Performatica Webinar

LNG Industry Outlook

Followed by a Panel Discussion

Agenda

Subject	Speakers	Timeline
Introduction	Murthy Divakaruni	-
LNG Value Chain	Dr Darukhanavala	10 mins
LNG Industry Outlook	V.V. Rao	35 mins
Panel Discussion	John Baumgartner	15 mins
Q&A	All Participants	15 mins

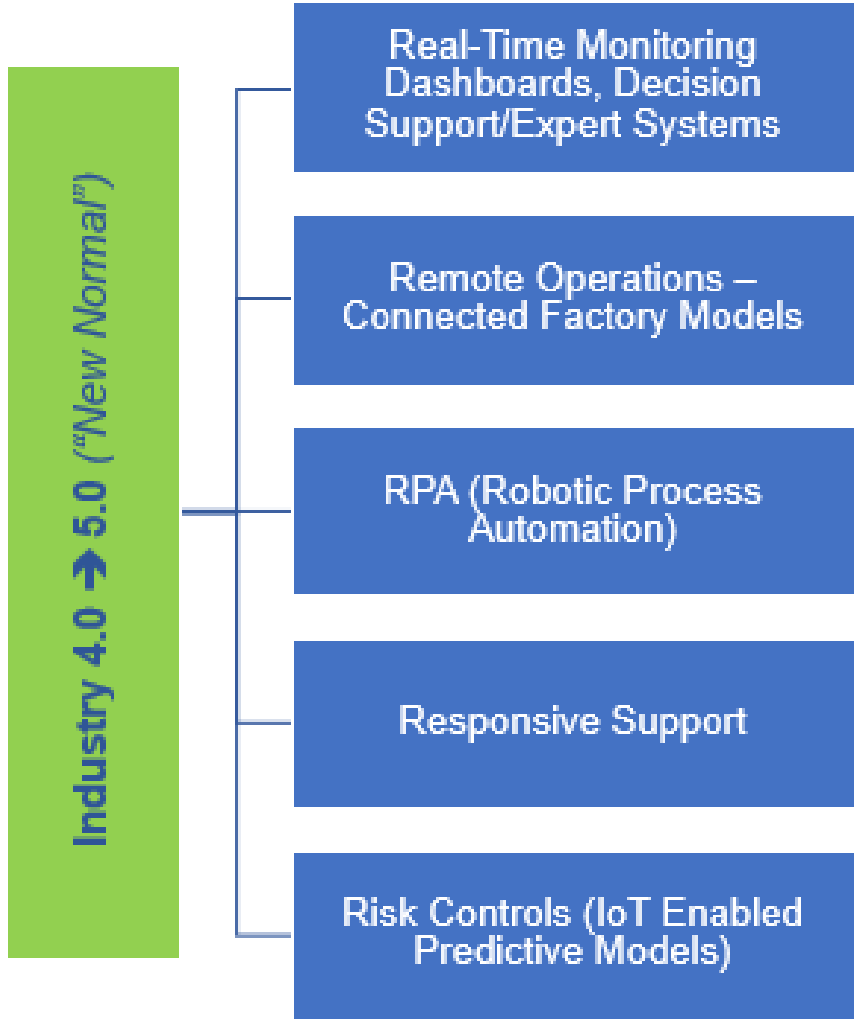
Performatica - Introduction

Management Consulting

- Advisory Services
- Business Performance
- Vertical Solutions
- Design Thinking for Smart Organization

Technology Consulting

- Energy & Sustainability
- Power & Renewables
- Manufacturing & Industrials
- Connected Healthcare



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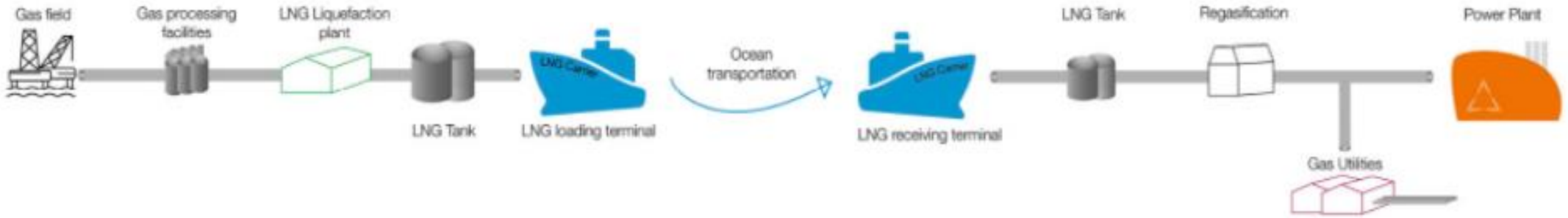
LNG Value Chain

