FEDERAL ENERGY REGULATORY COMMISSION

Cutting Edge Issues

Commissioner Philip Moeller

August, 2014

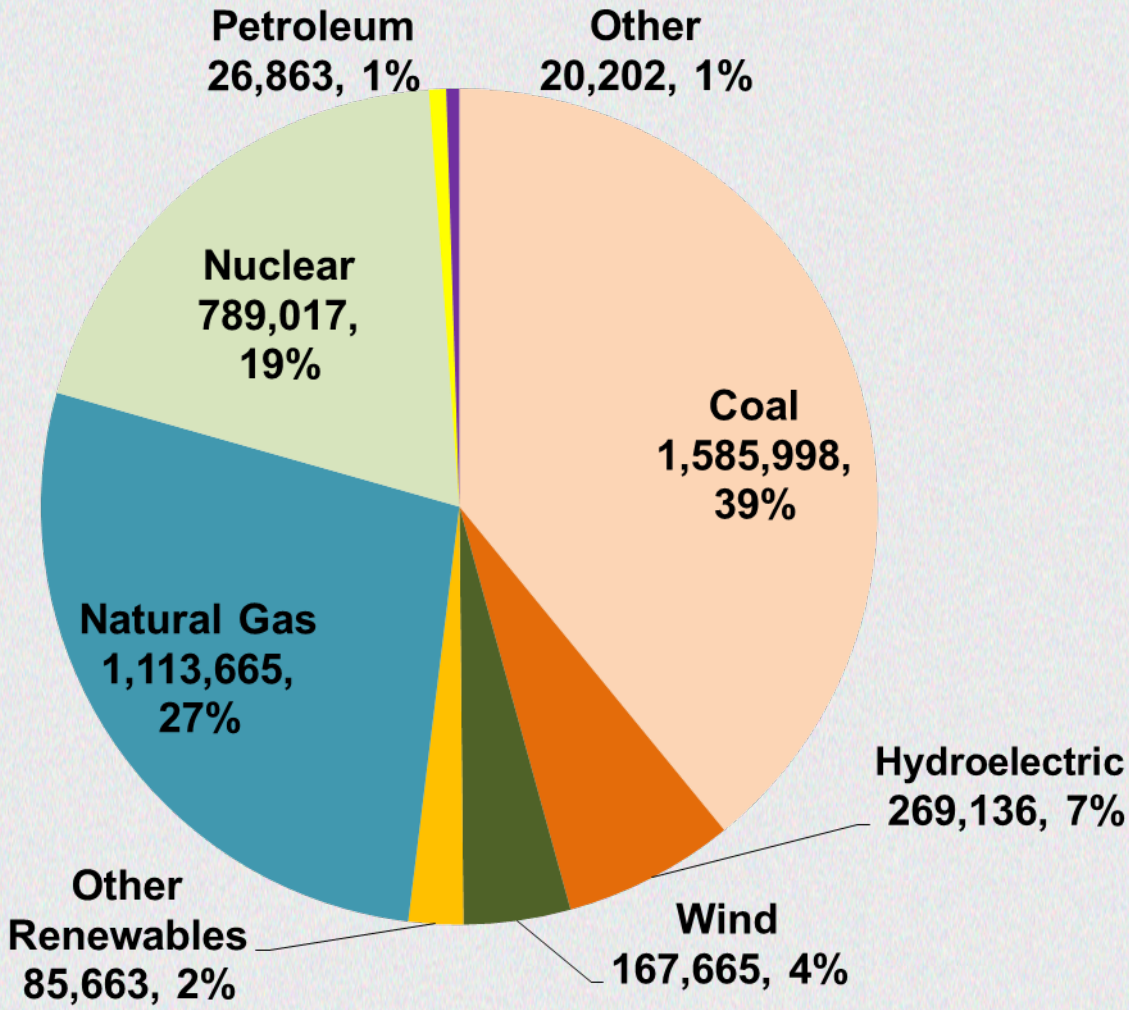
Asia-Pacific Regulatory Forum

Outline

Topics for discussion –

- Major transformation of the generating fleet
- Uncertainty over future electricity demand
- Uncertainty over the future of Demand Response & Distributed Generation
- Natural gas supply changes and cost and challenges in delivery
- How to build and finance more natural gas infrastructure & future of LNG
- Emerging market issues

