



CargillTM



Increasing Trade in Clean Electricity



Government
of Canada

Gouvernement
du Canada

Canada

Challenges and Barriers to Enhancing Trade in Clean Electricity and Ancillary Services

Challenges and Barriers to Enhancing Trade in Clean Electricity and Ancillary Services

- **Economic**
- **Regulatory**
- **Infrastructure**
- **Availability of Financing**



Where Have We Been???





1865
W W Cargill starts grain elevator business, Conover, Iowa

1869
Headquarters
Albert Lea, Minnesota



1978 – Public Utilities Regulatory Policies Act PURPA

The **Public Utility Regulatory Policies Act** (or **PURPA**) was a law passed in 1978 by the [United States Congress](#) as part of the [National Energy Act](#). It was meant to promote greater use of [renewable energy](#). This law created a market for non-utility [electric power](#) producers forcing [electric utilities](#) to buy power from these producers at the "avoided cost" rate, which was the cost the electric utility would incur were it to generate or purchase from another source. Generally, this is considered to be the fuel costs incurred in the operation of a traditional power plant.



This 20-kW hydropower plant in the Village of Oxford, Wisconsin, sells its power to Alliant Energy

North America Energy Trading Landscape

Timeline: Energy Trading Business – 25+ Year History & Evolution



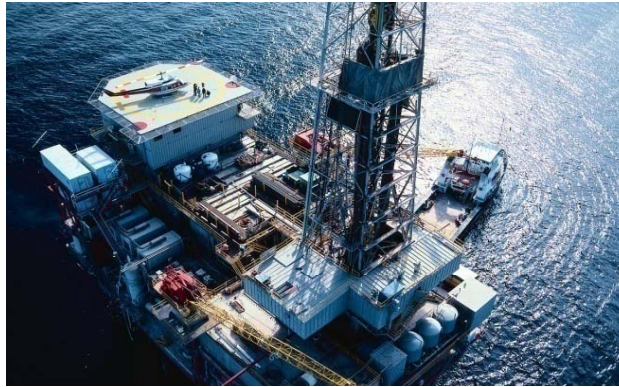
Energy Market Risk

Fundamental Risk

- Weather (hurricanes, cold, heat, precipitation, wind)
- **Infrastructure Capacity (pipelines, production assets, transmission, generation, storage)**
- Operations & Maintenance Schedules
- Fuel Supply Cost – Domestic and Import
- Industrial Demand
- Population & **Economic Growth**

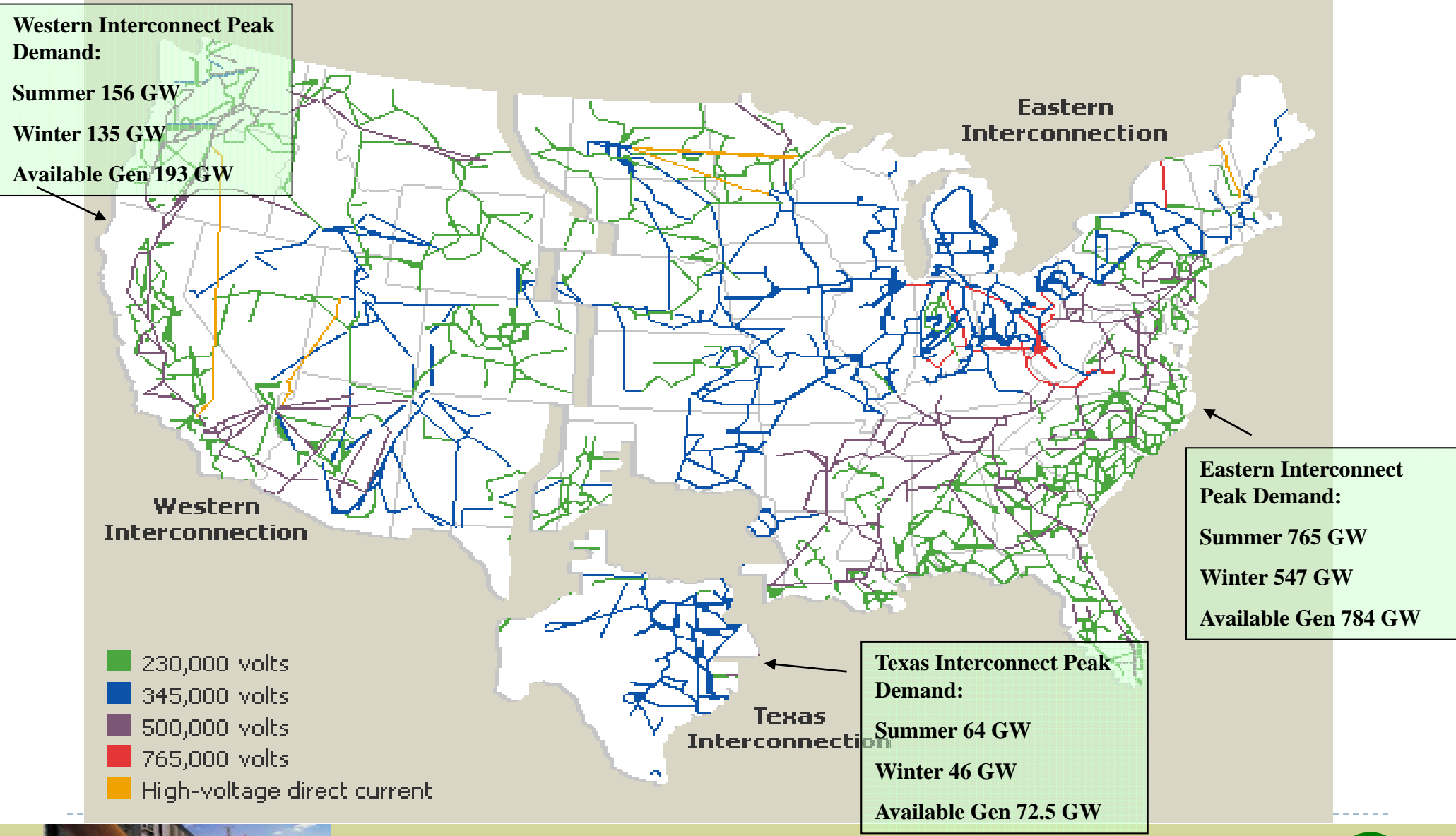
Non-Fundamental Risk

- Technicals (charts)
- Funds & Money Flows (FX)
- Technology
- **Project Development / Financing**
- **Regulatory**
- Political (policy)
- Transaction (credit / counterparty / liquidity)



