

Haddington Ventures, L.L.C.

Gas/Electric Partnership Conference – Gas Storage Roundtable



January 2018

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Haddington Ventures Specializes in Bulk Storage Development

- Magnum is a portfolio company of Haddington Ventures
- Haddington Ventures has a 30 yr track record of underground storage development in the U.S. with projects across the energy value chain, including:
 - NGLs, Natural Gas and Crude oil, and;
 - Depleted reservoir, new build salt cavern, and salt cavern product conversions
- Successful history over 30 years in underground storage across storage media and regulatory jurisdictions

Project Name	Product Stored	Storage Medium	Status	Storage Capacity ⁽¹⁾
<u>TPC Corporation</u>				
Moss Bluff Gas Storage	Natural Gas	Salt Caverns	Sold	7.8 Bcf
Egan Gas Storage	Natural Gas	Salt Caverns	Sold	4.7 Bcf
<u>Haddington Ventures</u>				
Lodi Gas Storage	Natural Gas	Depleted Reservoir	Sold	12.0 Bcf
Norton Energy Storage (CAES)*	Electricity	Limestone Mine	Sold	80.0 MMbbls
Bobcat Gas Storage	Natural Gas	Salt Caverns	Sold	19.0 Bcf
Magnum NGL Storage	Natural Gas Liquids	Salt Caverns	Sold	1.8 MMbbls
Fairway Energy Partners	Crude Oil	Salt Caverns	In Construction	19.3 MMbbls
Apex (CAES)*	Electricity	Salt Caverns	Dev. Phase	8-10 MMbbls
Magnum Gas Storage	Natural Gas	Salt Caverns	Dev. Phase	40.0 Bcf
Magnum Refined Products Storage	Refined Products	Salt Caverns	Dev. Phase	4.0 MMbbls
Magnum CAES	Electricity	Salt Caverns	Dev. Phase	TBD
Magnum Crude Oil Storage	Crude Oil	Salt Caverns	Dev. Phase	TBD

* Compressed Air Energy Storage

(1) Storage capacity at the time of sale. In the case of Fairway, storage capacity reflects total capacity controlled at Fairway Pierce Junction.

(2) Sold as part of \$450 million TPC Corp. corporate sale to PacificCorp

Magnum Energy Midstream Business



Magnum Energy Midstream (“MEM”) is creating the first High Deliverability Multi-Cycle (“HDMC”) salt dome gas storage and transmission facility strategically located in the Western U.S., located near Delta, UT to serve power generators, gas utilities, marketers and pipelines

Key Attributes

Location

- Strategically located assets play a critical role in the balancing between prolific supply basins and high demand centers

Flexible Assets

- Shovel ready, highly flexible assets can be customized to meet multiple applications