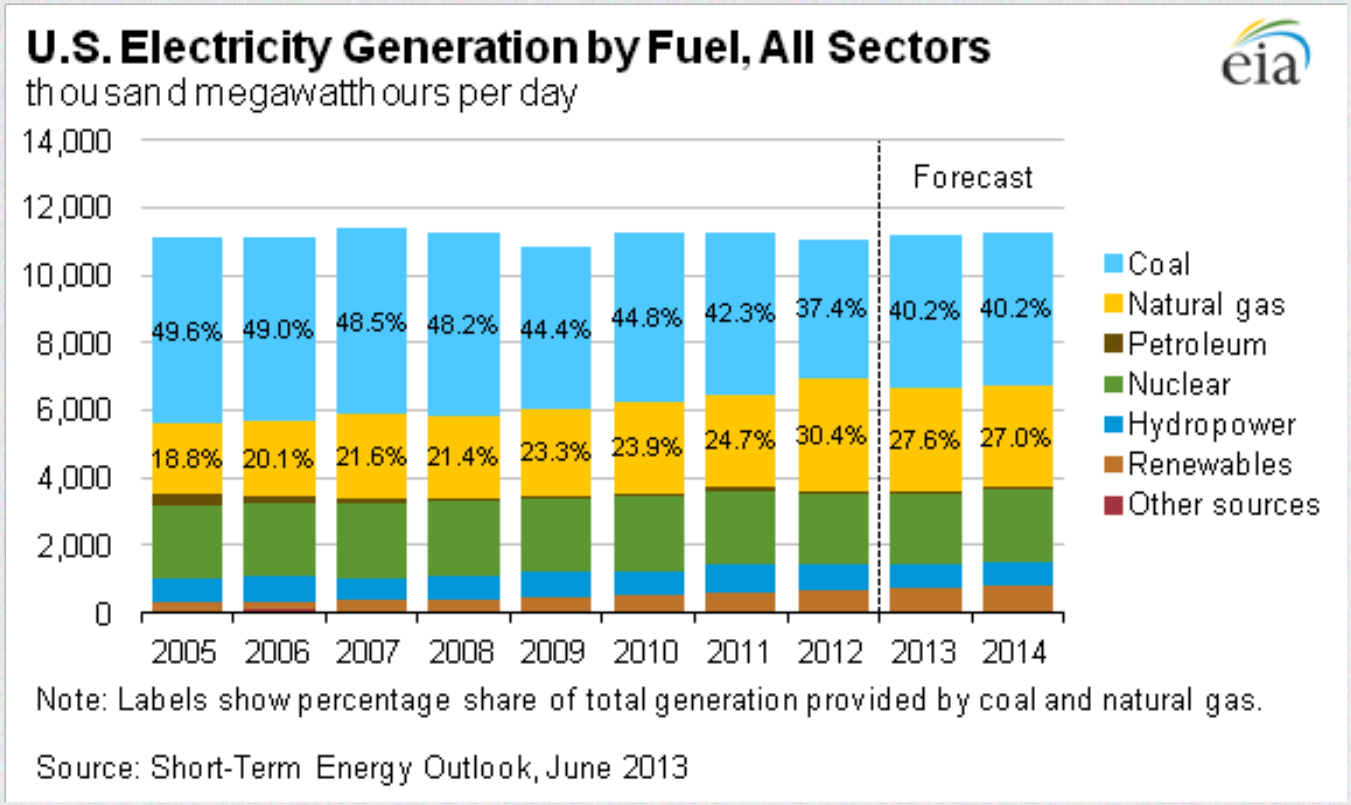
Electric Generation (2013)



Total Electricity Generation by Fuel Type, U.S., 2013 (Thousand Megawatthours)

Source: EIA Electric Power Monthly, February 2014

Electric Generation by Fuel



- **The types of resources used to generate electricity are changing, driven largely by economics and environmental policies**
