ASSESSING ENERGY POLICY IN RESOURCE RICH COUNTRIES: LNG IMPORT IN SAUDI ARABIA

Acknowledgment

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By Matt Egan, CNN Business

Updated 1928 GMT (0328 HKT) May 22, 2019

ASSESSING ENERGY POLICY IN RESOURCE RICH COUNTRIES

- Question: What is the value of integrating Saudi Arabia in global natural gas market?

  - Why Saudi Arabia is using oil for power generation?
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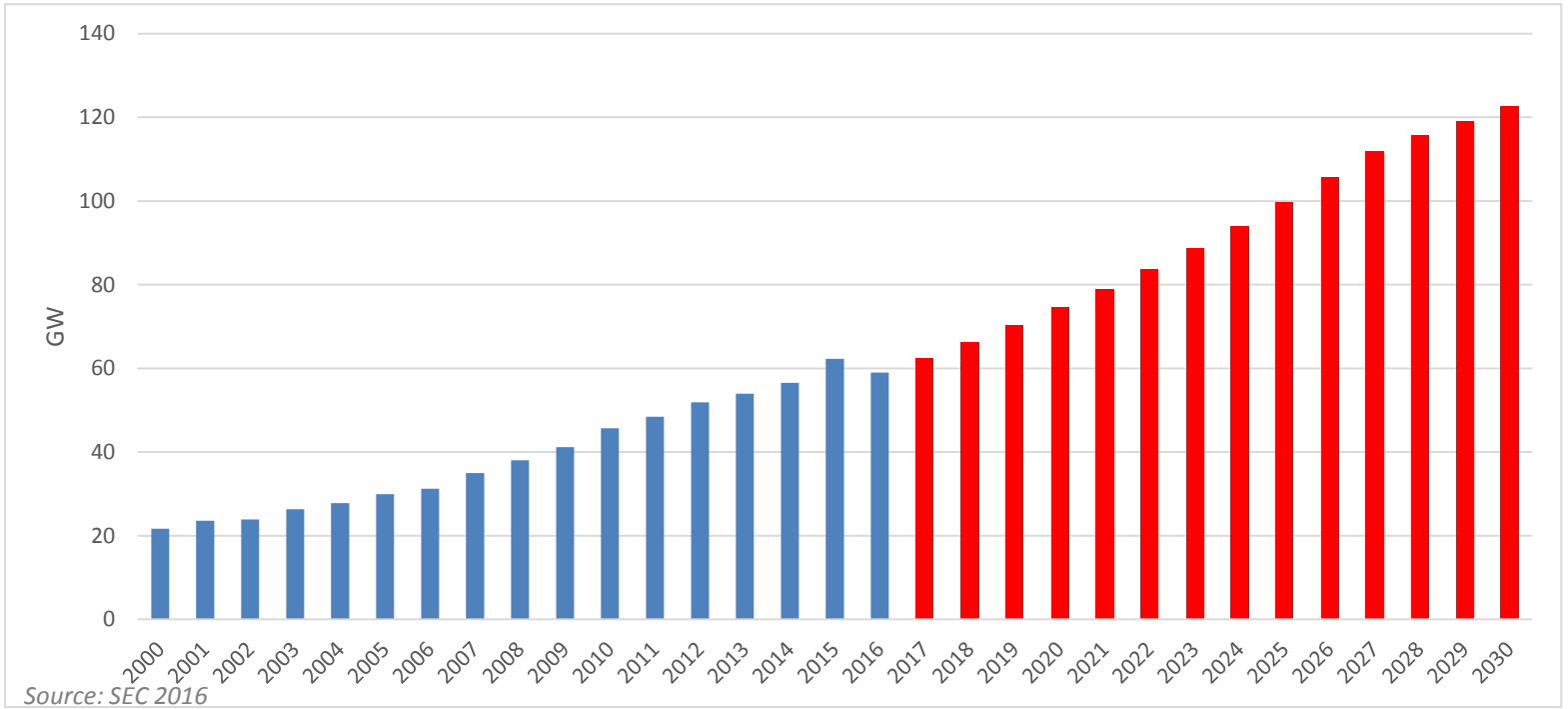
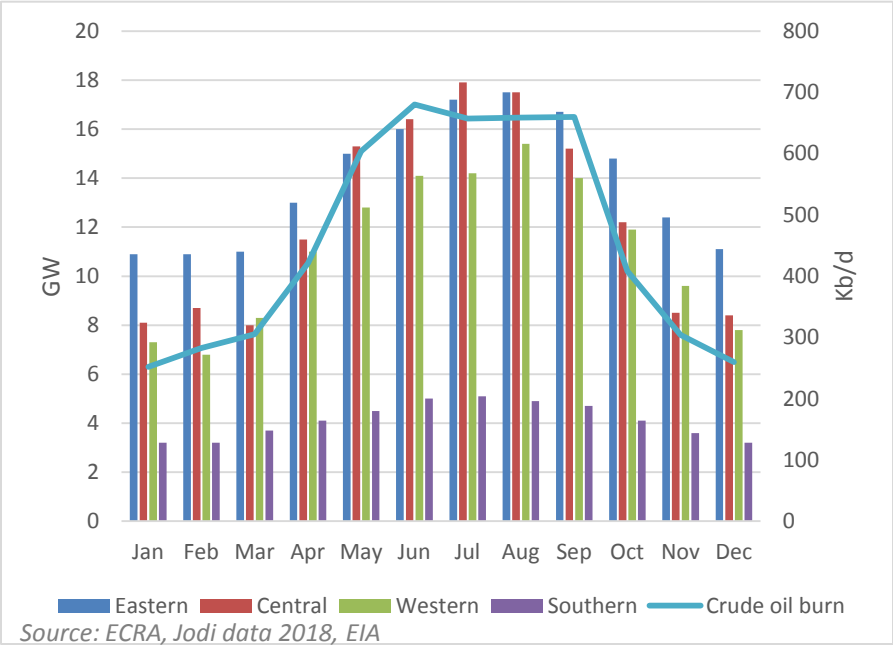
Peak load demand expected to increase