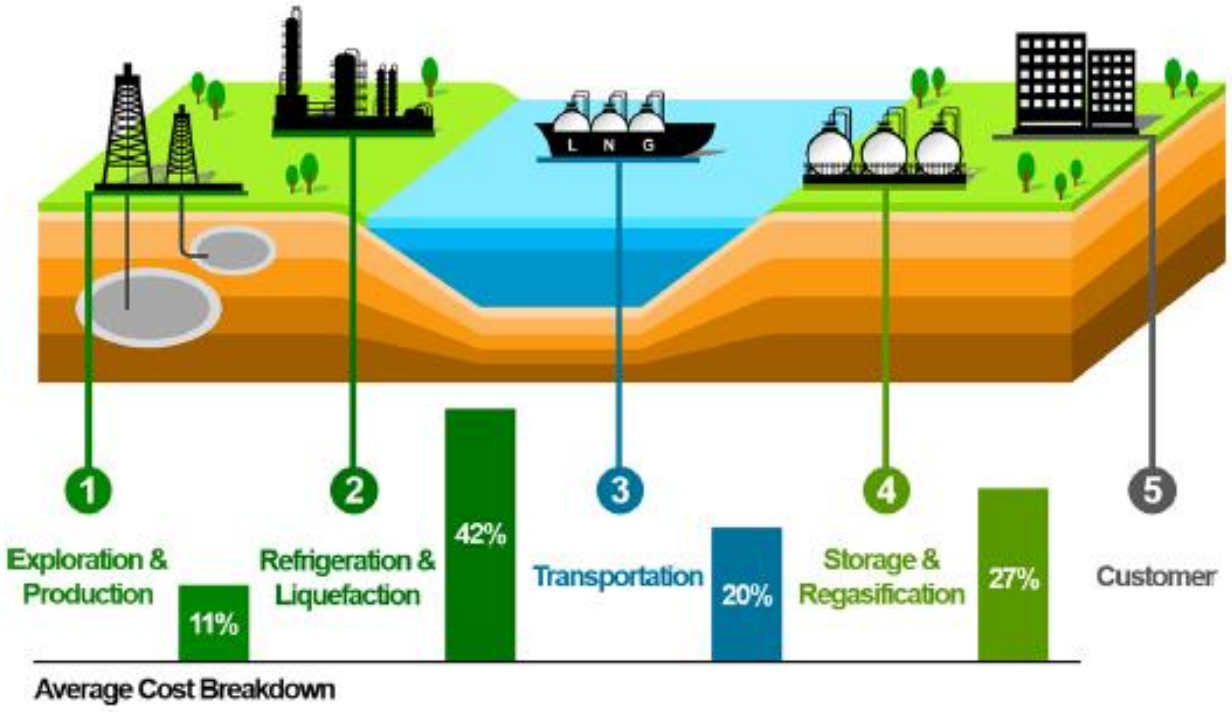
Source - Industrial & Engineering Chemistry Research



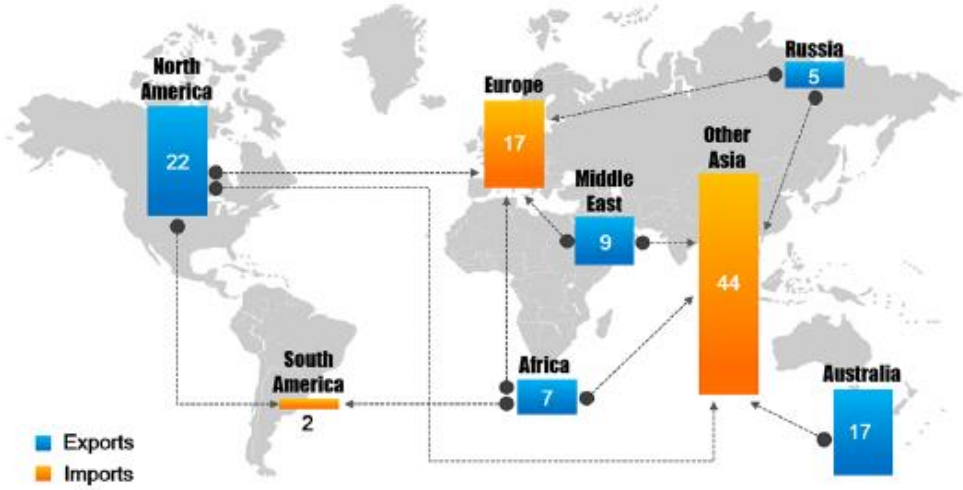
The LNG value chain starts with gas extraction/production followed by pre-treatment/processing and liquefaction. Then the LNG is stored in large insulated tanks ready for transport. It is transported with specially built LNG tankers across oceans. At the receiving end, LNG is pumped to large on-shore tanks or off-shore FS(R)Us. Finally LNG is regasified and pumped into the local gas pipelines or further transported by trucks in the form of LNG.