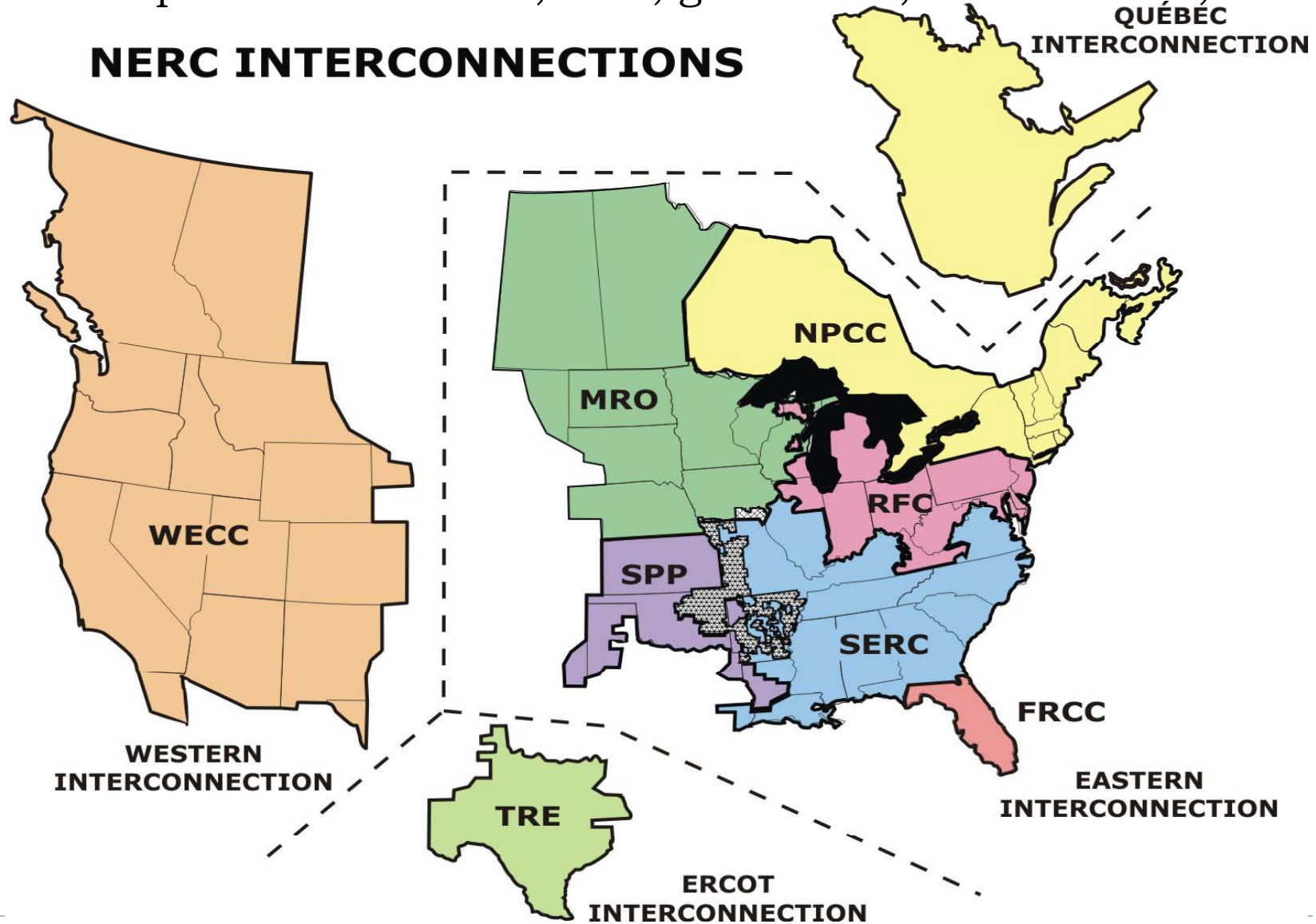
North America Power Grid – 3 Independent Networks

NA is interconnected via transmission. Grid reliability is FIRST priority



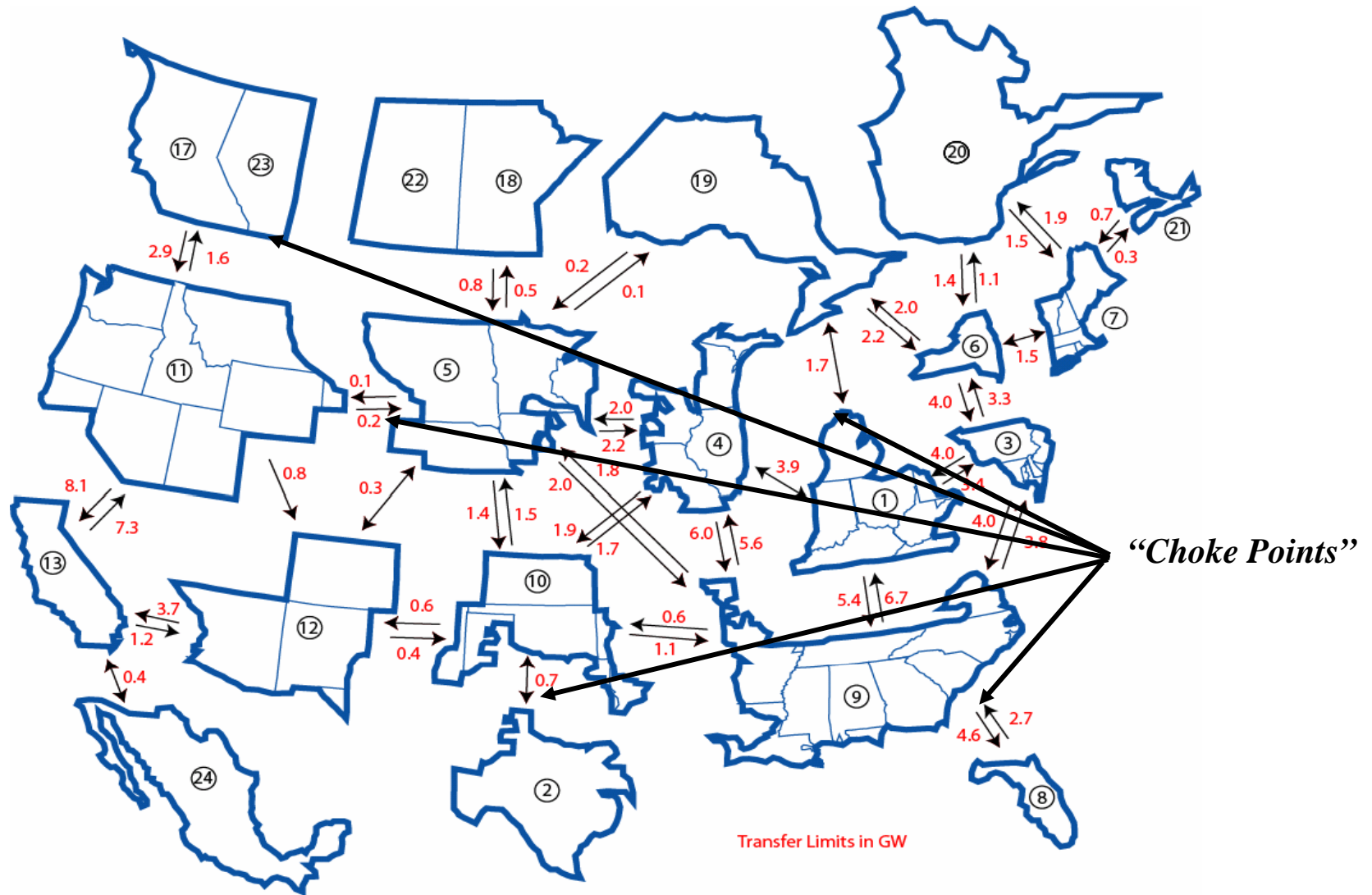
NERC Interregional System and Sub-regions

