

# ENERGY INVESTING

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- Founded 1998, and have invested >\$1.5 billion across 4 private equity funds in midstream and broader energy infrastructure
- Founding partners have been in midstream business since mid-1980's, pioneers of commercially independent, high deliverability natural gas storage in the U.S.
- Development, construction, operations focus
- 66% of invested capital has gone into underground storage, with a particular focus on salt cavern storage
- Active ongoing development of multiple storage projects across energy value chain

# Starting Thoughts

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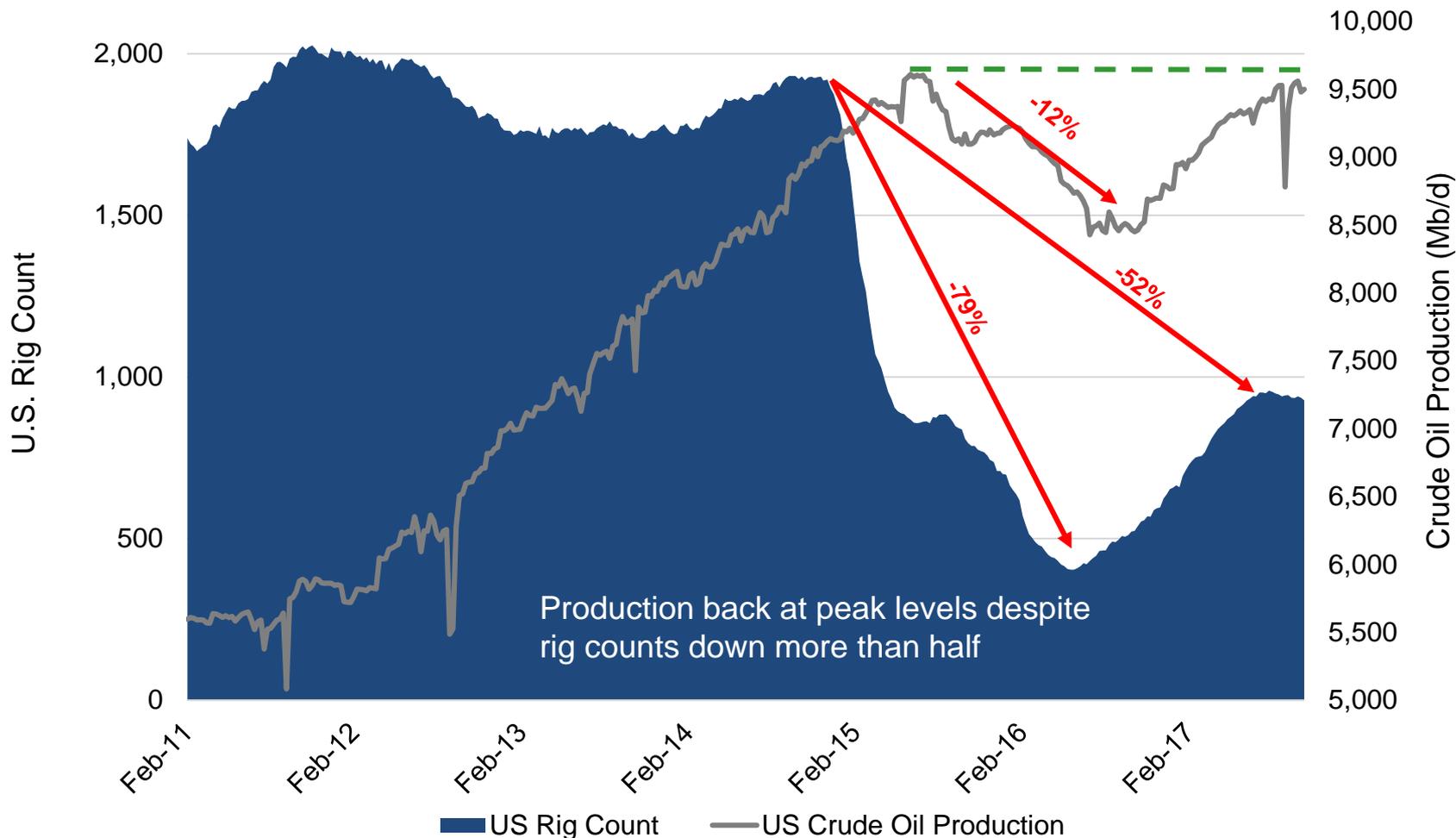


- World is long capital, short ideas
  - Days of easy money are long gone
- Institutional investors searching for low-risk yield
- Institutional investors have (over) allocated to energy aggressively in recent years
- Pressure on traditional private equity fee structure
  - Mgmt overhead burn, plus mgmt team incentives, mgmt fee @ GP & GP carried interest all under pressure
- Increased (stated) preference for direct deals and asset ownership although many LPs still lack energy sophistication
  - Potential for long-term/perpetual vehicles
- Risk appetites extremely low, with low energy prices across value chain, need some sort of “scheme” to incentivize investment
- Evolution of consumer choice – “Netflix” model