LNG Value Chain – Cost Breakdown and Projected Demand

Source - Industrial & Engineering Chemistry Research



LNG value chain and the cost breakdown



Projected net LNG exports and imports in 2035 (Bcf/d)

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LNG Update

January 2021

LNG Industry Journey in 2020

- The year started with most expecting LNG demand to rise to almost 380 mtpa. (2019 was 360). In Jan, Chinese demand dropped. Asia & Europe followed in the Spring as COVID set-in. At that point, forecasts expected 2020 demand to stay at 2019 levels or worse. The other exacerbating factor was that over 20 mtpa of new capacity, especially in the US, was coming online in 2020.

- Hence, there was a "swing" in the supply - demand supply balance of almost 35 mtpa negative. In order to physically rebalance the LNG market, several things happened:
    1. *As the Europe-US Arbitrage window closed, US LNG exports stopped.*
    2. *LNG Buyers exercised downward flexibility and cancelled cargoes.*
    3. *LNG was "stored" either in LNG Tanks, LNG Ships or via gas pipeline storage.*

- Just when things were looking dark, demand rebounded in China, later Asia and then Europe. There was also some opportunistic buying in markets like India. Now the forecast is that 2020 could see demand again in the low to mid 360 mpta range. Another balancing factor was Liquefaction outages in Australia and Norway and Ukraine storage.

- Many proposed Liquefaction projects were suspended or cancelled. Except Qatar which kept moving forward with its plans to add over 30 mtpa of new facilities by later 2020's.

- Only one project was sanctioned (ECA in Mexico) – 2 mpta.

LNG prices varied more than any other year on record

Spot Price (JKM) started the year at $5.00/MMBtu, went down to $2.00 and closed at $15/MMBtu

June	**Worst of the worst**. New US facilities on-line. Global Demand Destruction. Everything working from a logistics and infrastructure standpoint. Only Silver Lining is that China seems to have recovered from initial COVID demand shock.	$2.11
Aug	**A slight opening**. US Exports Stop. Australia/Norway LNG projects have outages. Russians decide to back off on exports due to low price.	$3.69
Oct	**Moving back to equilibrium**: US Exports Resume. Australia/Norway outages continue. Qatar starts having problems. Winter arrives in Northern Hemisphere.	$6.21
Dec	**Things start getting tight**: Outages expand : Australia/Norway/Qatar/Angola, Trinidad. Winter arrives with a bang in China, Japan, Korea. Shipping gets very tight and Panama Canal runs out of capacity. Dec 31 closing price $15.10.	$10.82
Jan	**All "H#ll" Breaks Loose**: Continuing outages, very cold winter, inventories down, Dutch gas fields have problems, Japan Nuclear Plants are down, etc. Prices spike to $30 range briefly.	$17.25

Thoughts about the 2020 Spot Price journey

- LNG is the least mature segment of the natural gas industry. Small perturbations of demand, supply or logistics can lead to dramatic price spikes or price depressions. LNG spot price varied by almost a factor of 15 in less than one year. Oil has never done that!

- Weather, particularly in NE Asia, can play a huge role in price determination. And it will play a bigger role as customers increasingly rely on shorter term contracts. Japan, Korea and China buy up to 170 mtpa which is about 45% of 2020 LNG demand.

