

Southwest Energy Conference



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SEPTEMBER 20-21, 2018
HOTEL VALLEY HO | SCOTTSDALE, ARIZONA

James Ogsbury Western Governors' Association





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How have carbon and renewable policies impacted the Southwest energy mix?



Southwest Energy Conference

September 20, 2018
Gerry DaRosa
Director, Energy Innovations

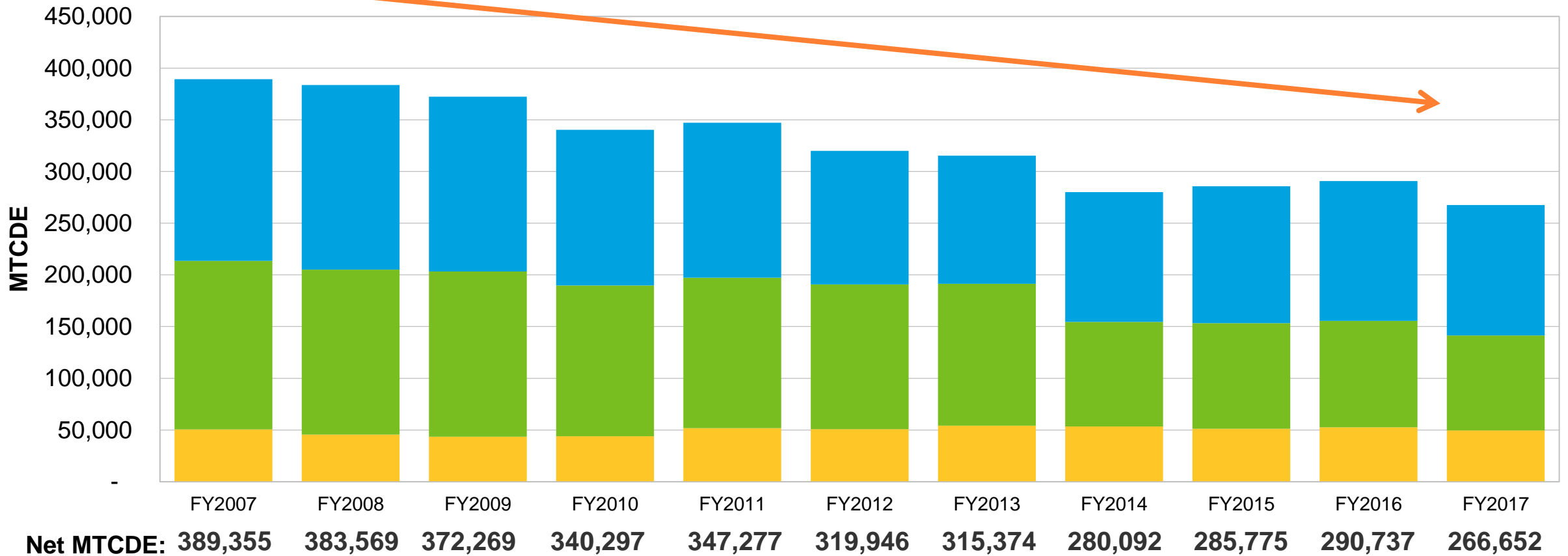


Energy Innovations

Net Greenhouse Gas Emissions 2007-2017

FY17 Net Emissions: 266,652 MTCDE

Total Net Emissions Over Time



31% reduction in net emissions

Scope 1 Scope 2 Scope 3

Sun Devil Power: Solar Throughout our Campuses



Photo Courtesy of SunPower

Sunpower c7, 1250 kWdc, SAT CPV



SDFCT, 1411 kWdc eq. (thermal) and 261 kWdc (Fixed PV)



WFA, 497 kWdc, Fixed RT PV



West Prkg, 2,680 kWdc, PV



Poly Grd Mt, 801 kWdc SAT PV

Sun Devil Power: Solar at Tempe Campus



Gammage Pkwy PP, 494 kWdc PV



Farrington Std. 251 kWdc, PV



Orange Mall PP, 310 kWdc, PV

Sun Devil Power: Off-site Solar



Red Rock Solar Plant

- Roughly $\frac{1}{2}$ of plant capacity developed for ASU – 65,000 MWh/yr
- APS owned/operated

Photo courtesy of APS



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The Integrated Resource Planning process – how has it changed, and what is the effect on long term planning?



SRP Integrated Resource Planning Process

Stakeholder
Involvement

Scenarios,
Portfolios &
Analysis

3rd Party
Validation

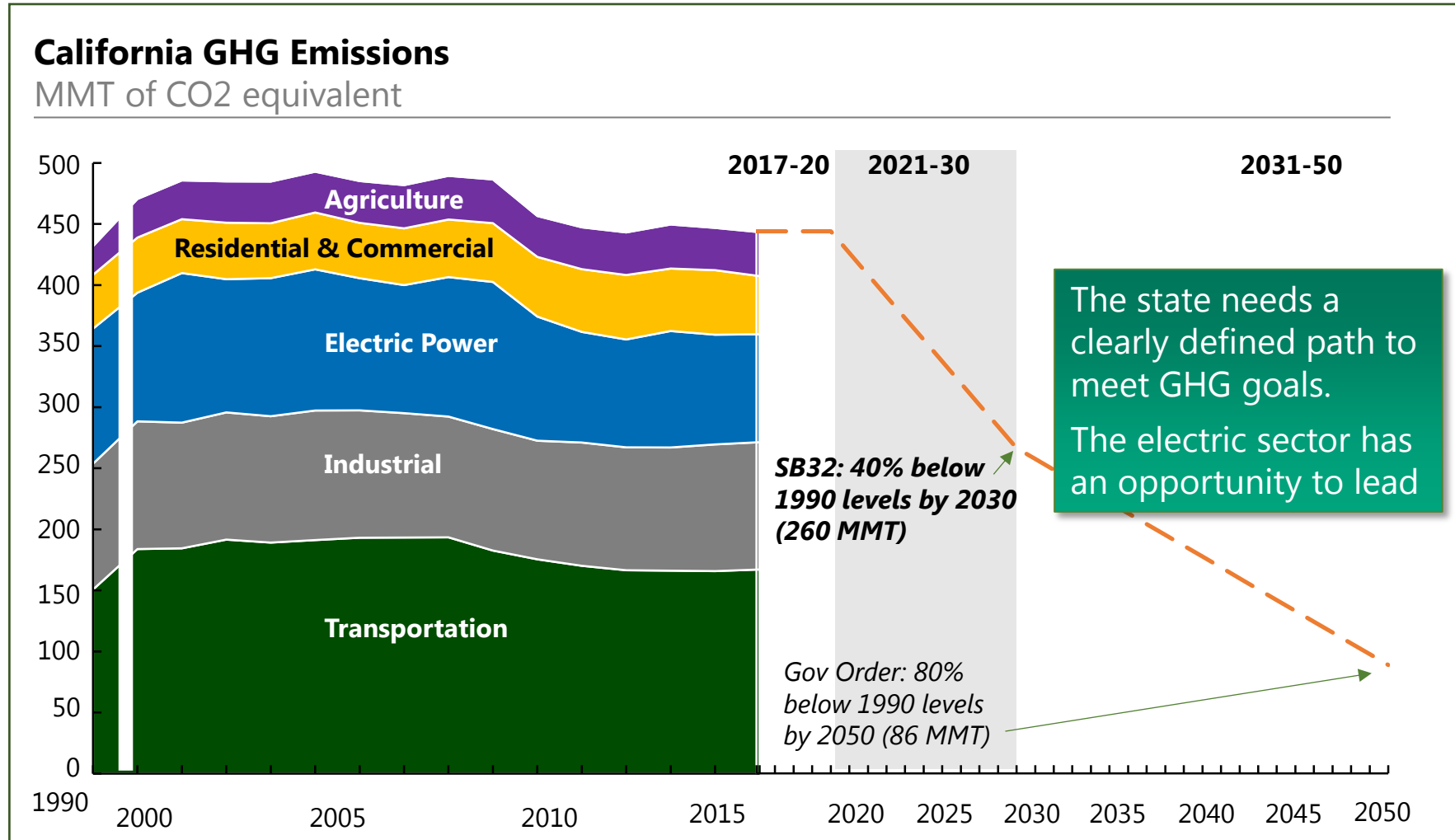
Strategic
Conclusions



Southern California Edison 2018 IRP Planning for Decarbonization

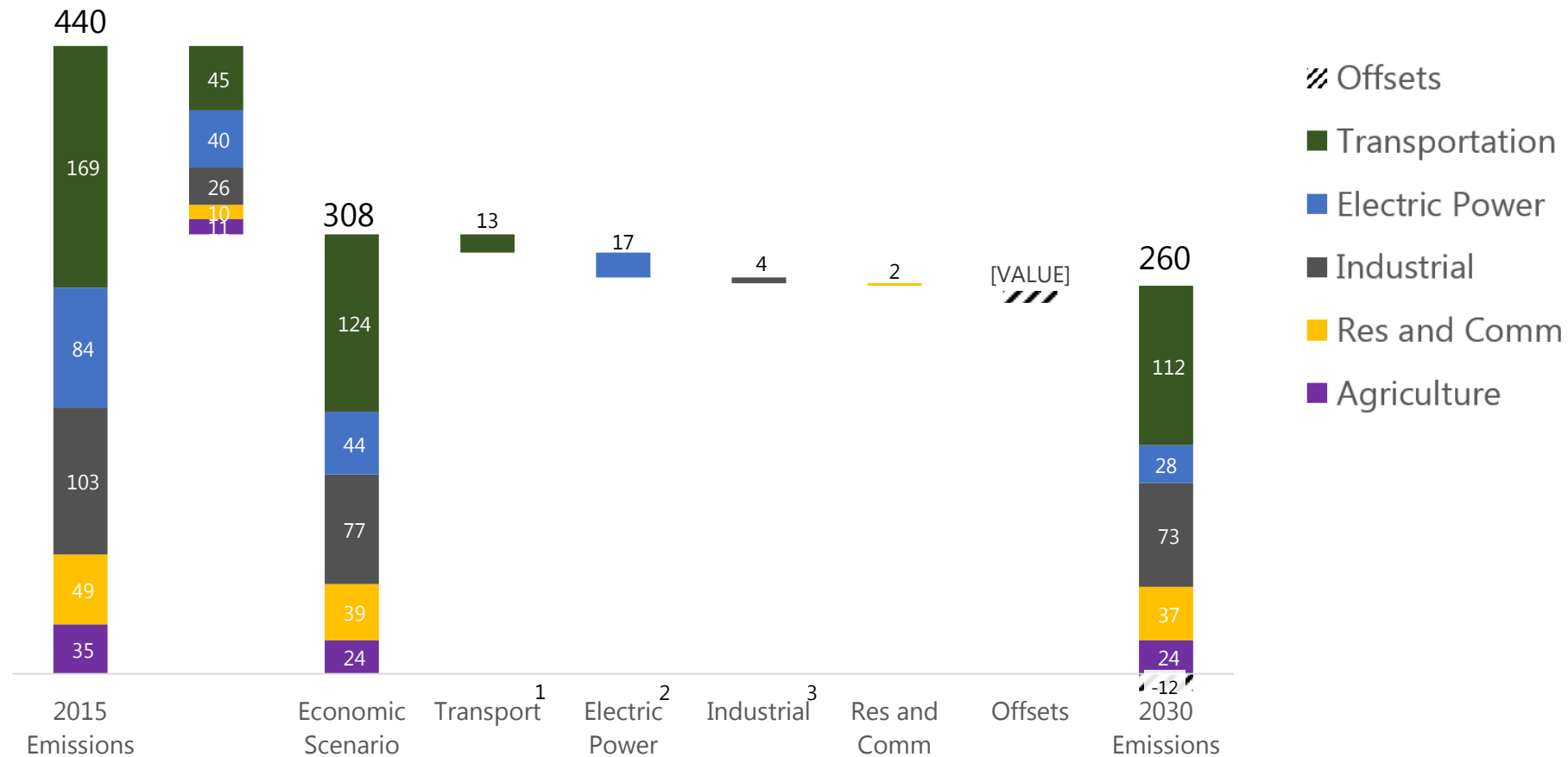
Presentation to Southwest Energy Conference
Scottsdale, AZ
September 20, 2018

Achieving California's GHG goals in 2030 and beyond requires an acceleration of decarbonization



Current policies reduce emissions in all sectors, but trans. and electric sectors must reduce further to meet goals

SCE perspective on abatement by sector in 2030
Annual MMT CO₂E vs. 2015⁴



¹ Includes transportation, communications, and utilities public infrastructure usage

² Includes electric sector, pipeline hydrogen, and biogas

³ Includes industrial, oil & gas extraction, and petroleum refining, and assumes only 8% reduction in refinery emissions through efficiency improvements

⁴ Some numbers may not sum due to rounding in chart

Renewables, storage, and LDV electrification are the key levers to meet 2030 goals

	Opportunity	What it would take to close the gap - 2030	Incremental abatement ¹ (Annual MMT CO ₂ E ²)
Transportation	<ul style="list-style-type: none"> Light duty auto electrification 	<ul style="list-style-type: none"> Incremental ~5 M EVs, for total 7 M (65% of all new LDVs are BEVs and PHEVs by 2030) 80,000 MDVs and 2,000 HDV (matching EV filling) 	13
Electric Power / Fuel Supply	<ul style="list-style-type: none"> Renewable generation 	<ul style="list-style-type: none"> Renewables expanded to 70% (up from 50% RPS) which equates to >80% carbon-free electricity 10GW of storage to balance renewables DG solar PV remains at 18.2 GW 	17
	<ul style="list-style-type: none"> Landfill gas 	<ul style="list-style-type: none"> Landfill gas replaces up to ~7% of pipeline gas (increase from ~3% economic scenario) 	2
Industrial	<ul style="list-style-type: none"> Refinery activity reduction 	<ul style="list-style-type: none"> ~21% reduction in refinery emissions (further reduction from ~10% in economic scenario due to further decreases in gasoline demand and efficiency improvements) 	4
Residential and Commercial	<ul style="list-style-type: none"> Heat pump adoption 	<ul style="list-style-type: none"> Electrification of additional 0.6M residential water heaters, for a total of 2.1M water heaters and 3.5M space heaters (i.e., all new residential construction space/water heating 2022 and 47% of all sales by 2030) Electrification of ~30% of commercial space heaters 	2
Other	<ul style="list-style-type: none"> Offsets 	<ul style="list-style-type: none"> Alternate market compliance mechanism (non-measure specific – limited to 4-8% of allowances) 	12
Total	<ul style="list-style-type: none"> Cost of incremental abatement: \$79/ton 	<ul style="list-style-type: none"> Realization of all identified opportunities achieve 2030 target 	48

¹ Abatement vs. 2015 emissions

Proposed CAISO-wide System Plan reflecting decarbonization vision

SCE Pathway System Plan Capacity Additions

GW, cumulative



Energy storage



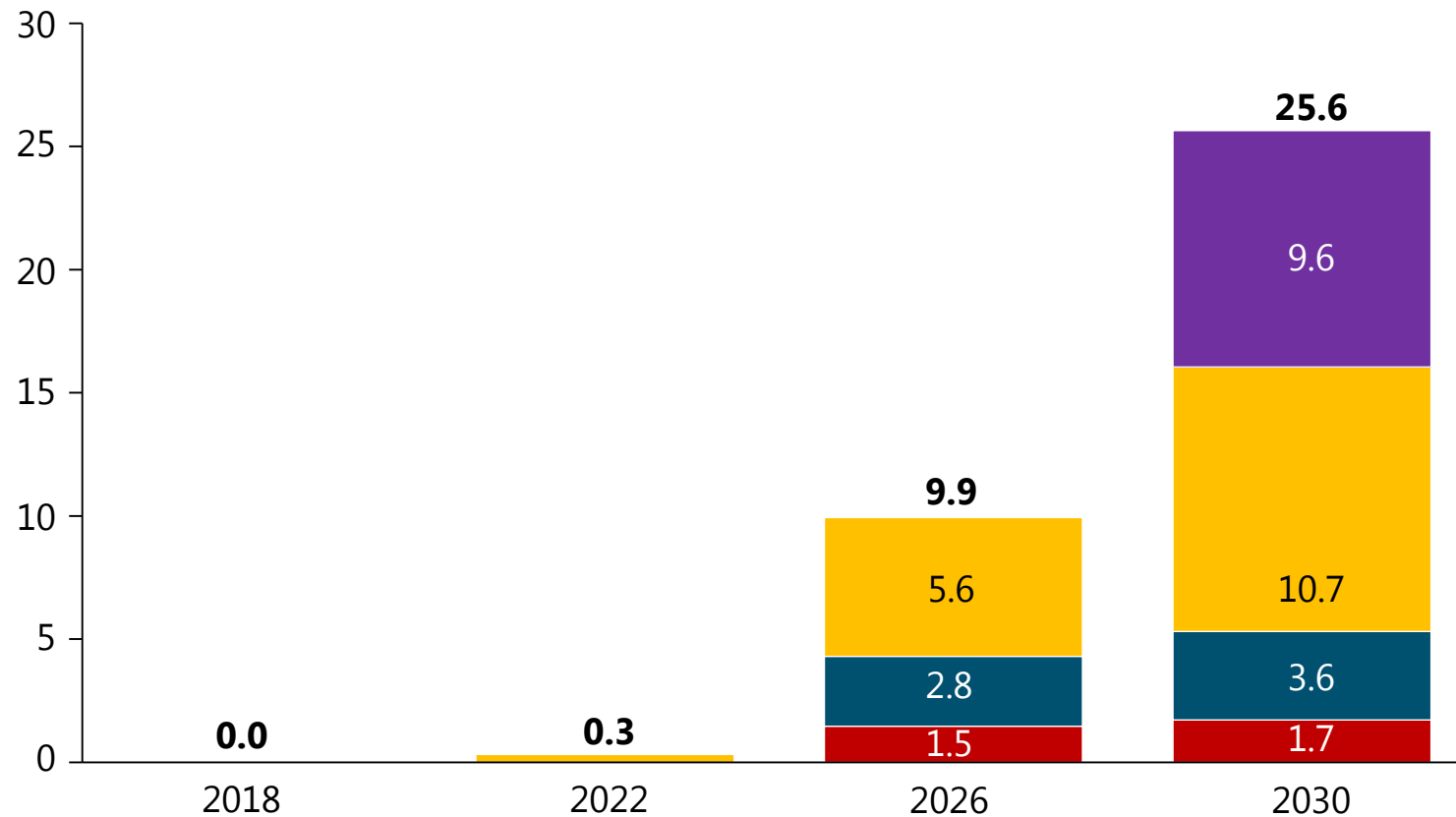
Wind



Solar PV



Geothermal



RESOURCE PLANNING

Reliability-Driven, Customer-Focused

Jeff Burke
Director, Resource Planning
September 20, 2018



APS - OVERVIEW

Company

- Serving AZ since 1886
- AZ largest tax payer
 - \$3.4B annual economic impact

Customers

- 1.2 million

2017 Peak Demand

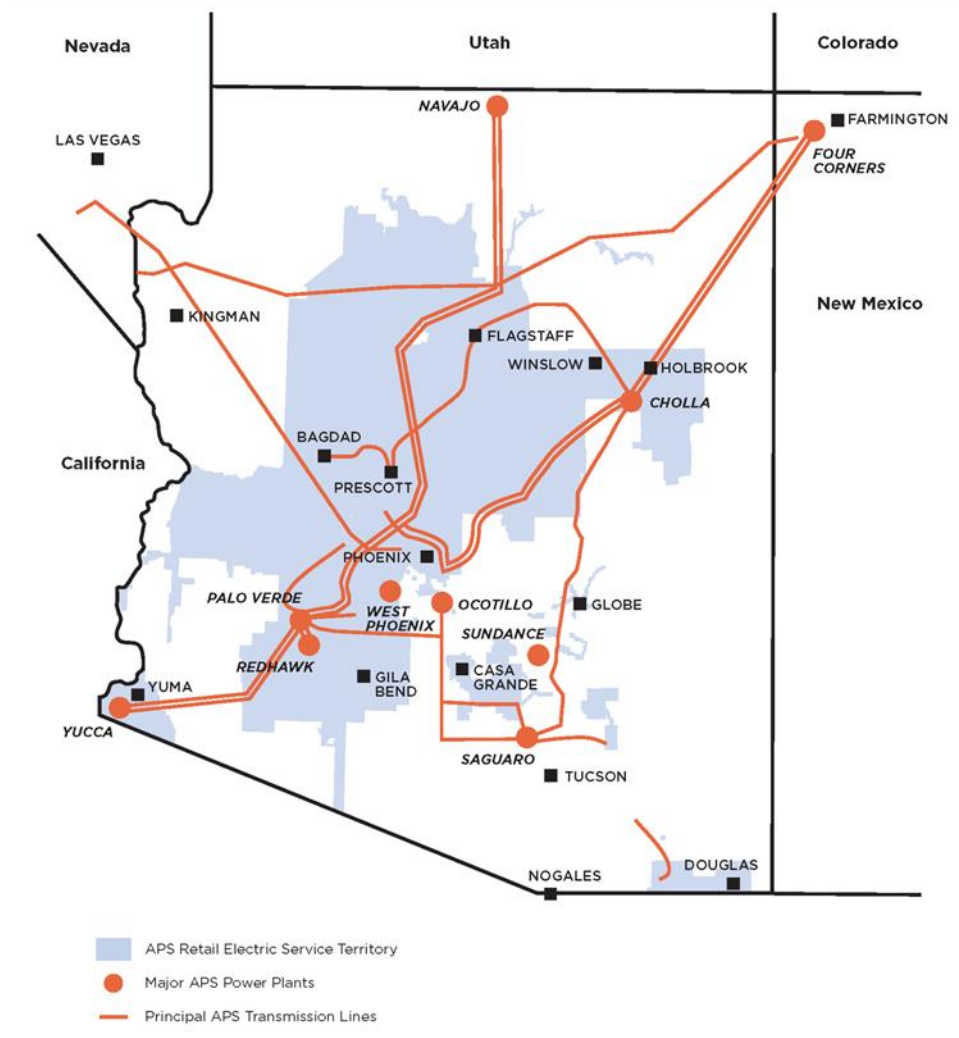
- 7,367 MW

Generation Capacity

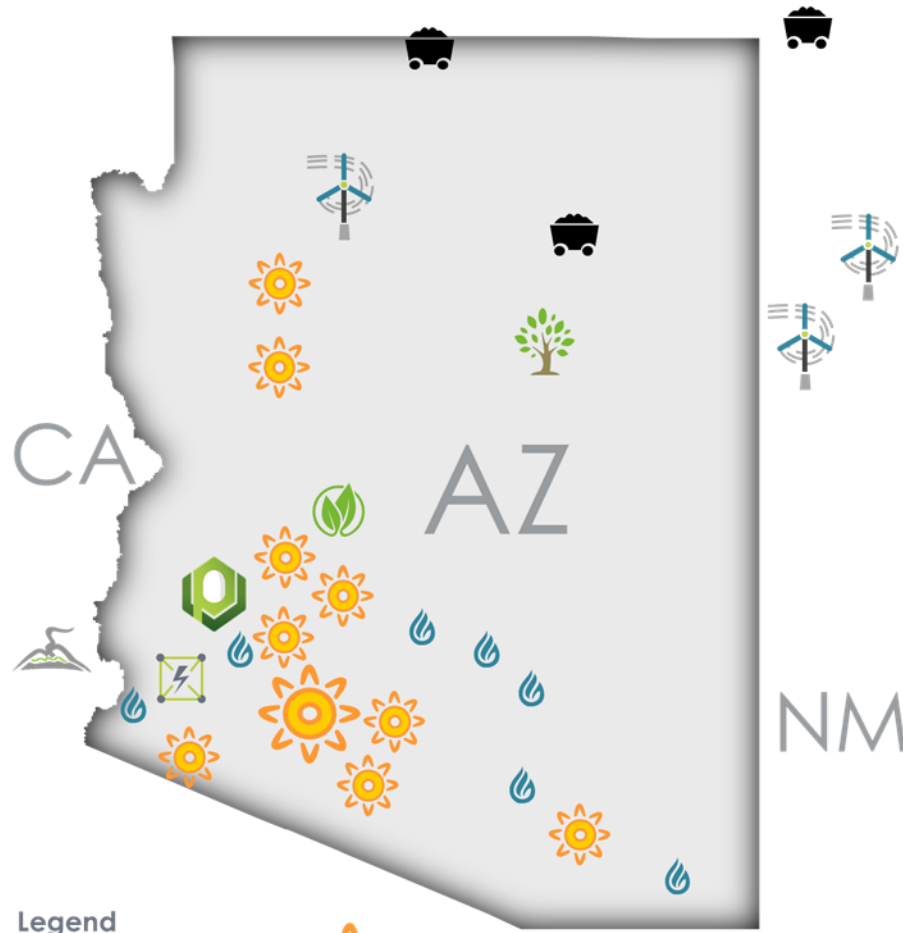
- About 6,300 MW of owned capacity

Transmission & Distribution

- Approximately 430 substations, 300,000 transformers and more than 550,000 poles and structures