Each is unique – market rules; SnD, generation; transmission; customers



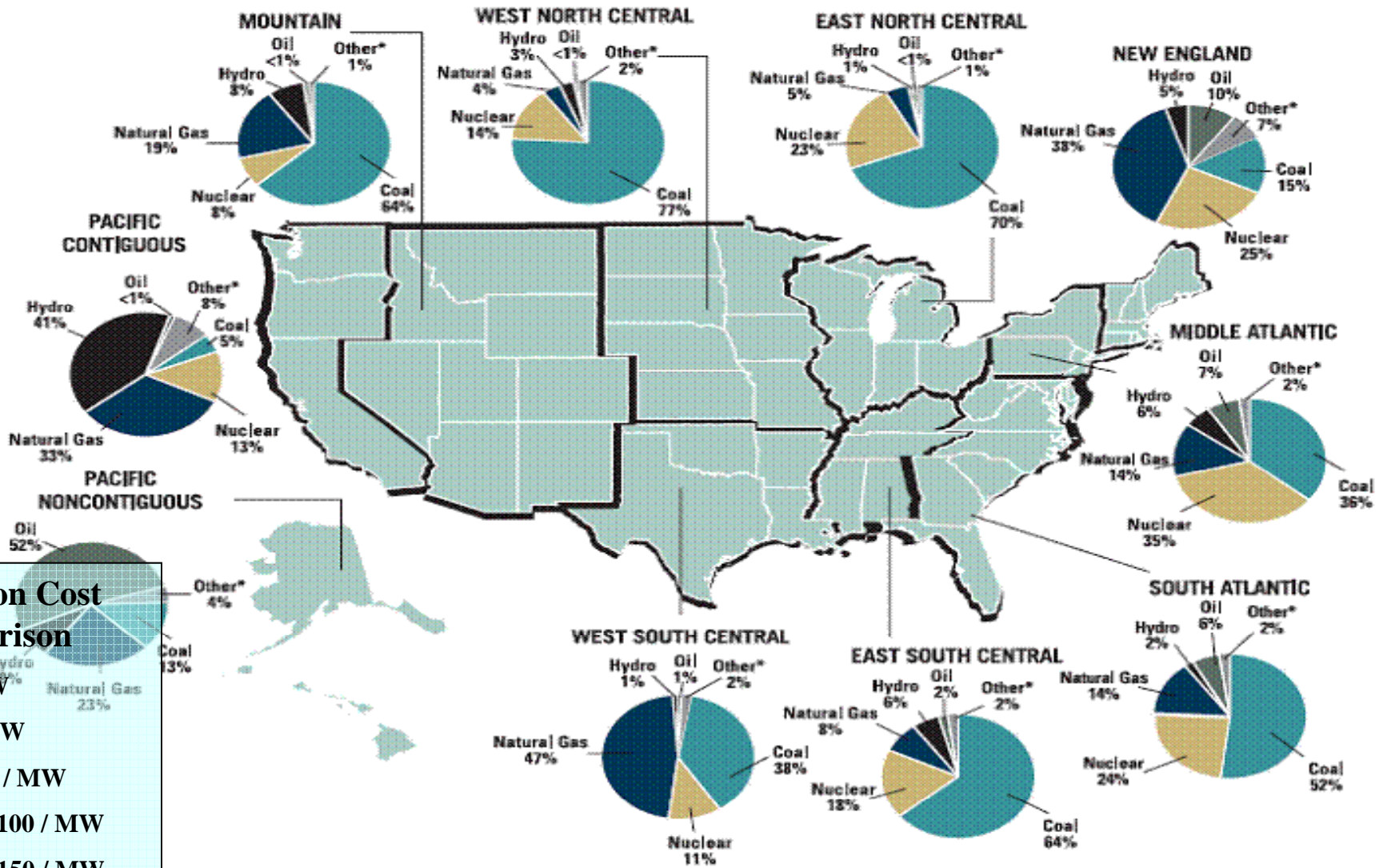
Transmission Lines Connect All Sub-regions

Limited Transmission Between Regions Leads To “Choke Points”



Generation Fuel Mix (by Region)