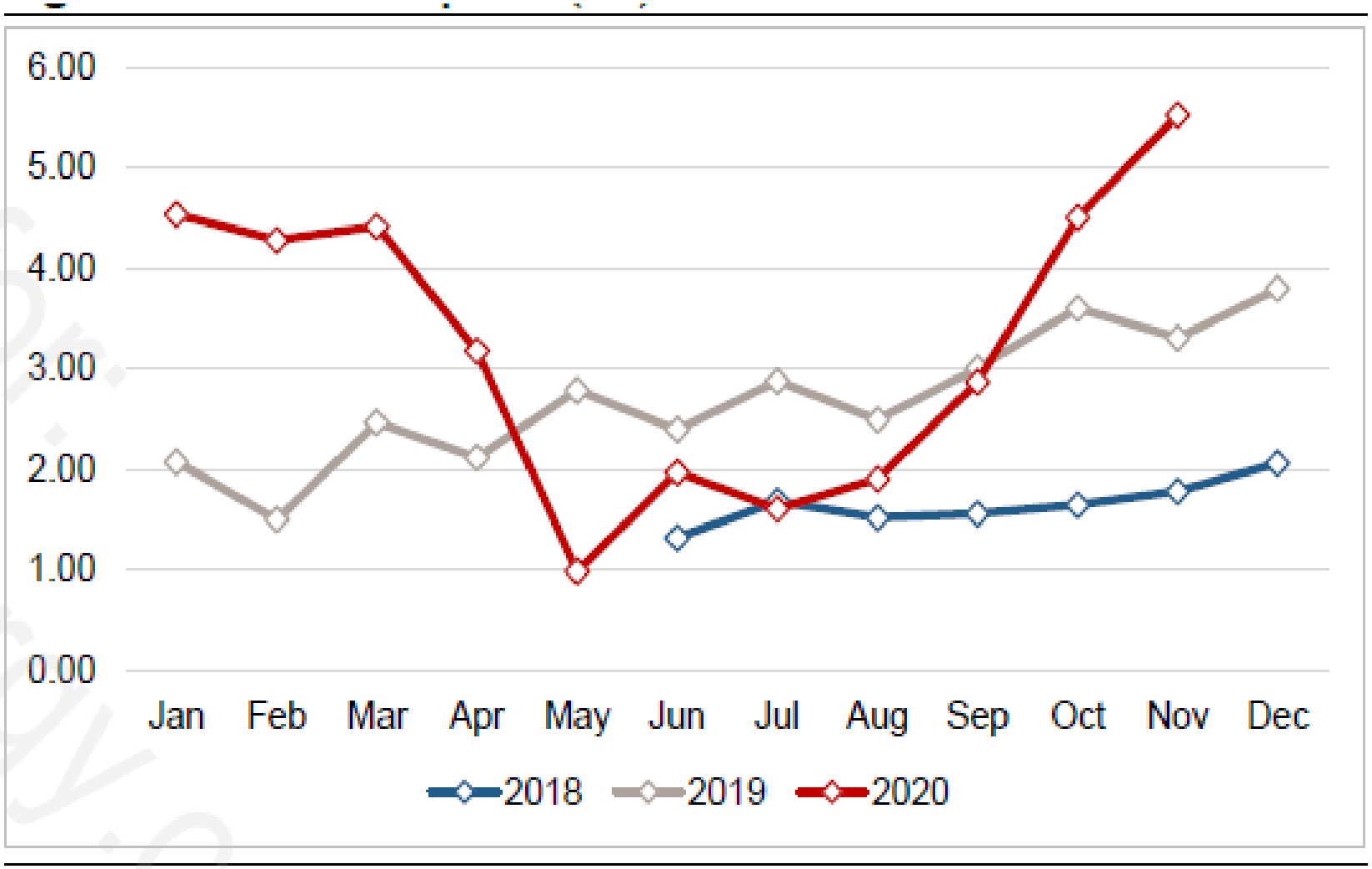
- And when this demand comes, it is inelastic, serves essential customer segments and alternate gas supply sources are not available in country (except for a bit of China).

- Hard to see how JKM can be hedged for long periods of time let alone to see how JKM is a financeable index for new greenfield LNG projects.

- Circumstances in the LNG industry can, have and do change dramatically over short periods of time.
  - Three years ago, everyone was developing US LNG
  - Six months ago, no one was developing US LNG
  - A few perceptional factors could change how developers view the world in six months.

US LNG Exports reflected the broader LNG industry trends

A Wild Ride: Started normally, went super bearish and then swung up sharply with high JKM