- **As the resources change, the operation of the grid changes**

New Renewable and Gas-Fired Generation Replace Nuclear and Coal

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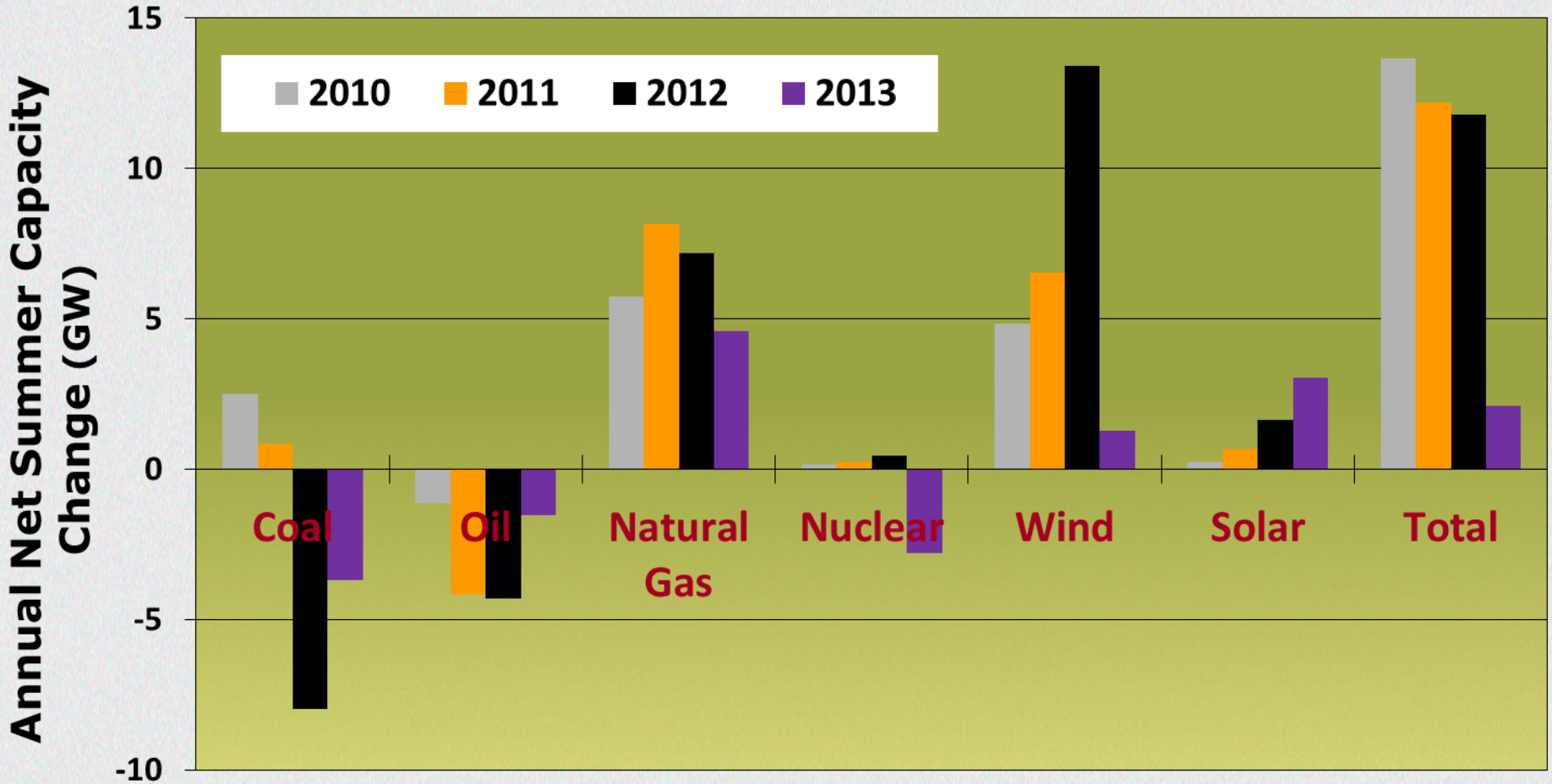
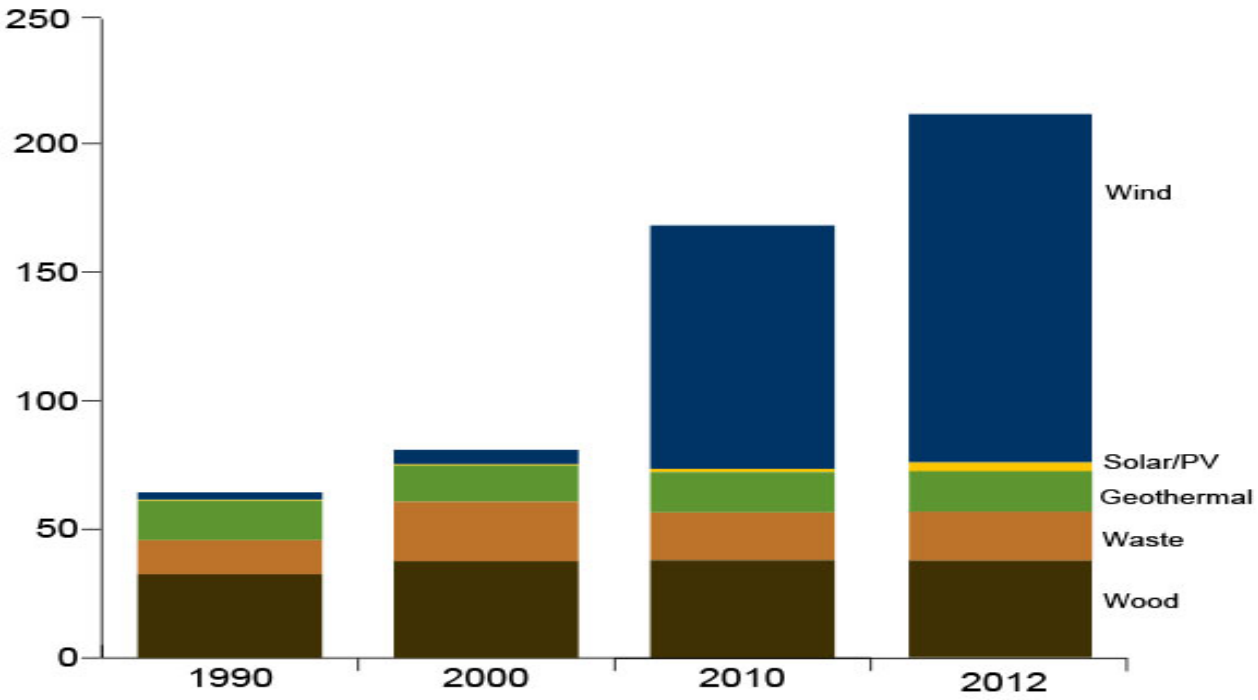