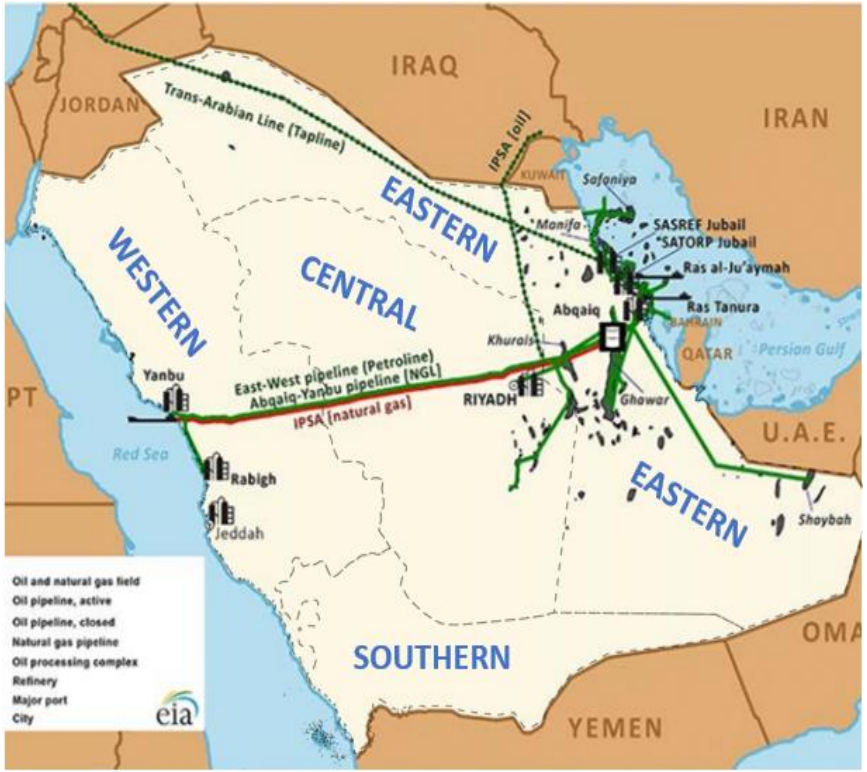


Source: SEC 2016

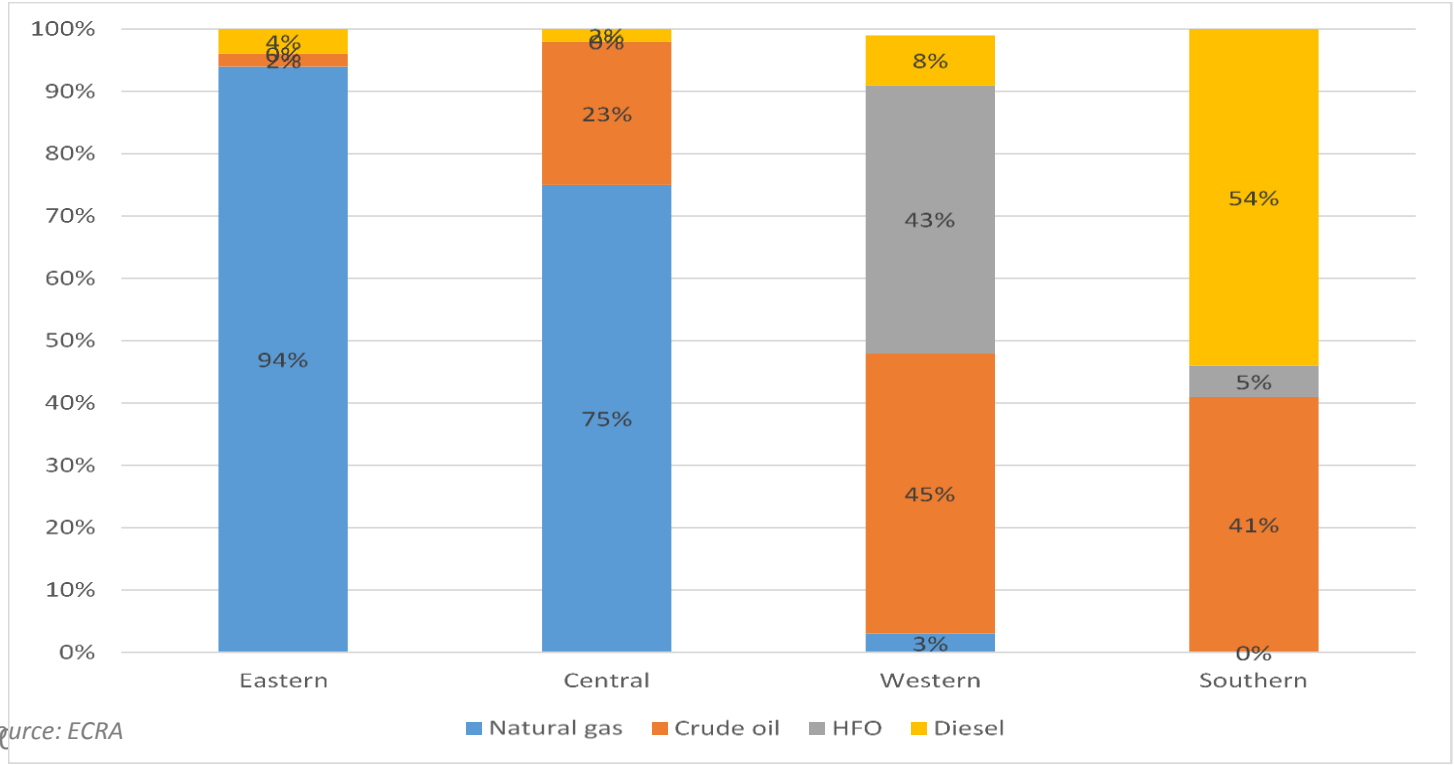
Monthly average load variation in Saudi Arabia by region, 2017



