Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Ocean Going Vessel	ISO Conatainer Loading Facility & Location	U.S. Export Port or Terminal	Volume (Mcf of Natural Gas)	Notes
1/3/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	Michelangelo Trader, 223S	Ft. Lauderdale, Florida	880	
1/3/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Jamaica	AS Savanna	Miami, Florida	880	
1/9/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	JSP BORA	Ft. Lauderdale, Florida	880	
1/9/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	JSP BORA	Ft. Lauderdale, Florida	880	
1/24/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	JSP BORA	Ft. Lauderdale, Florida	880	
2/6/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	JSP BORA	Ft. Lauderdale, Florida	880	
2/8/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Jamaica	AS Sabrina	Miami, Florida	880	
2/21/2023	Eagle LNG Partners Jacksonville II LLC	Tiger Paw Marketing LLC	2017-79-LNG	Long-Term	Antigua and Barbuda	Other	Ft. Lauderdale, Florida	879	
TOTAL Exports of LNG (ISO)								**7,039**	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG) SHIPPED BY ISO CONTAINER

Table 2b

Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Ocean Going Vessel	ISO Conatainer Loading Facility & Location	U.S. Export Port or Terminal	Volume (Mcf of Natural Gas)	Notes
NA									
TOTAL Exports of LNG (ISO)								0	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

[C] Commissioning cargo – pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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VESSEL-BORNE EXPORTS OF DOMESTICALLY-PRODUCED LIQUEFIED NATURAL GAS (LNG) SHIPPED BY ISO CONTAINER

Table 2b

Date of Departure	Name of Exporter	Supplier	Docket Number	Country of Destination	Name of Ocean Going Vessel	ISO Conatainer Loading Facility & Location	U.S. Export Port or Terminal	Volume (Mcf of Natural Gas)	Notes
NA									
TOTAL Exports of LNG (ISO)								0	

[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorized types.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

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VESSEL-BORNE RE-EXPORTS OF LIQUEFIED NATURAL GAS (LNG)

Table 2c

Date of Departure	Authorization Holder	Supplier(s)	Exporter	Purchaser	Docket Number	Country of Destination	Name of Tanker	Departure Terminal	Volume (Mcf of Natural Gas)	Notes
1/10/2023	Carib Energy (USA) LLC	Naturgy Aprovisionamientos, S.A.	Carib Energy (USA) LLC	BARBADOS NATIONAL OIL COMPANY	2021-99-LNG	Barbados	Midnight Reign	Penuelas, Puerto Rico	14,364	
1/23/2023	Carib Energy (USA) LLC	Naturgy Aprovisionamientos, S.A.	Carib Energy (USA) LLC	BARBADOS NATIONAL OIL COMPANY	2021-99-LNG	Barbados	Midnight Reign	Penuelas, Puerto Rico	11,803	
2/6/2023	Carib Energy (USA) LLC	Naturgy Aprovisionamientos, S.A.	Carib Energy (USA) LLC	BARBADOS NATIONAL OIL COMPANY	2021-99-LNG	Barbados	Midnight Reign	Penuelas, Puerto Rico	16,796	
2/16/2023	Carib Energy (USA) LLC	Naturgy Aprovisionamientos, S.A.	Carib Energy (USA) LLC	BARBADOS NATIONAL OIL COMPANY	2021-99-LNG	Barbados	Midnight Reign	Penuelas, Puerto Rico	16,974	
2/27/2023	Carib Energy (USA) LLC	Naturgy Aprovisionamientos, S.A.	Carib Energy (USA) LLC	BARBADOS NATIONAL OIL COMPANY	2021-99-LNG	Barbados	Midnight Reign	Penuelas, Puerto Rico	15,188	
TOTAL Re-Exports of LNG									**75,125**	

[S] Spot - a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Prior to 2006, spot cargos could be included in either long-term or short-term authorization types.
[*] Split cargo - a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.
[C] Commissioning cargo - pre-commercial cargo loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

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LNG Imports by Country of Origin

(Bcf of Natural Gas)

Table 2d(i)

2022	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
Egypt	-	-	-	-	-	-	-	-	-	-	-	-	0.0
France	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Jamaica	1.3	-	-	-	-	-	-	-	-	-	-	-	1.3
Nigeria	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Norway	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Qatar	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Trinidad	1.3	4.0	-	-	-	-	-	-	-	-	-	-	5.3
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Yemen	-	-	-	-	-	-	-	-	-	-	-	-	0.0
TOTAL Imports of LNG	**2.6**	**4.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.6**

LNG Imports by Receiving Terminal

(Bcf of Natural Gas)

Table 2d(ii)

2022	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
Cameron, LA	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Cove Point, MD	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Elba Island, GA	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Everett, MA	2.6	4.0	-	-	-	-	-	-	-	-	-	-	6.6
Freeport, TX	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Golden Pass, TX	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Gulf LNG, MS	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Lake Charles, LA	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Neptune Deepwater Port	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Northeast Gateway	-	-	-	-	-	-	-	-	-	-	-	-	0.0
TOTAL Imports of LNG	**2.6**	**4.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.6**

LNG Imports by Company

(Bcf of Natural Gas)

Table 2d(iii)

2022	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
BG LNG Services, LLC	-	-	-	-	-	-	-	-	-	-	-	-	0.0
BP Energy	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Cheniere Marketing LLC	-	-	-	-	-	-	-	-	-	-	-	-	0.0
ConocoPhillips	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Constellation LNG, LLC	2.6	4.0	-	-	-	-	-	-	-	-	-	-	6.6
Engie Gas & LNG LLC	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Excelerate Energy Gas Marketing L.P.	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Freeport LNG Development, L.P.	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Pacific Summit Energy LLC	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Sempra LNG Marketing	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Shell NA LNG LLC	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Statoil Natural Gas	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total Gas & Power	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Total Imports of LNG	**2.6**	**4.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**6.6**

*Very small volumes shown as zero due to rounding.

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Email: ngreports@hq.doe.gov

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SHORT-TERM VESSEL-BORNE IMPORTS OF LIQUEFIED NATURAL GAS

Table 2e(i)

Date of Arrival	Name of Importer	Seller	Docket Number	Country of Origin	Name of Tanker	Receiving Terminal	Volume (Mcf of Natural Gas)	Notes
NA								
TOTAL Short-Term Imports of LNG							**0**	

[S] Spot - a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Prior to 2006, spot cargos could be included in either long-term or short-term authorization types.
[*] Split cargo - a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

LONG-TERM VESSEL-BORNE IMPORTS OF LIQUEFIED NATURAL GAS

Table 2e(ii)

Date of Arrival	Name of Importer	Seller	Docket Number	Country of Origin	Name of Tanker	Receiving Terminal	Volume (Mcf of Natural Gas)	Notes
1/9/2023	Constellation LNG, LLC	Naturgy LNG Marketing Limited	2019-5-LNG	Jamaica	Cadiz Knutsen	Everett, Massachusetts	1,258,592	
1/23/2023	Constellation LNG, LLC	Naturgy LNG Marketing Limited	2019-5-LNG	Trinidad	Cadiz Knutsen	Everett, Massachusetts	1,328,668	
2/9/2023	Constellation LNG, LLC	Naturgy LNG Marketing Limited	2019-5-LNG	Trinidad	Cadiz Knutsen	Everett, Massachusetts	2,743,627	
2/23/2023	Constellation LNG, LLC	Naturgy LNG Marketing Limited	2019-5-LNG	Trinidad	Cadiz Knutsen	Everett, Massachusetts	1,248,758	
						TOTAL LNG IMPORTS	**6,579,645**	

[S] Spot - a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Prior to 2006, spot cargos could be included in either long-term or short-term authorization types.
[*] Split cargo - a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.
[E-P] - a portion of this cargo was delivered to Everett, MA on 16 February 2017 and a portion was delivered to Ponce, Puerto Rico on 22 February 2017.

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Email: ngreports@hq.doe.gov

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VESSEL-BORNE IMPORTS OF LIQUEFIED NATURAL GAS (LNG) TO PUERTO RICO

Table 2f

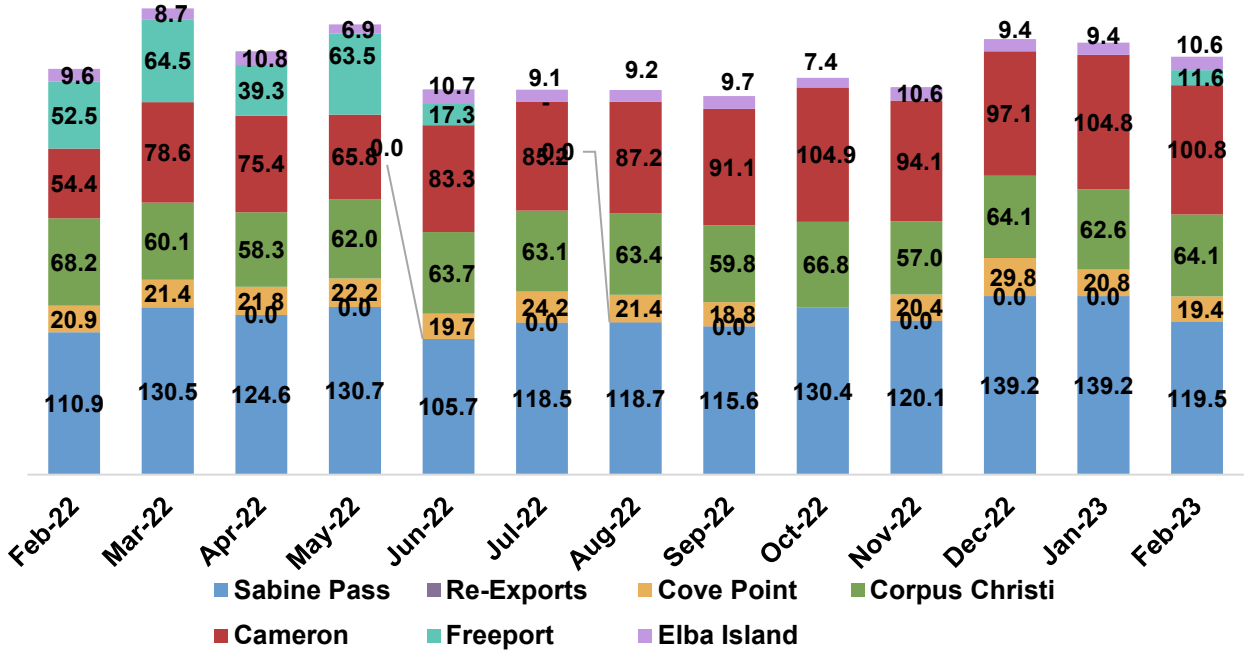
Date of Arrival	Name of Importer	Seller	Docket Number	Country of Origin	Name of Tanker	Receiving Terminal	Volume (Mcf of Natural Gas)	Notes
1/1/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Trinidad	Avenir Accolade	San Juan, Puerto Rico	17,906	[S]
1/4/2023	Naturgy Aprovisionamientos S.A.	Naturgy Aprovisionamientos S.A.	2022-107-LNG	Nigeria	Iberica Knutsen	Ponce, Puerto Rico	1,371,477	[*]
1/8/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Nigeria	CNTIC VPower Global	San Juan, Puerto Rico	287,074	[S]
1/15/2023	Naturgy Aprovisionamientos S.A.	Naturgy Aprovisionamientos S.A.	2022-107-LNG	Nigeria	Iberica Knutsen	Ponce, Puerto Rico	1,370,483	[*]
1/17/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Nigeria	Coral Encanto	San Juan, Puerto Rico	82,562	[S]
1/21/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Trinidad	Avenir Accolade	San Juan, Puerto Rico	112,049	[S]
1/27/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Trinidad	CNTIC VPower Global	San Juan, Puerto Rico	575,419	[S]
1/30/2023	Naturgy Aprovisionamientos S.A.	Naturgy Aprovisionamientos S.A.	2022-107-LNG	Trinidad	Cadiz Knutsen	Ponce, Puerto Rico	1,402,869	[*]
2/1/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Trinidad	Avenir Accolade	San Juan, Puerto Rico	160,315	[S]
2/7/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Trinidad	CNTIC VPower Global	San Juan, Puerto Rico	585,113	[S]
2/10/2023	Naturgy Aprovisionamientos S.A.	Naturgy Aprovisionamientos S.A.	2022-107-LNG	Nigeria	Castillo de Villalba	Ponce, Puerto Rico	1,383,285	[*]
2/18/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Nigeria	CNTIC VPower Global	San Juan, Puerto Rico	604,246	[S]
2/22/2023	Naturgy Aprovisionamientos S.A.	Naturgy Aprovisionamientos S.A.	2022-107-LNG	Trinidad	BW GDF Suez Boston	Ponce, Puerto Rico	1,424,017	[*]
2/23/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Nigeria	Avenir Accolade	San Juan, Puerto Rico	157,783	[S]
2/27/2023	NFEnergia LLC	NFE North Trading Ltd	2022-4-LNG	Nigeria	CNTIC VPower Global	San Juan, Puerto Rico	619,222	[S]
TOTAL Imports of LNG to Puerto Rico							**10,153,820**	

Note: Naturgy Aprovisionamientos S.A. (formerly Gas Natural Aprovisionamientos SDG. S.A.)

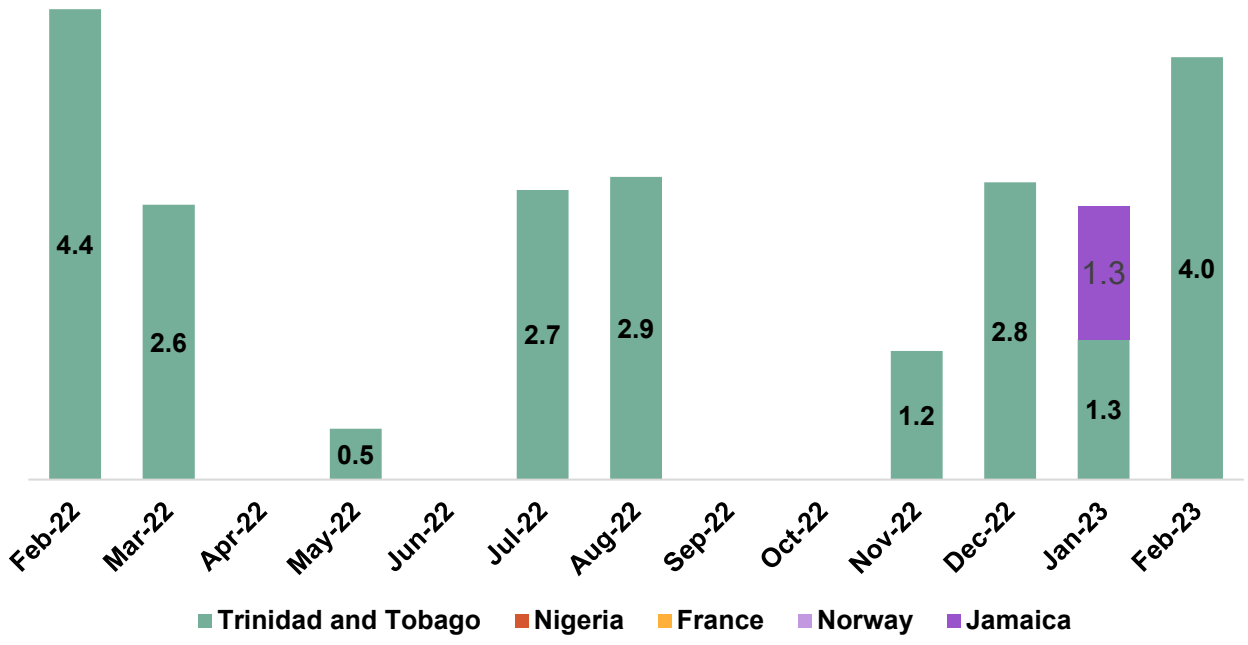
[S] Spot – a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location.

[*] Split cargo – a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

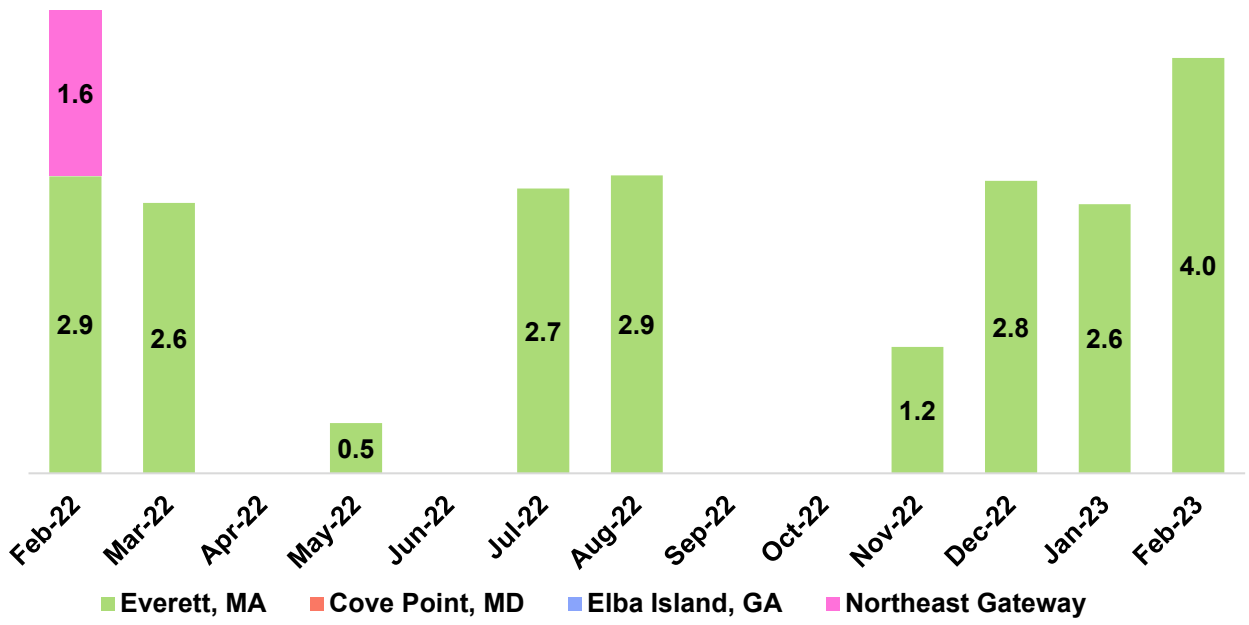
U.S. LNG by Vessel – Export and Re-Export Volumes
(Bcf)



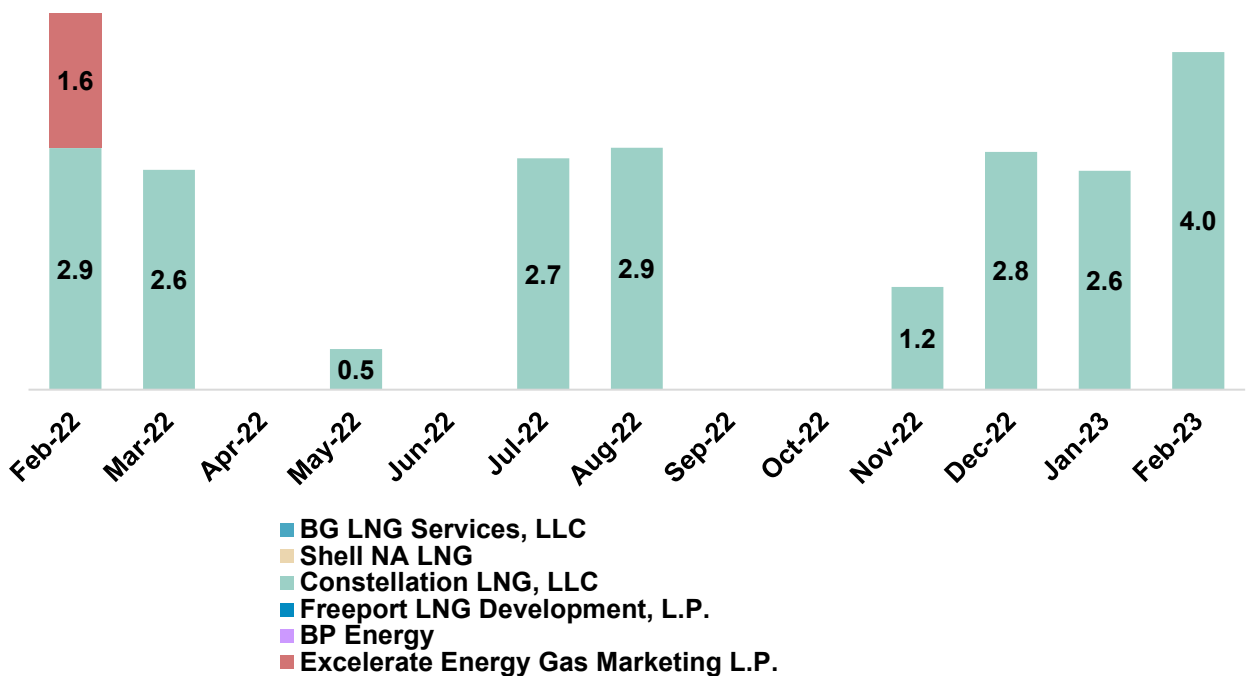
U.S. LNG Import Volume by Source Country
(Bcf)



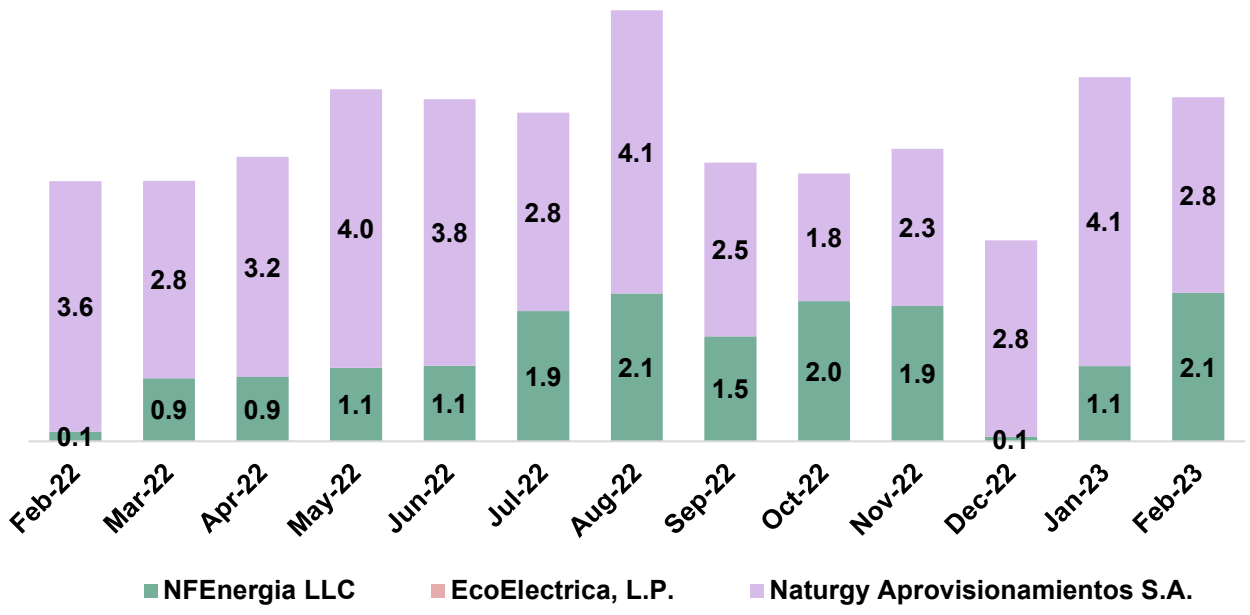
U.S. LNG Import Volume by Terminal
(Bcf)



U.S. LNG Import Volume by Company
(Bcf)



U.S. LNG Import Volume by Company, Puerto Rico
(Bcf)



NOTES AND DEFINITIONS

1) Import prices are landed and include the price of the LNG, the transportation cost to the U.S. terminal, and the cost of offloading the LNG. Landed prices do not include regasification fees.

2) The data are provided by importers and exporters as a condition of their authorizations (which are issued by this office). They are reported as filed, after DOE review and any subsequent revisions by importers and exporters.

3) Spot cargos [S] are a one-time transaction for near-term delivery of a specific quantity of LNG at a specific location. Spot cargos could be included in either long-term or short-term authorization types.

4) Split cargos [*] refer to a single shipment of LNG where portions of the cargo have different transactional characteristics. For instance, a single cargo can have more than one buyer, supplier, price, unloading port, loading port, or DOE authorization.

5) Commissioning cargos [C] refer to pre-commercial cargos loaded while export facility operations are still undergoing final testing and inspection. Commissioning cargos may occur multiple times for the same facility as individual LNG trains enter service.

6) Export prices are free on board (FOB) and are inclusive of all costs of the LNG up to the point of export, including commodity costs and liquefaction fees. Prior to July 2019, cargo prices that include liquefaction fees are indicated by the footnote [L].

7) Short-term imports or exports are those cargos imported or exported under a company's short-term or "blanket" authorization. This type of authorization covers supply contracts with terms up to 2 years, including spot cargos. The authorization is not based on a specific supply contract, but covers all of the importer's short-term supply deals. DOE does not have copies of those contracts and they are not filed with the applications.

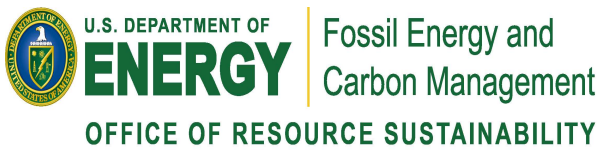
8) Long-term imports or exports are those cargos imported or exported under a company's long-term authorization. This type of authorization is tied to one specific supply contract with a term of more than two years. Redacted copies of the contracts are available on our website (please see below).

9) Authorization holders are required to file volume data in thousand cubic feet (Mcf). Therefore, data collected does not necessarily include equivalent amounts of energy, measured in million British thermal units (MMBtu).

10) Prices for re-exports are the prices at the point of export, also known as FOB (free on board).

11) Data are current as of the publication date. Any revisions to reported data will be published in the next scheduled LNG Monthly.

Our web address is: www.fossil.energy.gov
Click "Services," then click "Natural Gas Regulation."



Source: *Delfin Midstream Inc.*

April 24, 2023 06:30 ET

Delfin Signs LNG Sale and Purchase Agreement with Hartree

20-year binding SPA for LNG Supply from Delfin Deepwater Port LNG Export Facility Advances Project Closer to Final Investment Decision

First FLNG Vessel is Fully Committed and Marketing of Second FLNG Vessel Underway

Citi Appointed as Financial Advisor with FID expected in Mid-2023

HOUSTON, April 24, 2023 (GLOBE NEWSWIRE) -- Delfin Midstream Inc. ("Delfin") announced today that its wholly owned subsidiary Delfin LNG LLC ("Delfin LNG") has finalized a binding Liquified Natural Gas ("LNG") Sale and Purchase Agreement ("SPA") with Hartree Partners Power & Gas Company (UK) Limited ("Hartree"), a wholly owned subsidiary of Hartree Partners, LP.

Under the SPA, Delfin LNG will supply 0.6 million tonnes per annum ("MTPA") on a free on-board ("FOB") basis at the Delfin Deepwater Port, 40 nautical miles off the coast of Louisiana, to Hartree for a 20-year period. The SPA is indexed to the Henry Hub benchmark.

"We are excited about partnering with Delfin LNG and to strengthen their progress toward reaching Final Investment Decision and look forward to a successful and collaborative long-term relationship," Stephen Hendel, one of Hartree Partners' Founding Managing Directors said. "This deal will also support our wider strategy of delivering low cost, tailor-made and reliable LNG supply chain solutions that meet the specific requirements of our customers."

The 20-year binding SPA with Hartree serves as an additional milestone for Delfin and builds on the company's previously announced long-term agreements with strong, strategic counterparties. Delfin has now secured commitments for 3.1 MTPA of LNG sales which is sufficient to make Final Investment Decision ("FID") on the first Floating LNG ("FLNG") vessel for the Delfin Deepwater Port LNG Export Facility. Delfin expects to make FID in mid-2023.

"The signing of this long-term SPA with Hartree represents another significant milestone for our company and signifies the beginning of a strong, mutually beneficial relationship with a world-class trading company such as Hartree," Dudley Poston, CEO of Delfin, said.

Delfin has appointed Citi as its exclusive financial structuring advisor and is well advanced in securing project level equity and debt for the first FLNG vessel.

"The Delfin project's ability to make FID one vessel at a time is attracting significant interest from buyers, and Delfin is already in advanced discussions for marketing LNG for its second FLNG vessel," continued Mr. Poston.

Wouter Pastoor, COO of Delfin, added, "With strong commercial and financial progress, Delfin is finalizing construction contracts for multiple identical liquefier vessels which will offer material cost savings and position us to make FID on our second FLNG vessel by the end of this year."

About Delfin

Delfin is a leading LNG export infrastructure development company utilizing low-cost Floating LNG technology solutions. Delfin is the parent company of Delfin LNG and Avocet LNG LLC. Delfin LNG is a brownfield Deepwater Port requiring minimal additional infrastructure investment to support up to four FLNG Vessels producing up to 13.3 MTPA of LNG. Delfin purchased the UTOS pipeline, the largest natural gas pipeline in the Gulf of Mexico. Delfin LNG received a positive Record of Decision from MARAD and approval from the Department of Energy for long-term exports of LNG to countries that do not have a Free Trade Agreement with the United States. Further information is available at www.delfinmidstream.com.

About Hartree

Hartree Partners, LP is a leading global energy and commodities firm with an international reputation for integrity developed over decades. Hartree's global breadth and reach provide a competitive presence in all major commodity markets, enriched by the firm's employees who add deep insight, expertise and innovative thinking. More information concerning Hartree can be found at www.hartreepartners.com.

Media Contact:

Delfin
Dan Gagnier
Gagnier Communications
+1 646-569-5897

VENTURE GLOBAL LNG

NEWS & PRESS RELEASES

< PREV

VENTURE GLOBAL ANNOUNCES 20-YEAR LNG SALES AND PURCHASE AGREEMENT WITH JERA

APRIL 28, 2023
PRESS RELEASE

- *CP2 progressing through federal permitting process.*
- *Significant commercial momentum for the project, with over a third of its 20MTPA nameplate capacity sold.*
- *Construction expected to begin in 2023.*

Arlington, Virginia– Today, Venture Global LNG announced the execution of a long-term Sales and Purchase Agreement (SPA) with JERA Co., Inc. for the sale of 1 million tonnes per annum (MTPA) of liquefied natural gas (LNG) from CP2 LNG for 20 years. CP2 LNG is Venture Global's third project and is expected to commence construction later this year. To date, the company has announced SPAs for over a third of the 20MTPA nameplate facility with active discussions ongoing for the remainder of its capacity. This deal follows JERA Global Markets' purchase of the inaugural commissioning cargo of LNG exported from Venture Global's first project, Calcasieu Pass.

"Venture Global is thrilled to be expanding our partnership with JERA, one of the world's premiere energy providers and largest buyers of LNG," said **Mike Sabel, CEO of Venture Global LNG**. "Japan has taken a pragmatic approach to ensuring its energy security while advancing environmental progress. We are honored to supply our growing customer

“LNG procurement competition has been intensifying and thus, stable procurement of LNG in a timely manner in line with the domestic electricity supply-demand situation is needed to secure a stable supply of energy in Japan. This is a destination free FOB contract, which enables JERA to secure LNG in a high flexible manner and is expected to help with our capability to respond to volatility in the domestic electricity supply and demand.” said **Sunao Nakamura, Senior Managing Executive Officer, Optimization of JERA.**

About Venture Global LNG

Venture Global is a long-term, low-cost provider of U.S. LNG sourced from resource rich North American natural gas basins. Venture Global’s first facility, Calcasieu Pass, commenced producing first LNG in January 2022. The company is also constructing or developing an additional 60 MTPA of production capacity in Louisiana to provide clean, affordable energy to the world. The company is developing Carbon Capture and Sequestration (CCS) projects at each of its LNG facilities.

Venture Global media contact:

Shaylyn Hynes
D: +1 202 920-0964 shynes@vglng.com

VENTURE GLOBAL LNG

Our Strategy

Contact

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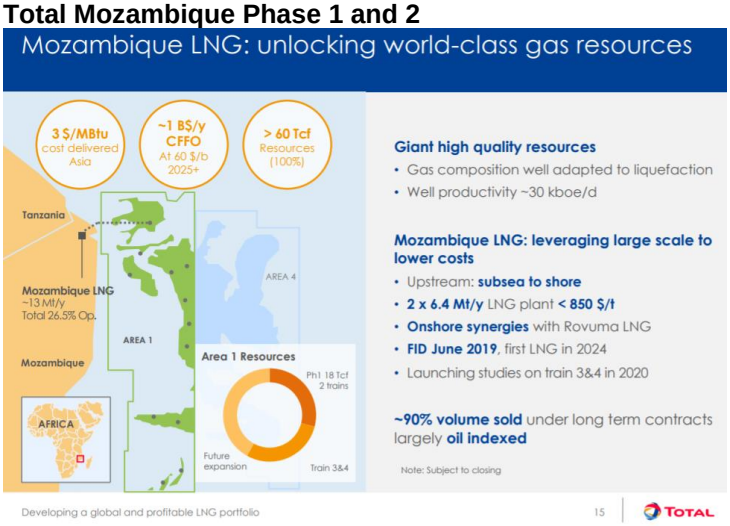
Multiple Brownfield LNG FIDs Now Needed To Fill New LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2?

Posted Wednesday April 28, 2021. 9:00 MT

The next six months will determine the size and length of the new LNG supply gap that is hitting harder and faster than anyone expected six months ago. Optimists will say the Mozambique government will bring sustainable security and safety to the northern Cabo Delgado province and provide the confidence to Total to quickly get back to LNG development such that its LNG in-service delay is a matter of months and not years. We hope so for Mozambique's domestic situation, but will it be that easy for Total's board to quickly look thru what just happened? Total suspended LNG development for 3 months, restarted development on March 25, but then 3 days of violence led it to suspend development again on March 28, and announce force majeure on Monday April 26. Even if the optimists are right, Mozambique LNG is counted on for LNG supply and the major LNG supply project that are in LNG supply forecasts are now all delayed – Total Phase 1 of 1.7 bcf/d and its follow on Phase 2 of 1.3 bcf/d, and Exxon's Rozuma Phase 1 of 2.0 bcf/d. It is important to remember this 5.0 bcf/d of major LNG supply is being counted in LNG supply forecasts and starting in 2024. At a minimum, we think the more likely scenario is a delay of at least 2 years in this 5.0 bcf/d from the pre-Covid timelines. And this creates a much bigger and sooner LNG supply gap starting ~2025 and stronger outlook for LNG prices. Thermal coal in Asia will play a role in keeping a lid on LNG prices. But there will be the opportunity for LNG suppliers to at least review the potential for brownfield LNG projects to fill the growing supply gap. The thought of increasing capex was a non-starter six months ago, but there is a much stronger outlook for global oil and gas prices. Oil and gas companies are pivoting from cutting capex to small increases in 2021 capex and expecting for higher capex in 2022. We believe this sets the stage for looking at potential FID of brownfield LNG projects before the end of 2021 to be included in 2022 capex budgets. Mozambique is causing an LNG supply gap that someone will try to fill. And if brownfield LNG is needed, what about Shell looking at 1.8 bcf/d brownfield LNG Canada Phase 2? Cdn natural gas producers hope so as this would mean more Cdn natural gas will be tied to Asian LNG markets and not competing in the US against Henry Hub.

Total declares force majeure on Mozambique LNG, Yesterday, Total announced [LINK] "*Considering the evolution of the security situation in the north of the Cabo Delgado province in Mozambique, Total confirms the withdrawal of all Mozambique LNG project personnel from the Afungi site. This situation leads Total, as operator of Mozambique LNG project, to declare force majeure. Total expresses its solidarity with the government and people of Mozambique and wishes that the actions carried out by the government of Mozambique and its regional and international partners will enable the restoration of security and stability in Cabo Delgado province in a sustained manner".* Total is working Phase 1 is ~1.7 bcf/d (Train 1 + 2, 6.45 mtpa/train) and was originally expected to being LNG deliveries in 2024. There was no specific timeline for Phase 2 of 1.3 bcf/d (Train 3 + 4, 5.0 mtpa/train), but was expected to follow Phase 1 in short order to keep capital costs under control with a continuous construction process with a potential onstream shortly after 2026.

Total Mozambique Phase 1 and 2



Source: Total Investor Day September 24, 2019

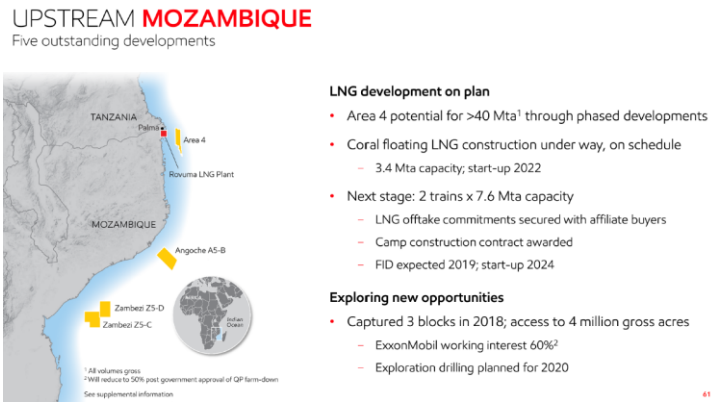
Total's Mozambique force majeure is no surprise, especially the need to the restoration of security and stability "in a sustained manner". Yesterday, Total announced [LINK] "*Considering the evolution of the security".* No one should be surprised by the force majeure or the sustained manner caveat. SAF Group posts a weekly Energy Tidbits research memo [LINK], wherein we have, in multiple weekly memos, that Total had shut down development in December for 3 months due to the violent and security risks. It restarted development on Wed March 24, violence/attacks immediately resumed for 3 consecutive days, and then Total suspended development on Sat March 27. Local violence/attacks shut development down in Dec, the situation gets settled enough for Total to restart in March, only to be shut down 3 days thereafter. No one should be surprised especially with Total's need to see security and stability "in a sustained manner".

Does anyone really think Total will risk another quick 2-3 month restart or even in 2021? The Mozambique government will be working hard to convince Total to restart soon. We just find it hard to believe Total board will risk a replay of March 24-27 in 2021. Unfortunately, Mozambique has had internal conflict for years. It reached a milestone to the positive in August 2019. Our SAF Group August 11, 2019 Energy Tidbits memo [LINK] highlighted the signing of a peace pact between Mozambique President Nyusi and leader of the Renamo opposition Momade. This was the official end to a 2013 thru 2016 conflict following a failure to hold up the prior peace pact. At that time, FT reported [LINK] "Mr Nyusi has said that "*the government and Renamo will come together and hunt" rebels who fail to disarm. The government has struggled to stem the separate insurgency in the north, which has killed or displaced hundreds near the gas-rich areas during the past two years. While the roots of the conflict remain murky, it is linked to a local Islamist group and appears to be drawing on disaffection over sharing gas investment benefits, say analysts*." This is just a reminder this is not a new issue. LNG is a game changer to Mozambique's economic future. It is, but also has been, a government priority to have the security and safety for Total and Exxon to move on their LNG developments. Its hard to believe the Mozambique government will be able to quickly convince Total and Exxon boards that they can be comfortable there is a sustained security/safety situation and they can send their people back in to develop the LNG. Total's board would allow any resumption of development before year end 2021. The last thing Total wants is a replay of March 24-27. The first question is how long will it take before the Total board is convinced its safe to restart. Could you imagine them doing a replay of what just happened? Wait three months, restart development and have to stop again right away? We have to believe that could lead the Total board to believe it is unfixable for years. We just don't think they are to prepared to risk that decision in 3 months. Its why we have to think there isn't a restart approval until at least in 2022 at the earliest ie. why we think the likely scenario is a delay of 2-3 years, and not a matter of months.