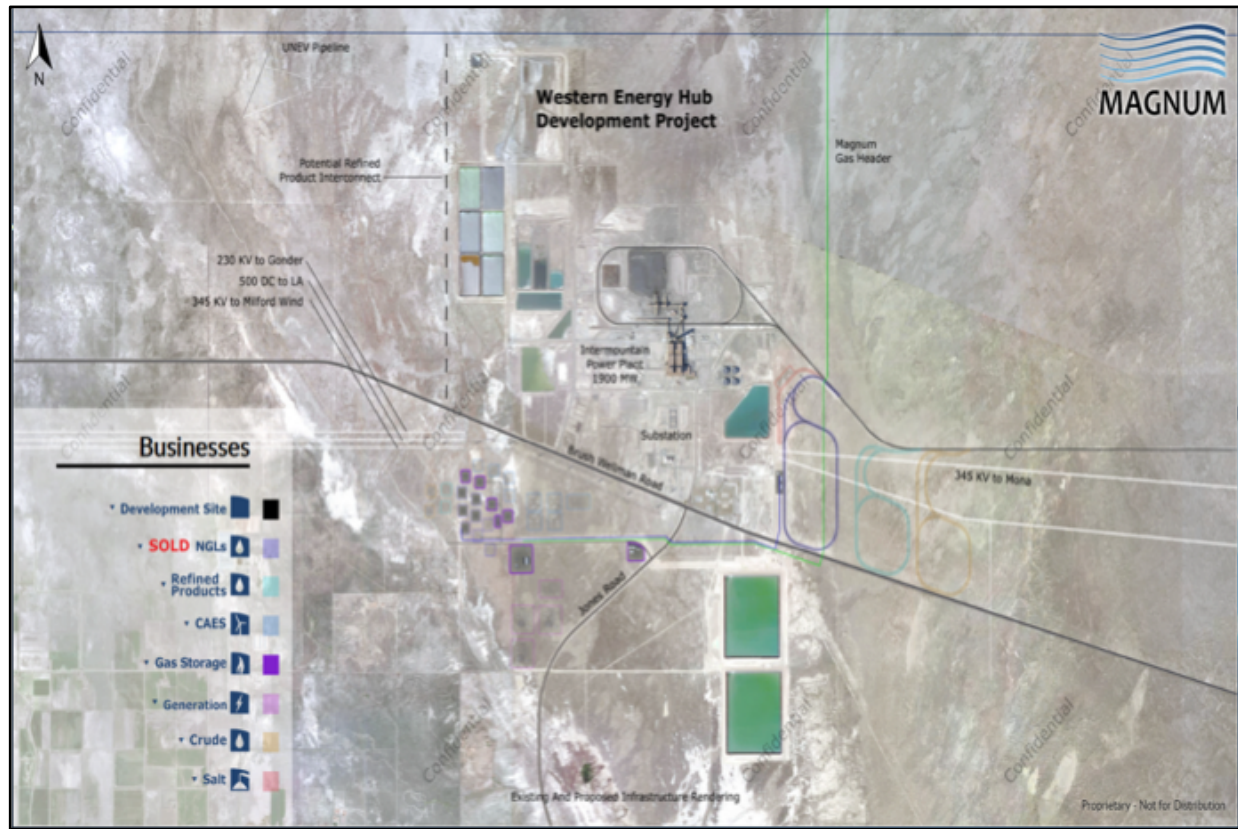
Industry Fundamentals

- Compelling medium and long-term energy fundamentals driven by gas supply and demand dynamics

Management Team

- Independently operating management team has substantial experience in the natural gas storage and midstream transportation sectors
- Proven record of EPC experience for midstream infrastructure, delivering projects on-time and under budget

Location - Flexible Assets - Industry Fundamentals - Management Team



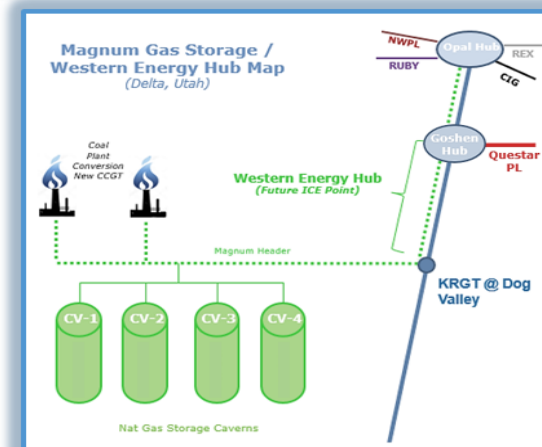
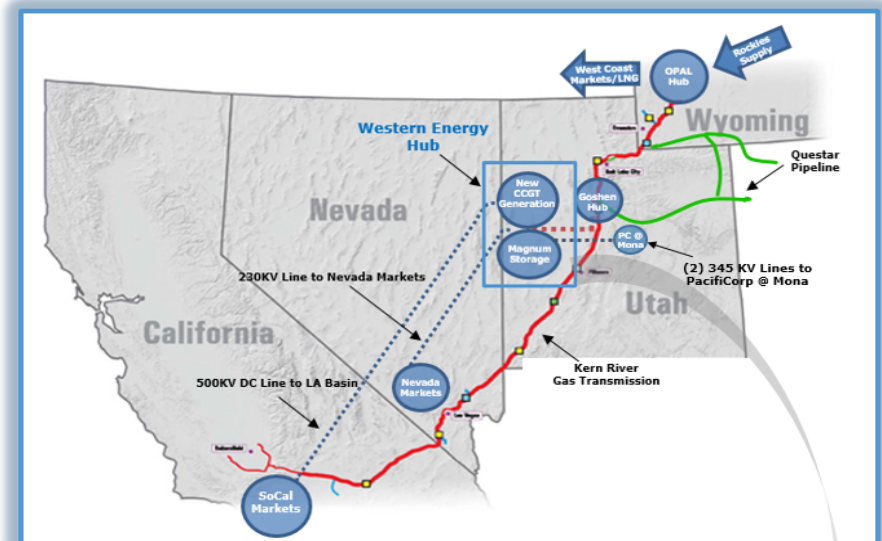
Market Drivers – Power Generation @ the Delta Site