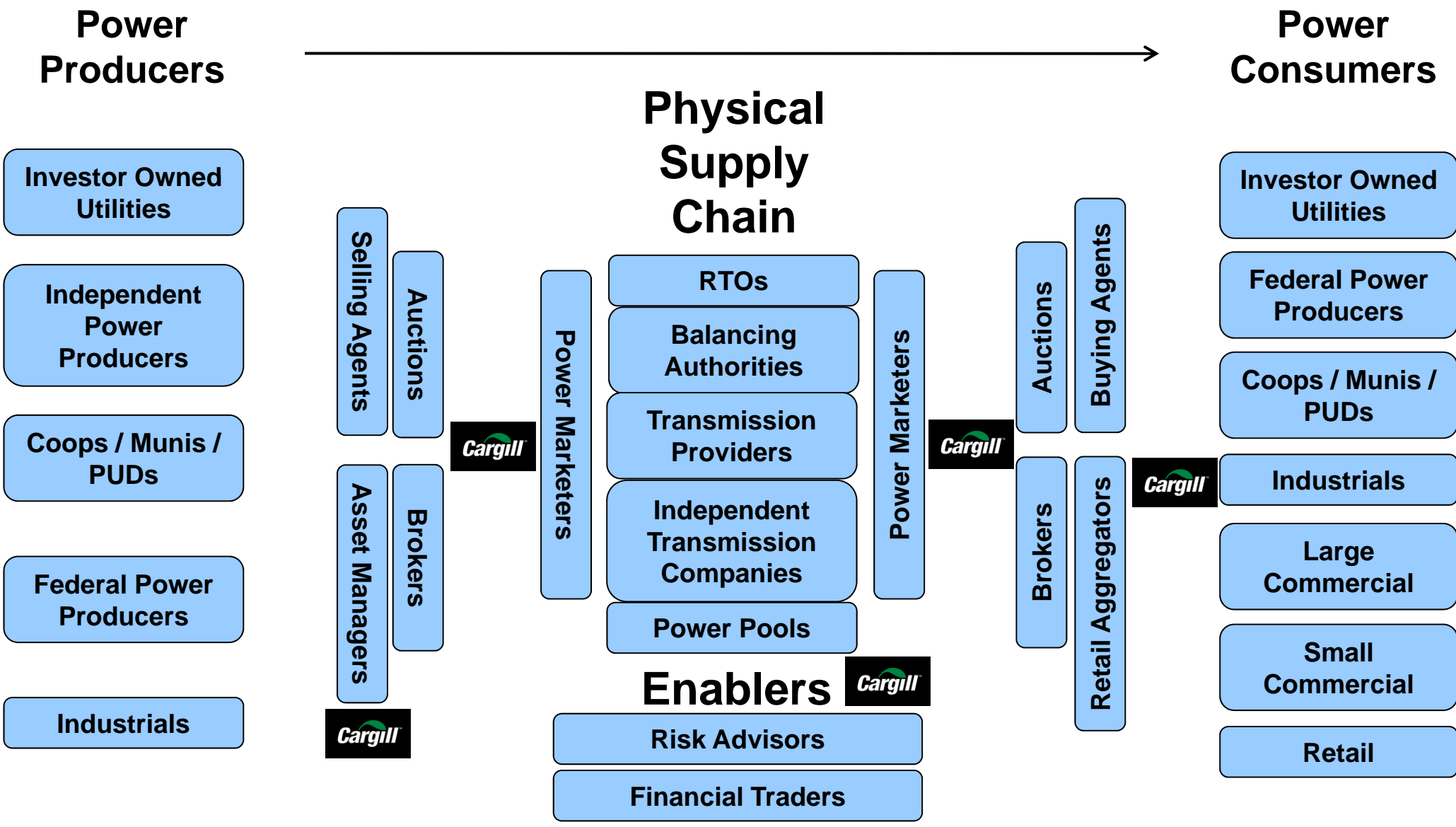
Different generation mix presents regional-specific challenges



Generation Cost Comparison

- Hydro – \$2 / MW
- Nuclear – \$7 / MW
- Coal – \$10 – \$50 / MW
- Nat Gas – \$40 – \$100 / MW
- Fuel Oil – \$50 – \$150 / MW

