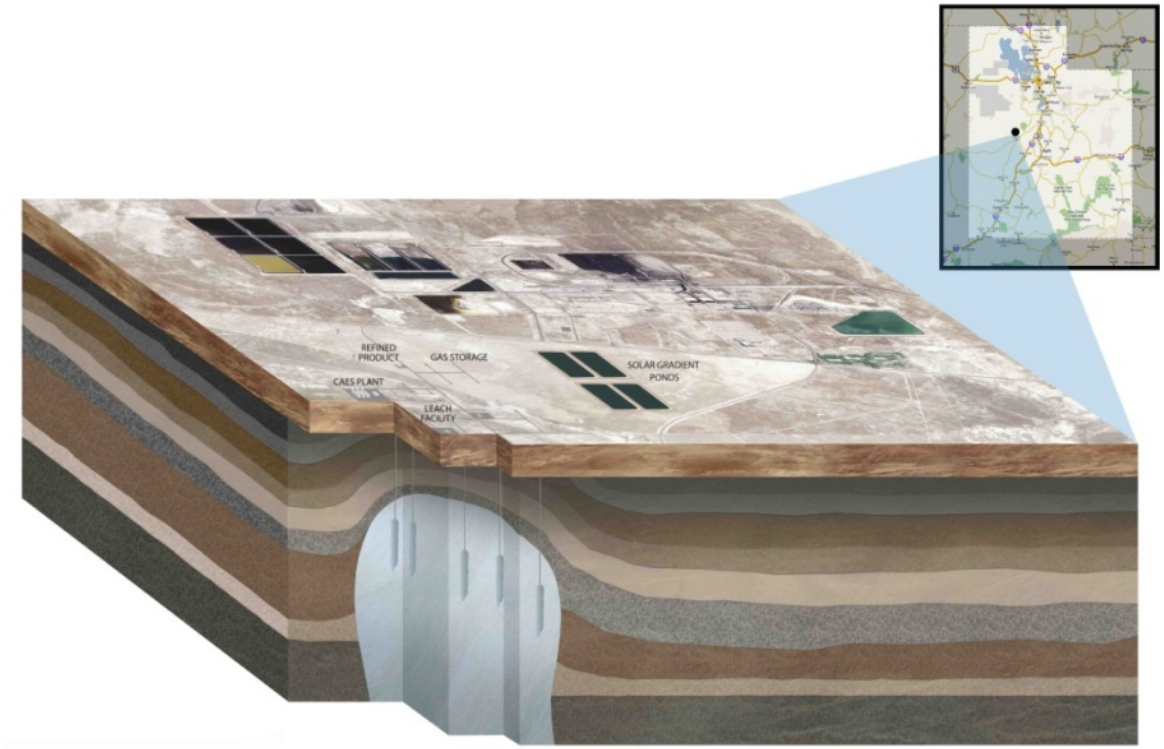
Introduction to Magnum's Western Energy Hub



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Wyoming Pipeline Authority Meeting
May 19th, 2009

What Makes it Unique?

A Truly Integrated Energy Hub!