California SB350 requires energy providers to seek alternative forms of energy to meet 2030 RPS requirements, which may include Gas Fired Generation at the Intermountain Power Plant (IPP) as well as Renewable Energy that may include development of Magnum CAES Units

IPP Coal Plant Repowering and Development of Magnum CAES will require a Natural Gas fuel supply source

- IPP, which is directly adjacent to the Magnum site, is in the process of decommissioning 1,900 MW of coal-fired power and replacing it with gas fired generation (i.e. coal to gas switching)
- IPP will need a fuel supply strategy that may include natural gas transmission and storage services
- IPP/Magnum combination strategically positioned to deliver gas by pipe or wire to Southern California Markets
- IPP seeks maximum flexibility in daily fuel options including potential no-notice and/or hourly balancing services
- Support Magnum CAES/Sempra due diligence efforts
- Ideally situated to support Magnum CAES development efforts



Market Drivers - Increased Volatility from Renewables

Increased Renewable Portfolio Standards (RPS) and increased use of natural gas for summer peak power generation and winter peak heating needs in Western U.S. will result in a significant need for enhanced intra-day deliverability that only HDMC storage can provide

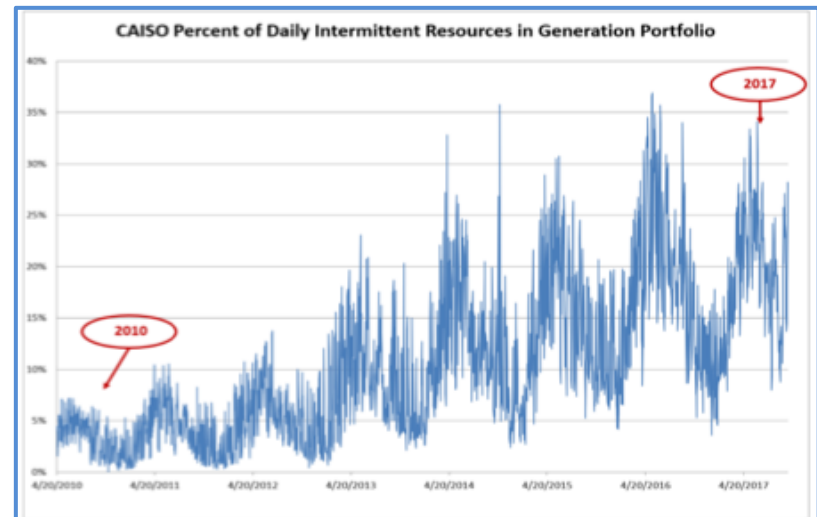
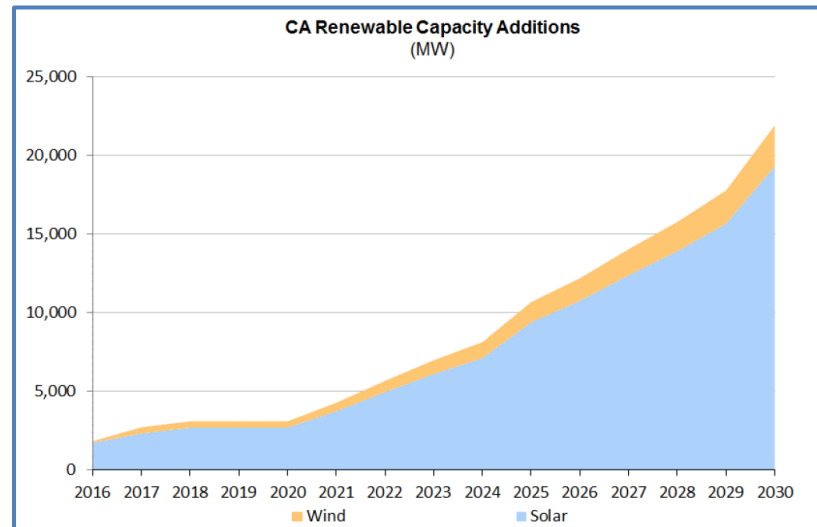
Increase use of Solar and Wind...