APS RESOURCE DIVERSITY



Legend



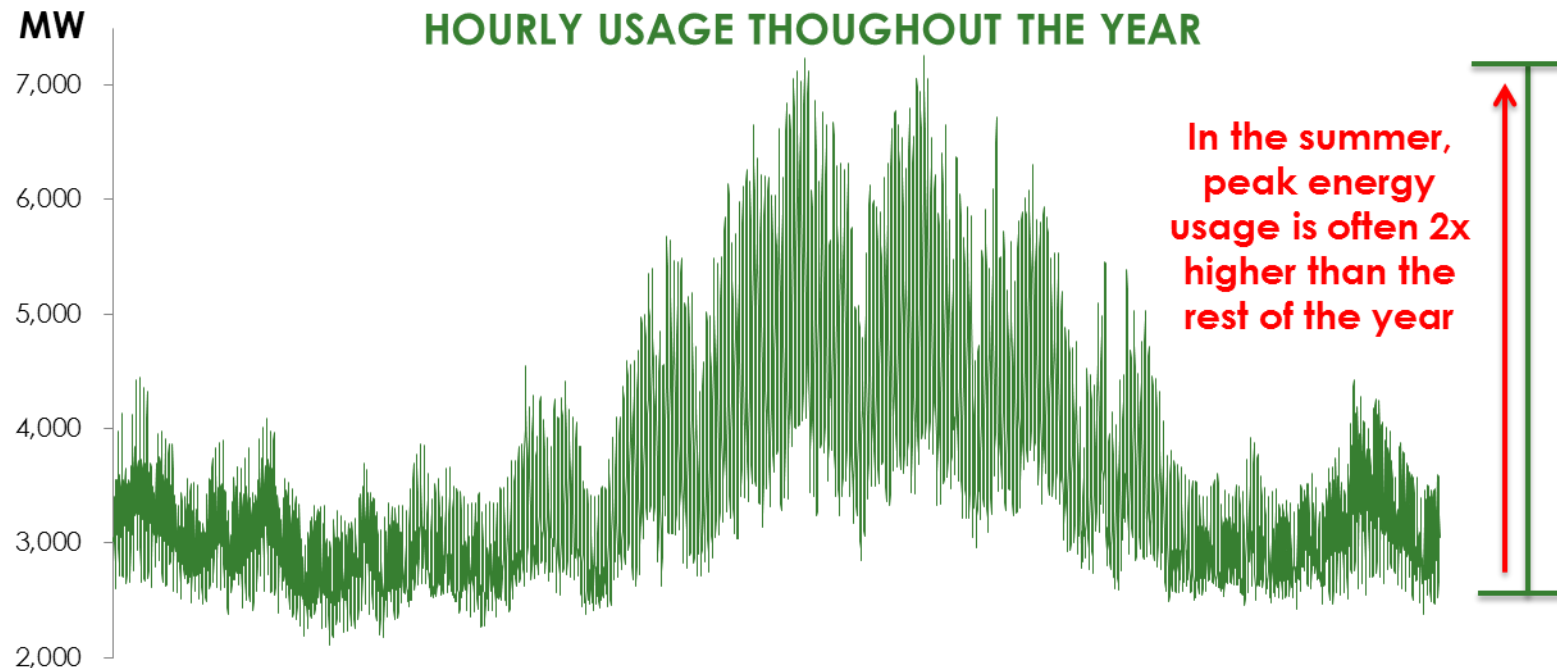
- Renewable energy resources are the second largest piece of the APS system

2018 Resources (MWs)

	NAMEPLATE CAPACITY
Nuclear	1,146
Coal	1,672
Natural Gas	4,959
Microgrid/ESS (Quick Start)	34
Renewables (Utility-Scale)	889
Customer-Based (Including Renewables)	1,749
TOTAL	10,448

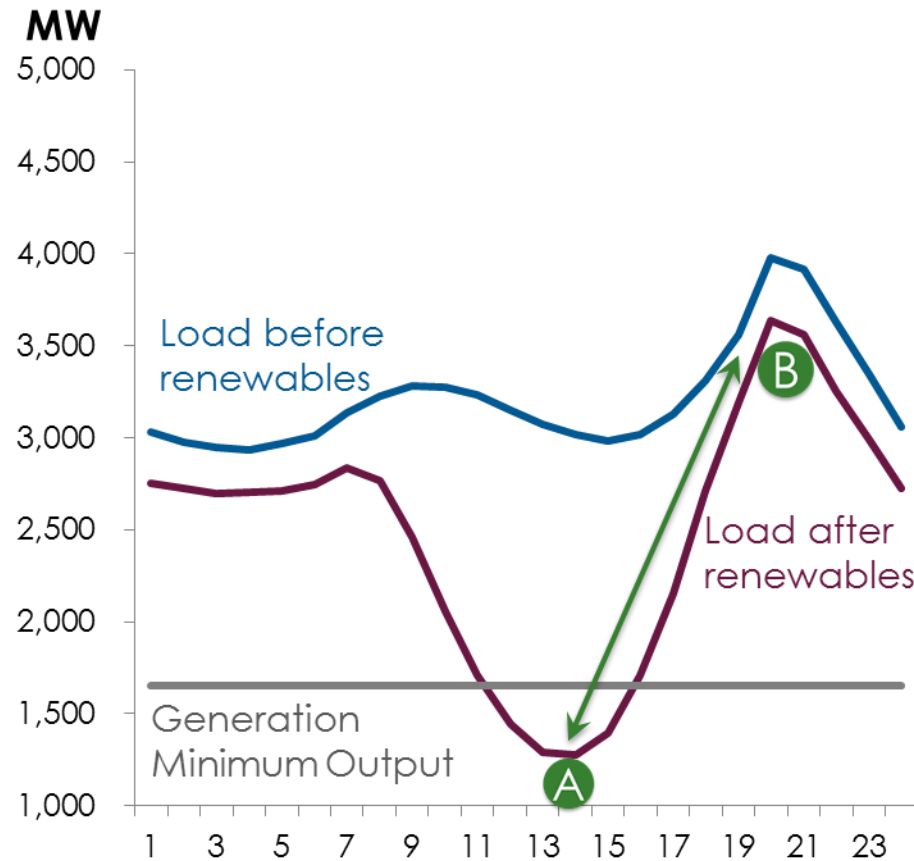
TYPICAL ANNUAL ENERGY USAGE

- APS's customer base is ~90% residential
- Weather conditions drive load and resource needs
- Customer demand for power peaks in the summer months due to air conditioner load in Arizona's 100^o+ temperatures



THE “DUCK CURVE”

Non-Curtailable Rooftop Solar is Changing the Load Shape of the Grid



A The mid-day dip in load due to growth of non-curtailable rooftop solar resources on the system

B Evening peak

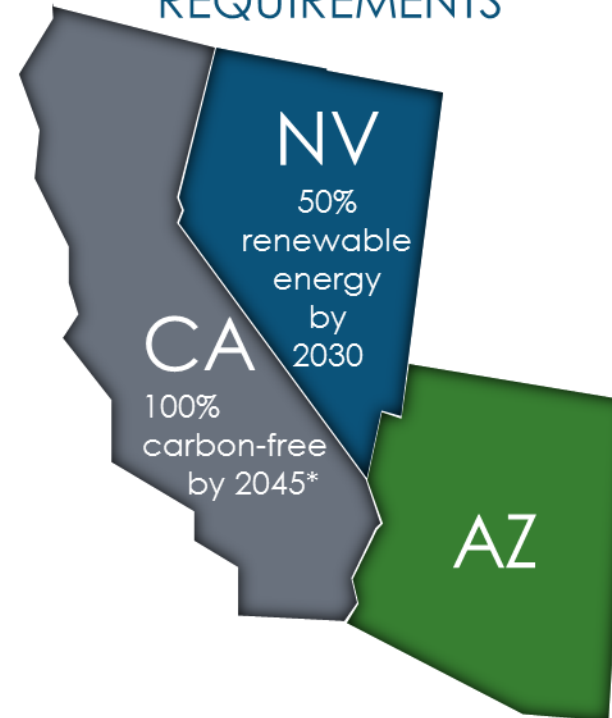
Meeting Evening Peak

- The mid-day dip in load disappears once the sun sets
- This causes a steep ramp in demand heading into the evening peak
 - Requires fast-starting, flexible resources to respond

MEGATRENDS AFFECTING ENERGY SUPPLY

- Increasing levels of regional renewable energy resources due to:
 - Regulatory / legislative mandates
 - Continued growth in rooftop solar resources
- Baseload resources challenged
 - Designed to operate at high capacity factors
- Low natural gas prices

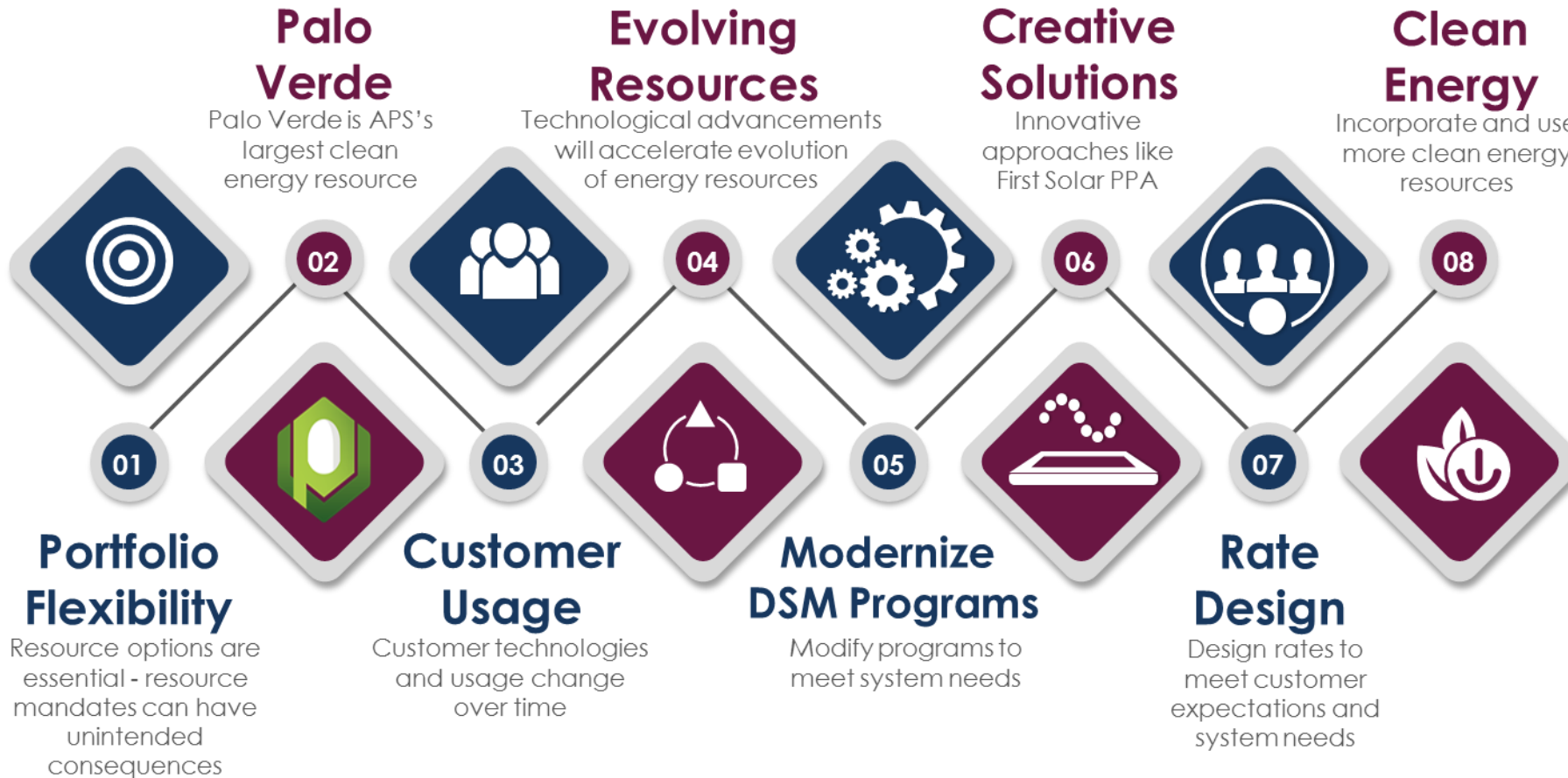
RECENTLY PROPOSED AND ENACTED RENEWABLE ENERGY REQUIREMENTS



*Enacted September 10, 2018

PLANNING REQUIRES FLEXIBILITY

The Future Must Have an All-The-Above Approach





Western
Area Power
Administration

Southwest Energy Conference

September 20, 2018

Rodney Bailey
Power Marketing Advisor

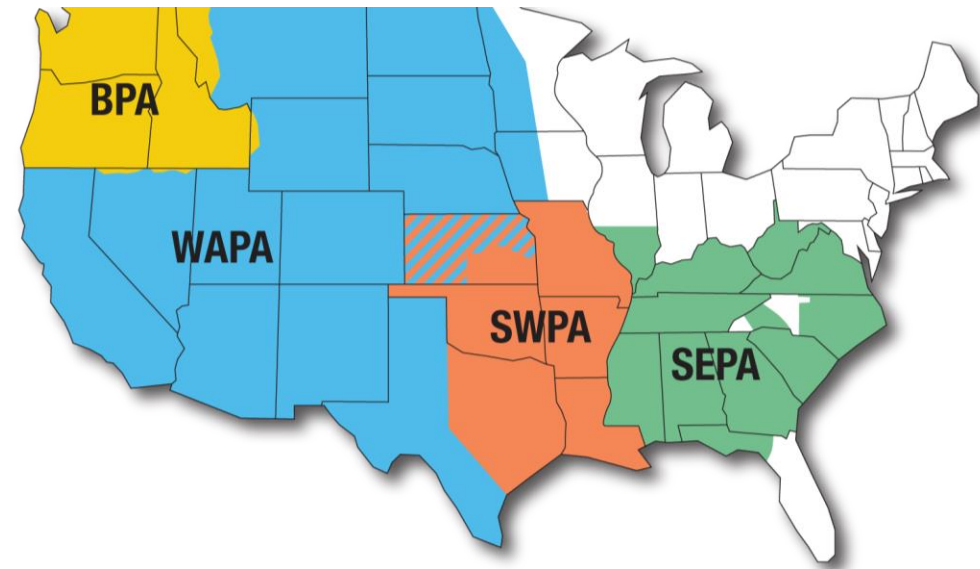
rbailey@wapa.gov

Check out “The Source” at WAPA.GOV



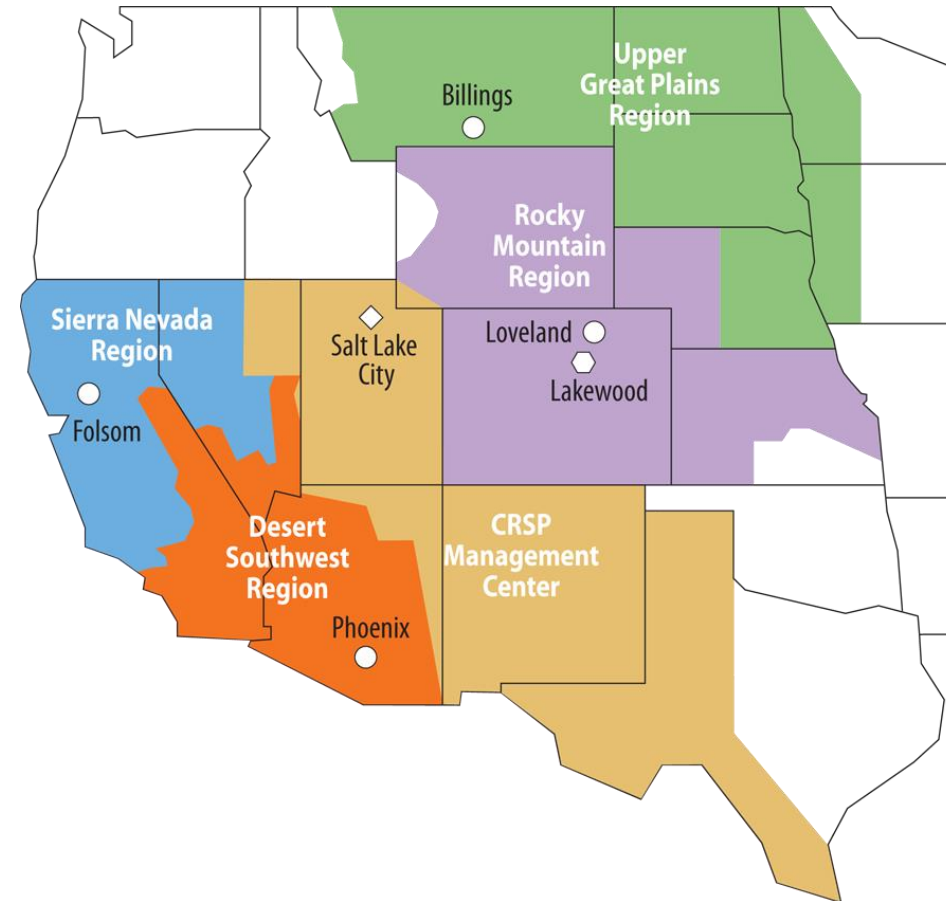
What is WAPA?