Phase I

- High Deliverability Natural Gas Storage

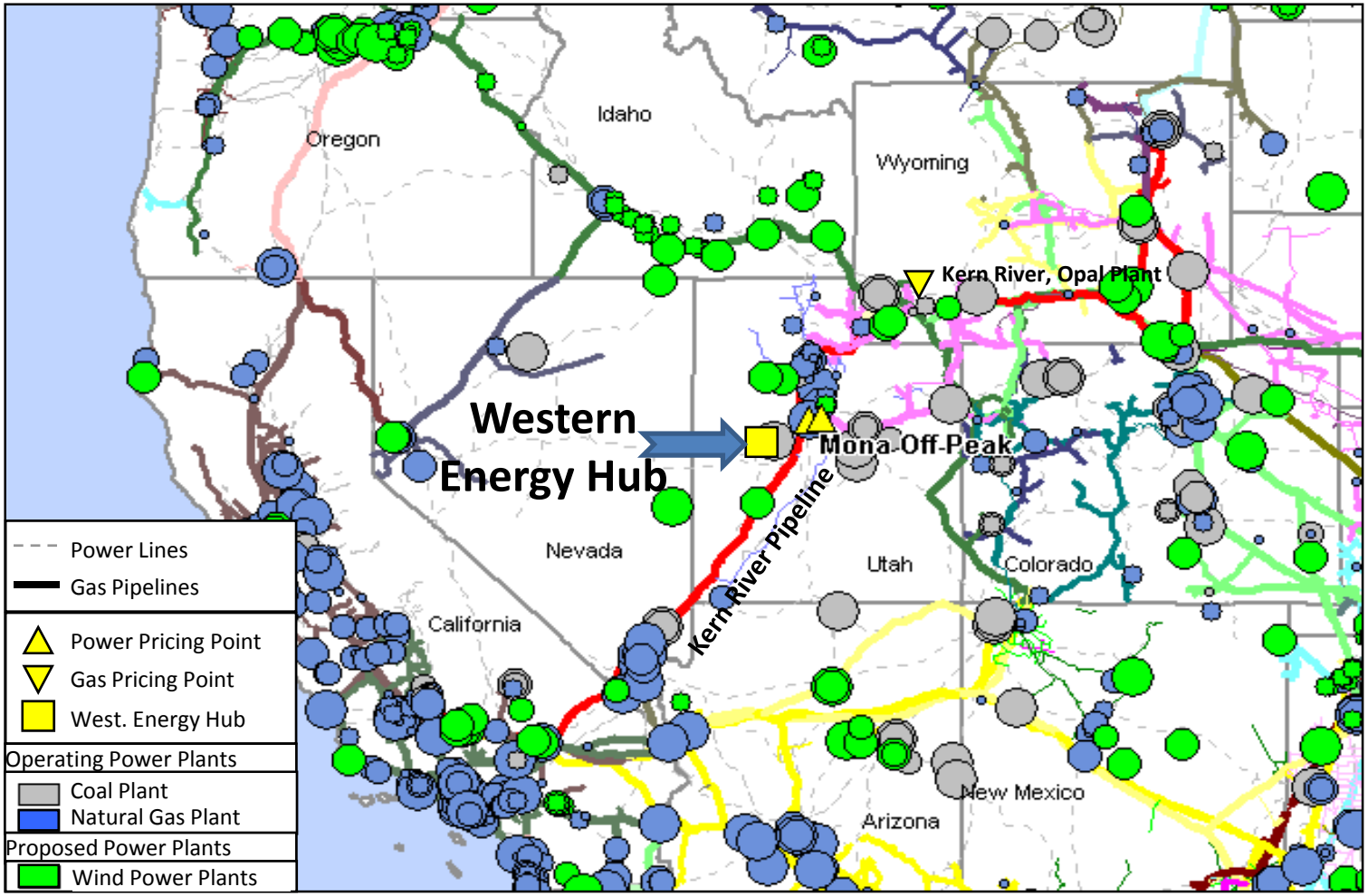
Potential Future Phases

- Compressed Air Energy Storage (CAES)
- Gas-fired Combined Cycle Power Generation
- Refined Products Storage
- Industrial Development

Western Energy Hub's Strategic Location

At a crossroads for gas and power infrastructure

- Western Energy Hub is working with "strategic" partners to create a "super hub" capable of serving existing and future natural gas and electric infrastructure balancing needs.



Source: Energy Velocity

Magnum Gas Storage
Western Energy Hub Highlights

- Supports the real time operation of natural gas fired generation in response to variable western power demand.
- Creates new options for both gas and electric producers to lower risk and optimize existing resources.
- Creates the ability to use existing and new natural gas and electric transmission more efficiently, thus reducing environmental impacts and costs.
- Supports reliable delivery of renewable energy when market demand for power is at its highest.
- Will enhance the reliability and efficiency of energy infrastructure throughout the West.

Who Are We?

Haddington Ventures and Magnum

- Private Equity Fund Manager
- Specialize in mid stream energy infrastructure development – pipelines, gathering, processing, storage, and specialized refining and power – across all hydrocarbons
- Haddington principals founded TPC Corporation in 1984, once the largest independent natural gas storage developer in U.S.
- Haddington principals have extensive prior subsurface project development successes

–- Moss Bluff Gas Storage (TPC) - Bobcat Gas Storage (HEP)
–- Egan Gas Storage (TPC) - Norton Energy Storage (HEP)
–- Lodi Gas Storage (HEP) - Magnum Energy Storage (HEP)

Magnum Team – Extended Family

Haddington Ventures, L.L.C.	Private Equity – Salt Storage Development
Sandia National Laboratories	Geology – Core Evaluation – Cavern Design
BLACK & VEATCH	Engineering & Market Economics
SUBSURFACE	Cavern Design & Project Development
Dewey & LeBoeuf	FERC Permitting & Legal Strategy
TETRA TECH, INC.	Environmental Permitting
BOART LONGYEAR	Exploration Drilling & Coring
Interactive Earth Sciences Corp.	Geophysics and Seismic Evaluation
WELLS FARGO	Corporate Banking
JONES WALDO	State Permitting & Legal Support
Clyde Snow Sessions & Swenson	Legal and Water Acquistion