- 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

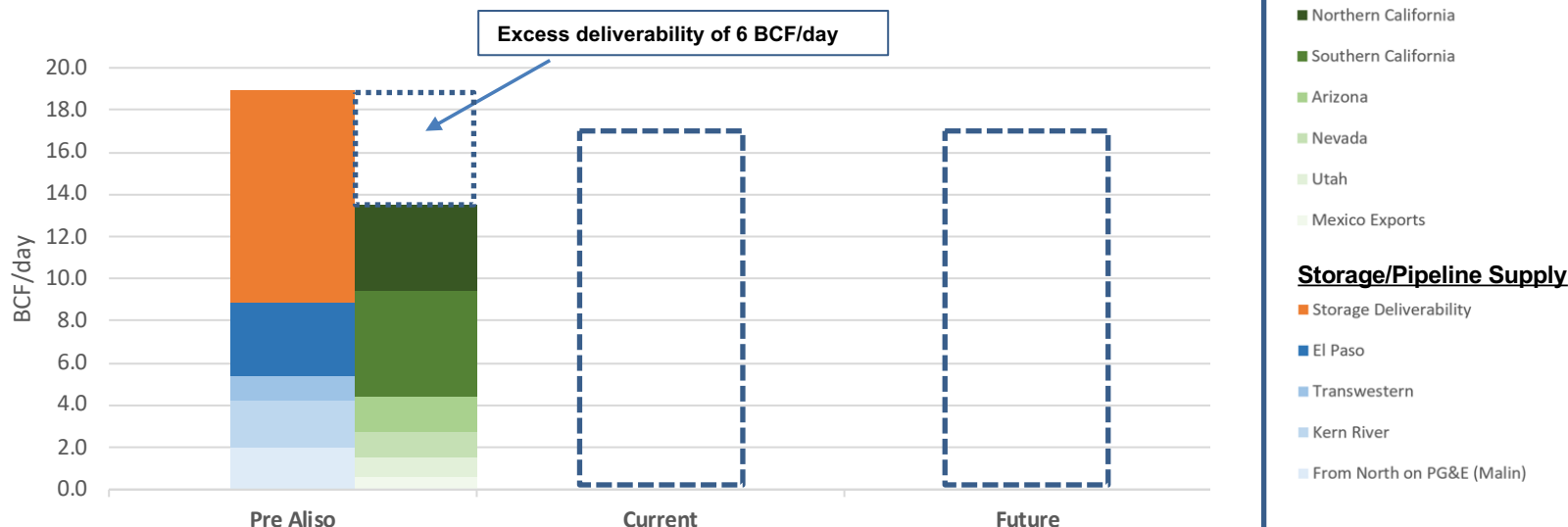
Southwest Region Peak Day Gas Supply Picture (Pre Aliso)



