THE U.S. POTENTIAL AS A SWING SUPPLIER IN THE ATLANTIC BASIN

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OVERVIEW

- Purpose
- Methods
- Results
- Conclusion
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What is the potential for the United States to operate as a marginal supplier of LNG to the Atlantic Basin between 2016 and 2030?

RESEARCH QUESTION

METHODS

1. Assess the global gas market through 2030

2. Evaluate risks to relevant sources of supply and demand within the Atlantic Basin

3. Assess the U.S.'s cost to produce with regards to other producers

SOURCES OF SUPPLY AND DEMAND

Indirect Supply

Supply
Algeria
Angola
Equatorial Guinea
Nigeria
Norway
Oman
Trinidad & Tobago
Yemen

Australia

Indonesia

Malaysia

Qatar

Demand
Africa
The Caribbean
Europe*
South America

*European Union

RELEVANT SOURCES OF SUPPLY AND DEMAND

Source: Author

Europe and South America considered the most likely recipients of U.S. LNG out to 2030

- Barbados and Puerto Rico have imported LNG using ISO tanks, but not on a large scale

RISKS TO COMPETITOR SUPPLY

UPSIDE

- Efficiencies in technology
- Lifting of fracking bans

DOWNSIDE

- Supply disruptions
- Falling domestic production
- Increased domestic demand
- High project costs

RISKS TO DEMAND FOR U.S LNG

UPSIDE

- Falling domestic production
- GHG-reduction policies
- Geopolitical motivations
- Weather variation
- Economic growth

DOWNSIDE

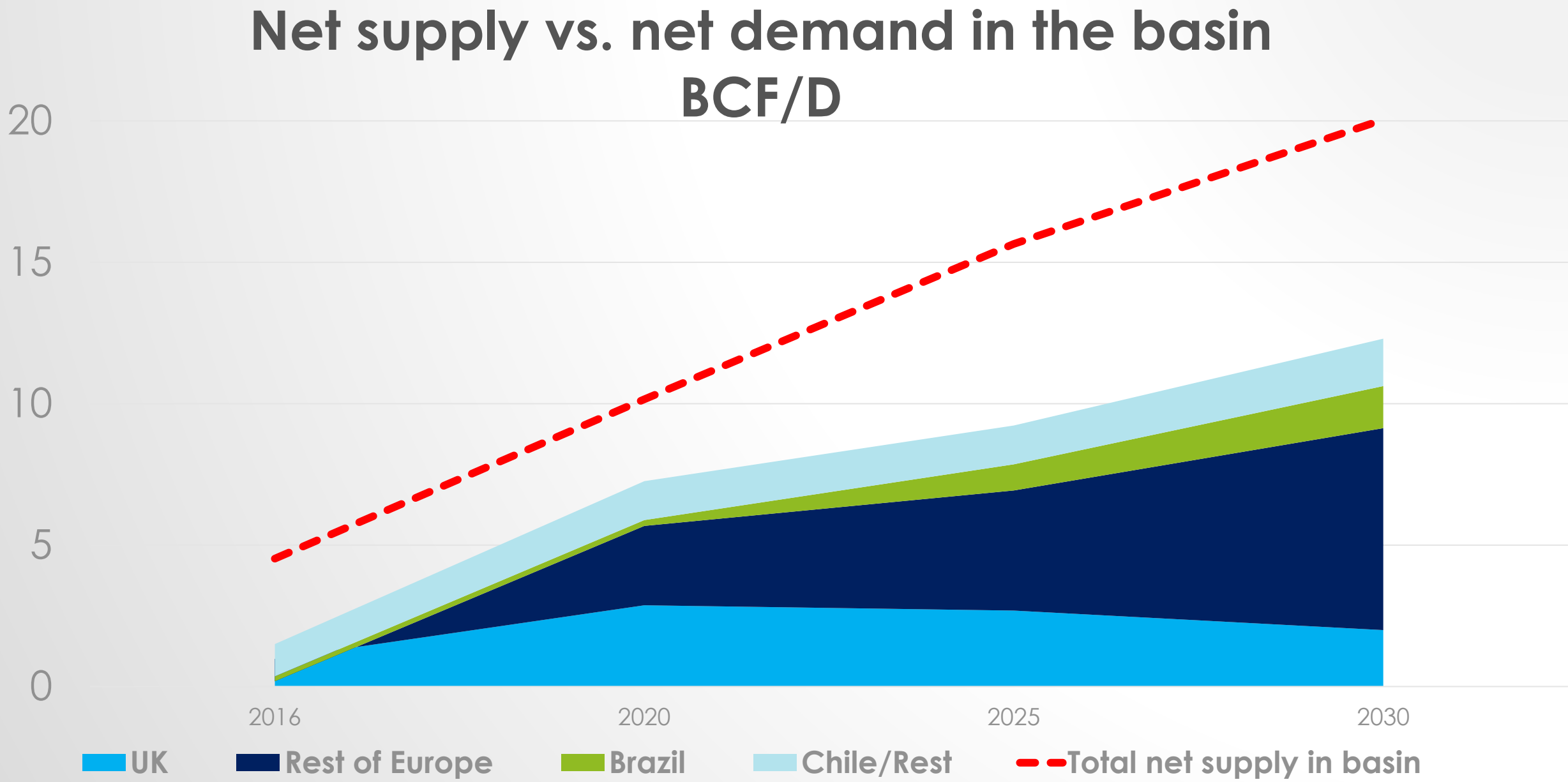
- Competition with renewables in the long-term (past 2030)