- One of 4 power marketing administrations, under DOE
- Agency formed in 1977
- Wholesale electricity supplier
- ~ 700 long-term/firm power preference customers



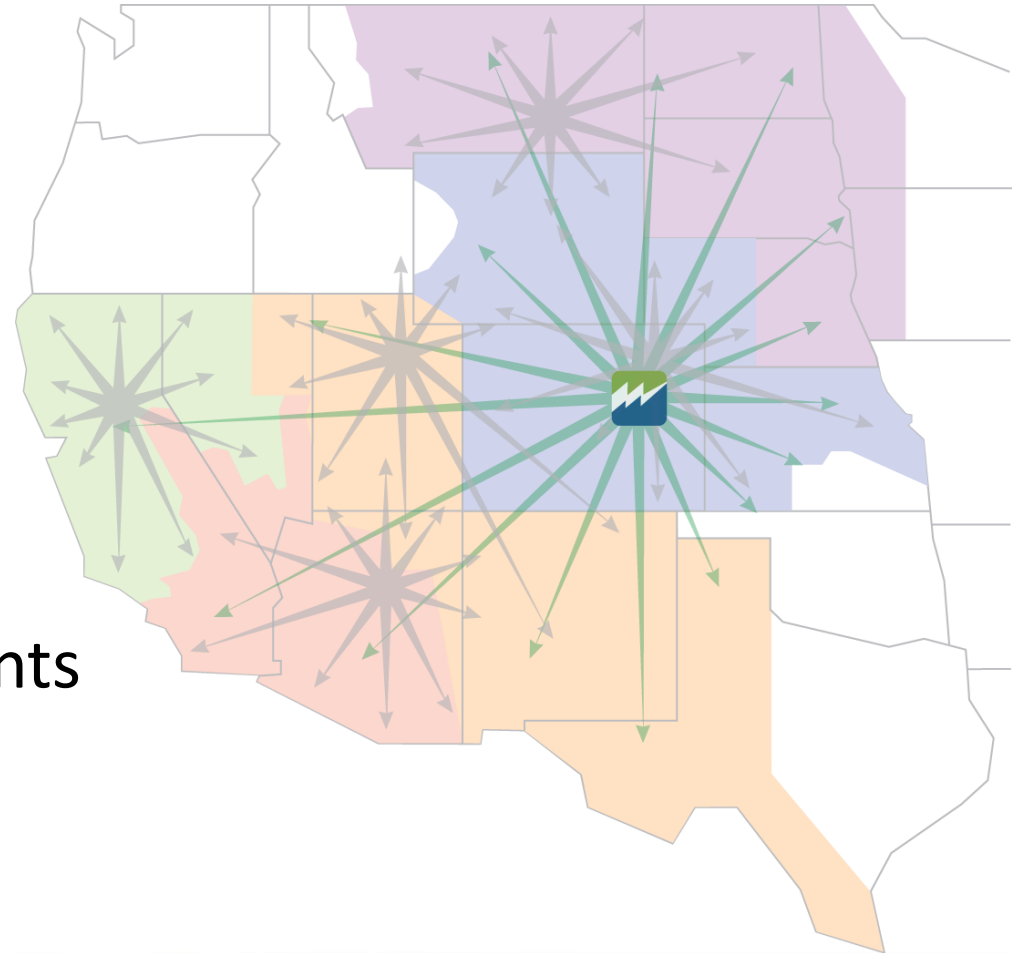
Who is WAPA?

- 15 states
- Operate 4 BAs
- 57 hydropower plants
- 10,503 MW of installed capacity
- 17,231 miles of transmission lines
- 40 million end users/year



WAPA's Challenges

- Statutory requirements
- Each region has unique legislation and needs
- Costs/Rates
- No load growth
- Environmental constraints
- Drought conditions





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Tom Forese Arizona Corporation Commission





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Regionalization and the future of the market in the West?





California ISO

Regionalization and the future of the market in the west

Mark Rothleder

Vice President

Market Quality and Renewable Integration

September 21, 2018

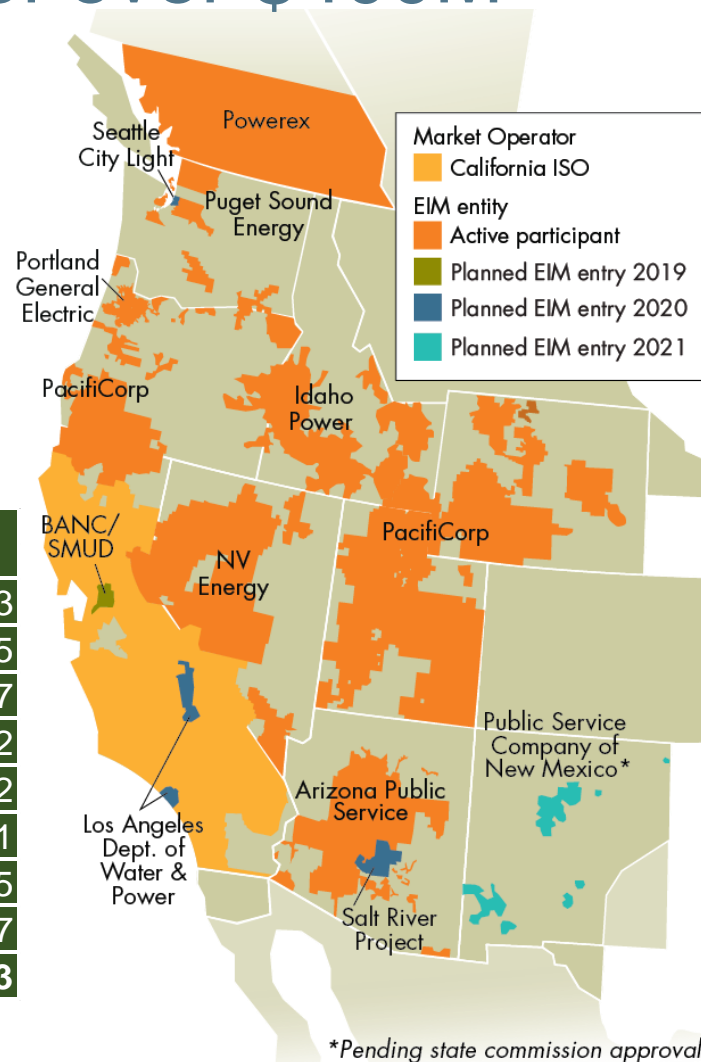
Arizona Energy Consortium

Southwest Energy Conference

Western EIM serves 2/3 of the western load and has gross economic benefits of over \$400M

- Nine western states – Arizona, California, Idaho, Oregon, Nevada, New Mexico, Utah, Washington & Wyoming
- Canada – southern portion of British Columbia
- Mexico – Baja California (under consideration)

BAA	2014	2015	2016	2017	2018	Total
APS			5.98	34.56	14.49	55.03
IPCO					7.75	7.75
ISO	1.23	12.66	28.34	36.96	42.78	121.97
NVE		0.84	15.57	24.20	9.51	50.12
PAC	4.73	26.23	45.47	37.41	22.18	136.02
PGE				2.83	8.98	11.81
PSE			1.56	9.86	5.33	16.75
PWRX					2.27	2.27
Total	5.96	39.73	96.92	145.82	113.29	\$ 401.73



Regional coordination will evolve to meet the needs as the system transforms

- Expanded renewable and clean energy targets
 - California SB100 – 60% by 2030, 100% by 2045
- Western Energy Imbalance Market
 - Continues to grow, 2/3 of WECC load will participate by 2020
 - Explore extending success of EIM into Day-Ahead Market
- Reliability Coordinator
 - ISO will be RC of record by July 1, 2019 for CA BAA and other BAAs by November 2019.
 - ISO will be the RC of 80% - 90% of the load area in the west
- Western RTO?
 - Where there's a will, there may be a way

APS Wholesale Market Participation

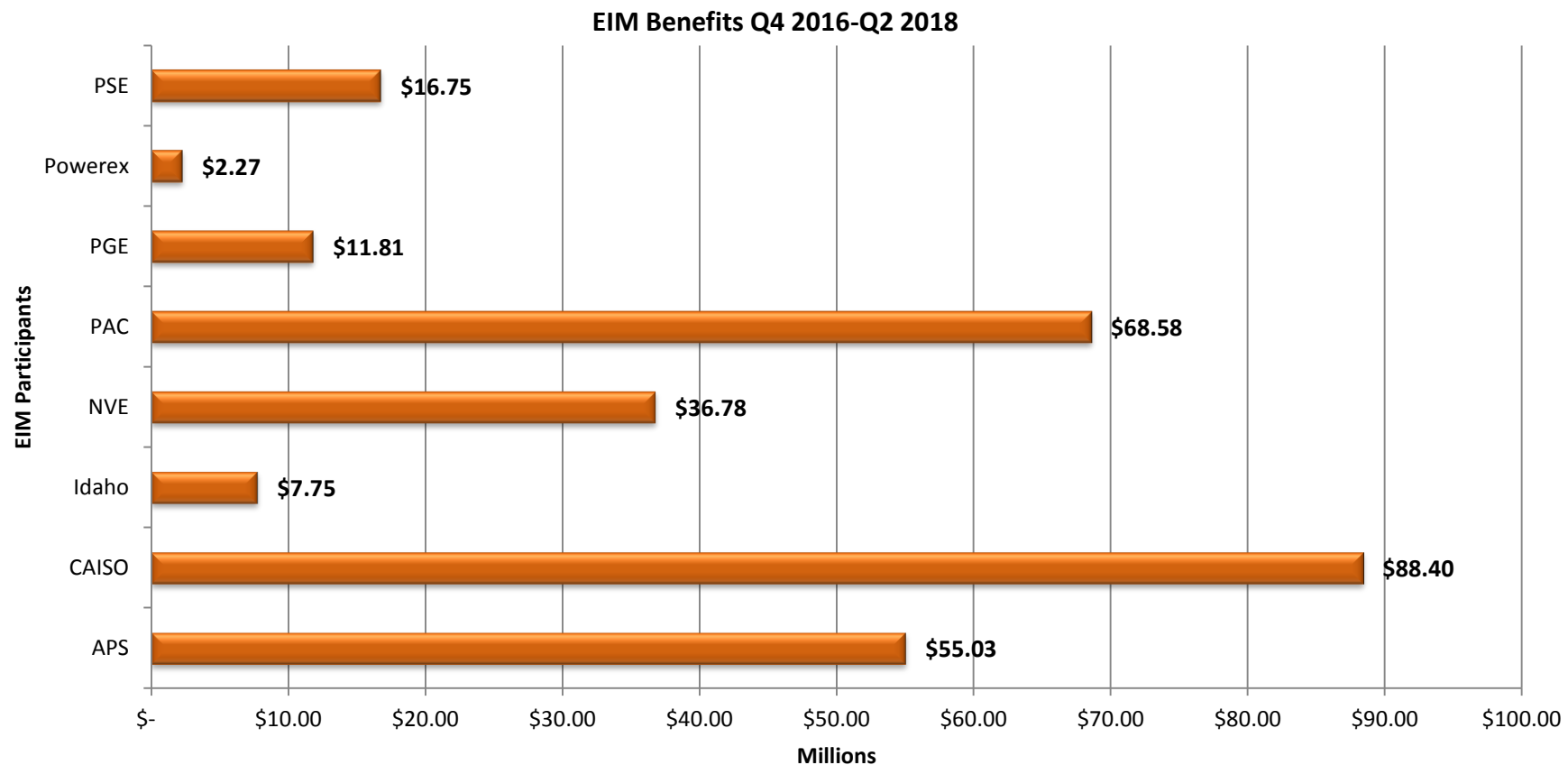
Brad Albert
September 21, 2018



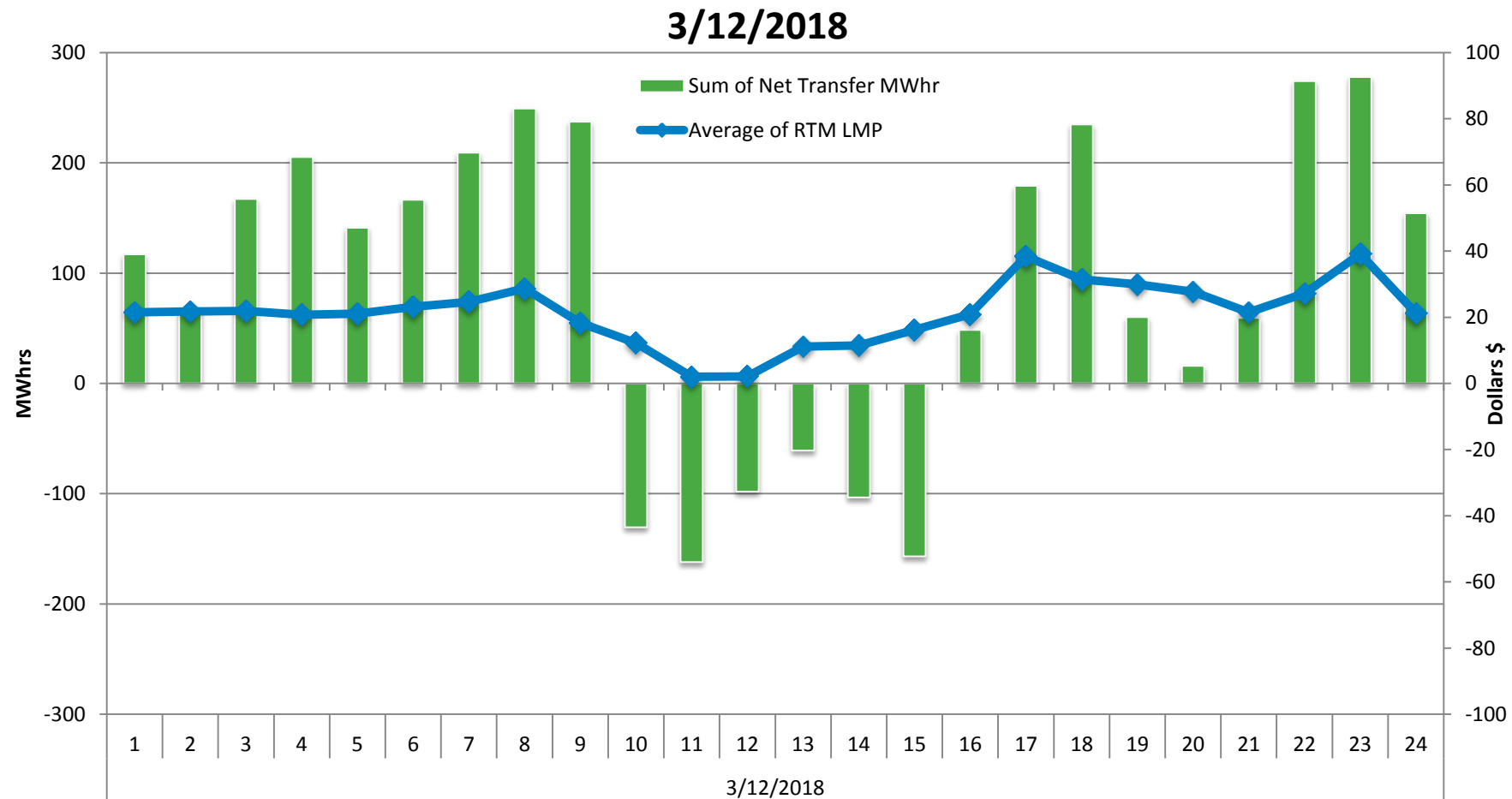
APS' Philosophy on Energy Markets

- Our participation in energy markets is a means to an end:
 - APS is not a trading company!
 - We participate in energy markets to serve our customers better:
 - Improve cost effectiveness and reliability
 - Promote price stability
 - Integrate variable energy resources more efficiently
 - We also believe in using all of the tools in the toolbox:
 - Participation in the Western EIM
 - Creation of a “trough hours” trading product

APS Has Realized Significant Benefits From EIM Participation



Sample Day – EIM Transfers and Prices



Markets Will Continue to Evolve

- Markets have evolved significantly during my career:
 - 1980's – inter-utility economy interchange
 - Mid-1990's – wholesale energy markets form with multiple participants
 - Late-1990's – organized wholesale markets form under ISOs/RTOs:
 - » CalPX
 - » Continue to develop and refine through the 2000's
 - Formation of EIM in the west
 - » Enabled by advancing IT and communication capabilities
 - » Motivated by the desire to more effectively integrate VERs

Markets Will Continue to Evolve

- Continued evolution is inevitable and desired:
 - APS supports evolution that will bring economic and reliability benefits for our customers
- Markets also serve as a motivating force for operational changes and advances
 - Lowering Pmin's on our baseload units and gas CC's
 - Responsiveness of solar assets
 - Manually curtailable today
 - Fully dispatchable tomorrow

REGIONALIZATION & RENEWABLES

Path to Higher Penetration &
Lower Cost

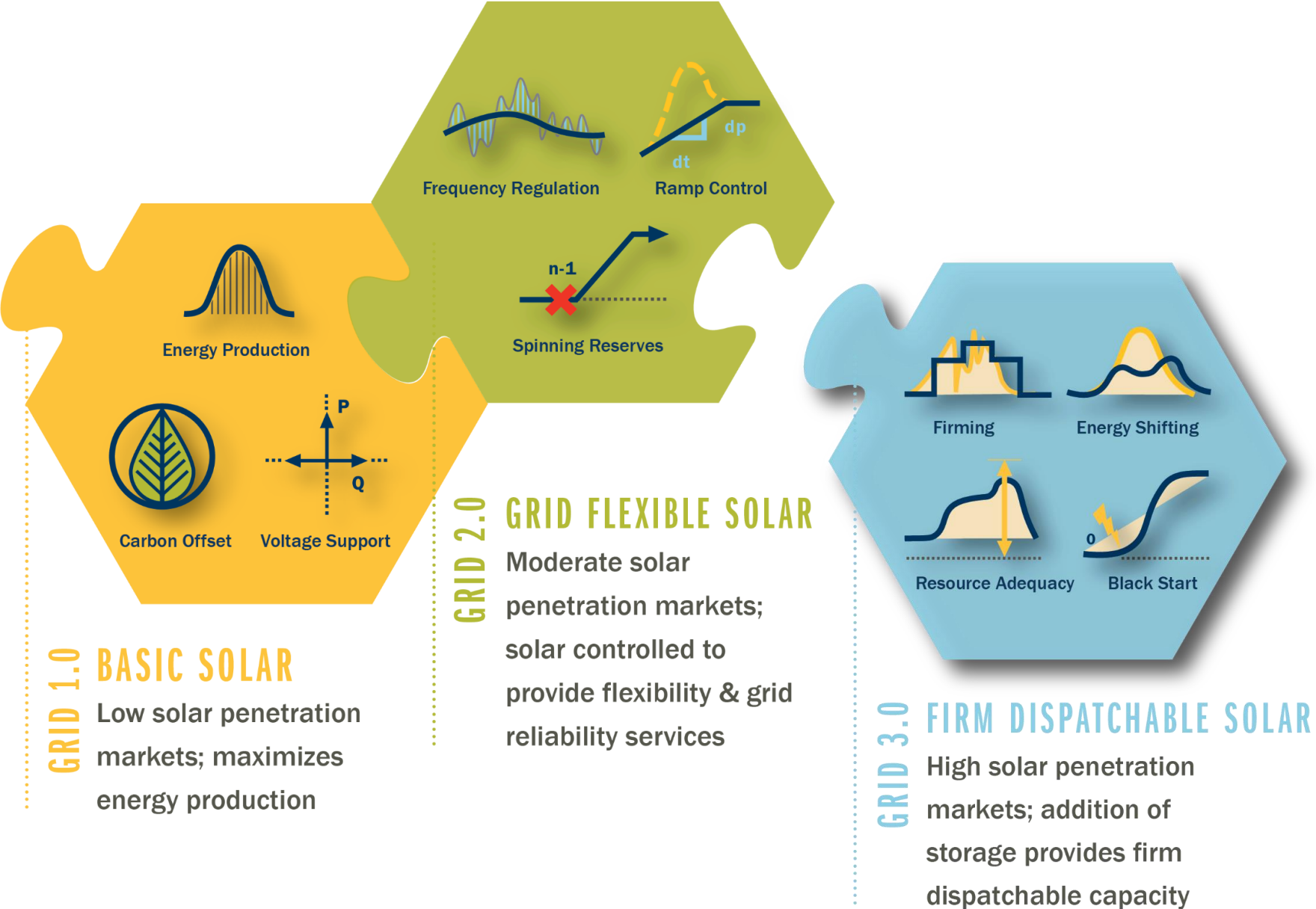
Eran Mahrer – VP Markets,
Origination and Government Affairs



LEADING THE WORLD'S
SUSTAINABLE ENERGY FUTURE



UTILITY-SCALE SOLAR PROVIDES GRID FLEXIBILITY



MARKET DESIGN PRINCIPLES

Enabling a Clean, Sustainable Grid in the Future Requires Proactive Industry Collaboration Today

- Institute workshops leading to rulemaking proceedings
- Industry collaboration on PPA evolution to drive increased dispatchability

Grid Flexibility is a Necessity for Grid Modernization

- Increased coordination and participation in regional markets
- Prioritize efficiency and accuracy in provision of grid services
- Increased granularity and dispatchability in day-ahead

Planning, Procurement, Contracting, and Market Operations Must Evolve to Incorporate and Enable Grid Flexibility from Renewable Resources

- Model solar as fully dispatchable in IRPs
- Design RFPs around grid flexibility / provision of grid services
- Target requirements around renewable resources providing grid services as part of RPS evolution



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SUSTAINABLE ENERGY FUTURE

To learn more, visit www.firstsolar.com/Grid-Evolution



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What are the impacts on insurance and finance as market risks and dynamics change?



Delivering Energy
Solutions to Our
Customers Worldwide



About RAI

- RAI Energy International, Inc. (“RAI”) is a global energy development company that was established in 2006
- Based in the Silicon Valley with regional offices in San Jose, California and Amman, Jordan
- Market emphasis on U.S. and MENA
- Our development is focused on utility-scale solar PV and energy storage



About RAI (Cont.)



- Management team has extensive experience in every aspect of renewable energy sector
- Dedicated to providing reliable and affordable renewable energy
- Our corporate culture is:
 - Credibility Focused
 - Integrity Driven
 - Financially Sound

Successful Projects



***Seville Solar Project – 50 MW
(CapEx - \$70 MM)***



***Jordan Solar One – 50 MW
(CapEx – \$60 MM)***



***DG Solar Projects in USA – 20 MW plus
(CapEx - \$36 MM)***



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September 21, 2018

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Alliant SPECIALTY

Engineering, Procurement &
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3,450+
Employees



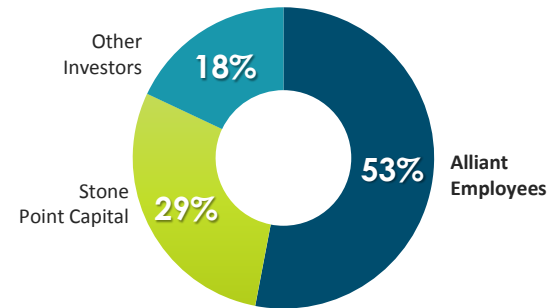
\$1.2 Billion
In Revenue



100+
Offices Nationally

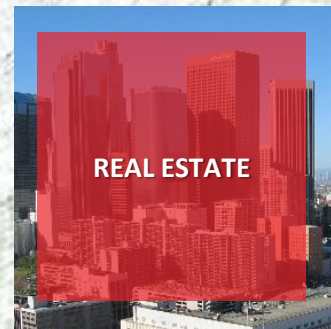


\$13 Billion
Premium Volume



53%
Employee Owned

Alliant SPECIALTY



CONSTRUCTION SERVICES GROUP

The Broker of Choice



Broker of Choice

Manage the 3 largest Public, P3 and Private Projects in the U.S.