- Before the failure of Aliso Canyon, California and neighboring SW states had nearly 6 BCF/day of excess deliverability to meet peak day demand
- Historically, California storage has dominated the SW region
 - California has historically served 9.2 BCF/day of the SW region's 10 BCF/day in storage deliverability



Southwest Region - Gas Supply / Peak Demand Day Balance



*For detailed sources: see appendix

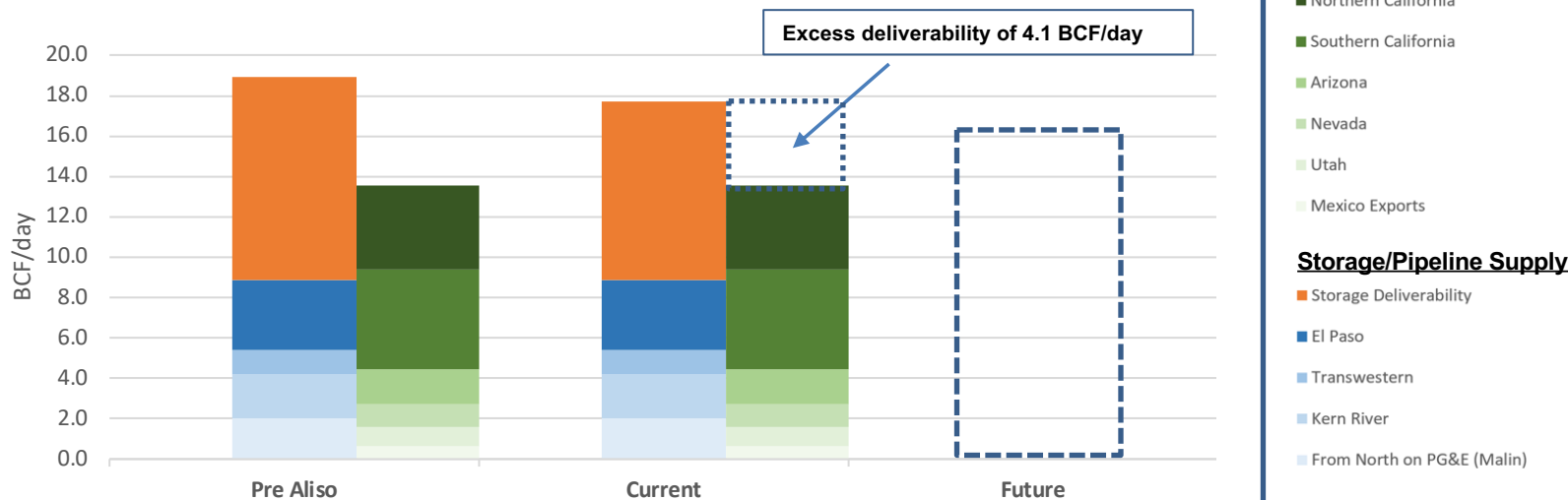
Southwest Region Peak Day Gas Supply Picture (Current)



- With the limitations at Aliso Canyon, California has lost nearly 1.2 BCF/day of daily deliverability
- Without Aliso Canyon, SoCalGas has tightened its balancing requirements on its system
- Volatility has started to rise (see next slide)