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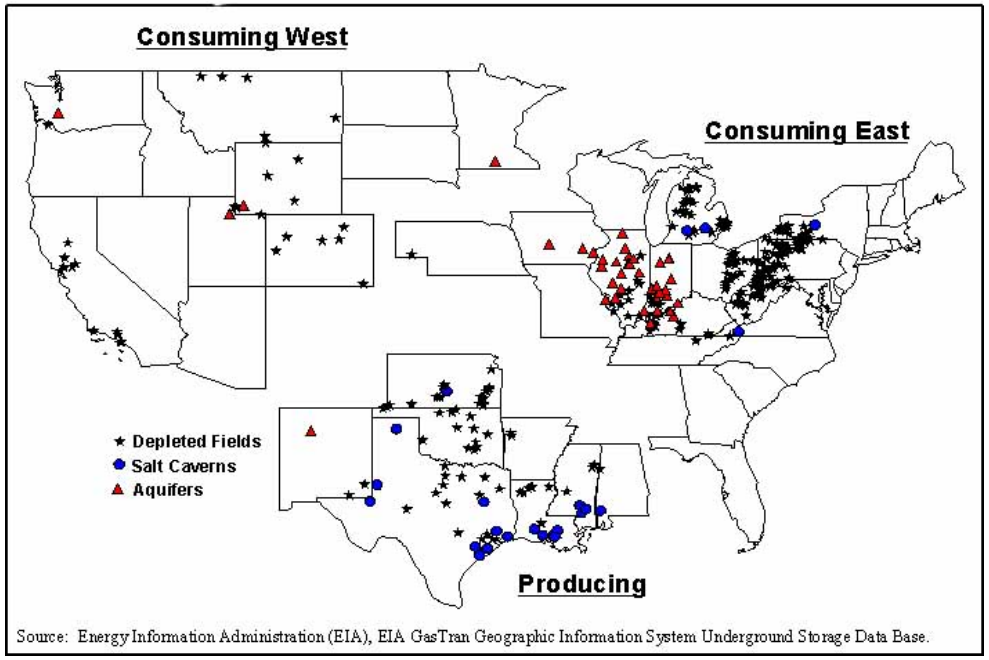
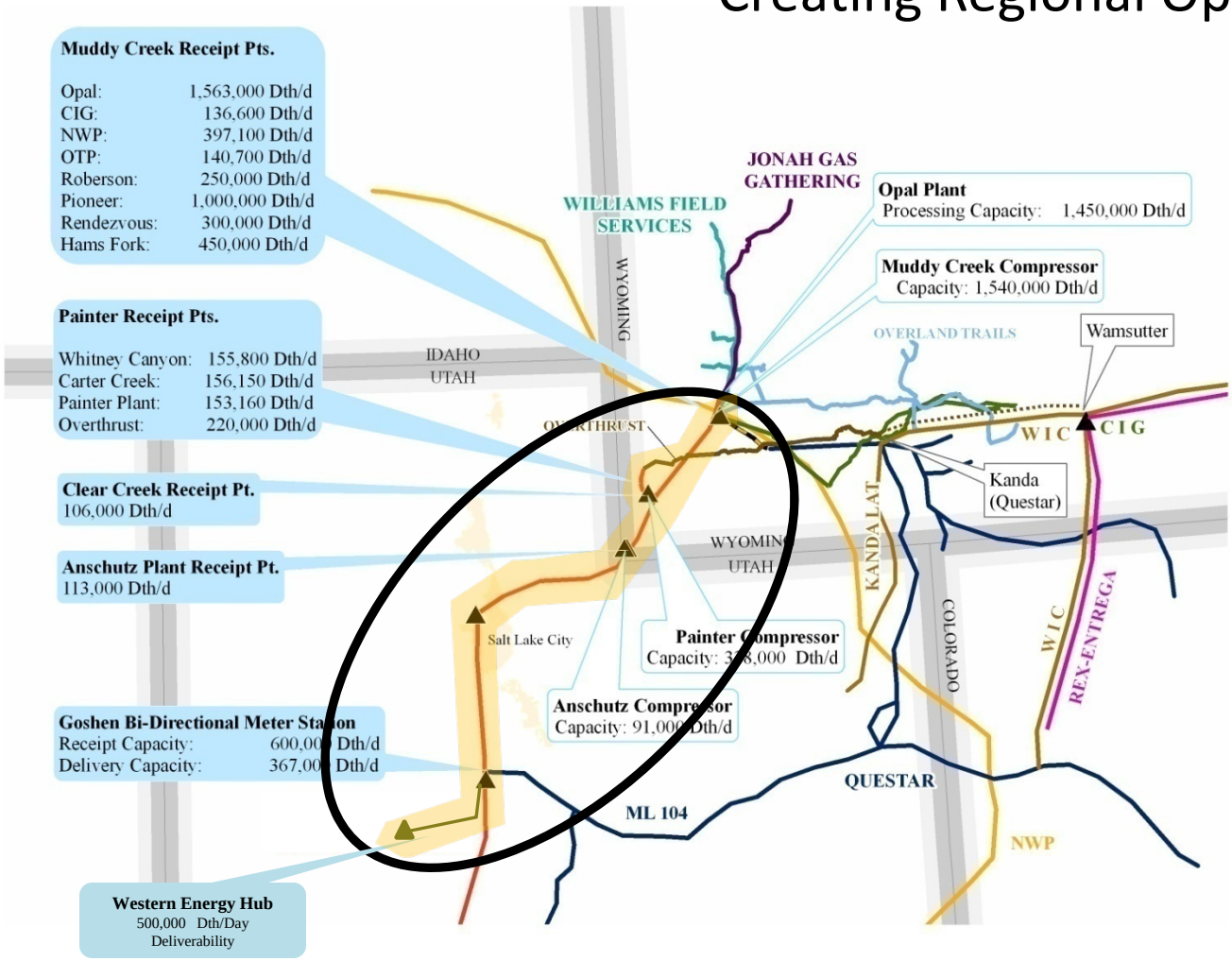
What is the value of High Deliverability Natural Gas Storage?

- Enables renewable energy to efficiently reach market by providing high deliverability multi-cycle gas storage to effectively provide firming in conjunction with gas fired electric generation
- Makes the gas market more efficient
- Optimizes existing infrastructure of regional gas pipelines