Source: ECRA, Jodi data 2018, EIA

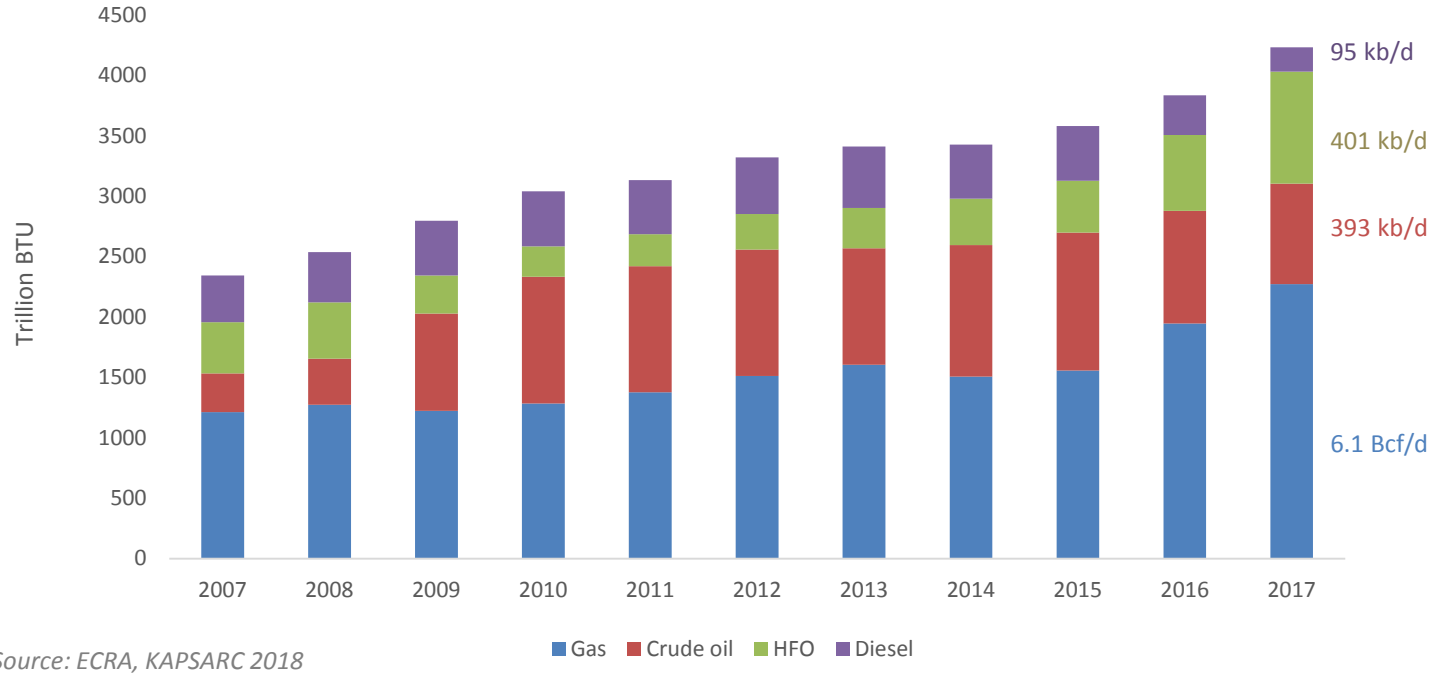


Distribution of Annual Fuel Consumption by region, 2017



Source: ECRA

Yearly fuel consumption of power and seawater desalination by type