Mozambique's security issues pushes back 5.0 bcf/d of new LNG supply at least a couple years. The global LNG issue is that 5 bcf/d of new Mozambique LNG supply (apart from the Eni Coral FLNG of 0.45 bcf/d) won't start up in 2024 and

continuing thru the 2020s. And we believe all LNG forecasts included this 5.0 bcf/d to be in service in the 2020s as Mozambique had been considered the best positioned LNG supply to access Asia after Australia and Papua New Guinea. (i) Eni Coral Sul (Rovuma Basin) FLNG of 0.45 bcf/d planned in service in 2022. [LINK] This is an offshore floating LNG vessel that is still expected to be in service in 2022. (ii) Total Phase 1 to add 1.7 bcf/d with an in service originally planned for 2024. We expect the in service data to be pushed back to at least 2026 assuming Total gives a development restart approval in Dec 2021. In theory, this would only be a 1 year loss of time. However, Total has let services go, the project will be idle for 9 months, it isn't clear if the need to get people out quickly let them do a complete put the project on hold, and how many people will be on site maintaining the status of the development during the force majeure. Also what new procedures and safety will be put in place for a restart. These all mean there will be added time needed to get the project back to where it was when force majeure was declared ie. why we think a 12 month time delay will be more like an 18 month project delay. (iii) Exxon's Rozuma Phase 1 LNG will add 2.0 bcf/d and, pre-Covid, was expected to be in service in 2025. We believe the delays related to security and safety at Total are also going to impact Exxon. We find it highly unlikely the Exxon board would take a different security and safety decision than Total. Pre-pandemic, Exxon's March 6, 2019 Investor Day noted their operated Mozambique Rovuma LNG Phase 1 was to be 2 trains each with 1.0 bcf/d capacity for total initial capacity of 2.0 bf/d with FID expected in 2019 and first LNG deliveries in 2024. The 2019 FID expectation was later pushed to be expected just before the March 2020 investor day. But the pandemic hit, and on March 21, 2020, we tweeted [LINK] on the Reuters story "*Exclusive: Coronavirus, gas slump put brakes on Exxon's giant Mozambique LNG plan"* [LINK] that noted Exxon was expected to delay the Rovuma FID. There was no timeline, but the expectation was that FID would now be in 2022 (3 years later than original timeline0 and that would push first LNG likely to 2027. (iv) Total Phase 2 was to add 1.3 bcf/d. There was no firm in service date but it was expected to follow closely behind Phase 1 to maintain services. That would have put it originally in the 2026/2027 period. But if Phase 1 is pushed back 2 years, so will Phase 2 so more likely 2028/2029.. (v) Total Phase 1 + 2 and Exxon Rozuma Phase 1 total 5.0 bcf/d and would have been (and still are) in all LNG supply forecasts for the 2020s. (vi) We aren't certain if the LNG supply forecasts include Exxon Rozuma Phase 2 ,which would be an additional 2.0 bcf/d on top of the 5.0 bcf/d noted above. Exxon Rozuma has always been expected to be at least 2 Phases. This has been the plan since the Anadarko days given the 85 tcf size of the resource on Exxon's Area 4. There was no firm in service data for Phase 2, but it was expected they would also closely follow Phase 1 to maintain services. We expect that original timeline would have been 2026/2027 and that would not be pushed back to 2029/2030. (vii) It doesn't matter if its only 5 bcf/ of Mozambique that is delayed 2 to 3 years, it will cause a bigger LNG supply gap and sooner. The issue for LNG markets is this is taking projects that are in development effectively out of the queue for some period.

Exxon Mozambique LNG



Source: Exxon Investor Day March 6, 2019

Won't LNG and natural gas get hit by Biden's push for carbon free electricity? Yes, in the US. For the last 9 months, we have warned on Biden's climate change plan that were his election platform and now form his administration's energy transition map. We posted our July 28, 2020 blog "*Biden To Put US On "Irreversible Path to Achieve Net-Zero Emissions, Economy-Wide" Is a Major Negative To US Natural Gas in 2020s* "[LINK] on Biden's platform "*The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future*" [LINK]. Biden's new American Jobs Plan

[LINK] lines up with his campaign platform including to put the US "*on the path to achieving 100 percent carbon-free electricity by 2035*.". Our July 28, 2020 blog noted that it would require replacing ~60% of US electricity generation with more renewable and it could eliminate ~40% (33.5 bcf/d) of 2019 US natural gas consumption. If Biden is 25% successful by 2030, it would replace ~6.3 bcf/d of natural gas demand. It would be a negative to US natural gas and force more US natural gas to export markets. The wildcard when does US natural gas start to decline if producers are faced with the reality of natural gas being phased out for electricity. The other hope is that when Biden says "carbon-free", its not what ends up in the details of any formal policy statement ie. carbon electricity will be allowed with Biden's push for CCS.

Will Cdn natural gas be similarly hit by if Trudeau move to "emissions free" and not "net zero emissions" electricity? Yes and No. Our SAF Group April 25, 2021 Energy Tidbits memo [LINK] was titled ""*Bad News For Natural Gas, Trudeau's Electricity Goal is Now 100% "Emissions Free" And Not "Net Zero Emissions*". On Thursday, PM Trudeau spoke at Biden's global climate summit [LINK] and looks like he slipped in a new view on electricity than was in last Monday's budget and his Dec climate plan. Trudeau said "*In Canada, we've worked hard to get to over 80% emissions-free electricity, and we're not going to stop until we get to 100%."* Speeches, especially ones made on a global stage are checked carefully so this had to be deliberate. Trudeau said "*emissions free*" and not net zero emissions electricity. It seems like this language is carefully written to exclude any fossil fuels as they are not emissions free even if they are linked to CCS. Recall in Liberals big Dec 2020 climate announcement [LINK], Liberals said ""*Work with provinces, utilities and other partners to ensure that Canada's electricity generation achieves net-zero emissions before 2050*." There is no way Trudeau changed the language unless he meant to do so. And this is a major change as it would seem to indicate his plan to eliminate all fossil fuels used for electricity. If so this would be a negative to Cdn natural gas that would be stuck within Western Canada and/or continuing to push into the US when Biden is trying to switch to carbon free electricity. We recognize that there is still some ambiguity in what will be the details of policy and the Liberals aren't changing to no carbon sourced electricity at all. Let's hope so. But let's also be careful that politicians don't change language without a reason or at least with a view to setting up for some future hit. Plus Trudeau had a big warning in that same speech saying "*we will make it law to respect our new 2030 target and achieve net-zero emissions by 2050*". They plan to make it the law that Canada has to be on track for the Liberals 2030 emissions targets. This means that the future messaging will be that the Liberals have no choice but to take harder future emissions actions as it is the law. They will be just obeying the law as they will be obligated to obey the law. Everyone knows the messaging will be we have to do more get to Net Zero, that in itself will inevitably mean it will be the law if he actually does move to eliminate any carbon based electricity. So yes it's a negative, that is unless more Cdn natural gas can be exported via LNG to Asia. We believe this would be a plus to be priced against global LNG instead of Henry Hub.

Biden's global climate summit reminded there is too much risk to skip over natural gas as the transition fuel. Apart from the US and Canada, we haven't seen a sea shift to eliminating natural gas for power generation, especially from energy import dependent countries. There is a strong belief that hydrogen and battery storage will one day be able to scale up at a competitive cost to lead to the acceleration away from fossil fuels. But that time isn't yet here, at least not for energy import dependent countries. One of the key themes from last week's leader's speeches at the Biden global climate summit – to get to Net Zero, the world is assuming there wilt be technological advances/discoveries that aren't here today and that have the potential to immediately ramp up in scale. IEA Executive Director Faith Birol was blunt in his message [LINK] saying "*Right now, the data does not match the rhetoric – and the gap is getting wider*." And "*IEA analysis shows that about half the reductions to get to net zero emissions in 2050 will need to come from technologies that are not yet ready for market. This calls for massive leaps in innovation. Innovation across batteries, hydrogen, synthetic fuels, carbon capture and many other technologies.* US Special Envoy for Climate John Kerry said a similar point that half of the emissions reductions will have to come from technologies that we don't yet have at scale. UK PM Johnson [LINK] didn't say it specifically, but points to this same issue saying "*To do these things we've got to be constantly original and optimistic about new technology and new solutions whether that's crops that are super-resistant to drought or more accurate weather forecasts like those we hope to see from the UK's new Met Office 1.2bn supercomputer that we're investing in*." It may well be that the US and other self sufficient energy countries are comfortable going on the basis of assuming technology developments will occur on a timely basis. But, its clear that countries like China, India, South Korea and others are not prepared to do so. And not prepared to have the confidence to rid themselves of coal power generation. This is why there hasn't been any material change in the LNG demand outlook

We expect the IEA's blunt message that the gap is getting wider will be reinforced on May 18. We have had a consistent view on the energy transition for the past few years. We believe it is going to happen, but it will take longer, be a bumpy road and cost more than expected. This is why we believe the demise of oil and natural gas won't be as easy and fast as hoped for by the climate change side. The IEA's blunt warning on the gap widening should not be a surprise as they warned on this in June 2020. Birol's climate speech also highlighted that the IEA will release on May 18 its roadmap for how the global energy sector can reach net zero by 2050. Our SAF Group June 11, 2020 blog "*Will The Demise Of Oil Take Longer, Just Like Coal? IEA and Shell Highlight Delays/Gaps To A Smooth Clean Energy Transition*" [LINK] feature the IEA's June 2020 warning that the critical energy technologies needed to reduce emissions are nowhere near where they need to be. In that blog, we said "there was an excellent illustration of the many significant areas, or major pieces of the puzzle, involved in an energy transition by the IEA last week. The IEA also noted the progress of each of the major pieces and the overall conclusion is that the vast majority of the pieces are behind or well behind where they should be to meet a smooth timely energy transition. It is important to note that these are just what the IEA calls the "*critical energy technologies*" and does not get into the wide range of other considerations needed to support the energy transition. The IEA divides these "critical energy technologies "into major groupings and then ranked the progress of each of these pieces in its report "*Tracking Clean Energy Progress"* [LINK] by on track, more efforts needed, or not on track". Our blog included the below IEA June 2020 chart.

IEA's Progress Ranking For "Critical Energy Technologies" For Clean Energy Transition

Power	Renewable Power	Geothermal
	Solar PV	Ocean Power
	Onshore Wind	Nuclear Power
	Offshore Wind	Natural Gas-Fired Power
	Hydropower	Coal-Fired Power
	Bioenergy Power Generation	CCUS in Power
	Concentrating Solar Power	
Fuel Supply	Methane Emissions from O&G	Flaring Emissions
Industry	Chemicals	Pulp and Paper
	Iron and Steel	Aluminum
	Cement	CCUS in Industry and Transformation
Transport	Electric Vehicles	Transport Biofuels
	Rail	Aviation
	Fuel Consumption of Cars and Vans	International Shipping
	Trucks and Busses	
Buildings	Building Envelopes	Lighting
	Heating	Appliances and Equipment
	Heat Pumps	Data Centres and Data Transmission Networks
	Cooling	
Energy Integration	Energy Storage	Demand Response
	Hydrogen	Direct Air Capture
	Smart Grids	

Source: IEA

On Track More Efforts Needed Not on Track

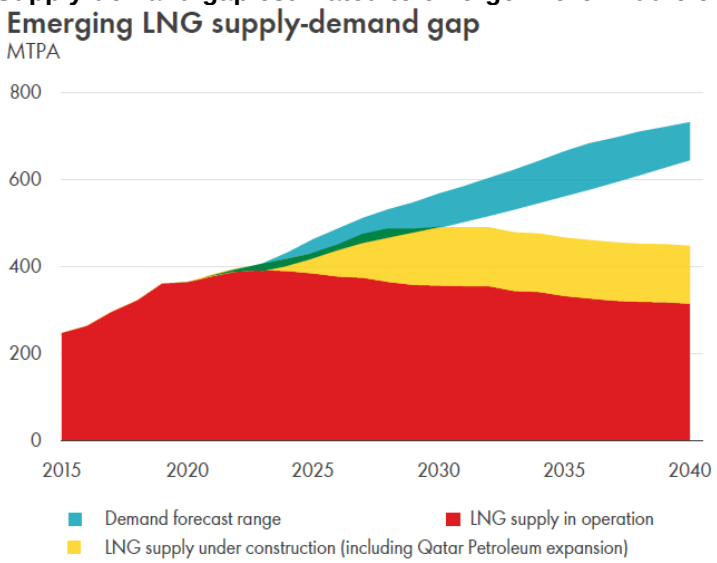
Source: IEA Tracking Clean Energy Progress, June 2020

We are referencing Shell's long term outlook for LNG We recognize there are many different forecasts for LNG, but are referencing Shell' LNG Outlook 2021 from Feb 25, 2021 for a few reasons. (i) Shell's view on LNG is the key view for when and what decision will be made for LNG Canada Phase 2. (ii) Shell is one of the global leaders in LNG supply and trading. (iii) Shell provides on the record LNG outlooks every year so there is the ability to compare and make sure the outlook fits the story. It does. (iv) Shell, like other supermajors, has had to make big capex cuts post pandemic and that certainly wouldn't put any bias to the need for more capex.

Shell's March 2021 long term outlook for LNG demand was basically unchanged vs 2020 and leads to a LNG supply gap in mid 2020s Shell does not provide the detailed numbers in their Feb 25, 2021 LNG forecast. We would assume they

would have reflected some delay, perhaps 1 year, at Mozambique but would be surprised if they put a 2-3 year delay in for the 5 bcf/d from Total Phase 1 +2 and Exxon Rozuma Phase 1. Compared to their LNG Outlook 2020, it looks like there was no change for their estimate of global natural gas demand growth to 2040, which looked relatively unchanged at approx. 5,000 bcm/yr or 484 bcf/d. Similarly, long term LNG demand looked unchanged to 2040 of ~700 mm tonnes (92 bcf/d) vs 360 mm tonnes (47 bcf/d) in 2020. In the 2021 outlook, Shell highlighted that the pandemic delayed project construction timelines and that the "*lasting impact expected on LNG supply not demand"*. And that Shell sees a LNG "*supply-demand gap estimated to emerge in the middle of the current decade as demand rebounds*". Comparing to 2020, it looks like the supply-demand gap is sooner.

Supply-demand gap estimated to emerge in the middle of the current decade



Source: Shell LNG Outlook 2021, Feb 25, 2021

Mozambique delays are redefining the LNG markets for the 2020s: Delaying 5 bcf/d of Mozambique new LNG supply 2-3 years means a much bigger supply gap starting in 2025.. Even if the optimists are right, there are now delays to all major Mozambique LNG supply from LNG supply forecasts. We don't have the detail, but we believe all LNG forecasts, including Shell's LNG Outlook 2021, would have included Total's Phase 1 and Phase 2 and Exxon Rozuma Phase 1. As noted earlier, we believe that the likely impact of the Mozambique security concerns is that these forecasts would likely have to push back 1.7 bcf/d from Total Phase 1 to at least 2026, 2.0 bcf/d Exxon Rozuma Phase 1 to at least 2027, and 1.3 bcf/d Total Phase 2 to at least 2028/2029 with the real risk these get pushed back even further. 5.0 bcf/d is equal to 38 mtpa. These delays would mean there is an increasing LNG supply gap in 2025 and increasingly significantly thereafter. And even if a new greenfield LNG project is FID's right away, it wouldn't be able to step in to replace Total Phase 1 prior startup timing for 2024 or likely the market at all until at least 2027. Its why the decision on filling the gap will fall on brownfield LNG projects.

And does this bigger, nearer supply gap force LNG players to look at what brownfield LNG projects they could advance? A greenfield LNG project would likely take at least until 2027 to be in operations. Its why we believe the Mozambique delays will effectively force major LNG players to look to see if there are brownfield LNG projects they should look to advance. Prior to the just passed winter, no one would think Shell or other major LNG players would be considering any new LNG FIDs in 2021. All the big companies are in capital reduction mode and debt reduction mode. But Brent oil is now solidly over $60 and LNG prices hit record levels in Jan and the world's economic and oil and gas demand outlook are increasing with vaccinations. And we are starting to see companies move to increasing capex with the higher cash flows. We would not expect any major LNG players to move to FID right away. But we see them watching to see if 2021 plays out to still support this increasing LNG supply gap. And unless new mutations prevent vaccinations from returning the world to normal, we suspect that major LNG players, like other oil and gas companies, will be looking to increase

capex as they approve 2022 budgets. The outlook for the future has changed dramatically in the last 5 months. The question facing Shell and others, should they look to FID new LNG brownfield projects in the face of an increasing LNG supply gap that is going to hit faster and harder than expected a few months ago. We expect these decisions to be looked at before the end of 2021. LNG prices will be stronger, but we expect the limiting cap in Asia will be that thermal coal will be used to mitigate some LNG price pressure.

Back to Shell, does increasing LNG supply gap provide the opportunity to at least consider a LNG Canada Phase 2 FID over the next 9 months? Shell is no different than any other major LNG supplier in always knowing the market and that the oil and gas outlook is much stronger than 6 months ago. No one has been or is talking about this Mozambique impact and how it will at least force major LNG players to look at if they should FID new brownfield LNG projects to take advantage of this increasing supply gap. We don't have any inside contacts at Shell or LNG Canada, but that is no different than when we looked at the LNG markets in September 2017 and saw the potential for Shell to FID LNG Canada in 2018. We posted a September 20, 2017 blog *"China's Plan To Increase Natural Gas To 10% Of Its Energy Mix Is A Global Game Changer Including For BC LNG*" [LINK]. Last time, it was a demand driven supply gap, this time, it's a supply driven supply gap. We have to believe any major LNG player, including Shell, will be at least looking at their brownfield LNG project list and seeing if they should look to advance FID later in 2021. Shell has LNG Canada Phase 2, which would add 2 additional trains or approx. 1.8 bcf/d. And an advantage to an FID would be that Shell would be able to commit to its existing contractors and fabricators for a continuous construction cycle following on LNG Canada Phase 1 ie. to help keep a lid on capital costs. No one is talking about the need for these new brownfield LNG projects, but, unless Total gets back developing Mozambique and keeps the delay to a matter of months, its inevitable that these brownfield LNG FID internal discussions will be happening in H2/21. Especially since the oil and gas price outlook is much stronger than it was in the fall and companies will be looking to increase capex in 2022 budgets

A LNG Canada Phase 2 would be a big plus to Cdn natural gas. A LNG Canada Phase 2 FID would be a big plus for Cdn natural gas. It would allow another ~1.8 bcf/d of Cdn natural gas to be priced against Asian LNG prices and not against Henry Hub. And it would provide demand offset versus Trudeau if he moves to make electricity "emissions free" and not his prior "net zero emissions". Mozambique may be in Africa, but, unless sustained peace and security is attained, it is a game changer to LNG outlook creating a bigger and sooner LNG supply gap. And with a stronger tone to oil and natural gas prices in 2021, the LNG supply gap will at least provide the opportunity for Shell to consider FID for its brownfield LNG Canada Phase 2 and provide big support to Cdn natural gas for back half of the 2020s. And perhaps if LNG Canada is exporting 3.6 bcf/d from two phases, it could help flip Cdn natural gas to a premium to US natural gas especially if Biden is successful in reducing US domestic natural gas consumption for electricity. The next six months will be very interesting to watch for LNG markets.

Asian LNG Buyers Abruptly Change and Lock in Long Term Supply – Validates Supply Gap, Provides Support For Brownfield LNG FIDs

Posted 11am on July 14, 2021

The last 7 days has shown there is a sea change as Asian LNG buyers have made an abrupt change in their LNG contracting and are moving to lock in long term LNG supply. This is the complete opposite of what they were doing pre-Covid when they were trying to renegotiate Qatar LNG long term deals lower and moving away from long term deals to spot/short term sales. Why? We think they did the same math we did in our April 28 blog "*Multiple Brownfield LNG FIDs Now Needed To Fill New LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2?*" and saw a much bigger and sooner LNG supply gap driven by the delay of 5 bcf/d of Mozambique LNG that was built into most, if not all LNG supply forecasts. Asian LNG buyers are committing real dollars to long term LNG deals, which we believe is the best validation for the LNG supply gap. Another validation, Shell, Total and others are aggressively competing to invest long term capital to partner in Qatar Petroleum's massive 4.3 bcf/d LNG expansion despite plans to reduce fossil fuels production in the 2020s. And even more importantly to LNG suppliers, the return to long term LNG contracts provides the financing capacity to commit to brownfield LNG FIDs. The abrupt change by Asian LNG buyers to long term contracts is a game changer for LNG markets and sets the stage for brownfield LNG FIDs likely as soon as before year end 2021. It has to be brownfield LNG FIDs if the gap is coming bigger and sooner. And we return to our April 28 blog point, if brownfield LNG is needed, what about Shell looking at 1.8 bcf/d brownfield LNG Canada Phase 2? LNG Canada Phase 1 at 1.8 bcf/d capacity is already a material positive for Cdn natural gas producers. A FID on LNG Canada Phase 2 would be huge, meaning 3.6 bcf/d of Cdn natural gas will be tied to Asian LNG markets and not competing in the US against Henry Hub. And with a much shorter distance to Asian LNG markets. This is why we focus on global LNG markets for our views on the future value of Canadian natural gas.

Sea change in Asian LNG buyers is also the best validation of the LNG supply gap and big to LNG supply FIDs. Has the data changed or have the market participants changed in how they react to the data? We can't recall exactly who said that on CNBC on July 12, it's a question we always ask ourselves. In the LNG case, the data has changed with Mozambique LNG delays and that has directly resulted in market participants changing and entering into long term contracts. We can't stress enough how important it is to see Asian LNG buyers move to long term LNG deals. (i) Validates the sooner and bigger LNG supply gap. We believe LNG markets should look at the last two weeks of new long term deals for Asian LNG buyers as being the validation of the LNG supply gap that clearly emerged post Total declaring force majeure on its 1.7 bcf/d Mozambique LNG Phase 1 that was under construction and on track for first LNG delivery in 2024. Since then, markets have started to realize the Mozambique delays are much more than 1.7 bcf/d. They have seen major LNG suppliers change their outlook to a more bullish LNG outlook and, most importantly, are now seeing Asian LNG buyers changing from trying to renegotiate long term LNG deals lower to entering into long term LNG deals to have security of supply. Asian LNG buyers are cozying up to Qatar in a prelude to the next wave of Asian buyer long term deals. What better validation is there than companies/countries putting their money where their mouth is. (ii) Provides financial commitment to help push LNG suppliers to FID. We believe these Asian LNG buyers are doing much more than validating a LNG supply gap to markets. The big LNG suppliers can move to FID based on adding more LNG supply to their portfolio, but having more long term deals provides the financial anchor/visibility to long term capital commitment from the buyers. Long term contracts will only help LNG suppliers get to FID.

It was always clear that the Mozambique LNG supply delay was 5.0 bcf/d, not just 1.7 bcf/d from Total Phase 1. LNG markets didn't really react to Total's April 26 declaration of force majeure on its 1.7 bcf/d Mozambique LNG Phase 1. This was an under construction project that was on time to deliver first LNG in 2024. It was in all LNG supply forecasts. There was no timeline given but, on the Apr 29 Q1 call, Total said that it expected any restart decision would be least a year away. If so, we believe that puts any actual construction at least 18 months away. There will be work to do just to get back to where they were when they were forced to stop development work on Phase 1. Surprisingly, markets didn't look the broader implications, which is why we posted our 7-pg Apr 28 blog "*Multiple Brownfield LNG FIDs Now Needed To Fill New LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2?*" [LINK] We highlighted that Mozambique LNG delays were actually 5 bcf/d, not 1.7 bcf/d. And this 5 bcf/d of Mozambique LNG supply was built into most, if not all, LNG supply forecasts. The delay in Total Phase 1 would lead to a commensurate delay in its Mozambique LNG Phase 2 of 1.3 bcf/d. Total Phase 2 was to add 1.3 bcf/d. There was no firm in service date, but it was expected to

follow closely behind Phase 1 to maintain services. That would have put it originally in the 2026/2027 period. But if Phase 1 is pushed back at least 2 years, so will the follow on Phase 2, so more likely, it will be at least 2028/2029. The assumption for most, if not all, LNG forecasts was that Phase 2 would follow Phase 1. Exxon Rozuma Phase 1 of 2.0 bcf/d continues to be pushed back in timeline especially following Total Phase 1. Exxon's Mozambique Rozuma Phase 1 LNG will add 2.0 bcf/d and, pre-Covid, was originally expected to be in service in 2025. The project was being delayed and Total's force majeure has added to the delays. Rozuma onshore LNG facilities are right by Total. On June 20, we tweeted [LINK] on the Reuters report "*Exclusive: Galp says it won't invest in Rovuma until Mozambique ensures security*" [LINK]. Galp is one of Exxon's partners in Rozuma. Reuters reported that Galp said they won't invest in Exxon's Rozuma LNG project until the government ensures security, that this may take a while, they won't be considering the project until after Total has reliably resumed work on its Phase 1, which likely puts any Rozuma decision until at least end of 2022 at the earliest. Galp has taken any Rozuma Phase 1 capex out of their new capex plans thru 2025 and will have to take out projects in their capex plan if Rozuma does come back to work. This puts Rozuma more likely 2028 at the earliest as opposed to before the original expectations of before 2025. Pre-pandemic, Exxon's March 6, 2019 Investor Day noted their operated Mozambique Rovuma LNG Phase 1 was to be 2 trains each with 1.0 bcf/d capacity for total initial capacity of 2.0 bf/d with FID expected in 2019 and first LNG deliveries sometime before 2025. LNG forecasts had been assuming Exxon Rozuma would be onstream around 2025. The 2019 FID expectation was later pushed to be expected just before the March 2020 investor day. But the pandemic hit, and on March 21, 2020, we tweeted [LINK] on the Reuters story "*Exclusive: Coronavirus, gas slump put brakes on Exxon's giant Mozambique LNG plan"* [LINK] that noted Exxon was expected to delay the Rovuma FID. There was no timeline, but now, any FID is not expected until late 2022 at the earliest, that would push first LNG likely to at least 2028. What this means is that the Mozambique LNG delays are not 1.7 bcf/d but 5.0 bcf/d of projects that were in all, if not most, LNG supply forecasts. There is much more in our 7-pg blog. But Mozambique is what is driving a much bigger and sooner LNG supply gap starting ~2025 and stronger outlook for LNG prices

<u>One of the reasons why it went under the radar is that major LNG suppliers played stupid on the Mozambique impact.</u> It makes it harder for markets to see a big deal when the major LNG suppliers weren't making a big deal of Mozambique or playing stupid in the case of Cheniere in their May 4 Q1 call. In our May 9, 2021 Energy Tidbits memo, we said we had to chuckle when we saw Cheniere's response in the Q&A to its Q1 call on May 4 that they only know what we know from reading the Total releases on Mozambique and its impact on LNG markets. It's why we tweeted [LINK] "*Hmm! $LNG says only know what we read on #LNG market impact from $TOT $XOM MZ LNG delays. Surely #TohokuElectric & other offtake buyers are reaching out to #Cheniere. MZ LNG delays is a game changer to LNG in 2020s, see SAF Group blog. Thx @olympe_mattei @TheTerminal #NatGas".* How could they not be talking to LNG buyers for Total and /or Exxon Mozambique LNG projects. In the Q1 Q&A, mgmt was asked about Mozambique and didn't know any more than what you or I have read. Surely, they were speaking to Asian LNG buyers who had planned to get LNG supply from Total Mozambique or Exxon Rozuma Mozambique or both. Mgmt is asked "*wanted to just kind of touch on the color use talking about for these supply curve. And are you able to kind of provide any thoughts on the Mozambique and a deferral with the project of that size on 13 and TPA being deferred by we see you have you noticed any impact to the market has is there any impact for stage 3 with that capacity? Thanks*." Mgmt replies "*No. Look, I only know about the Mozambique delay with what I read as well as what you read that from total and an Exxon. And it's a sad situation and I hope everybody is safe and healthy that were there to experience that unrest but no I don't think it's, again it's a different business paradigm than what we offer. So, we offer a full value product, the customer doesn't have to invest in equity, customer doesn't have to worry about the E&P side of the business because, we've been able to both the by at our peak almost 7 Dee's a day of US NAT gas from almost a 100 different producers on 26 different pipelines and deliver it to our to facilities. So we take care of a lot of what the customer needs".*

<u>There are other LNG supply delays/interruptions beyond Mozambique.</u> There have been a number of other smaller LNG delay or existing supply interruptions that add to Asian LNG buyers feeling less secure about the reliability of mid to long term LNG supply. Here are just a few examples. (i) Total Papua LNG 0.74 bcf/d. On June 8, we tweeted [LINK] *"Timing update Papua #LNG project. $OSH June 8 update "2022 FEED, 2023 FID targeting 2027 first gas". $TOT May 5 update didn't forecast 1st gas date. Papua is 2 trains w/ total capacity 0.74 bcf/d."* We followed the tweet saying [LINK] *"Bigger #LNG supply gap being created >2025. Papua #LNG originally expected FID in 2020 so 1st LNG is 2 years delayed.*

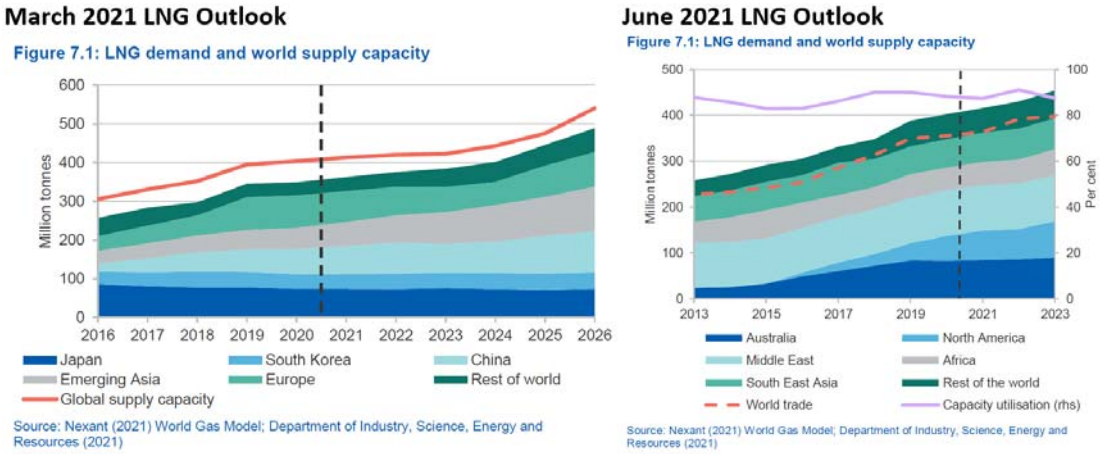
Common theme - new LNG supply is being delayed ie. [Total] Mozambique. Don't forget need capacity>demand due to normal maintenance, etc. Positive for LNG." (ii) Chevron's Gorgon. A big LNG story in H2/20 was the emergence of weld quality issues in the propane heat exchangers at Train 2, which required additional downtime for repair. Train 2 was shut on May 23 with an original restart of July 11, but the repairs to the weld quality issues meant it didn't restart until late Nov. The same issue was found in Train 1 but repairs were completed. However extended downtime for the trains led to lower LNG volumes. Gorgon produced ~2.3 bcf/d in 2019 but was down to 2.0 bcf/d in 2020. (iii) Equinor's Melkoeya 0.63 bcf/d shut down for 18 months due to a fire. A massive fire led to the Sept 28, 2020 shutdown of the 0.63 bcf/d Melkoeya LNG facility in Norway. On April 26, Equinor released "*Revised start-up date for Hammerfest LNG*" [LINK] with regard to the 0.63 bcf/d Melkoeya LNG facility. The original restart date was Oct 1, 2021 (ie. a 12 month shut down), but Equinor said "*Due to the comprehensive scope of work and Covid-19 restrictions, the revised estimated start-up date is set to 31 March 2022".* When we read the release, it seemed like Equinor was almost setting the stage for another potential delay in the restart date. Equinor had two qualifiers to this March 31, 2022 restart date. Equinor said "*there is still some uncertainty related to the scope of the work*" and "*Operational measures to handle the Covid-19 situation have affected the follow-up progress after the fire. The project for planning and carrying out repairs of the Hammerfest LNG plant must always comply with applicable guidelines for handling the infection situation in society. The project has already introduced several measures that allow us to have fewer workers on site at the same time than previously expected. There is still uncertainty related to how the Covid-19 development will impact the project progress."*

Cheniere stopped the game playing the game on June 30. Our July 4, 2021 Energy Tidbits memo noted that it looks like Cheniere has stopped playing stupid with respect to the strengthening LNG market in 2021. We can't believe they thought they were fooling anyone, especially their competitors. Bu that week, they came out talking about how commercial discussions have picked up in 2021 and it's boosted their hope for a Texas (Corpus Christi) LNG expansion. On Wednesday, Platts reported "*Pickup in commercial talks boosts Cheniere's hopes on mid-scale LNG project*" [LINK] Platts wrote "*Cheniere Energy expects to make a "substantial dent" by the end of 2022 in building sufficient buyer support for a proposed mid-scale expansion at the site of its Texas liquefaction facility, Chief Commercial Officer Anatol Feygin said June 30 in an interview." " As a result, he said, " The commercial engagement, I think it is very fair to say, has really picked up steam, and we are quite optimistic over the coming 12-18 months to make a substantial dent in that Stage 3 commercialization."* Platts also reported that Cheniere noted this has been a tightening market all year (ie would have been known by the May 4 Q1 call). Platts wrote "*We obviously find ourselves at the beginning of this year and throughout in a very tight market where prices today into Asia and into Europe are at levels that we frankly haven't seen in a decade-plus," Feygin said. "We've surpassed the economics that the industry saw post the Fukushima tragedy in March 2011, and that's happened in the shoulder period."* It's a public stance as to a more bullish LNG outlook

But we still see major LNG suppliers like Australia hinting but not outright saying that LNG supply gap is coming sooner. We have to believe Australia will be unveiling a sooner LNG supply gap in their September forecast. On June 28, we tweeted [LINK] on Australia's Resources and Energy Quarterly released on Monday [LINK] because there was a major change to their LNG outlook versus their March forecast. We tweeted "*#LNGSupplyGap. AU June fcast now sees #LNG mkt tighten post 2023 vs Mar fcast excess supply thru 2026. Why? $TOT Mozambique delays. See below SAF Apr 28 blog. Means brownfield LNG FID needed ie. like #LNGCanada Phase 2. #OOTT #NatGas".* Australia no longer sees supply exceeding demand thru 2026. In their March forecast, Australia said "*Nonetheless, given the large scale expansion of global LNG capacity in recent years, demand is expected to remain short of total supply throughout the projection period."* Note this is thru 2026 ie. a LNG supply surplus thru 2026. But on June 28, Australia changed that LNG outlook and now says the LNG market may tighten beyond 2023. Interestingly, the June forecast only goes to 2023 and not to 2026 as in March. Hmmm! On Monday, they said "*Given the large scale expansion of global LNG capacity in recent years, import demand is expected to remain short of export capacity throughout the outlook period. Beyond 2023, the global LNG market may tighten, due to the April 2021 decision to indefinitely suspend the Mozambique LNG project, in response to rising security issues. This project has an annual nameplate capacity of 13 million tonnes, and was previously expected to start exporting LNG in 2024*." 13 million tonnes is 1.7 bcf/d so they are only referring to Total Mozambique LNG Phase 1. So no surprise the change is Mozambique LNG driven but we have to believe the reason why they cut their forecast off this time at 2023 is that they are looking at trying to figure out what to forecast beyond 2023 in addition to Total Phase 1. And, importantly, we believe they will be changing their LNG forecast for more than Mozambique ie. India

demand that we highlight later in the blog. They didn't say anything else specific on Mozambique but, surely they have to also be delaying the follow on Total Phase 2 of 1.3 bcf/d and Exxon Rozuma Phase 1 of 2.0 bcf/d.

Australia's LNG Outlook: March 2021 vs June 2021 Forecasts

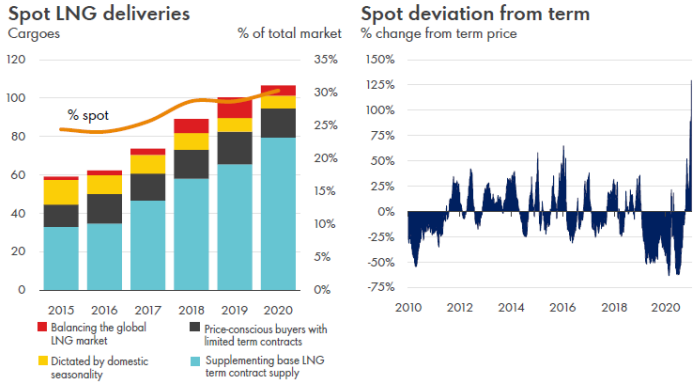


Source: Australia Resources and Energy Quarterly

Clearly Asian LNG buyers did the math, saw the new LNG supply gap and were working the phones in March/April/May trying to lock up long term supply. We wrote extensively on the Total Mozambique LNG situation before the April 26 force majeure as it was obvious that delays were coming to a project counted on for first LNG in 2024. Total had shut down Phase 1 development in December for 3 months due to the violence and security risks. It restarted development on Wed March 24, violence/attacks immediately resumed for 3 consecutive days, and then Total suspended development on Sat March 27. That's why no one should have been surprised by the April 26 force majeure. Asian LNG buyers were also seeing this and could easily do the same math we were doing and saw a bigger and sooner LNG supply gap. They were clearly working the phones with a new priority to lock up long term LNG supply. Major long term deals don't happen overnight, so it makes sense that we started to see these new Asian long term LNG deals start at the end of June.

A big pivot from trying to renegotiate down long term LNG deals or being happy to let long term contracts expire and replace with spot/short term LNG deals. This is a major pivot or abrupt turn on the Asian LNG buyers contracting strategy for the 2020s. There is the natural reduction of long term contracts as contracts reach their term. But with the weakness in LNG prices in 2019 and 2020, Asian LNG buyers weren't trying to extend long term contracts, rather, the push was to try to renegotiate down its long term LNG deals. The reason was clear, as spot prices for LNG were way less than long term contract prices. And this led to their LNG contracting strategy – move to increase the proportion of spot LNG deliveries out of total LNG deliveries. Shell's LNG Outlook 2021 was on Feb 25, 2021 and included the below graphs. The spot LNG price derivation from long term prices in 2019 and 2020 made sense for Asian LNG buyers to try to change their contract mix. Yesterday, Maeil Business News Korea reported on the new Qatar/Kogas long term LNG deal with its report "*Korea may face LNG supply cliff or pay hefty price after long-term supplies run out*" [LINK], which highlighted this very concept – Korea wasn't worried about trying to extend expiring long term LNG contracts. Maeil wrote "*Seoul in 2019 secured a long-term LNG supply contract with the U.S. for annual 15.8 million tons over a 15-year period. But even with the latest two LNG supply contracts, the Korean government needs extra 6 million tons or more of LNG supplies to keep up the current power pipeline. By 2024, Korea's long-term supply contracts for 9 million tons of LNG will expire - 4.92 million tons on contract with Qatar and 4.06 million tons from Oman, according to a government official who asked to be unnamed."*

Spot LNG deliveries and Spot deviation from term price



Source: Shell LNG Outlook 2021 on Feb 25, 2021

Asian LNG buyers moving to long term LNG deals provide financing capacity for brownfield LNG FIDs. We believe this abrupt change and return to long term LNG deals is even more important to LNG suppliers who want to FID new projects. The big LNG players like Shell can FID new LNG supply without new long term contracts as they can build into their supply options to fill their portfolio of LNG contracts. But that doesn't mean the big players don't want long term LNG supply deals, as having long term LNG contracts provide better financing capacity for any LNG supplier. It takes big capex for LNG supply and long term deals make the financing easier.