# Doing More With Less – So where to invest?



## Weekly U.S. Rig Count vs. Crude Oil Production



Source: EIA, Baker Hughes

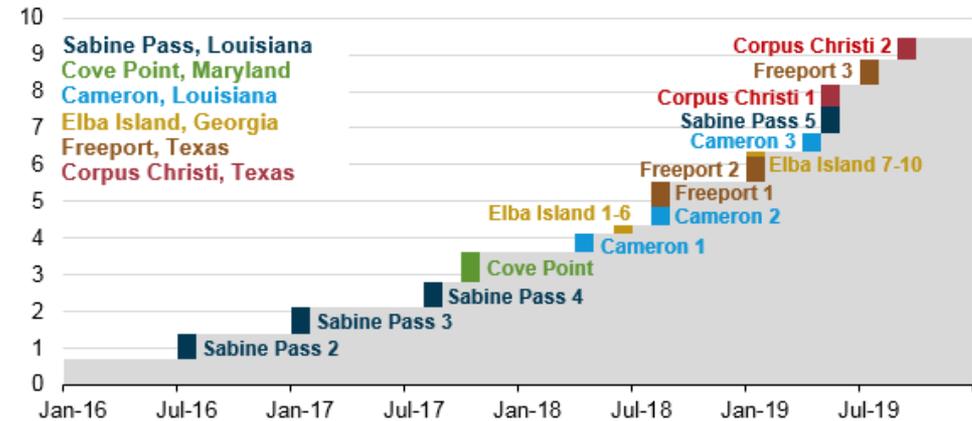
# The Demand Response to Revitalize Gas Volatility



*Domestic and Global rebalancing currently underway across hydrocarbon spectrum creating new demand sinks and allowing U.S. molecules to enter global trade flows*

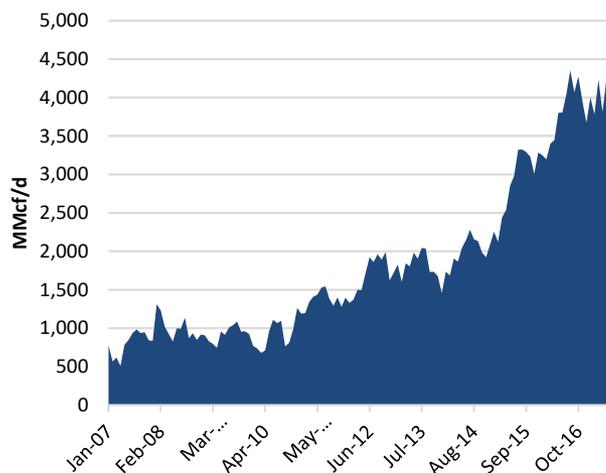
- Storage has not kept pace with demand or supply growth, existing fleet is aging significantly
- Not all capacity is created equal
  - Capacity vs. Deliverability
- Security of supply to become key as volatility increases
- Ironically, domestic markets re-regionalize as U.S. becomes a more global player