Source: Derived from EIA data

The Fuel Source Transition

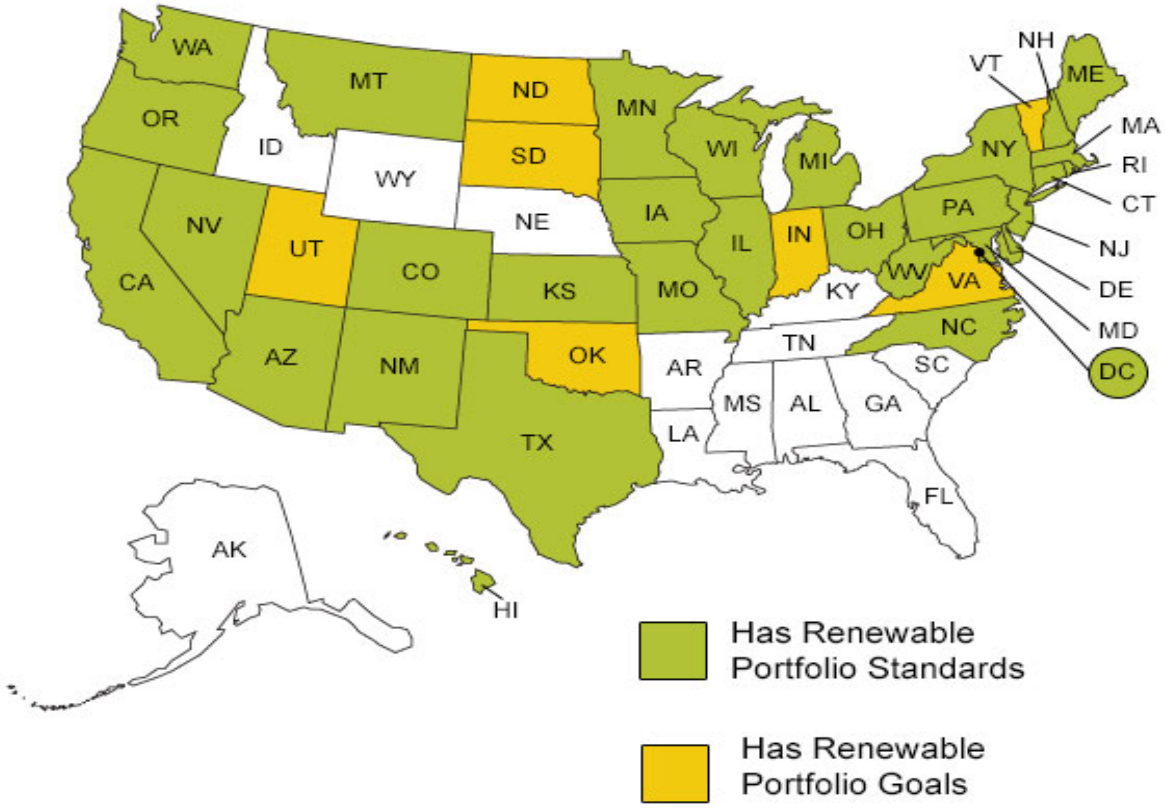
Nonhydropower Renewable Electricity Generation by Source, 1990-2012



Source: U.S. Energy Information Administration, the *Electric Power Monthly* (March, 2013).