Source: ECRA, KAPSARC 2018

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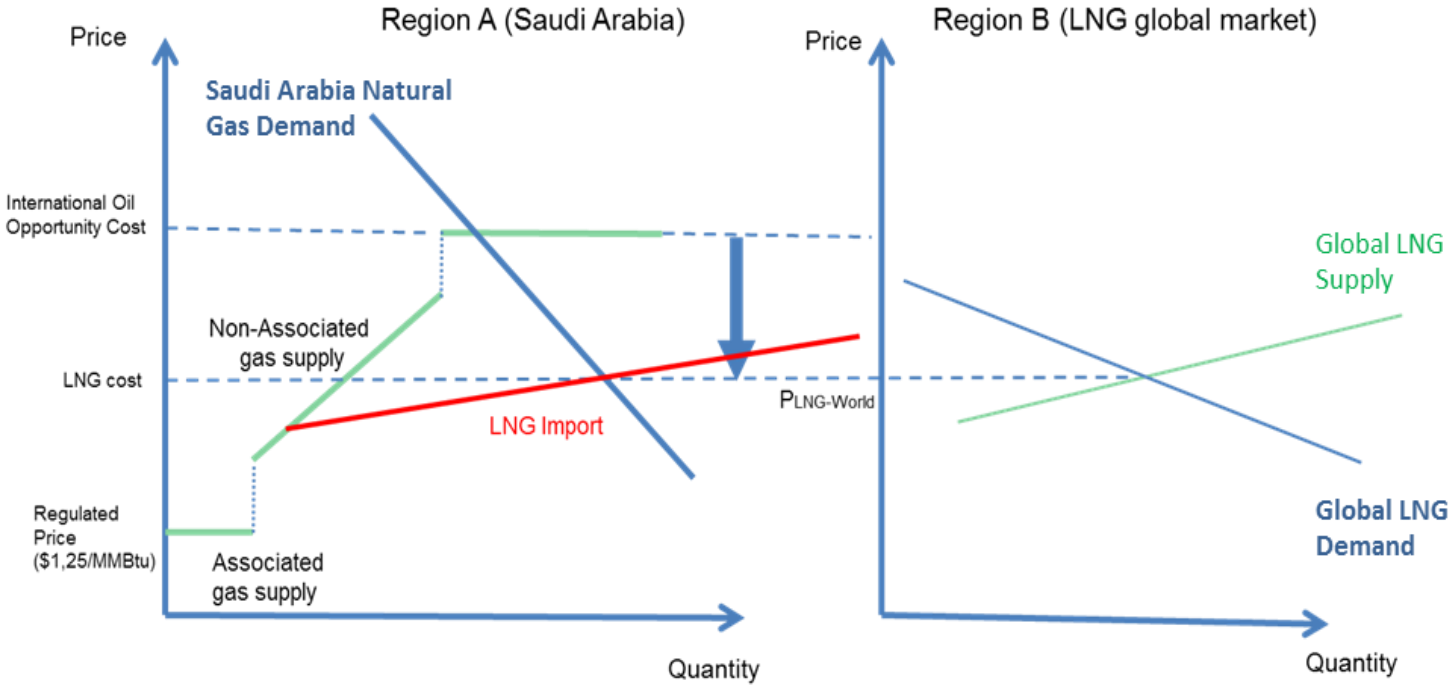
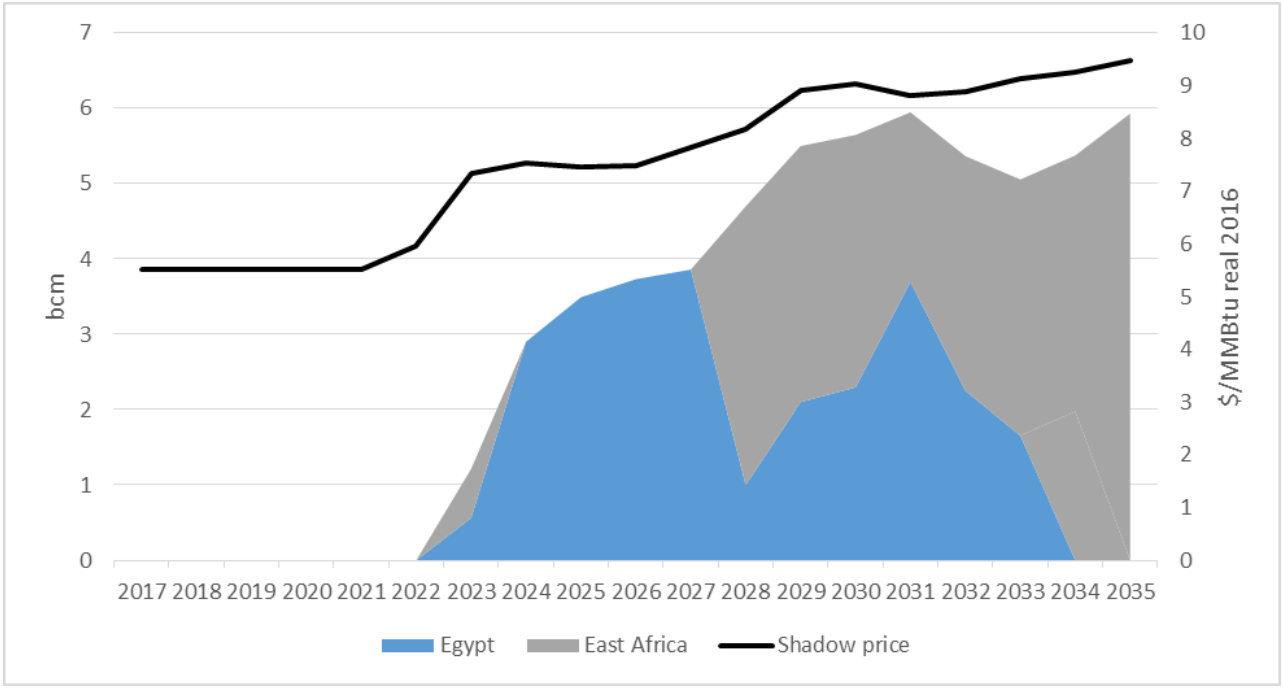
Supply curve for power generation including international LNG trade



