PLANO Meeting
Effects of the Trump presidency on the US Oil Patch

Eric N. Smith
Associate Director
Tulane Energy Institute
2-23-17
Policy Changes

• After 8 years, the advent of a hydrocarbon friendly administration
• US petrochemical production, investment and exports are increasing and will continue to increase due to cost advantaged NGLs.
• With plentiful supplies, the US is becoming a formidable exporter of light sweet crude, medium sour crude, LNG, refined products, NGLs/Olefins and bulk plastics.
• Cheap domestic energy and feed stocks should translate into more plentiful downstream domestic manufacturing jobs.
• Additional infrastructure spending is bi-partisan and can accelerate the process, providing near term employment. (River dredging and IHNC)
• Expect more pipelines connecting population centers to shale based energy centers.
• Expect more CCGT power generation.
• Trade policy: globalization will wane as protectionism waxes. Back to Bi-lateral trade agreements.
• Tax policy will probably be disappointing because of inertia as well as known and unknown ripple effects.
Exploration and Production
Baker Hughes Rig Count 2-17-17

• US Rig Count = 751 rigs, an increase of 10 in the last week. A year ago 514 rigs were working. Total 2017 US wells should jump 26.8% to 18,552 from 14,631 in 2016.

• GOM Offshore Rig count was 17 down 8 from the same week of 2016 or down 33 from the same week of 2015. The last time La. was this low was in August, 2010.

• La. Lost 3 rigs, but should see a 31% increase with the state overall increasing 12.8% to 123 from 109 in 2016.
Discoveries at their lowest level since the 1950s
Estimated recoverable resources of newly found fields (bn boe)

Source: IHS Markit
We’re not looking and we’re not discovering!

- The world added 190 bn BOE in the last 10 years
- But, only 174 discoveries in 2016 vs. 400-500/year until 2013
- Low discovery level => less conventional and more shale drilling and production.
- Deepwater offshore wells cost $150 mm whereas onshore shale oil wells cost $4-10 mm. There’s no discovery risk and easier access to infrastructure. As for execution risk, practice makes perfect!
- World wide, exploration expenditures dropped from $100 bn in 2014 to $40 bn in 2016.
- Discoveries hit a six decade low in 2015 and then dropped again in 2016 to ~8.2 billion bbl.
- The world’s two largest discoveries in 2016 were both in the US, Smith Bay (up to 4 bn bbl) and the Willow discovery (300 mm bbl), both in Alaska. Other discoveries included Senegal and Angola. Zohr, offshore Egypt, was in 2015.
Oil production in the United States (2000-2015)

million barrels per day

from hydraulically fractured wells (51% in 2015)

from nonhydraulically fractured wells (49% in 2015)
Lower 48 onshore crude oil production by region (Reference case)

million barrels per day

2016

history projections

Southwest

Dakotas/Rocky Mountains

Gulf Coast

Midcontinent

West Coast

East

2000 2010 2020 2030 2040

U.S. Energy Information Administration

#AEO2017  www.eia.gov/aeo
### Table 5.4: US liquids production breakdown forecast, 2016-2017, tb/d

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2016</th>
<th>Change</th>
<th>2016</th>
<th>Change</th>
<th>2017</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tight crude</td>
<td>3,926</td>
<td>4,524</td>
<td>598</td>
<td>3,910</td>
<td>-14</td>
<td>3,628</td>
<td>-282</td>
</tr>
<tr>
<td>Gulf of Mexico crude</td>
<td>1,397</td>
<td>1,515</td>
<td>118</td>
<td>1,625</td>
<td>110</td>
<td>1,775</td>
<td>150</td>
</tr>
<tr>
<td>Other crude</td>
<td>3,441</td>
<td>3,376</td>
<td>-65</td>
<td>3,324</td>
<td>-52</td>
<td>3,234</td>
<td>-90</td>
</tr>
<tr>
<td>Unconventional NGL</td>
<td>1,594</td>
<td>1,961</td>
<td>367</td>
<td>2,183</td>
<td>222</td>
<td>2,260</td>
<td>77</td>
</tr>
<tr>
<td>Other NGL</td>
<td>1,420</td>
<td>1,382</td>
<td>-39</td>
<td>1,280</td>
<td>-102</td>
<td>1,256</td>
<td>-30</td>
</tr>
<tr>
<td>Biofuels + Other liquids</td>
<td>1,238</td>
<td>1,283</td>
<td>45</td>
<td>1,295</td>
<td>11</td>
<td>1,315</td>
<td>20</td>
</tr>
<tr>
<td>US total supply</td>
<td>13,017</td>
<td>14,041</td>
<td>1,024</td>
<td>13,617</td>
<td>-424</td>
<td>13,462</td>
<td>-155</td>
</tr>
</tbody>
</table>

*Note: *2016 = Estimate and 2017 = Forecast.
Source: OPEC Secretariat.