- **Fastest growing renewable energy source is wind generation**
- **No marginal cost to operate, but output is variable**

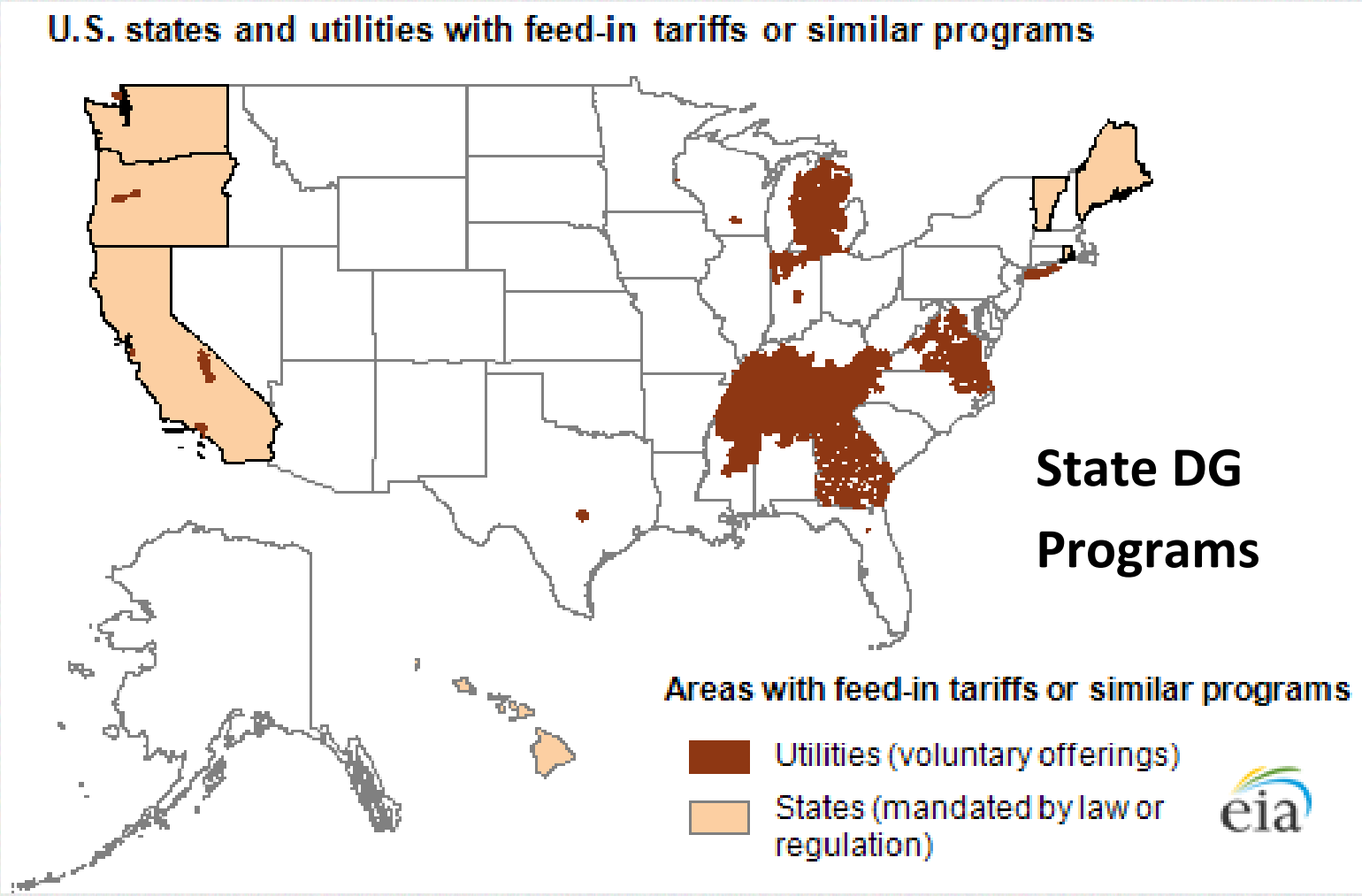
State Activity in Renewables



Source: Interstate Renewable Energy Council, Database of State Incentives for Renewables & Efficiency (accessed January 2013).

- **Most states have renewable energy mandates or goals, driving the growth in wind and other variable generation**

Distributed Generation



Major Transformation of the Generating Fleet

Short term to moderate term reliability challenges as the generating fleet transforms –

- Less coal -- more gas -- more renewables
- Transition to more just-in-time fuel from pipelines and our approaches toward natural gas-electricity coordination
- Need for reliability-must-run (RMR) units
- Reliability and economic consequences of the need for fast-acting (gas) generation to address ramping issues with greater intermittent renewable generation
- Distributed generation increases its penetration → reliability and ratemaking challenges for our state colleagues at the distribution level of regulation