\$2.0B

Construction Premium Annually

#1

EPC
Broker in
North America



\$10.0B

Revenue Generated
for Clients

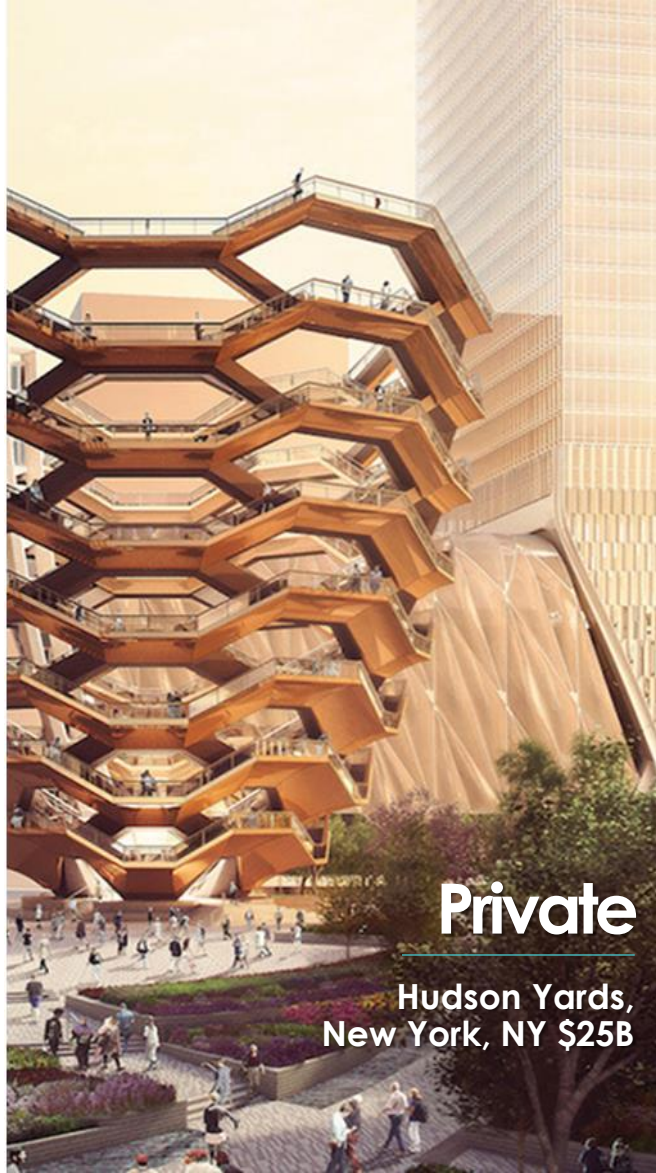


480+

EPC Specialty Advisors

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Largest Projects in the U.S.



Private

Hudson Yards,
New York, NY \$25B



Public

California High Speed Rail
\$9B+



PPP

LaGuardia Airport,
New York, NY \$4.0B+

Alliant

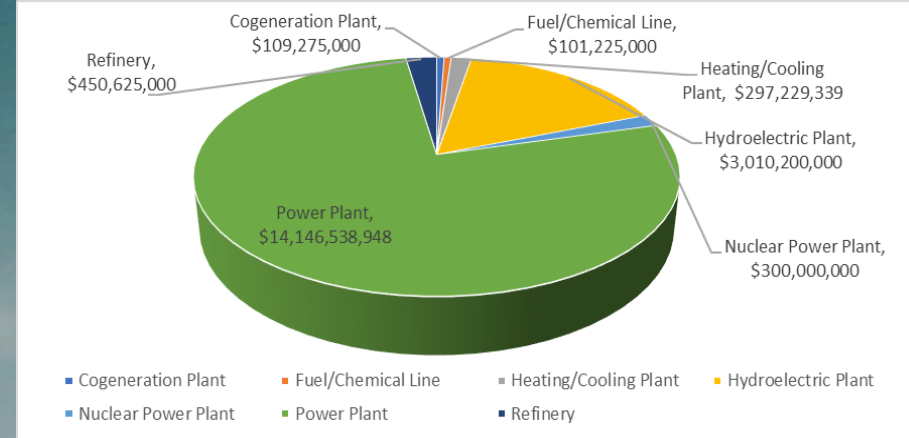
Current Market Opportunity

(source: Dodge Data & Analytics)

CALIFORNIA

\$18.5B

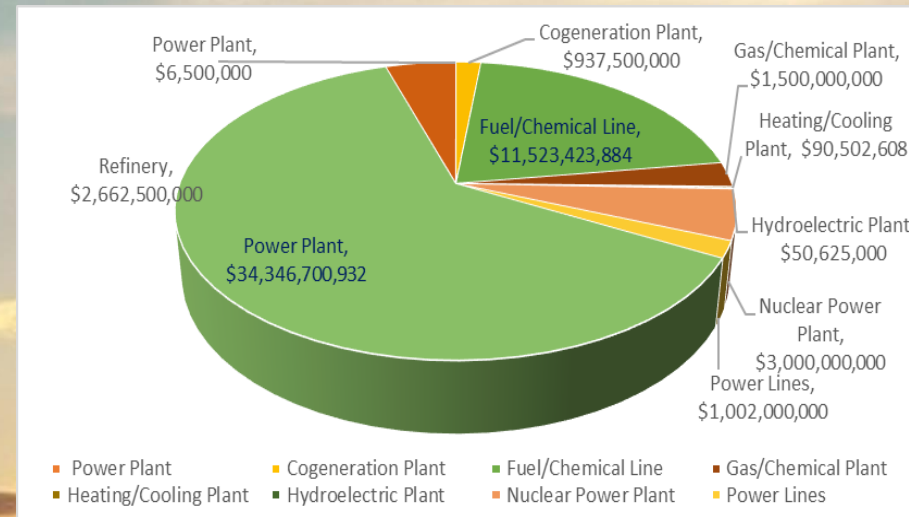
Project Type	# Projects	Owner		Geography	Project Value (est.)	Allocated
		Public	Private			
Cogeneration Plant	5	5	0	California	\$ 109,275,000	0.59%
Fuel/Chemical Line	8	4	4	California	\$ 101,225,000	0.55%
Heating/Cooling Plant	11	11	0	California	\$ 297,229,339	1.61%
Hydroelectric Plant	5	2	3	California	\$ 3,010,200,000	16.35%
Nuclear Power Plant	1	1	0	California	\$ 300,000,000	1.63%
Power Plant	56	32	24	California	\$ 14,146,538,948	76.82%
Refinery	2	2	0	California	\$ 450,625,000	2.45%
	88	57	31		\$ 18,415,093,287	100.00%



SOUTHWEST STATES

\$55.2B

Project Type	# Projects	Owner		Geography	Project Values (est.)	Allocated
		Public	Private			
Power Plant	2	1	1	Southwest	\$ 6,500,000	0.01%
Cogeneration Plant	3	2	1	Southwest	\$ 937,500,000	1.70%
Fuel/Chemical Line	41	21	20	Southwest	\$ 11,523,423,884	20.91%
Gas/Chemical Plant	1	1	0	Southwest	\$ 1,500,000,000	2.72%
Heating/Cooling Plant	10	10	0	Southwest	\$ 90,502,608	0.16%
Hydroelectric Plant	2	1	1	Southwest	\$ 50,625,000	0.09%
Nuclear Power Plant	2	2	0	Southwest	\$ 3,000,000,000	5.44%
Power Lines	2	1	1	Southwest	\$ 1,002,000,000	1.82%
Power Plant	90	76	14	Southwest	\$ 34,346,700,932	62.31%
Refinery	3	3	0	Southwest	\$ 2,662,500,000	4.83%
	156	118	38		\$ 55,119,752,424	100.00%



Project Impacts in an Ever Changing Market Environment

Risk Mitigation (Insurance and Risk Financing)

The Correlation to Project Finance & Viability – Life Cycle Risk

- Overall Credit Rating of the Concession and How This Impacts Project Viability. (Can you actually secure project financing?)
- Technology – Meeting Availability Thresholds (Proven Methods vs. Untested Innovation)
- Failure to Operate Due to Insured vs. Uninsured Perils
- Termination Risk
- Regulatory Risk
- Tolling Agreements – Contract vs. Market Availability (Is the Contract Congruent?)
- Liquidated Penalties
- Force Majeure Events
- Representations and Warranties
- Events of Default - Contract Triggers
- Limitations with Remedies or Failure to Recognize and Finance These Limitations
- Indemnification
- Risk Transfer – Contract | Insurance | Self-Funded | Risk Allocation Methods

Project Risk Assessment

Front End Alignment is Critical!

Project Stakeholders Should Consider.....

- This is NOT a Conversation about Insurance. It is a Conversation about Stakeholder Risk
- Total Cost of Risk (T.C.O.R) for a Project – 5% to 11% of the Project Cost
- Risk Identification | Probability + Severity + Urgency = PSUx Score
- Life Cycle Risk – Pre-Construction | Construction | Operations & Maintenance
- Using Both Conventional and Unconventional Risk Transfer Methods to Develop FAIR Allocation of Risk
- Secondary Recourse Mind Set - Insurance Should Never be the First Line of Defense
- Terms of Contract are Critical – Unreasonable Provisions and Non-Equitable Risk Distribution Amongst Key Project Stakeholders Usually are Deal Killers for the Debt, Equity and Insurance Markets



Southwest Energy Conference

September 20, 2018

Marathon Capital Overview

Overview

- Marathon Capital is a leading advisor and investment banker to investors, developers, owners and operators in the energy & infrastructure markets
 - Headquartered in Chicago with representative offices in San Francisco, New York and Canada
 - Experienced staff of 40 investment banking professionals
- Actively engaged on transactions across a range of sectors within renewable energy and power
- Closed more than 60 energy transactions in the past five years

Four-Time Recipient
"Best Renewable Asset M&A Advisor"
 Power Finance & Risk



Power Asset M&A Advisor Rankings

SNL Power Asset M&A Transactions from 2013-2018

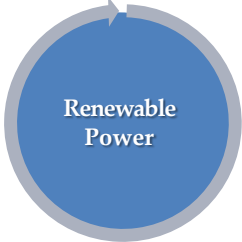
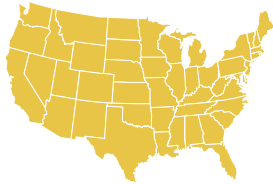
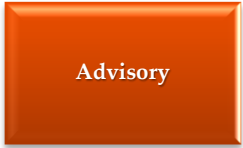
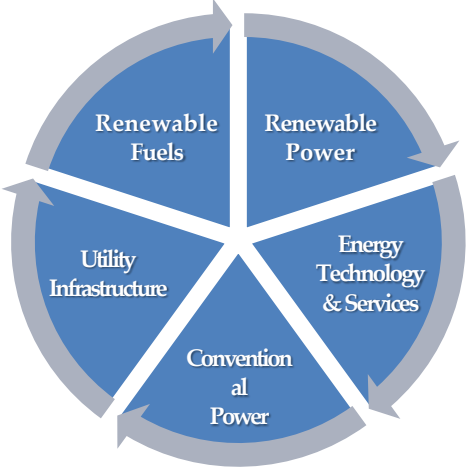


Rank	Firm	# of Deals
1	Marathon Capital, LLC	25
2	Morgan Stanley	24
3	Barclays Capital Inc.	22
4	Citigroup Global Markets Inc.	20
5	Credit Suisse (USA), Inc.	14
6	Bank of America Merrill Lynch	12
6	J.P. Morgan Securities LLC	12
8	RBC Capital Markets, LLC	10
9	Evercore Inc.	9
10	Goldman Sachs & Co. LLC	8

Source: SNL Financial League Table Rankings - Power Asset M&A in North America from 1/2/2013 - 1/1/2018

Select Recent Marathon Capital Transactions

<p>August 2018</p> <p>Equity Capital Raise</p> <p>Provided by</p>	<p>August 2018</p> <p>Back Leverage and Mezzanine Debt Refinancing of Operating Solar Portfolio</p> <p>Provided by</p>	<p>August 2018</p> <p>Sale of Microinverter Business</p> <p>to</p>	<p>July 2018</p> <p>Purchase of EverPower's Wind Development Platform and 2GW of Wind Development Pipeline</p> <p>from</p>	<p>May 2018</p> <p>Residential Solar Fund</p> <p>Provided by</p>	<p>April 2018</p> <p>Sale of Company</p> <p>to</p>	<p>April 2018</p> <p>\$82,500,000 Debt Refinancing of Operating Residential and C&I Solar Portfolio</p> <p>Provided by</p>	<p>February 2018</p> <p>\$1.1 Billion Sale of 482 MW Operating and Under-Construction Portfolio & 5 GW Pipeline</p> <p>to</p>
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Energy & Infrastructure Advisor Evolution

	Target Markets	Client Geographic Focus	Business Lines
Marathon Capital 1.0			
Marathon Capital 2.0			

Marathon is expanding its target markets, geographies and business lines to better serve the energy and infrastructure sponsor and investor communities

Select Marathon Capital Transactions

<p>August 2018</p>  <p>Equity Capital Raise</p> <p>Provided by</p> 	<p>August 2018</p>  <p>Back Leverage and Mezzanine Debt Refinancing of Operating Solar Portfolio</p> <p>Provided by</p> 	<p>August 2018</p>  <p>Sale of Microinverter Business</p> <p>to</p> 	<p>July 2018</p>  <p>Purchase of EverPower's Wind Development Platform and 2GW of Wind Development Pipeline</p> <p>from</p> 	<p>May 2018</p>  <p>Residential Solar Fund</p> <p>Provided by</p> 	<p>April 2018</p>  <p>Sale of Company</p> <p>to</p> 	<p>April 2018</p>  <p>\$82,500,000 Debt Refinancing of Operating Residential and C&I Solar Portfolio</p> <p>Provided by</p> 
<p>February 2018</p>  <p>\$1.1 Billion Sale of 482 MW Operating and Under-Construction Portfolio & 5 GW Pipeline</p> <p>to</p> 	<p>December 2017</p>  <p>Sale of 242 MW_{DC} Distributed Utility-Scale Solar Portfolio</p> <p>to</p> 	<p>December 2017</p>  <p>Sale of Equity Interest in 845 MW Shepherd's Flat Wind Projects</p> <p>to</p> 	<p>December 2017</p>  <p>Tax Equity Raise 120 MW_{AC} Gulf Coast Power Solar Projects</p> <p>Provided by</p> 	<p>August 2017</p>  <p>Purchase of Equity Interest in 230 MW Horse Creek and 230 MW Electra Wind Projects</p> <p>from</p> 	<p>August 2017</p>  <p>Sale of 194 MW Utility-Scale Solar Portfolio</p> <p>to</p> 	<p>April 2017</p>  <p>Purchase of Minority Equity Interest in 921 MW U.S. Portfolio of Solar & Wind Power Generation Projects</p> <p>from</p> 
<p>July 2017</p>  <p>\$1,577,000,000 Sale of Company including 1.3 GW Operating Portfolio and 10 GW Pipeline</p> <p>to</p> 	<p>December 2016</p>  <p>Capital Commitments</p> <p>Provided by</p> 	<p>November 2016</p>  <p>Distributed Generation Fund</p> <p>Provided by</p> 	<p>November 2016</p>  <p>Equity Capital Partnership</p> <p>to</p> 	<p>November 2016</p>  <p>Sale of Company and Development Pipeline</p> <p>to</p> 	<p>September 2016</p>  <p>Sale of Development Wind Assets</p> <p>to</p> 	<p>September 2016</p>  <p>Tax Equity Capital Raise and Construction Debt Financing 163.2 MW Astra Wind Project</p> <p>Provided by</p> 
<p>May 2016</p>  <p>\$57,000,000 Sale of 5.06% Ownership Interest in the Prairie State Energy Campus</p> <p>to</p> 	<p>April 2016</p>  <p>Sale of Company</p> <p>to</p> 	<p>February 2016</p>  <p>Sale of 230 MW Electra Wind Project</p> <p>to</p> 	<p>January 2016</p>  <p>Sale of Company and Development Pipeline</p> <p>to</p> 	<p>December 2015</p>  <p>Sale of 230 MW Horse Creek Wind Project</p> <p>to</p> 	<p>December 2015</p>  <p>Equity Capital Raise and Construction Project Financing La Bufa 1 Wind Farm</p> <p>to</p> 	<p>September 2015</p>  <p>Sale of Equity Interest in the 240 MW_{AC} Panoche Valley Solar Farm</p> <p>to</p> 

State of the Market

Competitive market environment with varying buyer strategies

- The U.S. renewables market is experiencing significant M&A activity driven by significant available liquidity
- Several large wind and solar platforms have been bought over the past year and a number of the remaining players have been exploring strategic alternatives
- New entrants with relatively high costs of capital – such as infrastructure funds – are entering the market looking to take some level of development risk and capture development fee and flip premiums
- Others are looking to build an IPP followed by a sell-down to lower their cost of capital, a strategy that can be attractive for pension funds looking for passive investments underpinned by lowest cost of equity

Competitive friction is driven by project underwriting assumptions as much as discount rate

- Most bidder behavior is driven by and focused on project underwriting assumptions such as merchant curves, O&M, asset management, wind turbine performance, etc.
- While discount rate and cost of capital play a role, bidder views on project operating assumptions and enhancements are the difference between winning and losing

State of the Market

Asset and platform premiums are being driven partly by scarcity

- Development platforms with a mid-to-late stage pipeline are becoming more valuable given their relative scarcity in select verticals and markets
- Operating assets with traditional off-take and long-term contracts demand a premium as offtakes become shorter in term and see downward pressure by market fundamentals

Clear delineation in the market landscape between different buyers by risk curve preference

- Given the competitive market, we are seeing market participants execute on a single short-to-medium term strategy in order to achieve strategic objectives within the tax credit expiration timeframe
- The market is clearly divided into buyers interested in investing in higher return assets, such as mid-late stage development assets, merchant assets, assets with basis risk etc. and the traditional operating assets with long-term offtake, minimum basis risk, etc. being pursued by the lower cost of capital

State of the Market

PPA prices are facing downward pressure

- In recent years, corporate PPA procurement has spiked as energy costs have tightened
- The growth in corporate PPA activity and declining energy costs has put continuing downward pressure on PPA pricing for both wind and solar

Industry moves more towards customer-centric strategies

- Utilities are increasingly evolving their growth strategies to drive more value from their customer base
- Recent adoption of customer-centric business strategies include M&A around energy services, demand response, and retail

U.S. Solar Market Summary

Near-term Impact

M&A to secure development pipeline, skill sets and development margin.

View that tariffs impact while important will be offset by continuing cost declines.