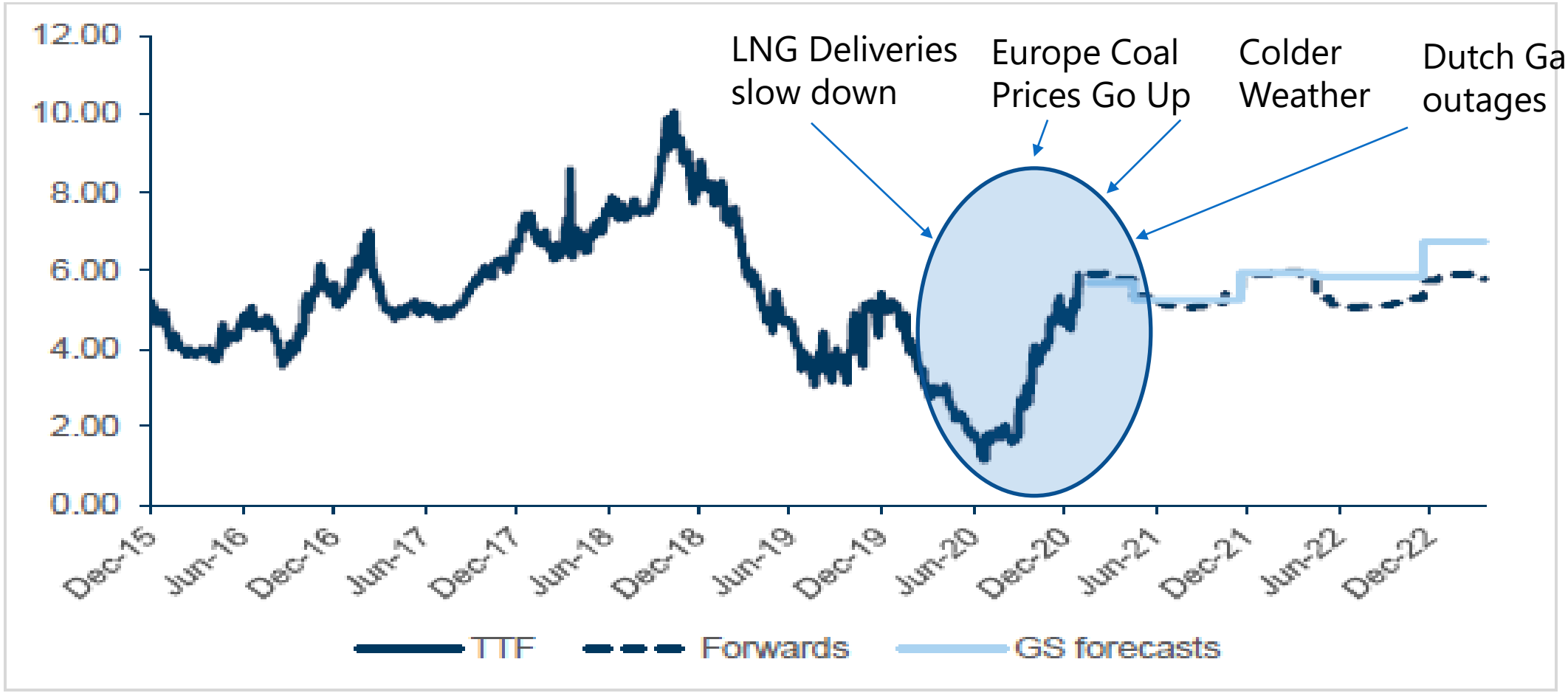


- US LNG Liquefaction Plants are reporting that exports are almost back to normal levels.
- Nevertheless, US Exports will be much lower than the 50-55 mtpa that was expected the beginning of 2020. Perhaps around 40 mtpa.
- Right now, any spare LNG cargoes are garnering massive margins but there are those expecting lower exports in summer 2021 with remote possibility of shut-ins.

Source: Credit Suisse 2020

European Spot Prices varied significantly – similar trend line to JKM

Europe gas prices are relevant because Global gas is interconnected and a home for US LNG



Source: ICE, Platts, Goldman Sachs Global Investment Research

Near Term Gas/LNG Forecasts and Forwards (Jan 2021)

Despite low 2020 gas prices, they are expected to rise

Forwards as of January 12th, 2021

Natural Gas	NYMEX Henry Hub ($/mmbtu)		TTF ($/mmbtu)			JKM ($/mmbtu)			API2 coal ($/t)	
	Forecast**	Fwrds	Forecast	Prev.	Fwrds	Forecast	Prev.	Fwrds	Implied in our base case for Europe	Fwrds
* Winter 20/21	3.25	2.73	8.30	6.65	8.56	14.30	12.65	16.82	69.10	72.40
* Summer 21	3.25	2.80	6.30	5.25	6.39	7.20	6.05	7.15	62.00	72.79
* Winter 21/22	2.75	3.01	6.60	5.95	6.91	8.50	7.75	8.11	62.00	73.51
* Summer 22	2.75	2.51	6.30	5.85	5.64	7.25	6.80	6.12	62.00	73.89
* Winter 22/23	2.75	2.72	6.90	6.75	6.23	8.95	8.80	7.12	62.00	73.70

* Winter 20/21: Feb-Mar; Summer: Apr-Oct; Winter Nov-Mar

** NYMEX gas forecast reverts to our long-term forecast from Nov21.

Source: ICE, Platts, CME, Goldman Sachs Global Investment Research

- Goldman thinks that forwards are not properly factoring in the tightness in the Gas and LNG Market and hence forwards are too low relative to their forecast.
- Short Term Tightness is due to various factors: LNG moving to Asia, colder winters, less medium term LNG additions, decline in some Dutch gas fields, etc.
- JKM TTF differential is key: A $1.00 + differential moves LNG away from Europe to Asia.