Four Asian buyer long term LNG deals in the last week. It was pretty hard to miss a busy week for reports of new Asian LNG buyer long term LNG deals. There were two deals from Qatar Petroleum, one from Petronas and one from BP. The timing fits, it's about 3 months after Total Mozambique LNG problems became crystal clear. And as noted later, there are indicators that more Asian buyer LNG deals are coming.

> Petronas/CNOOC is 10 yr supply deal for 0.3 bcf/d. On July 7, we tweeted [LINK] on the confirmation of a big positive to Cdn natural gas with the Petronas announcement [LINK] of a new 10 year LNG supply deal for 0.3 bcf/d with China's CNOOC. The deal also has special significance to Canada. (i) Petronas said "*This long-term supply agreement also includes supply from LNG Canada when the facility commences its operations by middle of the decade*". This is a reminder of the big positive to Cdn natural gas in the next 3 to 4 years – the start up of LNG Canada Phase 1 is ~1.8 bcf/d capacity. This is natural gas that will no longer be moving south to the US or east to eastern Canada, instead it will be going to Asia. This will provide a benefit for all Western Canada natural gas. (ii) First ever AECO linked LNG deal. It's a pretty significant event for a long term Asia LNG deal to now have an AECO link. Petronas wrote "*The deal is for 2.2 million tonnes per annum (MTPA) for a 10-year period, indexed to a combination of the Brent and Alberta Energy Company (AECO) indices. The term deal between PETRONAS and CNOOC is valued at approximately USD 7 billion over ten years.*" 2.2 MTPA is 0.3 bcf/d. (iii) Reminds of LNG Canada's competitive advantage for low greenhouse gas emissions. Petronas said "*Once ready for operations, the LNG Canada project paves the way for PETRONAS to supply low greenhouse gas (GHG) emission LNG to the key demand markets in Asia."*
>
> Qatar Petroleum/CPC (Taiwan) is 15 yr supply deal for 0.16 bcf/d. Pre Covid, Qatar was getting pressured to renegotiate lower its long term LNG contract prices. Now, it's signing a 15 year deal. On July 9, they entered in a new small long term LNG sales deal [LINK], a 15-yr LNG Sale and Purchase Agreement with CPC Corporation in Taiwan to supply it ~0.60 bcf/d of LNG. LNG deliveries are set to begin in January 2022. H.E. Minister for Energy Affairs & CEO of Qatar Petroleum Al-Kaabi said *"We are pleased to enter into this long term LNG SPA, which is another milestone in our relationship with CPC, which dates back to almost three decades. We look forward to commencing deliveries under this SPA and to continuing our supplies as a trusted and reliable global LNG provider."* The pricing was reported to be vs a basket of crudes.

BP/Guangzhou Gas, a 12-yr supply deal for 0.13 bcf/d. On July 9, there was a small long term LNG supply deal with BP and Guangzhou Gas (China). Argus reported [LINK] BP had signed a 12 year LNG supply deal with Guangzhou Gas (GG), a Chinese city's gas distributor, which starts in 2022. The contract prices are to be linked to an index of international crude prices. Although GG typically gets its LNG from the spot market, it used a tender in late April for ~0.13 bcf/d starting in 2022. BP's announcement looks to be for most of the tender, so it's a small deal. But it fit into the trend this week of seeing long term LNG supply deals to Asia. This was intended to secure deliveries to the firm's Xiaohudao import terminal which will become operational in August 2022.

Qatar/Korea Gas is a 20-yr deal to supply 0.25 bcf/d. On Monday, Reuters reported [LINK] "*South Korea's energy ministry said on Monday it had signed a 20-year liquefied natural gas (LNG) supply agreement with Qatar for the next 20 years starting in 2025. South Korea's state-run Korea Gas Corp (036460.KS) will buy 2 million tonnes of LNG annually from Qatar Petroleum".* There was no disclosure of pricing.

More Asian buyer long term LNG deals (ie. India) will be coming. There are going to be more Asian buyer long term LNG deals coming soon. Our July 11, 2021 Energy Tidbits highlighted how India's new petroleum minister Hardeep Singh Puri (appointed July 8) hit the ground running with what looks to be a priority to set the stage for more India long term LNG deals with Qatar. On July 10, we retweeted [LINK] "*New India Petroleum Minister hits ground running. What else w/ Qatar but #LNG. Must be #Puri setting stage for long term LNG supply deal(s). Fits sea change of buyers seeing #LNGSupplyGap (see SAF Apr 28 blog http://safgroup.ca) & wanting to tie up LNG supply. #OOTT".* It's hard to see any other conclusion after seeing what we call a sea change in LNG buyer mentality with a number of long term LNG deals this week. Puri tweeted [LINK] "*Discussed ways of further strengthening mutual cooperation between our two countries in the hydrocarbon sector during a warm courtesy call with Qatar's Minister of State for Energy Affairs who is also the President & CEO of @qatarpetroleum HE Saad Sherida Al-Kaabi".* As noted above, we believe there is a sea change in LNG markets that was driven by the delay in 5 bcf/d of LNG supply from Mozambique (Total Phase 1 & Phase 2, and Exxon Rozuma Phase 1) that was counted on all LNG supply projections for the 2020s. Puri's tweet seems to be him setting the stage for India long term LNG supply deals with Qatar.

Supermajors are aggressively competing to commit 30+ year capital to Qatar's LNG expansion despite stated goal to reduce fossil fuels production. It's not just Asian LNG buyers who are now once again committing long term capital to securing LNG supply, it's also supermajors all bidding to be able to commit big capex to part of Qatar Petroleum's 4.3 bcf/d LNG expansion. Qatar Petroleum received a lot of headlines following the their June 23 announcement on its LNG expansion [LINK] on how they received bids for double the equity being offered. And there were multiple reports that these are on much tougher terms for Qatar's partners. Qatar Petroleum CEO Saad Sherida Al-Kaabi specifically noted that, among the bidders, were Shell, Total and Exxon. Shell and Total have two of the most ambitious plans to reduce fossil fuels production in the 2020's, yet are competing to allocate long term capital to increase fossil fuels production. And Shell and Total are also two of the global LNG supply leaders. It has to be because they are seeing a bigger and sooner LNG supply gap.

Remember Qatar's has a massive expansion but India alone needs 3x the Qatar expansion LNG capacity. In addition to the competition to be Qatar Petroleum's partners, we remind that, while this is a massive 4.3 bcf/d LNG expansion, India alone sees its LNG import growing by ~13 bcf/d to 2030. The Qatar announcement reminded they see a LNG supply gap and continued high LNG prices. We had a 3 part tweet. (i) First, we highlighted [LINK] "*1/3. #LNGSupplyGap coming. big support for @qatarpetroleum expansion to add 4.3 bcf/d LNG. but also say "there is a lack of investments that could cause a significant shortage in gas between 2025-2030" #NatGas #LNG".* This is after QPC accounts for their big LNG expansion. The QPC release said "*However, His Excellency Al-Kaabi voiced concern that during the global discussion on energy transition, there is a lack of investment in oil and gas projects, which could drive energy prices higher by stating that "while gas and LNG are important for the energy transition, there is a lack of investments that could cause a significant shortage in gas between 2025-2030, which in turn could cause a spike in the gas market."* (ii) Second, this is a big 4.3 bcf/d expansion, but India alone has 3x the increase in LNG import demand. We tweeted [LINK] "*2/3. Adding 4.3 bcf/d is big, but dwarfed by items like India. #Petronet gave 1st specific forecast for what it means if #NatGas is to be 15%*

of energy mix by 2030 - India will need to increase #LNG imports by ~13 bcf/d. See SAF Group June 20 Energy Tidbits memo." (iii) Third, Qatar's supply gap warning is driven by the lack of investments in LNG supply. We agree, but note that the lack of investment is in great part due to the delays in both projects under construction and in FIDs that were supposed to be done in 2019. We tweeted [LINK] "3/*3. #LNGSupplyGap is delay driven. $TOT Mozambique Phase 1 delay has chain effect, backs up 5 bcf/d. See SAF Group Apr 28 blog Multiple Brownfield LNG FIDs Now Needed To Fill New #LNG Supply Gap From Mozambique Chaos? How About LNG Canada Phase 2? #NatGas*."

Seems like many missed India's first specific LNG forecast to 2030. Our June 20, 2021 Energy Tidbits memo highlighted the first India forecast that we have seen to estimate the required growth in natural gas consumption and LNG imports if India is to meet its target for natural gas to be 15% of its energy mix by 2030. India will need to increase LNG imports by ~13 bcf/d or 3 times the size of the Qatar LNG expansion. Our June 6, 2021 Energy Tidbits noted the June 4 tweet from India's Energy Minister Dharmendra Pradhan [LINK] reinforcing the 15% goal "*We are rapidly deploying natural gas in our energy mix with the aim to increase the share of natural gas from the current 6% to 15% by 2030."* But last week, Petronet CEO AK Singh gave a specific forecast. Reuters report "*LNG's share of Indian gas demand to rise to 70% by 2030: Petronet CEO"* [LINK] included Petronet's forecast if India is to hit its target for natural gas to be 15% of energy mix by 2030. Singh forecasts India's natural gas consumption would increase from current 5.5 bcf/d to 22.6 bcf/d in 2030. And LNG shares would increase from 50% to 70% of natural gas consumption ie. an increase in LNG imports of ~13 bcf/d from just under 3 bcf/d to 15.8 bcf/d in 2030. Singh did not specifically note his assumption for India's natural gas production, but we can back into the assumption that India natural gas production grows from just under 3 bcf/d to 6.8 bcf/d. It was good to finally see India come out with a specific forecast for 2030 natural gas consumption and LNG imports if India is to get natural gas to 15% of its energy mix in 2030. Petronet's Singh forecasts India natural gas consumption to increase from 5.5 bcf/d to 22.6 bcf/d in 2030. This forecast is pretty close to our forecast in our Oct 23, 2019 blog "*Finally, Some Visibility That India Is Moving Towards Its Target For Natural Gas To Be 15% Of Its Energy Mix By 2030*". Here part of what we wrote in Oct 2019. "*It's taken a year longer than we expected, but we are finally getting visibility that India is taking significant steps towards India's goal to have natural gas be 15% of its energy mix by 2030. On Wednesday, we posted a SAF blog [LINK] "Finally, Some Visibility That India Is Moving Towards Its Target For Natural Gas To Be 15% Of Its Energy Mix By 2030".* Our 2019 blog estimate was for India natural gas demand to be 24.0 bcf/d in 2030 (vs Singh's 22.6 bcf/d) and for LNG import growth of +18.4 bcf/d to 2030 (vs Singh's +13 bcf/d). The difference in LNG would be due to our Oct 2019 forecast higher natural gas consumption by 1.4 bcf/d plus Singh forecasting India natural gas production +4 bcf/d to 2030. Note India production peaked at 4.6 bcf/d in 2010.

Bigger, nearer LNG supply gap + Asian buyers moving to long term LNG deals = LNG players forced to at least look at what brownfield LNG projects they could advance and move to FID. All we have seen since our April 28 blog is more validation of the bigger, nearer LNG supply gap. And now market participants (Asian LNG buyers) are reacting to the new data by locking up long term supply. Cheniere noted how the pickup in commercial engagement means they "*are quite optimistic over the coming 12-18 months to make a substantial dent in that Stage 3 commercialization."* Cheniere can't be the only LNG supplier having new commercial discussions. It's why we believe the Mozambique delays + Asian LNG buyers moving to long term deals will effectively force major LNG players to look to see if there are brownfield LNG projects they should look to advance. Prior to March/April, no one would think Shell or other major LNG players would be considering any new LNG FIDs in 2021. Covid forced all the big companies into capital reduction mode and debt reduction mode. But Brent oil is now solidly over $70, and LNG prices are over $13 this summer and the world's economic and oil and gas demand outlook are increasing with vaccinations. And we are starting to see companies move to increasing capex with the higher cash flows. The theme in Q3 reporting is going to be record or near record oil and gas cash flows, reduced debt levels and increasing returns to shareholders. And unless new mutations prevent vaccinations from returning the world to normal, we suspect that major LNG players, like other oil and gas companies, will be looking to increase capex as they approve 2022 budgets. The outlook for the future has changed dramatically in the last 8 months. The question facing major LNG players like Shell is should they look to FID new LNG brownfield projects in the face of an increasing LNG supply gap that is going to hit faster and harder and Asian LNG buyers prepared to do long term deals. We expect these decisions to be looked at before the end of 2021 for 2022 capex budget/releases. One wildcard that could force these decisions sooner is the already stressed out global supply chain. We have to believe that discussion there will be pressure for more Asian LNG buyer long term deals sooner than later.

For Canada, does the increasing LNG supply gap provide the opportunity to at least consider a LNG Canada Phase 2 FID over the next 6 months? Our view on Shell and other LNG players is unchanged since our April 28 blog. Shell is no different than any other major LNG supplier in always knowing the market and that the oil and gas outlook is much stronger than 9 months ago. Even 3 months post our April 28 blog, we haven't heard any significant talks on how major LNG players will be looking at FID for new brownfield LNG projects. We don't have any inside contacts at Shell or LNG Canada, but that is no different than when we looked at the LNG markets in September 2017 and saw the potential for Shell to FID LNG Canada in 2018. We posted a September 20, 2017 blog *"China's Plan To Increase Natural Gas To 10% Of Its Energy Mix Is A Global Game Changer Including For BC LNG*" [LINK]. Last time, it was a demand driven supply gap, this time, it's a supply driven supply gap. We have to believe any major LNG player, including Shell, will be at least looking at their brownfield LNG project list and seeing if they should look to advance FID later in 2021. Shell has LNG Canada Phase 2, which would add 2 additional trains or approx. 1.8 bcf/d. And an advantage to an FID would be that Shell would be able to commit to its existing contractors and fabricators for a continuous construction cycle following on LNG Canada Phase 1 ie. to help keep a lid on capital costs. We believe maintaining a continuous construction cycle is even more important given the stressed global supply chain. No one is talking about the need for these new brownfield LNG projects, but, unless some major change in views happen, we believe its inevitable that these brownfield LNG FID internal discussions will be happening in H2/21. Especially since the oil and gas price outlook is much stronger than it was in the fall and companies will be looking to increase capex in 2022 budgets.

A LNG Canada Phase 2 would be a big plus to Cdn natural gas. LNG Canada Phase 1 is a material natural gas development as its 1.8 bcf/d capacity represents approx. 20 to 25% of Cdn gas export volumes to the US. The EIA data shows US pipeline imports of Cdn natural gas as 6.83 bcf/d in 2020, 7.36 bcf/d in 2019, 7.70 bcf/d in 2018, 8.89 bcf/d in 2017, 7.97 bcf/d in 2016, 7.19 bcf/d in 2015 and 7.22 bcf/d in 2014. A LNG Canada Phase 2 FID would be a huge plus for Cdn natural gas. It would allow another ~1.8 bcf/d of Cdn natural gas to be priced against pricing points other than Henry Hub. And it would provide demand offset versus Trudeau if he moves to make electricity "emissions free" and not his prior "net zero emissions". Mozambique has been a game changer to LNG outlook creating a bigger and sooner LNG supply gap. And with a stronger tone to oil and natural gas prices in 2021, the LNG supply gap will at least provide the opportunity for Shell to consider FID for its brownfield LNG Canada Phase 2 and provide big support to Cdn natural gas for the back half of the 2020s. And perhaps if LNG Canada is exporting 3.6 bcf/d from two phases, it could help flip Cdn natural gas to a premium vs US natural gas especially if Biden is successful in reducing US domestic natural gas consumption for electricity. The next six months will be very interesting to watch for LNG markets and Cdn natural gas valuations. Imagine the future value of Cdn natural gas is there was visibility for 3.6 bcf/d of Western Canada natural gas to be exported to Asia.

https://www.argusmedia.com/en/news/2403155-high-hurdles-to-grow-chevrons-venezuela-oil-output

High hurdles to grow Chevron's Venezuela oil output

Published date: 21 December 2022

An internal Chevron plan to increase Venezuelan oil production to 200,000 b/d by mid-2023 relies on efforts to rehabilitate some 18,000 wells in various states of disrepair in the country's once-prolific Occidente region.

According to a report from Venezuela state-owned PdV obtained by *Argus*, about 7pc of existing wells in Occidente are operating. The 1,400 or so "Category 1" wells are producing oil, but many at declining rates.

About 8,700 wells fall into Category 2, which includes non-operating wells that may just need minor work to become operational. These wells may need around $500,000 each in new investment to be viable, according to sources familiar with the field.

In Category 3 are more than 7,900 wells that need between $5mn-$6mn of investment each to be commercially viable.

Hundreds of wells in the PdV report are reportedly shut down just for a lack of reliable electricity, which plagues many parts of the country. Many more have been stripped bare of any surface equipment by thieves.

Production in Occidente has declined from 150,000 b/d earlier this year to around 90,000 b/d in November.

Much of Chevron's work in Venezuela has been curtailed in recent years by US sanctions. The US eased some sanctions in late November when the government agreed to resume talks with the opposition about new elections, which will allow Chevron to sell crude from its Venezuela joint ventures.

Chevron was expected to send its first cargo of Venezuelan crude to a US Gulf coast refiner since 2018 by the end of December, but it is not yet clear if that will happen. Government officials are anxious to send a symbolic message with a cargo before the new year, while Chevron appears less concerned with rushing any shipments.

Chevron plans to increase its global spending in 2023 to $17bn, up from around $15bn in 2022, but has not disclosed any specific plans for Venezuela.

By Carlos Camacho

https://www.wsj.com/articles/chevron-waiting-it-out-in-venezuela-tells-u-s-now-is-the-time-to-pump-oil-11647959248?mod=newsviewer_click&adobe_mc=MCMID%3D43904269652561322512265019543051439235%7CMCORGID%3DCB68E4BA55144CAA0A4C98A5%2540AdobeOrg%7CTS%3D1647963540

Chevron, Waiting It Out in Venezuela, Tells U.S. Now Is the Time to Pump Oil

An oil refinery in Venezuela, where the U.S. has banned American oil companies from operating since 2019. YURI CORTEZ/AFP/GETTY IMAGES

By Christopher M. Matthews and José de Córdoba
March 22, 2022 10:27 am ET

HOUSTON—For months, Biden administration officials snubbed top executives and lobbyists for Chevron Corp. who had pressed officials in Washington to ease sanctions so the company could boost production in Venezuela, where the U.S. has banned such activities since 2019.

Then Vladimir Putin invaded Ukraine.

Now the Biden administration is listening closely to Chevron, say people familiar with the conversations, which says it can help double Venezuela's 800,000 barrels-a-day production within months. That could replace the loss of roughly 700,000 barrels a day the U.S. was importing from Russia before it attacked Ukraine. And it could help lower gasoline prices—a major concern for the Biden administration in a tough election year.

"Chevron came in November, they pitched it around, but got laughed out of town," said Juan Cruz, a former National Security Council official in charge of the Western Hemisphere who has closely followed the Biden administration's policy toward Venezuela. "But what was really funny in November is a plan today."

Since the Russians invaded on Feb. 24 and Mr. Biden canceled Russian oil imports, Chevron Chief Executive Officer Mike Wirth has offered the company's help to Secretary of Energy Jennifer Granholm in shoring up U.S. energy supplies by ramping up production in Venezuela, according to people briefed on the talks. Chevron is the only major U.S. producer to retain assets in Venezuela following nationalizations by the Socialist government and, much later, U.S. sanctions.

Granting the San Ramon, California-based company and other U.S. producers permits to operate could boost Venezuelan production while keeping other sanctions in effect. Broadly easing sanctions on Venezuela faces stiff opposition in the U.S. over concerns it would prop up the country's autocratic regime. U.S. officials are divided over the issue, say people familiar with the situation.

Asked recently by CNN about the outreach to Venezuela and Saudi Arabia for more oil, Ms. Granholm, said, “I think Americans should see the administration calling right now for an increase in supply as something that helps them,” naming the benefit of reducing costs at the pump.

Shortly after Mr. Wirth talked to the energy secretary, three senior U.S. officials—Juan Gonzalez, the senior National Security Council official in charge of Latin America; James Story, the U.S. ambassador to Venezuela; and Roger D. Carstens, a special envoy—flew to Caracas on March 5 and met with President Nicolás Maduro and other top Venezuelan officials.

Another person who spoke with senior Venezuelan officials after the invasion was Ali Moshiri, a charismatic Iranian-American who had headed Chevron’s Latin America division and was considered a “dear friend” by the late Hugo Chávez, the founder of the political movement now led by Mr. Maduro, with whom Mr. Moshiri also has close a close relationship. Mr. Moshiri retired from Chevron in 2017 but now consults for the company in Venezuela, where he has deep ties with senior officials, say people familiar with the matter.

Many oil industry executives say that Mr. Moshiri was essential to Chevron’s controversial decision to stay in the country even as other Western oil companies exited after the Venezuelan government in 2007 nationalized billions of dollars of assets owned by ConocoPhillips, Exxon Mobil Corp. and others. He has also lobbied Biden officials to loosen sanctions on Venezuela, where Chevron has operated for nearly a century.

“You cannot ignore Venezuela,” Mr. Moshiri said in an interview last week. “Venezuela will always be part of our energy security.”

The White House declined to comment about Chevron’s possible role or its own talks in Venezuela. The Energy Department declined to comment.

People briefed on the talks say Mr. Moshiri has argued to U.S. officials that the U.S. can’t cede influence of Venezuelan energy to rivals like China and Russia, which have increased their activities in the country in recent years. He has also spoken with Venezuelan officials for months to try to win the release of Americans imprisoned in Venezuela, these people said.

A Chevron spokesman said Mr. Moshiri isn’t representing the company in negotiations with the U.S. or with Venezuelan officials. Mr. Moshiri declined to provide details about his contract with Chevron. After leaving Chevron, he founded a firm, Amos Global Energy, which seeks investment opportunities in Venezuela, people familiar with the matter said.

A few days after the March 5 meeting in Caracas with U.S. officials, the Maduro government freed two American captives, one of them an executive of Citgo, the U.S. refining subsidiary of state-run oil company Petróleos de Venezuela SA, or PdVSA. The government also agreed to restart negotiations in Mexico with representatives of Venezuela's opposition, who want officials to agree to free and fair presidential elections in 2024.

News of the meeting in Caracas, though, has caused a political backlash in Washington and in Florida, where exiled Venezuelans live and have forged links to the state's powerful and conservative Cuban American community.

"The democratic aspirations of the Venezuelan people, much like the resolve and courage of the people of Ukraine, are worth much more than a few thousand barrels of oil," New Jersey Sen. Robert Menendez, the Democratic chairman of the Senate Foreign Affairs Committee, wrote in a statement. Those sentiments were echoed by both Democratic and Republican lawmakers in Florida.

SHARE YOUR THOUGHTS

Should the U.S. ease sanctions on Venezuela to get more oil? Why or why not? Join the conversation below.

Venezuelan opposition leader Juan Guaidó, whom the U.S. recognizes as Venezuela's legitimate president, was told of the U.S.-Venezuela meeting after it had taken place. Mr. Guaidó wrote a letter to Mr. Biden, according to a person with knowledge of the matter, saying that lifting sanctions on Venezuela would do little to ease the world's crude supply shortages while rewarding Mr. Maduro, a Putin ally whose rule is blamed for leading six million Venezuelans to flee the country.

"Today, more than ever we should be firm and morally consistent," said Mr. Guaidó in a video press conference from Caracas last week. He said any lifting of sanctions on Venezuela or permission for Chevron to pump oil there should only come in exchange for democratic concessions by the regime.

Answering reporters' questions last week White House press secretary Jen Psaki said, "There is no dialogue between us and the regime." She said the administration would consider lifting sanctions on the basis of progress in talks between Mr. Maduro and the opposition.

Chevron officials still say the company could win a license permitting it, along with European oil companies such as Eni Spa and Repsol SA, to operate in Venezuela.

A refinery of state-owned Petróleos de Venezuela in El Palito. Venezuelan oil production has plummeted since the 1990s due to mismanagement.

PHOTO: MANAURE QUINTERO/BLOOMBERG NEWS

Venezuela claims to have the world's largest proven oil reserves. But years of mismanagement, corruption and nationalization of oil ventures led production to fall from 3.2 million barrels a day in

the 1990s to a 10th of that in 2020. Since then, production has more than doubled as Venezuela turned to opaque foreign companies to boost production, say industry executives. Chevron's lobbyists assert that the recent production increases show that the U.S. sanctions aren't working as intended.

But though Chevron has told U.S. officials it could jack up production quickly, some oil analysts who closely track Venezuela doubt the company could deliver. Even in good times, Venezuela had never increased production anywhere near the level of recent optimistic projections, according to Francisco Monaldi, director of the Latin America Energy Program at Rice University's Baker Institute. Chevron's perseverance in Venezuela has come as the company has tried to get Venezuela to pay money owed under production-sharing agreements. The company wrote down all of its assets there in 2020, taking a charge of $2.6 billion. Nonetheless, it stayed, receiving periodic licenses from the U.S. government to retain but not operate assets.

—Timothy Puko in Washington contributed to this article.

Write to Christopher M. Matthews at christopher.matthews@wsj.com and José de Córdoba at jose.decordoba@wsj.com

https://tass.com/economy/1611353

28 APR, 10:42

Putin allows oil exports under contracts with friendly states regardless of price cap

On December 27, 2022, Putin signed a decree on the application of special economic measures in response to the establishment of a price cap for Russian oil products and oil by a number of countries

MOSCOW, April 28. /TASS/. Russian President Vladimir Putin has withdrawn supplies to friendly countries under contracts signed before February 1, 2023, from the ban on exports of oil and oil products on conditions of the price cap policy. The relevant decree signed on April 28, has been published on the portal of legal information.

"The effect of this decree does not cover supplies of Russian oil conducted under the contracts signed in implementation of Russia’s effective international agreements on oil supplies to the states that are not included in the list of foreign states and territories approved by the Russian government, which are committing unfriendly actions regarding Russia, its legal entities and individuals," the document says.

On December 27, 2022, Putin signed a decree on the application of special economic measures in response to the establishment of a price cap for Russian oil products and oil by a number of countries. The ban on oil supplies at ‘capped’ prices is effective from February 1 to July 1, 2023. A separate paragraph of the decree leaves the head of state the right to make special decisions on the supply of oil and oil products, the implementation of which is prohibited by the decree.

On December 5, 2022, an embargo on maritime Russian oil shipments to the European Union came into force. G7 nations, the EU and Australia agreed on a price cap for Russian oil delivered by sea, setting the ceiling at $60 a barrel. Moreover, starting February 5, 2023, similar restrictions on deliveries of petroleum products from Russia were enforced as the EU Council officially greenlighted the decision, in conjunction with the G7, to introduce a price ceiling on Russian petroleum products supplied by sea at $100 for premium oil and at $45 for discount.

https://www.globaltimes.cn/page/202304/1289651.shtml

China-Russia energy deals now settled in yuan, ruble: official

By Global Times Published: Apr 23, 2023 10:32 PM

RMB Photo:VCG

Energy trading between China and Russia has been settled in both the yuan and the ruble, Russian Deputy Prime Minister Alexander Novak said in interview with Russian media over the weekend, according to a report by China's state broadcaster CCTV.

Trades using the yuan, the ruble and the Turkish lira are increasing and becoming common, while deals using the US dollar or the euro are trending down, Novak said.

Moscow intends to abandon the use of the US dollar and the euro in energy transactions, while using the local currencies of relevant countries, Novak said.

The promotion of energy settlements in their own currencies will facilitate China-Russia trade as energy remains a major stabilizer in bilateral ties, Lin Boqiang, director of the China Center for Energy Economics Research at Xiamen University, told the Global Times on Sunday.

China's commerce with Russia maintained its strong growth momentum in the first quarter this year. Bilateral trade totaled $53.85 billion, up 38.7 percent from a year earlier, far outpacing the growth of China's total foreign trade, data from China's General Administration of Customs showed.

China and Russia have moved to strengthen their energy and financial cooperation and made solid progress in strategic projects.

In September, Russian energy giant Gazprom said that it had signed an agreement to start switching payments for gas supplies to China to the yuan and the ruble, instead of the US dollar, Reuters reported.

Gazprom CEO Alexei Miller said that the new payment mechanism is a "mutually beneficial, timely, reliable and practical decision" and will "make settlements easier, serve as a great example to other companies, and give a new impetus to our economies," read a statement on the website of Gazprom.

"China-Russia energy cooperation has great potential as complementarity is strong between the two countries," Lin said.

China purchased more than 86.25 million tons of crude oil from Russia in 2022, up 8 percent from a year earlier, Chinese Ambassador to Russia Zhang Hanhui said in an interview with Sputnik news agency in March.

Zhang pointed out that China's energy market has huge growth potential. With the rapid recovery of China's economy this year, growth in investment and consumption will mean stronger demand for energy.

https://www.reuters.com/markets/commodities/indian-cos-sometimes-face-delays-paying-russian-oil-above-60bbl-oil-secretary-2023-04-24/

1 minute readApril 24, 20231:21 AM MDTLast Updated 17 hours ago

Indian cos sometimes face delays in paying for Russian oil above $60/bbl - oil secretary

Reuters

NEW DELHI, April 24 (Reuters) - Indian companies "sometimes" face delays in paying for Russian oil priced above the $60 cap per barrel fixed by the Western nations, India's oil secretary Pankaj Jain said on Monday.

"Nobody stops us from buying Russian oil at above the price cap level provided. We are not using western service," Jain told reporters on the sidelines of an event.

In case of Russian oil priced above the cap, the companies on their own manage to find alternative mechanisms to settle payments, he said, adding most Russian oil supplies to India are made at below the price cap level.

He also said India is seeking to buy oil at discounts from other countries depending on grades.

India has significantly increased oil imports from Russia since the beginning of the conflict in Ukraine.

Reporting by Nidhi Verma in New Delhi; Editing by Nivedita Bhattacharjee

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Excerpts from ANI reporting on Hardeep Singh Puri comments post Jennifer Granholm meeting in Washington

https://aninews.in/news/world/us/india-is-clear-about-its-policy-regarding-oil-purchases-will-buy-oil-from-wherever-it-has-to-hardeep-singh-puri20221008143703/

India is clear about its policy regarding oil purchases, will buy oil from wherever it has to: Hardeep Singh Puri

ANI | Updated: Oct 08, 2022 14:37 IST

Washington [US], October 8 (ANI): India has reiterated its choice of importing oil from countries like Russia after OPEC Plus, a consortium of oil-producing nations led by Russia and Saudi Arabia announced a slash in oil production by two million barrels per day.

While taking to reporters in Washington DC during his ongoing US visit, Union Minister of Petroleum and Natural Gas Hardeep Singh Puri on Saturday touched on several topics including how India will balance OPEC Plus oil production cut, diversification of energy - equity infusion, bio-fuel blending and green hydrogen.

With rising global energy requirements, the OPEC production cut is likely to impact countries like India, the third largest oil importer. Speaking on the topic of balancing the imports from OPEC Plus countries as well as from the US, which is also a oil exporting country, Puri said "If you are clear about your policy, which means you believe in energy security, energy affordability you will buy from wherever you have to. Our energy purchases from sources hitherto unheard of, we are in discussion with them."

Answering how India will negotiate the tightrope of expectations, he told ANI, "It's not a tight rope, I don't look at - We will also acquire assets outside wherever - I mean in recent months- we did USD 1.6 billion equity infusion which BPCL has done in Brazil. We are looking at assets in Africa."

Puri explained that oil exporting countries need buyers as they have to sell their products in the market.

"Sometimes when you are looking at it in a journalistic manner, you would say that producers are holding all the cards. I disagree with that; I think the person or country with a large market also has a huge role to play. I am giving you a hypothetical example - If we decide to limit consumption, no matter what you produce, you will have to find a place to sell it too and I can tell you that in the last year or so, I have had my oil companies tell me that we can raise it from here, but there are traditional suppliers, this is a discussion which will go on," Puri said in response to a question by ANI.

"Much of the trade incidentally takes place in a manner which is not properly understood outside. It's not that - you have some fuels which have high density, some are lighter fuels - I don't want to get into that discussion - it may originate somewhere - we own assets outside, the product of those assets does not come to India, it goes in, it's sold in the swap market etc," he added.

This week's OPEC Plus announcement on oil production cut will likely have a cascading impact on geopolitical shifts amid the Russia-Ukraine crisis.

"Oil and energy have been traded for years. Governments in particular situations will react to geopolitical events. At the end of the day all governments are committed to issues of energy provisions; that is security and affordability," said Puri.

Meanwhile, an intense pressure campaign by the US to dissuade its Arab allies seemingly fell on deaf ears. Russia is already pumping below its OPEC+ ceiling, and the bulk of the cuts will be made by Gulf producers.

Speaking about the conflict and Indian diversification, Union minister Puri said, "I don't see any conflict. There are countries in OPEC that sell to us. They've never turned around and told us that they don't want to sell to us. If you don't sell to India and China, there are not many big markets left, even Europe collectively. Many of these are matured markets in energy. They don't utilize crude oil - some of them have gone into nuclear energy, and others are going into biofuels. I also want to share with you some of the advances which India has made - biofuel blending, when I was Ambassador to Brazil, we tried very hard, the central government tried to introduce 5 per cent ethanol blending in 15 of our States and Union Territories, we couldn't get it done."

Puri further stated that the India had taken a giant leap in bio-fuel blending after Prime Minister Narendra Modi assumed power in 2014.

"In 2014, when Prime Minister Narendra Modi assumed office, our bio-fuel blending was 1.4 per cent, today we have already reached 10.5 per cent of blending. We have a target of 20 per cent blending by 2030. We have just brought it forward to 2024-2025," said Puri.

He also gave examples of green Hydrogen and how India is providing opportunities for oil exploring companies.

"Green Hydrogen - We have Indian companies selling green ammonia to Germany - the world is moving at different fronts - exploration and production in India will shoot up. I have always said that we have neglected to the point, I even use words like 'criminal neglect.' We have 3.5 million square kilometres of sedimentary basin, and one million square kilometres of that sedimentary basin was called a 'no go area', just now a few months ago, 99.5 per cent of that 'no go area' has been cleaned up which means for an investor are happy to come and explore. There are not hundreds of players in the energy sector, five to six big companies, they are all interested, they are either forming joint ventures, just to come (to India)," said Puri. (ANI)

https://aninews.in/news/world/us/india-under-no-global-pressure-to-shun-russian-oil-hardeep-singh-puri20221008093740/

Union Minister of Petroleum and Natural Gas, Hardeep Singh Puri.

India under no global pressure to shun Russian oil: Hardeep Singh Puri

ANI | Updated: Oct 08, 2022 09:37 IST

Washington [US], October 8 (ANI): Union Minister of Petroleum and Natural Gas, Hardeep Singh Puri on Saturday said that India is under no pressure to shun Russian oil.

In a bilateral meeting with US energy secretary Jennifer Granholm, Puri said that the Indian government has a moral duty to provide energy to its citizens and it will continue to buy oil from wherever it has to.

Have I been told by anyone to stop buying Russian oil? The answer is a categorical No," Puri told reporters in Washington.

"India will buy oil from wherever it has to for the simple reason that this kind of a discussion cannot be taken to the consuming population of India," he added.

Since the start of the Ukraine conflict. India has sought to carve a middle path between Moscow and its Western critics and so far largely resisted Western pressure to cut its economic ties with the Kremlin.

The US is holding "deep talks" with India over the latter's reliance on Russian arms and oil, according to media reports citing a state department official. The official claimed that Indian representatives are starting to look at other markets to meet their demands as they try to become less dependent on Moscow for oil purchases.

Notably, the European Union (EU) on Thursday (local time) adopted its latest package of sanctions against Russia over the illegal annexation of Ukraine's Donetsk, Luhansk, Zaporizhzhia and Kherson regions.

The EU adopted restrictive measures against an additional 30 individuals and seven entities, read the EU's statement.

EU sanctions (8th package since the Ukraine war began) aim to force Russia to reduce prices & lose oil revenue. But at imports to the tune of 1.7 million barrels per day, the EU is still the biggest market for Russian crude.

Moreover, the EU is trying to determine the pricing of Russian oil through its insurance firms as Russia is the world's largest oil exporter. The European insurers rule commercial oil tankers by providing them with massive insurance.

The EU sanctions ll forbid these insurers from providing services to Russian companies selling oil above the price cap.

Moreover, EU's sanctions package on Russia will impact countries like India. EU is capping what other countries can pay for Russian oil. It bans the sale of oil above that price. This applies only to oil transported by sea. While, the EU members importing Russian oil by pipeline won't be hurt by these sanctions.

Puri highlighted India is one of the largest oil importer and the demand is expected to rise driven by an increase in India's per capita consumption of energy which currently stands at one-third of the global average. Puri further stressed that the fuel demand is expected to keep rising as the country's economy grows.

It is pertinent to note that External Affairs Minister S Jaishankar also on several platforms had explained India's decision to continue buying Russian oil. Recently, Jaishankar said PM Modi's advice on the issue was to do what is best for the nation. "Due to the Russia-Ukraine conflict, petrol prices doubled. We had pressure from where to buy the oil but Prime Minister Narendra Modi and the government were of the view that we have to do what is the best for our nation," Jaishankar said. (ANI)

https://aninews.in/news/world/us/oil-price-rise-in-india-is-way-below-global-price-hikes-hardeep-singh-puri20221008091154/

Oil price rise in India is way below global price hikes: Hardeep Singh Puri

ANI | Updated: Oct 08, 2022 09:11 IST

Washington [US], October 8 (ANI): Union Petroleum and Natural Gas minister Hardeep Singh Puri said that compared to fuel price hikes globally, India only raised prices by 2 per cent, which is way below that of other countries.

"In terms of petrol and diesel, if the increases in North America are 43-46 per cent, in India we allow prices to go up by only 2 per cent or so. In terms of gas, global benchmarks went up by 260-280 per cent and our own ability to contain gas price increases was something around 70 per cent," Puri told reporters in Washington DC.

Puri on Thursday held bilateral meeting with US energy secretary Jennifer Granholm and other top officials of the Biden Administration.

The minister also highlighted India's commitment to accelerating a just and sustainable energy transition at the ministerial dialogue on India-US strategic clean energy.

During his visit, the union minister also held meetings with senior officials of the World Bank, the Presidential envoy for energy and infrastructure Amos Hochstein and senior representatives of the White House. Puri is scheduled to meet energy business leaders in Houston on Saturday.

The Union Minister said that India was "very confident" of navigating the Organisation of Petroleum Exporting Countries Plus (OPEC+) decision to cut oil production from November by a steeper-than-expected two million barrels per day (bpd). "

How will this impact India? We are very confident of being able to navigate through the situation," Puri told reporters in Washington.

"How will this navigate India? We're very confident of being able to navigate through the situation," said Puri.