Magnum Gas Storage Market

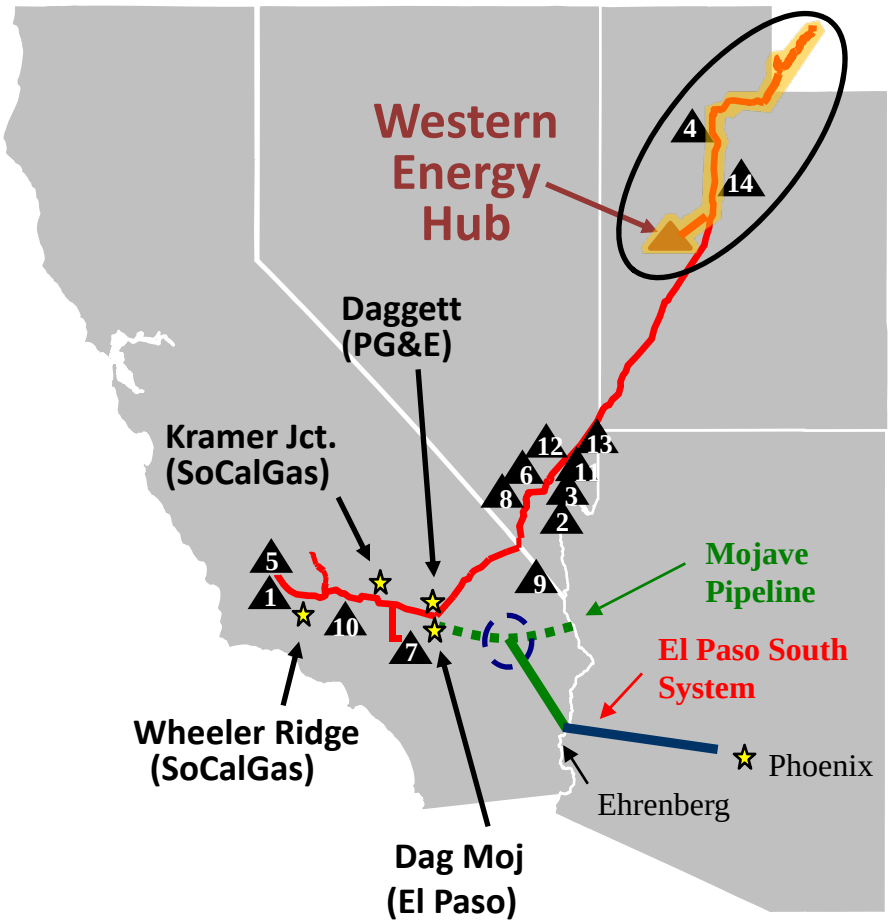
Creating Regional Opportunities



Base map Source: Kern River Gas Transmission

Electric Power Sourcing Rockies Gas from Magnum Gas Storage

Power Plants and Interconnects



POWER PLANTS

▲ In-service since 2001

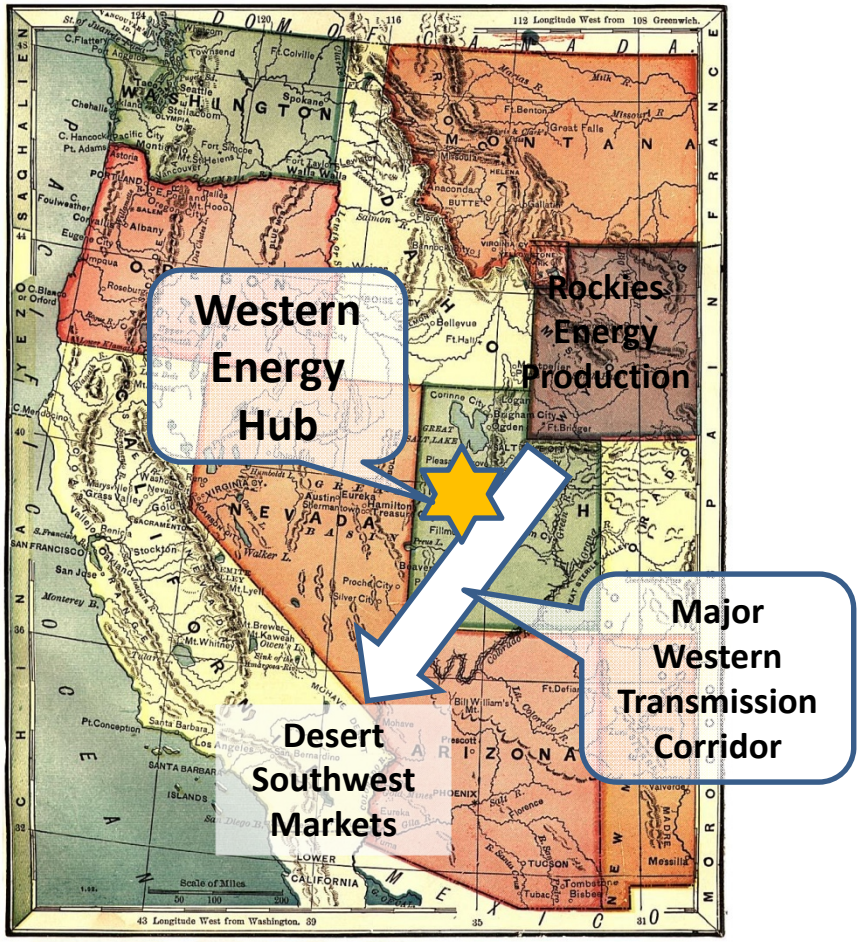
	PROJECT	MW
1	Sunrise (Edison Mission)	585
2	El Dorado (Sempra)	480
3	L.V. Cogen (Black Hills)	280
4	West Valley (PacifiCorp)	170
5	La Paloma (Complete Energy)	1,125
6	Apex (LS Power)	550
7	High Desert (Tenaska)	830
8	Silverhawk (Nevada Power)	570
9	Bighorn (Reliant)	570
10	Pastoria (Calpine)	750
11	Chuck Lenzie (Nevada Power)	1,200
12	Harry Allen (Nevada Power)	160
13	NCA 1 & 2 (NV Cogen Ass.)	170
14	Lake Side (PacifiCorp)	535
	TOTAL MW	7,975

Base map Source: Kern River Gas Transmission

What is the Project FERC Timeline?

- Sept. 2008 – Introductory Meeting
- Nov. 2008 – Pre-filing Submitted
- Dec. 2008 – Pre-filing Approved
- Feb. 2009 – Resource Report Draft 1 Submitted
- Mar. 2009 - Conduct Open House with FERC Staff and Stakeholders
- Jun. 2009 – File
- Jun. 2009 – Scoping Period Ends – Respond to Any Issues Raised
- Jun. /Jul. 2009 – File Draft of Environmental Assessment
- Jul./Aug. 2009 – File Certificate Application
- Oct. 2009 – FERC Issues Environmental Assessment
- Dec. 2009 – FERC Issues Approval of Certificate Order