LNG Supply / Demand Balance

Demand is still growing but less than before

MTPA

		2015	2016	2017	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E	yoy 19	yoy20	yoy21	yoy 22	yoy 23	yoy 24	yoy 25	
Supply	Qatar	81	80	79	79	80	80	79	79	79	79	89	0.8	0.0	-0.8	0.0	0.0	0.0	9.6	Qatar
	Australia	30	45	57	70	79	80	81	81	78	77	77	8.4	1.7	0.2	0.3	-3.1	-0.5	-0.3	Australia
	United States	1	3	14	23	37	48	71	74	80	84	90	14.0	11.6	22.7	3.0	6.3	3.1	6.2	United States
	Russia	11	11	11	19	30	31	30	31	31	36	44	10.9	0.5	-1.1	1.8	0.0	4.3	7.8	Russia
	Malaysia	25	25	27	25	26	24	26	27	27	27	27	1.8	-2.6	2.3	0.4	0.0	0.0	0.0	Malaysia
	Nigeria	21	18	21	20	22	21	21	21	21	21	21	1.1	-0.1	-0.8	0.0	0.0	0.0	0.1	Nigeria
	Indonesia	17	17	17	16	13	13	12	12	12	12	12	-3.3	0.1	-0.5	0.1	0.2	-0.1	-0.3	Indonesia
	Trinidad	14	12	11	13	14	12	13	13	13	13	13	0.6	-2.0	1.5	0.0	0.0	0.0	0.0	Trinidad
	Algeria	12	12	13	10	13	11	12	13	13	13	13	2.3	-1.7	1.0	0.5	0.0	0.0	0.0	Algeria
	Mozambique	0	0	0	0	0	0	0	1	3	3	9	0.0	0.0	0.0	1.0	2.0	0.5	5.5	Mozambique
	Canada	0	0	0	0	0	0	0	0	0	0	2	0.0	0.0	0.0	0.0	0.0	0.0	1.5	Canada
	RoW Supply	41	42	46	48	52	48	49	54	55	57	60	3.8	-4.1	1.0	4.9	0.9	2.8	2.6	RoW Supply
	World Supply	**252**	**264**	**296**	**324**	**365**	**368**	**394**	**406**	**412**	**422**	**454**	**40.3**	**3.5**	**25.5**	**12.0**	**6.2**	**10.0**	**32.6**	**Total**
Demand	Asia	180	189	215	245	251	260	280	301	316	330	346	6.4	9.3	20.0	20.8	15.2	13.5	16.2	Asia
	Japan	87	84	86	86	79	77	78	81	77	76	78	-6.4	-2.8	1.7	2.4	-3.7	-0.7	1.4	Japan
	South Korea	34	34	39	46	42	43	42	40	40	42	44	-3.6	0.4	-0.7	-2.1	0.4	1.8	2.4	South Korea
	Mainland China	20	28	40	56	64	71	83	94	103	109	115	7.9	6.5	12.1	10.6	9.5	6.4	5.7	Mainland China
	India	16	19	20	23	25	28	30	34	38	40	41	1.5	3.3	1.9	4.2	4.1	1.7	0.9	India
	Taiwan	15	15	17	17	17	18	18	19	20	21	23	-0.4	1.3	0.3	0.5	1.0	1.0	1.7	Taiwan
	Pak-Ban	1	3	5	8	12	12	14	15	15	15	15	4.6	-0.4	2.1	0.9	0.2	0.0	0.0	Pak-Ban
	SE Asia	6	6	8	9	11	12	15	19	23	26	30	2.7	0.9	2.5	4.3	3.9	3.3	4.2	SE Asia
	Middle East	10	18	16	10	7	7	7	9	11	12	13	-3.2	0.3	0.2	1.8	1.8	1.0	0.8	Middle East
	OECD Europe	39	39	47	50	89	87	91	80	69	64	80	39.0	-2.6	4.7	-11.9	-10.7	-4.4	15.7	OECD Europe
	South America	13	9	9	8	7	6	6	6	6	6	6	-1.7	-0.2	-0.3	-0.3	0.0	-0.2	0.0	South America
	Central & North America	10	9	9	10	10	7	8	8	7	7	7	0.1	-3.4	0.9	-0.1	-0.6	-0.2	0.0	Central & North America
	RoW Demand	0	0	0	1	0	0	1	2	3	3	3	-0.2	0.1	0.1	1.6	0.5	0.2	0.0	RoW Demand
	World Demand	**252**	**264**	**296**	**324**	**365**	**368**	**394**	**406**	**412**	**422**	**454**	**40.3**	**3.5**	**25.5**	**12.0**	**6.2**	**10.0**	**32.6**	**Total**