Puri highlighted India is one of the largest oil importers and the demand is expected to rise driven by an increase in the country's per capita consumption of energy which currently stands at one-third of the global average. Puri further stressed that the fuel demand is expected to keep rising as the country's economy grows.

"In India, 5mn (oil) bpd is being consumed daily; it's set to rise. Our per capita consumption compared to global averages is 1/3rd. But I see in the coming years, 25 per cent of the global increase in demand will come from India. Energy is a critical driver of economic growth," the union minister said.

The Union Minister also said that India will buy crude oil from whichever country it wanted and that New Delhi faces no pressure from Washington to cut its energy buys from Russia.

"India will buy oil from wherever it has to for the simple reason that this kind of a discussion cannot be taken to the consuming population of India," Puri told reporters in Washington. (ANI

https://www.libyaherald.com/2023/02/libya-will-produce-more-than-1-5-million-barrels-of-oil-per-day-in-2023-agoco-chairman/

Libya will produce more than 1.5 million barrels of oil per day in 2023: AGOCO chairman

Provision of budget, continued and fast development, stability in Libya and oil sector - all contributing factors

by**Ibrahim Senusi** February 14, 2023

AGOCO chairman Gatrani said Libya can increase production to 1.5 million bpd this year (Photo: AGOCO).

The continuation of the Arabian Gulf Oil Company's (AGOCO) development operations at this pace will inevitably lead to Libya reaching a production rate of more than 1.5 million barrels of oil per day in 2023, AGOCO chairman Salah Gatrani said in an exclusive statement to *Libya Herald*.
He said this was because of the stability witnessed by the country in general, and by the oil sector in particular. Therefore, he continued, the Gulf Company has developed its own plan within the efforts of the National Oil Corporation (NOC). Libya has been unable to maintain production beyond 1.2 million bpd.

Gatrani was commenting to *Libya Herald* following Sunday's AGOCO's meeting on developing reserves and increasing oil production in the sector companies, attended by relevant AGOCO and NOC management.
The AGOCO chairman said that his company has already begun to implement the plan prepared by the NOC to raise production and increase reserves.

Training, localising and developing new techniques
He said AGOCO had actually delayed several projects to raise the efficiency of the employees in the company, including a cooperation project with KAMCO Oil Services Company to raise the efficiency

of employees, localize and develop technology in the company, and keep pace with global updates in the fields of drilling oil wells and extracting crude oil.

Gatrani referred to the conclusion of a training course for workers in the Nafoura field in the field of production engineering on the use of new techniques of electrical narratives and their applications to evaluate rock layers in oil-producing wells as well as water injection wells.

NOC is providing finance after securing it from government

He commended the NOC for supporting its oil companies financially, especially after allocating a good budget to the sector from the Abd Alhamid Aldabaiba government, which positively affected the entire oil sector, as several oil wells have returned to production and the completion of preparations in several new wells.

At the meeting Gatrani referred to the speech by NOC chairman Farhat Bengdara at a previous expanded meeting on the NOC's strategic plan to raise production and develop reserves. He pointed to the importance of this plan, which he said requires concerted efforts to achieve it and provide the necessary capabilities that would ensure access to the target smoothly. The most important of these capabilities, he said, is the steady cash flow as well as overcoming and developing all the problems that hinder the productive process.

AGOCO expected to increase most production

Speaking at the meeting, Khalifa Abdul Sadig, NOC board member, said that this meeting is very important and strategic to increase production and develop reserves in AGOCO, which, he said, constitutes the largest percentage of this plan. He said the NOC is counting on AGOCO to Increase production, develop reserves, and counting on it for the success of the NOC's increased production plan. He admitted that the challenges are great, but with a strong will and wise management, Libya will be able to achieve the goals and results.

Tags: AGOCO Arabian Gulf Oil Company

https://www.globaltimes.cn/page/202304/1289654.shtml

China not yet in middle of second wave of COVID-19: epidemiologists

By Global Times Published: Apr 23, 2023 10:36 PM

Discussion of re-infection with COVID-19 has become trendy on Chinese social media after a bunch of users posted positive antigen results for the coronavirus. Epidemiologists whisked off concerns of a second wave coming, and they said that most people infected with COVID-19 now are those who did not contract the virus before.

Recently, some netizens posted pictures of their positive antigen tests on Chinese social media, claiming they were "re-infected" with COVID-19. A Nanjing netizen said on Chinese Instagram-like fashion and lifestyle-sharing platform Xiaohongshu that five people in her family tested positive for COVID-19 in recent days, almost four months after they first tested positive in December last year.

A company in Beijing on Sunday began to survey whether its employees had been infected with COVID-19 lately, and asked those who had contracted the virus to stay at home, the Global Times learned. Similarly, a primary school in South China's Guangdong Province is following a similar practice for teachers and students alike.

The Chinese Center for Disease Control and Prevention (China CDC), which has been monitoring COVID-19 infection numbers and new variants, said on Sunday that health departments reported 2,661 positive COVID-19 cases nationwide on Thursday.

The COVID-19 positive rate for Thursday was slightly higher than it was on April 13. On March 13, the China CDC announced that 1.3 percent of those who took nucleic acid tests were positive, and the rate on Thursday was 1.7 percent.

Chinese epidemiologists believed those who get infected twice are "rare cases." Most COVID-19 infections in China at the current stage are people who dodged the bullet during the first massive infection wave at the end of last year.

"From December until now, almost one-third of those who did not infect during the last wave are gradually getting infected. Later, more and more of those who haven't got COVID-19 will be infected, but the peak won't surpass even 10 percent of that in December last year," Wang Guangfa, a respiratory expert from Peking University First Hospital, told the Global Times.

Thus, there won't be palpable pressure on China's hospitals and the medical system, according to Wang, who expects a second wave will come in September this year.

Li Tongzeng, chief physician in the respiratory and infectious diseases department at Beijing You'an hospital, told the Global Times that the risk of being reinfected with COVID-19 will increase, but most people who are infected a second time will have relatively milder symptoms, thus the blow of the second wave to the medical system will be less severe than in December.

According to China CDC's data, the number of COVID-19 infections in China peaked at 6.94 million per day on December 22 last year and then began to fall gradually.

Speaking at a forum on Thursday, Zhang Wenhong, head of the infectious disease department at Huashan Hospital in Shanghai, also director of the National Center for Infectious Diseases, said that monitoring data showed that most of the current infections in China are people who haven't contracted the virus before.

Zhang noted that if the coronavirus mutates, some people will be re-infected after six months. But the scale will not be huge. However, if the mutation manages to break the immune barrier formed during the previous wave, an infection peak will come.

The China CDC claimed it had detected 12 new variants in this country. The center had found 42 cases of

XBB.1.16 - referred to as "arcturus"— which has been the dominant variant in India since March. The China CDC assured the public, saying that there are a very small number of XBB.1.16 carriers, which have yet to form a transmission trend.

Although the scale won't be as huge as the previous wave, Zhang still called for stockpiling of small molecule antivirals of COVID-19, and at the same time establishing a model that could treat COVID-19 patients within 48 hours.

"I believe constant monitoring, warnings and stockpiling of medicines will enable us to respond rapidly to any mutations and run faster than the next infection," said Zhang.

The public are concerned if infections will surge during the upcoming May Day holidays, as a booking surge leads to large-scale gatherings.

Wang said it's likely that infections will climb during the May Day holidays. Yet the majority of people in China are vaccinated, and many have already been infected, which means high-level immunity among the public.

"Large-scale infection is unlikely," said Wang.

https://www.globaltimes.cn/page/202304/1289993.shtml

First day of May Day holidays witnesses record railway trips, booming consumer spending

By Global Times Published: Apr 30, 2023 02:31 PM Updated: Apr 30, 2023 05:53 PM

Photo: CFP

A tourist who arrived at Sanxingdui Museum in Southwest China's Sichuan Province at 8 am, ahead of the opening, queued for more than one hour to enter, which was an vivid miniature of the first day of the May Day holidays on social media platform Xiaohongshu.

Such travel mania was seen nationwide on Saturday, the first day of the five-day holidays. Air, sea and land passenger traffic surged 151.8 percent year-on-year on Saturday, latest statistics revealed.

A total of 19.661 million railway passenger trips were made on Saturday with 12,064 passenger trains operating, which made a new high in terms of single-day passenger traffic, according to China Railway on Sunday. The railway operator estimated that 18 million passenger trips will be made on Sunday, with 11,217 trains scheduled to run.

Local authorities of a number of cities and provinces also released local travel statistics for the first day of the holiday.

Beijing welcomed 1.841 million tourists on Saturday, doubling 2022 levels. Sales revenues reached 107 million yuan ($15.5 million), an increase of 180 percent year-on-year, which tied the revenues in 2019. Shanghai received 3.062 million travelers on Saturday.

More than 30,000 visited the Universal Studios Beijing on Saturday, and the number is expected to increase in following days with more than 75 percent of tourists come from cities and provinces outside Beijing, according

to media reports.

For South China's Guangdong Province, its 150 key scenic spots received 2.21 million tourists on Saturday, up 80.1 percent year-on-year. Expressway traffic in Guangdong reached a record high of 9.12 million vehicle trips on Saturday, according to official statistics released on Sunday.

Some 3.618 million travelers visited Sichuan, up 67.61 percent from 2022, with ticket sales reaching 32.34 million yuan, up 119.34 percent year-on-year.

Changsha in Central China's Hunan Province reported a year-on-year growth of 909 percent for travel order on Saturday. First-day hotel bookings increased 685 percent year-on-year, while scenic spot ticket sales increased 724 percent.

The metro network in Wuhan, Central China's Hubei Province, recorded 5.06 million passenger trips on Saturday, a record high. The well-known scenic spot Yellow Crane Tower said on Sunday that ticket sales have been suspended, as the number of visitors who have made reservations for it has reached 90 percent of its maximum capacity.

Driven by resurgent enthusiasm for travel, China's consumer market boomed sharply during the holidays.

China's key retail and catering enterprises saw sales growth of 21.4 percent year-on-year on Saturday, according to the monitoring of the Ministry of Commerce (MOFCOM) released on Sunday.

Catering and leisure consumption increased significantly, with sales of key catering enterprises up 36.9 percent on a yearly basis. Sales of clothing, shoes and hats, gold, silver and jewelry, tobacco and alcohol all increased by about 20.9 percent, 17.6 percent, 17.4 percent and 16.8 percent, all on year-on-year basis, MOFCOM data showed.

In particular, on-site consumption saw a significant growth during the May Day holidays.

On Saturday, the box office reached 294 million yuan, with 464,000 screenings attracting an audience of 7.26 million, according to statistics sent to the Global Times on Sunday from Maoyan, a box-office tracking site.

The number of buyers to Suning's stores across the country on Saturday increased by 32 percent year-on-year, with the volume of orders spiked 47 percent, Chinese retailer Suning said in a note sent to the Global Times on Sunday.

The tourism industry estimated that the 2023 May Day holidays will be the biggest in over four years. A total of 240 million trips are expected to be made during the holidays, which tops that in 2019, with tourism revenues expected to reach 120 billion yuan, according to the China Tourism Academy.

Global Times

https://www.globaltimes.cn/page/202304/1289981.shtml

China's May Day rush fuels optimism with passenger flow hitting historic levels, a strong start of economic recovery

By Yin Yeping Published: Apr 29, 2023 08:15 PM

Passengers wait at Guangzhou Baiyun International Airport on April 29, 2023, the first day of the five-day May Day holidays. Photo: Courtesy of Guangzhou Baiyun International Airport

China's tourism industry ushered in a rare and eye-catching recovery during the May Day holidays, with passenger flows for trains and flights hitting historic levels on the first day of holidays, data released by several domestic travel platforms showed.

The robust travel performance of the holidays is also a vivid display of the vibrancy of China's economy which was highlighted at a top leadership's meeting one day earlier, and it also reflected a turning point in the consumption rebound and a good start on the path back to economic recovery, experts said.

The national railway is expected to transport19.5 million passengers on Saturday, the first day of the five-day long holidays, more than 10 percent higher than the previously recorded. And 120 million passengers are expected to transport from Thursday to May 4, an increase of 20 percent over the same period in 2019, according to China Railway.

Booming rail travel reflected on the business of some major train stations in the country. For example, Beijing South Railway Station will welcome its largest passenger flow on Saturday since the station was built in 1897 with an estimated 235,000 passengers leaving Beijing from the station on a single day.

Due to the high demand for travel, some train or flight tickets have been very hard to get. A Beijing resident surnamed Zhao told the Global Times on Saturday that the tickets, no matter via airlines or train to Huangshan, East China's Anhui Province were all booked out or with high prices days before the holidays. "I have switched to a trip to neighboring Tianjin and plan to spend my whole holidays there," Zhao said.

Passengers wait at Guangzhou Baiyun International Airport on April 29, 2023, the first day of the five-day May Day holidays. Photo: Courtesy of Guangzhou Baiyun International Airport

Tourists have shown a strong willingness to travel during the holidays, with surging travel demand, the Global Times also learned from the news released by several tourism platforms on Saturday.

Data from the travel portal Fliggy showed that the turnover of domestic travel products on Saturday hit a historical peak. The turnover of domestic air tickets, accommodation, train tickets, and car rental has all surpassed the same period in 2019 by a large margin.

The spike in hotel and homestay bookings has been particularly strong, with a turnover increase of 129 percent year-on-year in 2019, Fliggy said.

Data released by Ctrip, a major online travel agency in China, on Saturday, the overall travel orders on the platform increased by more than 10 fold year-on-year, or more than doubled than that of 2019, and a surge of 668 percent compared to the first day of this year's Spring Festival holidays.

Air travel has also surged. Guangzhou Baiyun International Airport, one of the top three hubs in terms of passenger throughput recorded more than 200,000 passenger trips for two consecutive days on Thursday and Friday. In detail, the domestic passenger throughput of the airport reached 184,200 on Friday, 1.18 times that of the same period in 2019.

Data from industry information provider VariFlight showed that the number of international and domestic passenger flights on Friday reached the highest peak in over three years, with 13,650 passenger flights for domestic routes and 1,053 passenger flights for overseas routes.

Air ticket prices spiked long before the holiday. As of April 23, the overall price of air tickets during the holidays had increased by over 30 percent compared to the same period in 2019, VariFlight said.

The bullish tourism recovery also reflected on the numbers for tourists for major domestic popular tourism destinations.

According to the Beijing Municipal Bureau of Culture and Tourism, the city's 206 key monitored tourist

attractions welcomed 1.841 million tourists in total on Saturday, recovering to 84.8 percent of the same period in 2019. Also, the operating income of the corresponding attractions on Saturday hit 107 million yuan ($15.48 million), recovering to 100 percent of the same period in 2019, said the bureau.

A forecast made by the Yunnan Provincial Department of Culture and Tourism said that the province will receive more than 30 million tourists during the holidays, which is about 200 percent more than the same period in 2019, according to media reports.

Given the positive trends, the China Tourism Academy predicated that the number of tourists during this year's May Day holidays is expected to exceed the level of the same period in 2019, reaching 240 million passenger trips, according to CCTV.com.

Experts said that the dent-up demand for travel enthusiasm for three years has been fully released on May Day holidays, which will be an important turning point for an economy wide rebound.

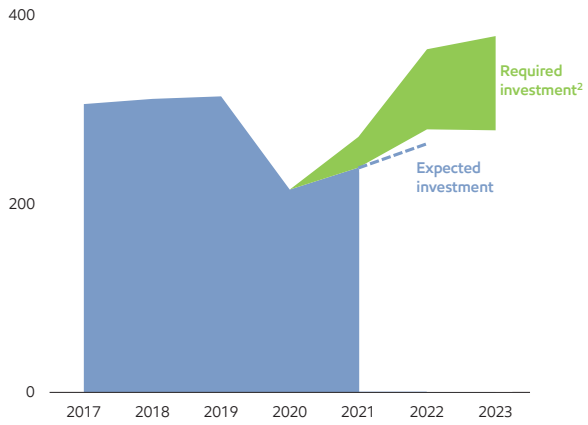
The tourism rebound is a very positive signal for the rapid recovery of domestic consumption, and it is the primary driving force for the economic revival, said Li Changan, a professor at the Academy of China Open Economy Studies of the University of International Business and Economics told the Global Times on Saturday.

"Consumption has become the most important driving force behind China's economic growth. With a contribution rate of more than 50 percent in recent years, it will be a strong source of support for the realization of the annual economic growth target," Li said.

The consumption rebound during the May Day holidays came after a meeting convened by China's top leadership on Friday, saying that economic growth has been better than expected, market demand has been gradually recovering, economic development has shown an upward momentum, and economic operation has got off to a good start.

INDUSTRY INVESTMENT NOT KEEPING UP WITH RECOVERING DEMAND

UPSTREAM OIL INVESTMENT[1]
Billion USD



- Effects of the pandemic exacerbated stagnant industry investment
- Investments lagging estimated third-party requirements as the oil market recovers
  - Additional investment needed to offset depletion and to meet recovering demand
- Finding, developing, and producing new oil supplies takes years

See Supplemental Information for footnotes.

5

For a perspective on the current price environment, it's important to consider the balance in supply and demand. Demand is recovering to pre-pandemic levels. However, for oil and gas, supply has attritted through depletion and reduced industry investment. You can see the significant reduction in industry oil investment in the graph.

Industry's investments were already low leading up to the pandemic. When the pandemic hit in 2020, economy wide shutdowns dramatically reduced demand for crude. That deeply impacted industry's earnings and cash flows. As cash flows came down, the industry sought to preserve cash, and further curtailed capital investments.

As a depletion business, large annual investments in oil and gas production are needed to offset the decline in supply – roughly a 7% per year reduction. Even more investment is required to grow net production. As the world began to recover from the pandemic, demand for all but jet fuels recovered far faster than the time required to bring on new investments. As a result, the industry hasn't been able to meet the recovery in demand.

Third-party estimates for required investments to meet demand are shown as the range in green, which contrasts with the blue area showing historical investment levels, and the blue line showing expected near term investment … which are beneath the low end of the range. Clearly, to lower prices, the industry needs to increase investment and catch up to recovering demand. Unfortunately, this will take time.

Exxon's Math Calls For Overall Global Oil Decline Rate of ~7%, A Very Bullish Argument For Post 2020 Oil Prices

Posted: Thursday June 20, 2019. 5:30pm Mountain

We believe Exxon presented a very bullish argument for oil prices beyond 2020 and that it has been overlooked because most readers only flip thru a slide deck and don't listen to or read transcripts of management's spoken words. Exxon's spoken words highlighted one of the forgotten (and perhaps most important) oil supply/demand concerns for post 2020 - the mid term challenge to replace increasing rate of overall global oil declines. And what is eye opening is Exxon's estimated overall global oil decline rate, which is way higher than any we can ever remember seeing. Its impossible to tell from the small oil supply/demand graph in the slide deck, but Exxon's spoken words says long term oil demand is 0.7% per year and then "*When you factor in depletion rates, the need for new oil grows at close to 8% per year and new gas at close to 6% per year*." Exxon may not specifically say what the global decline rate is, but their math is that the world needs new oil supply to grow annually at close to 8% to meet the 0.7% annual increase in oil demand and offset declines ie. an overall global decline rate of approx. 7%. This is an overall global oil decline rate for OPEC and non-OPEC. This compares to BP's estimate of overall global oil decline rate of 4.5% and we expect most are probably assuming something around 5%, certainly not above 6%. No one should be surprised by the increased decline rate given that high decline US shale and tight oil have increased by ~2.5 mmb/d in the last ~2 years. But an implied ~7% overall global oil decline rate is way higher than expectations. There is a big difference between needing to offset oil declines of ~7 mmb/d vs declines of ~4.5 mmb/d ie. an additional 2.5 mmb/d of new oil supply every year. Even if the implied difference was to 6%, it would still be an additional 1.5 mmb/d of new oil supply and that would also be very bullish for post 2020 oil. We recognize that the 2019/2020 oil supply demand story is the need for OPEC+ to keep cuts thru 2020, but Exxon's math implying ~7% overall global oil decline rate sets up a very bullish view for oil post 2020. We believe the reality to replace oil declines post 2020 is overlooked.

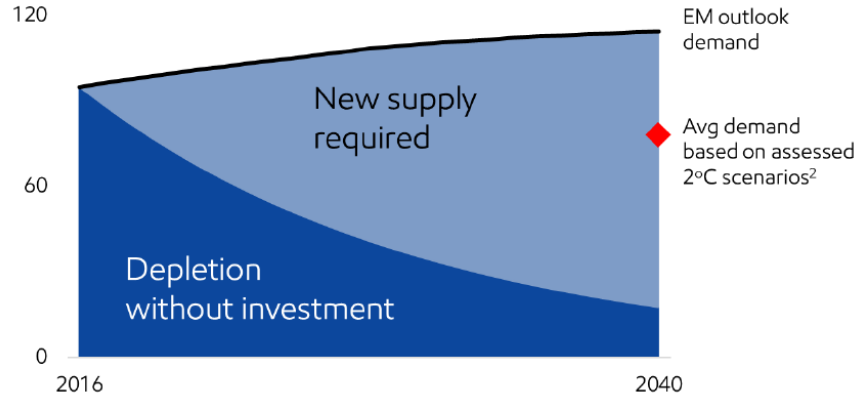
The 2019/2020 oil story - oil inventories still above the 5 yr ave and OPEC+ need to work together in 2020. There is increasing geopolitical risk to oil in a range of regions (Iran/Saudi Arabia, Libya, Venezuela, etc.) yet the prevailing tone to oil in the past month is negative with the concerns on trade wars/lower economic growth leading to weakness in oil demand. This was reinforced in the past week with the view that there is the need for OPEC+ to continue to work together in H2/19 and in 2020. Our SAF June 16, 2019 Energy Tidbits memo [LINK] reviewed the IEA's new monthly Oil Market Report [LINK], which included (i) "*OECD oil stocks remain at comfortable levels 16 mb above the five-year average"*, (ii) the EIA lowered its 2019 oil demand growth rate by 0.1 mmb/d to +1.2 mmb/d, and (iii) a negative first look at 2020 oil supply/demand. The EIA's first 2020 forecast puts more pressure on OPEC+ to continue with cuts through 2020. IEA says oil demand growth rate will grow from +1.2 mmb/d in 2019 to +1.4 mmb/d in 2020. This is a positive, however, it is more than offset as the IEA forecasts another year of big non-OPEC oil supply growth of +2.3 mmb/d in 2020. In theory a lesser call on OPEC of 0.9 mmb/d. The IEA writes "*A clear message from our first look at 2020 is that there is plenty of non-OPEC supply growth available to meet any likely level of demand, assuming no major geopolitical shock, and the OPEC countries are sitting on 3.2 mb/d of spare capacity".*

Exxon sees modest annual growth in oil demand, but peak oil demand sometime after 2040. Exxon presented at a US sellside energy conference on Tues. We expect a big reason why Exxon's oil outlook was ignored was that the presentation was almost all about providing a great detailed look at the Guyana oil play. Plus its headline annual growth rate for oil demand of 0.7% per year wouldn't have made anyone bullish, if anything maybe even more so so on oi. Exxon only provided some brief comments on their oil supply and demand outlook. Exxon said *"In this scenario, oil demand is expected to grow 0.7% per year, driven by commercial transportation and chemical"*. This compares to 2018 oi demand growth of 1.45% and even this year's lower oil demand growth rates of 1.15%. However, we recognize it is tough to get data from a small graph, but a positive tn the graph is that it seems to indicate that peak oil demand doesn't happen before 2040.

However, Exxon says new oil supply of 8% per year is needed to meet demand growth and offset decline rates. On one hand, we continue to be surprised that Exxon's view on new oil supply has received no attention. On the other, it makes sense because the vast majority of readers only flip thru a slide deck so will miss the spoken word that gives numbers and context to a slide. That was clearly the case with the Exxon presentation. If Exxon is anywhere near right, this is a hugely bullish view for mid/long term oil ie post 2020 oil. Exxon highlighted one of the forgotten oil supply/demand concerns is

the mid term challenge to replace global oil declines. And what is eye opening is Exxon's estimated decline rate, which is way higher than any we can ever remember seeing. Exxon says long term oil demand is 0.7% per year and then says "*When you factor in depletion rates, the need for new oil grows at close to 8% per year and new gas at close to 6% per year*." Exxon didn't specifically say that the overall global decline rate was ~7%, but the math looks straightforward. The world needs new oil supply to growth at close to 8% per year to meet 0.7% annual demand growth and to offset declines in global (OPEC and non-OPEC) oil production ie. the overall global oil decline rate is approx. 7%. This is an overall OPEC and non-OPEC global decline rate.

Oil Supply/Demand (moebd)

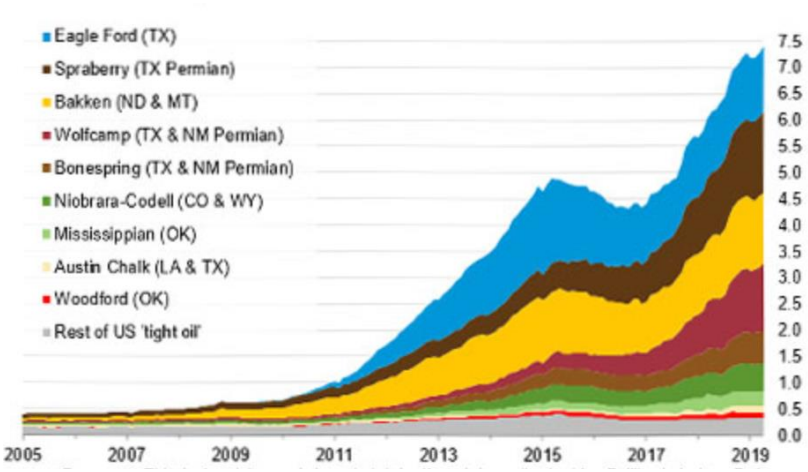


Source: Exxon US Sellside Conference Presentation June 18, 2019

Implies a huge overall global decline rate of ~7% - way higher than other estimates. It may well be the case that forecasters haven't updated their global oil decline models to reflect the impact of the US adding ~2.5 mmb/d of high decline shale and tight oil in the past two years. But we aren't aware of anyone who is using an overall global oil decline rate as high as 7%. We have seen estimates for 7% for decline rates for non-OPEC oil, but not for the decline rates overall for global oil. Rather, we expect that most have been assuming overall global oil decline rates of 4% to 5%. Later in the blog, we note our peak oil demand comment from Nov 6, 2017 (prior to the big ramp up in US shale and tight oil) that used Core Laboratories spring 2017 estimate for overall global oil decline of ~3.3%.

Exxon's global leadership position, especially in shale, is why we should pay attention to this view of significantly higher global oil decline rates. Everyone knows Exxon is the largest public international oil company and is in all major oil regions and all types of plays from conventional, oil sands, middle east, deepwater oil and shale oil, We believe that Exxon is viewed as the global leader in the Permian, and this shale oil leadership is critical to understand as we believe that the growth of US shale is the key reason for the increasing overall global oil decline rates. Exxon's shale oil leadership is why we should be paying attention to this estimate. The game changer to global oil decline rates has been the increasing oil production from high decline US shale and tight oil. The EIA estimates [LINK] that US shale and tight oil plays are up over 6 mmb/d this decade and ~2.5 mmb/d n the past two years alone.

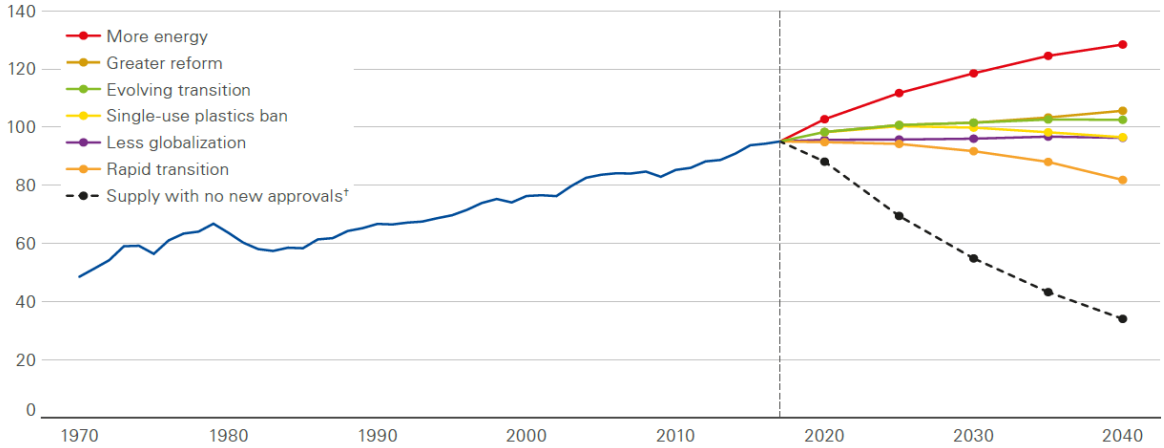
US Tight Oil Production – Selected Plays (Million barrels of oil per day)



Source: EIA

BPs recent forecast for overall global oil decline rate is 4.5% per year. BP's Energy Outlook 2019 Edition (Feb 14, 2019) [LINK] included their outlook for oil supply and demand and specifically on overall global oil decline rates. BP wrote "*Second, significant levels of investment are required for there to be sufficient supplies of oil to meet demand in 2040. If future investment was limited to developing existing fields and there was no investment in new production areas, global production would decline at an average rate of around 4.5% p.a. (based on IEA's estimates), implying global oil supply would be only around 35 Mb/d in 2040."* Below is the graph from their Energy Outlook 2019 Edition report.

Demand and Supply of Oil (Mbd)



Source: BP Energy Outlook 2019 Edition

If Exxon is anywhere close, this is a hugely bullish signal for mid/long term oil ie. post 2020 oil. We recognize that this significantly higher than expected overall global oil decline rate will take a year or two to work thru the current supply/demand fundamentals given where markets are today. However, over the mid term, the need to add ~7 mmb/d of new oil supply is a huge challenge for the world. The difference between an Exxon type view of ~7% declines vs BP's 4.5% declines is approx. 2.5 mmb/d of an additional new oil supply every year is needed to balance the markets. In reality, even if Exxon's implied overall global decline rate was ~6%, it would still be very bullish for mid/long term oil as this means an additional ~1.5 mmb/d of new global oil supply per year.

Its even more bullish for post 2020 oil than we thought in our Nov 6, 2017 peak oil demand blog. We have always been in the camp that believes peak oil demand is coming, but we have also been of the view that the post 2020 challenge to replace oil declines would be getting tougher. We believe Exxon's view of higher global oil decline rates is consistent with the ~2.5 mmb/d increase in US shale and tight oil in the past two years. And is way more bullish than we wrote in our Nov 6, 2017 blog "*Peak Oil Demand Is Coming, But >4 Mmb/d Of New Oil Supply Will Be Needed Every Year To Replace Declines To Get There*" [LINK], and "*We buy into the narrative of peak oil demand, believe it is inevitable, its visible and will happen before 2030. Peak oil demand will be from the cumulative impact of a number of factors including EVs, battery/storage, LNG for power, LNG for transportation, increased energy efficiency, etc. But the peak oil demand narrative forgets the most basic fundamentals of oil – industry has to add new oil supply every year to replace declines just to keep production flat. Even after today's big oil rally, long dated strips are still under $52 from 2020 thru 2025. We don't believe long dated 2020 thru 2025 strips are predictive of future prices or indicative of the marginal supply costs to add 4 to 5 million b/d every year in 2020 to 2025 or to add >3 million b/d every year once peak oil demand is reached and is in plateau. We believe these marginal supply costs are significantly higher and >$60. We believe oil can quickly move to a base of >$60 with this supply challenge and there will be longevity to this call as markets appreciate this challenge and that the marginal supply cost to add this much new oil production every year is well over $60. Peak oil demand won't take away from the challenge to add significant new oil production every year."* Note that our Nov 6, 2017 blog was based on the spring 2017 Core Laboratories estimate that the global world wide annual decline rate in oil was then 3.3%. But to Core Laboratories support, this estimate would have been before the ~2.5 mmb/d of added US shale and tight oil in the past two years.

Apr 28, 2023 06:13:46

OIL DEMAND MONITOR: Gauges Resilient in Face of Economic Worries

Oil futures markets wobble as macroeconomic concerns linger
Range of markers yet to show dramatic consumption reductions

By John Deane

(Bloomberg) -- Fears of economic stagnation, sliding profits from turning crude into products such as diesel and talk that some refineries could cut output have cast a pall over the oil futures markets in recent weeks. For now though, a range of indicators suggests overall demand remains resilient.

The market is grappling with mixed signals on the health of the global economy. Futures have tumbled, with the gains that followed the announcement of OPEC+ output cuts evaporating, amid concerns about the strength of China's post-virus rebound and the prospects for the US economy. There's a focus on the diesel market, where premiums against crude futures have plunged.

But running alongside that narrative, a variety of real-world measures suggest that – for now at least – there is robust appetite for fuels in many parts of the world, with gasoline and jet fuel set to underpin demand growth through the rest of the year.

In the US, the latest government data showed a jump in weekly implied gasoline demand of almost a million barrels a day to the highest level since December 2021, bringing the four-week average back up and setting the country's gasoline consumption on a bullish path before peak driving season. Total crude stockpiles, including both commercial and Strategic Petroleum Reserve inventories, fell by more than six million barrels for a second week.

Oil refiners in India – lately a key driver of global demand growth – processed a record volume of crude in March, according to government data. There was a similar picture in China, as the nation's post-Covid Zero recovery continued.

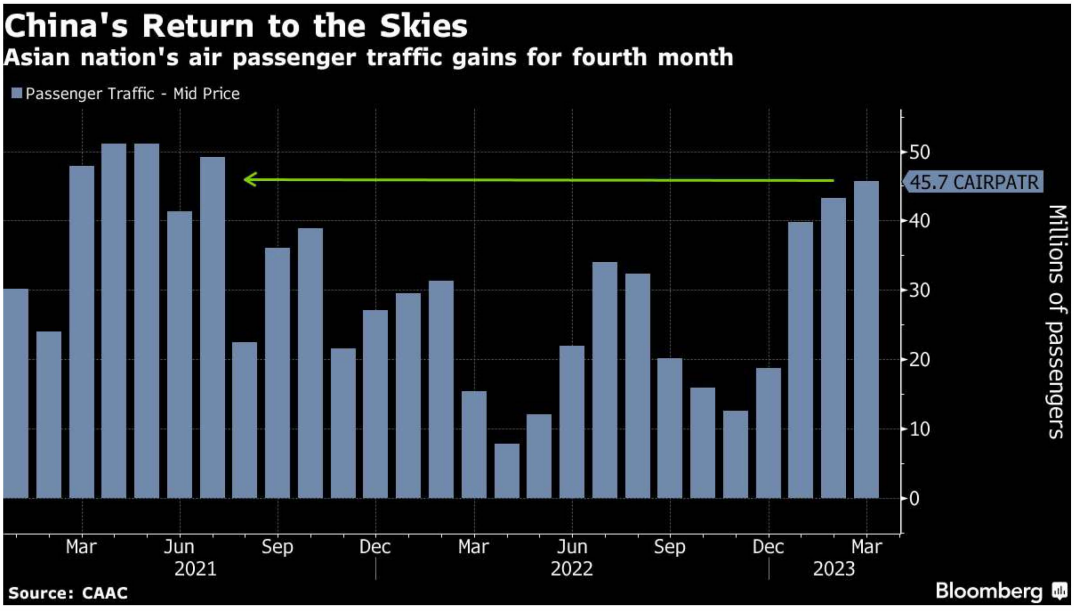
In the skies, the gradual recovery from the impact of the pandemic continues.

China's air passenger traffic gained for a fourth month in March to the highest since the summer of 2021, according to data from the country's civil aviation administration. Those levels are set to get a further boost from the country's Golden Week holidays in early May.

Globally, domestic airline capacity is 3% above 2019 levels, and is expected to reach 70 million seats by early July, according to data provider OAG Aviation. International capacity remains 12% below where it was in the same week in 2019, though the gap is seen "improving each week for the next few months."

London's Heathrow Airport, among the world's busiest, this week boosted its passenger forecasts for the full year, to as many as 78 million, citing "a strong recovery in demand over the first quarter, which we expect to continue over the rest of the year."

Read More: Aviation Indicators Weekly: Ending April on a High



On the roads, congestion exceeded 2019 levels in three of 13 major world cities – London, Rome and Berlin – as of Monday, according to BNEF seven-day moving average calculations based on TomTom data. Several other cities, including New York, Los Angeles, Madrid and Paris, were within a few index points of that level.

The resilience of Russian crude and product flows – despite the repercussions of the invasion of Ukraine – may mean that oil markets tighten less, or more slowly, than many analysts had expected in the months ahead. Nevertheless, plenty of commentators still see the market's balance compressing significantly as the year unfolds.

In a report this week, Facts Global Energy said it remained confident "that a market deficit will emerge in May and persist until OPEC+ unwinds the next phase of its planned cuts. Our projections from May onwards show an extremely tight global crude balance emerging compared to historical levels."

While acknowledging that views on recession will ebb and flow, PVM Oil Associates Ltd. analyst Tamas Varga said in a note that "global oil demand, helped by the beginning of the US driving season and Chinese economic revival, will pick up and scale new peaks."

Read More: Aviation Indicators Weekly: Ending April on a High

The Bloomberg oil-demand monitor uses a range of high-frequency data to help identify emerging trends. Following are the latest indicators. The first two tables shows fuel demand and road congestion, the next shows air travel globally and the last is refinery activity:

Demand Measure	Location	%vs 2022	% vs 2021	% vs 2020	% vs 2019	% m/m	Freq	Latest Date	Latest Value	Source
Gasoline product supplied	US	+8.8	+7.1	+79	+1.1	+4	w	April 21	9.51m b/d	EIA
Distillates product supplied	US	-2.8	-14	+19	-1.8	+0.4	w	April 21	3.73m b/d	EIA
Jet fuel product supplied	US	-3.8	+29	+150	-16	+5.9	w	April 21	1.53m b/d	EIA
Total oil products supplied	US	+2	-0.9	+43	-1.1	-1.3	w	April 21	20.21m b/d	EIA
All motor vehicle use index	UK	+9.8	+26	+159	+1	+16	m	April 6	101	DfT
Car use	UK	+10	+31	+169	-3	+18	m	April 6	97	DfT
Heavy goods vehicle use	UK	-1	unch.	+69	+3	+7	m	April 6	103	DfT
Gasoline (petrol) avg sales per filling station	UK	+5.1	+22	+208	-2.9	-0.4	m	Week to April 2	6,977 liters/d	BEIS
Diesel avg sales per station	UK	-2.2	+6	+118	-13	+0.1	m	Week to April 2	9,090 liters/d	BEIS
Total road fuels sales per station	UK	+0.9	+12	+150	-8.7	-0.1	m	Week to April 2	16,067 liters/d	BEIS
Gasoline	India	+1.9				-6.6	m	April 1-15	1.1m tons	Bberg
Diesel	India	+15				+8.4	m	April 1-15	3.5m tons	Bberg
Jet fuel	India	+14				-3.8	m	April 1-15	285k tons	Bberg
LPG	India	+5.8				-6.4	m	April 1-15	1.1m tons	Bberg
Gasoline	Spain	+15				+17	m	March	509k m3	Exolum
Diesel (and heating oil)	Spain	+11				+7.7	m	March	2,370k m3	Exolum
Jet fuel	Spain	+23				+23	m	March	484k m3	Exolum
Total oil products	Spain	+12				+11	m	March	3,363k m3	Exolum
Road fuel sales	France	+2.7				+20	m	March	4.264m m3	UFIP
Gasoline	France	+6.9					m	March	n/a	UFIP
Road diesel	France	+1.3					m	March	n/a	UFIP
Jet fuel	France	+4.6		-23		-0.2	m	March	530k m3	UFIP
All petroleum products	France	-1.5				+15	m	March	4.722m tons	UFIP
All vehicles traffic	Italy	+5.5				+4.1	m	March	n/a	Anas
Heavy vehicle traffic	Italy	-1				+5.9	m	March	n/a	Anas
Gasoline	Italy	+9.5	+45	+143	+14	+19	m	March	677k tons	Economic Development Ministry
Transport diesel	Italy	-0.3	+13	+70	+1.1	+11	m	March	2.03m	Ministry

Diesel/gasoil	Italy	-0.7	+11	+51	+0.7	+13 m	March	tons 2.27m tons	Ministry
LPG	Italy	-10	+13	+24	+5.7	-6.4 m	March	279k tons	Ministry
Jet fuel	Italy	+29	+233	+170	-9.4	+28 m	March	310k tons	Ministry
Total oil product sales	Italy	unch.	+9.8	+52	-0.5	+12 m	March	4.32m tons	Ministry
Gasoline	Portugal	-9.3	+54	+52	+20	+24 m	March	99.76k tons	ENSE
Diesel	Portugal	-14	+26	+30	+14	+18 m	March	455k tons	ENSE
Jet fuel	Portugal	+28	+435	+72	+13	+15 m	March	125k tons	ENSE

Notes: Click here for a PDF with more information on sources, methods. The frequency column shows w for data updated weekly, 2/m for twice a month and m for monthly.