State Specific Electric Issues

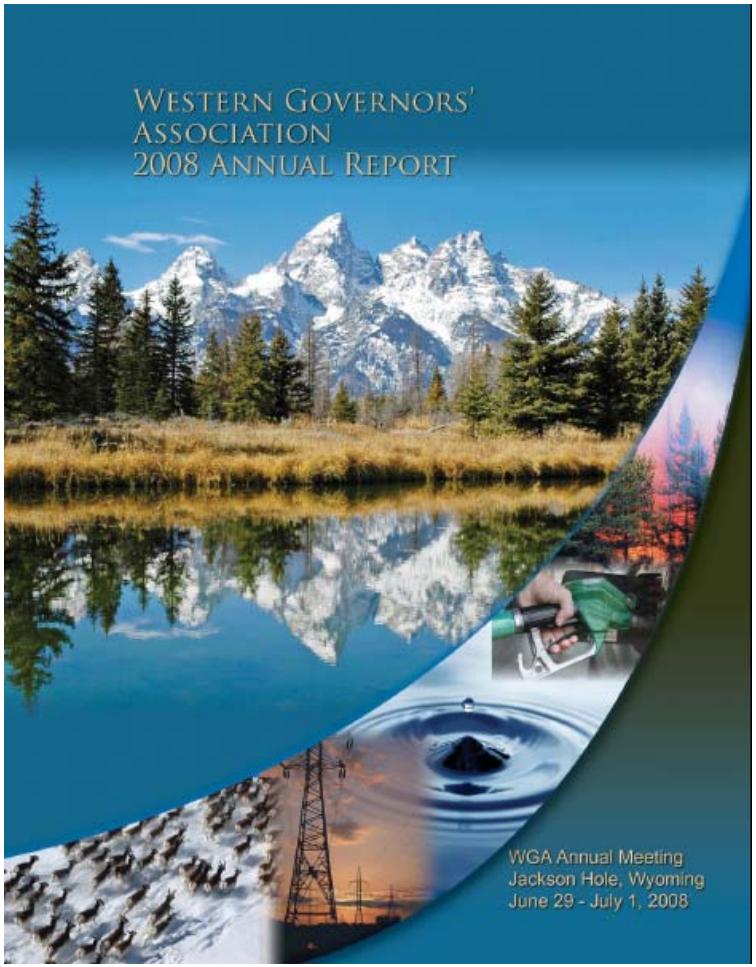


- California has a major position in Utah coal fired generation that it is retreating from politically & contractually.
- Wyoming has significant current and future potential for the generation of electricity from coal and wind resources, but limited export capacity.
- Renewable energy development has very strong demand but is offset by grid integration and transmission issues.
- Regional utilities project substantial resource shortfall over the next ten years.
- Major investment in transmission will be required to meet both renewable and other resource demands over the next decade.

How do you enable renewables?

Compressed Air Energy Storage(CAES)

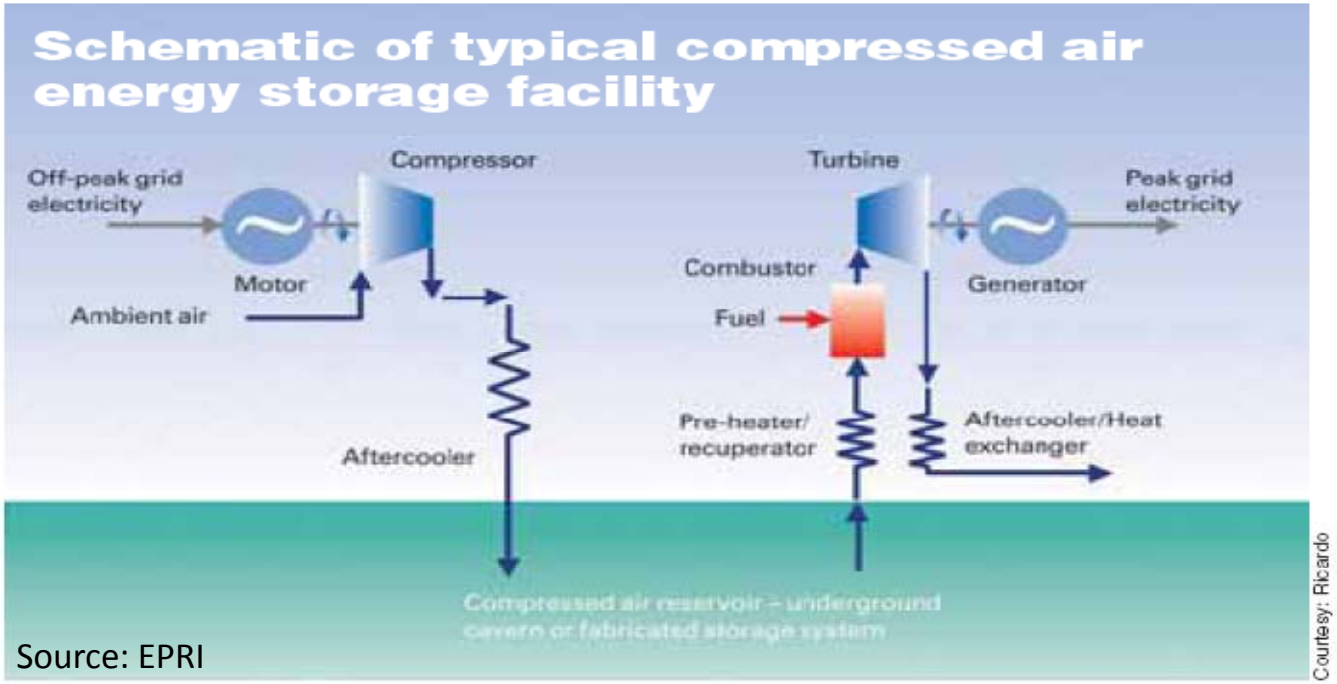
- Renewable energy is intermittent
- Renewable energy generally is not produced during periods of peak demand
- CAES allows for the storage of renewable energy produced in off-peak hours and delivered during peak demand
- First Wind transmission lines cross the Hub's property
- Solar facility currently proposed for adjacent area