COST TO PRODUCE: SHORT RUN VS. LONG RUN MARGINAL COST

Short Run Marginal Cost	$/mmBtu
Henry Hub	4.00
Liquefaction (HHx1.15)	.60
	4.60

Long Run Marginal Cost	$/mmBtu
Henry Hub	4.00
Liquefaction (HHx1.15)	.60
Tolling ($3.00)	3.00
	7.60

RESULTS: ASSESSING THE MARKET

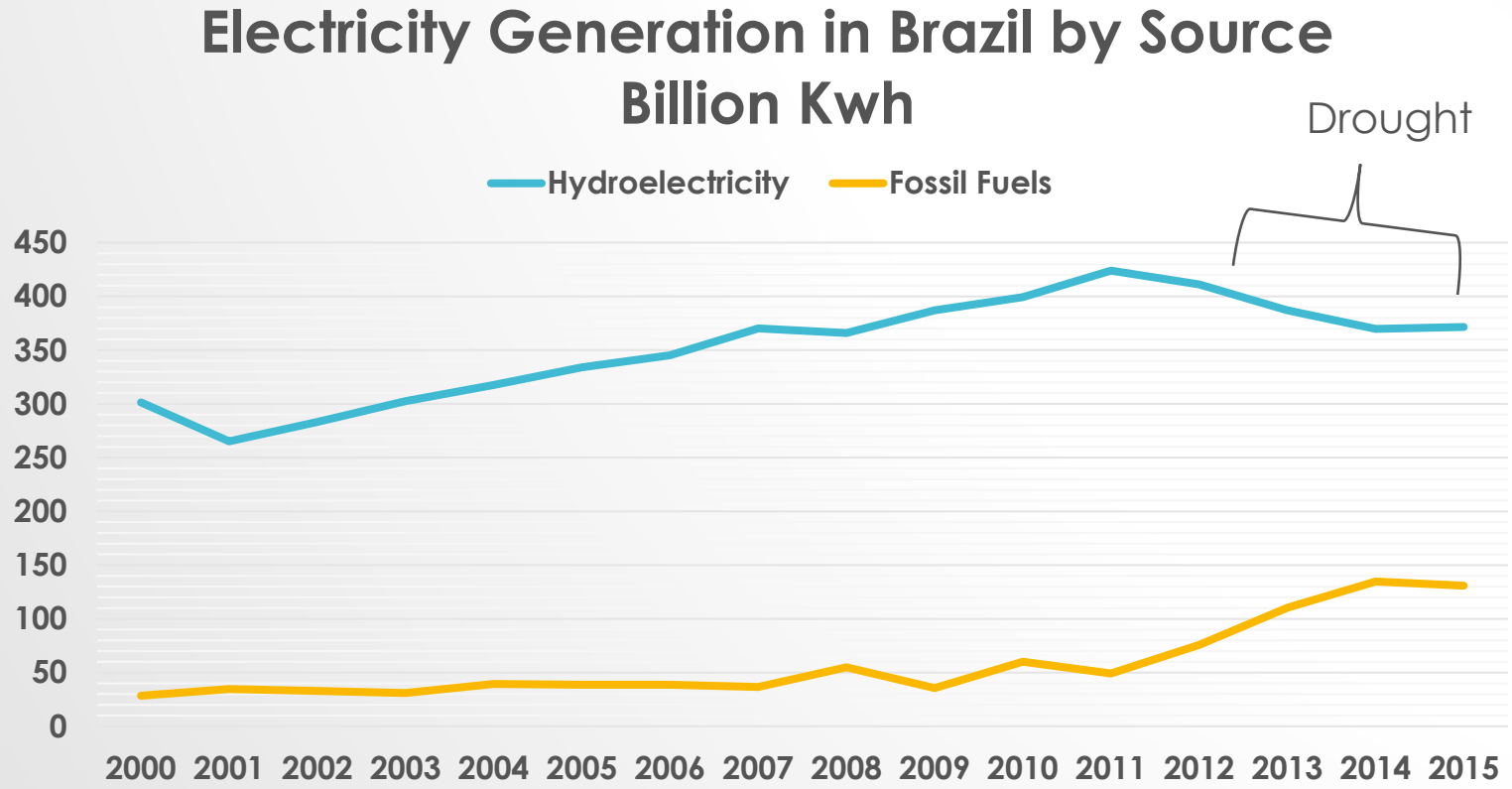


RESULTS: RISKS TO SUPPLY AND DEMAND

- Europe most realistic source of (marginal) demand for U.S. LNG
  - Slowing domestic production
  - Europe's GHG-reduction policies strongly favor LNG
  - Russia's dominance in European gas market.