U.S. liquefied natural gas export capacity  
billion cubic feet per day

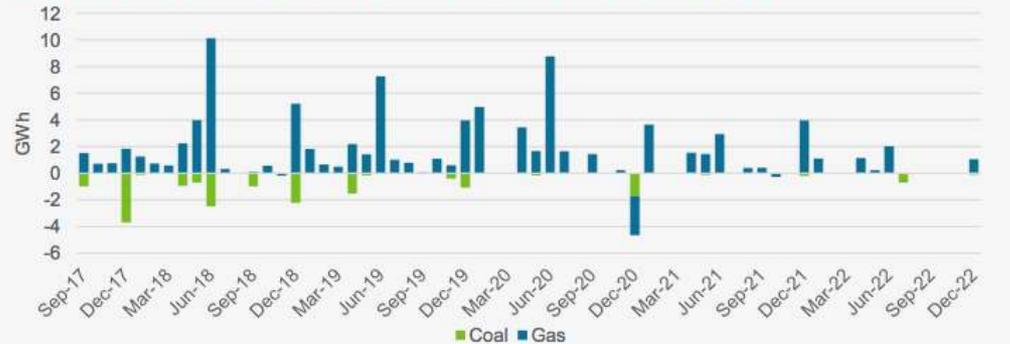


Source: U.S. Energy Information Administration, compiled from trade press

U.S. Pipeline Exports of Natural Gas to Mexico

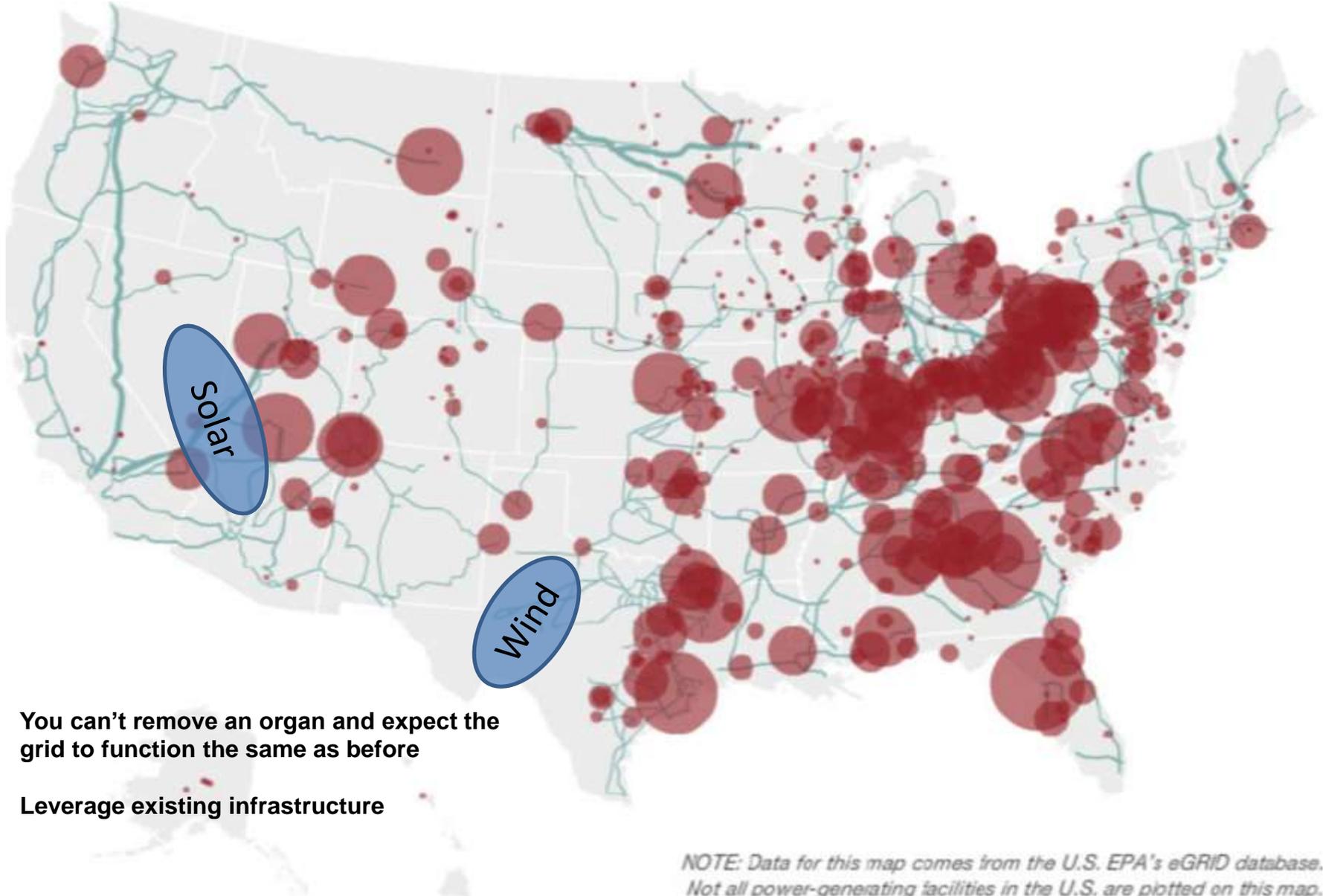


Expected Monthly Change in Power Infrastructure by Fuel



Source: Drilling Info

# Power Grid Biology 101



**You can't remove an organ and expect the grid to function the same as before**

**Leverage existing infrastructure**

*NOTE: Data for this map comes from the U.S. EPA's eGRID database. Not all power-generating facilities in the U.S. are plotted on this map.*

# Six Million Dollar Grid



Historic policy has incentivized the existence of renewable resources, not the quality of the resource. This has led to rapid and aggressive buildout of 'like' renewable resources