### Graph 5.8: Trend of US oil production’s components, 2005-2017

![Graph of US oil production's components](image)
Breakeven oil prices for North America's shale basins and the Gulf of Mexico vary widely, but on average they look competitive even with oil below $60 a barrel.

Source: Wood Mackenzie

Note: Breakeven prices reflect projected level needed to generate a 10 percent return on drilling and completion costs in 2017.
Approved permits for shallow water Gulf of Mexico (1ft to 499ft):

Shallow water Gulf of Mexico approved permits since 2005

Housing Crisis

Approved permits for deepwater Gulf of Mexico (500ft or deeper):

Deepwater Gulf of Mexico approved permits since 2005

2005: 55
2006: 95
2007: 106
2008: 69
2009: 76
2010: 32
2011: 38
2012: 57
2013: 68
2014: 69
2015: 71
2016 (10 months annualized): 71

Katrina & Rita
Housing Crisis
McCondo

### Deepwater Gulf of Mexico field starts (2015)

<table>
<thead>
<tr>
<th>Field name</th>
<th>Majority operator</th>
<th>Associated project</th>
<th>Water depth (ft)</th>
<th>Discovery year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silvertip</td>
<td>Shell</td>
<td>Perdido</td>
<td>9,280</td>
<td>2004</td>
</tr>
<tr>
<td>West Boreas</td>
<td>Shell</td>
<td>Mars B</td>
<td>3,094</td>
<td>2009</td>
</tr>
<tr>
<td>Hadrian South</td>
<td>ExxonMobil</td>
<td>Lucius</td>
<td>7,983</td>
<td>2009</td>
</tr>
<tr>
<td>Lucius</td>
<td>Anadarko</td>
<td>Lucius</td>
<td>7,168</td>
<td>2009</td>
</tr>
<tr>
<td>Deimos South</td>
<td>Shell</td>
<td>Mars B</td>
<td>3,122</td>
<td>2010</td>
</tr>
<tr>
<td>Big Bend</td>
<td>Noble Energy</td>
<td>Rio Grande</td>
<td>7,273</td>
<td>2012</td>
</tr>
<tr>
<td>Marmalard</td>
<td>LLOG Exploration</td>
<td>Delta House</td>
<td>6,148</td>
<td>2012</td>
</tr>
<tr>
<td>Dantzler</td>
<td>Noble Energy</td>
<td>Rio Grande</td>
<td>6,580</td>
<td>2013</td>
</tr>
</tbody>
</table>

### Anticipated Deepwater Gulf of Mexico field starts (2016-17)

<table>
<thead>
<tr>
<th>Field name</th>
<th>Majority operator</th>
<th>Water depth (ft)</th>
<th>Discovery year</th>
<th>Anticipated production start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stones</td>
<td>Shell</td>
<td>9,556</td>
<td>2005</td>
<td>2016</td>
</tr>
<tr>
<td>Heidelberg</td>
<td>Anadarko</td>
<td>5,271</td>
<td>2009</td>
<td>2016</td>
</tr>
<tr>
<td>Holstein Deep</td>
<td>Freeport McMoRan</td>
<td>4,326</td>
<td>2014</td>
<td>2016</td>
</tr>
<tr>
<td>Son of Bluto 2</td>
<td>LLOG Exploration</td>
<td>6,461</td>
<td>2012</td>
<td>2017</td>
</tr>
<tr>
<td>Horn Mountain Deep</td>
<td>Freeport McMoRan</td>
<td>5,400</td>
<td>2015</td>
<td>2017</td>
</tr>
</tbody>
</table>
The U.S. weekly offshore rig count has fallen by three units, leaving the U.S. with only 18 active offshore drilling rigs. The U.S. onshore rig count is on the rise.
Shale vs. Offshore

North America shale D&C capex
USD Billion

Offshore greenfield capex by commitment year
USD Billion

2014
2015
2016
2017

Source: Rystad Energy DCube, Offshore 2-17-17
Rystad Energy Oilfield Service Index by award year
Indexed to 2014