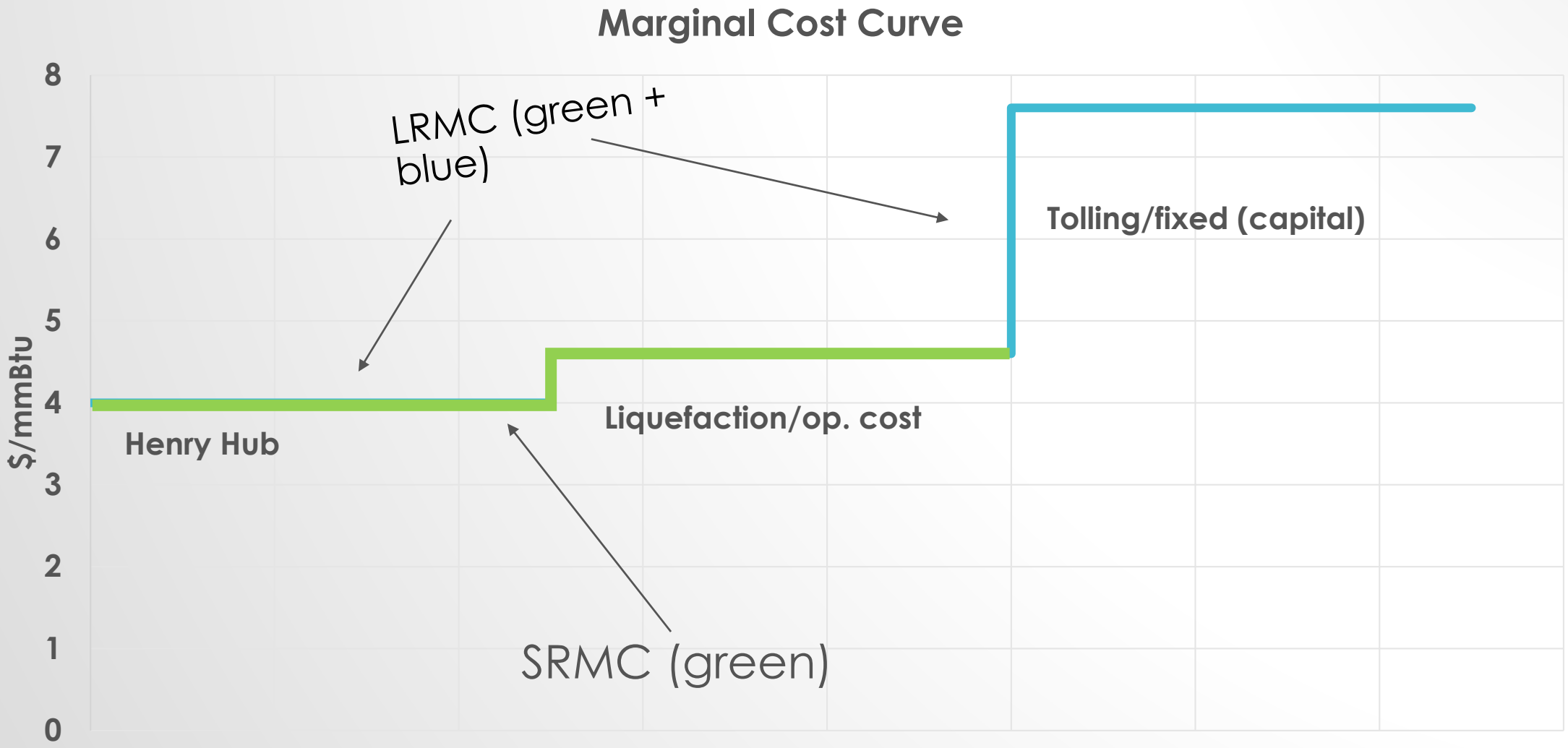
RESULTS: RISKS TO SUPPLY AND DEMAND (CONT'D.)

- South America likely to be a source of demand only during volatile weather events