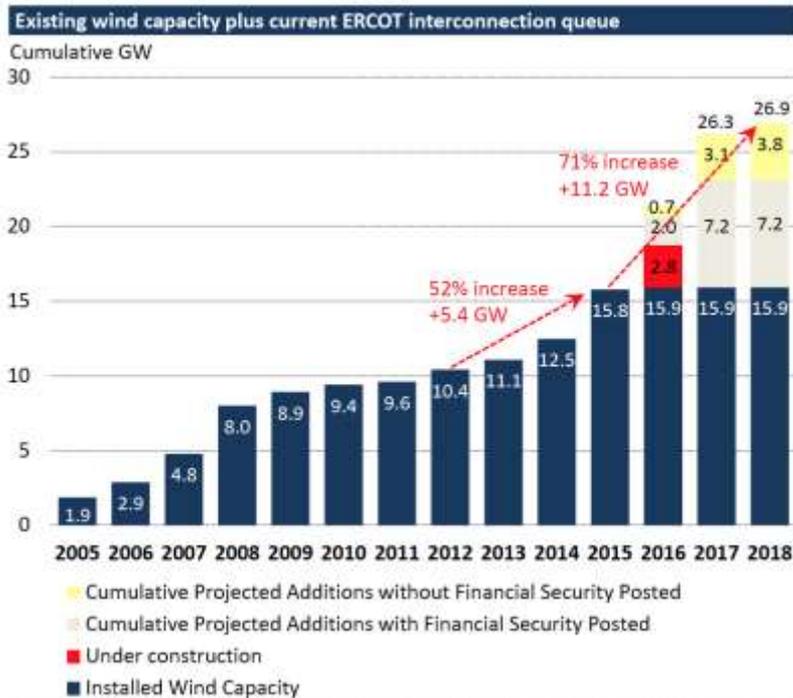


# ERCOT DYNAMICS

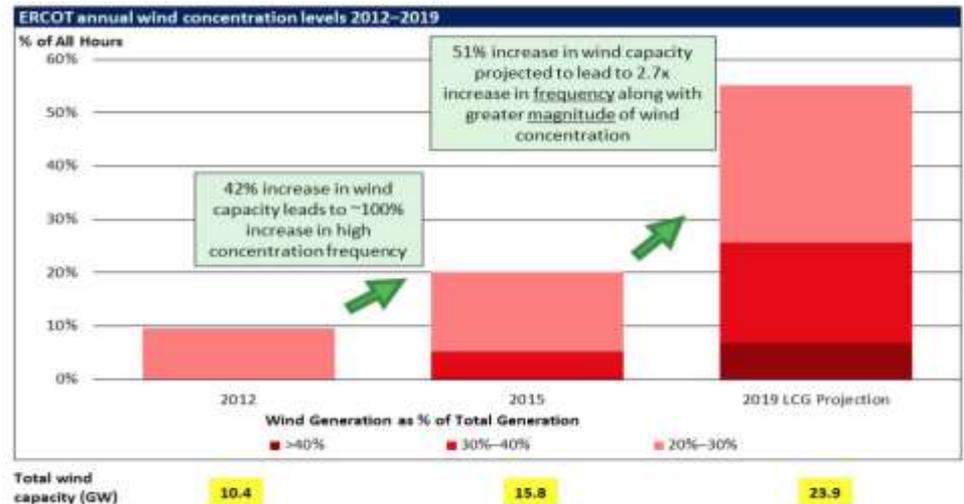
# ERCOT Renewable Trends



In 2012, wind output in ERCOT was over 20% of total generation in only 10% of all hours. By 2015, wind output represented at least 20% of total generation in 20% of all hours. Apex CAES commissioned LCG Consulting, a broadly recognized ERCOT market expert, to develop a forecast of future market conditions and prices, with a particular focus on the market impact of growing wind resources. The LCG study predicts that wind output in 2019 will exceed 20% of total supply in over 50% of all hours – with output exceeding 40% of total generation in approximately 7% of all hours

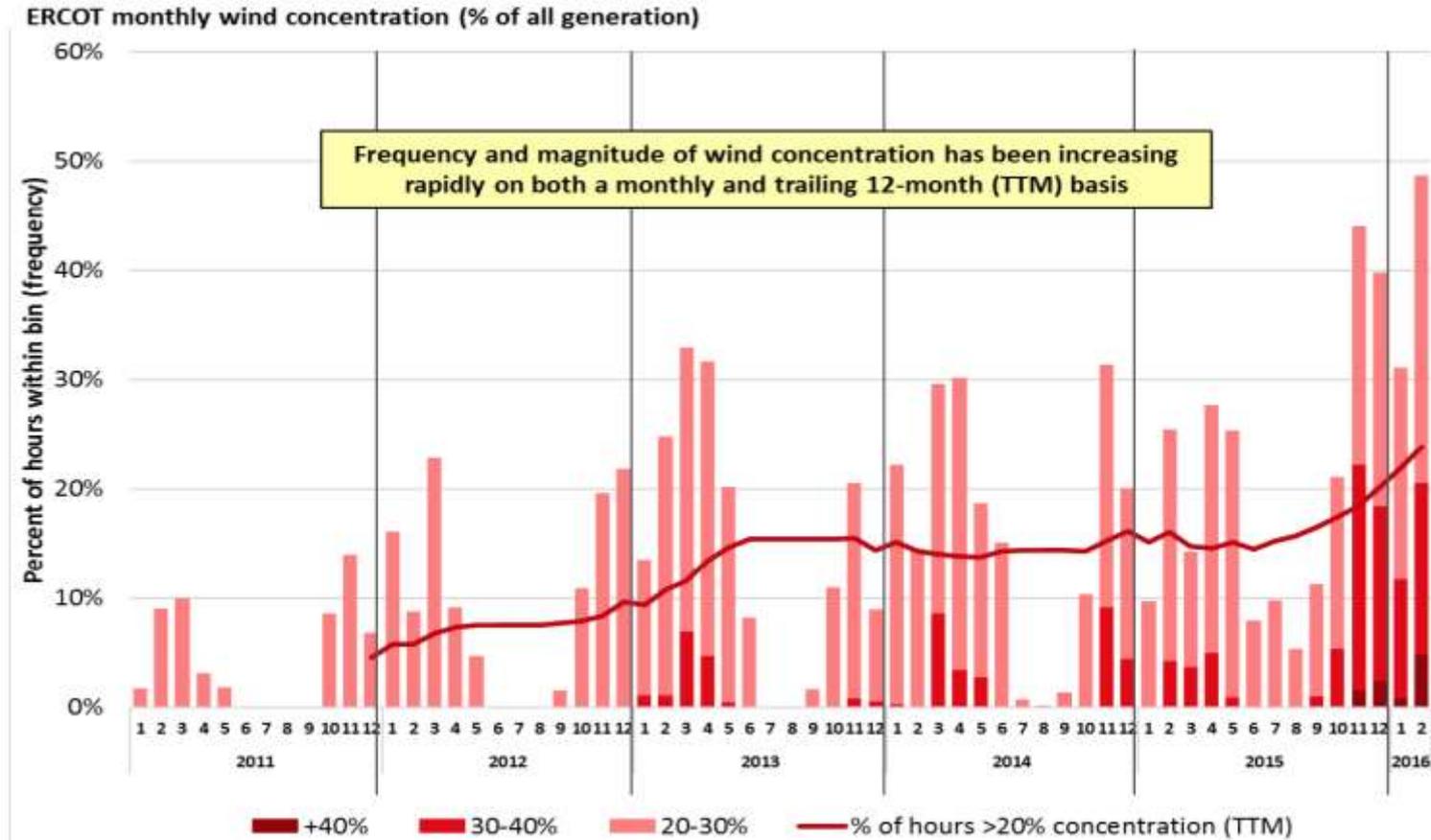


Source: ERCOT Generation Interconnection Status Report, March 2016; American Wind Energy Association



Source: ERCOT Interval Generation by Fuel Type Report; projection based on LCG Independent Market Report.