CAES Provides Grid Scale Power Storage

Critical technology for expanding renewable generation

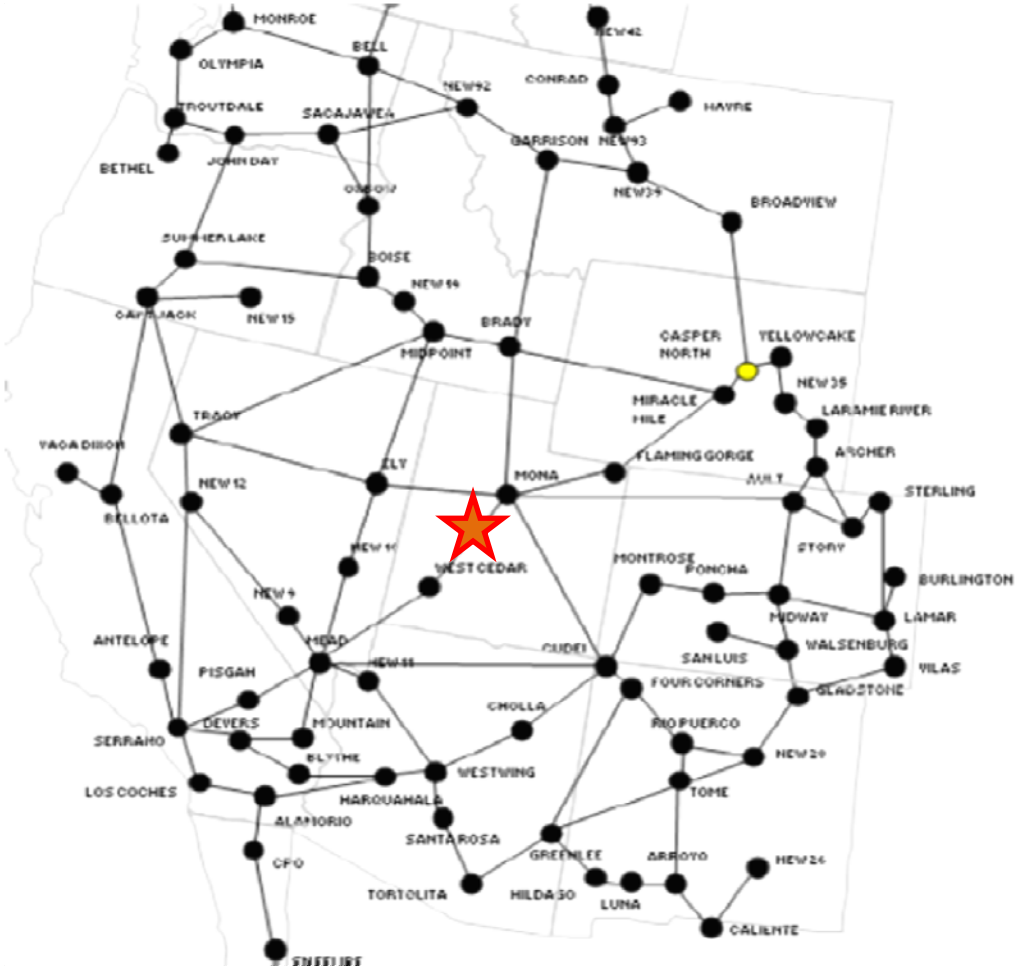
- Stores energy by compressing air with motor driven compressors into an underground cavern, and generates electricity by releasing the compressed air, heating it and using it in the conventional gas turbine cycle.
- Operating CAES Plants: 110 MW McIntosh, Alabama and 290 MW Huntorf, Germany. Both compress air into excavated salt formations and have reliably operated for years.
- EPRI notes: "CAES plants can perform ramping duty to smooth the intermittent output of renewable generation sources as well as provide spinning reserve and frequency regulation to improve overall grid operations."



Source: EPRI

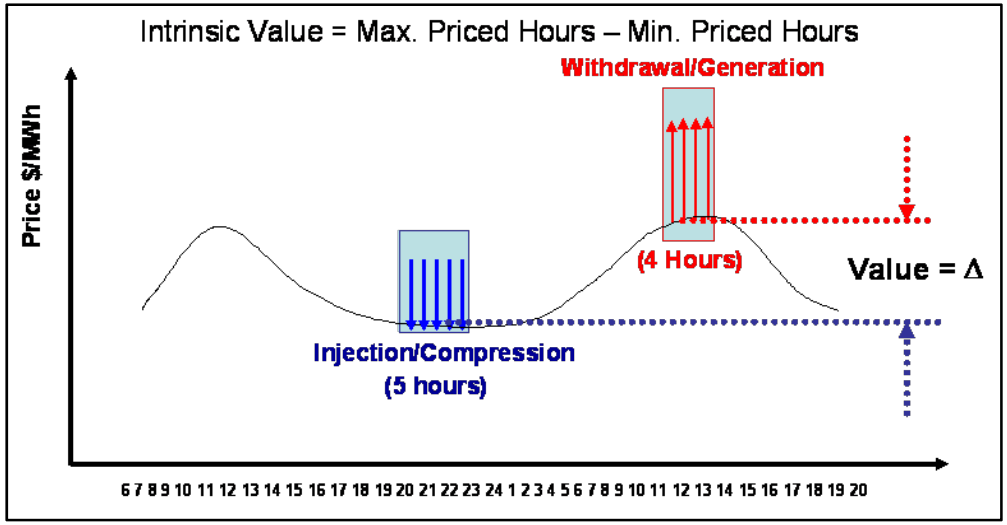
Benefits of Electric Storage to the Western Electric Grid

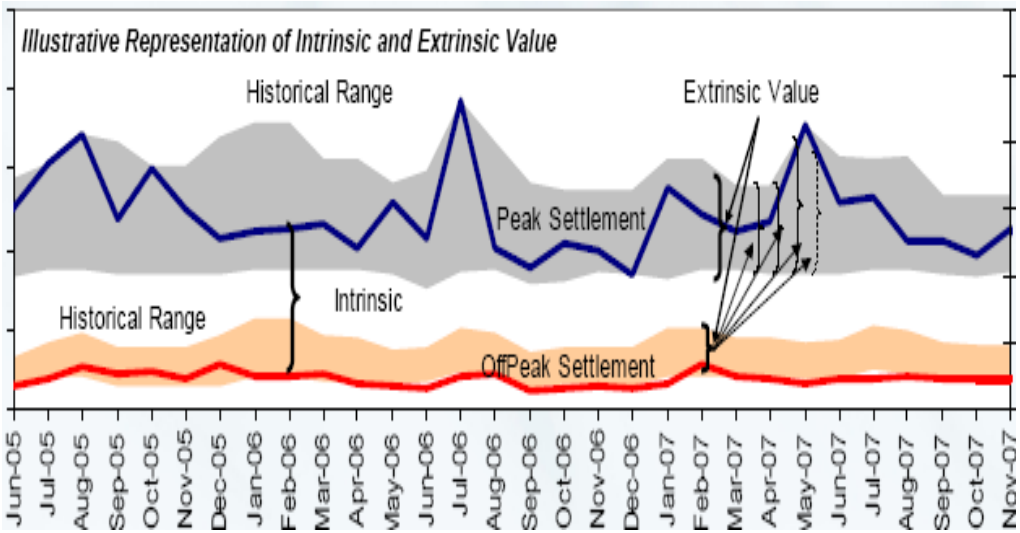
- Allows for gas-fired generation at WEH or IPA
- CAES makes renewables more productive
- CAES allows excess capacity from IPA to be stored until needed