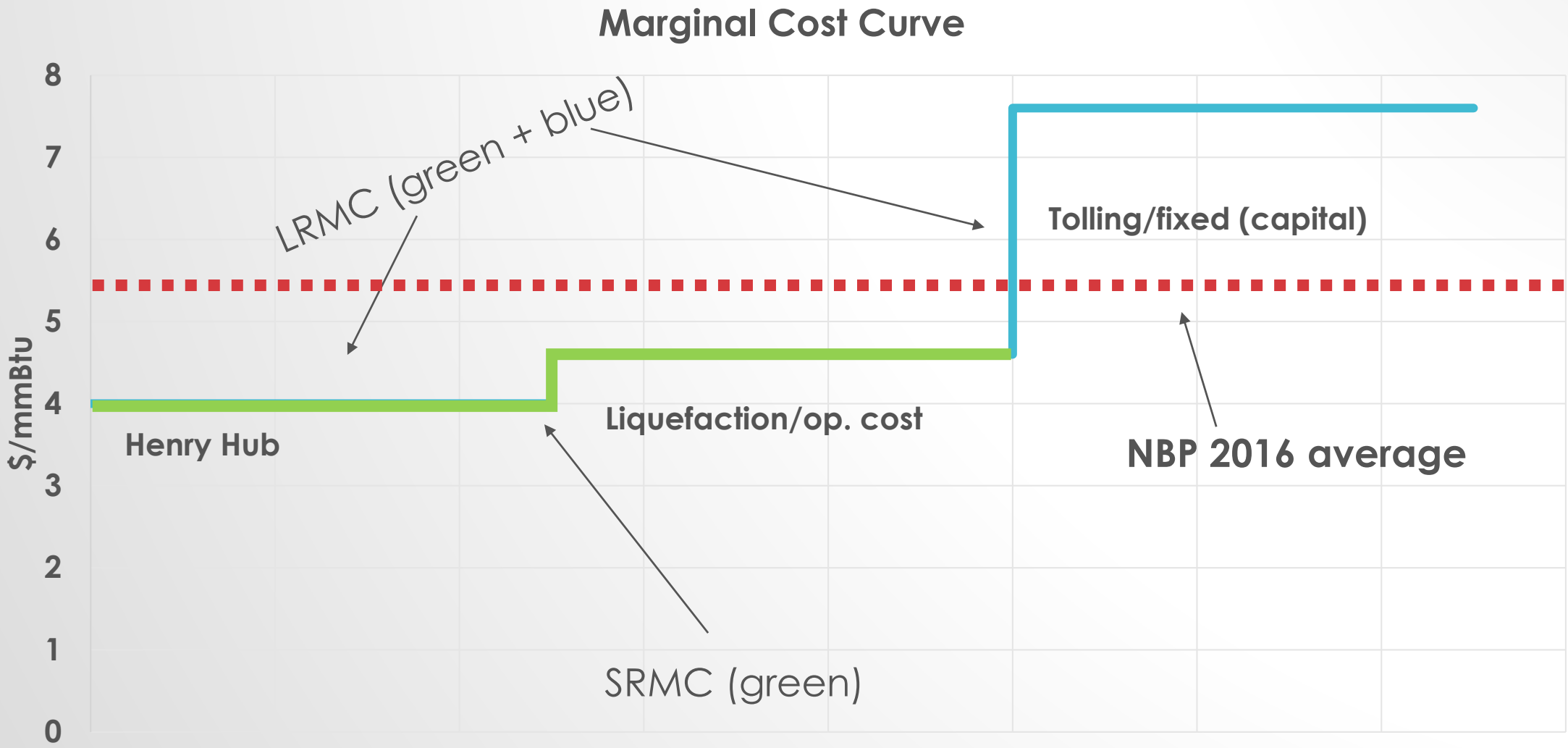


Source: EIA

RESULTS- COST TO PRODUCE



RESULTS- COST TO PRODUCE VS. UK NBP



U.S. LNG MAY NOT BE ABLE TO CONSISTENTLY COMPETE IN REGIONAL MARKETS, CREATING UNCERTAINTY FOR U.S. LNG PROJECTS*

U.S. Costs to Produce ($/mmBtu)	Short Range Marginal Cost	Long Range Marginal Cost
Henry Hub	3.00	3.00
Operating Cost (15% of Henry Hub)	0.45	0.45
Amortization/Tolling	-	3.00
Freight to Europe	0.45	0.45
Regasification	0.30	0.30
Total Henry Hub Lay-down Cost in Europe	4.20	7.20

Profit/(Loss) for movement from US Gulf to Europe ($/mmBtu)	Short Range Marginal Cost	Long Range Marginal Cost
US Lay-down Cost vs. TTF ($4.6/mmBtu)	0.40	(2.60)
US Lay-down Cost vs. Aggressive Russian price (Gazprom-$4/mmBtu)	(0.20)	(3.20)
US Lay-down Cost vs. Qatari breakeven price ($2/mmBtu)	(2.20)	(5.20)

* Economics based on Cheniere Sabine Pass contract specifications plus freight and gasification estimates from Barclays "EU gas for those that never cared" Barclays Commodity Research 7 June 2017.

CONCLUSION

- Global oversupply in the 2020's
- The U.S. will likely operate on the margin
- Policy and geopolitical motivations make Europe the most realistic "sink" for U.S. LNG, out to 2030
- Uncertainty and U.S. LNG:
  - Role of renewables and U.S. cost to produce

Q&A

FURTHER RESEARCH

- Floating Storage and Regasification Units (FSRU's)
  - LNG can reach non-traditional markets
- Transportation and shipping
  - Natural gas vehicles
  - Bunkering