In DfT UK daily data the column showing versus 2019 is actually showing the change versus the first week of February 2020, to represent the pre-Covid era.

In BEIS UK daily data, the column showing versus 2019 is actually showing the change versus the average of Jan. 27-March 22, 2020, to represent the pre-Covid era.

After December, Atlantia ceased publishing its toll road data.

City congestion:

Measure	Location	Apr 24	Apr 17	Apr 10	Apr 3	Mar 27	Mar 20	Mar 13	Mar 6	Feb 27	Feb 20	Feb 13	Feb 6
Congestion	Tokyo	85	81	83	105	102	106	91	88	92	92	83	85
Congestion	Taipei	86	82	66	82	85	80	84	74	85	83	83	78
Congestion	Jakarta	35	85	68	69	51	87	89	99	93	75	79	83
Congestion	Mumbai	50	51	47	45	48	52	39	49	50	49	51	53
Congestion	New York	94	77	76	88	87	87	86	80	70	77	79	75
Congestion	Los Angeles	95	90	86	94	94	92	96	93	86	92	92	93
Congestion	London	122	96	87	107	119	125	117	117	96	119	121	110
Congestion	Rome	110	98	102	113	119	116	113	107	99	102	100	106
Congestion	Madrid	96	92	27	76	88	73	89	86	74	81	85	85
Congestion	Paris	95	98	92	96	94	106	108	82	78	99	105	99
Congestion	Berlin	110	94	75	109	104	106	85	100	97	101	99	88
Congestion	Mexico City	79	63	35	81	74	72	77	81	75	83	83	72
Congestion	Sao Paulo	71	81	69	80	87	87	99	86	56	71	92	80

Source: TomTom. Click here for a PDF with more information on sources, methods

NOTE: TomTom changed its methodology for calculating traffic delays with data for Feb. 20 and no longer publishes comparisons with pre-Covid levels. We have therefore switched to using figures calculated by BNEF, which show 7-day moving average congestion indexed to average 2019 levels. See the linked PDF for more details.

NOTE: A public holiday in Indonesia affected traffic levels April 24.

READ: Road Traffic Indicators: World Continues Upward Trend

Air Travel:

Measure	Location	vs 2022	vs 2021	vs 2020	vs 2019	m/m	w/w	Freq.	Latest Date	Latest Value	Source
		changes shown as %									
Seat capacity per week	Worldwide	+20	+72	+227	-3.2		+1 w		April 24 week	106.5m seats	OAG
Air traffic (flights)	Europe				-5.8	+20	+1.1 d		April 24	28,578	Eurocontrol
Airline passenger throughput (7-day avg)	US	+9	+73	+2,210	+0.2	unchg.	-0.2 w		April 23	2.35m	TSA
Air passenger traffic per month	China	+197	-4.4	+203	-15	+5.8	m		March	45.7m	CAAC
Heathrow airport passengers	UK	+48	+1,050	+101	-4.6	+20	m		March	6.23m	Heathrow

NOTE: Comparisons versus 2019 are a better measure of a return to normal for most nations, rather than y/y comparisons.

Refineries:

Measure	Location	vs 2022	vs 2021	vs 2019	m/m chg	Latest as of Date	Latest Value	Source
			Changes are in ppt unless noted					
Crude intake	US	+1%	+5.4%	-4.5%	+0.1%	April 21	15.83m b/d	EIA
Utilization	US	+1	+5.9	+1.2	+1	April 21	91.3%	EIA
Utilization	US Gulf	+1.2	+5.9	+2.5	+0.7	April 21	95.4%	EIA
Utilization	US East	+8	+15	+4.4	+21	April 21	92%	EIA
Utilization	US Midwest	-5.3	+5.1	-6.2	-2.7	April 28	85.6%	EIA
Utilization (indep. refs)	Shandong, China	+9.9	-8.4	-3.9	-2.9	April 28	60.4%	Oilchem

NOTE: US refinery data is weekly. Changes are shown in percentages for the row on crude intake, while refinery utilization changes are shown in percentage points. SCI99 data on Chinese refinery run rates was discontinued in late 2021.

Previous versions:

Click here for prior versions of the OIL DEMAND MONITOR or run NI OILDEMON

--With assistance from Joao Lima, Bill Lehane, Julian Lee and Prejula Prem.

To contact the reporter on this story:
John Deane in London at jdeane3@bloomberg.net

To contact the editors responsible for this story:
Alaric Nightingale at anightingal1@bloomberg.net
John Deane, Brian Wingfield

This story was produced with the assistance of Bloomberg Automation.

https://www.nesdis.noaa.gov/news/large-geomagnetic-storm-hits-earth

Large Geomagnetic Storm Hits Earth

April 28, 2023

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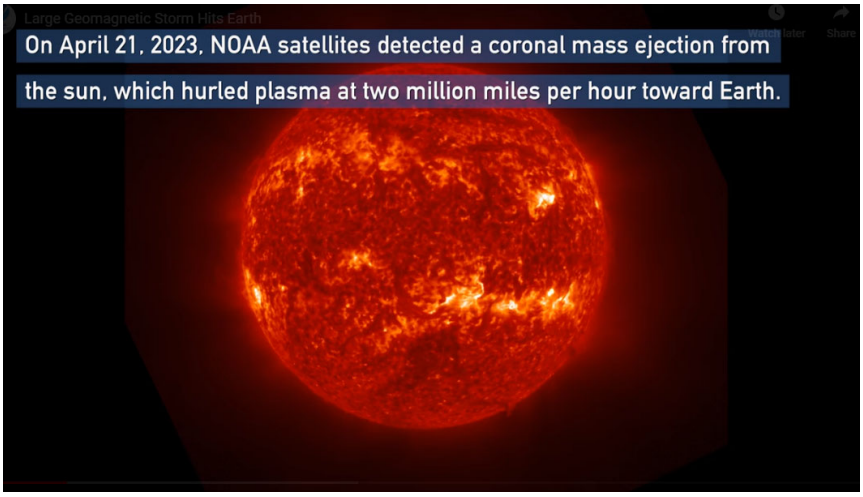


On April 21, 2023, a coronal mass ejection (CME) erupted from the sun, spewing out a burst of plasma that raced toward Earth at nearly two million miles per hour and generated a severe

geomagnetic storm (level 4 out of 5 on NOAA's space weather G- scale) at 3:26 p.m. EDT on April 23.

Increased solar radiation and associated geomagnetic storms can have various effects:

- They can affect power grids on Earth as well as radio signals and communications systems.
- They can affect our satellite operations and GPS navigation capabilities.
- They can impact astronauts in space, particularly if they are doing a spacewalk. Outside of the Earth's protective atmosphere, the extra radiation they are exposed to may cause radiation poisoning or other harmful health effects.
- They can create spectacular auroras on Earth.

This is the third severe geomagnetic storm (G4) since Solar Cycle 25 began in 2019. The other storms took place on November 4, 2021, and March 24, 2023. Forecasters observed the elevated solar winds measurement for these events using NOAA's DSCOVR spacecraft, which informed the geomagnetic storm forecasts.

NOAA satellites help monitor the activity of the sun and when solar flares, or coronal mass ejections occur. Since these events can happen unpredictably and some can reach Earth within minutes, NOAA's Space Weather Prediction Center uses this information to monitor the activity on the sun and makes forecasts, predictions, and alerts. In this case, NOAA forecasters issued several warnings for the geomagnetic storm and provided decision support to customers so they could minimize impacts.

To help with this, the GOES satellites also house the Extreme Ultraviolet and X-ray Irradiance Sensors (EXIS), which monitor the sun's electromagnetic radiation and serve as a critical first warning system for the onset of flares, the Space Environmental In-Situ Suite (SEISS), which helps assess the electrostatic discharge risk and radiation hazards to astronauts and satellites, and a Magnetometer, which measures the Earth's magnetic field.

Executive summary

Electric car sales break new records with momentum expected to continue through 2023

Electric car markets are seeing exponential growth as sales exceeded 10 million in 2022. A total of 14% of all new cars sold were electric in 2022, up from around 9% in 2021 and less than 5% in 2020. Three markets dominated global sales. China was the frontrunner once again, accounting for around 60% of global electric car sales. More than half of the electric cars on roads worldwide are now in China and the country has already exceeded its 2025 target for new energy vehicle sales. In Europe, the second largest market, electric car sales increased by over 15% in 2022, meaning that more than one in every five cars sold was electric. Electric car sales in the United States – the third largest market – increased 55% in 2022, reaching a sales share of 8%.

Electric car sales are expected to continue strongly through 2023. Over 2.3 million electric cars were sold in the first quarter, about 25% more than in the same period last year. We currently expect to see 14 million in sales by the end of 2023, representing a 35% year-on-year increase with new purchases accelerating in the second half of this year. As a result, electric cars could account for 18% of total car sales across the full calendar year. National policies and incentives will help bolster sales, while a return to the exceptionally high oil prices seen last year could further motivate prospective buyers.

There are promising signs for emerging electric vehicle (EV) markets, albeit from a small base. Electric car sales are generally low outside the major markets, but 2022 was a growth year in India, Thailand and Indonesia. Collectively, sales of electric cars in these countries more than tripled compared to 2021, reaching 80 000. For Thailand, the share of electric cars in total sales came in at slightly over 3% in 2022, while both India and Indonesia averaged around 1.5% last year. In India, EV and component manufacturing is ramping up, supported by the government's USD 3.2 billion incentive programme that has attracted investments totalling USD 8.3 billion. Thailand and Indonesia are also strengthening their policy support schemes, potentially providing valuable experience for other emerging market economies seeking to foster EV adoption.

Landmark EV policies are driving the outlook for EVs closer to climate ambitions

Market trends and policy efforts in major car markets are supporting a bright outlook for EV sales. Under the IEA Stated Policies Scenario (STEPS), the global outlook for the share of electric car sales based on existing policies and firm objectives has increased to 35% in 2030, up from less than 25% in the previous outlook. In the projections, China retains its position as the largest market for electric cars with 40% of total sales by 2030 in the STEPS. The United States doubles its market share to 20% by the end of the decade as recent policy announcements drive demand, while Europe maintains its current 25% share.

Projected demand for electric cars in major car markets will have profound implications on energy markets and climate goals in the current policy environment. Based on existing policies, oil demand from road transport is projected to peak around 2025 in the STEPS, with the amount of oil displaced by electric vehicles exceeding 5 million barrels per day in 2030. In the STEPS, emissions of around 700 Mt CO_2-equivalents are avoided by the use of electric cars in 2030.

The European Union and the United States have passed legislation to match their electrification ambitions. The European Union adopted new CO_2 standards for cars and vans that are aligned with the 2030 goals set out in the Fit for 55 package. In the United States, the Inflation Reduction Act (IRA), combined with adoption of California's Advanced Clean Cars II rule by a number of states, could deliver a 50% market share for electric cars in 2030, in line with the national target. The implementation of the recently proposed emissions standards from the US Environmental Protection Agency is set to further increase this share.

Battery manufacturing continues to expand, encouraged by the outlook for EVs. As of March 2023, announcements on battery manufacturing capacity delivered by 2030 are more than sufficient to meet the demand implied by government pledges and would even be able to cover the demand for electric vehicles in the Net Zero Emissions by 2050 Scenario. It is therefore well possible that higher shares of sales are achievable for electric cars than those anticipated on the basis of current government policy and national targets.

As spending and competition increase, a growing number of more affordable models come to market

Global spending on electric cars exceeded USD 425 billion in 2022, up 50% relative to 2021. Only 10% of the spending can be attributed to government support, the remainder was from consumers. Investors have also maintained confidence in EVs, with the stocks of EV-related companies consistently

outperforming traditional carmakers since 2019. Venture capital investments in start-up firms developing EV and battery technologies have also boomed, reaching nearly USD 2.1 billion in 2022, up 30% relative to 2021, with investments increasing in batteries and critical minerals.

SUVs and large cars dominate available electric car options in 2022. They account for 60% of available BEV options in China and Europe and an even greater share in the United States, similar to the trend towards SUVs seen in internal combustion engine (ICE) car markets. In 2022, ICE SUVs emitted over 1 Gt CO_2, far greater than the 80 Mt net emissions reductions from the electric vehicle fleet that year. Battery electric SUVs often have batteries that are two- to three-times larger than small cars, requiring more critical minerals. However, last year electric SUVs resulted in the displacement of over 150 000 barrels of oil consumption per day and avoided the associated tailpipe emissions that would have been generated through burning the fuel in combustion engines.

The electric car market is increasingly competitive. A growing number of new entrants, primarily from China but also from other emerging markets, are offering more affordable models. Major incumbent carmakers are increasing ambition as well, especially in Europe, and 2022-2023 saw another series of important EV announcements: fully electric fleets, cheaper cars, greater investment, and vertical integration with battery-making and critical minerals.

Consumers can choose from an increasing number of options for electric cars. The number of available electric car models reached 500 in 2022, more than double the options available in 2018. However, outside of China, there is a need for original equipment manufacturers (OEMs) to offer affordable, competitively priced options in order to enable mass adoption of EVs. Today's level of available electric car models is still significantly lower than the number of ICE options on the market, but the number of ICE models available has been steadily decreasing since its peak in the mid-2010s.

Focus expands to electrification of more vehicle segments as electric cars surge ahead

Electrification of road transport goes beyond cars. Two or three-wheelers are the most electrified market segment today; in emerging markets and developing economies, they outnumber cars. Over half of India's three-wheeler registrations in 2022 were electric, demonstrating their growing popularity due to government incentives and lower lifecycle costs compared with conventional models, especially in the context of higher fuel prices. In many developing economies, two/three-wheelers offer an affordable way to get access to mobility, meaning their electrification is important to support sustainable development.

The commercial vehicle stock is also seeing increasing electrification. Electric light commercial vehicle (LCV) sales worldwide increased by more than 90% in 2022 to more than 310 000 vehicles, even as overall LCV sales declined by nearly 15%. In 2022, nearly 66 000 electric buses and 60 000 medium- and heavy-duty trucks were sold worldwide, representing about 4.5% of all bus sales and 1.2% of truck sales. Where governments have committed to reduce emissions from public transport, such as in dense urban areas, electric bus sales reached even higher shares; in Finland, for example, electric bus sales accounted for over 65% in 2022.

Ambition with respect to electrifying heavy-duty vehicles is growing. In 2022, around 220 electric heavy-duty vehicle models entered the market, bringing the total to over 800 models offered by well over 100 OEMs. A total of 27 governments have pledged to achieve 100% ZEV bus and truck sales by 2040 and both the United States and European Union have also proposed stronger emissions standards for heavy-duty vehicles.

EV supply chains and batteries gain greater prominence in policy-making

The increase in demand for electric vehicles is driving demand for batteries and related critical minerals. Automotive lithium-ion (Li-ion) battery demand increased by about 65% to 550 GWh in 2022, from about 330 GWh in 2021, primarily as a result of growth in electric passenger car sales. In 2022, about 60% of lithium, 30% of cobalt and 10% of nickel demand was for EV batteries. Only five years prior, these shares were around 15%, 10% and 2%, respectively. Reducing the need for critical materials will be important for supply chain sustainability, resilience and security, especially given recent price developments for battery material.

New alternatives to conventional lithium-ion are on the rise. The share of lithium-iron-phosphate (LFP) chemistries reached its highest point ever, driven primarily by China: around 95% of the LFP batteries for electric LDVs went into vehicles produced in China. Supply chains for (lithium-free) sodium-ion batteries are also being established, with over 100 GWh of manufacturing capacity either currently operating or announced, almost all in China.

The EV supply chain is expanding, but manufacturing remains highly concentrated in certain regions, with China being the main player in battery and EV component trade. In 2022, 35% of exported electric cars came from China, compared with 25% in 2021. Europe is China's largest trade partner for both electric cars and their batteries. In 2022, the share of electric cars manufactured in China and sold in the European market increased to 16%, up from about 11% in 2021.

EV supply chains are increasingly at the forefront of EV-related policy-making to build resilience through diversification. The Net Zero Industry Act, proposed by the European Union in March 2023, aims for nearly 90% of the European Union's annual battery demand to be met by EU battery manufacturers, with a manufacturing capacity of at least 550 GWh in 2030. Similarly, India aims to boost domestic manufacturing of electric vehicles and batteries through Production Linked Incentive (PLI) schemes. In the United States, the Inflation Reduction Act emphasises the strengthening of domestic supply chains for EVs, EV batteries and battery minerals, laid out in the criteria to qualify for clean vehicle tax credits. As a result, between August 2022 and March 2023, major EV and battery makers announced cumulative post-IRA investments of at least USD 52 billion in North American EV supply chains – of which 50% is for battery manufacturing, and about 20% each for battery components and EV manufacturing.

Trends and developments in EV markets

Electric light-duty vehicles

Electric car sales continue to increase, led by China

Electric car sales [1] saw another record year in 2022, despite supply chain disruptions, macro-economic and geopolitical uncertainty, and high commodity and energy prices. The growth in electric car sales took place in the context of globally contracting car markets: total car sales in 2022 dipped by 3% relative to 2021. Electric car sales – including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) – exceeded 10 million last year, up 55% relative to 2021.[2] This figure – 10 million EV sales worldwide – exceeds the total number of cars sold across the entire European Union (about 9.5 million vehicles) and is nearly half of the total number of cars sold in China in 2022. In the course of just five years, from 2017 to 2022, EV sales jumped from around 1 million to more than 10 million. It previously took five years from 2012 to 2017 for EV sales to grow from 100 000 to 1 million, underscoring the exponential nature of EV sales growth. The share of electric cars in total car sales jumped from 9% in 2021 to 14% in 2022, more than 10 times their share in 2017.

Over 26 million electric cars were on the road in 2022, up 60% relative to 2021 and more than 5 times the stock in 2018

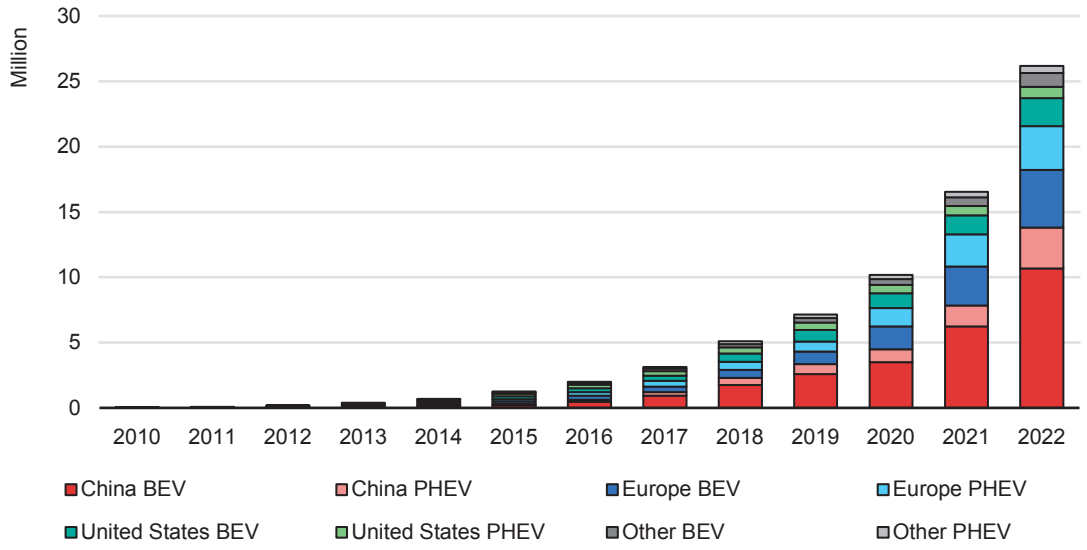
Increasing sales pushed the total number of electric cars on the world's roads to 26 million, up 60% relative to 2021, with BEVs accounting for over 70% of total annual growth, as in previous years. As a result, about 70% of the global stock of electric cars in 2022 were BEVs. The increase in sales from 2021 to 2022 was just as high as from 2020 to 2021 in absolute terms – up 3.5 million – but relative growth was lower (sales doubled from 2020 to 2021). The exceptional boom in 2021 may be explained by EV markets catching up in the wake of the coronavirus

[1] The term sales, as used in this report, represents an estimate of the number of new vehicles hitting the roads. Where possible, data on new vehicle registrations is used. In some cases, however, only data on retail sales (such as sales from a dealership) are available. See Box 1.2 for further details. The term car is used to represent passenger light-duty vehicles and includes cars of different sizes, sports utility-vehicles and light trucks.

[2] Unless otherwise specified, the term electric vehicle is used to refer to both battery electric and plug-in hybrid electric vehicles but does not include fuel cell electric vehicles. For a brief description of the trends related to fuel cell electric vehicles, see Box 1.3.

(Covid-19) pandemic. Seen in comparison to recent years, the annual growth rate for electric car sales in 2022 was similar to the average rate over 2015-2018, and the annual growth rate for the global stock of electric cars in 2022 was similar to that of 2021 and over the 2015-2018 period, showing a robust recovery of EV market expansion to pre-pandemic pace.

Figure 1.1 Global electric car stock in selected regions, 2010-2022



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle. Electric car stock in this figure refers to passenger light-duty vehicles. In "Europe", European Union countries, Norway, and the United Kingdom account for over 95% of the EV stock in 2022; the total also includes Iceland, Israel, Switzerland and Türkiye. Main markets in "Other" include Australia, Brazil, Canada, Chile, Mexico, India, Indonesia, Japan, Malaysia, New Zealand, South Africa, Korea and Thailand.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source: IEA analysis based on country submissions, ACEA, EAFO, EV Volumes and Marklines.

Over 26 million electric cars were on the road in 2022, up 60% relative to 2021 and more than five times the stock in 2018.

Half of the world's electric cars are in China

The increase in electric car sales varied across regions and powertrains, but remains dominated by the People's Republic of China (hereafter "China"). In 2022, BEV sales in China increased by 60% relative to 2021 to reach 4.4 million, and PHEV sales nearly tripled to 1.5 million. The faster growth in PHEV sales relative to BEVs warrants further examination in the coming years, as PHEV sales still remain lower overall and could be catching up on the post-Covid-19 boom only now; BEV sales in China tripled from 2020 to 2021 after moderate growth over 2018-2020. Electric car sales increased even while total car sales dipped by 3% in 2022 relative to 2021.

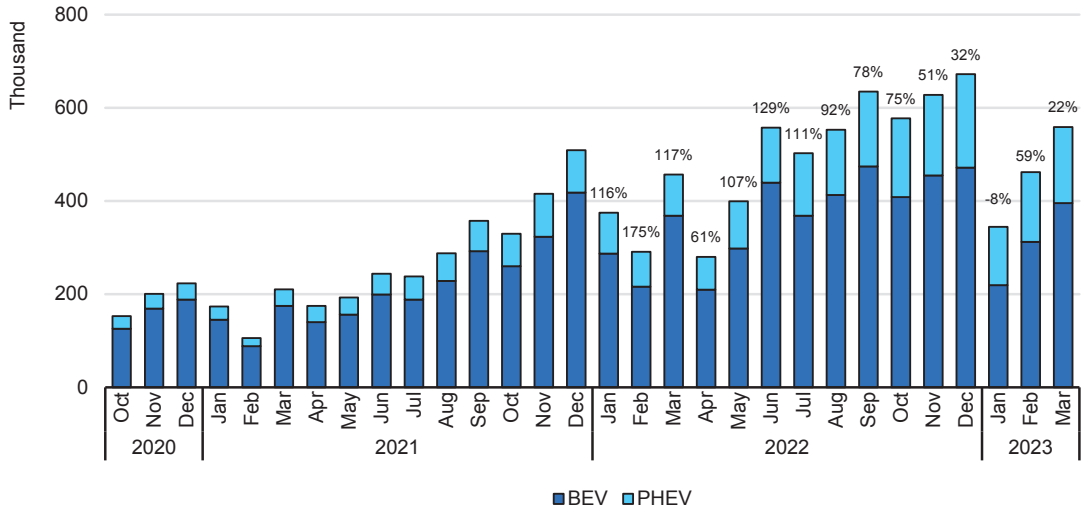
China accounted for nearly 60% of all new electric car registrations globally. For the first time in 2022, China accounted for more than 50% of all the electric cars on the world's roads, a total of 13.8 million. This strong growth results from more than a decade of sustained policy support for early adopters, including an extension of purchase incentives initially planned for phase-out in 2020 to the end of 2022 due to Covid-19, in addition to non-financial support such as rapid roll-out of charging infrastructure and stringent registration policies for non-electric cars.

In 2022, the share of electric cars in total domestic car sales reached 29% in China, up from 16% in 2021 and under 6% between 2018 and 2020. China has therefore achieved its 2025 national target of a 20% sales share for so-called new energy vehicles (NEVs)[3] well in advance. All indicators point to further growth: although the national NEV sales target is yet to be updated by China's Ministry of Industry and Information Technology (MIIT), which is responsible for the automotive industry, the objective of greater road transport electrification is re-affirmed in multiple strategy documents. China aims to reach a 50% sales share by 2030 in so-called "key air pollution control regions", and 40% across the country by 2030 to support the national action plan for carbon peaking. If recent market trends continue, China's 2030 targets may also be reached ahead of time. Provincial governments are also supporting adoption of NEVs, with 18 provinces to date having set NEV targets.

Support at the regional level in China has also helped to advance some of the world's largest EV makers. Shenzhen-based BYD has supplied most of the city's electric buses and taxis, and its leading position is also reflected in Shenzhen's ambition of reaching a 60% NEV sales share by 2025. Guangzhou, which has a 50% NEV sales share by 2025 target, facilitated the expansion of Xpeng Motors to become one of the national EV frontrunners.

[3] NEVs (China) include BEVs, PHEVs and fuel cell electric vehicles.

Figure 1.2 Monthly new electric car registrations in China, 2020-2023



Note: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle. Percentage labels in 2022-2023 refer to year-on-year growth rates relative to the same month in the previous year.
Source: IEA analysis based on EV Volumes.

Electric car sales in China have been steadily increasing since 2020, but future trends will warrant further examination given that purchase incentives ended in 2022.

Whether China's electric car sales share will remain significantly above the 20% target in 2023 remains uncertain, as sales may have been especially high in anticipation of incentives being phased out at the end of 2022. Sales in January 2023 plunged, and while this is in part due to the timing of the Chinese New Year, they were nearly 10% lower than sales in January 2022. However, electric car sales caught up in February and March 2023, standing nearly 60% above sales in February 2022 and more than 25% above sales in March 2022, thereby bringing sales in the first quarter of 2023 more than 20% higher than in the first quarter of 2022.

Growth remained steady in Europe despite disruptions

In Europe,[4] electric car sales increased by more than 15% in 2022 relative to 2021 to reach 2.7 million. Sales grew more quickly in previous years: annual growth stood at more than 65% in 2021 and averaged 40% over 2017-2019. In 2022, BEV sales rose by 30% relative to 2021 (compared to 65% growth in 2021 relative to 2020) while PHEV sales dipped by around 3%. Europe accounted for 10% of global growth in new electric car sales. Despite slower growth in 2022, electric car

[4] Europe includes European Union countries, Iceland, Israel, Norway, Switzerland, Türkiye, and the United Kingdom.

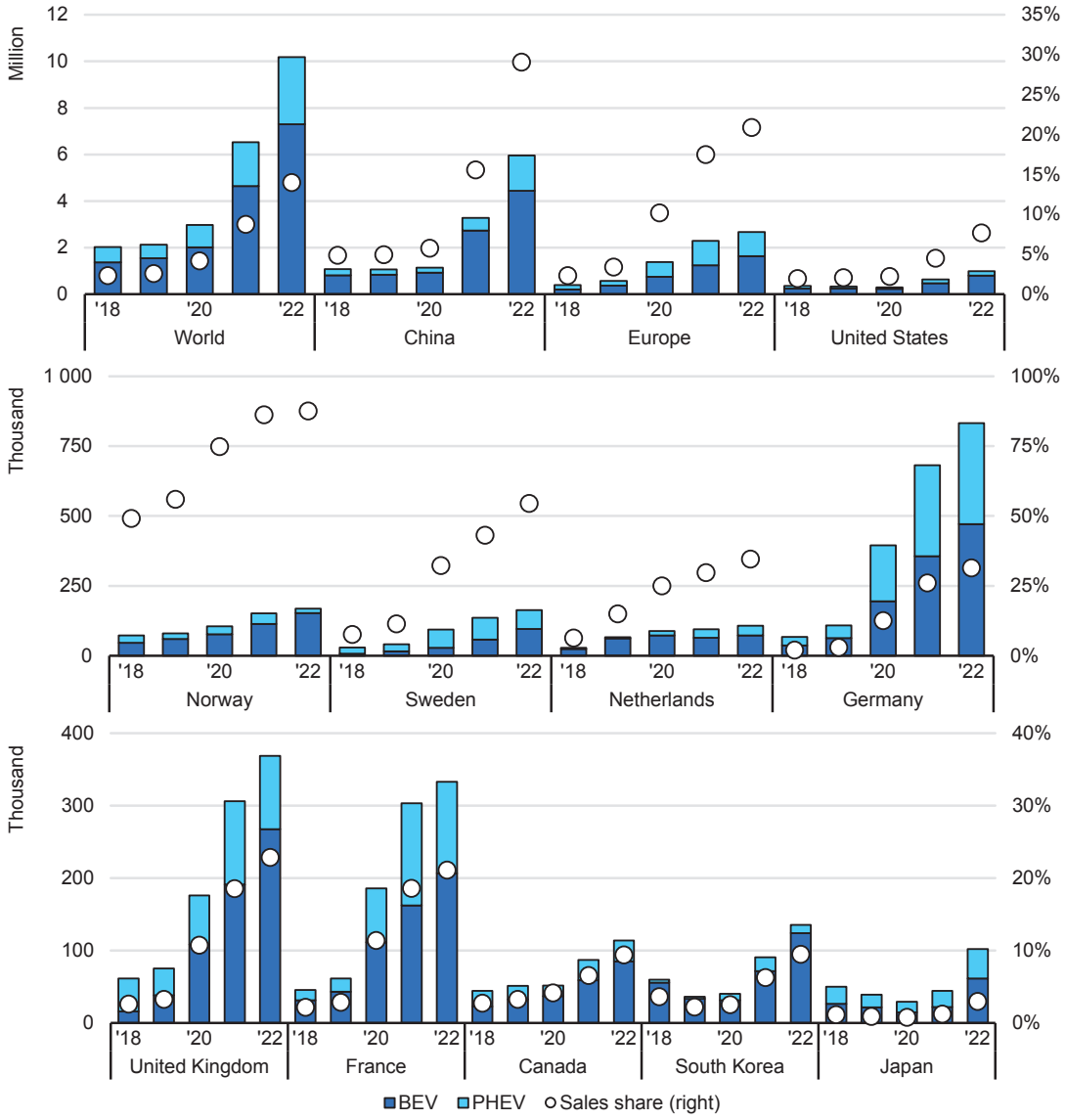
sales are still increasing in Europe in the context of continued contraction in car markets: total car sales in Europe dipped by 3% in 2022 relative to 2021.

The slowdown seen in Europe relative to previous years was, in part, a reflection of the exceptional growth in electric car sales that took place in 2020 and 2021 in the European Union, as manufacturers quickly adjusted corporate strategy to comply with the CO_2 emission standards passed in 2019. These standards covered the 2020-2024 period, with EU-wide emission targets becoming stricter only from 2025 and 2030 onwards.

High energy prices in 2022 had a mixed impact on the competitiveness of EVs relative to internal combustion engine (ICE) cars. Gasoline and diesel prices for ICE cars spiked, but residential electricity tariffs (with relevance for charging) also increased in some cases. Higher electricity and gas prices also increased manufacturing costs for both ICE and EV cars, with some carmakers arguing that high energy prices could restrict future investment for new battery manufacturing capacity.

Europe remained the world's second largest market for electric cars after China in 2022, accounting for 25% of all electric car sales and 30% of the global stock. The sales share of electric cars reached 21%, up from 18% in 2021, 10% in 2020 and under 3% prior to 2019. European countries continued to rank highly for the sales share of electric cars, led by Norway at 88%, Sweden at 54%, the Netherlands at 35%, Germany at 31%, the United Kingdom at 23% and France at 21% in 2022. In volume terms, Germany is the biggest market in Europe with sales of 830 000 in 2022, followed by the United Kingdom with 370 000 and France with 330 000. Sales also exceeded 80 000 in Spain. The share of electric cars in total car sales has increased tenfold in Germany since before the Covid-19 pandemic, which can in part be explained by increasing support post-pandemic, such as purchase incentives through the Umweltbonus, and a frontloading of sales in 2022 in expectation of subsidies being further reduced from 2023 onwards. However, in Italy, electric car sales decreased from 140 000 in 2021 to 115 000 in 2022, and they also decreased or stagnated in Austria, Denmark and Finland.

Figure 1.3 Electric car registrations and sales share in selected countries and regions, 2018-2022



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle. Passenger light-duty vehicles only. Major markets at the top. Other countries (middle, bottom) ordered by the share of electric car sales in total car sales. Y-axes do not have the same scale to improve readability.

Source: IEA analysis based on country submissions, ACEA, EAFO, EV Volumes and Marklines.

Electric car sales exceeded 10 million in 2022, up 55% relative to 2021. Sales in China increased by 80% and accounted for 60% of global growth. Growth in Europe remained high (up 15%) and accelerated in the United States (up 55%).

Sales are expected to continue increasing in Europe, especially following recent policy developments under the 'Fit for 55' package. New rules set stricter CO_2 emission standards for 2030-2034 and target a 100% reduction in CO_2 emissions for new cars and vans from 2035 relative to 2021 levels. In the nearer term, an

incentive mechanism operating between 2025 and 2029 will reward manufacturers that achieve a 25% car sales share of zero- and low-emission cars (17% for vans). In the first two months of 2023, battery electric car sales were already up by over 30% year-on-year, while overall car sales increased by just over 10% year-on-year.

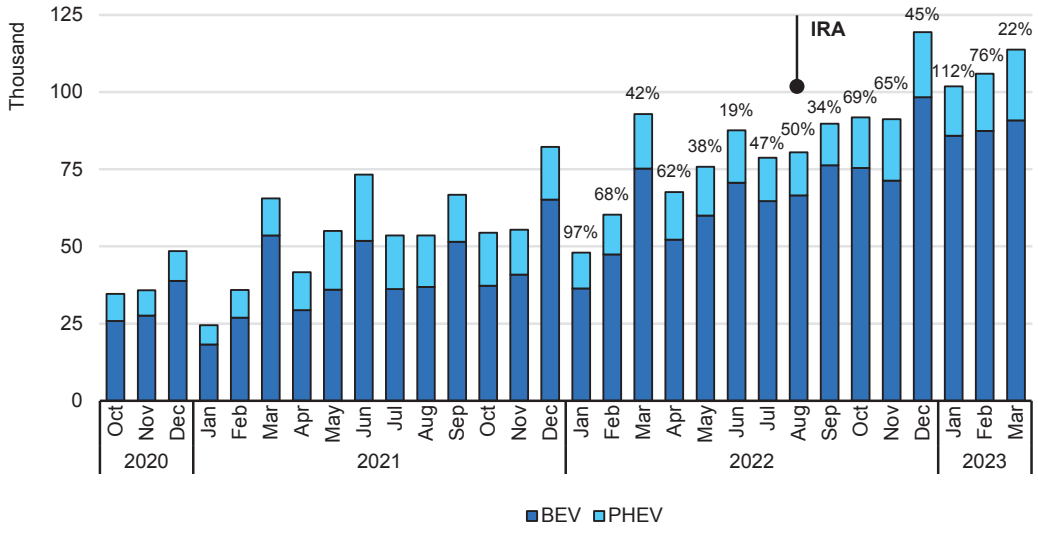
The United States confirms return to growth

In the United States, electric car sales increased 55% in 2022 relative to 2021, led by BEVs. Sales of BEVs increased by 70%, reaching nearly 800 000 and confirming a second consecutive year of strong growth after the 2019-2020 dip. Sales of PHEVs also grew, albeit by only 15%. The increase in electric car sales was particularly high in the United States, considering that total car sales dropped by 8% in 2022 relative to 2021, a much sharper decrease than the global average (minus 3%). Overall, the United States accounted for 10% of the global growth in sales. The total stock of electric cars reached 3 million, up 40% relative to 2021 and accounting for 10% of the global total. The share of electric cars in total car sales reached nearly 8%, up from just above 5% in 2021 and around 2% between 2018 and 2020.

A number of factors are helping to increase sales in the United States. A greater number of available models, beyond those offered by Tesla, the historic leader, helped to close the supply gap. Given that major companies like Tesla and General Motors had already reached their subsidy cap under US support in previous years,[5] new models from other companies being available means that more consumers can benefit from purchase incentives, which can be as high as USD 7 500. Awareness is increasing as government and companies lean towards electrification: in 2022, a quarter of Americans expect that their next car will be electric, according to the American Automobile Association. Although charging infrastructure and driving range have improved over the years, they remain major concerns for US drivers given the typically long travel distances and lower popularity and limited availability of alternatives such as rail. However, in 2021 the Bipartisan Infrastructure Law strengthened support for EV charging, allocating USD 5 billion in total funding over the 2022-2026 period through the National Electric Vehicle Infrastructure Formula Program, as well as USD 2.5 billion in competitive grants over the same period through the Charging and Fueling Infrastructure Discretionary Grant Program.

[5] Manufacturer caps were still in place for sales taking place in 2022, with models by carmakers having sold over 200 000 EVs losing eligibility for the purchase incentive, even if they were manufactured in North America following requirements under the IRA. Caps were removed starting from 2023.

Figure 1.4 Monthly new electric car registrations in the United States, 2020-2023



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle; "IRA" refers to the Inflation Reduction Act. Percentage labels in 2022-2023 refer to year-on-year growth rates relative to the same month in the previous year.
Source: IEA analysis based on EV Volumes.

Monthly sales of electric cars have been steadily increasing in the United States, with further growth expected in 2023 as a result of strengthened policy support.