Demand Response

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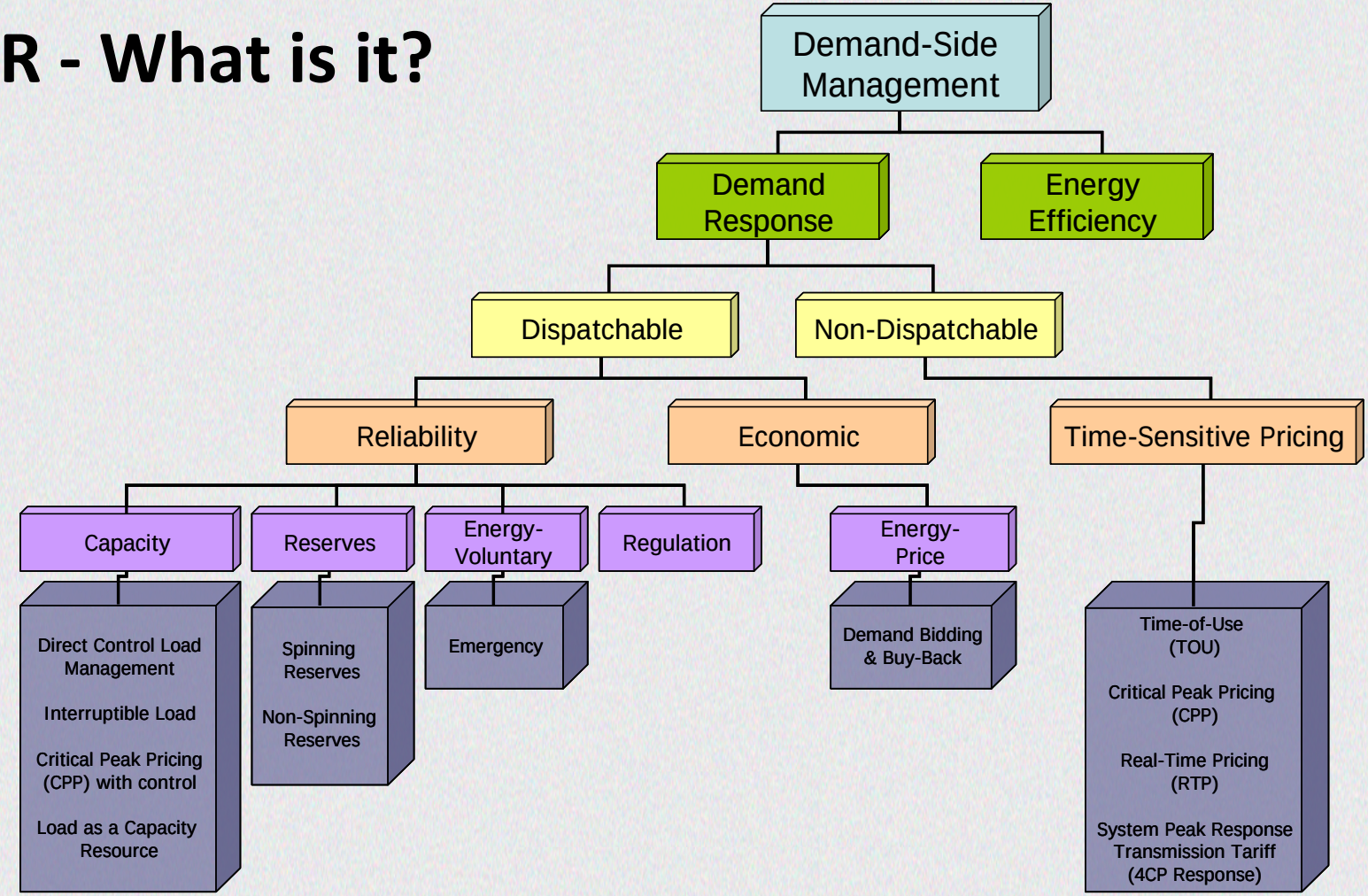
DR - What is it?



Electricity Demand Falls for Third Straight Year

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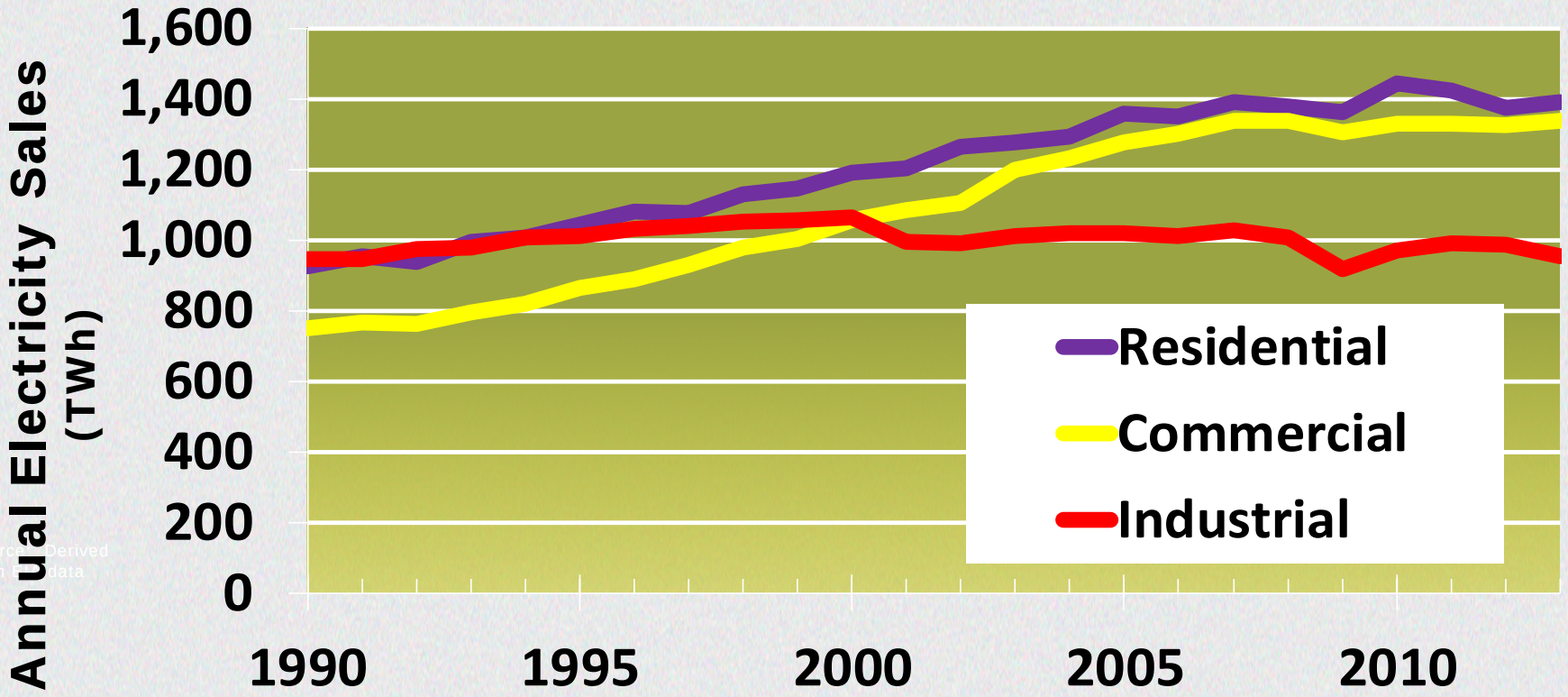