NA Power Industry Physical Supply Chain

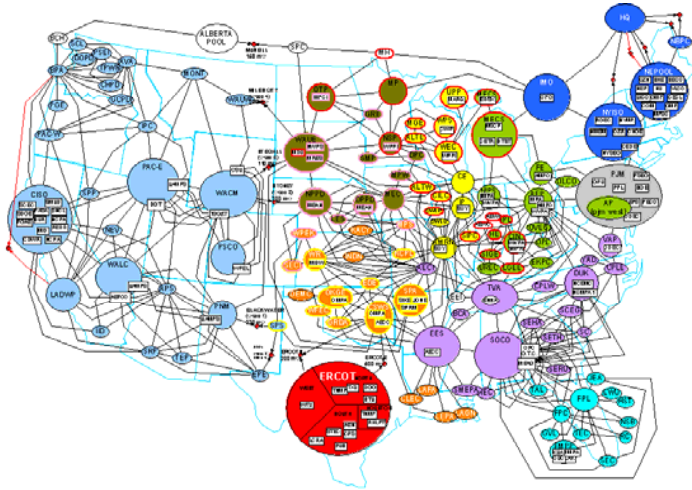


Evolution of Power Markets & Reliability in NA

From vertically integrated monopoly markets to regional marketplaces

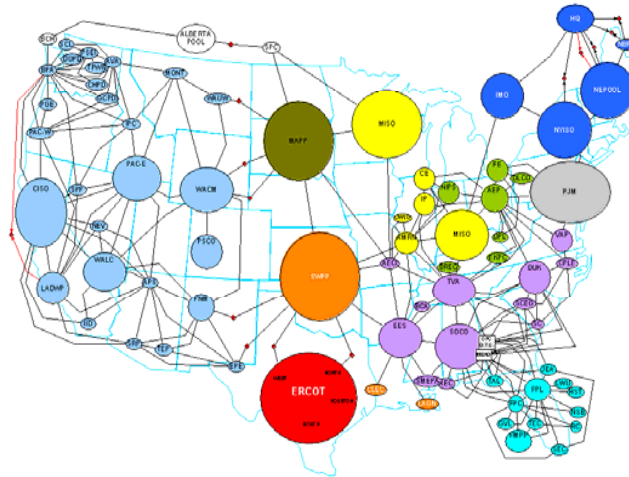
PAST

Individual utilities ensure reliability



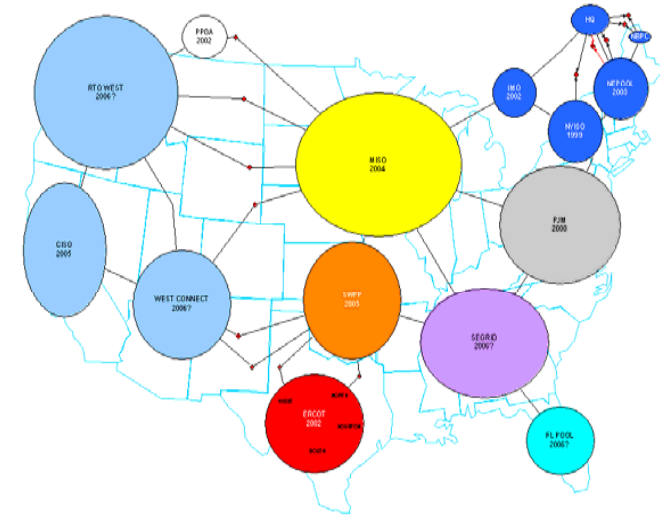
PRESENT

ISOs* & RTOs* manage multiple utility systems for reliability



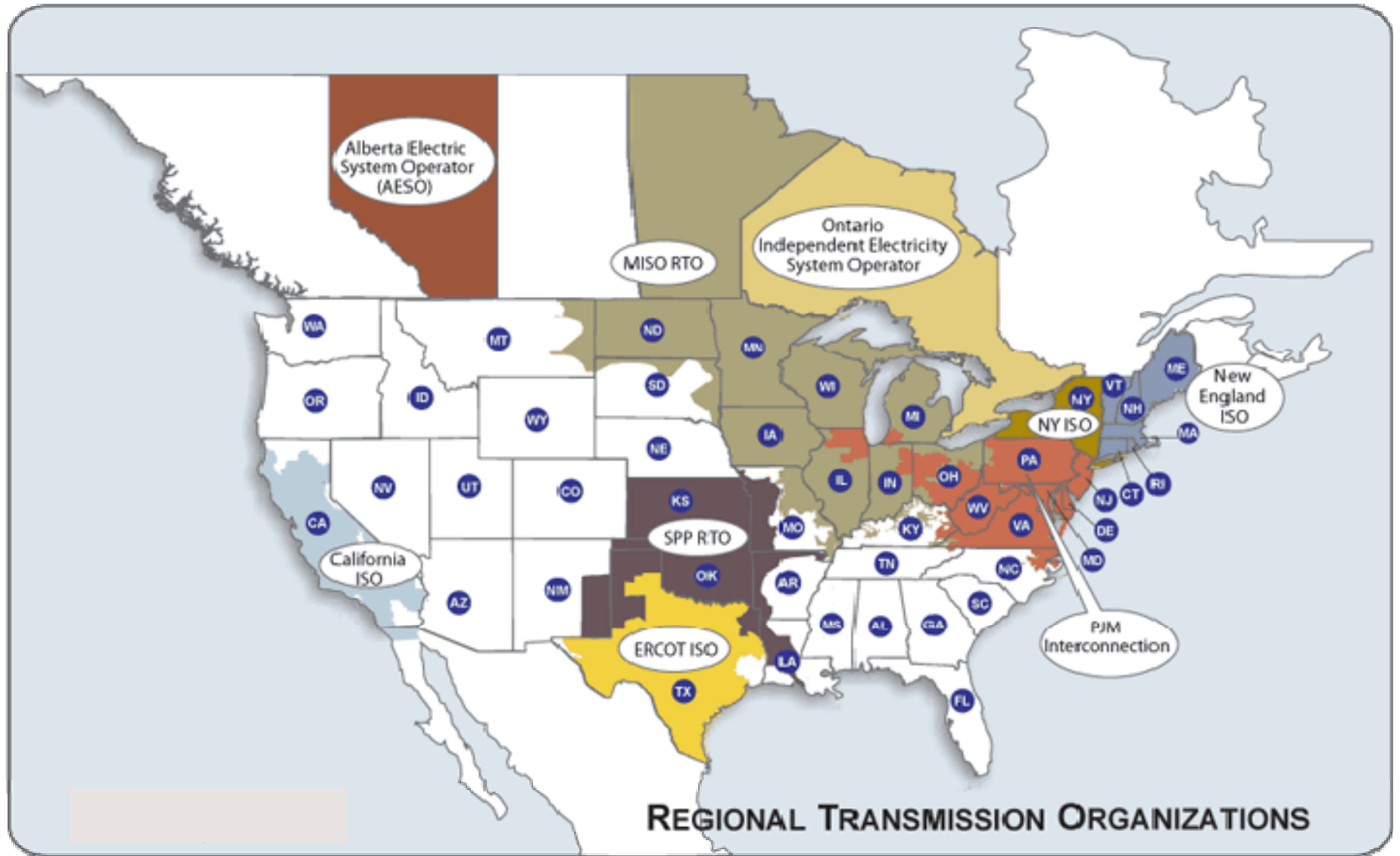
FUTURE?

Standard Market Design (SMD)
10-20 regional systems



* ISO – Independent System Operator; RTO – Regional Transmission Operator

Regional Transmission Organizations are Increasing



NA Pipeline System Continues to Expand

Wyoming – Expansion of the intrastate pipeline systems in the Green River and Powder River basins and an increase in interstate pipeline capacity towards Midwest and Western markets.

Canadian Border Import Growth – Completion of Alliance Pipeline and expansion of the Northern Border Pipeline system.

Midwest – Completion of Cheyenne Plains and Rockies Express Pipelines to transport Wyoming/Colorado production to the Midwest.

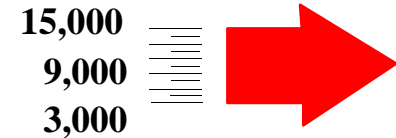
Canadian Border Export – Completion of the Vector Pipeline system designed to transport supplies back to Canada.

Wyoming/Utah/Nevada
Doubling of capacity on the Kern River system.

New England – Completion of the Maritimes & Northeast and the Portland Natural Gas pipeline systems.

New Mexico/Arizona – Expansion of the Transwestern, El Paso Natural Gas, and Questar systems.

Capacity
(mmcf/d)



→ = Direction of Flow

↔ = Bi-directional

California – Completion of the North Baja Pipeline adding export capacity to Mexico.

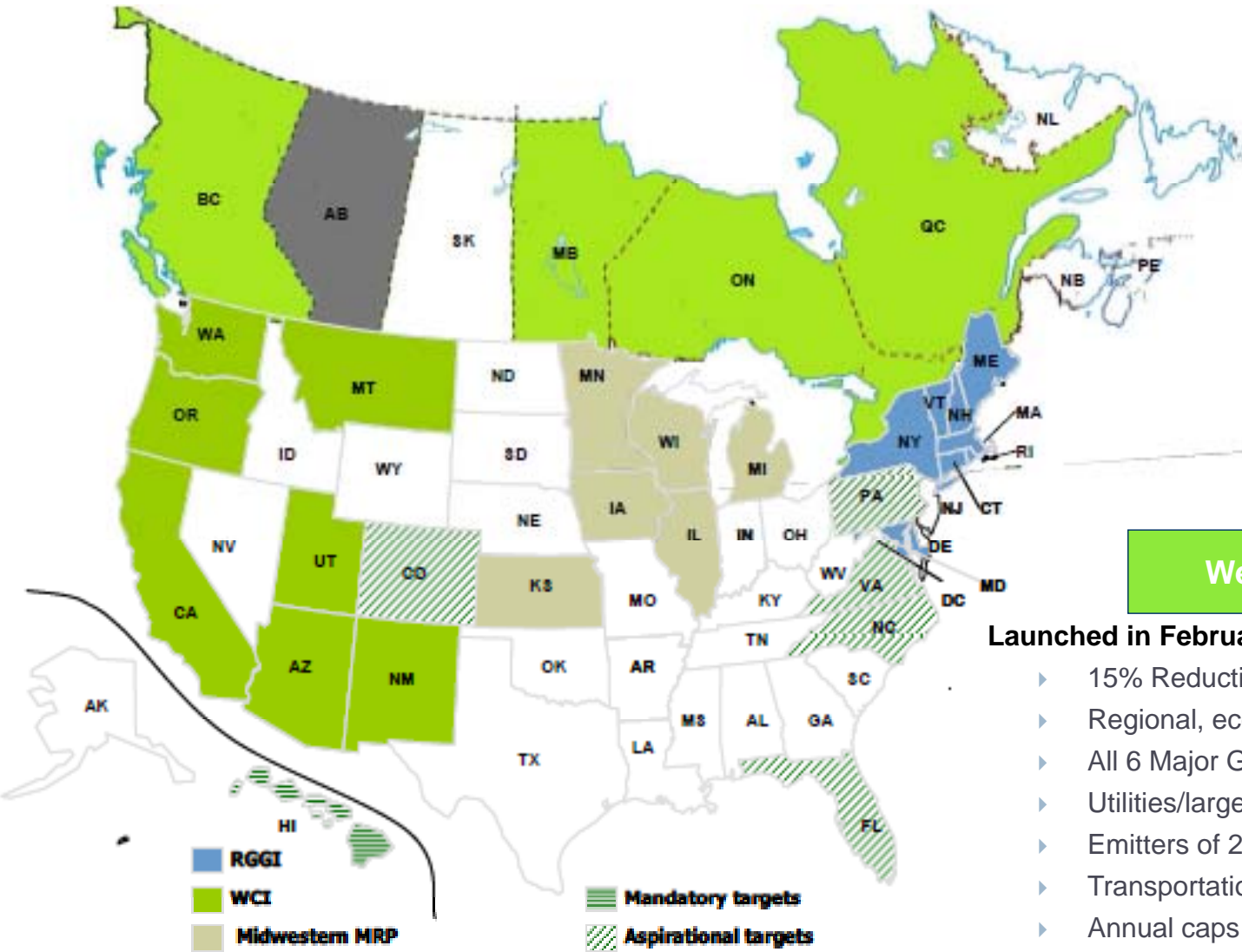
Texas – Expansion of intrastate pipeline network in the Barnett Shale formation area and to interstate pipelines for transport to Midwestern and eastern natural gas markets.