Source: Rystad Energy DCube, Offshore 2-17-17
Rystad Energy Oilfield Service Index by award year
Indexed to 2014

Source: Rystad Energy Research and Analysis
Pipelines
Gas
Liquids – Crude, Refined Products, NGLs
Natural Gas Pipelines
Existing North American Crude Oil Pipelines
There are approximately 95,000 miles nationwide of refined products pipelines. These refined product pipelines vary in size from relatively small 8 to 12 inch diameter lines up to 42 inches in diameter. The major pipelines for the Atlantic Seaboard are the Plantation Pipeline, which ends south of Washington, DC and the Colonial Pipeline which supplies product to the entire seaboard, ending in Linden, NJ.
Liquids Pipeline Mileage Separated by Product

From Association of Oil Pipe Lines and American Petroleum Institute
Pipeline Issues

• Canadian Heavy Crude Imports to Gulf Coast via Keystone XL doesn’t solve Louisiana’s Venezuelan problem

• Domestic Shale Oil “Imports” to Louisiana for use and export via Dakota Access and Bayou Bridge pipelines

• Gas pipelines face stasis at FERC until commission quorum re-established

• Liquids pipelines have no federal access to eminent domain

• “Buy American” impact unknown
Refining and Petrochemicals
### Separation - Typical Alkanes in Crude Oil

<table>
<thead>
<tr>
<th>Alkane</th>
<th>Molecular Structure</th>
<th>Fuel Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Butane</td>
<td><img src="image" alt="Butane Structure" /></td>
<td>LPG</td>
</tr>
<tr>
<td>5 Pentane</td>
<td><img src="image" alt="Pentane Structure" /></td>
<td>Gasoline</td>
</tr>
<tr>
<td>6 Hexane</td>
<td><img src="image" alt="Hexane Structure" /></td>
<td>Gasoline</td>
</tr>
<tr>
<td>8 Octane</td>
<td><img src="image" alt="Octane Structure" /></td>
<td>Gasoline</td>
</tr>
<tr>
<td>10 Decane</td>
<td><img src="image" alt="Decane Structure" /></td>
<td>Gasoline</td>
</tr>
<tr>
<td>12 Dodecane</td>
<td><img src="image" alt="Dodecane Structure" /></td>
<td>Jet Fuel</td>
</tr>
<tr>
<td>16 Cetane</td>
<td><img src="image" alt="Cetane Structure" /></td>
<td>Diesel</td>
</tr>
</tbody>
</table>
Crude oil and associated liquids contain a wide variety of hydrocarbons.
U.S. Refinery Capacity and Complexity varies by Region

Figure 1. U.S. regional refinery capacity

- Rocky Mountain
  - No coker: 0.3
  - With coker: 0.4

- Midwest
  - No coker: 1.2
  - With coker: 2.9

- Gulf Coast
  - No coker: 1.3
  - With coker: 7.8

- West Coast
  - No coker: 1.0
  - With coker: 2.0

- East Coast
  - No coker: 1.0
  - With coker: 0.4

Notes: As of January 1, 2014, there were 133 operating refineries with atmospheric crude oil distillation units (ACDU) totaling capacity of 18.9 million barrels per stream day. Heavy capacity denotes refineries with coking capacity; light capacity denotes refineries without coking capacity. Source: U.S. Energy Information Administration.

21.5% of US Coking capacity
57.8% of US Coking capacity
Imports and Exports

Imports = Heavy Sour
Exports = Light Sweet and refined products
Refinery Exports

• US domestic refinery shipments peaked in 2005 with ~1 mm bbl./day of exports.

• 2014 US export shipments (2.8 mm bbl./day) to Western Hemisphere clients were at 25% or requirements vs 10% in 2005, an increase of almost 2 mm bbl/day. Argentina, Brazil, Canada, Chile, Columbia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Panama, Peru and Venezuela all received record or near record shipments from the US in 2014.

• Brazil imports quadrupled to 215,000 bbl./day since 2009, Canada more than doubled to 478,000 bbl/day and Mexico was up 70% to 555,000 bbl./day.