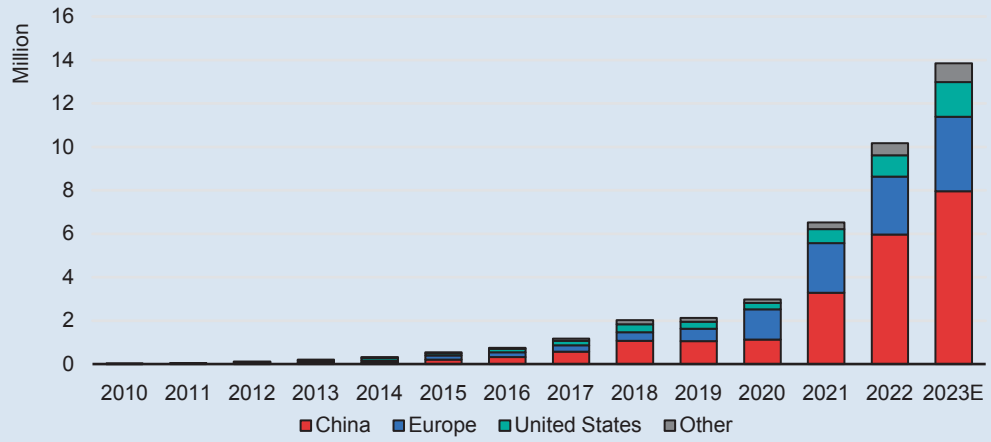
The acceleration in sales growth could continue in 2023 and beyond thanks to recent new policy support (see Prospects for electric vehicle deployment). The Inflation Reduction Act (IRA) has triggered a rush by global electromobility companies to expand US manufacturing operations. Between August 2022 and March 2023, major EV and battery makers announced cumulative post-IRA investments of USD 52 billion in North American EV supply chains, of which 50% is for battery manufacturing, and about 20% each for battery components and EV manufacturing. Overall, company announcements including tentative commitments for US investments for future battery and EV production add up to around USD 75-108 billion. As an example, Tesla plans to relocate its Berlin-based lithium-ion battery gigafactory to Texas, where it will work in partnership with China's CATL, and to manufacture next-generation EVs in Mexico. Ford also announced a deal with CATL for a battery plant in Michigan, and plans to increase electric car manufacturing sixfold by the end of 2023 relative to 2022, at 600 000 vehicles per year, scaling up to 2 million by 2026. BMW is seeking to expand EV manufacturing at its plant in South Carolina following the IRA. Volkswagen chose Canada for its first battery plant outside Europe, which will begin operations in 2027, and is also investing USD 2 billion in its plant in South Carolina. While these investments can be expected to lead to high growth in the years to come, the impact may only fully be seen from 2024 onwards as plants come online.

In the immediate term, the IRA has constrained eligibility requirements for purchase incentives, as vehicles need to be produced in North America in order to qualify for a subsidy. However, electric car sales have remained strong since August 2022 (Figure 1.4), and the first months of 2023 have been no exception: In the first quarter of 2023, electric car sales increased 60% compared to the same period in 2022, potentially boosted by the January 2023 removal of the subsidy caps for manufacturers, which means models by market leaders can now benefit from purchase incentives. In the longer-term, the list of models eligible for subsidies is expected to expand.

Box 1.1 The 2023 outlook for electric cars is bright

Early indications from first quarter sales of 2023 point to an upbeat market, supported by cost declines as well as strengthened policy support in key markets such as the United States. Globally, our current estimate is therefore for nearly 14 million electric cars to be sold in 2023, building on the more than 2.3 million already sold in the first quarter of the year. This represents a 35% increase in electric car sales in 2023 compared to 2022 and would bring the global electric sales share to around 18%, up from 14% in 2022.

Electric car sales, 2010-2023



Note: 2023 sales ("2023E") are estimated based on market trends through the first quarter of 2023.
Source: IEA analysis based on EV Volumes.

Electric car sales in the first three months of 2023 have shown strong signs of growth compared to the same period in 2022. In the United States, more than 320 000 electric cars were sold in the first quarter of 2023, 60% more than over the same period in 2022. Our current expectation is for this growth to be sustained throughout the year, with electric car sales reaching over 1.5 million in 2023, bringing the electric car sales share in the United States up to around 12% in 2023.

In China, electric car sales were off to a rough start in 2023, with January sales being 8% lower than in January 2022. The latest available data suggests a quick recovery: over the entire first quarter of 2023, electric car sales in China were more than 20% higher than in the first quarter of 2022, with more than 1.3 million electric cars being registered. For the remainder of 2023, we expect the generally favourable cost structure of electric cars to outweigh the effects of the phase-out of the NEV subsidy. As a result, our current expectation is for electric car sales in China to be more than 30% higher than in 2022 and reach around 8 million by the end of 2023, reaching a sales share of over 35% (from 29% in 2022).

Based on recent trends and tightening CO_2 targets not going into effect until 2025, the growth of electric car sales in Europe is expected to be the lowest of the three largest markets. In the first quarter of 2023, electric car sales in Europe increased by around 10% compared to the same period in 2022. For the full year, we currently expect electric car sales to increase by over 25%, with one-in-four cars sold in Europe being electric.

Outside of the major EV markets, electric car sales are expected to reach around 900 000 in 2023 – 50% higher than in 2022. Electric car sales in India in the first quarter of 2023 are already double what they were in the same period in 2022. In India and across all regions outside the three major EV markets, electric car sales are expected to represent 2-3% of car sales in 2023, a relatively small yet growing share.

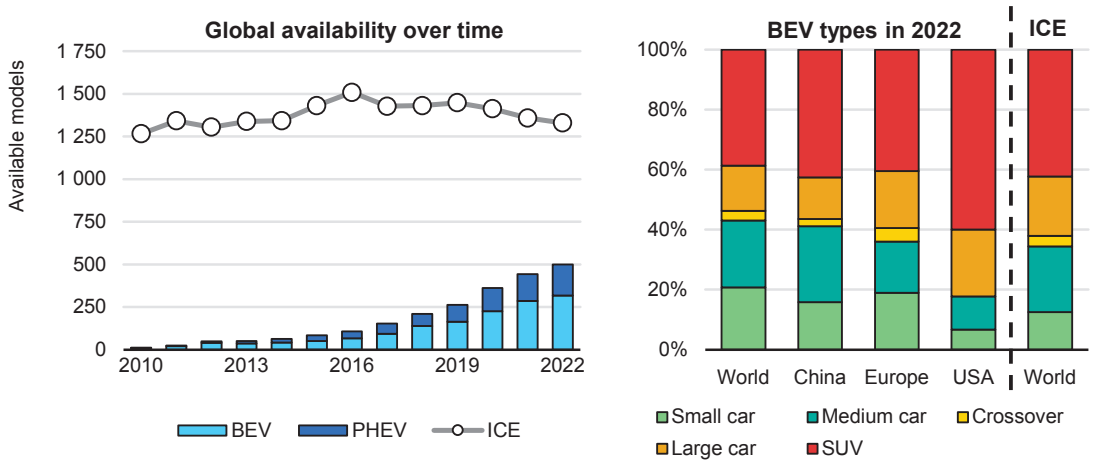
There are, of course, downside risks to the 2023 outlook: a sluggish global economy and the phase-out of subsidies for NEVs in China could reduce 2023 growth in global electric car sales. On the upside, new markets may open up more quickly than anticipated, as persistent high oil prices make the case for EVs stronger in an increasing number of settings. And new policy developments, such as the April 2023 proposal from the US Environmental Protection Agency (EPA) to strengthen GHG emissions standards for cars, may send signals that boost sales even before going into effect.

The number of electric car models rises, especially for large cars and SUVs, at the same time as it decreases for conventional cars

The race to electrification is increasing the number of electric car models available on the market. In 2022, the number of available options reached 500, up from below 450 in 2021 and more than doubling relative to 2018-2019. As in previous years, China has the broadest portfolio with nearly 300 available models, double the number available in 2018-2019, prior to the Covid-19 pandemic. This remains nearly twice as many as in Norway, the Netherlands, Germany, Sweden, France and the United Kingdom, which all have around 150 models available, more than

three times as many as before the pandemic. In the United States, there were fewer than 100 models available in 2022, but twice as many as before the pandemic; and 30 or fewer were available in Canada, Japan and Korea.

Figure 1.5 Car model availability by powertrain, 2010-2022 (left), and breakdown of available cars by powertrain and segment in 2022 (right)



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid vehicle; ICE = internal combustion engine; SUV = sports utility vehicle; USA = United States. Analysis based on models for which there was at least one new registration in a given year; a model on sale but never sold is not counted, and as such actual model availability may be underestimated. In the chart on the right-hand side, distribution is based on the number of available models, not sales-weighted. Small cars include A and B segments. Medium cars include C and D segments. Crossovers are a type of sports utility vehicle (SUV) built on a passenger car platform. Large cars include E and F segments and multi-purpose vehicles.

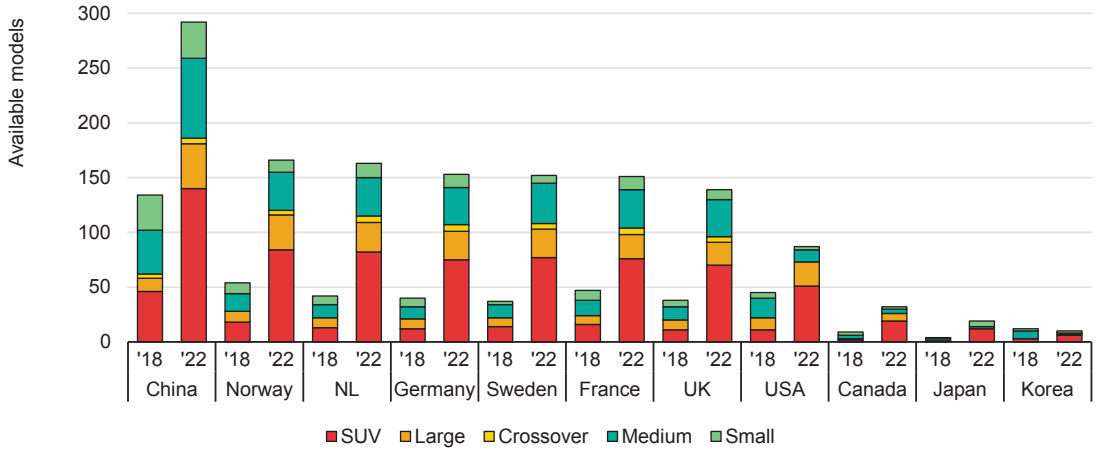
Source: IEA analysis based on Marklines.

The number of available electric car models reached 500 in 2022 but remains far below the number of ICE options. Large cars and SUVs still account for over half of available BEVs.

The 2022 trend reflects the increasing maturity of EV markets and demonstrates that carmakers are responding to increasing consumer demand for electric cars. However, the number of electric car models available remains much lower than that of conventional ICE cars, which has remained above 1 250 since 2010 and peaked at 1 500 in the middle of the past decade. In recent years, the number of ICE models sold has been steadily decreasing, at a compound annual growth rate of minus 2% over the 2016-2022 period, reaching about 1 300 models in 2022. This dip varies across major car markets and is most pronounced in China, where the number of available ICE options was 8% lower in 2022 than in 2016, versus 3-4% lower in the United States and Europe over the same period. This could result from contracting car markets and a progressive shift towards EVs among major carmakers. Looking forward, the total number of ICE models available could remain stable, while the number of new models shrinks, if carmakers focus on electrification and keep selling existing ICE options rather than increasing budgets to develop new models.

In contrast to ICE models, EV model availability has been growing quickly, at a compound annual growth rate of 30% over the 2016-2022 period. Such growth is to be expected in a nascent market with a large number of new entrants bringing innovative products to the market, and as incumbents diversify their portfolios. Growth has been slightly lower in recent years: the annual growth rate stood at around 25% in 2021 and 15% in 2022. In the future, the number of models can be expected to continue to increase quickly, as major carmakers expand their EV portfolios and new entrants strengthen their positions, particularly in emerging markets and developing economies (EMDEs). The historic number of ICE models available on the market suggests that the current number of EV options could double, at least, before stabilising.

Figure 1.6 Electric car model availability in selected countries by size, 2018-2022



Notes: NL = the Netherlands; UK = United Kingdom; USA = United States; SUV = sports utility vehicle. Includes battery electric vehicles and plug-in hybrid electric vehicles. Countries are ordered by the number of available models in 2022. Analysis based on models for which there was at least one new registration in a given year; a model on sale but never sold is not counted, and as such actual model availability may be underestimated.

Source: IEA analysis based on Marklines.

In 2022, 7 countries had around 150 EV models or more available for sale, up from 50 in 2018. The number of large models is increasing more quickly than that of small models.

SUVs and large car models dominate both EV and ICE markets

A major concern for global car markets – both EV and ICE – is the overwhelming dominance of SUVs and large models among available options. Carmakers are able to generate higher revenues from such models, given higher profit margins, which can cover some of the investments made in developing electric options. In certain cases, such as in the United States, larger vehicles can also benefit from less stringent fuel economy standards, hence creating an incentive for carmakers to slightly increase the vehicle size of a car for it to qualify as a light truck.

However, large models are more expensive, which poses significant affordability issues across the board, and all the more so in EMDEs. Large models also have

implications for sustainability and supply chains, being equipped with larger batteries that require more critical minerals. In 2022, the sales-weighted average battery size of small battery electric cars ranged from 25 kWh in China to 35 kWh across France, Germany and the United Kingdom, and about 60 kWh in the United States. In comparison, the average for battery electric SUVs was around 70-75 kWh in these countries, and within the 75-90 kWh range for large car models.

Transitioning from ICE to electric is a priority for achieving net zero emissions targets, regardless of vehicle size, but mitigating the impacts of higher battery sizes will also be important. In France, Germany and the United Kingdom in 2022, the sales-weighted average weight of a battery electric SUV was 1.5 times higher than the average small battery electric car, requiring greater amounts of steel, aluminium and plastic; the battery in the SUV was twice as large, requiring about 75% more critical minerals. The CO_2 emissions associated with materials processing, manufacturing and assembly can be estimated at more than 70% higher as a result.

At the same time, in 2022, electric SUVs resulted in the displacement of over 150 000 barrels per day of oil consumption and avoided the associated tailpipe emissions that would have been generated through burning the fuel in combustion engines. Although electric SUVs represented roughly 35% of all electric passenger light-duty vehicles (PLDVs) in 2022, their share of oil displacement was even higher (about 40%), as SUVs tend to be driven more than smaller cars. Of course, smaller vehicles generally require less energy to operate and less materials to build, but electric SUVs certainly remain favourable to ICE vehicles.

In 2022, ICE SUVs emitted more than 1 Gt CO_2, far greater than the 80 Mt net emissions reductions from the electric vehicle fleet that year. While total car sales decreased by 0.5% in 2022, SUV sales increased by 3% relative to 2021, accounting for about 45% of total car sales, with noticeable growth in the United States, India and Europe. Of the 1 300 available options for ICE cars in 2022, more than 40% were SUVs, compared to fewer than 35% for small and medium cars. The total number of available ICE options went down from 2016 to 2022, but the drop was only for small and medium cars (down 35%) while large cars and SUVs increased (up 10%).

Similar trends are observed in EV markets. Around 16% of all SUVs sold were electric in 2022, which is above the overall market share of EVs and demonstrates consumer preferences for SUVs regardless of whether they are an ICE vehicle or EV. Nearly 40% of all BEV models available in 2022 were SUVs, which is equivalent to the shares of small and medium car options combined. Other large models accounted for more than 15%. Just 3 years before, in 2019, small and medium models accounted for 60% of all available models, and SUVs just 30%.

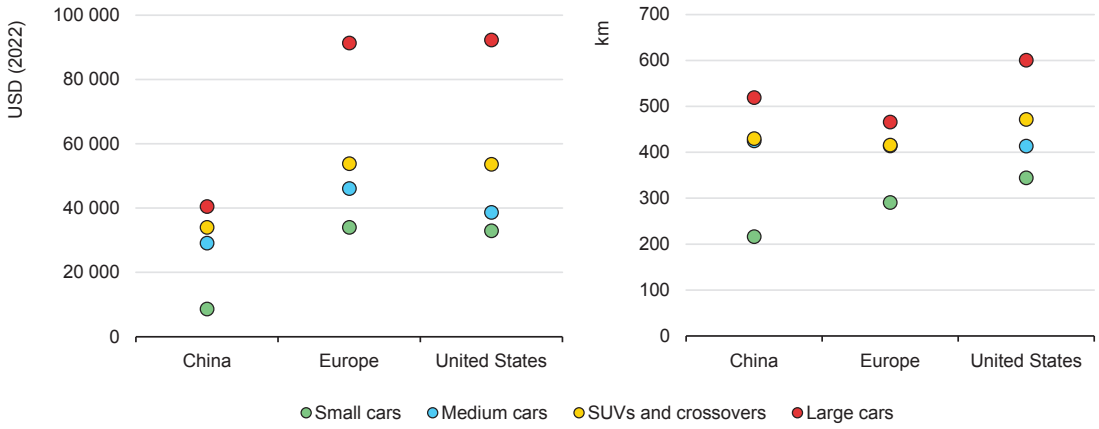
In China and Europe, SUVs and large models accounted for 60% of available BEV options in 2022, on par with the world average. As a comparison, ICE SUVs and large models accounted for about 70% of available ICE options in these regions,

suggesting that electric cars currently remain somewhat smaller than their ICE equivalents. Announcements by some major European carmakers indicate that there could be a greater focus on smaller, more popular models in the years to come. For example, Volkswagen has announced the launch of a compact model for the European market under EUR 25 000 by 2025 and under EUR 20 000 by 2026-2027, as a means to appeal to a broader consumer base. In the United States, over 80% of available BEV options in 2022 were SUVs or large car models, which is greater than the share of ICE SUVs or large models at 70%. Looking ahead, more electric SUVs are to be expected in the United States, should recent policy announcements on expansion of IRA incentives to more SUVs be implemented. Following the IRA, the US Treasury has been revising vehicle classifications, and in 2023 changed the eligibility criteria for clean vehicle credits relevant to smaller SUVs, which are now eligible if priced under USD 80 000, up from the previous limit of USD 55 000.

Electric cars remain much cheaper in China

The growth in electric car sales in China has been underpinned by sustained policy support, but also cheaper retail prices. In 2022, the sales-weighted average price of a small BEV in China was below USD 10 000. This is significantly less than the prices of small BEVs found in Europe and the United States, where the sales-weighted average price exceeded USD 30 000 in the same year.

Figure 1.7 Sales-weighted average retail price (left) and driving range (right) of BEV passenger cars in selected countries, by size, in 2022



Notes: BEV = battery electric vehicle; SUV = sports utility vehicle. 'Europe' is based on data only from France, Germany and the United Kingdom. Retail prices collected in 2022-2023, before subsidy.

Source: IEA analysis based on EV Volumes.

In 2022, BEV passenger cars remained much cheaper in China, which explains in part higher adoption rates there.

In China, the best-selling electric cars in 2022 were the Wuling Mini BEV, a small model priced at under USD 6 500, and BYD's Dolphin, another small model, below USD 16 000. Together, these two models accounted for nearly 15% of Chinese BEV passenger car sales, illustrating the appetite for smaller models. To compare, the best-selling small BEVs across France, Germany and the United Kingdom – Fiat's 500, Peugeot's e-208 and Renault's Zoe – were all priced above USD 35 000. Few small BEVs were sold in the United States, limited mainly to Chevrolet's Bolt and the Mini Cooper BEV, which are priced around USD 30 000. Tesla's Y Model was the best-selling BEV passenger car in both the selected European countries (priced at more than USD 65 000) and the United States (more than USD 50 000).[6]

Chinese carmakers have focused on developing smaller and more affordable models in advance of their international peers, cutting down costs following years of tough competition domestically. Hundreds of small EV manufacturers have entered the market since the 2000s, benefitting from a variety of public support schemes, including subsidies and incentives for both consumers and manufacturers. The majority of these firms went bankrupt due to competition as subsidies were gradually phased out, and the market has since consolidated around a dozen frontrunners, which have succeeded in developing small and cheap electric cars for the Chinese market. Vertical integration of battery and EV supply chains from mineral processing to battery and EV manufacturing, as well as cheaper labour, manufacturing and access to finance across the board, have also contributed to developing cheaper models.

Meanwhile, carmakers in Europe and the United States – both early developers such as Tesla and incumbent major manufacturers – have mostly focused on larger or more luxurious models to date, hence offering few options affordable for mass-market consumers. However, the small options available in these countries typically offer greater performance than those in China, such as longer driving range. In 2022, the sales-weighted average range of small BEVs sold in the United States was nearly 350 km, while in France, Germany and the United Kingdom it was just under 300 km, compared to under 220 km in China. For other segments, the differences are less significant. The broader availability of public charging points in China may, in part, explain why consumers there have been more willing to opt for lower driving ranges than their European or American counterparts.

In 2022, Tesla heavily reduced the price of its models on two occasions as competition increased, and many carmakers have also announced cheaper options in the coming years. While these announcements warrant further examination, this trend could indicate that the price gap between small electric cars and incumbent ICE options could progressively close during this decade.

[6] However, Tesla has decreased car prices several times since the publication of the IRA in the United States, in part to boost sales as competition gets tougher (see section on corporate strategy and finance).

Actual vehicle range depends on the loaded vehicle weight, duty cycle, aerodynamics and drivetrain efficiency, as well as environmental factors such as temperature. In addition, as no harmonised test procedure currently exists to measure electric range for medium- and heavy-duty vehicles in any of the major markets where deployment of electric trucks has begun, manufacturers can determine their own methods to declare the electric range of the commercially available and announced models. However, any standardised test procedure would need to consider complicated issues of non-motive energy consumption (e.g. heating ventilation and air conditioning in buses, cooling in refrigerated trucks), as well as the potential for buses and trucks to be used in vehicle-to-grid applications (as has been demonstrated, for instance, with electric school buses in the United States). In light of such considerations, a first regulatory step could be to mandate that electric medium- and heavy-duty vehicle makers measure and disclose the usable battery energy according to a yet-to-be-developed standardised measurement procedure.

Charging infrastructure

Public charging points are increasingly necessary to enable wider EV uptake

While most of the charging demand is currently met by home charging, publicly accessible chargers are increasingly needed in order to provide the same level of convenience and accessibility as for refuelling conventional vehicles. In dense urban areas, in particular, where access to home charging is more limited, public charging infrastructure is a key enabler for EV adoption. At the end of 2022, there were 2.7 million public charging points worldwide, more than 900 000 of which were installed in 2022, about a 55% increase on 2021 stock, and comparable to the pre-pandemic growth rate of 50% between 2015 and 2019.

Slow chargers

Globally, more than 600 000 public slow charging points[11] were installed in 2022, 360 000 of which were in China, bringing the stock of slow chargers in the country to more than 1 million. At the end of 2022, China was home to more than half of the global stock of public slow chargers.

Europe ranks second, with 460 000 total slow chargers in 2022, a 50% increase from the previous year. The Netherlands leads in Europe with 117 000, followed by around 74 000 in France and 64 000 in Germany. The stock of slow chargers

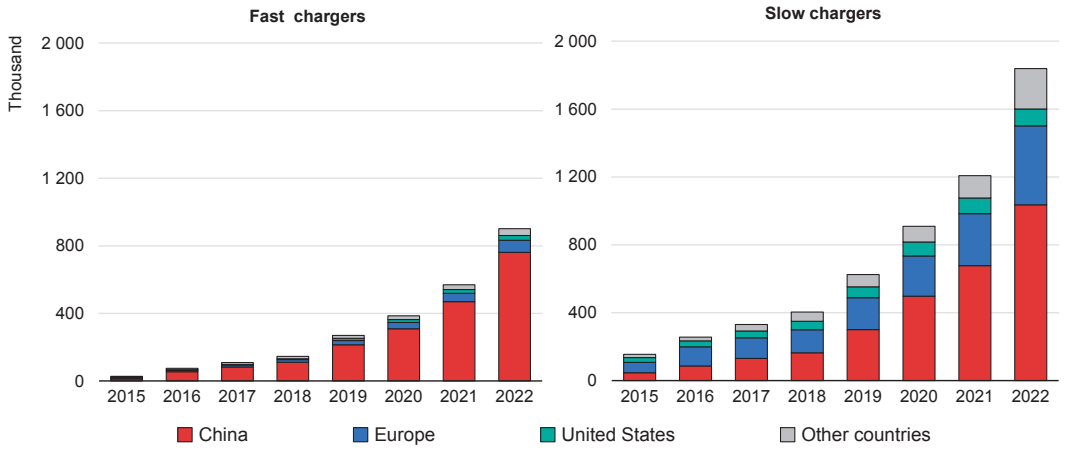
[11] Slow chargers have power ratings less than or equal to 22 kW. Fast chargers are those with a power rating of more than 22 kW and up to 350 kW. “Charging points” and “chargers” are used interchangeably and refer to the individual charging sockets, reflecting the number of EVs that can charge at the same time. ‘‘Charging stations” may have multiple charging points.

in the United States increased by 9% in 2022, the lowest growth rate among major markets. In Korea, slow charging stock has doubled year-on-year, reaching 184 000 charging points.

Fast chargers

Publicly accessible fast chargers, especially those located along motorways, enable longer journeys and can address range anxiety, a barrier to EV adoption. Like slow chargers, public fast chargers also provide charging solutions to consumers who do not have reliable access to private charging, thereby encouraging EV adoption across wider swaths of the population. The number of fast chargers increased by 330 000 globally in 2022, though again the majority (almost 90%) of the growth came from China. The deployment of fast charging compensates for the lack of access to home chargers in densely populated cities and supports China's goals for rapid EV deployment. China accounts for total of 760 000 fast chargers, but more than 70% of the total public fast charging pile stock is situated in just ten provinces.

Figure 1.13 Installed publicly accessible light-duty vehicle charging points by power rating and region, 2015-2022



Note: Values shown represent number of charging points.
Source: IEA analysis based on country submissions.

Installed publicly accessible charging points have increased by around 55%, with accelerated deployment led by China and Europe.

In Europe the overall fast charger stock numbered over 70 000 by the end of 2022, an increase of around 55% compared to 2021. The countries with the largest fast charger stock are Germany (over 12 000), France (9 700) and Norway (9 000). There is a clear ambition across the European Union to further develop the public charging infrastructure, as indicated by provisional agreement on the proposed

Alternative Fuels Infrastructure Regulation (AFIR), which will set electric charging coverage requirements across the trans-European network-transport (TEN-T).[12] An agreement between the European Investment Bank and the European Commission will make over EUR 1.5 billion available by the end of 2023 for alternative fuels infrastructure, including electric fast charging.

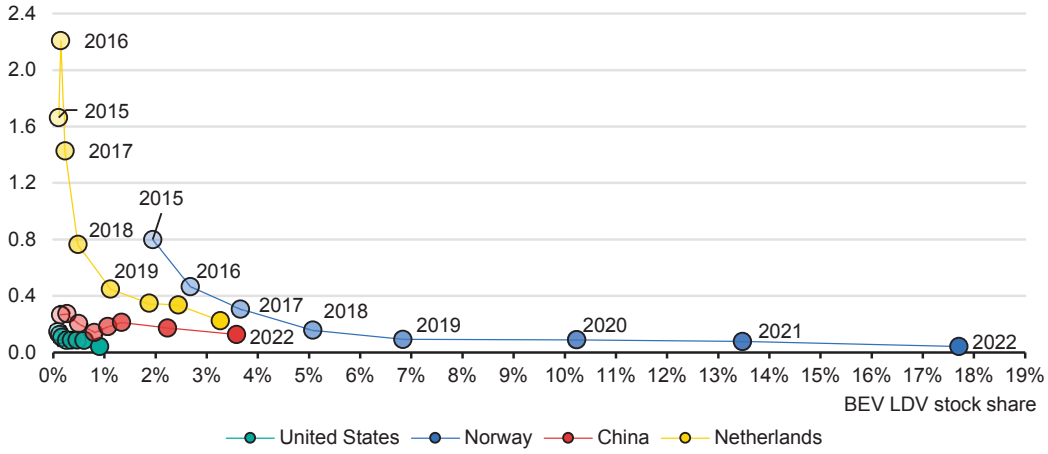
The United States installed 6 300 fast chargers in 2022, about three-quarters of which were Tesla Superchargers. The total stock of fast chargers reached 28 000 at the end of 2022. Deployment is expected to accelerate in the coming years following government approval of the National Electric Vehicle Infrastructure Formula Program (NEVI). All US states, Washington DC, and Puerto Rico are participating in the programme, and have already been allocated USD 885 million in funding for 2023 to support the build-out of chargers across 122 000 km of highway (see Policy support for EV charging infrastructure). The US Federal Highway Administration has announced new national standards for federally funded EV chargers to ensure consistency, reliability, accessibility and compatibility. As a result of the new standards, Tesla has announced it will open a portion of its US Supercharger (where Superchargers represent 60% of the total stock of fast chargers in the United States) and Destination Charger network to non-Tesla EVs.

Ratio of electric LDVs per public charger

Deployment of public charging infrastructure in anticipation of growth in EV sales is critical for widespread EV adoption. In Norway, for example, there were around 1.3 battery electric LDVs per public charging point in 2011, which supported further adoption. At the end of 2022, with over 17% of LDVs being BEVs, there were 25 BEVs per public charging point in Norway. In general, as the stock share of battery electric LDVs increases, the charging point per BEV ratio decreases. Growth in EV sales can only be sustained if charging demand is met by accessible and affordable infrastructure, either through private charging in homes or at work, or publicly accessible charging stations.

[12] Previously a directive, the proposed AFIR, once formally approved, would become a binding legislative act, stipulating, among other things, a maximum distance between chargers installed along the TEN-T, the primary and secondary roads within the European Union.

Figure 1.14 Public charging points per battery electric light-duty vehicle ratio in selected countries against battery electric light-duty vehicle stock share, 2015-2022



Notes: BEV = battery electric vehicle; LDV = light-duty vehicle. Charging points include only publicly available chargers, both fast and slow. Shading grows darker each year.

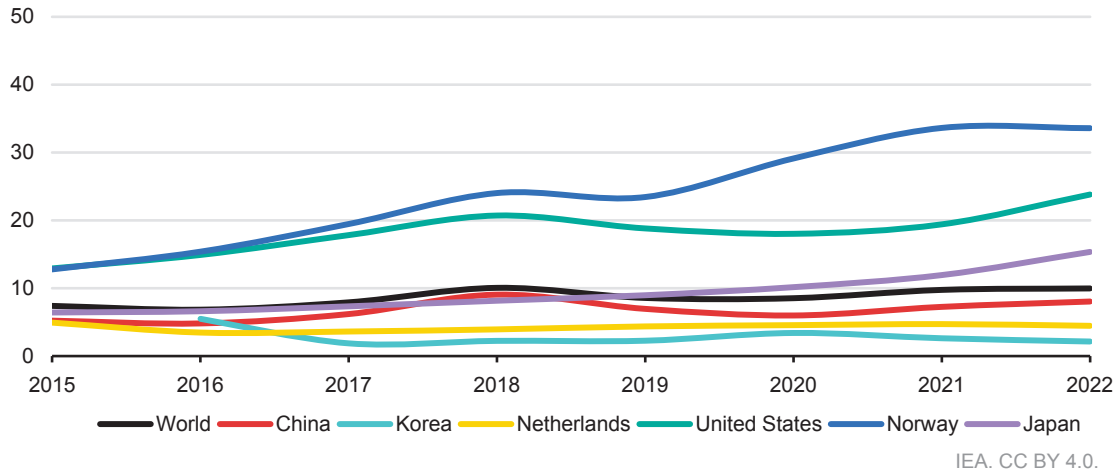
Source: IEA analysis based on country submissions.

In many advanced markets, as the stock share of battery electric LDVs increased, the charging point per BEV ratio has decreased.

While PHEVs are less reliant on public charging infrastructure than BEVs, policy-making relating to the sufficient availability of charging points should incorporate (and encourage) public PHEV charging. If the total number of electric LDVs per charging point is considered, the global average in 2022 was about ten EVs per charger. Countries such as China, Korea and the Netherlands have maintained fewer than ten EVs per charger throughout past years. In countries that rely heavily on public charging, the number of publicly accessible chargers has been expanding at a speed that largely matches EV deployment.

However, in some markets characterised by widespread availability of home charging (due to a high share of single-family homes with the opportunity to install a charger) the number of EVs per public charging point can be even higher. For example, in the United States, the ratio of EVs per charger is 24, and in Norway is more than 30. As the market penetration of EVs increases, public charging becomes increasingly important, even in these countries, to support EV adoption among drivers who do not have access to private home or workplace charging options. However, the optimal ratio of EVs per charger will differ based on local conditions and driver needs.

Figure 1.15 Electric light-duty vehicle per public charging point, 2010-2022



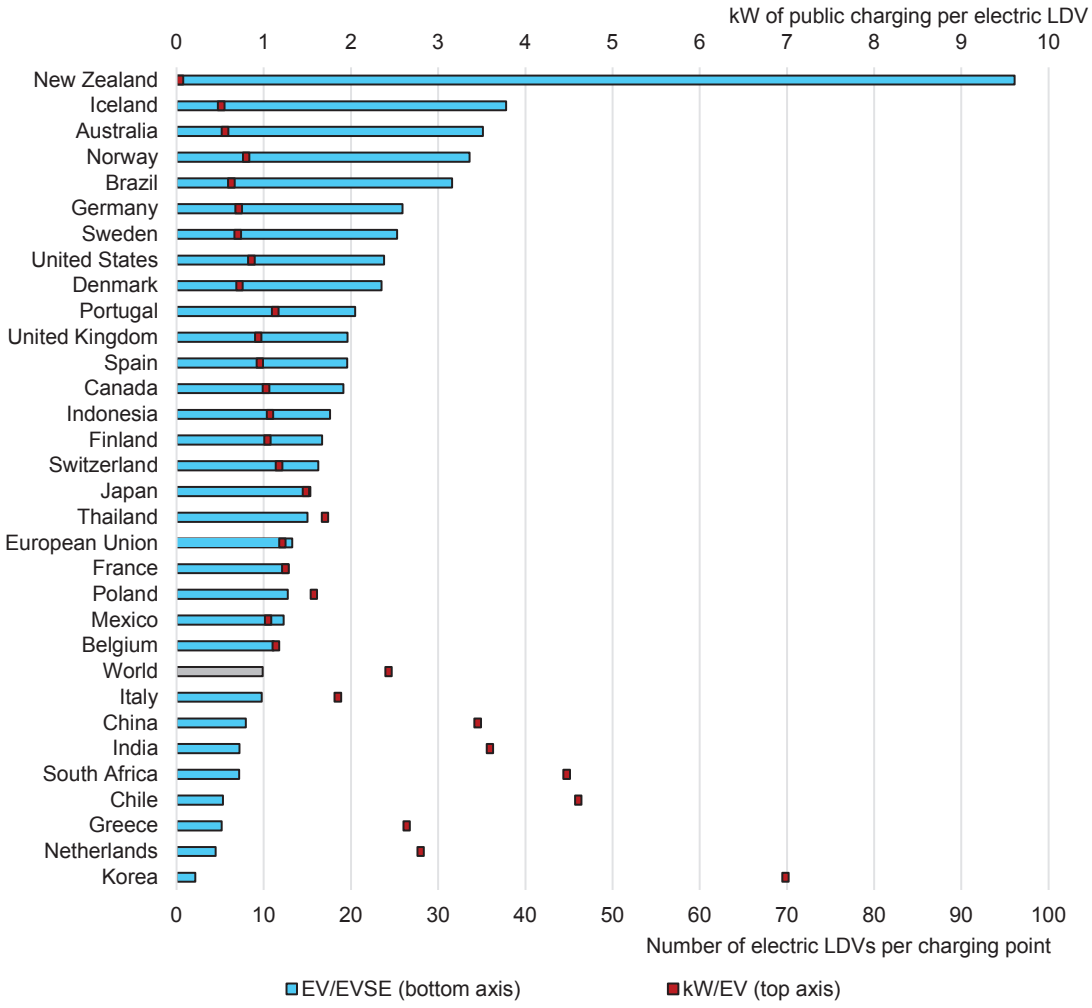
Note: Charging points include only publicly available chargers, both fast and slow.
Source: IEA analysis based on country submissions.

Countries show different speeds in public charging deployment as the number of EVs on the road increases.

Perhaps more important than the number of public chargers available is the total public charging power capacity per EV, given that fast chargers can serve more EVs than slow chargers. During the early stages of EV adoption, it makes sense for available charging power per EV to be high, assuming that charger utilisation will be relatively low until the market matures and the utilisation of infrastructure becomes more efficient. In line with this, the European Union's provisional agreement on the AFIR includes requirements for the total power capacity to be provided based on the size of the registered fleet.

Globally, the average public charging power capacity per electric LDV is around 2.4 kW per EV. In the European Union, the ratio is lower, with an average around 1.2 kW per EV. Korea has the highest ratio at 7 kW per EV, even with most public chargers (90%) being slow chargers.

Figure 1.16 Number of electric light-duty vehicles per public charging point and kW per electric light-duty vehicle, 2022



Notes: EV = electric vehicle; EVSE = electric vehicle supply equipment; LDV = light-duty vehicle. Kilowatts per EV are estimated assuming 11 kW for slow and 50 kW for fast chargers. Official national metrics might differ from these values as they can rely on more granular data.

Source: IEA analysis based on country submissions.

The number of electric light-duty vehicles per public EV charging point varies dramatically between countries, ranging from about 2 vehicles per charging point in Korea to almost 100 in New Zealand.

Charging needs for heavy-duty vehicles

In the regions where electric trucks are becoming commercially available, battery electric trucks can compete on a TCO basis with conventional diesel trucks for a growing range of operations, not only urban and regional, but also in the heavy-duty tractor-trailer regional and long-haul segments. Three parameters that determine the time at which TCO parity is reached are tolls; fuel and operations

costs (e.g. the difference between diesel and electricity prices faced by truck operators, and reduced maintenance costs); and CAPEX subsidies to reduce the gap in the upfront vehicle purchase price. Since electric trucks can provide the same operations with lower lifetime costs (including if a discounted rate is applied), the time horizon in which vehicle owners expect to recuperate upfront costs is a key factor in determining whether to purchase an electric or conventional truck.

The economics for electric trucks in long-distance applications can be substantially improved if charging costs can be reduced by maximising "off-shift" (e.g. night-time or other longer periods of downtime) slow charging, securing bulk purchase contracts with grid operators for "mid-shift" (e.g. during breaks), fast (up to 350 kW), or ultra-fast (>350 kW) charging, and exploring smart charging and vehicle-to-grid opportunities for extra income.

Electric trucks and buses will rely on off-shift charging for the majority of their energy. This will be largely achieved at private or semi-private charging depots or at public stations on highways, and often overnight. Depots to service growing demand for heavy-duty electrification will need to be developed, and in many cases may require distribution and transmission grid upgrades. Depending on vehicle range requirements, depot charging will be sufficient to cover most operations in urban bus as well as urban and regional truck operations.

The major constraint to rapid commercial adoption of electric trucks in regional and long-haul operations is the availability of "mid-shift" fast charging. Although the majority of energy requirements for these operations could come from "off-shift" charging, fast and ultra-fast charging will be needed to extend range such that operations currently covered by diesel can be performed by battery electric trucks with little to no additional dwell time (i.e. waiting). Regulations that mandate rest periods can also provide a time window for mid-shift charging if fast or ultra-fast charging options are available en route: the European Union requires 45 minutes of break after every 4.5 hours of driving; the United States mandates 30 minutes after 8 hours.