CAES Intrinsic and Extrinsic Value Similar to Gas Storage

Multiple dimensions to CAES value



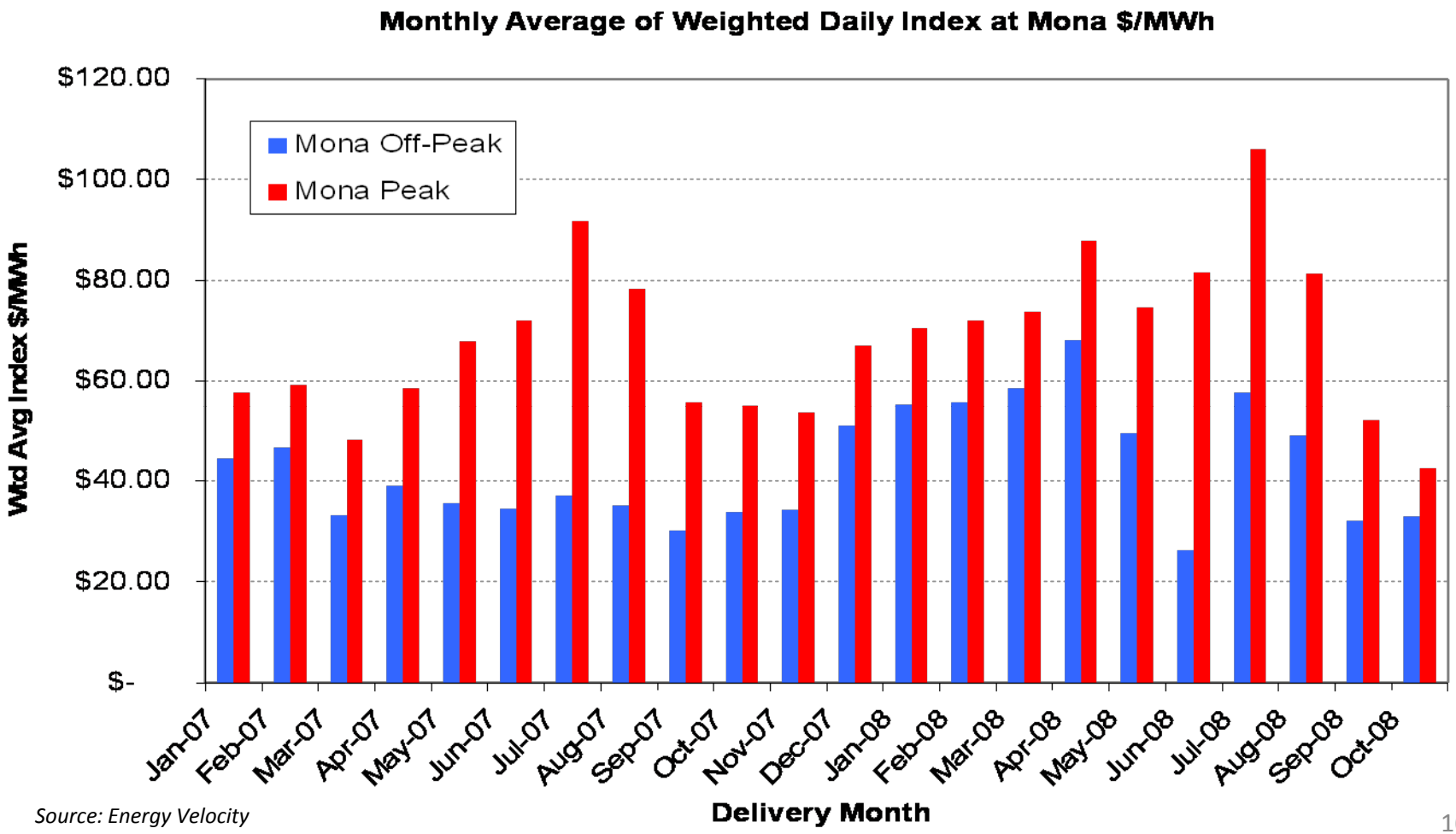


- Power bought off-peak when price is relatively low and sold on peak when price is relatively high.
- Intrinsic value is the spread between the cost of power to inject air (compress) and sale price of generated power (air withdraw).
- CAES can be conceptualized as pumped hydro with a heat rate. Flexibility in CAES operation typically greater than pumped hydro.
- Extrinsic value is derived from volatility and ability to lock in forward price spreads (Cash to Prompt and forward to forward).
- Volatility in power markets typically far greater than natural gas markets. In addition, Renewable Energy Credits offer potential revenue stream.

Western U.S. Power Market Prices Likely to Support CAES

Average peak – off peak price spreads a fraction of full value

- More expensive natural gas driving higher on-peak prices in the West. Mona peak versus off-peak price spreads have averaged approximately $50/MWh in summer. Growing wind resources will pressure off-peak prices.