Louisiana – Capacity to accommodate new deepwater production.

Florida – Completion of the Gulfstream Pipeline system and expansion of Florida Gas Transmission system.

NA Carbon & Emissions Markets are Evolving

RGGI* & WCI* Represent Two Examples of Evolution in US Compliance Market



Regional Greenhouse Gas Initiative (RGGI)

- January 1, 2009 start date
- Regional Cap of 188M tons (roughly 2005 emissions)
- 25MW+ generators only
- Emissions stabilize from 2009-2014
- 1% reduction/yr 2015-2018
- 5% below business as usual by 2020
- 1st auction cleared \$3.07, 2nd auction \$3.38
- Price floor = \$1.86 / allowance

Western Climate Initiative (WCI)

Launched in February 2007 by California

- ▶ 15% Reduction below 2005 levels by 2020
- ▶ Regional, economy-wide goal
- ▶ All 6 Major GHGs
- ▶ Utilities/large industrial facilities participate in 2012
- ▶ Emitters of 25,000+ tonsCO₂/yr subject to cap
- ▶ Transportation sector participates in 2015
- ▶ Annual caps until 2020 will decline per 2012 rules
- ▶ Caps after 2020 set at least 3 years in advance

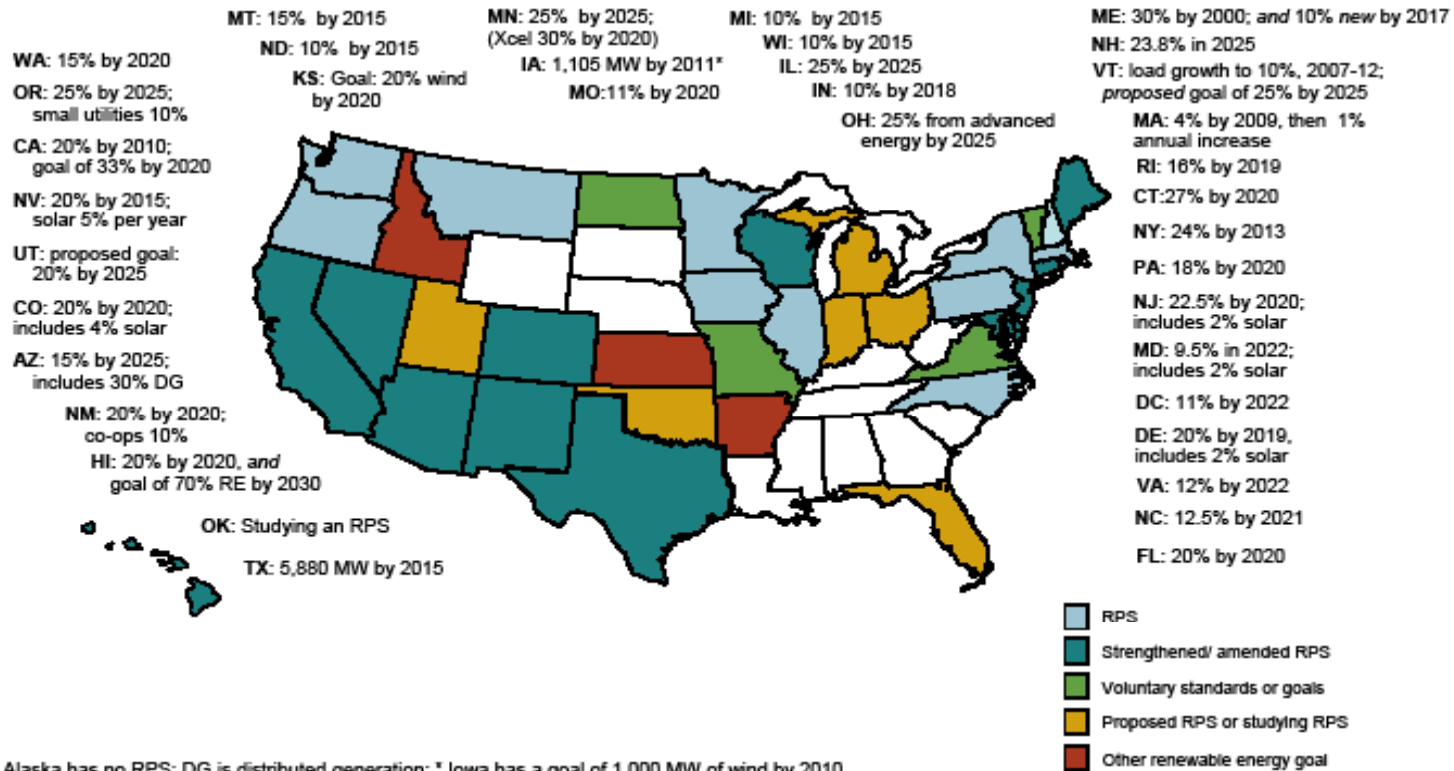
* RGGI – Regional Greenhouse Gas Initiative; WCI – Western Climate Initiative