• Total international shipments are now at ~4 mm bbl./day vs. 1 mm bbl./day in 2005. Other recipients include France, Nigeria, China, South Korea, Australia and Lebanon

• The last time refined exports soared this high was in 1945, at the end of WWII.
U.S. distillate, gasoline, and propane export flows

- Propane to Asia
- Propane to Mexico
- Distillate, gasoline, and propane to Central and South America
- Gasoline to Africa
- Distillate and propane to Europe

Source: U.S. Energy Information Administration, Petroleum Supply Monthly
Note: PADD is Petroleum Administration for Defense Districts.
Figure 3.4: US Gulf Coast Heavy Crude Imports (thousand barrels per day)

Source: EIA PADD 3 imports by country of origin, 2015
Overall, Crude Oil Imports have Declined

Imports of all grades from World to Total U.S.

Source: U.S. Energy Information Administration
Light, Sweet Crude Oil Imports have Declined Significantly

Source: U.S. Energy Information Administration
Heavy Crude Oil Imports Have Increased

Imports of heavy (sweet and sour) from World to Total U.S.

Source: U.S. Energy Information Administration
98% of U.S. Imports Less Than 35° API Gravity

Figure 5. 98% of U.S. Imports Less Than 35° API Gravity. Source: Drilling Info, Labyrinth Consulting Services, Inc. and Crude Oil Peak.

=> Heavy Sour Crude for Complex Refineries
Venezuelan crude into key markets
(source: ClipperData)
Petrochemicals
U.S. ETHANE SUPPLY / DEMAND OUTLOOK

Source: EOG Fundamentals
Note: Assumes 50% spending rate for Petchems, 70% for Exports. Potential projects are viewed as <80% likely to occur.
U.S. LPG... A GROWING SURPLUS

Source: EPD Fundamentals

Note: LPG is Propane and Butane
For all of 2015, propane exports averaged 616,000 barrels a day, up 46 percent from the record set in 2014 and more than five times the 2010 level. U.S. LPG exports, which are mostly butane and propane, move all over the globe. Mexico was the top consumer in December, bringing in 21 percent of total shipments. China and Japan combined to take 25 percent.
As US propane production has increased and domestic demand has remained relatively flat, the US has transitioned from being a net propane importer to a net exporter. Sources: US Energy Information Administration, US Department of Commerce.
U.S. BECOMES LARGEST EXPORTER OF PROPANE
Propane Exports from EPD Facilities as of July 2015

<table>
<thead>
<tr>
<th>Region</th>
<th>% of Cargoes Loaded</th>
<th>% of Destination Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>26%</td>
<td>51%</td>
</tr>
<tr>
<td>South America</td>
<td>34%</td>
<td>18%</td>
</tr>
<tr>
<td>Europe</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Far East</td>
<td>31%</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: Waterborne
GLOBAL TRADE FLOWS
POLYETHYLENE AND POLYPROPYLENE

POLYETHYLENE SUMMARY
- Global supplies of polyethylene to increase by 32% from 2015 to 2025
- Shale based ethane and coal will be the dominant new projects
- India & China to remain key global drivers for demand growth
- Post 2025, higher operating rates expected reducing deficit required
- Medium term, market to expect surpluses
- Low crude oil price to hang over future investments

POLYPROPYLENE SUMMARY
- The Americas will need to add about 356,000 mt of new capacity during the next decade to keep up with demand
- Europe is expected to be balanced to long for the duration of the forecast period
- The Middle East will see surpluses peak at 5.1 million mt in 2022, and will have surpluses of around 4 million mt throughout the forecast period
- Asia remains net short throughout the forecast period, and could see deficits totaling 7.4 million mt by 2025 if no new capacity is announced
- Africa is expected to remain net short, reaching a deficit of 670,000 mt towards the end of our forecast period

All of the information contained within this graphic is taken from Platts Global Polyethylene Outlook report and data package. For more information visit: www.platts.com/stock

All figures correct at the time of publishing, February 2016
Major ethane cracker projects (announced and under construction) in the U.S. and proposed new ethylene capacity by state. Click on and interact with the map to learn more. Source: Petrochemical Update.
Shell cracker plant in Beaver County, PA to provide 600 jobs
**Formosa Plastics Group** is seeking permission from the state of Louisiana to invest $9.4 billion to build petrochemical plants. The Taiwanese chemicals producer is waiting for the U.S. state’s authorization for construction of the facilities in St. James, according to Lin Keh-Yen, executive vice president of Formosa Petrochemical Corp.