Southwest Region - Gas Supply / Peak Demand Day Balance



*For detailed sources: see appendix

Future Impact - California SB 887 and PHMSA

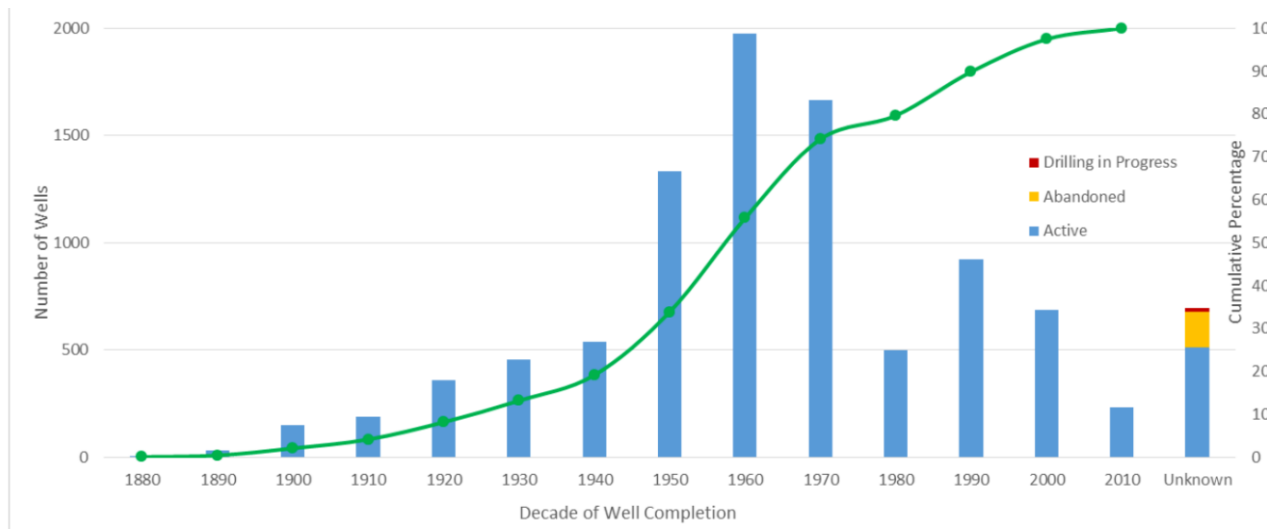


- **California:** SB 887 passed as a result of the Aliso Canyon failure
 - Rigorous new testing requirements to confirm older wells are not leaking
 - Major upgrades to existing facilities – **no “single point of failure”**
 - Expected deliverability impact by 60% or greater
 - Rules effective 1Q2018 – 3 to 5 years for implementation
- **Federal:** Pipeline and Hazardous Materials Safety Administration (PHMSA) of the Department of Transportation published new gas storage rules in December, 2016
 - A group of experts engaged by Magnum indicates a reduction in storage deliverability nationwide by 28% as a result of new PHMSA rules*
 - Kinder Morgan estimates that the new PHMSA rules may reduce deliverability by up to 60% in some cases**

* Analysis available on request

** Source: Kinder Morgan, VP of Gas Storage, Presentation at Energy Bar Association Forum on Aliso Canyon Aftershocks, October 2016

Aging U.S. Storage Fleet: Gas Storage Wells By Completion Decade



Source: Report Sandia Labs, Well Integrity for Natural Gas Storage, Dec 2016, Figure 15

- Aging and under-regulated natural gas storage fleet facing State and Federal regulatory scrutiny, in many cases, for the first time ever
- 80% of gas storage wells are at least 40 years old and at high risk of facing capacity and deliverability shortages