Renewable Portfolio Standards (RPS)

Electric Market Overview: Renewables

Federal Energy Regulatory Commission • Market Oversight @ FERC.gov

Renewable Energy Portfolio Standards (RPS)

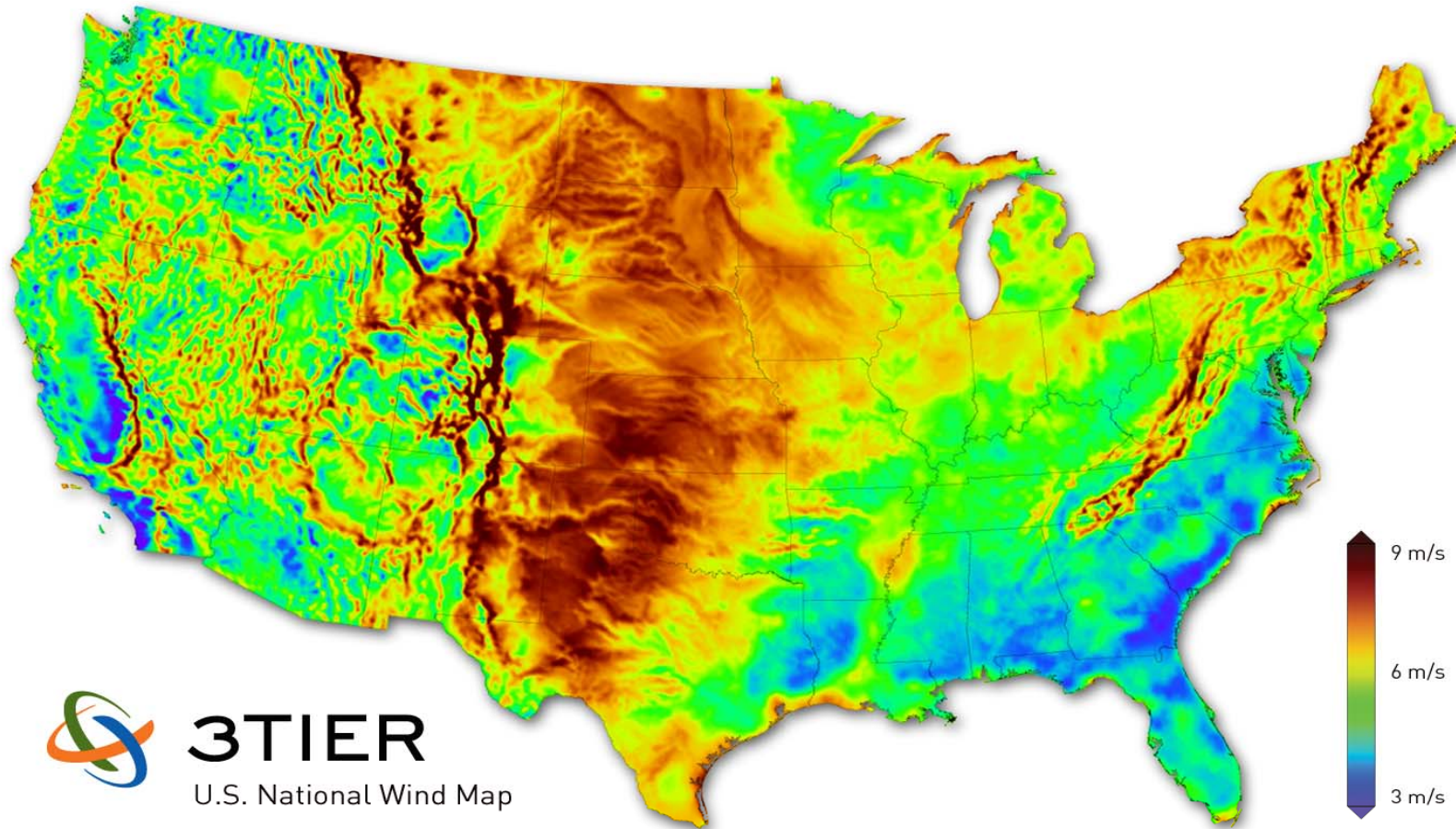


Notes: Alaska has no RPS; DG is distributed generation; * Iowa has a goal of 1,000 MW of wind by 2010
Sources: Derived from data in: EEI, EIA, LBNL, PUCs, State legislative tracking services, Database of State Incentives for Renewables and Efficiency, and the Union of Concerned Scientists.

Updated March 7, 2008

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US National Wind Map



3TIER
U.S. National Wind Map

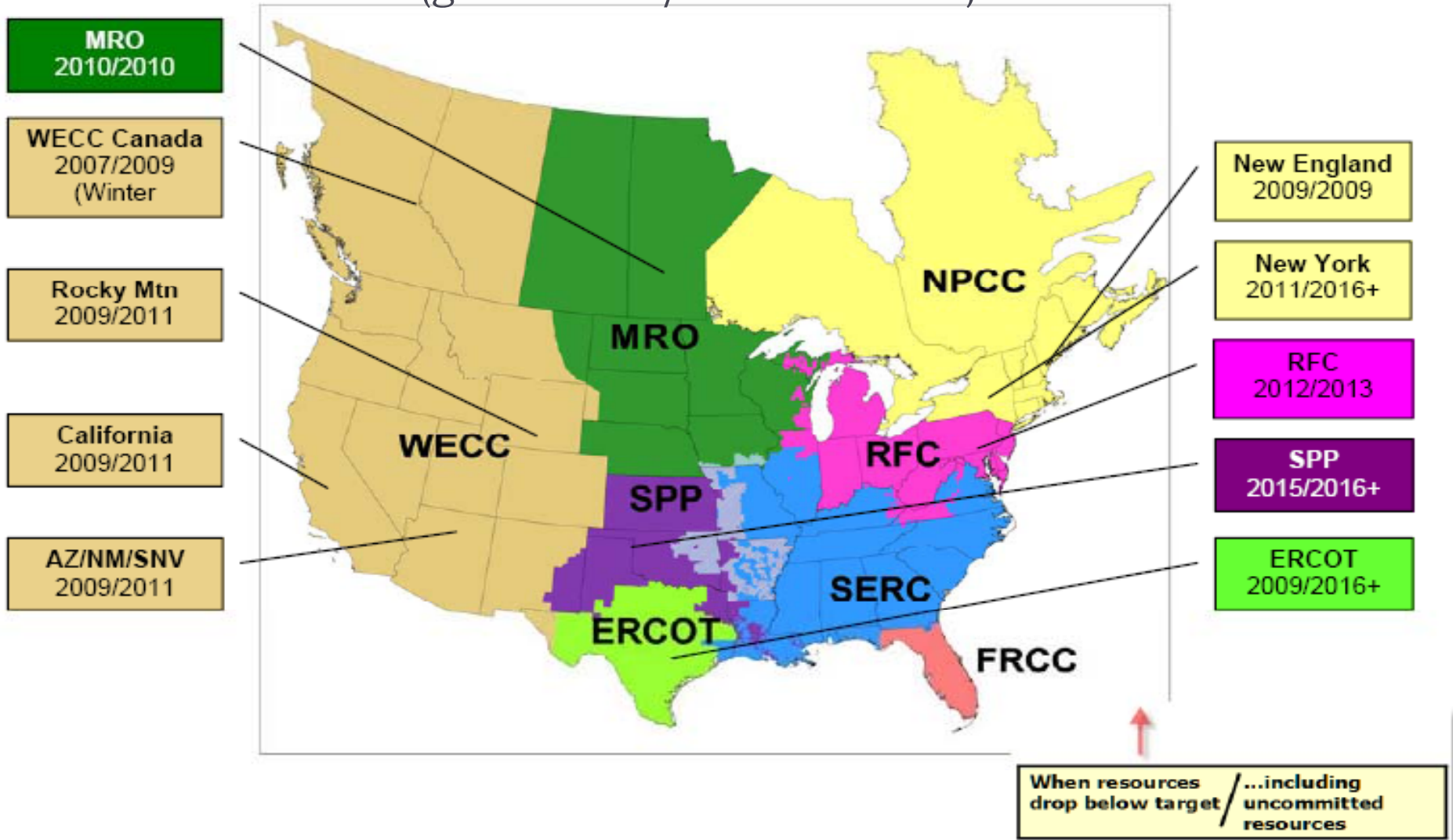
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Ave wind speeds measured @ 80 meters