Model Specifications

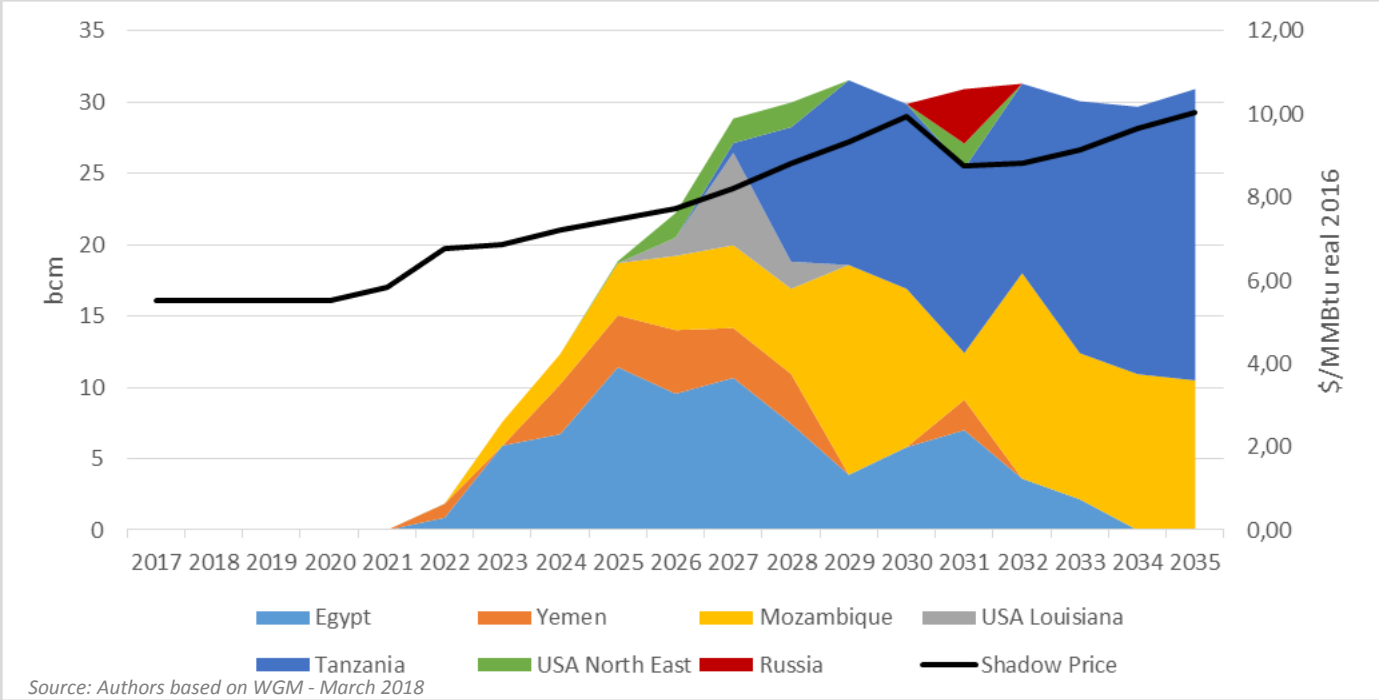
- We use a partial equilibrium model that is specified as a linear programming problem (Nexant 2018).
- The model has a dynamic nature: it considers a long time horizon (2040) that is further decomposed using a quarterly time resolution. From a spatial perspective, the representation used in the model includes all the countries that produce, consume and transit gas.
- Overall, the model mimics the decisions of a benevolent social planner that seeks to minimize the total cost of all the components of the global gas supply chain: including extraction, pipeline and LNG transportation and underground storage.
- The calibration of the model is conducted using Nexant's proprietary database, Kapsarc data and authors' analyses regarding Saudi Arabia and the world energy features that typically provides the trajectory of future demand levels at the consuming nodes, the cost and capacities at the extraction nodes, the characteristics of the infrastructures.
- The western coast of Saudi Arabia presents the best location for an LNG import terminal. All LNG routes and distances were calculated from each export terminal that exists and planned into the Saudi receiving port (Voyage Planner 2018).
- WGM's cost assumptions for Kuwait's FSRU are used as a cost benchmark.
- It is assumed that Saudi Arabia would start importing in 2021.