DR/DG Concerns

Uncertainty over future electricity demand –

- Generally thought to be “flatter” than it has been historically
- However, economic recovery could mask impending increases in demand
- Pockets of high industrial load growth, often in areas of growing energy development and delivery including areas with LNG export facilities
- Recent Court decision – Uncertainty over the future of Demand Response given the 745 ruling, at a time when we need it more than ever

Extreme Weather Stressed Natural Gas and Electricity Markets in 2014

Federal Energy Regulatory Commission

- Record cold temperatures during January resulted in record gas demand, well freeze-offs, large storage withdrawals, and constrained pipelines
- In the mid-Atlantic and Northeast, spot natural gas prices soared to over $120 per MMBtu
- On-peak power prices spiked to over $1,000 per MWh
- Staff monitored the winter events as they occurred and continues to assess what happened in the markets and whether market manipulation potentially took place

Natural Gas Supply and Cost

- **Seemingly long-term projections of moderate prices based on domestic supply dynamics**
  - Plenty of gas, but challenges in delivery as evidenced by the unprecedented price differentials during the Polar Vortex events
- **How to build more natural gas infrastructure**
  - As the natural gas pipeline industry sees potential significant growth of a relatively new customer class (power generation) how do pipelines get financed under a new business model?

New Shale Plays

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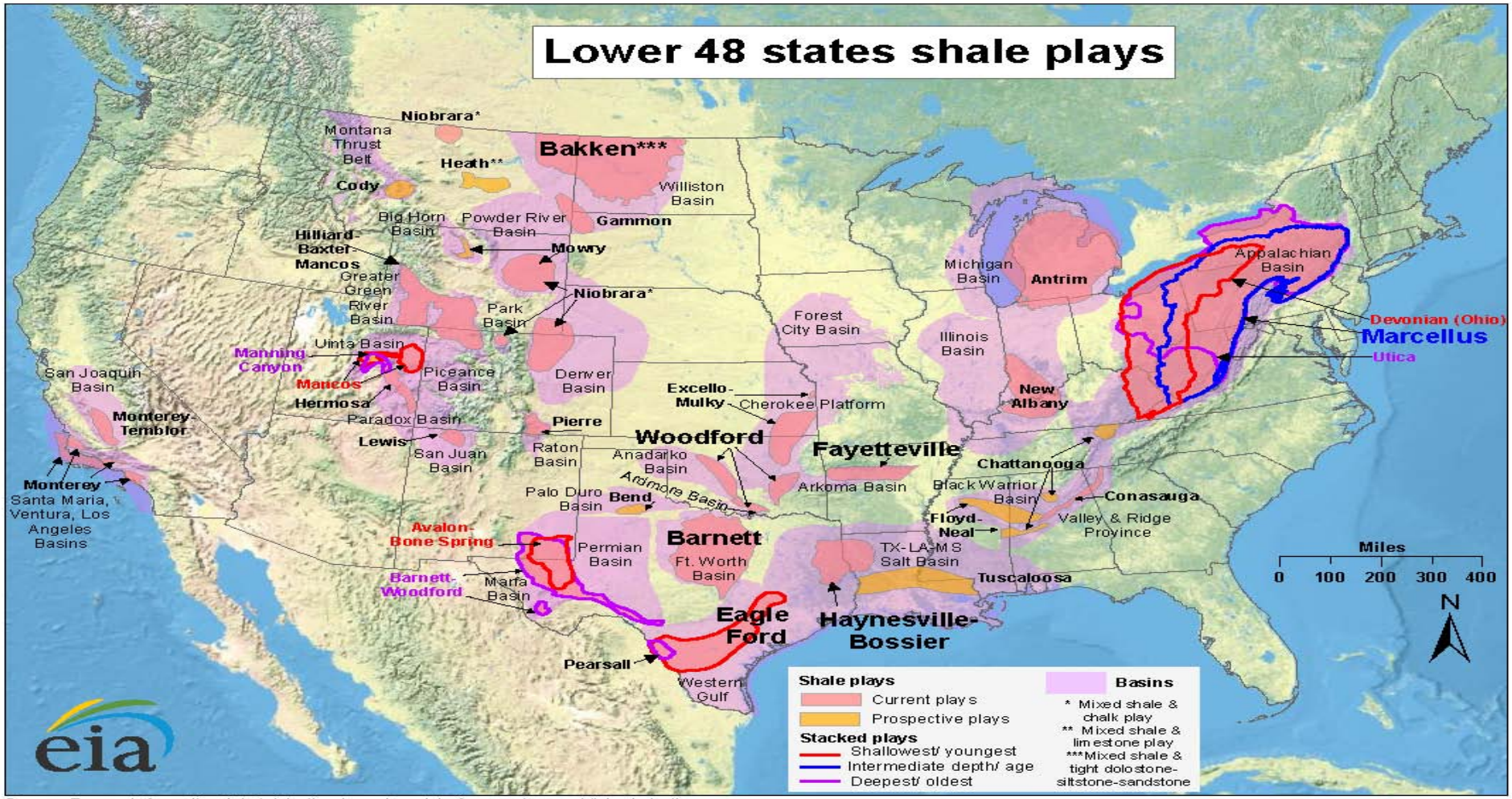
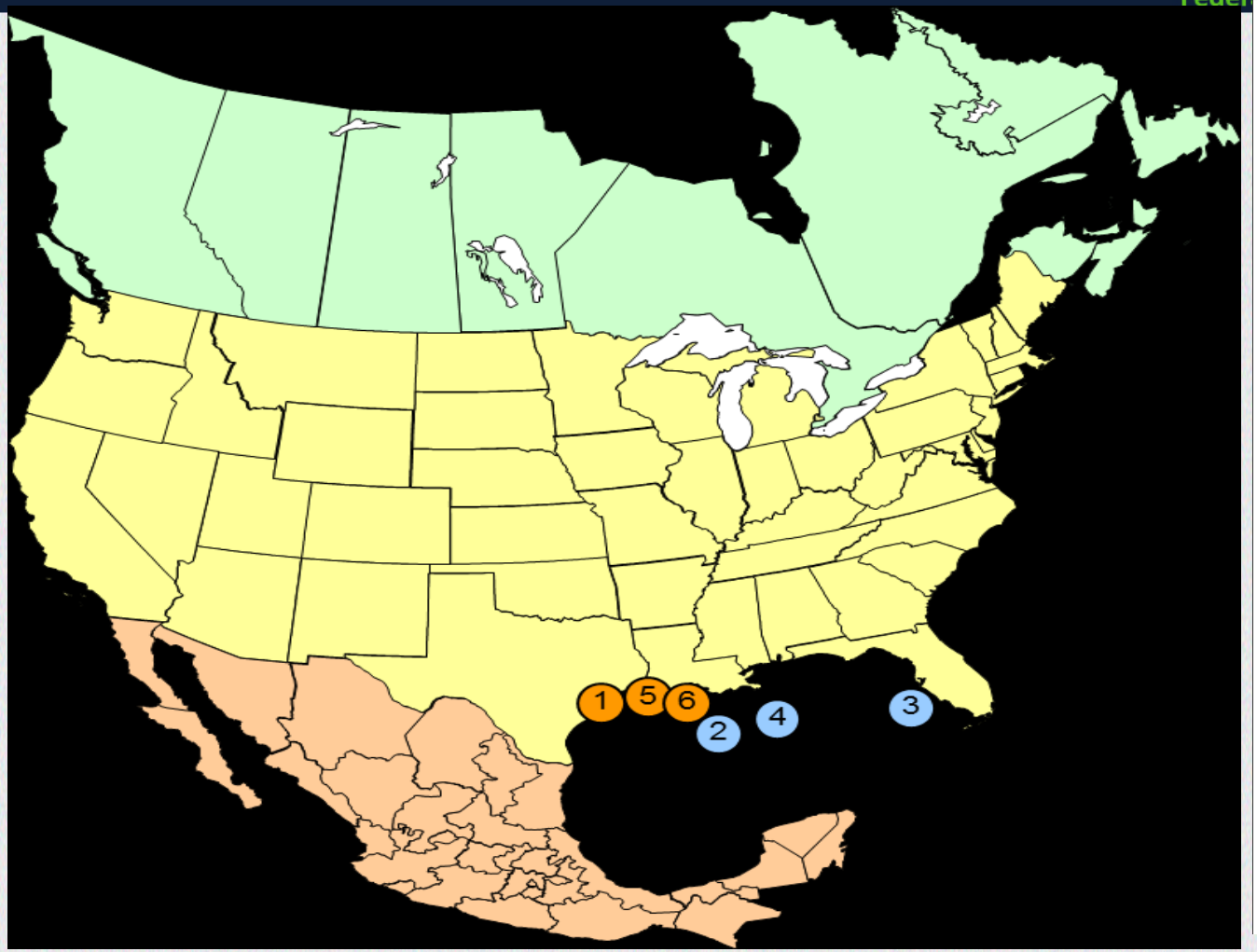


Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

LNG Existing Import/Export Facilities

Approved



Import Terminal

APPROVED - NOT UNDER CONSTRUCTION

U.S. - FERC

1. **Freeport, TX:** 2.5 Bcfd (Cheniere/Freeport LNG Dev. - Expansion)* (CP05-361)

U.S. - MARAD/Coast Guard

2. **Gulf of Mexico:** 1.0 Bcfd (Main Pass McMoRan Exp.)
3. **Offshore Florida:** 1.2 Bcfd (Hoëgh LNG - Port Dolphin Energy)
4. **Gulf of Mexico:** 1.4 Bcfd (TORP Technology-Bienville LNG)

Export Terminal

APPROVED - UNDER CONSTRUCTION

U.S. - FERC

5. **Sabine, LA:** 2.76 Bcfd (Cheniere/Sabine Pass LNG) (CP11-72 & CP14-12)

APPROVED – NOT UNDER CONSTRUCTION

U.S. - FERC

6. **Hackberry, LA:** 1.7 Bcfd (Sempra – Cameron LNG) (CP13-25)