# ERCOT Wind Concentrations on the Rise

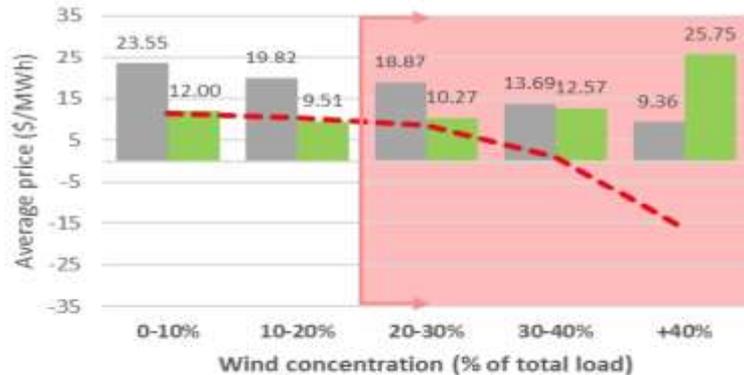


# Energy Prices Falling, Ancillaries Up

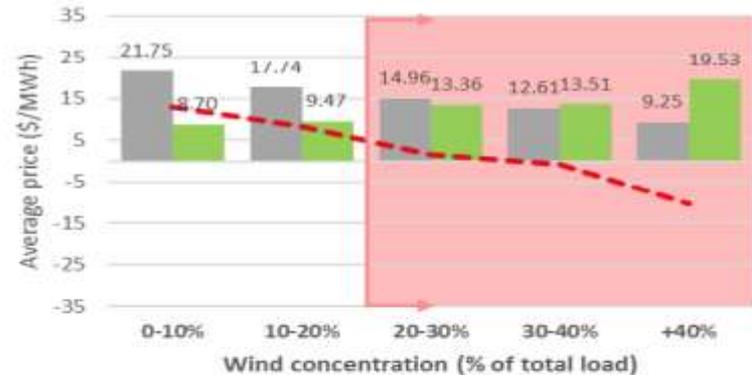


From November 2015 to February 2016, wind concentration produced lower energy prices and higher Ancillary Services prices. Comparing periods with 10-20% wind concentration to periods with >40% wind concentration, energy prices decreased by \$7 to \$14/MWh and Ancillary Services prices increased by \$10 to \$25/MW. These conditions drove Bethel's net compression costs below \$0/MWh for ~4hours/day on average.

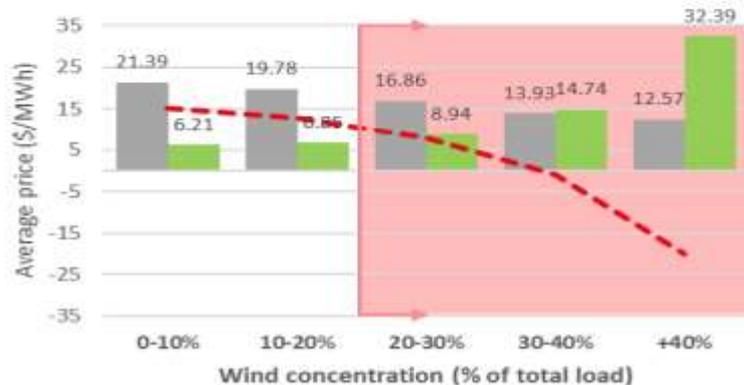
**November 2015**



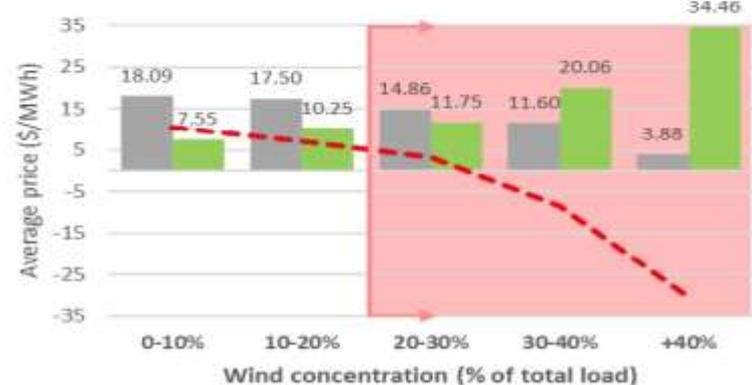
**December 2015**



**January 2016**



**February 2016**



Energy RRS Net compression cost (energy - RRS)

# CAISO / WESTERN MARKET DYNAMICS

# Magnum Development Overview



*Magnum is developing multiple businesses that leverage its geographically unique salt dome and an attractive mix of proximate energy infrastructure*

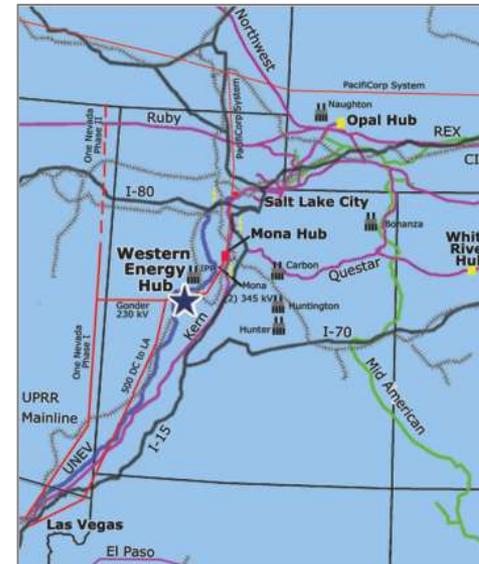
## Scarcity of Large Scale Salt in West



Map of salt cavern storage facilities for natural gas storage (Source: Ventyx)

- Only known “Gulf Coast” style domal-quality salt in the west capable of large caverns
- Salt dome size allows for ~100 caverns (Similar to Mont Belvieu, TX)
- 5 caverns created to date (~6 2mmbbls)
- Fee and long-term land and mineral lease with the Utah School and State Institutional Trust Land Administration (SITLA) provides investment and operational transparency