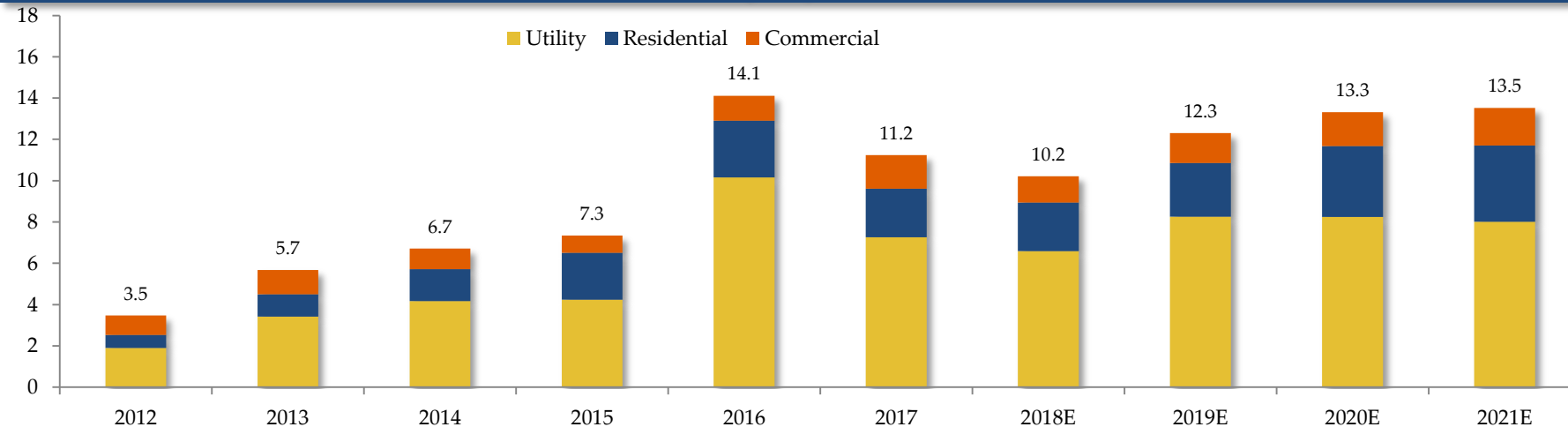
- Project development and utility procurement for 2018 has been pushed to 2019 through 2022 due to uncertainties created by Section 201 trade case
- Tax reform is expected to have less impact on solar than wind, however, pre-tax cash equity investors (certain financial investors) may experience disadvantages comparing to after-tax cash equity investors, especially tax efficient strategic investors, as pre-tax investors would not be able to take advantage of the lowered U.S. corporate tax rate
 - Uncertainties and a potentially tighter tax equity market would exacerbate the disadvantage

Market Themes by Segment

As a result of the Section 201 outcome, the overall U.S. solar market is expected to transition to a market decline; however, the growth themes in each segment varies greatly:

- Theme #1:** Utility-scale PV continues to drive U.S. market growth through both compliance and voluntary procurement, but faces the largest potential impact from Section 201
- Theme #2:** C&I solar continues to face challenges in financing and high transaction costs with growth driven by state-specific incentives and rate design. Demand pull in Massachusetts and Minnesota are expected to decline
- Theme #3:** Residential solar experienced a difficult 2017, with a 15% contraction, as the market transitions from leasing to loans. Sustainable growth is anticipated to restart, with Q1 2018 installation flat quarter-over-quarter
- Theme #4:** Combining the benefit of high power price and economies-of-scale, community solar is rapidly emerging as the 4th major solar market segment; however, investors are doubting its market sustainability
- Theme #5:** Solar and storage is increasingly becoming a popular combination across all solar market segments

Annual U.S. Capacity Installation (GW)



Source: BNEF 1H 2018 U.S. Renewable Energy Market Outlook; Excludes community solar, GTM US Solar Market Insight Q2 2018

U.S. Wind Market Summary

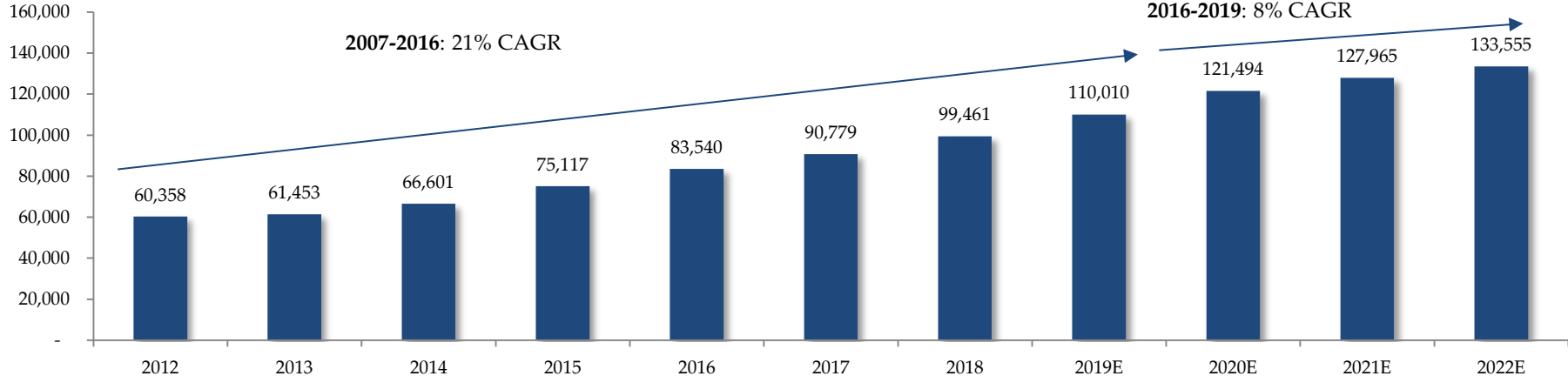
Overview

- Future new wind capacity is expected in three phases:
 - Through 2020: PTC-driven
 - 2021-2027: RPS-driven
 - 2028+: economically-incentivized
- More than 50% of installed U.S. wind capacity is owned by ten companies
 - The major owners include Nextera, Berkshire, Iberdrola, EDP, EDF, Enel, E.ON and Invenergy
- Recently there has been a reduction in independent wind development platforms and available pipeline as large strategics and other investors have been making significant acquisitions
- An increase in build-transfer development is expected as utilities such as Xcel, AEP and PacifiCorp start to want to directly own renewable assets
- Recently, there have been significant decreases in PPA pricing with rates seen between \$12-\$18/MWh with no escalation
- There is expected to be a significant construction boom in the near term as developers race to meet the 100% PTC window

Wind Trends

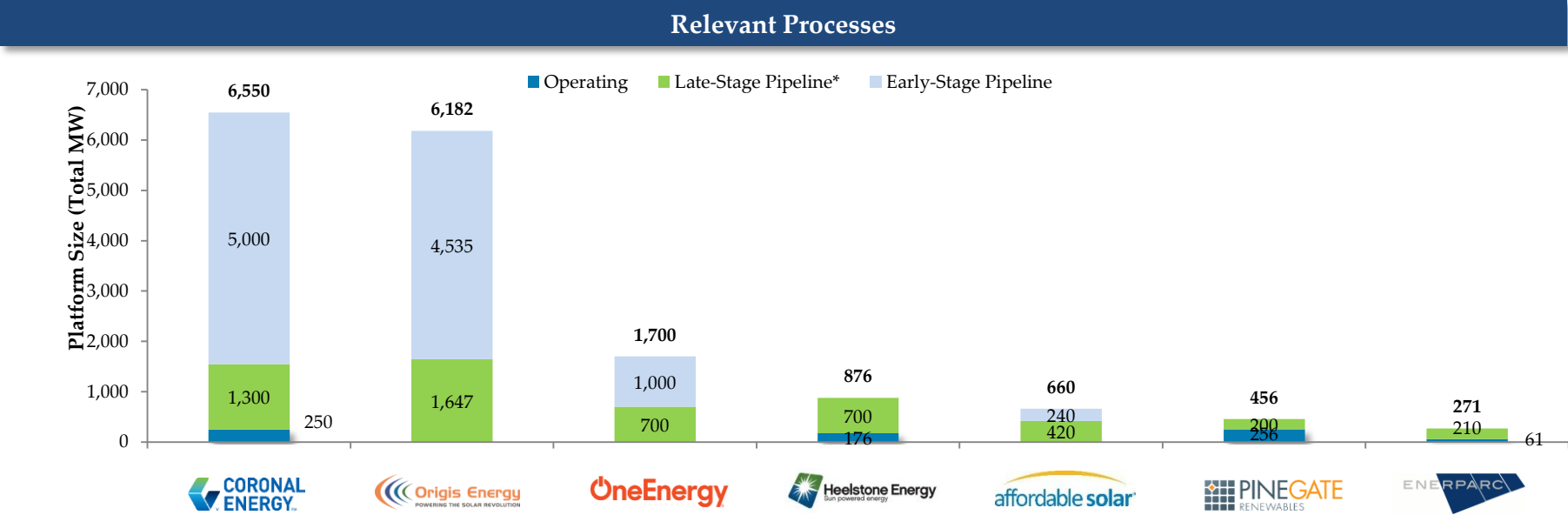
- Theme #1 – Ample Supply of Safe-harbored Equipment:** Availability of safe harbored equipment is not seen as a gating item for development projects. Turbines are expected to follow commercially viable projects
- Theme #2 – Notable Decrease in Turbine Prices:** Long running trend of reduction in \$ per kW turbine pricing has accelerated as a result of larger, more efficient turbines
- Theme #3 – Increasing Offtake Options:** Multiple Utility RFP solicitations conducted in 2017; wind hedges and corporate PPAs have continued to display strong momentum; retail electric suppliers in certain markets are looking for merchant wind and solar to contract for their customer base
- Theme #4 – Tax Reform Impact:** Tax equity continues to be available particularly for core customers, but is increasingly difficult for small companies and new entrants

Cumulative U.S. Wind Installed Capacity (MW)



Source: Bloomberg New Energy Finance, 2017-12-14

Ongoing U.S. Solar Sale Processes

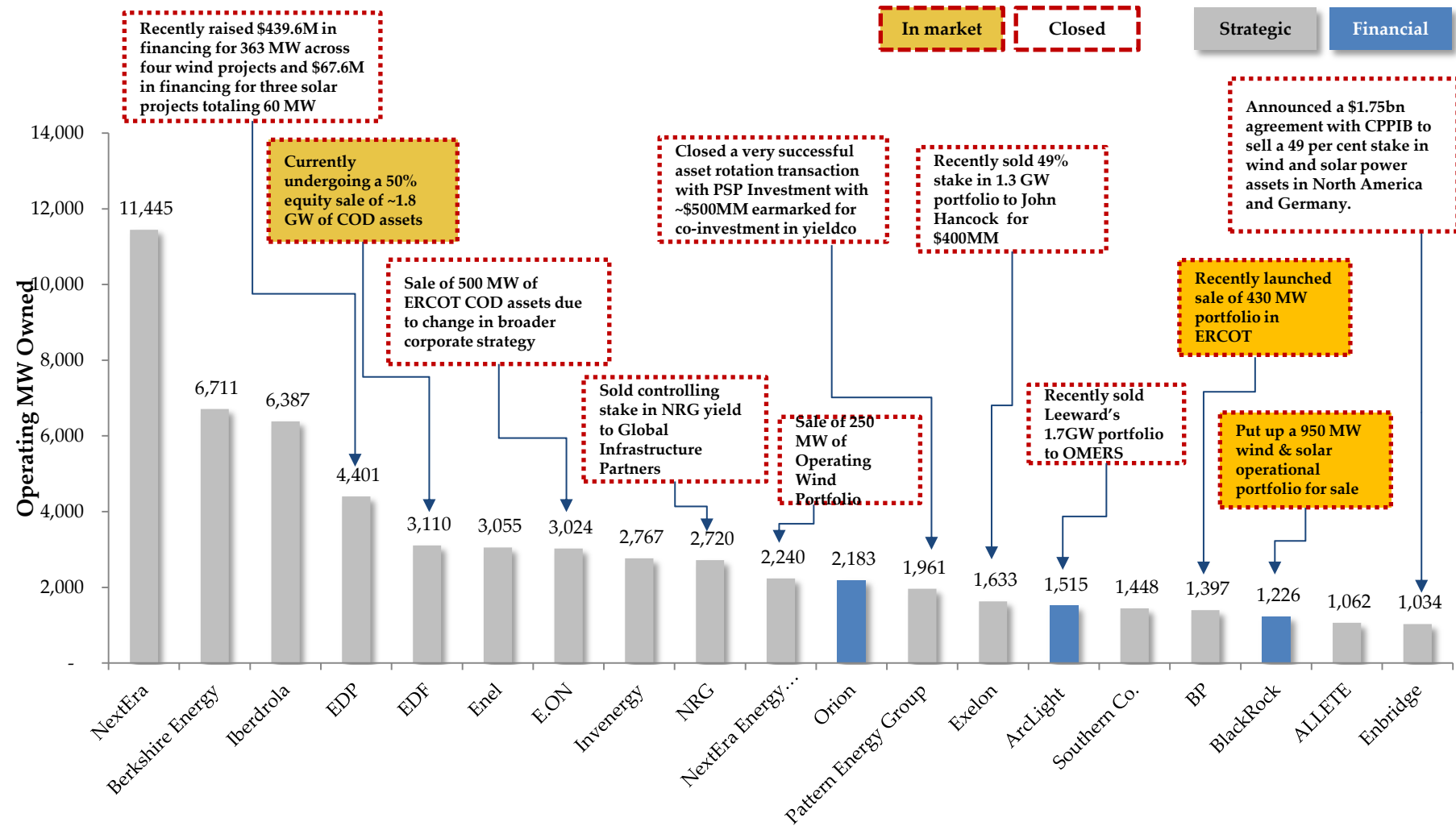


Segment	Utility-Scale	Utility-Scale	Distributed Utility	Utility-Scale	Residential, C&I	Utility-Scale	Distributed Utility
Markets	National	National	National	NC, SC, OR	Southwest	NC, SC, OR	West, Midwest, Mid-Atlantic
Asset Composition	Platform, Operating & Development Projects	Platform & Development Projects	Platform & Development Projects	Platform, Operating & Development Projects	Platform & Development Projects	Operating & Development Projects	Platform, Operating & Development Projects
Stage of Process	Mid	Late	Mid	Mid	Mid	Late	Early

*Late-stage assets defined as contracted, shortlisted or under-negotiation opportunities

The M&A market is active because capital markets offer accessible liquidity

2017-2018 Notable Sell-Down Activity in U.S. Renewables



Top Asset Owners in US – BNEF, 03.24.2018

2017-2018 saw an extremely active M&A market with leading asset owners monetizing partial or complete stakes in portfolios amidst a liquid capital market, validating the availability of buyer appetite



MARATHON CAPITAL

Chicago • New York • San Francisco • Canada

Renewable Energy

Risk & Insurance Issues

September 2018

Major Risks— Wind Farm Development

Site Selection

- Airspace
- Environmental
- Transmission
- Wind regime
- Public acceptance

Engineering

- Sub surface conditions
- Site suitability

Interconnection

- Ability to interconnect and move power
- Upgrade costs
- Timeline for available transmission capacity
- Risk of curtailment

Equipment Supply

- Performance
- Delivery Schedule
- Reliability

Off-take Contract

- Liability for shortfall of energy
- Risk of curtailment
- Commitments provided to off taker

Construction

- Scope of supply split
- Transmission routing
- Project schedule
- Cost over run risk

Financing and Insurance

- Incomplete financial model
- PTC tax opinion risks
- Acceptable studies and assessments
- Executed off take contract

Mitigating Risks

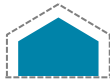


Site Selection

Third Party studies for FAA, desktop environmental, and wind studies

Good public relations plan including landowners, businesses, local political scene

Multi-year wind resource measurement program that is representative of the site



Engineering

Timely geo-tech studies

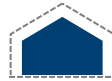
Early stage work with OEM for site suitability



Interconnection

Early third party transmission study.

First mover queue position (before queue reform in some areas)



Equipment Supply

- Top tier manufacturer
- Long term warranties
- Serial defect coverage
- Incentives / penalties on schedule and performance



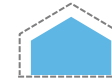
Off-take Contract

- Risks absorbed equitably between parties
- Limitation on total exposure under contract
- Commitments are consistent with supplier contract commitments



Construction






- Working closely with OEM and BOP contractor prior to executing TSA and EPC contracts
- Flanging up scope with other activities
- Incentives / penalties on schedule and safety



Financing and Insurance

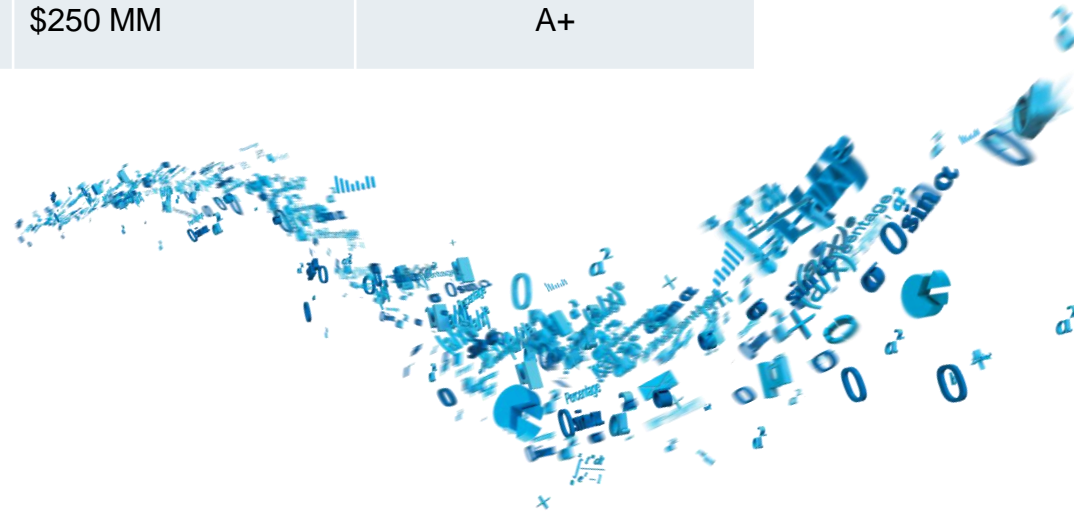
- Work with a knowledgeable insurance professional

Renewable Energy Market Overview

Category	2017 Direction	Commentary	2018 Outlook	Commentary
 Pricing/ Rates	↓	Rate reductions continued due to increasing capacity levels and strengthening regional and domestic markets. Nat Cat events have slowed this down	↔	Rate reductions may slow especially for locations that are exposed to Nat Cat and for aging technology out of warranty. For good performing assets and new build projects scope for reductions may continue
 Deductibles/ Retentions	↔	Client retentions remained stable. Insurers willing to grant sensible sub-limit increases where it is a differentiator	↔	We expect limits to remain stable in 2018
 Coverage	↗	In general, coverage broadened as Insurers sought to maintain their share and differentiate their offering. Weather products continue to be explored	↔	No changes expected in Property coverage
 Capacity/ Appetite	↑	Overall capacity continued to increase despite ongoing M&A Activity	↗	Renewables continues to be an attractive market to insurers so new entrants could emerge or older markets refresh approach
 Claims	↗	Nat Cat events have led to some notable losses for major markets such as Axis and GCube. The softening market conditions have hurt various carriers in the out of warranty wind space too	↔	Unless there are a number of major natural catastrophe events and/or a series of mega renewable energy losses, unlikely that claims will have a meaningful impact on the market

Principal Renewable Energy Insurers- property

Market	Capacity	Rating
G Cube	\$500 MM	A+
Per Se (RSA/Allianz leads)	\$400 MM	A+
Axis	\$450 MM	A+
Travelers	\$250 MM	A+



Emerging Risk Issues

Cyber Risk/ Hacking	Notable hack in 2017- increasing attention
Upscaling Technology	Technological risk- financeability; WTG's being introduced for onshore sale > 4 MW without DNV-GL certification
Transaction Liability-PTC and ITC issues- eligibility and timing	Transfer of representation, warranty or tax opinion risk to an insurance company
Power Sales/PPA's	Regulated utility PPA demand down; C&I appetite; merchant sales only financeable with hedges or swaps

Emerging Risk Solutions

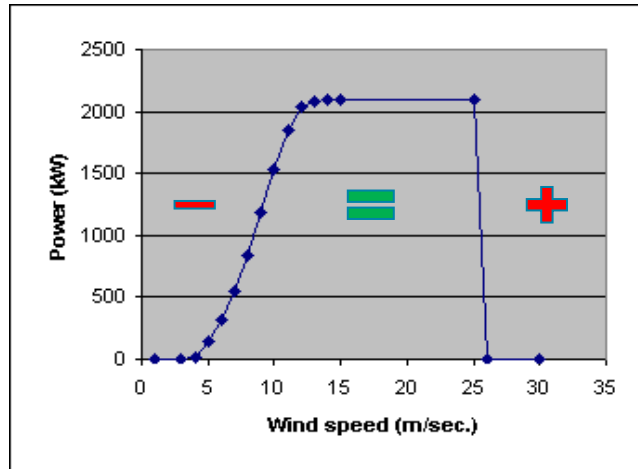
Extended Warranty	PV Panels, blades, gear boxes
Weather Insurance	Low Solar Resource, Low Wind Resource, Heating or Cooling Degree Days
Transaction Liability	Transfer of representation, warranty or tax opinion risk to an insurance company
Unscheduled Maintenance Protection	Enables financial directors and risk management teams to more effectively manage their long-term operations and maintenance budgets and rapidly reduce the requirement for excess working project capital

Wind Risk Insurance

Wind flow variations translate directly into production variability and cash flow of a wind farm

- "Bad Wind" as main revenue risk:
 - too little wind: < 5 m/s
 - too much wind: > 25 m/s

2.1 MW Wind Turbine Power Curve



Too much wind causing turbine engine burnout:



Photo: Stuart McMahon; Source: The Telegraph

- Construction of a Wind Production Index to translate wind speed into a theoretical power output (proxy for actual output):

$$WPI = \left(\sum_{i=1. \text{ January}}^{31. \text{ December}} P(\overline{v}_i) \right) * 24h * \# \text{ of turbines} * \text{efficiency factor}$$

$P(\overline{v}_i)$ = Turbine Power Curve

\overline{v}_i = Average wind speed (m/s)

Power generation and physical risks

Generic risks to power generation assets that can cause physical damage losses include:

- Fire
- Machinery Breakdown
- Electrical Breakdown
- Operating regime
- Theft
- Error in Design
- Terrorism
- Aging plant (wear and tear)
- Natural Catastrophe (earthquake, flood, windstorm)

Wind generation physical risks

On and Offshore

Scale

Design

Fire

Windstorm

Ice storm

Earthquake

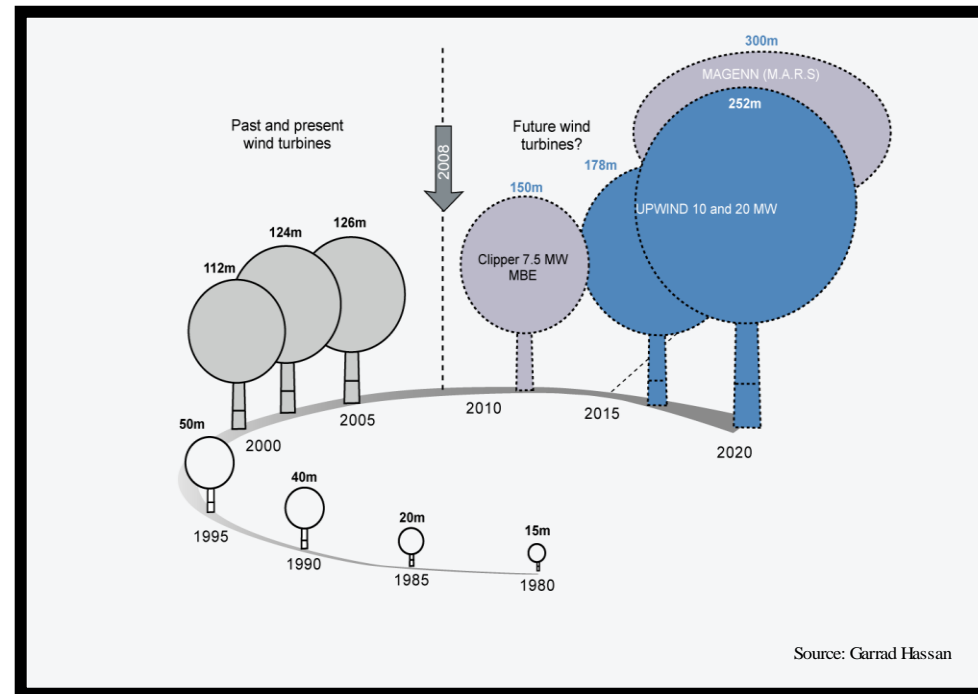
Grouting

Foundations

Series loss

- Rotor
- Cracking
- Blade failure

- Offshore
 - Wave
 - Boat collision
 - Access



Solar generation physical risks

Photovoltaic

- Degradation
- Hailstorm
- Windstorm
- Earthquake



CSP

- Vehicle collision
- Hailstorm
- Lightening
- Salt pool leakage

Battery Storage--Market Overview

The [grid scale battery \(GSB\) storage market](#) is largely an emerging one, especially when compared with other energy storage systems such as the well-established pumped hydro storage.