US Jurisdiction
- FERC
- MARAD/USCG

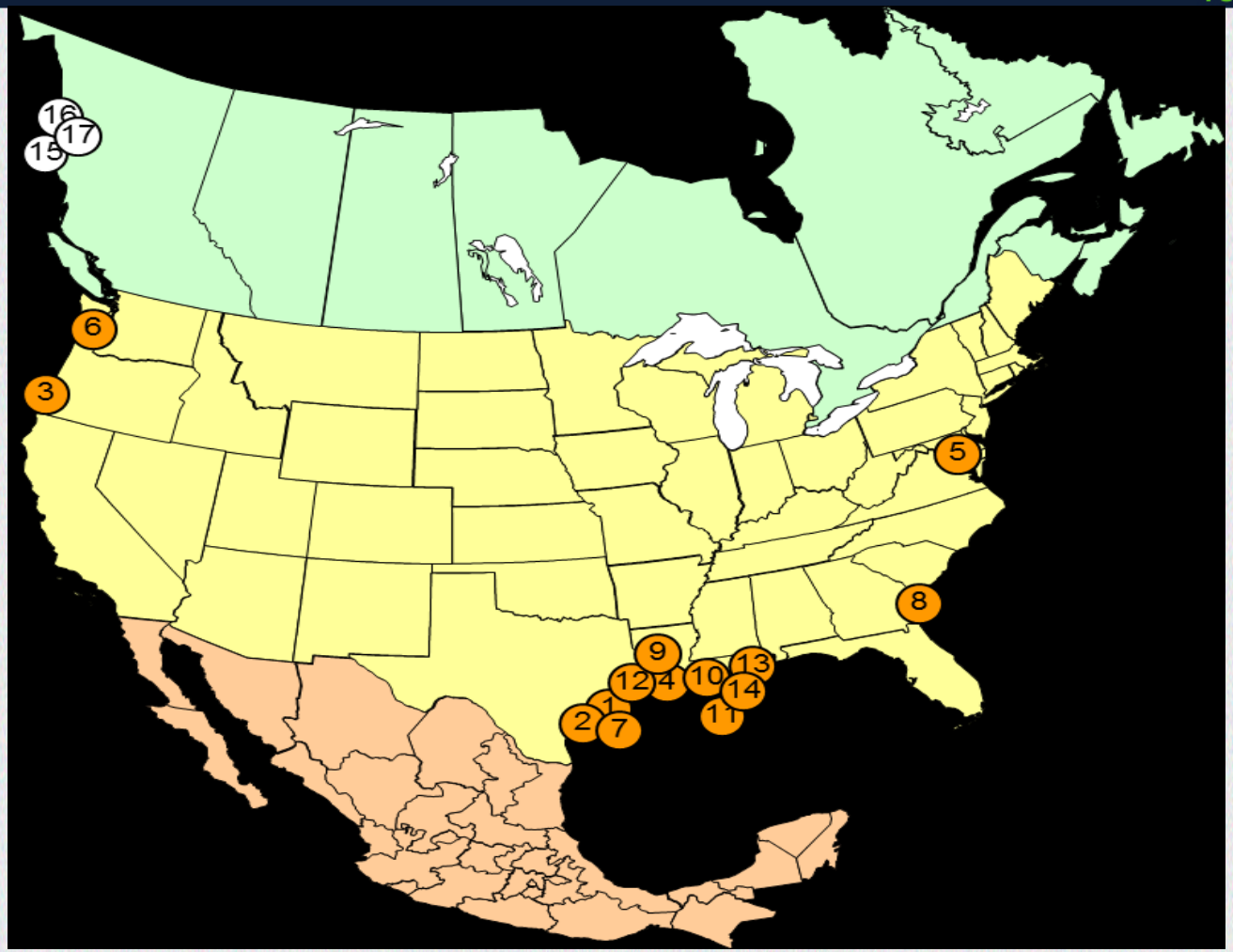
As of July 18,2014

* Expansion of an existing facility

North American LNG Export Terminals

Proposed

Federal Energy Regulatory Commission



As of July 18,2014

US Jurisdiction - FERC MARAD/USCG

Export Terminal

PROPOSED TO FERC

1. Freeport, TX: 1.8 Bcfd (Freeport LNG Dev/ Freeport LNG Expansion/FLNG Liquefaction)
2. Corpus Christi, TX: 2.1 Bcfd (Cheniere – Corpus Christi LNG)
3. Coos Bay, OR: 0.9 Bcfd (Jordan Cove Energy Project)
4. Lake Charles, LA: 2.2 Bcfd (Southern Union - Trunkline LNG)
5. Cove Point, MD: 0.82 Bcfd (Dominion – Cove Point LNG)
6. Astoria, OR: 1.25 Bcfd (Oregon LNG)
7. Lavaca Bay, TX: 1.38 Bcfd (Excelerate Liquefaction)
8. Elba Island, GA: 0.35 Bcfd (Southern LNG Co.)
9. Sabine Pass, LA: 1.40 Bcfd (Sabine Pass Liquefaction)
10. Lake Charles, LA: 1.07 Bcfd (Magnolia LNG)
11. Plaquemines Parish, LA: 1.07 Bcfd (CE FLNG)
12. Sabine Pass, TX: 2.1 Bcfd (ExxonMobil – Golden Pass)
13. Pascagoula, MS: 1.5 Bcfd (Gulf LNG Liquefaction)
14. Plaquemines Parish, LA: 0.30 Bcfd (Louisiana LNG)

PROPOSED BY CANADIAN PROJECT SPONSORS

15. Kitimat, BC: 1.28 Bcfd (Apache Canada Ltd.)
16. Douglas Island, BC: 0.23 Bcfd (BC LNG Export Cooperative)
17. Kitimat, BC: 3.23 Bcfd (LNG Canada)

Emerging Market Issues

Current high-priority issues –

1. Polar Vortex showed need for better price formation
   - ❖ We'll spend a lot of this year cleaning up the mess from uplift charges, price caps, unrecovered fuel costs, etc.
2. The transition to more just-in-time fuel from gas pipelines and our approaches toward natural gas/electricity coordination
3. The reliability and economic consequences of the need for fast-acting (gas) generation to address ramping issues with greater intermittent renewable generation
4. Reliability and ratemaking challenges given increased penetration of distributed generation
5. Better price formation should lessen reliance on capacity market revenues and reduce our need to constantly tweak those markets
   - ❖ Upcoming technical conference on uplift

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