Most commercially available direct current (DC) fast charging stations currently enable power levels ranging from 250-350 kW. The European Union's Alternative Fuels Infrastructure Regulation (AFIR) aims to enable mid-shift charging across the EU's core TEN-T network, which covers 88% of total long-haul freight activity, and along other key freight corridors. The provisional agreement reached by the European Council and Parliament includes a gradual process of infrastructure deployment for electric heavy-duty vehicles starting in 2025. Recent studies of power requirements for regional and long-haul truck operations in the United States and Europe find that charging power higher than 350 kW, and as high as 1 MW, may be required to fully recharge electric trucks during a 30- to 45-minute break.

Recognising the need to scale up fast or ultra-fast charging as a prerequisite for making both regional and, in particular, long-haul operations technically and economically viable, in 2022 Traton, Volvo, and Daimler established an independent joint venture, Milence. With EUR 500 million in collective investments from the three heavy-duty manufacturing groups, the initiative aims to deploy more than 1 700 fast (300 to 350 kW) and ultra-fast (1 MW) charging points across Europe.

Multiple charging standards are currently in use, and technical specifications for ultra-fast charging are under development. Ensuring maximum possible convergence of charging standards and interoperability for heavy-duty EVs will be needed to avoid the cost, inefficiency, and challenges for vehicle importers and international operators that would be created by manufacturers following divergent paths.

In China, co-developers China Electricity Council and CHAdeMO's "ultra ChaoJi" are developing a charging standard for heavy-duty electric vehicles for up to several megawatts. In Europe and the United States, specifications for the CharIN Megawatt Charging System (MCS), with a potential maximum power of 4.5 MW, are under development by the International Organization for Standardization (ISO) and other organisations. The final MCS specifications, which will be needed for commercial roll-out, are expected for 2024. After the first megawatt charging site offered by Daimler Trucks and Portland General Electric (PGE) in 2021, at least twelve high-power charging projects are planned or underway in the United States and Europe, including charging of an electric Scania truck in Oslo, Norway, at a speed of over 1 MW, Germany's HoLa project, and the Netherlands Living Lab Heavy-Duty and Green Transport Delta Charging Stations, as well as investments and projects in Austria, Sweden, Spain and the United Kingdom.

Commercialisation of chargers with rated power of 1 MW will require significant investment, as stations with such high-power needs will incur significant costs in both installation and grid upgrades. Revising public electric utility business models and power sector regulations, co-ordinating planning across stakeholders and smart charging can all help to manage grid impacts. Direct support through pilot projects and financial incentives can also accelerate demonstration and adoption in the early stages. A recent study outlines some key design considerations for developing MCS rated charging stations:

- Planning charging stations at highway depot locations near transmission lines and substations can be an optimal solution for minimising costs and increasing charger utilisation.
- "Right-sizing" connections with direct connections to transmission lines at an early stage, thereby anticipating the energy needs of a system in which high shares of freight activity have been electrified, rather than upgrading distribution grids on an

ad-hoc and short-term basis, will be critical to reduce costs. This will require structured and co-ordinated planning between grid operators and charging infrastructure developers across sectors.

- Since transmission system interconnections and grid upgrades can take 4-8 years, siting and construction of high-priority charging stations will need to begin as soon as possible.

Alternative solutions include installing stationary storage and integrating local renewable capacity, combined with smart charging, which can help reduce both infrastructure costs related to grid connection and electricity procurement costs (e.g. by enabling truck operators to minimise cost by arbitraging price variability throughout the day, taking advantage of vehicle-to-grid opportunities, etc.).

Other options to provide power to electric heavy-duty vehicles (HDVs) are battery swapping and electric road systems. Electric road systems can transfer power to a truck either via inductive coils[13] in a road, or through conductive connections between the vehicle and road, or via catenary (overhead) lines. Catenary and other dynamic charging options may hold promise for reducing the uncertainty of system-level costs in the transition to zero-emission regional and long-haul trucks, competing favourably in terms of total capital and operating costs. They can also help to reduce battery capacity needs. Battery demand can be further reduced, and utilisation further improved, if electric road systems are designed to be compatible not only with trucks but also electric cars. However, such approaches would require inductive or in-road designs that come with greater hurdles in terms of technology development and design, and are more capital intensive. At the same time, electric road systems pose significant challenges resembling those of the rail sector, including a greater need for standardisation of paths and vehicles (as illustrated with trams and trolley buses), compatibility across borders for long-haul trips, and appropriate infrastructure ownership models. They provide less flexibility for truck owners in terms of routes and vehicle types, and have high development costs overall, all affecting their competitiveness relative to regular charging stations. Given these challenges, such systems would most effectively be deployed first on heavily used freight corridors, which would entail close co-ordination across various public and private stakeholders. Demonstrations on public roads to date in Germany and Sweden have relied on champions from both private and public entities. Calls for electric road system pilots are also being considered in the China, India, the United Kingdom and the United States.

[13] Inductive solutions are further from commercialisation and face challenges to deliver sufficient power at highway speeds.

in 2022, and the company has set a target of 4 000 battery swap stations globally by 2025. The company claims their swap stations can perform over 300 swaps per day, charging up to 13 batteries concurrently at a power of 20-80 kW.

NIO also announced plans to build battery swap stations in Europe as their battery swapping-enabled car models became available in European markets towards the end of 2022. The first NIO battery swap station in Sweden was opened in November 2022, and by the end of 2022, ten NIO battery swap stations had been opened across Norway, Germany, Sweden and the Netherlands. In contrast to NIO, whose swapping stations service NIO cars, the Chinese battery swapping station operator Aulton's stations support 30 models from 16 different vehicle companies.

Battery swapping could also be a particularly attractive option for LDV taxi fleets, whose operations are more sensitive to recharging times than personal cars. US start-up Ample currently operates 12 battery swapping stations in the San Francisco Bay area, mainly serving Uber rideshare vehicles.

Batteries

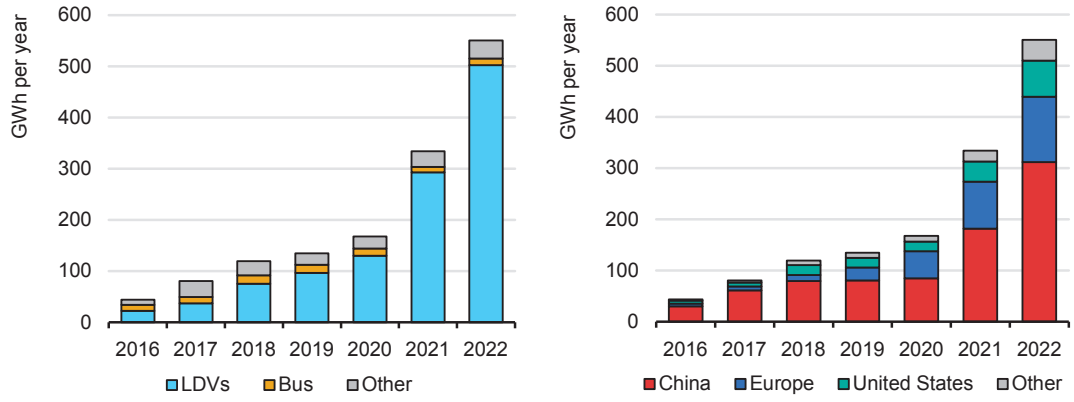
Battery demand for EVs continues to rise

Automotive lithium-ion (Li-ion) battery demand increased by about 65% to 550 GWh in 2022, from about 330 GWh in 2021, primarily as a result of growth in electric passenger car sales, with new registrations increasing by 55% in 2022 relative to 2021.

In China, battery demand for vehicles grew over 70%, while electric car sales increased by 80% in 2022 relative to 2021, with growth in battery demand slightly tempered by an increasing share of PHEVs. Battery demand for vehicles in the United States grew by around 80%, despite electric car sales only increasing by around 55% in 2022. While the average battery size for battery electric cars in the United States only grew by about 7% in 2022, the average battery electric car battery size remains about 40% higher than the global average, due in part to the higher share of SUVs in US electric car sales relative to other major markets,[14] as well as manufacturers' strategies to offer longer all-electric driving ranges. Global sales of BEV and PHEV cars are outpacing sales of hybrid electric vehicles (HEVs), and as BEV and PHEV battery sizes are larger, battery demand further increases as a result.

[14] For more information on the climate impact of SUVs, refer to the IEA's 27 February 2023 commentary on the subject.

Figure 1.17 Battery demand by mode and region, 2016-2022



Notes: LDVs = light-duty vehicles, including cars and vans; In the left chart, "Other" includes medium- and heavy-duty trucks and two/three-wheelers. Battery demand refers to automotive lithium-ion batteries. This analysis does not include conventional hybrid vehicles.

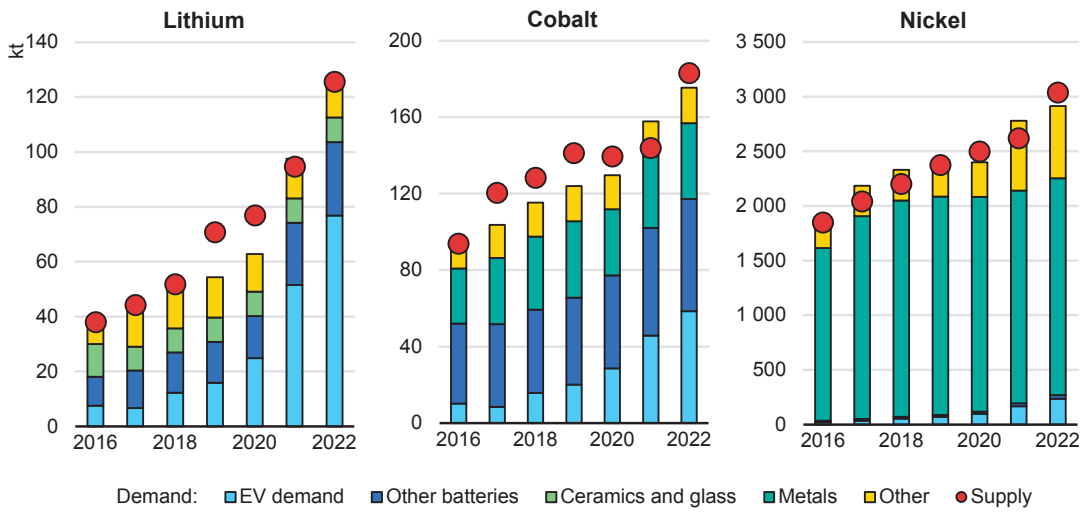
Source: IEA analysis based on EV Volumes.

Global battery demand increased by 65% in 2022, mainly as a result of electric car sales in China.

The increase in battery demand drives the demand for critical materials. In 2022, lithium demand exceeded supply (as in 2021) despite the 180% increase in production since 2017. In 2022, about 60% of lithium, 30% of cobalt and 10% of nickel demand was for EV batteries. Just five years earlier, in 2017, these shares were around 15%, 10% and 2%, respectively. As has already been seen for lithium, mining and processing of these critical minerals will need to increase rapidly to support the energy transition, not only for EVs but more broadly to keep up with the pace of demand for clean energy technologies.[15] Reducing the need for critical materials will also be important for supply chain sustainability, resilience and security. Accelerating innovation can help, such as through advanced battery technologies requiring smaller quantities of critical minerals, as well as measures to support uptake of vehicle models with optimised battery size and the development of battery recycling.

[15] For more information on the future of supply and demand of critical minerals, refer to the Energy Technology Perspective 2023 report.

Figure 1.18 Overall supply and demand of battery metals by sector, 2016-2022



Note: EV = electric vehicle. The metals category includes alloying applications. Supply refers to refinery output and not mining output.

Source: IEA analysis based on Mineral Commodity Summary 2022 by USGS, lithium and cobalt global supply-demand balance (January 2023) and nickel global supply-demand balance (January 2023) from S&P Global and World Metal Statistics Yearbook by the World Bureau of Metal Statistics.

In 2022, supply of nickel and cobalt exceeded demand, while lithium demand outpaced supply by a small margin.

Battery chemistries are diversifying

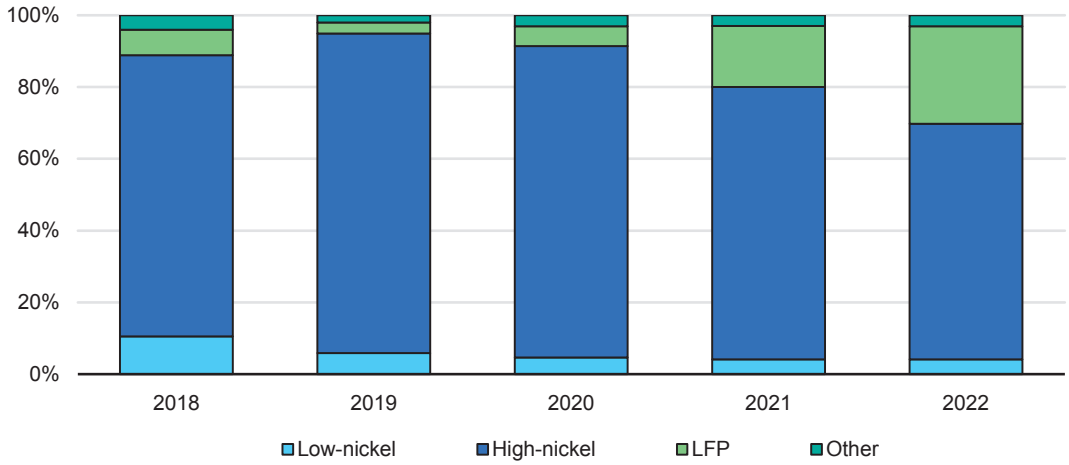
New alternatives to conventional lithium-ion are on the rise

In 2022, lithium nickel manganese cobalt oxide (NMC) remained the dominant battery chemistry with a market share of 60%, followed by lithium iron phosphate (LFP) with a share of just under 30%, and nickel cobalt aluminium oxide (NCA) with a share of about 8%.

Lithium iron phosphate (LFP) cathode chemistries have reached their highest share in the past decade (Figure 1.19). This trend is driven mainly by the preferences of Chinese OEMs. Around 95% of the LFP batteries for electric LDVs went into vehicles produced in China, and BYD alone represents 50% of demand. Tesla accounted for 15%, and the share of LFP batteries used by Tesla increased from 20% in 2021 to 30% in 2022. Around 85% of the cars with LFP batteries manufactured by Tesla were manufactured in China, with the remainder being manufactured in the United States with cells imported from China. In total, only around 3% of electric cars with LFP batteries were manufactured in the United States in 2022.

LFP batteries contrast with other chemistries in their use of iron and phosphorus rather than the nickel, manganese and cobalt found in NCA and NMC batteries. The downside of LFP is that the energy density tends to be lower than that of NMC. LFP batteries also contain phosphorus, which is used in food production. If all batteries today were LFP, they would account for nearly 1% of current agricultural phosphorus use by mass, suggesting that conflicting demands for phosphorus may arise in the future as battery demand increases.

Figure 1.19 Electric light-duty vehicle battery capacity by chemistry, 2018-2022

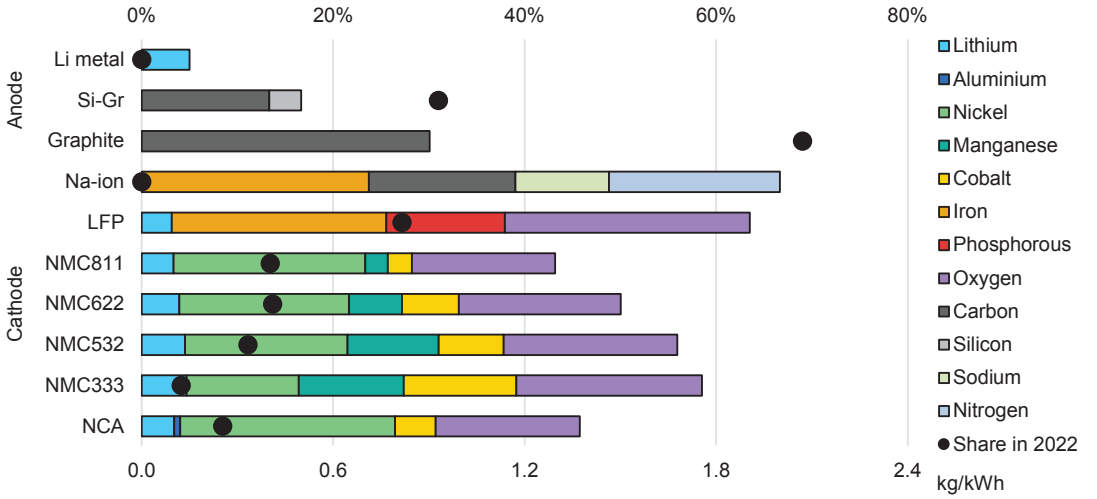


Notes: LFP = Lithium iron phosphate. Low-nickel includes: NMC333. High-nickel includes: NMC532, NMC622, NMC721, NMC811, NCA and NMCA. Cathode sales share is based on battery capacity.
Source: IEA analysis based on EV Volumes.

The share of lithium iron phosphate reached its highest ever point, accounting for almost 30% of new electric LDV battery capacity in 2022.

With regards to anodes, a number of chemistry changes have the potential to improve energy density (watt-hour per kilogram, or Wh/kg). For example, silicon can be used to replace all or some of the graphite in the anode in order to make it lighter and thus increase the energy density. Silicon-doped graphite already entered the market a few years ago, and now around 30% of anodes contain silicon. Another option is innovative lithium metal anodes, which could yield even greater energy density when they become commercially available (Figure 1.20).

Figure 1.20 Material content in different anode and cathodes



Notes: Li metal = Lithium metal anode; Si-Gr = Silicon-graphite anode; Graphite = Pure graphite anode; Na-ion = Sodium-ion; LFP = Lithium iron phosphate; NMC = Lithium nickel manganese cobalt oxide; NCA = Lithium nickel cobalt aluminium oxide. Materials composing the battery casing and the electrolyte are excluded. Chemistry shares are based on demand. The share of NCA battery includes every NCA type and Si-Gr includes every degree of silicon-graphite mix. Carbon covers the graphite composing anodes. The Na-ion cathode shown is the Prussian white.

Source: IEA analysis based on Lithium-Ion Batteries: State of the Industry 2022 by BNEF, BatPaC v4 by Argonne Laboratory and Sodium-ion batteries: disrupt and conquer? by Wood Mackenzie.

Lithium iron phosphate cathodes do not rely on nickel, manganese or cobalt, which has contributed to their increased market share.

In recent years, alternatives to Li-ion batteries have been emerging, notably sodium-ion (Na-ion). This battery chemistry has the dual advantage of relying on lower cost materials than Li-ion, leading to cheaper batteries, and of completely avoiding the need for critical minerals. It is currently the only viable chemistry that does not contain lithium. The Na-ion battery developed by China's CATL is estimated to cost 30% less than an LFP battery. Conversely, Na-ion batteries do not have the same energy density as their Li-ion counterpart (respectively 75 to 160 Wh/kg compared to 120 to 260 Wh/kg). This could make Na-ion relevant for urban vehicles with lower range, or for stationary storage, but could be more challenging to deploy in locations where consumers prioritise maximum range autonomy, or where charging is less accessible. There are nearly 30 Na-ion battery manufacturing plants currently operating, planned or under construction, for a combined capacity of over 100 GWh, almost all in China. For comparison, the current manufacturing capacity of Li-ion batteries is around 1 500 GWh.

Multiple carmakers have already announced Na-ion electric cars, such as the Seagull by BYD, which has an announced range of 300 km and is sold for USD 11 600 (with possible discounts bringing the price down to USD 9 500), and the Sehol EX10, produced by the VW-JAC joint venture, with a 250 km range.

While these first models are likely to be slightly more expensive than the cheapest small BEV models in China – such as the Wuling Mini BEV, sold for as little as USD 5 000 to 6 500 – they are still cheaper than equivalent options with similar driving range. To compare, the Wuling Mini BEV's range stands at 170 km, but BYD's Dolphin BEV, the second best-selling small BEV in China in 2022, with a similar range to the announced Na-ion cars, can cost more than USD 15 000. BYD plans to progressively integrate Na-ion batteries into all its models below USD 29 000 as battery production ramps up. These announcements suggest that electric vehicles powered by Na-ion will be available for sale and driven for the first time in 2023-2024, hence bringing the technology to a readiness level (TRL[16]) of 8-9, between first-of-a-kind commercial and commercial operation in the relevant environment. In 2022, it was assessed at TRL 6 (full prototype at scale) in the IEA Clean Technology Guide, compared to only TRL 3-4 (small prototypes) in the assessment from 2021, highlighting quick technological progress.

Critical mineral prices can have an impact on chemistry choice

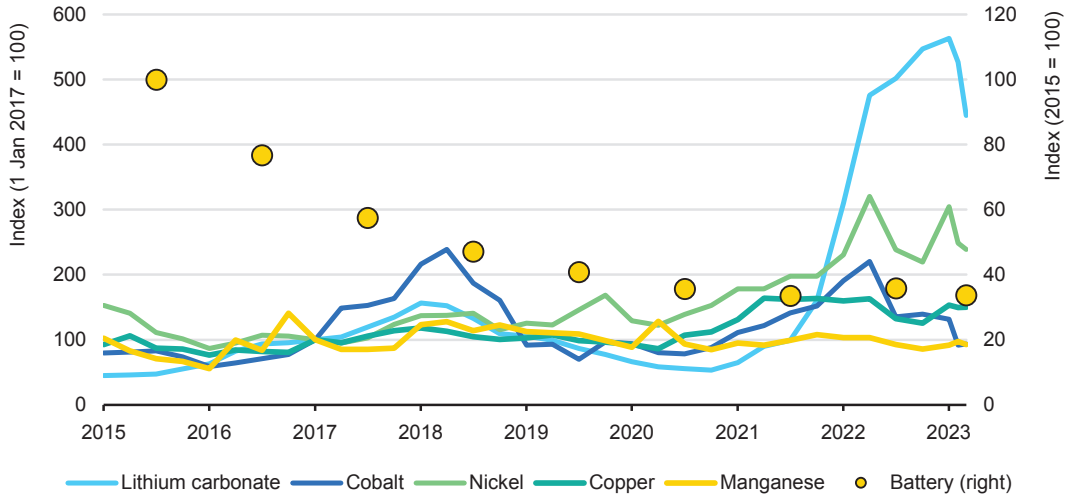
The variability in price and availability of critical minerals can also explain some of the developments in battery chemistry from the last few years (Figure 1.21). NMC chemistries using an equal ratio of nickel, manganese, and cobalt (NMC333 or NMC111) were popular until 2015. Since then, cobalt price increases and concerns affecting public acceptance of cobalt mining have contributed to a shift towards lower-cobalt ratios, such as NMC622, and then NMC811, which are nevertheless more difficult to manufacture. In 2022, the price of nickel increased, reaching a peak twice as high as the 2015-2020 average. This created incentives to use chemistries that are less reliant on nickel, such as LFP, despite their lower energy density.

Lithium carbonate prices have also been steadily increasing over the past two years. In 2021, prices multiplied four- to five-fold, and continued to rise throughout 2022, nearly doubling between 1 January 2022 and 1 January 2023. At the beginning of 2023, lithium prices stood six times above their average over the 2015-2020 period. In contrast to nickel and lithium, manganese prices have been relatively stable. One reason for the increase in prices for lithium, nickel and cobalt was the insufficient supply compared to demand in 2021 (Figure 1.18). Although nickel and cobalt supply surpassed demand in 2022, this was not the case for lithium, causing its price to rise more strongly over the year. Between January and March 2023, lithium prices dropped 20%, returning to their late 2022 level. The combination of an expected 40% increase in supply and slower growth in demand, especially for EVs in China, has contributed to this trend. This drop – if sustained – could translate into lower battery prices.

[16] Technology Readiness Level (TRL) provides a snapshot of the maturity of a given technology. It has 11 steps ranging from initial idea at step 1 to proof of stability reached at step 11. For more information, refer to the IEA Clean Technology Guide.

Beyond those materials, global commodity prices have surged in the last few years, as a result of supply disruptions in the wake of the Covid-19 pandemic, rising demand as the global economy started to recover, and Russia's invasion of Ukraine in February 2022, among other factors.

Figure 1.21 Price of selected battery materials and lithium-ion batteries, 2015-2023



Notes: Data until March 2023. Lithium-ion battery prices (including the pack and cell) represent the global volume-weighted average across all sectors. Nickel prices are based on the London Metal Exchange, used here as a proxy for global pricing, although most nickel trade takes place through direct contracts between producers and consumers. The 2023 battery price value is based on cost estimates for NMC 622.

Source: IEA analysis based on material price data by S&P, 2022 Lithium-Ion Battery Price Survey by BNEF and Battery Costs Drop as Lithium Prices in China Fall by BNEF.

From 2021 to the end of 2022, the price of critical materials such as lithium, cobalt and nickel increased dramatically, putting pressure on historical Li-ion battery price decreases.

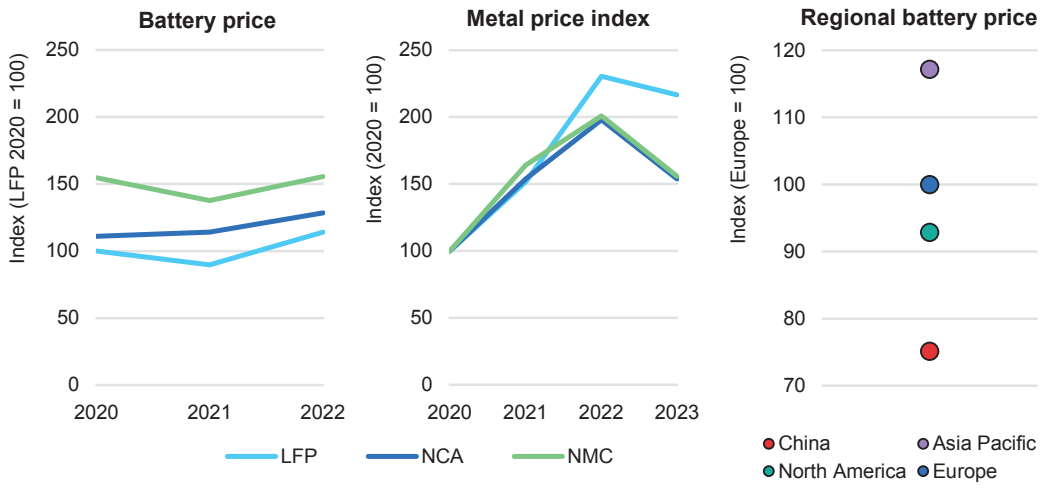
In 2022, the estimated average battery price stood at about USD 150 per kWh, with the cost of pack manufacturing accounting for about 20% of total battery cost, compared to more than 30% a decade earlier. Pack production costs have continued to decrease over time, down 5% in 2022 compared to the previous year. In contrast, cell production costs increased in 2022 relative to 2021, returning to 2019 levels. This can be explained in part by the increasing prices of materials, which account for a significant portion of cell price, and of electricity, which affects manufacturing costs, whereas efficiency gains in pack manufacturing help decrease costs. Bloomberg New Energy Finance (BNEF) sees pack manufacturing costs dropping further, by about 20% by 2025, whereas cell production costs decrease by only 10% relative to their historic low in 2021. This warrants further analysis based on future trends in material prices.

The effect of increased battery material prices differed across various battery chemistries in 2022, with the strongest increase being observed for LFP batteries

(over 25%), while NMC batteries experienced an increase of less than 15% (Figure 1.21). Since LFP batteries contain neither nickel nor cobalt, which are relatively expensive compared to iron and phosphorus, the price of lithium plays a relatively larger role in determining the final cost. Given that the price of lithium increased at a higher rate than the price of nickel and cobalt, the price of LFP batteries increased more than the price of NMC batteries. Nonetheless, LFP batteries remain less expensive than NCA and NMC per unit of energy capacity.

The price of batteries also varies across different regions, with China having the lowest prices on average, and the rest of the Asia Pacific region having the highest (Figure 1.21). This price discrepancy is influenced by the fact that around 65% of battery cells and almost 80% of cathodes are manufactured in China.

Figure 1.22 Price index for selected battery chemistries, regions and metal price, 2020-2023



Note: LFP = Lithium iron phosphate; NMC = Lithium nickel manganese cobalt oxide; NCA = Lithium nickel cobalt aluminium oxide. The metal price index is based on the price evolution of four commodities (lithium carbonate, cobalt, nickel and copper) weighted by their use in each battery chemistry. For this metal price index, NMC uses the NMC622 chemistry. The 2023 value of the metal price index covers only the first 3 months of the year. Asia Pacific excludes China. Regional battery (pack) price refers to 2022.

Source: IEA analysis based on material price data by S&P, 2022 Lithium-Ion Battery Price Survey by BNEF, BatPaC v4 by Argonne Laboratory and Lithium-Ion Batteries: State of the Industry 2022 by BNEF.

Despite a higher relative increase in price compared to other battery chemistries, LFP batteries remain the lowest price per kWh.

Prospects for electric vehicle deployment

Several pathways to electrify road transport in the period to 2030 are explored in this section. First, deployment of electric vehicles (EVs) is projected by region and road segment for the Stated Policies and Announced Pledges scenarios, and globally by segment for the Net Zero Emissions by 2050 Scenario. These projections are then compared to announcements by original equipment manufacturers (OEMs). Then the corresponding battery demand is projected, followed by roll-out requirements for charging infrastructure. Finally, the impacts of EV deployment are assessed, including increased electricity demand, oil displacement, implications for tax revenues, and net well-to-wheels GHG emissions.

Outlook for electric mobility

Scenarios

A scenario-based approach is used to explore road transport electrification and its impact, based on the latest market data, policy drivers and technology perspectives. Two IEA scenarios – the Stated Policies and Announced Pledges scenarios – inform the outlooks, which are examined in relation to the Net Zero Emissions by 2050 Scenario at the global level.[1] These scenarios are based on announced policies, ambitions and market trends through the first quarter of 2023.

The purpose of the scenarios is to assess plausible futures for global EV markets and the implications they could have. The scenarios do not make predictions about the future. Rather, they aim to provide insights to inform decision-making by governments, companies and stakeholders about the future of EVs.

These scenario projections incorporate GDP and population assumptions from the International Monetary Fund (2022) and United Nations (2022), respectively.

Stated Policies Scenario

The Stated Policies Scenario (STEPS) reflects existing policies and measures, as well as firm policy ambitions and objectives that have been legislated by

[1] The projections in the Stated Policies and Announced Pledges scenarios are based on historical trends through the end of 2022 as well as stated policies and ambitions as of the end of March 2023. The Net Zero Emissions by 2050 Scenario is consistent with the World Energy Outlook 2022 publication.

governments around the world. It includes current EV-related policies, regulations and investments, as well as market trends based on the expected impacts of technology developments, announced deployments and plans from industry stakeholders. The STEPS aims to hold up a mirror to the plans of policy makers and illustrate their consequences.

Announced Pledges Scenario

The Announced Pledges Scenario (APS) assumes that all announced ambitions and targets made by governments around the world are met in full and on time. With regards to electromobility, it includes all recent major announcements of electrification targets and longer-term net zero emissions and other pledges, regardless of whether these have been anchored in legislation or in updated Nationally Determined Contributions (NDCs). For example, the APS assumes that countries that have signed on to the Conference of the Parties (COP 26) declaration on accelerating the transition to 100% zero emissions cars and vans will achieve this goal, even if there are not yet policies or regulations in place to support it. In countries that have not yet made a net zero emissions pledge or set electrification targets, the APS considers the same policy framework as the STEPS. Non-policy assumptions for the APS, including population and economic growth, are the same as in the STEPS.

The difference between the APS and the STEPS represents the “implementation gap” that exists between the policy frameworks and measures required to achieve country ambitions and targets, and the policies and measures that have been legislated.

Net Zero Emissions by 2050 Scenario

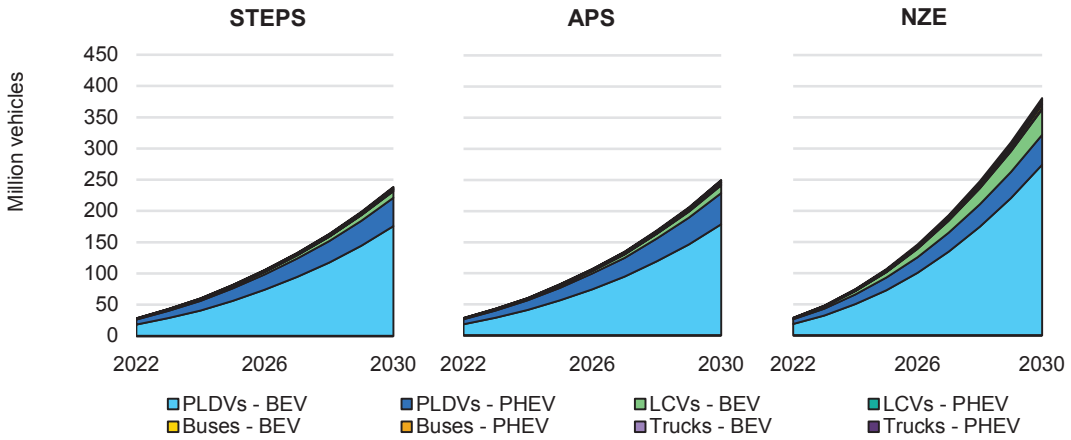
The Net Zero Emissions by 2050 Scenario (NZE Scenario) is a normative scenario that sets out a narrow but achievable pathway for the global energy sector to achieve net zero CO_2 emissions by 2050. The scenario is compatible with limiting the global temperature rise to 1.5°C with no or limited temperature overshoot, in line with reductions assessed by the Intergovernmental Panel on Climate Change in its Special Report on Global Warming of 1.5°C. There are many possible paths to achieve net zero CO_2 emissions globally by 2050 and many uncertainties that could affect them. The NZE Scenario is therefore *a* path and not *the* path to net zero emissions.

The difference between the NZE Scenario and the APS highlights the “ambition gap” that needs to be closed to achieve the goals under the 2015 Paris Agreement.

Electric vehicle fleet to grow by a factor of eight or more by 2030

The total fleet of EVs (excluding two/three-wheelers) grows from almost 30 million in 2022 to about 240 million in 2030 in the Stated Policies Scenario (STEPS), achieving an average annual growth rate of about 30%. In this scenario, EVs account for over 10% of the road vehicle fleet by 2030. Total EV sales reach over 20 million in 2025 and over 40 million in 2030, representing over 20% and 30% of all vehicle sales, respectively.

Figure 3.1. Electric vehicle stock by mode and scenario, 2022-2030

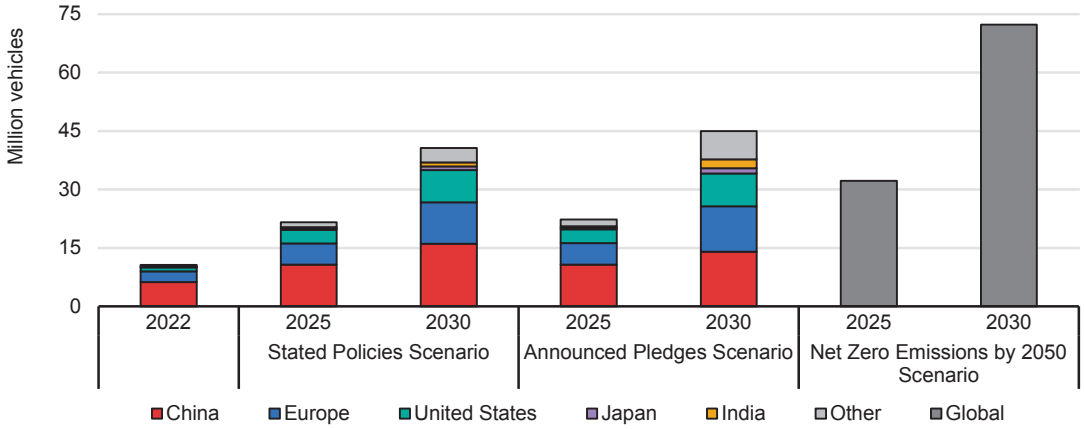


Notes: STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario; BEV = battery electric vehicle; PHEV = plug-in hybrid electric; PLDV = passenger light-duty vehicle; LCV = light commercial vehicle.

EV deployment commensurate with government pledges is only 5% above what stated policies would imply by 2030.

In the Announced Pledged Scenario (APS), based on announced government targets and pledges that go beyond existing policies, the global EV fleet reaches almost 250 million in 2030, around 5% higher than in the STEPS. The average annual growth rate in the APS is nearly 35%, with the result that one in seven vehicles on the road is an EV in 2030. Total EV sales reach 45 million in 2030, representing over 35% of all vehicle sales.

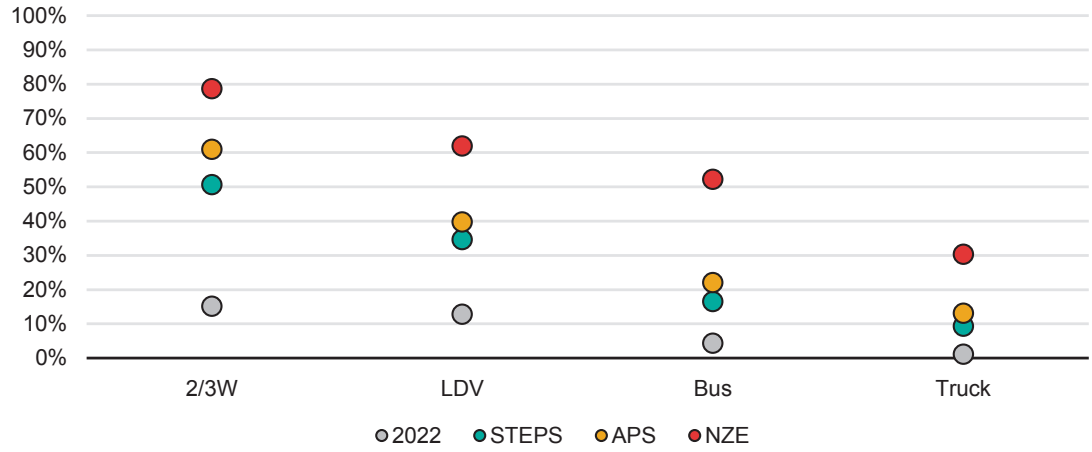
Figure 3.2. Electric vehicle sales by region, 2022-2030



Global EV sales increase around fourfold from 2022 to 2030 under both stated policies and announced ambitions.

The global EV sales share in 2030 in the STEPS is about half that in the NZE Scenario, in which the fleet of EVs grows more rapidly, at an average annual rate of around 40%, reaching 380 million EVs on the road in 2030. Electric vehicle sales reach over 30 million in 2025 and over 70 million in 2030, a total of approximately 30% and 60% of all vehicle sales, respectively.

Figure 3.3. Electric vehicle sales shares by mode and scenario, 2030



Notes: 2/3W = two/three-wheeler; LDV = light-duty vehicle; STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario.