[Grid scale batteries](#) are arriving at commercial viability, having been the subject of numerous demonstration projects. Several major recent projects announced, i.e., Vistra 300 MW at Moss Landing.

CA state mandate of 1.325 GW of battery storage for investor-owned utilities by 2020.

OR state mandate of 5 MW of storage for each of three investor-owned utilities.

PREPA (Puerto Rico) mandate: all new renewable energy projects must incorporate ES.

About Aon

Aon plc (NYSE:AON) is a leading global provider of risk management, insurance and reinsurance brokerage, and human resources solutions and outsourcing services. Through its more than 50,000 colleagues worldwide, Aon unites to empower results for clients in over 120 countries via innovative and effective risk and people solutions and through industry-leading global resources and technical expertise. Aon has been named repeatedly as the world's best broker, best insurance intermediary, best reinsurance intermediary, best captives manager, and best employee benefits consulting firm by multiple industry sources. Visit aon.com for more information on Aon and aon.com/manchesterunited to learn about Aon's global partnership with Manchester United.

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ARIZONA
ENERGY
CONSORTIUM
POWERING ARIZONA'S FUTURE

SOUTHWEST ENERGY CONFERENCE

SEPTEMBER 20-21, 2018
HOTEL VALLEY HO | SCOTTSDALE, ARIZONA

What are the anticipated impacts on pricing and reliability in the changing markets?

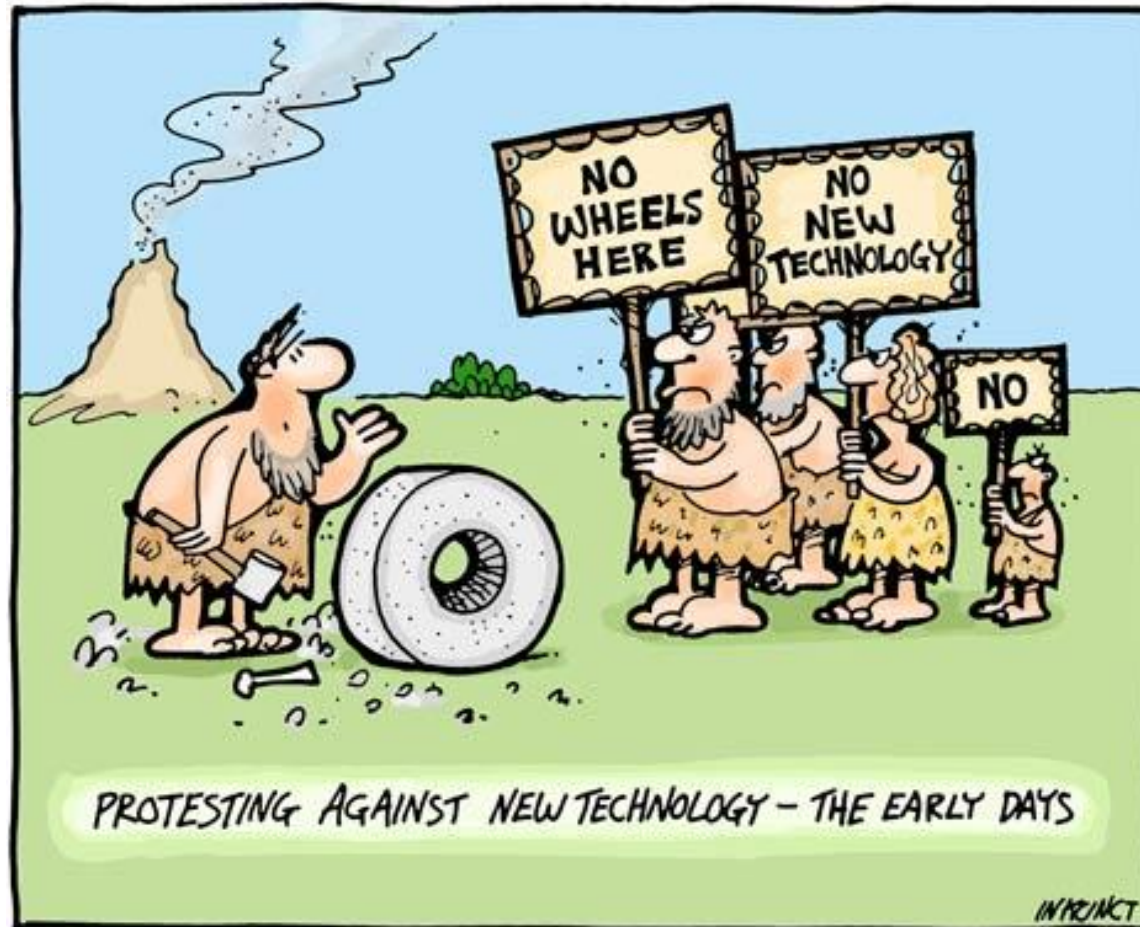




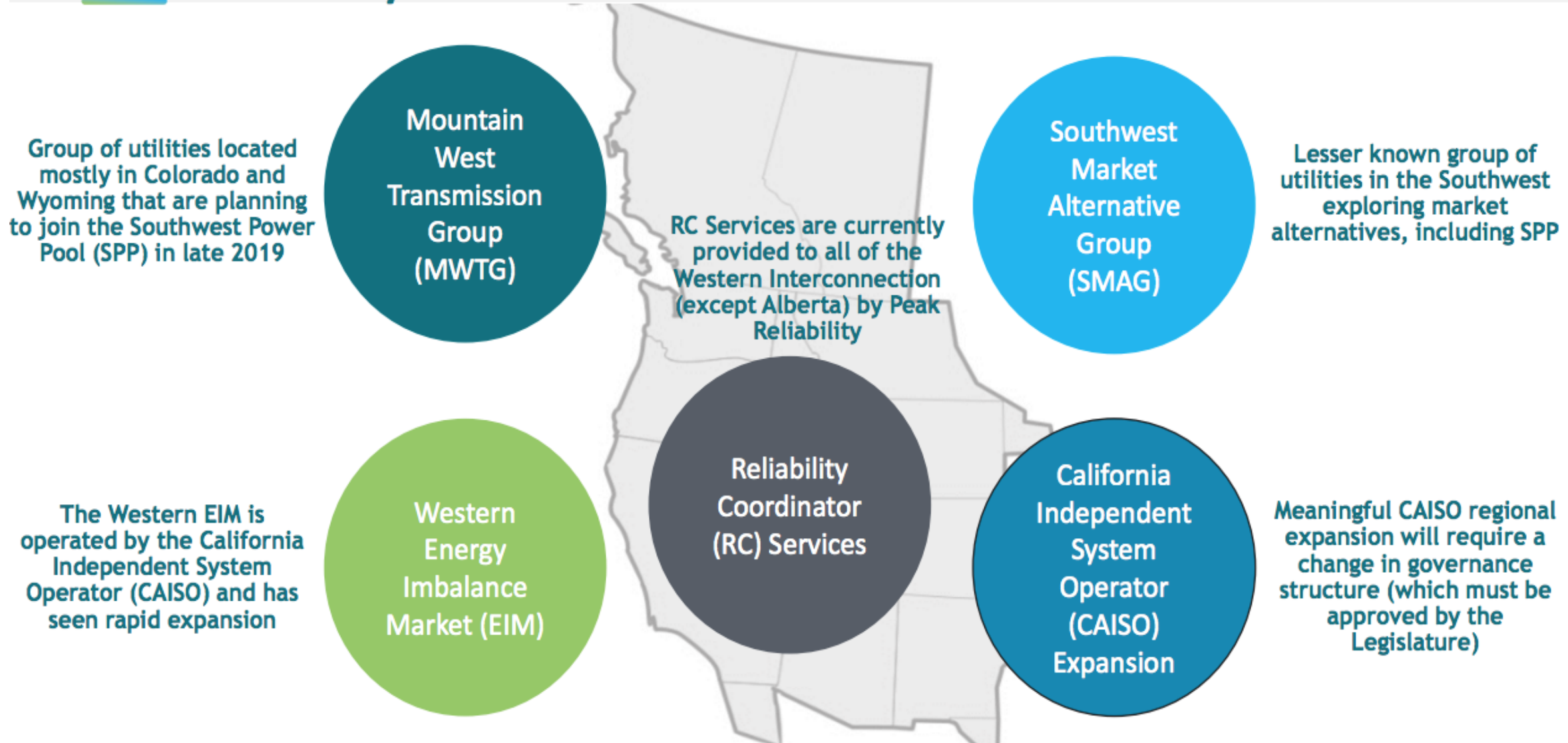
ARIZONA
ENERGY
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Southwest Energy Conference
September 21, 2018, 11-12pm

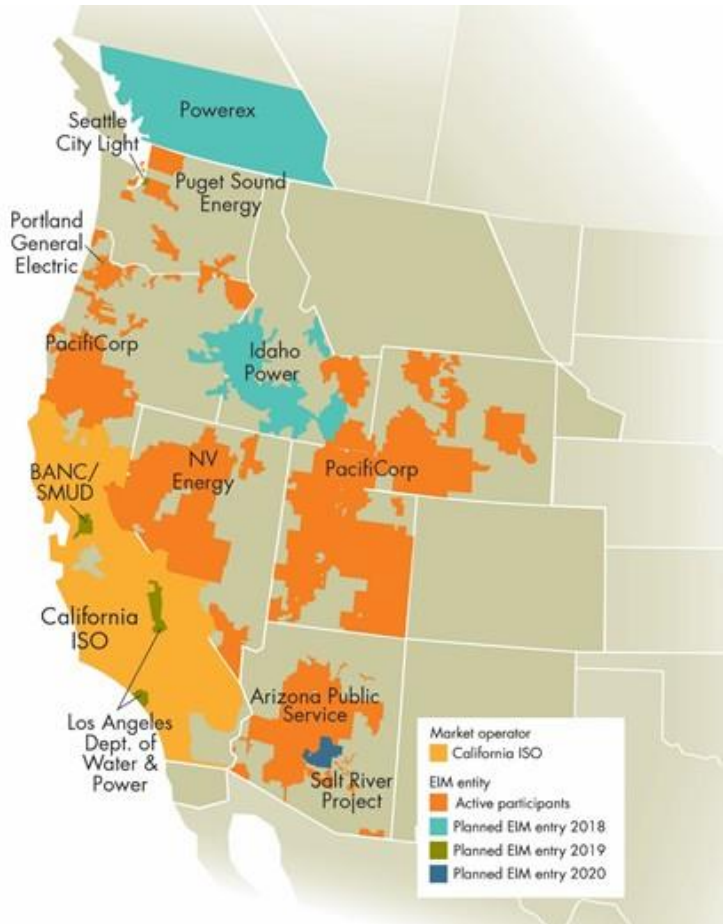
What are the anticipated impacts on pricing and reliability in the changing markets?



State of Play in the Western Interconnection



Western State Efforts



Nevada

- Nov. Ballot Q3 Constitutional amendment requiring State legislature to establish an open, competitive retail market that prohibits the granting of monopolies and exclusive franchises for the generation of electricity by 2023.

California

- Direct Access Bill, SB273, would alter the legislatively-imposed cap on direct access and allow ESPs to serve 4000mw of C&I customers (50% wait list).
- Bill passed to be carbon free by 2045.

Oregon

- 2017 – Legislature passed SB 978 requiring the OPUC to establish a public process for investigating electric industry trends, technologies and policy drivers.
- Portland Gas & Electric filed to form a Green Tariff program; some counties interested in the CCA model.

Washington

- Consideration of a carbon tax initiative or CCA.

Arizona

- Prop 127 is a constitutional amendment requiring 50% renewable (not nuclear) by 2030.
- Gov. Ducey signed HB2005 that subjects a utility to a penalty of no more than \$5000 and as low as \$100 for non-compliance with renewable standard.
- New all-encompassing ACC Docket replacing Tobin's Modernization Docket

DATE: August 17, 2018

RE: **REQUEST FOR A NEW DOCKET – IN THE MATTER OF POSSIBLE MODIFICATIONS TO THE COMMISSION’S ENERGY RULES (DOCKET NO. RU-00000A-18-XXXX)**

On August 14, 2018, the Commission, at a Commission Staff Meeting, directed Staff to initiate a rulemaking docket to evaluate proposed Arizona energy modernization. Therefore, the Utilities Division Staff requests that a new docket be opened for the purpose of exploring possible modifications to the Commission’s energy rules. Subjects to be considered will include the following:

1. Renewable Energy Standard and Tariff rules,
2. Electric Energy Efficiency Standards rules,
3. Gas Utility Energy Efficiency Standards rules,
4. Net Metering rules,
5. Resource Planning and Procurement rules,
6. Retail Electric Competition rules,
7. Electric vehicles,
8. Interconnection of distributed generation facilities,
9. Blockchain technology,
10. Technological developments in generation and delivery of energy,
11. Forest bioenergy,
12. Baseload security,
13. The statutory Biennial Transmission Assessment,
14. And other energy-related topics.

Staff requests that a new docket be opened with the following caption:

IN THE MATTER OF POSSIBLE MODIFICATIONS TO THE COMMISSION’S
ENERGY RULES

Current Snapshot of Community Choice Aggregation

CA CCAs now serve 2,000,000 customers. CPUC estimates 50% of the State will be served by CCAs by 2020; 85% by 2025.

Legal in 7 States:

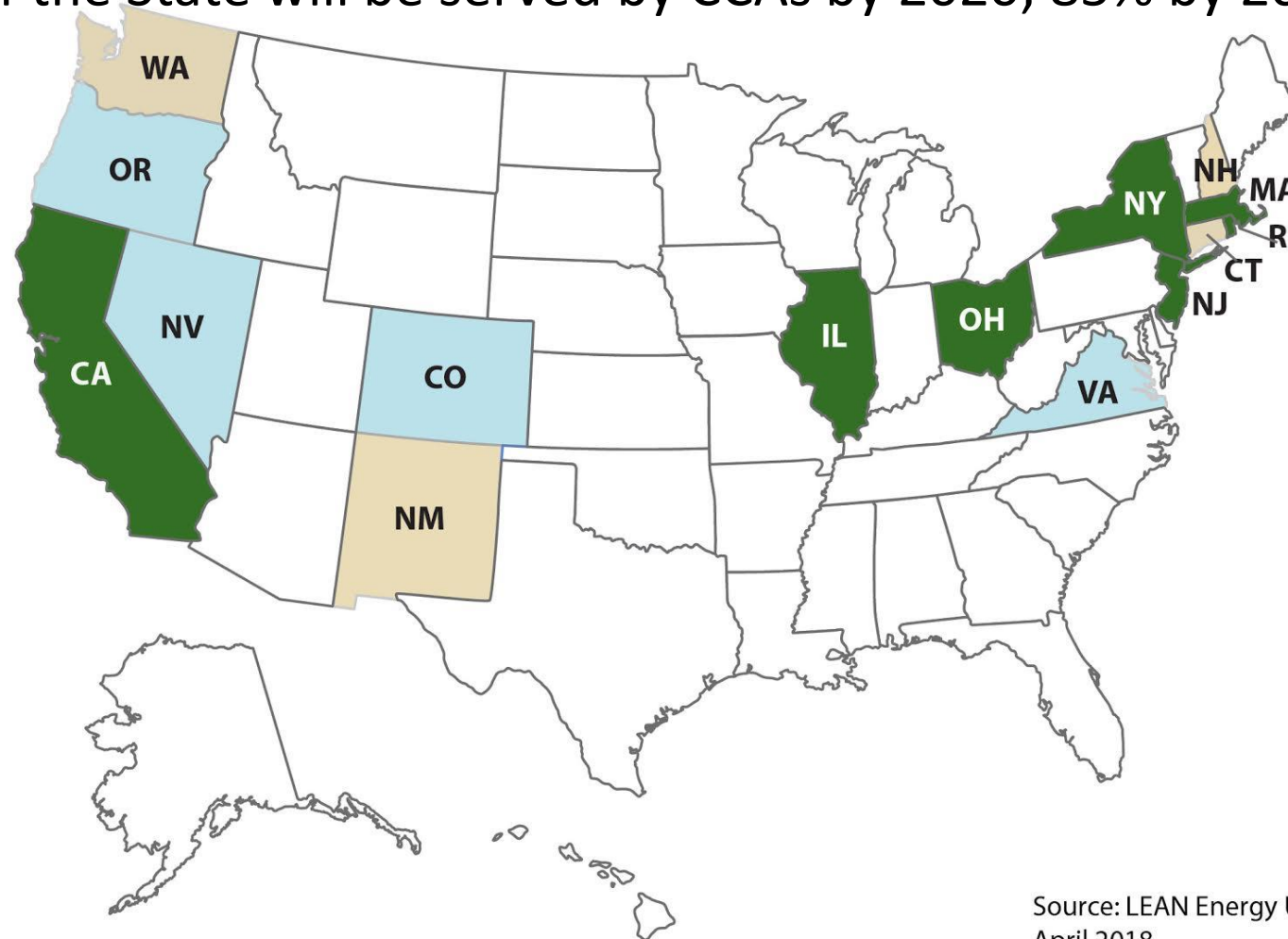
- California
- Illinois
- Massachusetts
- New Jersey
- New York
- Ohio
- Rhode island

Watch List/Potential:

- Colorado
- Nevada
- Oregon
- Virginia

Inquiries Received:

- Connecticut
- New Hampshire
- New Mexico
- Washington

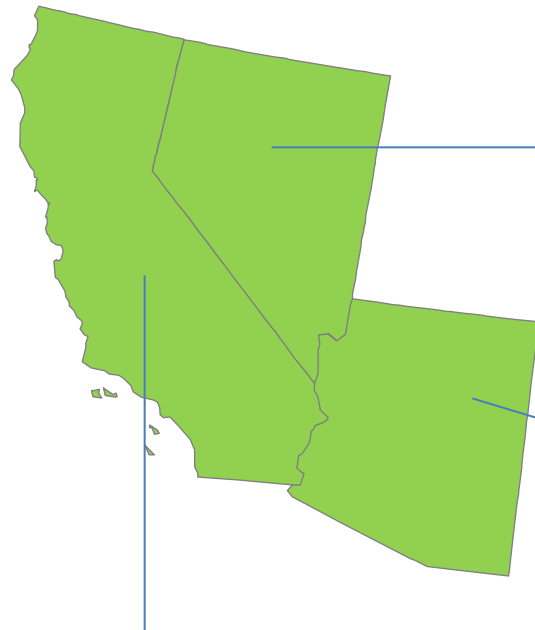


Changing Markets Southwest Energy Conference

Scottsdale, Arizona
September 21, 2018



Walmart's Footprint in the Region



Nevada

50 Retail Units
3 Distribution Centers
14,602 Associates
\$113 Million Spent with 637 Suppliers
(supporting over 11,000 jobs)

California

302 Retail Units
14 Distribution Centers
91,657 Associates
\$24 Billion Spent with 4,578 Suppliers (supporting over 257,000 jobs)

Arizona

127 Retail Units
4 Distribution Centers
34,253 Associates
\$1.4 Billion Spent with 637 Suppliers (supporting over 29,000 jobs)



Walmart's 2025 Energy Commitments

- In 2005 we set an aspirational goal to be powered 100% by renewable energy
- On November 4, 2016 we announced new sustainability goals for 2025 that build on our existing energy goals
 - Be supplied by 50% renewable energy
 - Use a combination of energy efficiency and renewable energy to reduce emissions in our operations by 18 percent
 - Target is science-based, which is the level of decarbonization needed to keep global temperature increase below 2°C compared to pre-industrial temperatures