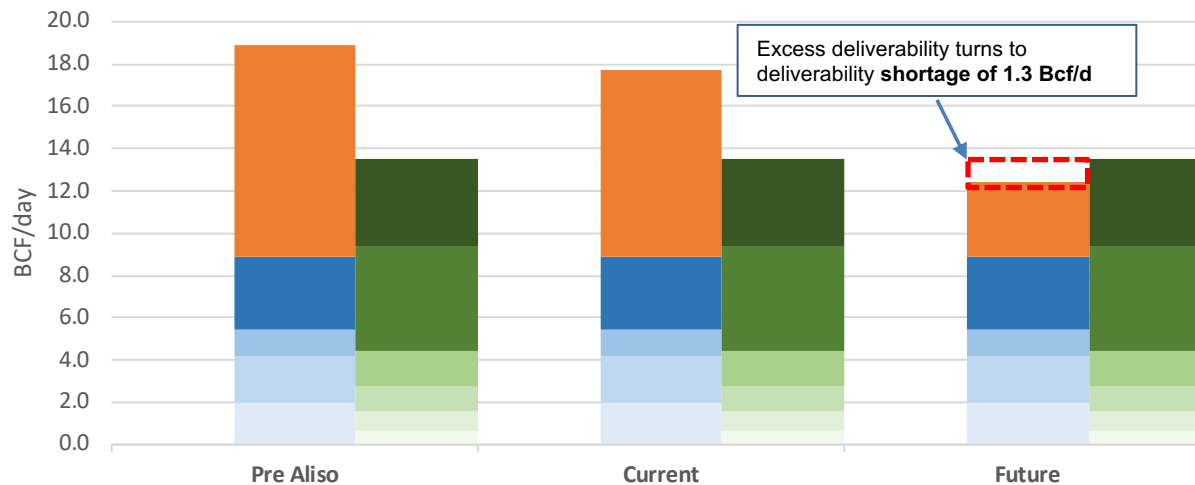
Southwest Region Peak Day Gas Supply Picture (Future)



- With full implementation of SB 887 and PHMSA, California and neighboring SW states will no longer have a supply cushion (assuming below a conservative 60% reduction in deliverability)
- **There is no longer reserve margin for supply disruptions and system outages**



Southwest Region - Gas Supply / Peak Demand Day Balance



Peak Demand

- Northern California
- Southern California
- Arizona
- Nevada
- Utah
- Mexico Exports

Storage/Pipeline Supply

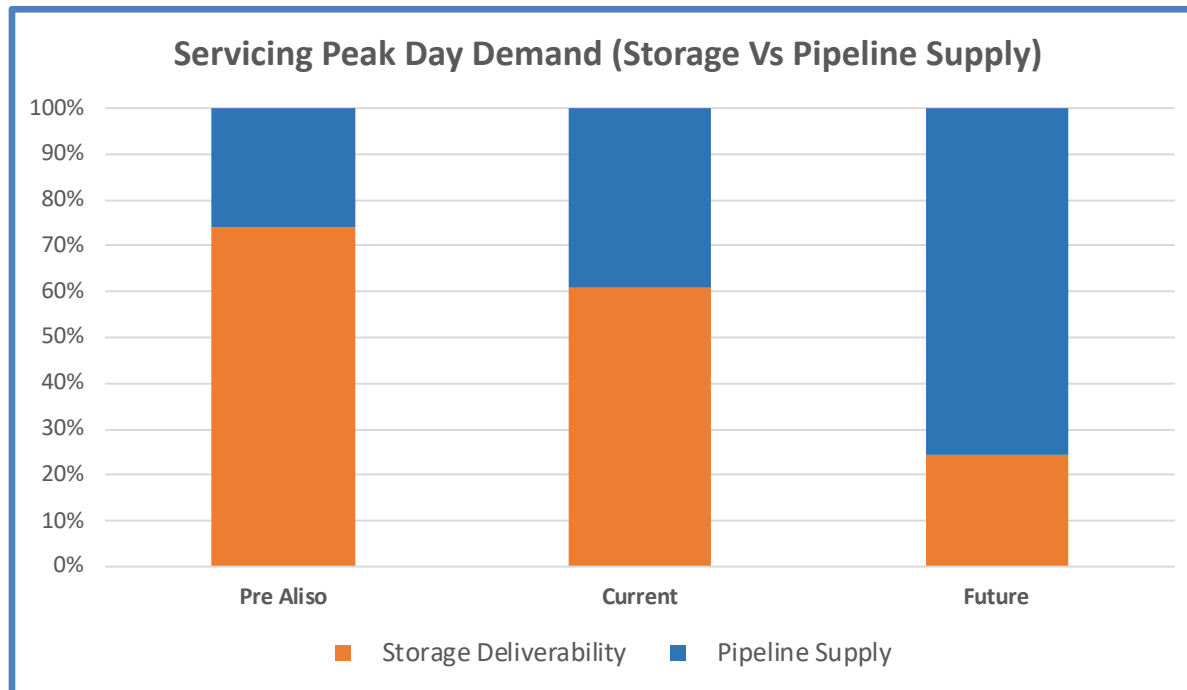
- Storage Deliverability
- El Paso
- Transwestern
- Kern River
- From North on PG&E (Malin)