Simulation of (6,8 bcm) 5 MTPA LNG import into Saudi Arabia



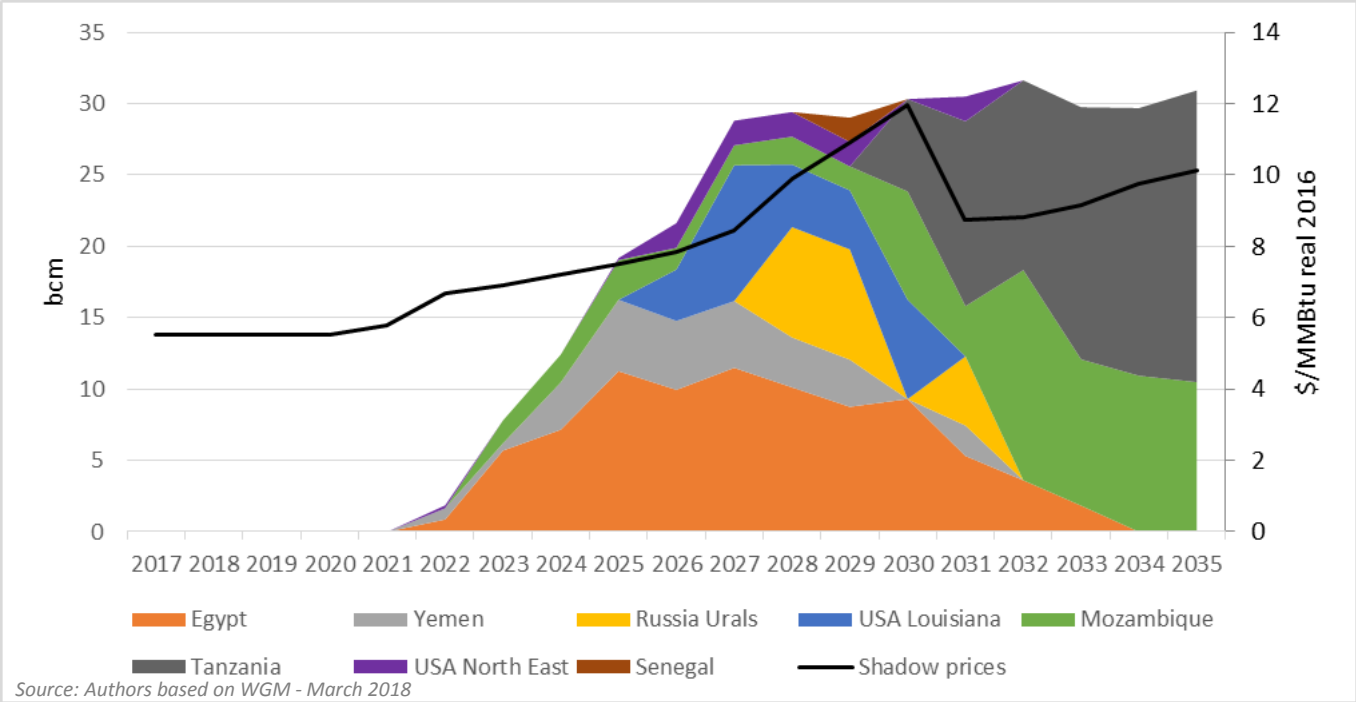
Source: Authors based on WGM - March 2018