## Access to Energy Infrastructure



- UNEV refined products pipeline
- Union Pacific Rail Mainline
- Kern River/Questar natural gas pipelines
- Power connectivity to major western markets; existing 1900 MW of coal-fired power generation and 4 high voltage transmission lines on site
- Truck transport access to multiple interstate highways

# Recent Western Market Developments



## Aggressive California RPS Targets

- SB 100 set RPS target at 100% by 2045
- Los Angeles city studying the feasibility of 100% renewables – with focus on in LA Basin resources
- The California PSC has started a state-wide integrated resource plan that includes the big three IOUs, LADWP and SMUD

## Other Western State Renewable Activities

- PacifiCorp has announced a 1100 MW, \$1.5 billion wind and transmission resource upgrade and a PV solar RFP
- All western states blessed with abundant solar resources, i.e. California, Arizona, Nevada, Utah and New Mexico are experiencing a “duck curve”
- Oregon and Washington are likely to follow California's lead

## Transmission and Markets

- The Energy Imbalance Market continues to expand with LADWP announcing participation
- California introduced legislation meant to support regionalization of the grid
- CAISO looking at quasi-day ahead market tariffs for non-CAISO participants

## Storage

- All major load serving entities are installing storage directly supporting PV solar projects or other reliability challenges
- Four hour time shifting and frequency regulation are the major objectives of storage
- None of the storage implemented to date shifts over 4 hours or at grid level capacities.

# Renewable CAES Business Opportunity



## Location & assets unsurpassed in the U.S.

- The Magnum Salt Dome is only Gulf Coast quality salt body in the West
- There is almost 5,000 MW of transmission connected at the site
- Over 2,000 MW of solar under development abutting the site
- CAES ability to maximize renewables and transmission usage is incorporable

## The IPP Coal Unit will shut down

- Two units with 1900 MW capacity and dedicated transmission rights
- To be replaced by up to 1200 MW of Combined Cycle Gas Turbines
- LADWP has announced a 1 or 2 unit CAES RFP

## LADWP Requirements & Opportunities

- The project must be RPS-Eligible by CA statute and regulation
- Design may qualify for some percentage of ITC
- Requires CAES to primarily store renewable energy
- Absolutely helps with the capacity factor and reliability of the transmission system

## LA Basin generation and storage at Delta

- LADWP is considering the future of three once through cooling gas plants
- Determining the grid implications of this change
- CAES can provide resource adequacy and local reserve capacity down the D.C. line

# Western US Renewable Additions



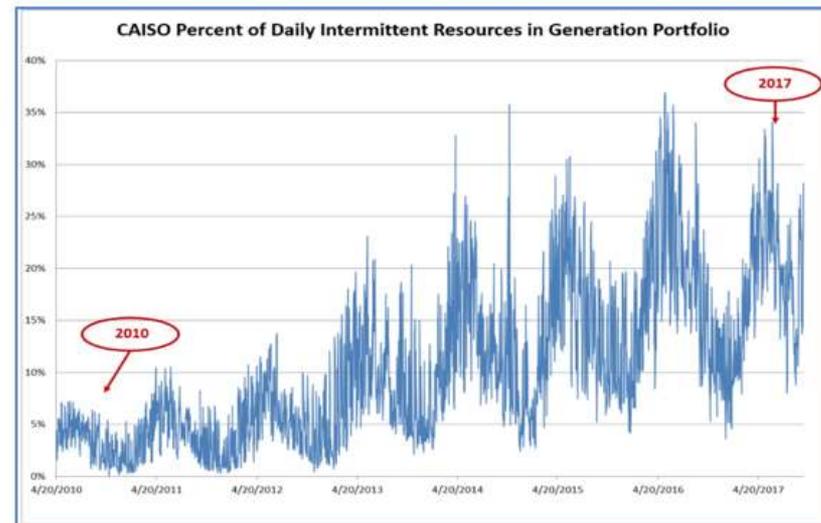
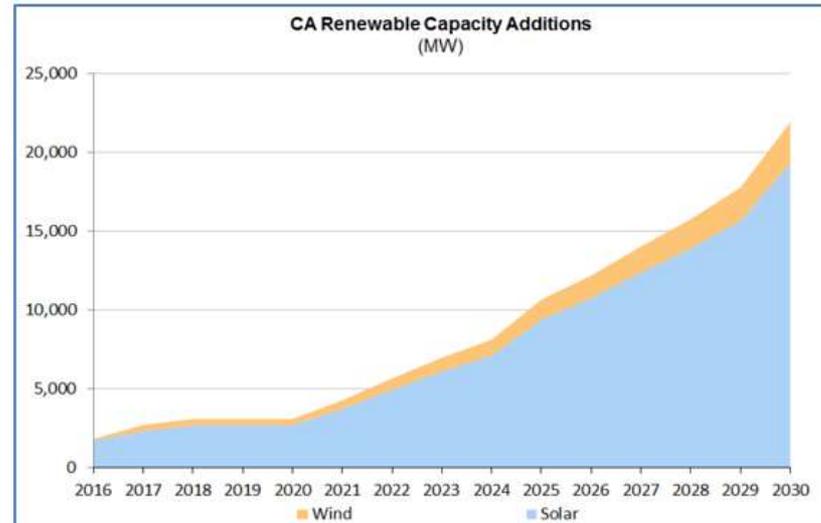
## Increase use of Solar and Wind...