BUILDING ON OUR SUSTAINABILITY GOALS



**BE SUPPLIED BY
50% RENEWABLE ENERGY**

As of 2015, 25% of our operations were powered by renewable energy

Walmart ✱

BUILDING ON OUR SUSTAINABILITY GOALS



REDUCE GREENHOUSE GASES BY 18%

We are the first retailer to set science-based targets for emissions reductions

Walmart ✱



Project Gigaton™

Six Pillars of the Program



Energy

- Renewable Energy
- Energy Efficiency
- Fleet Efficiency



Agriculture

- Fertilizer Optimization
- Animal Agriculture



Waste

- Food and Solid Waste Reduction



Packaging

- Using Recycled Content
- Recycling



Deforestation

- Avoid Deforestation



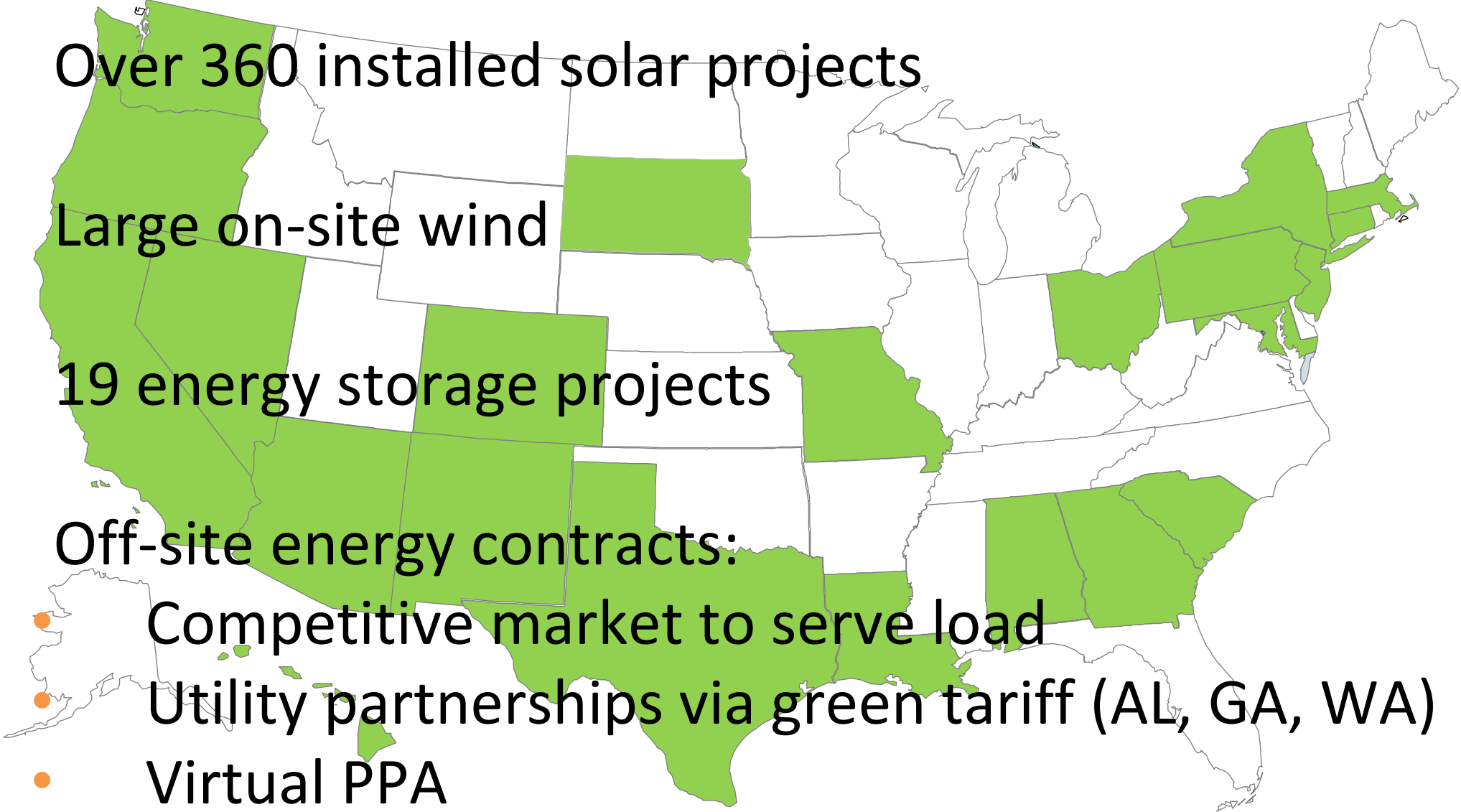
Product Use

- More energy efficient products

Learn more and commit at
walmartsustainabilityhub.com



Walmart Renewable Energy in the U.S.: 22 States, Puerto Rico, and Counting

- Over 360 installed solar projects
 - Large on-site wind
 - 19 energy storage projects
 - Off-site energy contracts:
 - Competitive market to serve load
 - Utility partnerships via green tariff (AL, GA, WA)
 - Virtual PPA
- 



Walmart Renewable Energy in the U.S.: 22 States, Puerto Rico, and Counting

Three Channels to Secure Resource Supply

Off-Site

- Structured for renewable energy to replace other energy, both physically and on bill
- Can utilize Texas Retail Energy, our in-house electric supplier, in deregulated retail markets where generation service can be provided by a company other than the wires utility

On-Site

- Contribution to renewable energy goals by replacing grid energy with energy from on-site resource
- Reduce operating costs for site
- Net metering compensation is not a driver

Utility Partner

- Work with utilities to develop workable and economic structures within confines of regulatory compact
- Some potential models:
 - Green tariff/sleeved resource
 - Shared resource (community or large scale)
 - On-site partnerships



Sounds great! So it all comes down to price, right? No.

Barriers in the Three Channels

Off-Site

- Limited number of deregulated markets
- Participation caps
- Pressures within some of those markets to erode customer ability to shop for generation service

On-Site

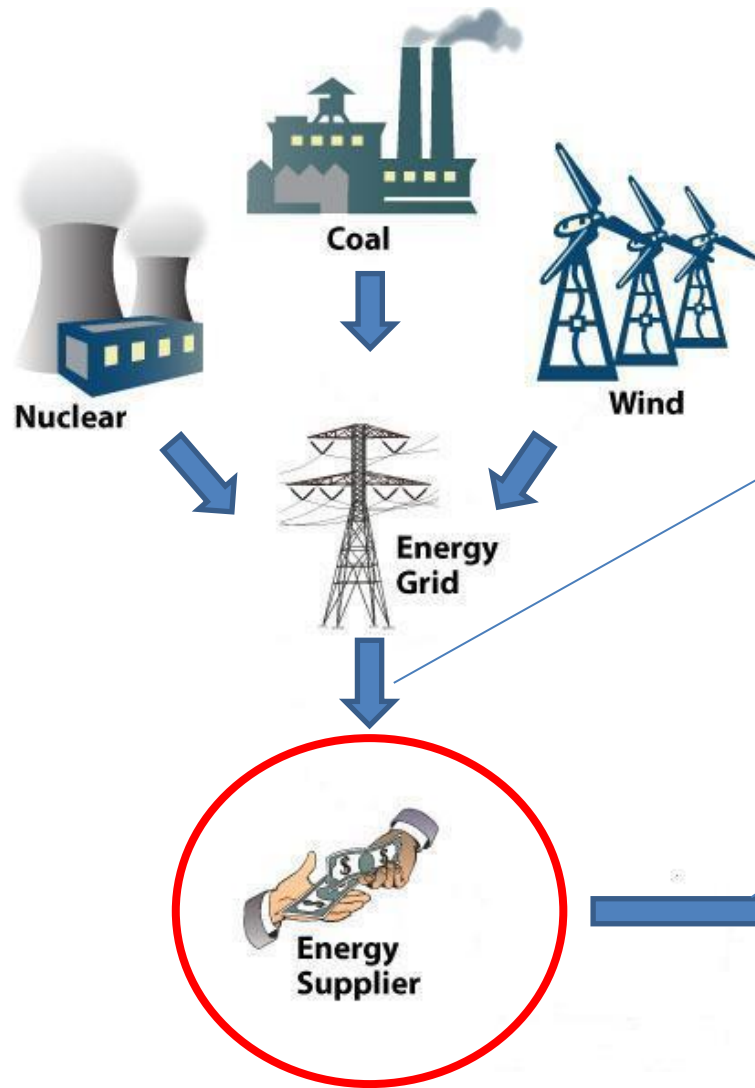
- Not all states allow third party financing of on-site generation (PPAs, leasing)
- System size restrictions
- Standby charges assessed on systems can add significant cost

Utility Partner

- A willing buyer needs a willing seller...
- Regulatory approval process and ratemaking concerns
 - Speed-to-market
 - Cost-shifting to other customers (is the program subsidized?)
 - Administration and marketing costs
 - New vs. existing load



Energy Supply: Traditional Supplier in a Deregulated Market



Wholesale trading with generators and counterparties

Energy Suppliers utilize wholesale markets to build supply portfolio. They add on their SG&A and Profit Margin.

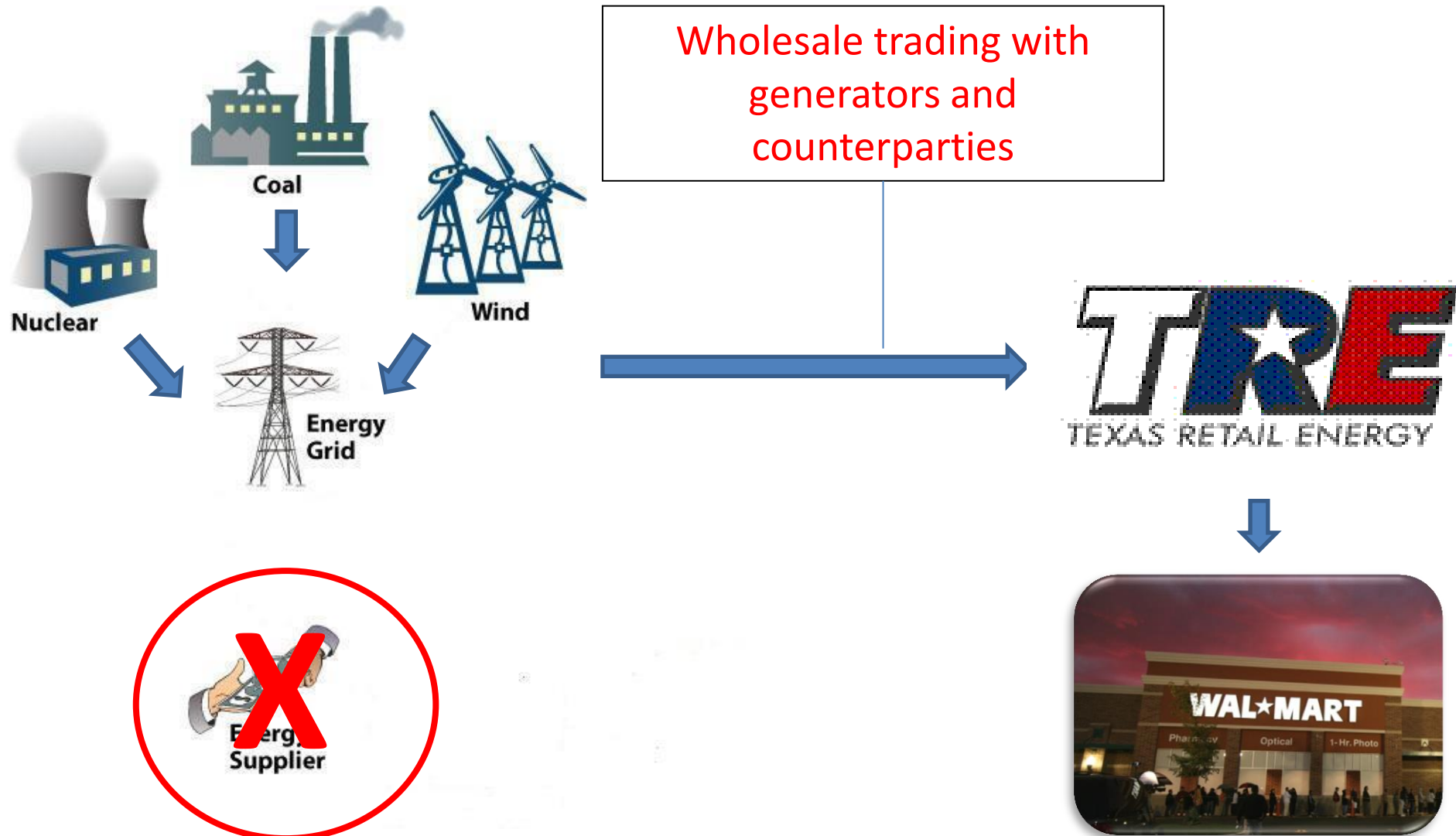


Energy Supply: Texas Retail Energy

- **Created in 2004 to buy energy for Walmart operated facilities in Texas**
- **Buys wholesale electricity from multiple suppliers in deregulated U.S. states and resells it to Walmarts facilities in the state**
- **Contracts with multiple supplier provides operational flexibility and mitigates risk, thus providing wholesale savings**
- **Provides access to renewable energy at scale by purchasing at the wholesale level**

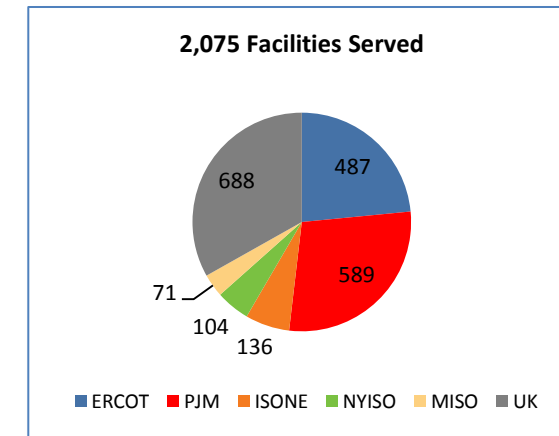
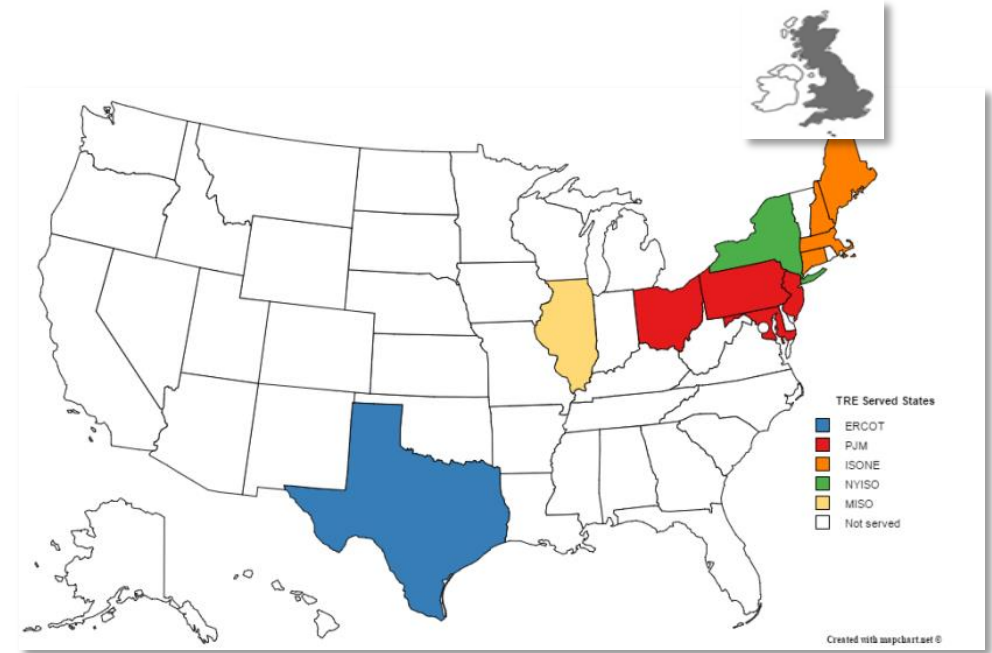


Energy Supply: Texas Retail Energy



Energy Supply: Texas Retail Energy

- 11 States/5 Markets/45 Utilities in the U.S. in addition to U.K.
- Savings compared to purchasing from a 3rd party
- Flexibility in suppliers, terms, contract structures
- Reduces WMT's counterparty and price risk
- Proactive load management
- Renewable energy purchase vehicle





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SEPTEMBER 20-21, 2018
HOTEL VALLEY HO | SCOTTSDALE, ARIZONA

What are the potential impacts of regionalization from transmission expansion to environmental concerns?



Regionalization and Transmission

Southwest Energy Conference

September 21, 2018



TRANSCANYON

TransCanyon Overview



TransCanyon is an independent developer of electric transmission infrastructure for WECC

- 50/50 joint venture between subsidiaries of Pinnacle West Capital Corporation (PNW) and Berkshire Hathaway Energy (BHE)
- Independent and well positioned to drive creative solutions
- Leverage the combined energy expertise and financial strength of BHE and PNW – \$107 billion in assets
- Focused on all phases – development through ongoing operation
- Long-term stewards of the environment
- Value collaboration to achieve success



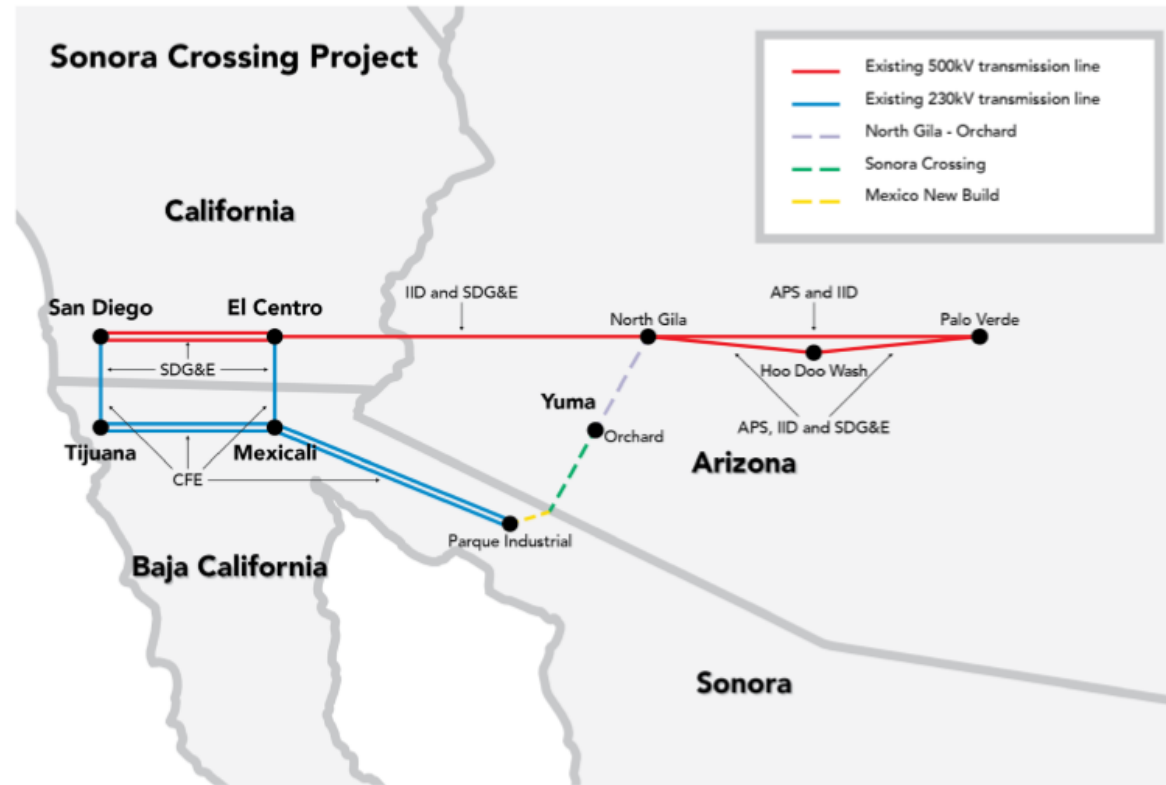
Sonora Crossing – Highlights



- New 230kV AC transmission line from the APS system in Yuma to the U.S.-Mexico border
- In-service December 2021
- Preliminary estimate of 300MW bidirectional transfer capability
- Cost estimate of \$50M
- Benefits to southwest U.S. and Mexico
 - Reliability
 - System resiliency
 - Production cost savings
 - Capacity cost savings
 - Renewable energy procurement cost savings
 - Reduction in APS customer rate base
- May 2018, TransCanyon and CENACE executed an MOU to jointly perform feasibility analysis on project
 - Increasing Mexico-U.S. transmission capacity one of top 3 goals for CENACE

Sonora Crossing – Overview

- TransCanyon and APS jointly build and own (50/50) the 14-mile North Gila to Orchard 230 kV Project (AZ CEC permit obtained 2/2/2012)
- TransCanyon develops, builds and owns the 17-mile 230 kV line from Orchard to the U.S.-Mexico border
- CFE or another Mexican firm builds the segment from the border to the existing Parque Industrial 230 kV substation
- TransCanyon offers an attractive single transmission rate for 300MW bidirectional service between North Gila (APS/CAISO/IID) and Mexico