The group also plans another $5 billion investment to expand production lines in Texas, Formosa Plastics Corp. Chairman Jason Lin said by phone. “Seeking a permit solidifies that Formosa wants to do the project,” said Tony Potter, a vice president at IHS in Singapore. “Ethane prices will remain relatively low. Because of the lower cost, you have a situation where the U.S. ethane based production will be able to deliver polymer products into places like China cheaper than they can be made from naphtha in China and the surrounding countries like Taiwan, Japan, Korea, Thailand, Singapore.”

*Bloomberg 2-20-17*
ETHYLENE EXPORT: CULTIVATING DEMAND

Enterprise’s export position for LPG, Ethane and Propylene can be broadened to include Ethylene

- Asian demand for ethylene continues to grow beyond local production; Asia is looking to diversify with stable shale-advantaged pricing
- The 40% expansion in ethylene production in the U.S. will result in an over supplied U.S. ethylene market
  - Domestic producers need to reach global markets, otherwise the operating capacity of U.S. crackers will be reduced as new builds are completed
  - The LPG and ethane export model has forged the path to connect foreign consumers to the shale revolution...ethylene export is the next logical step

Economics are very similar to the Ethane Export project...and any NGL can be exported from an Ethylene terminal
In Houston, the Enterprise Products terminal will be able to export 200,000 bbl/d of ethane. Asked why the project makes sense, one commentator says: “One word: shale.”
ETHANE EXPORT FACILITY
Largest of Its Kind

- Located at Morgan’s Point on Houston Ship Channel; combined operating rate
  \(\approx 200 \text{ MBPD}\) across two docks
  - \(\approx 80\%\) committed under long-term contracts
  - All major materials ordered; on schedule for June 2016 completion

**Shipbuilders Response to Increased Ethane Demand**

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (MMBls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>5</td>
</tr>
<tr>
<td>2015</td>
<td>14</td>
</tr>
<tr>
<td>2016</td>
<td>29</td>
</tr>
<tr>
<td>2017</td>
<td>50</td>
</tr>
</tbody>
</table>

(Order of vessels (1.25 = MBBls; capacity per vessel); confirmed shipbuilding orders only)

**Market Potential**

- Ethylene cracker feedstock — displacing current crude oil derivative feedstocks or new demand
  - \(\approx 300 \text{ MBPD}\) ethane demand generated by converting 25% of NW Europe coastal operating capacity to ethane feedstock

- Fuel Market / Power generation

- Ultimate waterborne capacity needed will be dependent on roundtrip transit times to end-use market
  - Europe vs. Caribbean / South America vs. Asia
MARINE TERMINAL / DOCK ACTIVITY

Crude Oil & Condensate

NGL Terminal Volumes

Petrochemical & Refined Products

Total Volumes

(1) Excludes Oil tanking volumes prior to October 1, 2014
(2) Reflects net interest volumes for joint owned assets.
The contest will be between the ability of U.S. Downstream processors to handle all of the raw ethane and propane being produced.

Even if all of the new steam crackers are built, that merely moves the chokepoint down stream to the polymerization level.

1) Ethane will be sourced along the Gulf Coast and in the Marcellus and Utica shale plays. The bulk of existing steam crackers (≈31) and polymerization capacity is along the Gulf Coast.

2) Therefore, we expect the bulk of new cracker capacity to be installed there. New capacity will also be seen in the northeast. Perhaps one of the three proposed Northeast crackers will be built which will double the census.

3) Beyond domestic consumption, ethane, ethylene, propane and propylene, and bulk polymer chips will all be exported from the US.
LNG Exports
LNG US export projects under construction

1. Sabine Pass, LA
2. Cove Point, MD
3. Cameron, LA
4. Freeport, TX
5. Corpus Christi, TX
LNG Export Capacity (Bcf/d)

Source: PointLogic Energy LNG Informant
Power
Different Regions of the Country Use Different Fuel Mixes for power generation

- **WEST NORTH CENTRAL**
  - Non-Hydro Renewables: 6%
  - Other: <0.5%
  - Hydro: 3%
  - Fuel Oil: <0.5%
  - Natural Gas: 14%
  - Coal: 72%

- **EAST NORTH CENTRAL**
  - Non-Hydro Renewables: 2%
  - Other: <0.5%
  - Hydro: 1%
  - Fuel Oil: <0.5%
  - Natural Gas: 4%
  - Coal: 69%

- **NEW ENGLAND**
  - Non-Hydro Renewables: 6%
  - Other: <0.5%
  - Hydro: 7%
  - Fuel Oil: 1%
  - Natural Gas: 42%
  - Coal: 12%