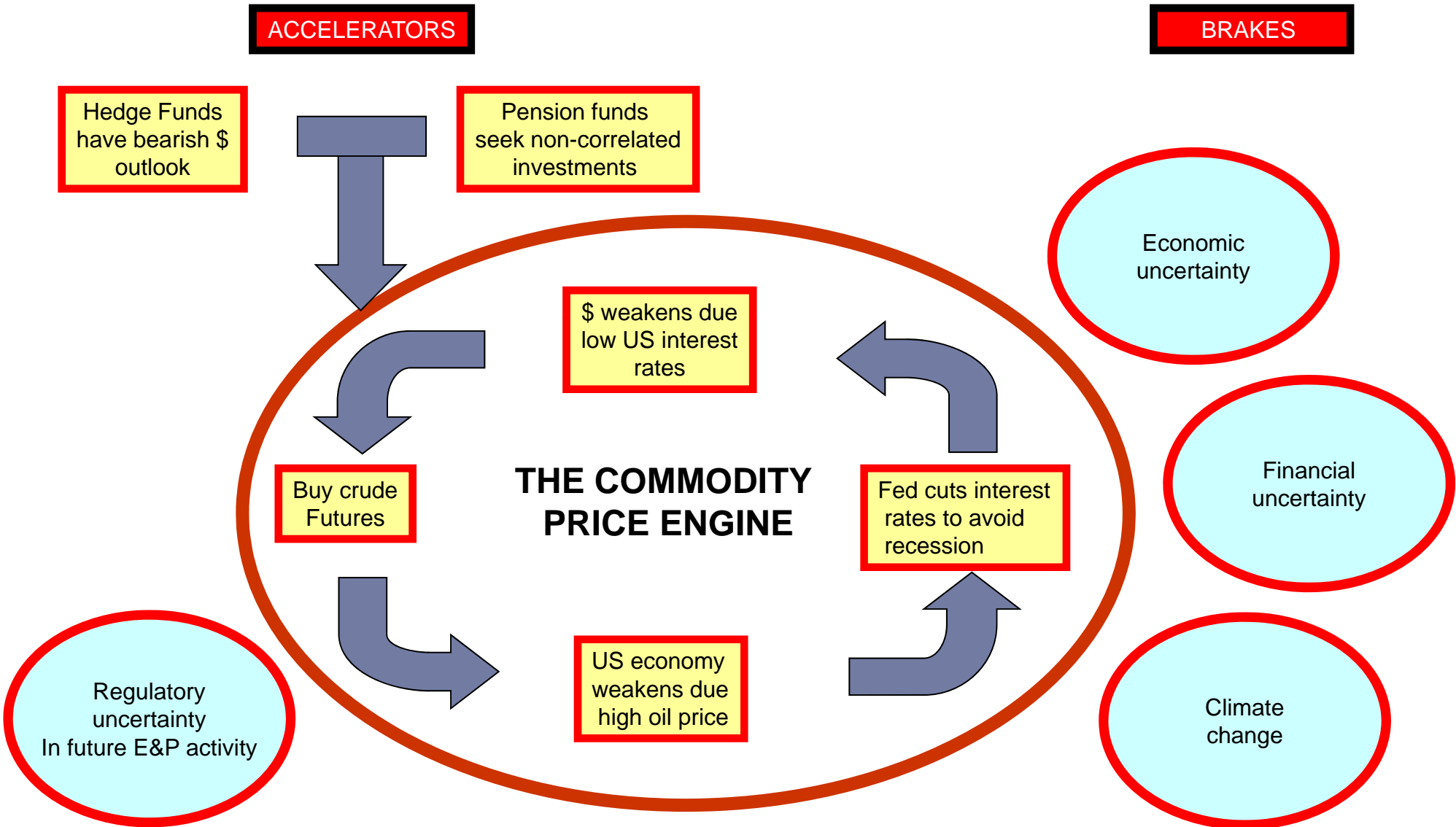


Supply & Demand Outlook – NERC Market Overview

Below ~15% Resource Adequacy level results in increased volatility and need for investment (generation / transmission)



The Commodity Price Engine – Oil example



Challenges and Barriers to Enhancing Trade in Clean Electricity and Ancillary Services

- **Economic**
- **Regulatory**
- **Infrastructure**
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Where Are We Going???



I don't know, but...



...it will continue to be interesting!!!



Cargill is the Right Energy Market Partner

As Energy Industry Evolves, Solutions Need to be Created – Cargill can Help

- **Adaptable**

- *Cargill has effectively adapted to market changes over the past 25+ years*

- **Experienced**

- *140+ years in commodities processing, marketing and trading*

- **Financially Stable**

- *Strong balance sheet (AA rating) supported by diverse earnings and businesses*

- **Global Experience**

- *Understanding of energy markets from a global perspective provides unique insights*





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