Simulation of a 30 bcm (22 MTPA) LNG imports into Saudi Arabia



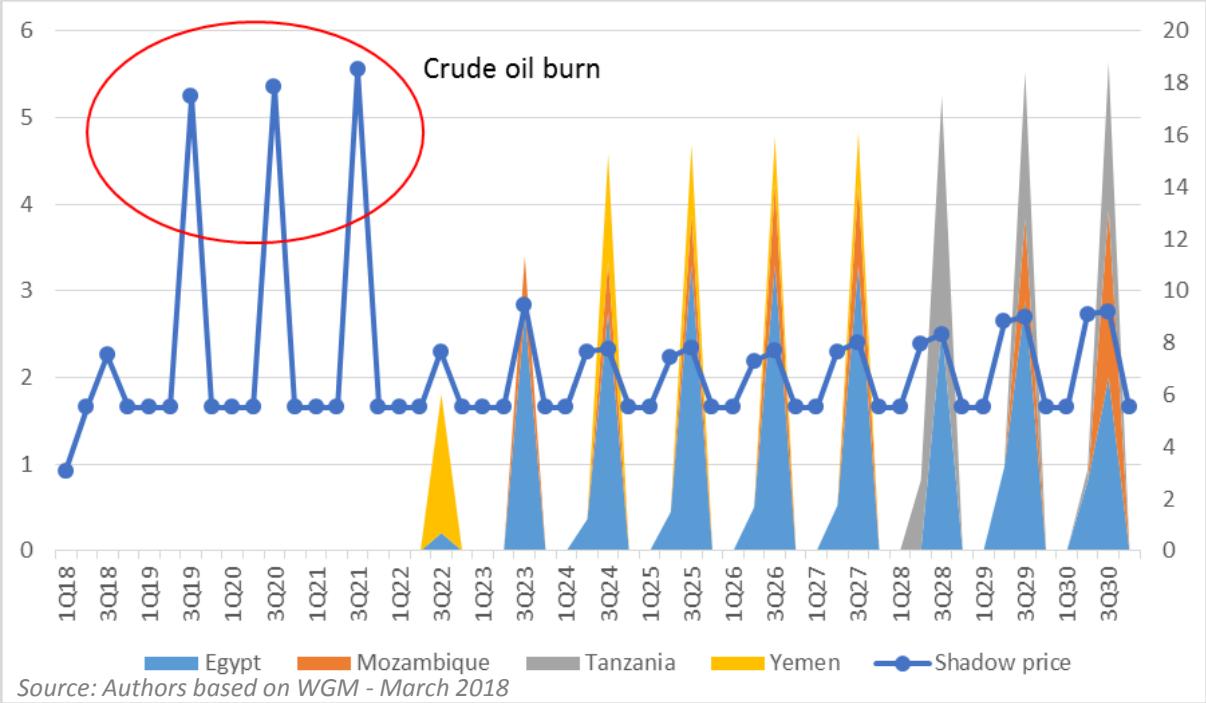
Source: Authors based on WGM - March 2018

Simulation of a 30 bcm (22 MTPA) LNG imports with risked East Africa



Source: Authors based on WGM - March 2018

LNG imports with a seasonal demand profile in Saudi Arabia



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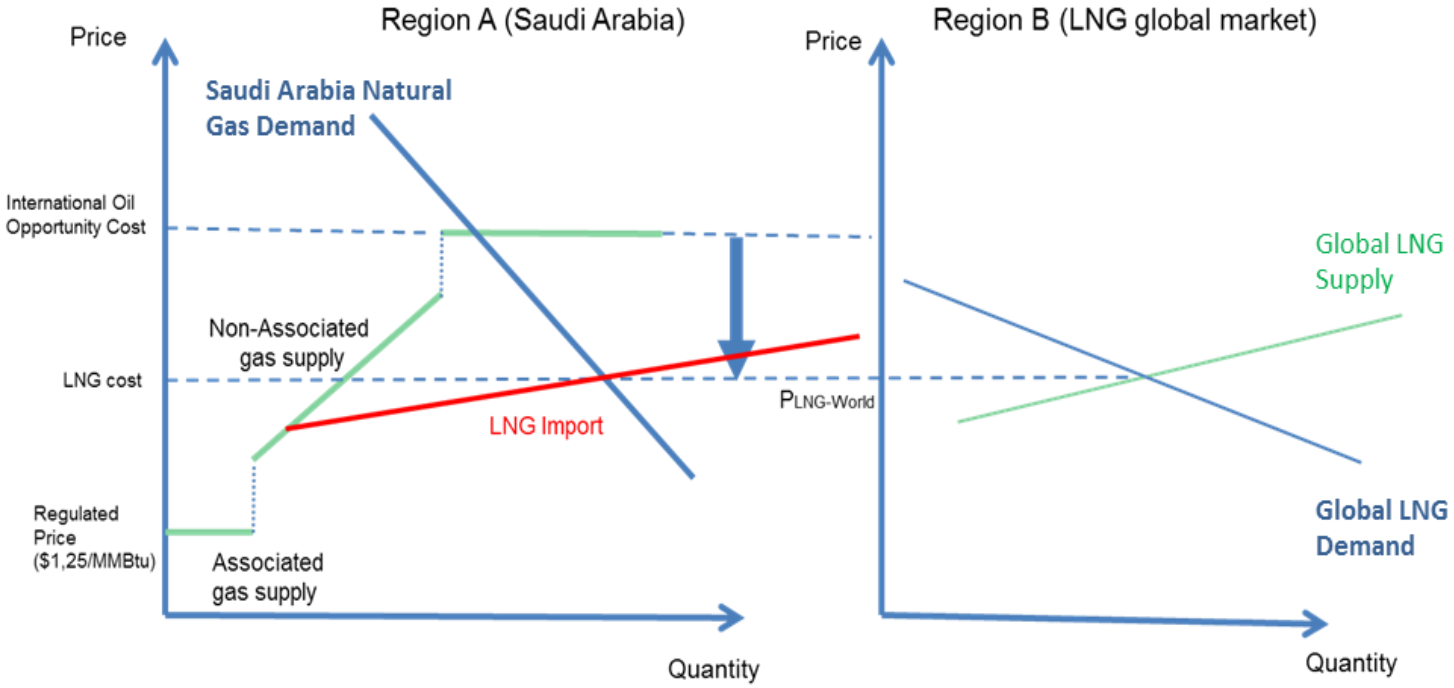