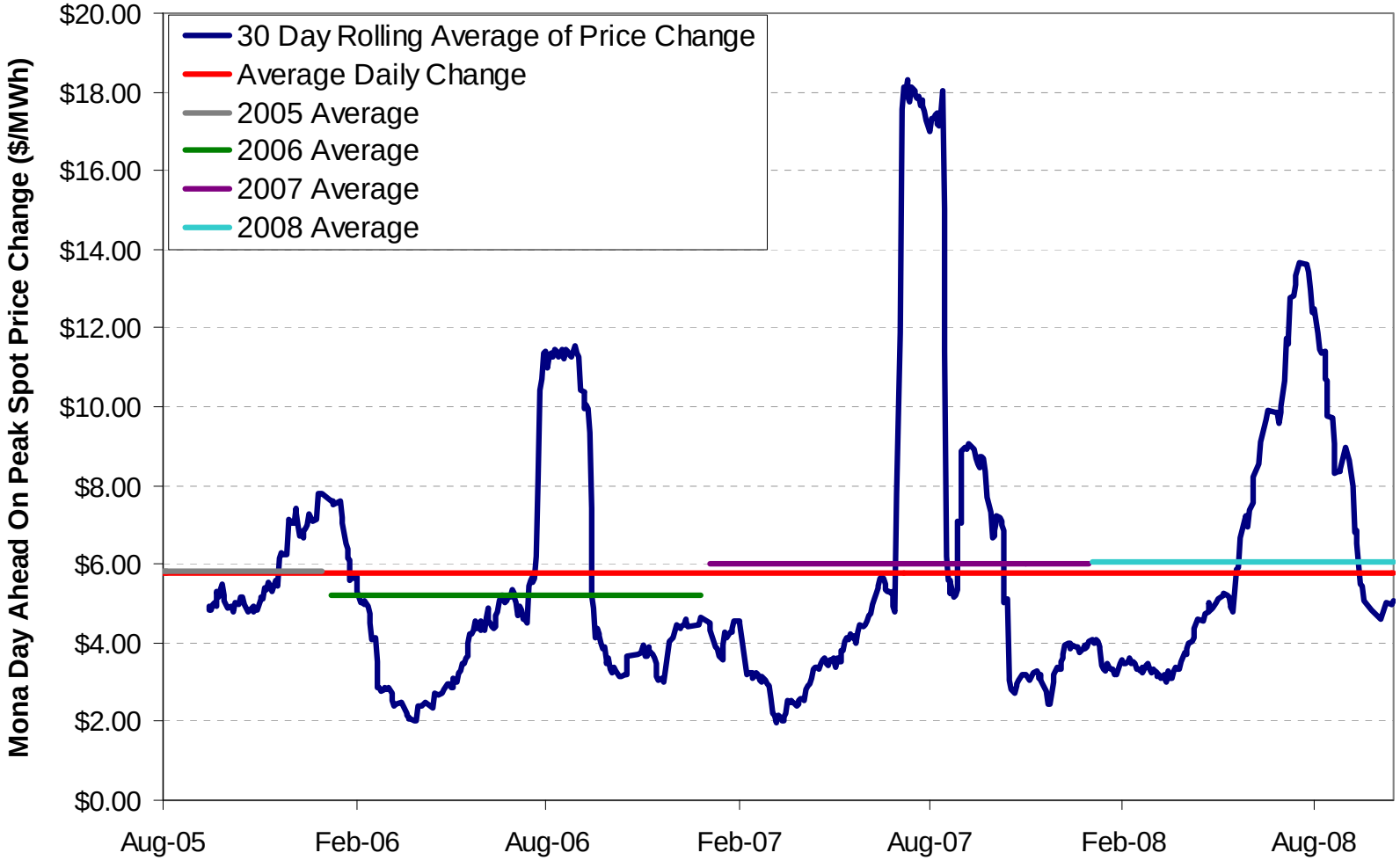


Source: Energy Velocity

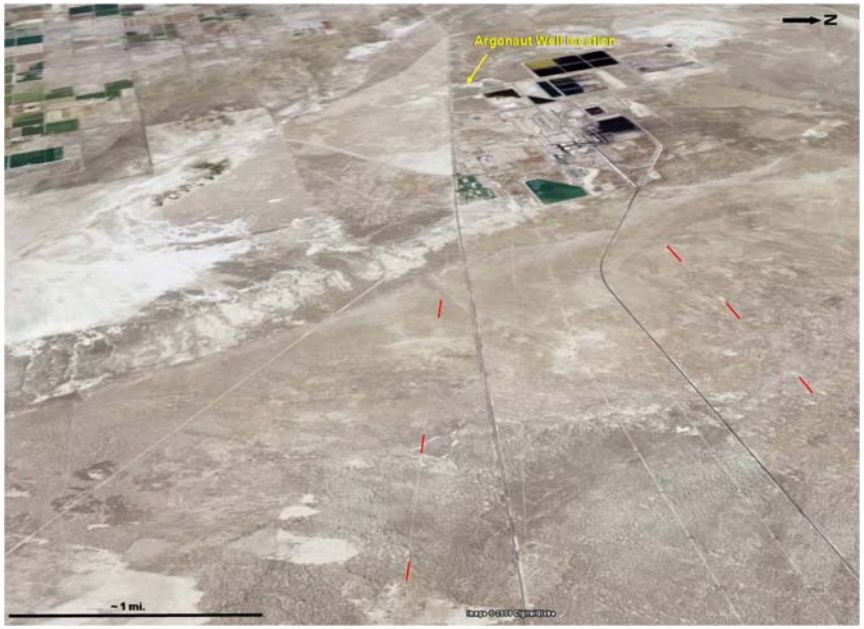
Mona Price Volatility Supportive of CAES

Average daily price change for Day Ahead On-Peak Power

- Based on historical Mona Day-Ahead price data for On-Peak, volatility is trending higher.



Other Project Opportunities



Abundant Real Estate Options

- Combined cycle gas-fired generating facility
- Petroleum product storage
- Solar gradient ponds and power generation facility
- CO2 sequestration
- Industrial site development opportunities

Summary

- **Strategic centrepiece for meeting Western States' goals**
- **Provides for more reliable and lower cost operation of both the gas and electric grids**
- **Maximizes the development and utilization of renewable energy**
- **Provides a demonstrated template for others to follow**

Magnum Development

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