- Driven by aggressive Renewable Portfolio Standards (“RPS”), 27 GW of solar and 6 GW of wind capacity is projected incrementally in WECC by 2030 requiring flexible gas generation sources to act as buffer thereby increasing volatility in power burn
- In order to support this aggressive RPS, approximately 24 GW of gas-fired generation capacity is likely to be added in WECC by 2030 to support RPS
- Finally, 10 GW of coal generation capacity is planned for retirements in WECC by 2030, creating room for intermittent renewable and gas peaker capacity

## ...drives significant increases in volatility met by natural gas

- Non-power gas demand in UT/NV/CA served by Kern River and Dominion Energy Questar Pipeline by residential/commercial/industrial growth has created higher volatility in gas demand and a need for no-notice type services that can only be met through high deliverability assets
- Integration of new intermittent renewable generation sources is expected to result in a significant increase in power burn volatility supporting demand for hourly balancing load following storage service in the Western Energy Imbalance Market (EIM)

Source: Enkon/CAISO



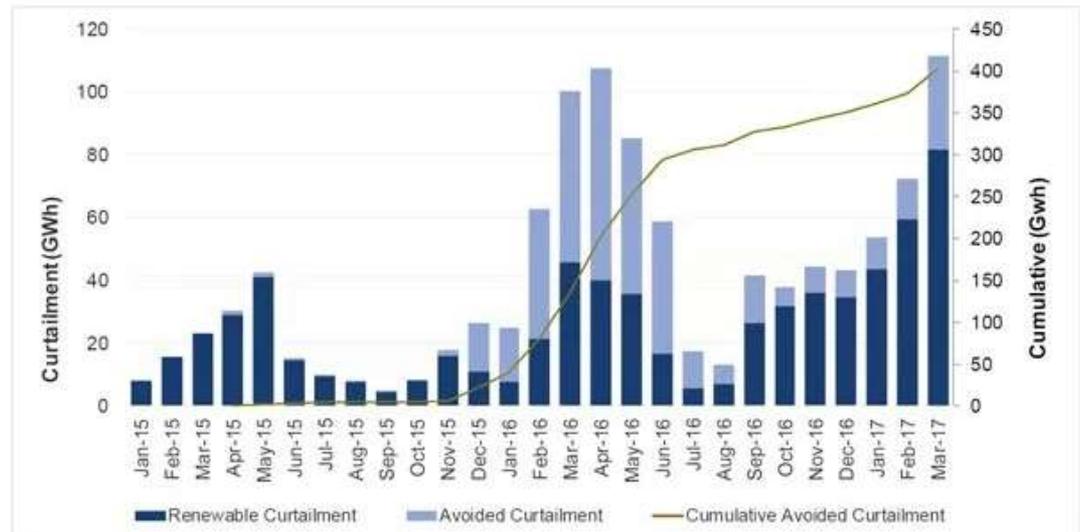
From less than 5% to over 35% in 7 Years

# No Use Crying Over Spilled Renewables?



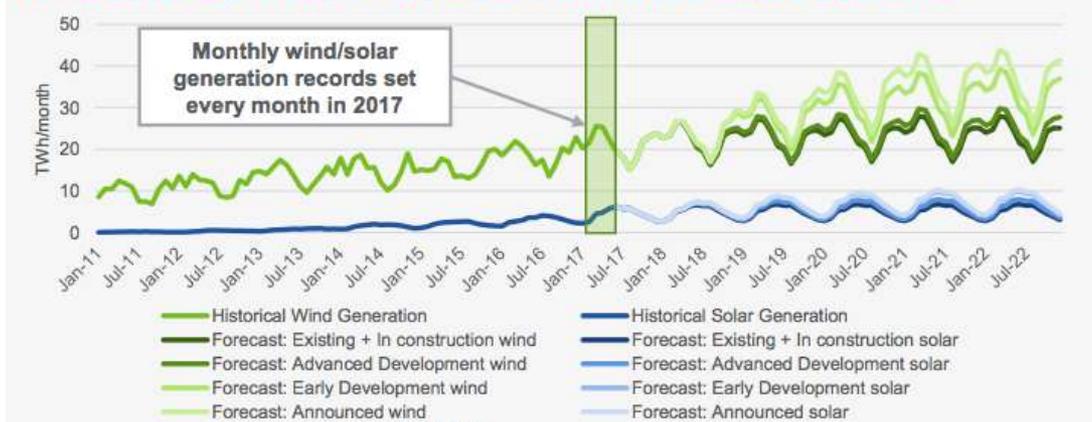
- In shoulder seasons, as much as 30% of CAISO solar is being curtailed due to ramping limitations on the grid
- Despite this wasted resource, policy and consumers continue to drive for increased renewable development
- Storage is **the** constraint to allow for increased penetration of renewables
- Don't count on electric vehicles to provide storage
- Moore's law doesn't apply to physics and chemistry