Discussion

- **Under the current regulated energy price framework, oil is always more competitive than LNG import in power generation.**
- **If the true opportunity cost of oil in the form of its international price is charged, then LNG import is always more competitive.**
- **LNG is an acceptable option compared to burning oil for power generation.**

Heat rate for crude oil power plant (MMBTu/Mwh)	10,83	source: EIA 2017 https://www.eia.gov/electricity/annual/html/epa_08_01.html	
Heat rate for NGCC (MMBTu/Mwh)	7,81	source: EIA 2017 https://www.eia.gov/electricity/annual/html/epa_08_01.html	
BBl to MMBTU	0,172	source: BP Statistical 2018	
2018 Regulated environment and opportunity cost of oil	oil at $6.45/bbl ansd gas at $1,75/MMBtu	oil at $85/bbl and gas at $1,75/MMBtu	oil at $55/bbl and gas at $1,75/MMBtu
Total cost of 1 Mwh from crude oil power plant ($/Mwh)	12,02	158,39	102,49
Total cost of 1 Mwh from natural gas combined cycle ($/Mwh)	13,67	13,67	13,67
US LNG (Tellurian fixed priced ie $8/MMBtu)	Oil at $85/bbl and LNG import at $8/MMBtu	Oil at $55/bbl and LNG import at $8/MMBtu	Oil at $35/bbl and LNG import at $8/MMBtu
Total cost of 1 Mwh from crude oil power plant ($/Mwh)	158,39	102,49	65,22
Total cost of 1 Mwh from natural gas combined cycle ($/Mwh)	62,50	62,50	62,50
LNG priced with standard (conservative) oil indexed clauses	Oil at $85/bbl and standard oil indexed contract for Asia (14%+1$)	Oil at $55/bbl and standard oil indexed contract for Asia (14%+1$)	Oil at $35/bbl and standard oil indexed contract for Asia (14%+1$)
Total cost of 1 Mwh from crude oil power plant ($/Mwh)	158,39	102,49	65,22
Total cost of 1 Mwh from natural gas combined cycle ($/Mwh)	100,77	67,96	46,09
2035 Market based price for LNG import in Saudi Arabia versus oil price at $85/bbl	Oil at $85/bbl and LNG at oil parity	Oil at $85/bbl and LNG scenario 1 - 6 Bcm	Oil at $85/bbl and LNG scenario 2 -30 bcm
Total cost of 1 Mwh from crude oil power plant ($/Mwh)	158,39	158,39	158,39
Total cost of 1 Mwh from natural gas combined cycle ($/Mwh)	114,21	74,21	81,24
2035 Market based price for LNG import in Saudi Arabia versus oil price at $55/bbl	Oil at $55/bbl and LNG at oil parity	Oil at $55/bbl and LNG scenario 1 - 6 Bcm	Oil at $55/bbl and LNG scenario 2 -30 bcm
Total cost of 1 Mwh from crude oil power plant ($/Mwh)	102,49	102,49	102,49
Total cost of 1 Mwh from natural gas combined cycle ($/Mwh)	73,90	74,21	81,24

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Conclusions

- LNG Transportation cost is critical is the setting of the policy as well as seasonality.
- Neither new domestic development of gas nor LNG import can be competitive at current regulated prices for power generation.
- LNG import could create a framework where Saudi Arabia navigates progressively towards more market pricing of energy while enabling the emergence of fuel competition domestically.
- Adding trading infrastructure benefits the global LNG market (higher demand in low summer month) and the local energy market (reducing cost and adding supply flexibility).
- Despite its apparent disruptiveness, a limited import of LNG could be a worthwhile and relatively easy to implement policy instrument to improve Saudi Arabia energy security and adaptability during the current energy transition era to avoid stranded investment in fossil fuels.