*For detailed sources: see appendix

Increased Reliance on Pipeline Gas Over Storage



- In addition to a shortage of supply to meet peak day demand, the Southwest region is increasingly relying on pipeline gas rather than storage
- **Pipeline flow with storage is more reliable when there are supply disruptions**
- With 60% of peak demand representing core retail customers, electrical power and industrial load will be cut first when there are curtailments
- See next two slides for examples of recent supply disruptions



Projecting forward the impact of SB 887, storage can service only 24% of regional peak day demand vs 74% Pre Aliso

**For detailed sources: see appendix*

- **The Western US gas markets are undergoing a fundamental shift where shortages of gas storage deliverability, which we expect will lead to inability to secure gas when needed**
- **We believe this change will lead to higher price volatility and greater value for storage**
- **Utilities and other organizations that have ultimate responsibility to deliver gas and power service should be concerned about system reliability as a result of these changes**
- **Other financial and marketing organizations that participate in the gas and power markets should position themselves for these changes**
- **Magnum is fully permitted and we believe is a near term gas storage project capable of adding high physical gas deliverability to the regional market**

Appendix: Sources and Methodology



Peak Gas Demand Methodology

- **Peak Gas Demand** is the sum of (1) maximum daily peak gas usage expected for the year in each of the four states (California, Arizona, Utah, and Nevada) and (2) exports to Mexico from these states
- The sources for this peak demand data are as follows:
 - Northern/Southern California - 2016 California Gas Report. http://docketpublic.energy.ca.gov/PublicDocuments/16-BSTD-06/TN212364_20160720T111050_2016_California_Gas_Report.pdf
 - Arizona – El Paso pipeline 2011-2012 Winter preparedness. <https://www.azcc.gov/Divisions/Utilities/gas/2011%20Winter%20Preparedness/Winter%20Preparedness%20EI%20Paso.pdf>
 - UT, NV – Peak day estimated from EIA gas demand data 2015 (correlated with California). https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm
 - Mexico Exports – Nov, 2016 avg export from CA,AZ - EIA data https://www.eia.gov/dnav/ng/NG_MOVE_POE2_A_EPG0_ENP_MMCF_M.htm
- The maximum daily demand generally occurs in the winter in each of these states. Note: gas burn during the summer can often approach peaks on an intraday basis that are as high as winter demand.

Appendix: Sources and Methodology



Peak Gas Supply Methodology

- **Peak Gas Supply** is the sum of the maximum daily deliverability of major pipelines and storage facilities in the four state region (California, Arizona, Utah, and Nevada)
- The sources for this peak supply data is as follows:
 - PG&E from Malin/Native California Production – 2016 California Gas Report.
http://docketpublic.energy.ca.gov/PublicDocuments/16-BSTD-06/TN212364_20160720T111050_2016_California_Gas_Report.pdf
 - Kern Capacity - <http://services.kernrivergas.com/portal>
 - El Paso Capacity – North and South legs near Arizona border.
<http://pipeportal.kindermorgan.com/PortalUI/DefaultB.aspx?TSP=EPNG>
 - Transwestern – Thoreau West Segment - <http://twtransfer.energytransfer.com/ipost/TW#>
 - Questar Southern Trails - <http://www.questarpipeline.com/indexSTP.php>
 - CA/UT Gas Storage Deliverability – Regulatory Impact on Nationwide Gas Storage, 1/18/17, Beckman, Lanham