## CAISO Renewable Curtailments



Source: CAISO

## Wind/Solar Generation Forecasts with Infrastructure Scenarios

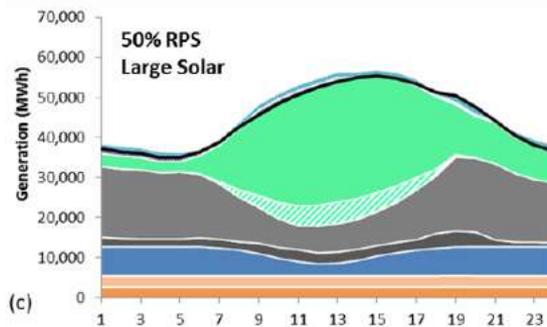
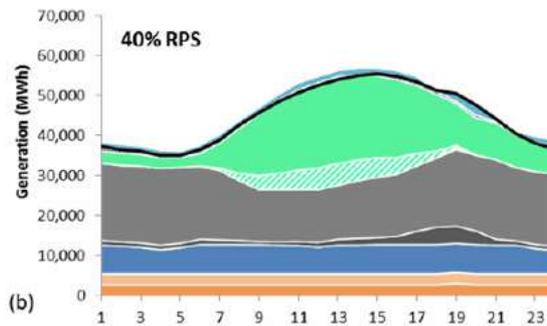
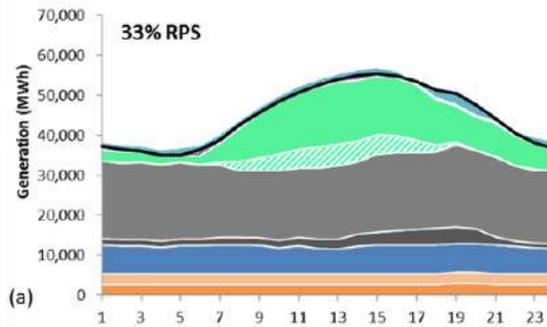


Source: DrillingInfo

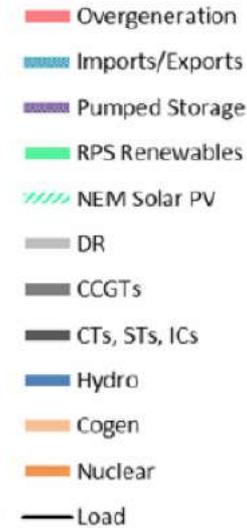
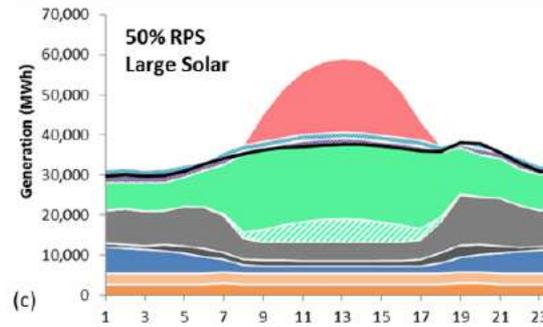
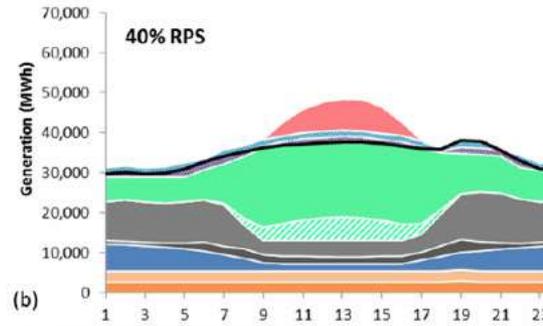
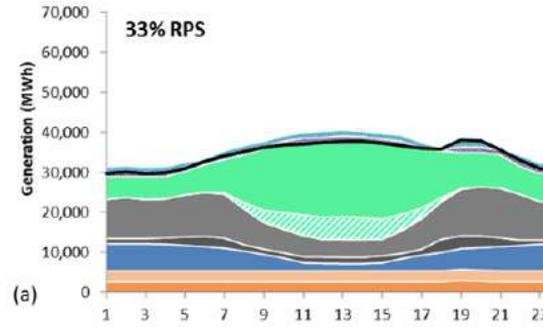
# California Duck Curves



July example



April example



- **Overgeneration occurs when energy demand is less than sum of “must-run” and renewable production**
- **Spring and fall seasons have lower energy demand levels and are most susceptible to overgeneration**

Source: “Investigating a Higher Renewables Portfolio Standard in California,” Energy & Environmental Economics, 2014

# CAES Investment Case Studies

- Compressed air energy storage (CAES) is a proven and reliable energy storage technology unique in its ability to efficiently store and redeploy energy on a large scale, in order to provide low-cost energy and ancillary services.
- Longer duration, operating life, superior grid-scale operating metric and capital costs as compared to lithium ion batteries

## DESTABILIZING GRIDS -- INCREASING RENEWABLE PENETRATION – FALLING ENERGY PRICE

### • ERCOT

>20 GW of installed wind capacity

Ancillary service markets becoming premium product

Less repeatable business model given ERCOT lack of connectivity to other ISOs

Severe Underperformance of ERCOT investments (Oncor, Panda, Energy Future Holdings, etc)

### • CAISO/WECC

Growing Solar Generation

Significant regulatory and political support

RFP issued by SPPA for CAES @ Magnum controlled site

Significant investor interest

# History May Not Repeat, But It Does Echo



- Markets appear to have bottomed and we are entering the back end of the commodity supercycle
- As markets globalize and become increasingly linked, security of supply becomes critical
  - i.e. Southern California natural gas consumers now have to compete against Mexican power generators, every global buyer of LNG, increased demand domestically in addition to all legacy sources of demand
  - This is also true for NGLs and refined products
- Ironically, as markets become more global, there is likely to be a re-regionalization within North America that will see regional markets become increasingly self reliant given increased demand
  - This highlights the changing customer set and needs of those customers
  - New infrastructure will be needed and underwritten by these strategic users
  - Market is becoming more 'strategic' and less 'opportunistic' with large scale infrastructure buildout underway and in certain cases already complete
- Capital deployment discipline (finally) being rewarded vs 'growth at any cost' model
  - Optimization of sunk capital
  - i.e. need for energy storage to optimize sunk cost in underutilized (and unusable) renewable generation capacity
- Deliverability, not capacity, is quickly becoming the differentiating and value creation driver
- Are we witnessing the death of the utility model, and if so, what's the solution?
- Land use vs. air quality debate