- **PACIFIC CONTIGUOUS**
  - Non-Hydro Renewables: 9%
  - Other: <0.5%
  - Hydro: 31%
  - Coal: 3%
  - Natural Gas: 25%

- **PACIFIC NONCONTIGUOUS**
  - Non-Hydro Renewables: 4%
  - Other: <0.5%
  - Hydro: 55%
  - Coal: 12%
  - Natural Gas: 21%

- **WEST SOUTH CENTRAL**
  - Non-Hydro Renewables: 4%
  - Other: <0.5%
  - Hydro: 2%
  - Fuel Oil: 1%
  - Natural Gas: 45%
  - Coal: 36%

- **EAST SOUTH CENTRAL**
  - Non-Hydro Renewables: 2%
  - Other: <0.5%
  - Hydro: 7%
  - Fuel Oil: 1%
  - Natural Gas: 16%
  - Coal: 54%

- **SOUTH ATLANTIC**
  - Non-Hydro Renewables: 2%
  - Other: <0.5%
  - Hydro: 2%
  - Fuel Oil: 2%
  - Natural Gas: 22%
  - Coal: 46%
The latest casualty - Diablo Canyon in California
Entergy Corp. plans to shut down the Palisades nuclear power plant in Michigan in 2018. Marvin Fertel, president and CEO at the Nuclear Energy Institute, touted Palisades' role in providing "emissions-free" power and jobs while helping to stabilize the grid and acting as a hedge against fuel supply interruptions. But the market does not value the plant for providing any of those benefits," Fertel said in a statement. "Nuclear plants are operated by corporations, with an eye on the bottom line. What is not paid for does not endure."
On August 28, 2013, Entergy announced that due to economic factors, notably the lower cost of electricity provided by competing natural gas-fired power plants, it would cease operations and schedule the plant's
Sources of Electricity Generation
Vermont - 2013

- Nuclear: 70.1%
- Hydro: 19.7%
- Other: 3.5%
- Biomass: 6.5%
- Wind: 0.3%

Vermont Yankee
ISO - New England Generation By Fuel Type
2014 v. 2015 v. 2016 Share of Market

- Coal
- Nuclear
- Natural Gas
- Hydro
- Wood/Refuse/Landfill
- Wind
- Oil
- Solar

Source: M. Twomey
Pros:
• Domestically abundant fuel
• Relatively low fuel cost
• Zero CO2 emissions
• SMRs (units of <300 mw) provide for lower capex
• Avoids the addition of new CCGT plants with increased CO2 emissions

Cons:
• Very high capital cost
• Currently can’t compete with natural gas fueled units
• Spent fuel disposal/storage issues
• Non-standardized fleet
• Burdensome Regulations
• Base load only; not economically dispatchable
• Eminent need for subsidies to avoid premature shutdown
High Voltage transmission
A network of cable transporting electrical energy from generating units to distribution stations and transmission customers.
Transmission grid is a massive interconnected network.
Transmission: From Point A to B

Transmission allows delivery of electricity, often generated hundreds of miles from generation stations to end users.

Significant rivalry amongst, State Utility Commissions, Independent System Operators and FERC in regulating Interstate power transmission.

Increasing intermittent sources (wind and solar) has complicated things.
Nine organized wholesale markets serve two thirds of US electric customers and one-half of Canadian customers.

MISO, the Midcontinent ISO is the largest in terms of area.

Note the transmission choke point between MISO North and MISO South.
Taxes
Tax Policy

• Beware of ripple effects! Existing tax code has been flawed and inefficient for a very long time, because it is difficult to modify. People have optimized around it.
• A century ago lawmakers focused on taxing profits regardless of where earned. They still want to ignore location. They should have focused on taxing revenue and expenses where they occur, but they didn’t.
• Welcome to the BAT or the Border Adjustment Tax, a proposed import tariff similar to the one that caused the advent of OPEC in 1960.
• Obvious side effects include changes in currency values, making exports more difficult, not only for the US, but also increasing the international cost of raw materials denominated in dollars, like oil.
• Protective tariffs also allow for opportunistic increases in the cost of locally manufactured products paid for by US consumers, like gasoline, diesel, and jet fuel. That was a major cause of the depression, not to mention the US Civil War.
• Also, let’s not forget the impact on non-energy products, like tourism and education, two large US service “exports”.
SPE Meeting
Effects of the Trump presidency on the US Oil Patch

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