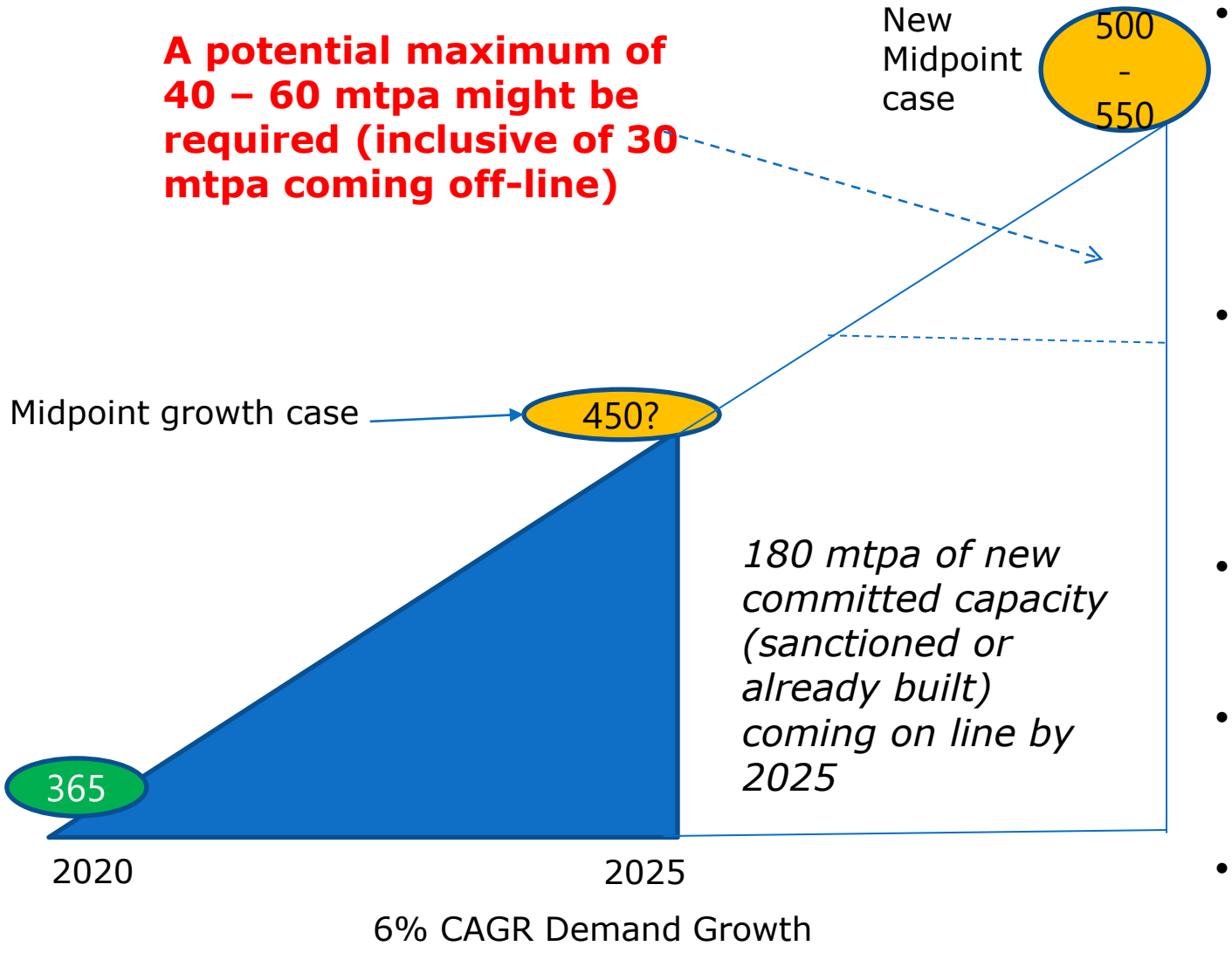
Footnote

1. RoW supply = Angola, Brunei, Cameroon, Egypt, Equatorial Guinea, Norway, Oman, Papua New Guinea, Peru, UAE, Yemen, Argentina, Mauritania
2. SE Asia = Malaysia, Philippines, Singapore, Thailand, Myammar, Sri Lanka, Vietnam, Hong Kong
3. Middle East = Bahrain, Egypt, Israel, Jordan, Kuwait
4. Row demand = Cyprus, Malta, Papua New Guinea, Russia, Ukraine, Ghana
5. We use a conversion factor of 0.45 from cubic meter to mt
6. Australia, Indonesia and UAE exports are now calculated net of imports

Source: Kpler, Goldman Sachs Global Investment Research

The 2020's will see some growth – but less than before

Qatar well positioned to capture some of it. But other regions have an opportunity –albeit smaller one



- The 2030 demand may be 100 mtpa less than was forecasted a year ago. Even though forecasts are fickle, it wouldn't be unreasonable to think that at least 50 mtpa of 2030 demand has shifted right.
- There is already 75 mtpa of projects that have reached FID since 2019. And over 100 mtpa of capacity is expected to come on line by 2025.
- Off-setting this is about 30 mtpa that will come off-line over the next decade.
- This leaves potentially 40 to 60 mtpa that is "up for grabs" globally.
- Qatar is probably in pole position to capture some of that. Perhaps 10 mtpa+?