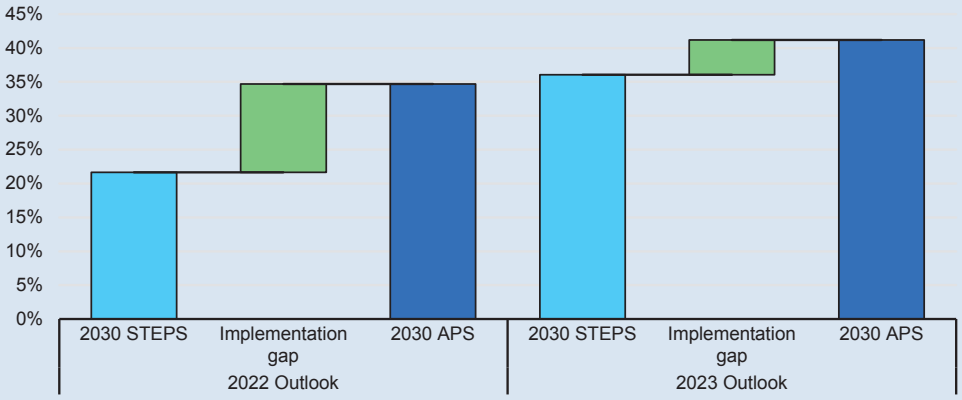
Existing policies are projected to yield market shares almost in line with country pledges across all modes of transport.

Box 3.1 Closing the implementation gap: how EV policy is catching up with targets

Targets and ambitions for clean energy technology deployment are generally more easily formulated than they are achieved, but in the case of EVs, the momentum is clearly on the side of achievement. Strong market uptake in 2022, combined with major policy announcements over the past year, have led to a significant upward revision of EV deployment to 2030 in the STEPS presented in this edition of the Global EV Outlook compared to the 2022 edition. The projected sales shares of EVs based on stated policies and market trends are now coming close to country stated ambitions for EVs, meaning that the policy implementation gap – the difference between country deployment ambitions and the policies currently in place – in the 2023 Outlook is much smaller than in the 2022 edition.

This is most notable for light-duty vehicles, where recent policies such as the US Inflation Reduction Act (IRA) and new EU CO_2 standards for cars and vans have resulted in a significantly higher EV sales share in 2030 in the STEPS. In this year's Outlook, under announced ambitions, the electric car sales share exceeds 40% in 2030 compared to 35% under stated policies: this gap has more than halved in the past year. For trucks and buses, the EV sales share in 2030 in the STEPS also increased faster than ambition. As a result, the gap between ambition and legislated policies for HDVs is half of what it was in the 2022 Outlook.

Electric car sales share implementation gap, 2030



Realising the potential of EVs to support government climate (as well as energy security) ambitions is thus almost in reach under current policy frameworks. In particular, the gap between policy and ambition has closed in three of the largest EV markets: the European Union, the United States and China. At the global level, oil displacement by EVs reaches 1.8 million barrels per day in 2025 (over 5 mb/d in 2030) under stated policies. As a result, global demand for oil-based road transport fuels will peak by 2025.

The momentum seen over the past year in terms of increasing EV sales and new supportive policies being introduced, along with funding designated for the necessary infrastructure (for example, the USD 5 billion allocated in the US IIJA to support EV charger installation), have also led industry players to invest more in EV supply chains. Notably, planned EV battery manufacturing expansions are set to increase capacity more than fourfold, reaching 6.8 TWh/year of production capacity in 2030, 65% higher than is needed to enable the level of EV deployment in the APS. Taken together, this suggests that even higher EV deployment than is implied by the APS is achievable by 2030 if policy efforts are sustained and critical potential bottlenecks (such as around recharging infrastructure and mining) are addressed early on.

Light-duty vehicles

Light-duty vehicles (LDVs), including passenger light-duty vehicles (PLDVs) and light commercial vehicles (LCVs), continue to make up the majority of electric vehicles (excluding two/three-wheelers). This is a result of strong policy support, including light-duty vehicle fuel economy or CO_2 standards, the availability of EV models, and the size of the LDV market. In the STEPS, electric LDV sales are projected to reach over 20 million in 2025, doubling the number of sales in 2022, and to quadruple to 40 million in 2030. The sales share of electric LDVs thus increases from 13% in 2022 to over 20% in 2025 and around 35% in 2030. The stock of electric LDVs reaches about 230 million in 2030, meaning that about one in every seven LDVs on the road is electric.

In the APS, the fleet of electric LDVs reaches over 240 million in 2030, a 15% stock share. Of these, 230 million are electric PLDVs, with only 6% being LCVs. Sales of electric LDVs reach almost 45 million in 2030 in the APS, representing a sales share of 40%. These results reflect government electrification ambitions and net zero pledges, including the 2021 COP 26 declaration target to achieve 100% zero-emission LDV sales by 2040, and by 2035 in leading markets, which 40 national governments have committed to.

In the NZE Scenario, the sales share of electric LDVs reaches 30% in 2025, four years earlier than in the STEPS. In 2030, the sales share is over 60%, about 80% higher than in the STEPS and 55% higher than in the APS.

Buses

Governments have made significant progress in electrifying public bus fleets. In 2022, there were more than 800 000 electric buses on the road, representing over 3% of all buses. As such, buses are the most electrified road segment, excluding two/three-wheelers. In the STEPS, the electric bus fleet reaches 1.4 million in 2025 and 2.7 million in 2030, at which point around one in ten buses will be electric. In the near term, electrification is expected to progress most rapidly within the publicly owned urban bus fleet, which is covered by government procurement

regulations and, in some cases, government funding. For example, Canada is aiming to put 5 000 electric public and school buses on the road by the end of 2025 via the CAD 2.75 billion Zero Emission Transit Fund.

In the APS, the electric bus fleet exceeds 3 million in 2030, reaching a stock share of over 10%. In 2030, about a quarter of buses sold are electric, which is about 35% higher than the sales share in the STEPS. In part, this increase is due to the proposed EU heavy-duty vehicle CO_2 standards, which would require 100% zero-emission city bus sales from 2030. In the NZE Scenario, the electrification of buses is even more rapid, with one in two buses sold in 2030 being electric.

Medium- and heavy-duty trucks

Medium- and heavy-duty trucks are more difficult to electrify than other road segments, due in part to the size, weight and cost of the batteries needed to fully electrify this segment. However, progress is being made: around 320 000 electric trucks were on the road in 2022. By 2030, the fleet of electric trucks reaches almost 3.5 million in the STEPS, over 3% of the total truck fleet.

In the APS, the stock of electric trucks exceeds 4 million in 2030, a stock share of 4%. Electric truck sales increase from a negligible share today to over 9% in the STEPS in 2030 and 13% in the APS. The increased sales in the APS are driven in particular by the Global Memorandum of Understanding (MoU) on Zero-Emission Medium- and Heavy-Duty Vehicles, through which 27 countries have now pledged to reach 30% zero-emission medium- and heavy-duty vehicle[2] sales by 2030 and 100% by 2040. In addition, the European Union has proposed HDV CO_2 standards that would require a 45% reduction in emissions in 2030 compared to 2019 levels.

In the NZE Scenario, electric trucks reach 30% of sales in 2030, which is aligned with the Global MoU on Zero-Emission Medium- and Heavy-Duty vehicles. However, this sales share is still two-and-a-half times that in the APS, and over three times that in the STEPS.

Two/three-wheelers

Two/three-wheelers are currently the most electrified road transport segment. Given the vehicles' light weight and limited daily driving distance, battery electrification is relatively easy and makes economic sense on a total cost of ownership basis in many regions. In 2022, the electric two/three-wheeler fleet totalled over 50 million, reaching a stock share of around 7%.

In the STEPS, the fleet of electric two/three-wheelers reaches 220 million in 2030, or a quarter of the total two/three-wheeler fleet. In the APS, the stock grows to 280 million, and almost 30% of all two/three-wheelers are electric. The electric sales share in 2030 reaches 50% in the STEPS and 60% in the APS. In the NZE Scenario, the electric two/three-wheeler sales share reaches almost 80% in 2030.

[2]Includes buses.

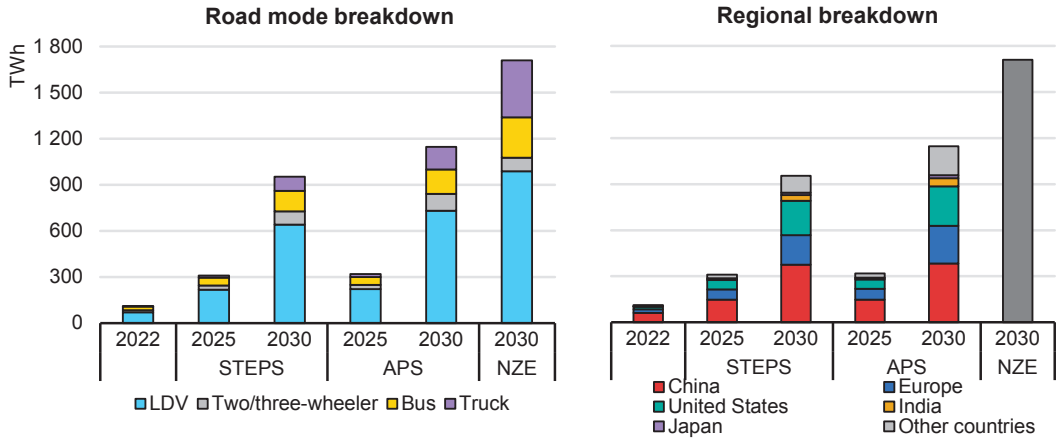
To power the growing stock of electric trucks, the number of depot chargers increases from around 300 000 today to 3.5 million in 2030 in the STEPS and 4.2 million in the APS. The installed capacity of truck depot chargers is about 310 GW in the STEPS and 380 GW in the APS in 2030. As with buses, the number of depot chargers needed in 2030 is far greater than the number of opportunity chargers. In the STEPS, the number of opportunity truck chargers is about 13 500 (6.5 GW installed capacity), increasing to 25 000 (13 GW installed capacity) in the APS in 2030.

Impact on energy demand and emissions

Electricity demand

The global EV fleet consumed about 110 TWh of electricity in 2022, which equates roughly to the current total electricity demand in the Netherlands. Almost a quarter of the total EV electricity consumption was for electric cars in China, and a fifth for electric buses in the same country. Electricity demand for EVs accounts for less than half a percent of current total final electricity consumption worldwide, and still less than one percent of China's final electricity consumption.

Figure 3.12. Electricity demand by mode and region, 2022-2030



Notes: STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario; LDV = light-duty vehicle; RoW = rest of the world. The analysis is carried out for each region in the transport model within the IEA's Global Energy and Climate Model (GEC-Model) separately and then aggregated for global results. For the Net Zero Emissions by 2050 Scenario, only global values are reported. Regional data can be interactively explored via the Global EV Data Explorer.

Electricity demand for EVs accounts for only a minor share of global electricity consumption in 2030 in the Announced Pledges Scenario.

Electricity demand for EVs is projected to reach over 950 TWh in the STEPS and about 1 150 TWh in the APS in 2030. Notably, electricity demand in the APS is

about 20% higher than in the STEPS, despite the stock of EVs only being about 15% higher. This is in part due to higher rates of electrification in many high-average vehicle mileage markets such as the United States, but also to greater electrification in the truck and bus segments, which contribute incrementally to vehicle stock, but have a high electricity demand per vehicle. In addition, it is assumed that in countries with net zero pledges, a larger share of energy consumption in PHEVs is provided by electricity (as opposed to gasoline or diesel). This is particularly relevant for cars and vans, which account for about two-thirds of demand in both scenarios.

By 2030, electricity demand for EVs accounts for less than 4% of global final electricity consumption in both scenarios. As shown in the World Energy Outlook 2022, in 2030 the share of electricity for EVs is relatively small compared to demand for industrial applications, appliances or cooling and heating.

Table 3.1 Share of electricity consumption from electric vehicles relative to final electricity demand by region and scenario, 2022 and 2030

Country/region	2022	Stated Policies Scenario 2030	Announced Pledges Scenario 2030
China	0.8%	3.8%	4.0%
Europe	0.7%	4.7%	5.7%
United States	0.4%	5.4%	6.3%
Japan	0.1%	1.7%	2.2%
India	0.1%	1.7%	2.5%
Global	0.5%	3.2%	3.8%

Note: Non-road electricity consumption from the World Energy Outlook 2022.

China remains the largest consumer of electricity for EVs in 2030, although its share of global EV electricity demand decreases significantly from about 55% in 2022 to less than 40% in the STEPS, and around 30% in the APS. This reflects wider adoption of electromobility across other countries in the period to 2030.

The size of the EV fleet becomes an important factor for power systems in both scenarios, with implications for peak power demand, transmission and distribution capacity. Careful planning of electricity infrastructure, peak load management, and smart charging will be critical. Reducing dependence on fast charging will allow for optimal planning and resiliency of power systems, mitigating peak power demand. More than 80% of the electricity demand for electric LDVs in 2030 in both scenarios is via slow chargers (private and public).

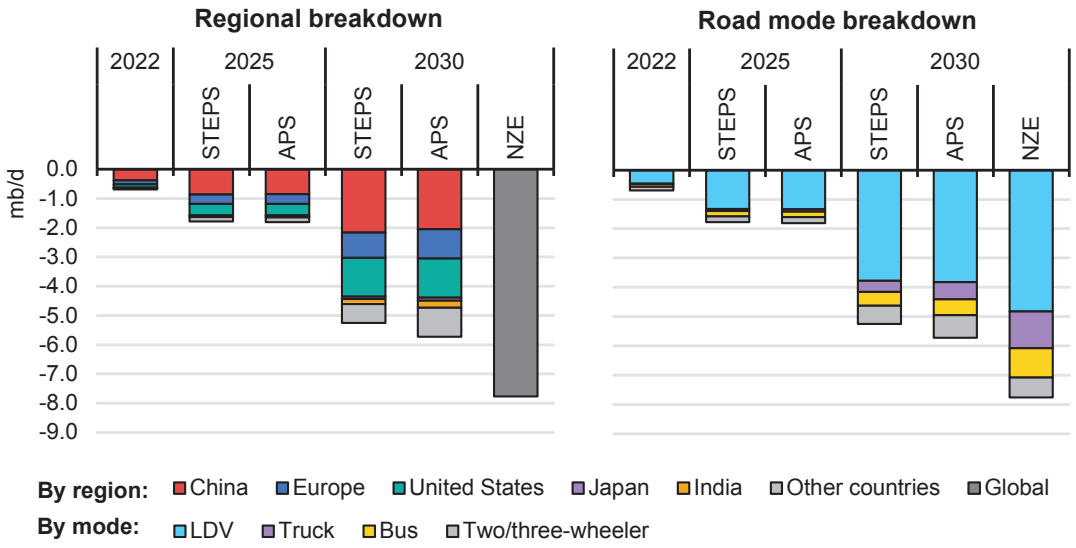
To help policy makers prioritise charging strategies according to the size of their EV fleet and their power system configuration, the IEA has developed a guiding framework and online tool for EV grid integration.

Oil displacement

The growing EV stock will reduce oil use, which today accounts for over 90% of total final consumption in the transport sector. Globally, the projected EV fleet in 2030 displaces more than 5 million barrels per day (mb/d) of diesel and gasoline in the STEPS and almost 6 mb/d in the APS, up from about 0.7 mb/d in 2022. For reference, Australia consumed around 1 mb/d of oil products across all sectors in 2021.

However, recent price volatility for critical minerals that are important inputs to battery manufacturing, and market tension affecting supply chains, are a stark reminder that in the transition to electromobility, energy security considerations evolve and require regular reconsideration.

Figure 3.13. Oil displacement by region and mode, 2022-2030



Notes: STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario; LDV = light-duty vehicle. Oil displacement based on internal combustion engine (ICE) vehicle fuel consumption to cover the same mileage as the EV fleet.

Oil displacement increases from 0.7 mb/d in 2022 to nearly 6 mb/d in 2030 if pledges supporting electromobility in road transport around the world are fulfilled.

Box 3.2 How much oil really gets displaced by electric vehicles?

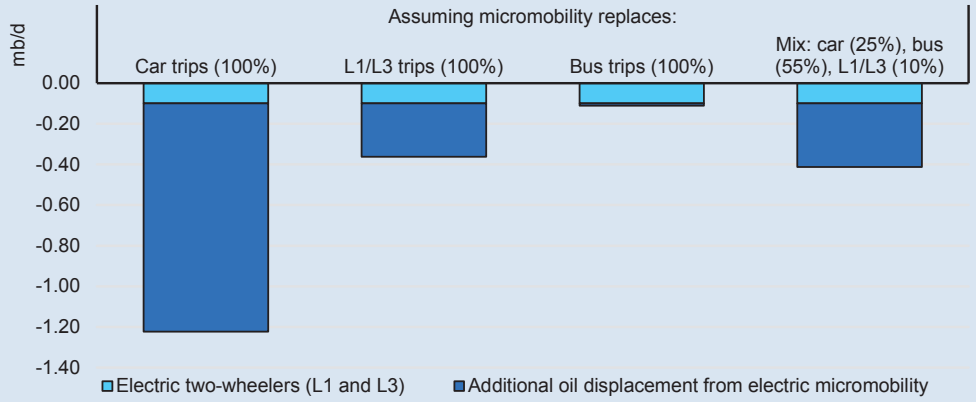
Oil displacement through the use of EVs can be estimated by assuming that the distance (total kilometres) travelled by EVs by segment each year would have otherwise been travelled by ICE vehicles or hybrid electric vehicles (HEVs) (based on the stock shares of each). In the case of PHEVs, only the distance covered by electricity gets included. The stock average fuel consumption of gasoline and diesel vehicles determines the total liquid fuel displacement, where the biofuel portion is taken out of the estimate based on regional blending rates. As a result, it can be estimated that in 2022, the stock of EVs displaced 700 000 barrels of oil per day.

This method of estimation assumes that EVs replace ICE or hybrid vehicles of the same segment, as opposed to some other means of transport, i.e. an electric car replaces an ICE car. The accuracy of this assumption is uncertain, in particular with respect to two-wheelers. In IEA analysis, only two-wheelers that fit the United Nations Economic Commission for Europe (UNECE) classification of L1 or L3 are considered. This definition excludes micromobility options such as electric-assisted bicycles and low-speed electric scooters, leading to a significantly lower stock (around 80% lower) than when including micromobility segments.

Whether or not electric micromobility avoids oil use is uncertain, as it might displace manual bicycles or walking rather than ICE two-wheelers. At the same time, there is evidence that in some cases micromobility displaces personal car or taxi trips. The estimate of the amount of oil use that is avoided by two-wheeled micromobility therefore strongly depends on the assumptions about the mode that is being displaced.

The case of China, which represents over 95% of the global stock of two-wheeled electric micromobility, is a good example. Assuming that all two-wheeled micromobility in China replaces conventional ICE two-wheelers would increase oil displacement by 260 kb/d (or 160%). If instead electric micromobility was assumed to replace only bus trips, then the total oil displacement from two-wheelers in China would increase by just 10 kb/d (10%). However, if it was assumed that they displaced car trips, then oil use avoided by two-wheelers in China would be more than 1 mb/d higher. Including oil displacement from the two-wheeled electric micromobility segment in China alone can therefore increase the estimated 2022 global oil displacement from all electric vehicles anywhere from 1% to 160%. But there is significant uncertainty as to whether any oil is displaced at all.

Additional two-wheeler oil displacement in China when accounting for micromobility segments, 2022



Notes: Electric L1 and L3 two-wheelers (based on UNECE classifications) are assumed to replace ICE two-wheelers. For this analysis, it is assumed micromobility two-wheelers travel on average 10 km/day. The mix shown is based on findings from an investigation of e-bike use in Kunming, China. The other 10% of the mix is assumed to replace active transport, and thus does not contribute to oil displacement.
Sources: IEA analysis based on BNEF and Cherry et al. (2016).

Tax revenues

Taxes on petroleum-based road fuels can be a significant source of income for governments, [7] and are often used to support investments in transport infrastructure, such as roads and bridges. Given the levels of oil displacement discussed above, the transition to EVs will reduce these tax revenues. Additional tax revenue from electricity will not be sufficient to fully compensate for this reduction, both because taxes on electricity tend to be lower on an energy basis and because EVs are more efficient and thus use less energy than ICE vehicles.

In 2022, the transition to electric vehicle stock displaced around USD 11 billion in gasoline and diesel tax revenues globally. At the same time, the use of EVs generated around USD 2 billion in electricity tax revenue, meaning there was a net loss of around USD 9 billion. Although China has the greatest stock of EVs, the greatest impact on tax revenues was seen in Europe, a trend which is expected to continue into the future. This is because Europe has some of the highest taxes on gasoline and diesel; for example, the gasoline tax rate in Germany is almost ten times the rate in China.

As the number of EVs increases globally, government fuel tax revenues are expected to decline, with global net tax losses increasing by around two-and-a-

[7] While the share of total government revenue from fuel taxes may be small, for example it has recently been less than 3% in the United Kingdom, in many cases it represents a large share of the budget allocations for transportation infrastructure.

Germany Faces €12 Billion Shortfall in Climate-Protection Fund
2023-04-25 10:23:36.382 GMT

By Kamil Kowalcze
(Bloomberg) -- Germany is facing a shortfall of about €12 billion ($13.2 billion) in its special climate-protection fund, suggesting the government in Berlin has significantly underestimated the cost of greening Europe's biggest economy.
Commitments to climate—protection projects exceed earmarked resources through 2026, according to people familiar with the budget details, who asked not to be identified discussing confidential information.
The estimated deficit doesn't take into account subsidies to ease the financial burden of replacing fossil-fuel heating systems, which could be as much as €15 billion, the people said.
The ruling coalition agreed last week to ban new gas- and oil-fired heaters in Germany from next year.
Spokespeople for the economy and finance ministries did not immediately respond to requests for comment.
The Climate and Transformation Fund (KTF) was set up last year outside the regular budget to provide subsidies for programs including renovating buildings, switching to e-mobility and clean manufacturing, expanding renewable energies and improving energy efficiency.
Germany is already likely to miss a goal of cutting greenhouse gases by 65% by 2030 compared to 1990-levels and additional funding challenges will mean the government will likely face some tough decisions on how to allocate available cash.
Read more: The Big Plan to Help Developing Nations Go Green Is Foundering
Economy Minister Robert Habeck, a member of the Greens who is also the vice chancellor, last week said the additional cost of subsidies to replace heating systems will be "manageable." Spokespeople for his ministry insist that there is sufficient cash available in the climate fund to cover the extra expense.
The government agreed to reallocate around €60 billion of unused pandemic aid to the fund, and it also receives revenue from European and national carbon-emissions trading mechanisms. That income is expected to increase from around €13 billion in 2022 to roughly €25 billion per year by 2026.
The fund has lost some of its expected revenue after a planned increase this year in Germany's carbon price on heating and fuels was postponed by one year due to the impact of Russia's war on Ukraine on energy costs.
To be sure, not all of the cash from the KTF allocated to specific subsidy programs is always fully exhausted and in some cases as much as 50% of the available funds is left over, according to people familiar with the details.
The uncertainty around funding for heating subsidies is playing out against the backdrop of a political spat that has been rumbling since last year between Habeck and Finance

Minister Christian Lindner.
Lindner — a self-styled budget hawk who leads the business-friendly Free Democrats — generally opposes blanket bans, while Habeck is keen to swiftly execute Germany's transformation to an emissions-free economy and favors ramping up spending and implementing stricter rules to achieve it.
Last year, Germany cut its carbon emissions by 1.9% to 746 million tons, a reduction path that experts say is far too slow.
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--With assistance from Petra Sorge.

To contact the reporter on this story:
Kamil Kowalcze in Berlin at kkowalcze@bloomberg.net
To contact the editors responsible for this story:
Zoe Schneeweiss at zschneeweiss@bloomberg.net;
Ben Sills at bsills@bloomberg.net
Iain Rogers, Rachel Morison

https://www.reuters.com/business/energy/german-cabinet-approves-bill-phase-out-oil-gas-heating-systems-2023-04-19/

4 minute readApril 19, 20236:15 AM MDTLast Updated 30 min ago

German cabinet approves bill to phase out oil and gas heating systems

By Riham Alkousaa and Markus Wacket

[1/3] German Economy Minister Robert Habeck attends a news conference to present a planned reform to the law on householding heating in Berlin, Germany, April 19, 2023. REUTERS/Christian Mang

1 2 3

- Summary
- New heating systems must run on 65% renewable energy from 2024, law says
- Heating switch to cost 9 billion euros annually
- Govt to subsidise replacement with up to 50% cover
- Heating contributed to 15% of German greenhouse emissions in 2022

BERLIN, April 19 (Reuters) - The German cabinet on Wednesday approved a bill that bans most new oil and gas heating systems from 2024, the economy minister said, a policy designed to cut greenhouse gas emissions but that critics warned could be costly for poorer households.

Berlin's ruling coalition last month agreed that almost all newly installed heating systems in Germany should run on 65% renewable energy from 2024, both in new and old buildings.

The plan is part of Germany's ambition to become climate neutral by 2045 as the construction sector was responsible for 112 million tonnes of greenhouse emissions last year or 15% of the country's emissions.

Houses could also use heat pumps that run on renewable electricity, district heating, electric heating or solar thermal systems as acceptable alternatives to fossil fuel heating, according to the bill, which was seen by Reuters.

The policy has met resistance from within Chancellor Olaf Scholz's coalition, with critics calling it too costly and a burden on low- and medium-income households and tenants.

Such a shift could cost Germans around 9.16 billion euros ($10 billion) annually until 2028, the draft bill showed. The costs would fall to 5 billion from 2029 as Berlin expects renewable energy expansion and a ramp up of heating pumps production to make the switch cheaper.

The government will offer a subsidy of 30% for residential properties occupied by owners and 10% extra if the owners opt for an earlier climate-friendly heating switch than required by law, regardless of the household income.

Homeowners who receive income-related welfare benefits could get 20% extra subsidy for the switch.

The money will come from the Climate and Transformation Fund, a supplementary budget to push green investments, with some 180 billion euros earmarked for 2023 to 2026.

"The financing is secured," Economy Minister Robert Habeck told journalists in a news conference presenting the bill. Habeck declined to give a figure of how much this would cost the government but the sum would be "moderate".

The bill gives some exemptions, for instance for homeowners who are over 80 years old and living in hardship.

Those who violate the new rules face a fine of 5,000 euros, said the draft law, which will be now be debated in parliament.

Germany's push to phase out gas in heating became more urgent after Moscow's invasion of Ukraine prompted Berlin to halt Russian fossil fuel imports.

Heating uses up more than 40% of Germany's annual gas consumption as almost half of the country's 41 million households heat with natural gas while almost 25% use heating oil.

"We're starting comparatively late with this. Other countries have done this earlier," Habeck said, citing the heating sector in Scandinavian countries that are much less reliant on fossil fuel to keep their homes warm.

The bill means Germany would have to shut down more than 90% of its 500,000-km (310,685-mile) gas distribution network in the next 20 years, a study by Agora think-tank showed on Tuesday.

($1 = 0.9143 euros)

Around 78% of Germans are against the planned law, a survey by Forsa pollster published by ntv and RTL broadcasters showed on Wednesday. About 62% of those surveyed expect heating bills to rise after a switch to renewables, the poll showed.

Germany's association of local utilities, VKU, said the law was an "emotional roller coaster" as the time given for the changes it required was too short.

"The deadlines should therefore be extended. At least transitional periods are urgently needed," VKU said in a statement.

Environmental group Greenpeace called the bill a "milestone" for climate protection in Germany, and was long "overdue".

"In this way, Germany can achieve the climate protection goals in the future, which the building sector has exceeded for three years," it said.

Reporting by Riham Alkousaa, Markus Wacket and Christian Kraemer; editing by Matthias Williams and Emelia Sithole-Matarise

https://www.bloomberg.com/news/articles/2023-04-29/germany-sets-the-new-standard-for-cheap-national-mass-transit?utm_content=business&utm_campaign=socialflow-organic&utm_medium=social&cmpid%3D=socialflow-twitter-tv&utm_source=twitter&cmpid=socialflow-twitter-business

Germany Sets the New Standard for Cheap, National Mass Transit

- €49 buys a month of rides on all urban buses, trams and trains
- Plan puts pressure on government to upgrade patchy network

By *Josefine Fokuhl*, *Wilfried Eckl-Dorna* and *Feargus O'Sullivan*
April 28, 2023 at 11:00 p.m. MDT

Germany will start one of the most affordable public transit offers anywhere in the world on Monday, setting a new benchmark to encourage consumers to ditch their cars and putting pressure on Berlin to make the shift work.

For just €49 ($54) a month, holders get unlimited travel on all city buses, subways and trams in every municipality across the country. That means with one ticket — which breaks down to less than the cost on one espresso a day — you can ride buses along the shores of Lake Constance on the Swiss border and traverse Hamburg's harbor on the North Sea.

A railway platform display promotes the Deutschland-Ticket, in Berlin.

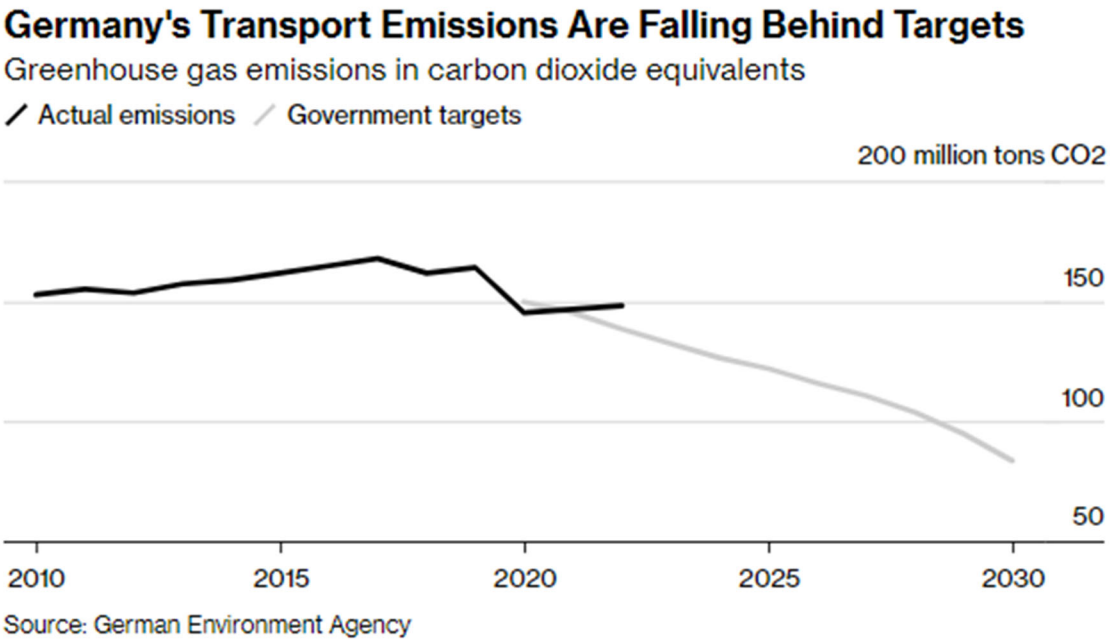
Photographer: Sean Gallup/Getty Images

Local and regional trains are included in the so-called Deutschland-Ticket, but not faster intercity services, as the idea is to encourage people to re-route short-distance travel.

The pass builds on the popular 9-euro ticket that was introduced last summer to help manage the energy crisis triggered by the war in Ukraine. While the new offer is notably more expensive, its proposed run of at least two years far exceeds its predecessor's three-month trial and indicates public transport is becoming a component of national policy rather than just a local service.

As part of the rollout, Chancellor Olaf Scholz on Thursday visited a bus depot in Berlin, throwing his weight behind the plan but also tying his reputation to its success.

The shift is sorely needed as the home of BMW, Mercedes-Benz and Porsche has struggled to make much of a dent in transport emissions. The sector has regularly missed targets for reducing carbon dioxide output and is well off the pace needed to nearly halve pollution by 2030.



The new ticket — available only by subscription — is priced well below normal monthly rates. To offset initial estimates of lost revenue, the federal government will provide €1.5 billion a year and Germany's 16 states have agreed to contribute the same amount. Any additional costs will also be split.

The plan though doesn't include investment in more services, which will likely limit its impact, according to Philipp Kosok, a public transport analyst at think tank Agora Verkehrswende.

"There is currently not one euro earmarked for expanded operations," he said. "We need a prioritization that says rail before road. We don't currently have that in German politics."

Despite the criticism, agreeing on the ticket was a major political act for Scholz's government. It involved getting more than 60 transport authorities to accept a digital-only ticket, a revolution for Germany where paper slips are often still the norm.

Germany's transit systems generally don't have turnstiles to control access. Passengers can hop on and off, but there are spot controls and fines for not having a valid ticket can be steep. In some regions, local operators don't have the technology to read chip cards or scan apps and may still demand printed proof. This may help kick-start a broader upgrade.

"The Deutschland-Ticket is an important step, which ultimately can help get more consumers onto trains," said Naren Shaam, chief executive officer and founder of Omio Group, an online travel comparison and booking site. "It's also proof that an interconnected, simplified transportation network is possible in Germany."

For commuters like Claudia Jutz, it's a rare instance of getting more for less. "It's a huge savings," said the 47-year-old billing clerk, who previously paid over 180 euros for a pass from her home on the outskirts of Munich.

Jutz was one of dozens of would-be buyers in a queue that snaked its way some 80 meters (nearly 90 yards) through a transit station below the Bavarian city's famed neo-gothic townhall. Armed with more travel freedom, she plans to visit nearby Salzburg in Austria with a friend, "which is something we wouldn't have done otherwise," she said.

That's one of the criticisms. The flat rate encourages people to take more leisure trips, adding stress to Germany's already-overloaded networks. Last summer's ultra-cheap offering led to widespread disruptions as passengers crammed into trains and buses. This time, operators anticipate less of a crush.

"We don't expect more passengers all of a sudden from one day to the next, as was the case with the 9-euro ticket," said a spokeswoman for national rail

operator Deutsche Bahn AG. “We’re assuming a noticeable, steady increase in demand,” including more traffic on weekends.

The impact of the ticket could ripple through to other countries by taking the potentially radical step of positioning transit systems as a public good to which all deserve affordable access. It could also be a model for others in the European Union, as the bloc aims to become climate neutral by 2050.

“Reinforcing the use of railway is an important priority for European governments,” Gonzalo Cantabrana Fernandez, a senior director at S&P Global.

But the impact might be modest in the near term. Germany’s unreliable train system serves as a disincentive for many consumers. On top of that, the lack of service in the countryside means people there are all but shut out.

“In rural areas, the willingness to buy a Deutschland-Ticket is low,” said Katharina Luca, a spokeswoman for German auto club ADAC, which surveyed members and found just 15% plan to use it.

Germany's also not using all the resources available. Private services like Omio aren't able to sell the ticket, and Deutsche Bahn-rival Flix SE lobbied the government to have its intercity bus services included, but fell short.

Volker Wissing at the launch of the Deutschland-Ticket in Berlin, on April 25.

Photographer: Sean Gallup/Getty Images

Germany's transport system has been a source of tension as climate activists regularly block traffic to protest the sluggish progress on green goals. Meanwhile, the ruling coalition is at odds over plans to expand the country's Autobahn network.

For fear of undermining the auto industry — a cornerstone of Europe's largest economy — some officials are signaling that the car remains the top dog. Transport Minister Volker Wissing even made the improbable suggestion that the 49-euro ticket could be given to everyone who buys a new vehicle.

While the simplicity of the offering will help, Germany still needs to focus on service to truly reduce road traffic, according to Andreas Barth, head of the Munich chapter of German passenger lobby Pro Bahn.

"The Deutschland-Ticket doesn't increase the number of trains," he said. "But it is a step in the right direction."

— With assistance by Iain Rogers

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IFIC Monthly Investment Fund Statistics – March 2023

Mutual Fund and Exchange-Traded Fund Assets and Sales

April 25, 2023 (Toronto) – The Investment Funds Institute of Canada (IFIC) today announced investment fund net sales and net assets for March 2023.

Mutual fund assets totalled $1.883 trillion at the end of March 2023. Assets increased by $15.3 billion or 0.8% compared to February 2023. Mutual funds recorded net redemptions of $3.4 billion in March 2023.

ETF assets totalled $337.1 billion at the end of March 2023. Assets increased by $9.2 billion or 2.8% compared to February 2023. ETFs recorded net sales of $6.8 billion in March 2023.

Mutual Fund Net Sales/Net Redemptions ($ Millions)*

Asset Class	Mar. 2023	Feb. 2023	Mar. 2022	YTD 2023	YTD 2022
Long-term Funds					
Balanced	(4,167)	(945)	257	(9,512)	8,419
Equity	(1,982)	423	1,104	(2,228)	8,733
Bond	497	2,365	(511)	6,324	(317)
Specialty	427	114	175	1,188	1,049
Total Long-term Funds	(5,225)	1,957	1,024	(4,227)	17,884
Total Money Market Funds	1,823	1,301	102	4,222	392
Total	(3,402)	3,258	1,126	(6)	18,276

Mutual Fund Net Assets ($ Billions)*

Asset Class	Mar. 2023	Feb. 2023	Mar. 2022	Dec. 2022
Long-term Funds				
Balanced	903.7	898.5	985.0	880.6
Equity	683.0	677.6	719.4	649.6
Bond	233.5	231.3	247.6	222.7
Specialty	23.7	23.2	22.6	22.3
Total Long-term Funds	1,844.0	1,830.6	1,974.6	1,775.2
Total Money Market Funds	39.2	37.3	27.0	34.5
Total	1,883.2	1,867.9	2,001.6	1,809.8

* Please see below for important information regarding this data.

ETF Net Sales/Net Redemptions ($ Millions)*

Asset Class	Mar. 2023	Feb. 2023	Mar. 2022	YTD 2023	YTD 2022
Long-term Funds					
Balanced	156	167	238	387	789
Equity	3,784	1,021	2,217	4,422	9,618
Bond	2,297	1,228	1,512	2,585	1,190
Specialty	(190)	313	498	615	895
Total Long-term Funds	6,047	2,729	4,465	8,010	12,492
Total Money Market Funds	795	1,371	116	2,441	688
Total	6,842	4,100	4,580	10,450	13,180

ETF Net Assets ($ Billions)*

Asset Class	Mar. 2023	Feb. 2023	Mar. 2022	Dec. 2022
Long-term Funds				
Balanced	13.0	12.7	12.4	12.0
Equity	209.3	204.3	213.0	194.9
Bond	84.4	81.3	78.2	80.4
Specialty	11.7	11.6	14.2	10.2
Total Long-term Funds	318.4	310.0	317.7	297.5
Total Money Market Funds	18.7	17.9	7.0	16.3
Total	337.1	327.9	324.7	313.7

* Please see below for important information regarding this data.

IFIC direct survey data (which accounts for approximately 85% of total mutual fund industry assets and approximately 83% of total ETF industry assets) is complemented by estimated data to provide comprehensive industry totals.

IFIC makes every effort to verify the accuracy, currency and completeness of the information; however, IFIC does not guarantee, warrant, represent or undertake that the information provided is correct, accurate or current.

*** Important Information Regarding Investment Fund Data:**

1. Mutual fund data is adjusted to remove double counting arising from mutual funds that invest in other mutual funds.
2. Starting with January 2022 data, ETF data is adjusted to remove double counting arising from Canadian-listed ETFs that invest in units of other Canadian-listed ETFs. Any references to IFIC ETF assets and sales figures prior to 2022 data should indicate that the data has not been adjusted for ETF of ETF double counting.
3. The Balanced Funds category includes funds that invest directly in a mix of stocks and bonds or obtain exposure through investing in other funds.
4. Mutual fund data reflects the investment activity of Canadian retail investors.
5. ETF data reflects the investment activity of Canadian retail and institutional investors.

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For more information please contact:

Pira Kumarasamy
Senior Manager, Communications and Public Affairs
pkumarasamy@ific.ca
416-309-2317