Proposed New Liquefaction Projects

Contenders

	REGION	TYPE	SIZE (mtpa)	Key' shareholders
Papua LNG	Papua New Guinea	Brownfield	8	XOM, TOT, Oil Search
Sakhalin-2 T3	Russia	Brownfield	5.4	Gazprom, RDS + Japanese
Pluto T2	Australia	Brownfield	4.5	Woodside
Cameron LNG T4-5	US	Brownfield	9	Total, Sempra + Japanese
Freeport LNG T4	US	Brownfield	5	
			31.9	

	REGION	TYPE	SIZE (mtpa)	Key' players
Qatari expansions	Qatar	Greenfield	33	QP + tbd
Qatari extra expansions	Qatar	Greenfield	16	QP + tbd
Obsky LNG	Russia	Greenfield	5	NVTK
Ust-Luga LNG	Russia	Greenfield	13	Gazprom
Moz LNG (Area 4)	Mozambique	Greenfield	15.2	XOM, ENI, Kogas, CNPC, Galp
Tortue Ph 2 & 3	Mauritania/Senegal	Greenfield/Brownfield	7.5	BP, Kosmos
Driftwood Ph 1	US	Greenfield/Brownfield	16.6	Tellurian Inc (indirectly Total)
Port Arthur Ph 1	US	Greenfield/Brownfield	13.5	Sempra
Rio Grande Ph 1 (3-trains)	US	Greenfield	16.5	NextDecade
Woodfibre	Canada	Greenfield	2.1	PO&G (backed by Chinese off-takers)
			138.4	
TOTAL			170.3	

Source: Company data, Credit Suisse estimates

Looking ahead to 2021 - 2025

- Pricing will likely remain in the 10-11% range for 2021 but could trend upward as existing surplus capacity is "eaten" up. Contracting for LNG in 2022 would likely require new greenfield projects which have a breakeven of about $7.00/MMBtu. This might push slopes above 11%.

- 2021-2025 demand growth rates are in the 2-3% range. Might be 450 mtpa in 2025. Early last year, forecasters were predicting a 2025 demand in the 475-500 mtpa.

- So new capacity is needed but not as much as predicted earlier. This leaves less room for new capacity. Many US projects now seem to be priced out except maybe for some brownfields.

- Qatar seems determined to provide some of this new capacity perhaps as much as 15-20 mtpa (2 trains) and is well positioned to do this. Mozambique seems committed.

- While HH seems out of favor with LNG Buyers now but that may depend on what restrictions other Sellers (i.e. Qatar) impose on terms like destination flexibility or the trajectory of other indexes.

Variables in the Future and Things to Watch For

Near Term

- Pace and depth of COVID economic rebound on global gas demand.
- Does LNG development euphoria return in 2021-22? Or do the big boys regain control?
- Do US LNG shut-ins return in summer? If so, this means high JKM Price were really a "blip"
- Does great price volatility "scare" LNG buyers into longer term contracts with predictable index?

Medium Term

- Qatar has not "blinked" so far on development. What is their ambition. Do they go for it?
- Do 2020 price swings on JKM, TTF, Oil impact their use as an index? Does HH gain traction?
- Is increasing renewable competition offset by decarbonization policies vis a vis gas demand?
- 2020 a difficult year for LNG traders. Where do they go and how do they do it?

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Panel Discussion

LNG Industry : Applying the latest techniques

Safer, Reliable, Predictable LNG Plant Performance

Technology

- **IT/OT INTEGRATION** - Unlock potential improvements by integrating Business & Operating systems for 360 degrees view
- **AUTOMATION** - Leverage the advancements in automation from plant controls to data gathering
- **SIMULATION** - Utilize Scenario analysis for enhanced operational knowledge, prioritization and business outcomes
- **PREDICTIVE ANALYTICS & INSIGHTS** - Benchmarking operational safety & risk management

Management

- **PROJECT MANAGEMENT** - CAPEX investments demand collated and concerted action of all stakeholders during the project lifecycle
- **SUPPLY CHAIN MANAGEMENT** – Logistics and supply chain KPIs to be integrated with production schedules to respond to market opportunities
- **CHANGE MANAGEMENT** - Manage change across business processes with minimal disruptions and risks
- **DESIGN THINKING** - Factor in multiple personas & viewpoints in steering though volatile environments

LNG Industry : Automation, Analytics and AI Solutions

01	Risk Analytics - Predicting Safety Incidents
02	ECM Analytics - ECM Controls vs Analytics
03	LNG Plant's Performance Forecasting
04	Spill Analytics – Predicting Accidents/Spills
05	Predictive Modelling/KPI Dashboards
06	Auto Reporting for Plant's Safety Incidents and Non-Compliance

Q&As/ Takeaways

- Low prices and as a low-carbon emission fuel, LNG will continue to enjoy market share.
- Improve operating efficiencies in new plant commissions and provide latest in management and technological solutions all along the LNG Value Chain.
- Leverage digital technologies and the latest in management techniques to improve LNG operations.

Takeaways

Thank you

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