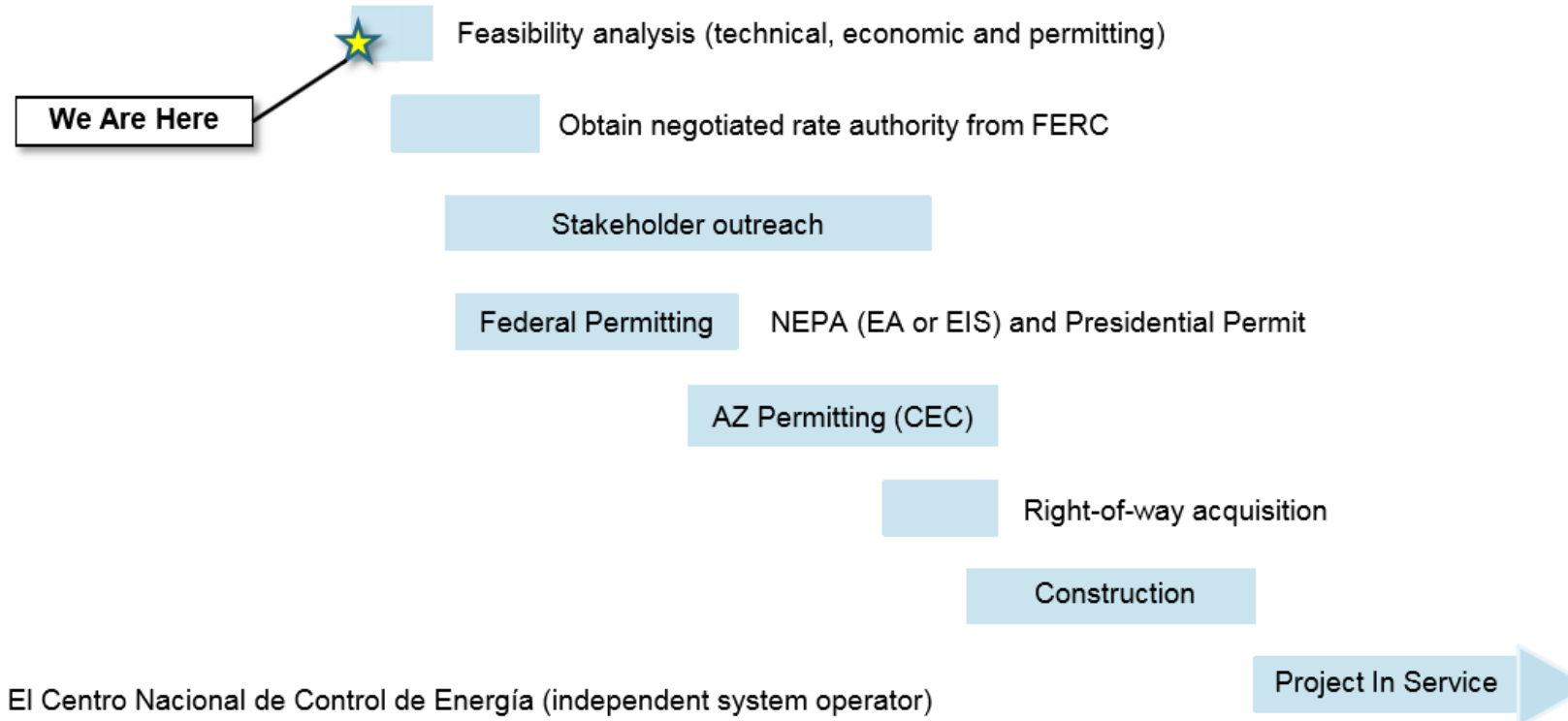


Sonora Crossing – Project Plan



2017	2018	2019	2020	2021	2022
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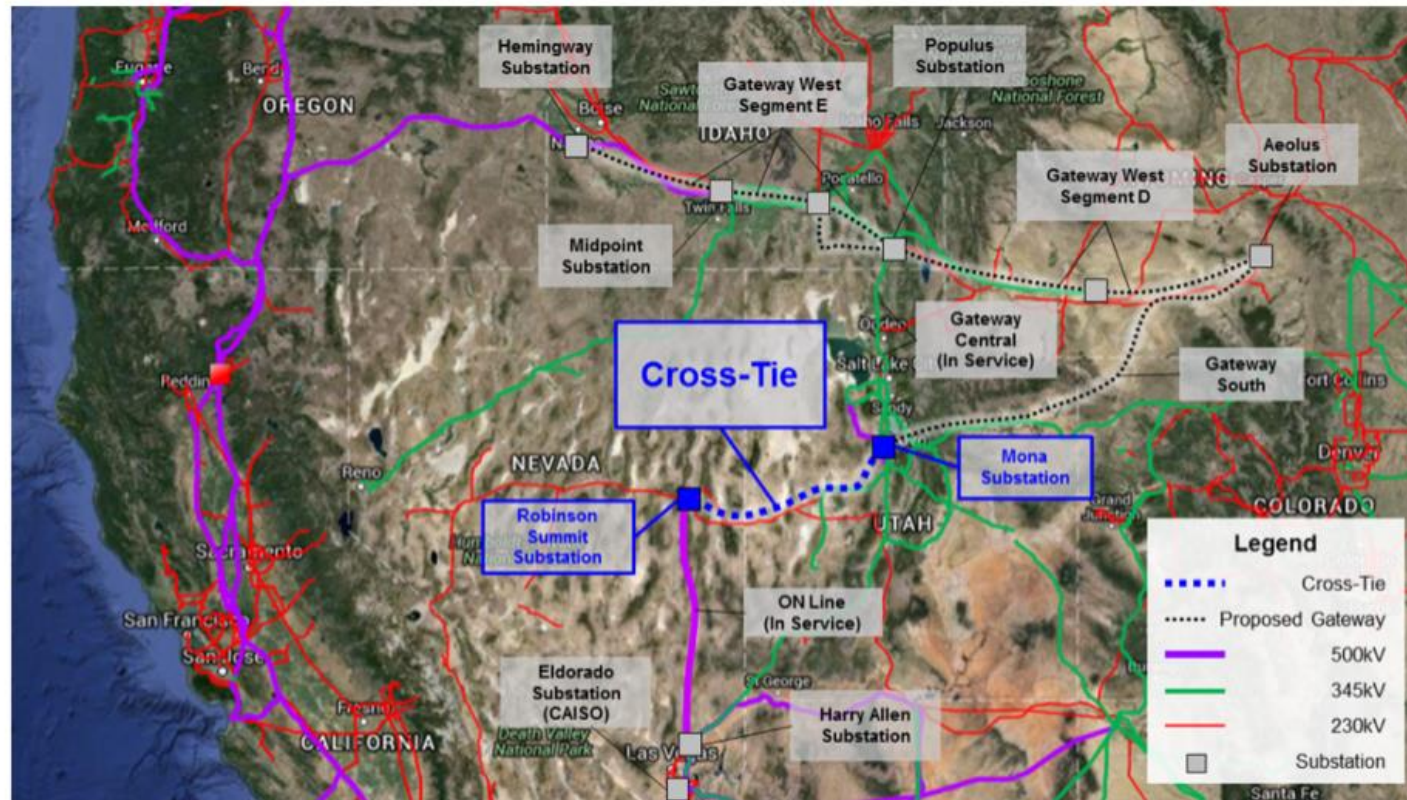
- ✓ TransCanyon met with CENACE and CFE – all parties agreed that there is a need for increased cross-border transmission particularly in the San Luis area of Sonora
- ✓ MOU with TransCanyon, CENACE and APS to perform joint feasibility analysis executed May 24, 2018



CENACE - El Centro Nacional de Control de Energía (independent system operator)
CFE - Comisión Federal de Electricidad (national transmission owner)

Cross-Tie – Overview

- 213-mile, 500kV AC transmission line with 1500MW transfer capability from central UT to east-central NV, anticipated in-service in Q4 2024
- Estimated capital cost of ~\$667mm including upgrades at Robinson Summit
- Submitted as Interregional Transmission Project to CAISO, NTTG and WestConnect
 - March 2016 (Cycle 1) and March 2018 (Cycle 2)



Cross-Tie – Regional Benefits



- Reliability Benefits:
 - Low-cost investment to leverage existing system and increase regional reliability benefits to the Western Interconnection
 - Improves system reliability during system disturbances and forced outages (weather, fire, natural disasters)
- Economic Benefits:
 - Regional economic benefits from more efficient resource procurement and dispatch
 - Relieves congestion on the California-Oregon Intertie by providing flow relief and alternate transmission paths
 - Substantially interconnects Berkshire Hathaway Energy's two largest load and generation centers in the west (PacifiCorp East and NV Energy)
 - Increase transmission capacity between the PacifiCorp, NV Energy, CAISO and Idaho Power Balancing Areas
 - EIM participants enjoy benefits of more transmission capacity to bid resources into neighboring markets
 - Benefits increase further with expanded RTO
 - Facilitates development of renewables to meet the RPS and GHG goals of the western states – enables lower cost way to meet policy objectives by enabling import/export of the best resources



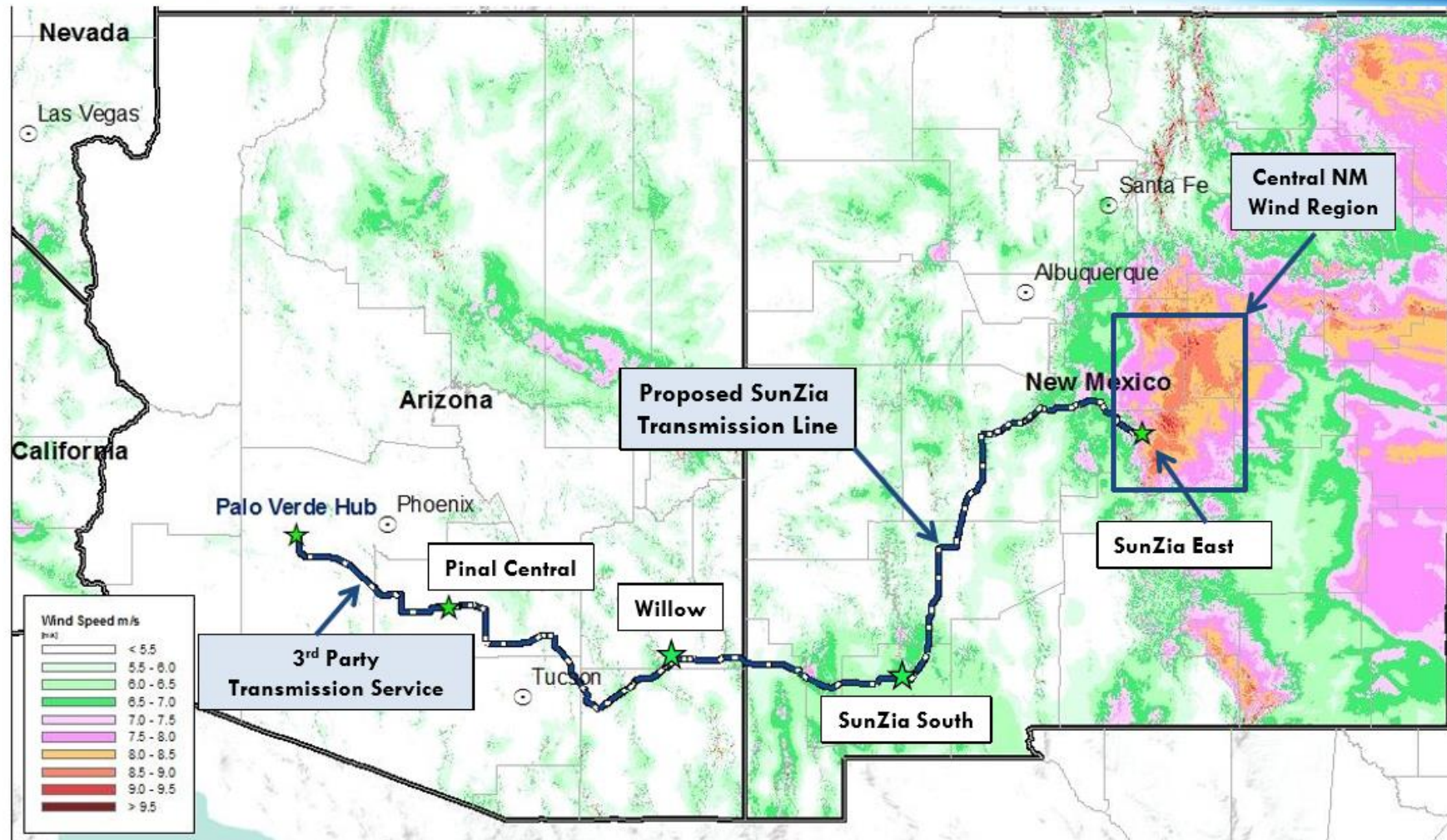
SunZia Southwest
Transmission Project



SunZia and Potential Impacts of Regionalization

Arizona Energy Consortium Conference

SunZia: 500kV Project delivering NM Wind to the Palo Verde Hub



Project Summary

- ⚡ 520 mile independent transmission project in New Mexico and Arizona
- ⚡ Two 500kV AC lines providing 3,000 MW of transfer capacity from NM to AZ and CA
- ⚡ Brings high-quality renewable energy to western utilities and power markets
- ⚡ Pattern Development was selected in August 2016 as the anchor customer for the first 500 kV transmission line and awarded 1,500 MW of transmission capacity
- ⚡ Construction start in 2019; Commercial operation of the first 500kV line by end-2020

NM Wind + SunZia = Commercial Success

- ⚡ On 7/31/2018, Pattern Energy Group 2 LP (Pattern Development) announced it had signed two 15-year power purchase agreements as follows:
 - » Silicon Valley Clean Energy (SVCE) for 110 MW
 - » Monterey Bay Community Power (MBCP) for 90 MW
- ⚡ Pattern will supply these customers from its 200 MW Duran Mesa wind project currently in development near Corona, New Mexico.
- ⚡ Duran Mesa will use SunZia to effect these deliveries.

NM Wind to California Today

⚡ **Delivered cost of energy NM wind energy to CA comprises:**

- a) Cost of NM wind generation
- b) Cost of gen tie-lines (to get from wind farms to SunZia)
- c) Cost of SunZia (to Pinal Central)
- d) Cost of Arizona transmission to California transmission
(could be to Palo Verde, West Wing, North Gila or Eldorado Valley)
- e) Cost of California transmission to customer

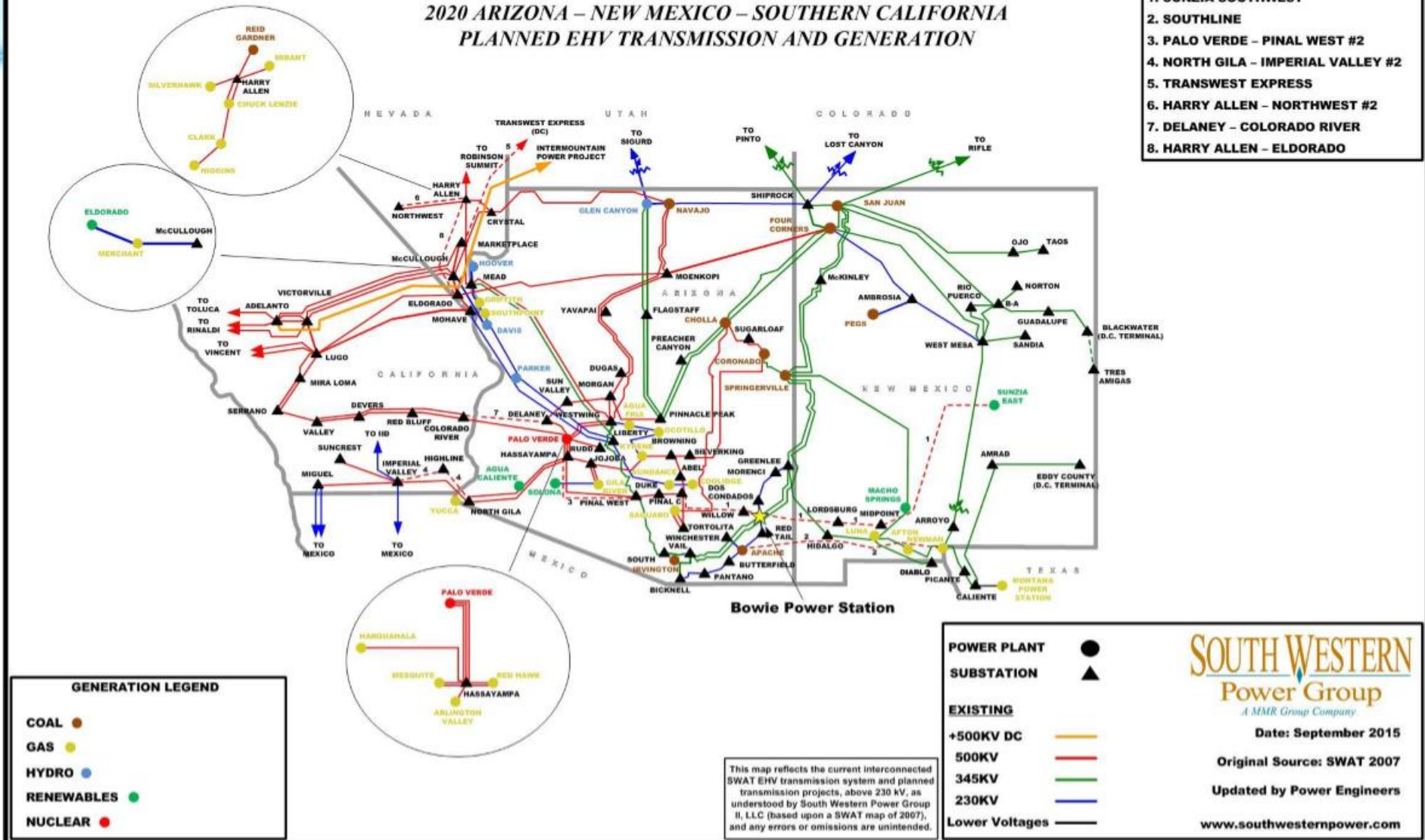
⚡ **Arizona transmission is ideally 1 wheel, but could be 2 or 3**

⚡ **This also assumes Seller can obtain firm transmission in AZ**

⚡ **Real power losses (f) are also additive for b, c, d and e above**

⚡ **Total cost = $(a + b + c + d1 + (d2 + d3 + \dots) + e) \div (100\% - f)$**

2020 ARIZONA – NEW MEXICO – SOUTHERN CALIFORNIA PLANNED EHV TRANSMISSION AND GENERATION

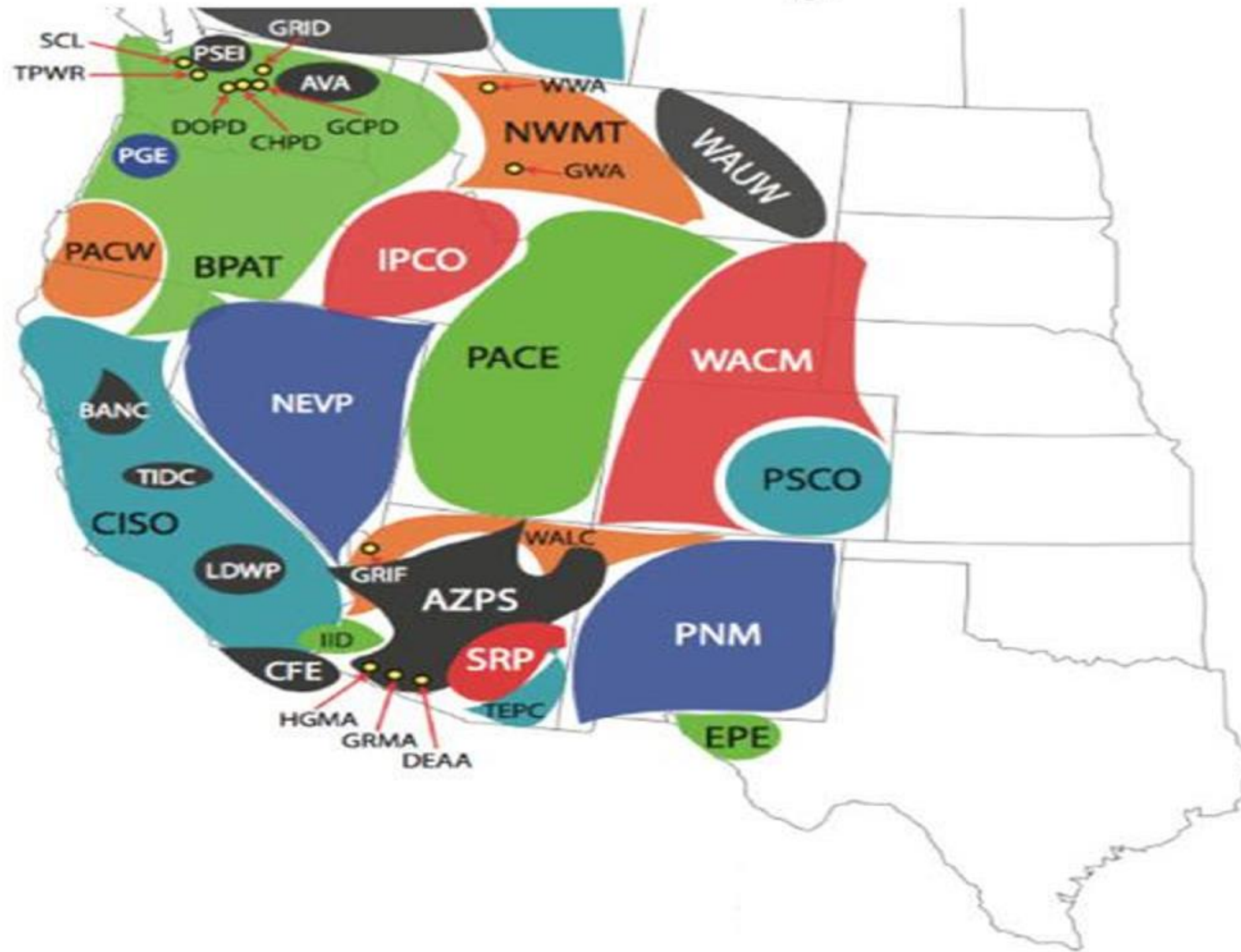


NM Wind to CA under Regionalization

- ⚡ **Delivered cost of energy NM wind energy to CA comprises:**
 - a) Cost of NM wind generation
 - b) Cost of gen tie-lines (to get from wind farms to SunZia)
 - c) Cost of SunZia (could be included in item d below)
 - d) Cost of regional transmission system
- ⚡ **Will the cost of a regional transmission system be less than the sum of the individual parts?**
- ⚡ **Will there be additional transmission capacity that arises?**

(flow-based capacity versus point to point, contract path)
- ⚡ **We expect the answers will likely be “yes” and “yes”**
- ⚡ **This does not include additional benefits of access to a wider market and to a broader set of resources to create better portfolios**

38 Western Balancing Areas



Benefits to AZ of Regionalization

- ⚡ **With access to a regional market, AZ utilities could:**
 - » Build better resource portfolios with
 - more options
 - more diversity
 - » Buy short-term energy (when it is economic)
 - » Sell short-term energy (when it is economic)
- ⚡ **Regional power markets will be more liquid and efficient (i.e., more buyers and sellers, more competition, lower costs to consumers)**
- ⚡ **Cost of operating the transmission system should be reduced with more centralized operations and administration**
- ⚡ **Increased transmission capacity with more efficient regional operations**

Outlook for Regionalization

⚡ **Difficult issues need to be resolved:**

- » Governance of the regional transmission entity
- » How to share costs of the regional entity within the region
- » Ensuring ability of new participants to serve existing load
- » Combining new transmission operations in a single entity
- » Fear of losing control & undue influence of majority party
- » Proving to participants that the benefits outweigh the costs
- » Proving to regulators that the benefits outweigh the costs

⚡ **It will require significant time to resolve the above issues**

⚡ **Nonetheless, it is still worth pursuing**



www.sunzia.net

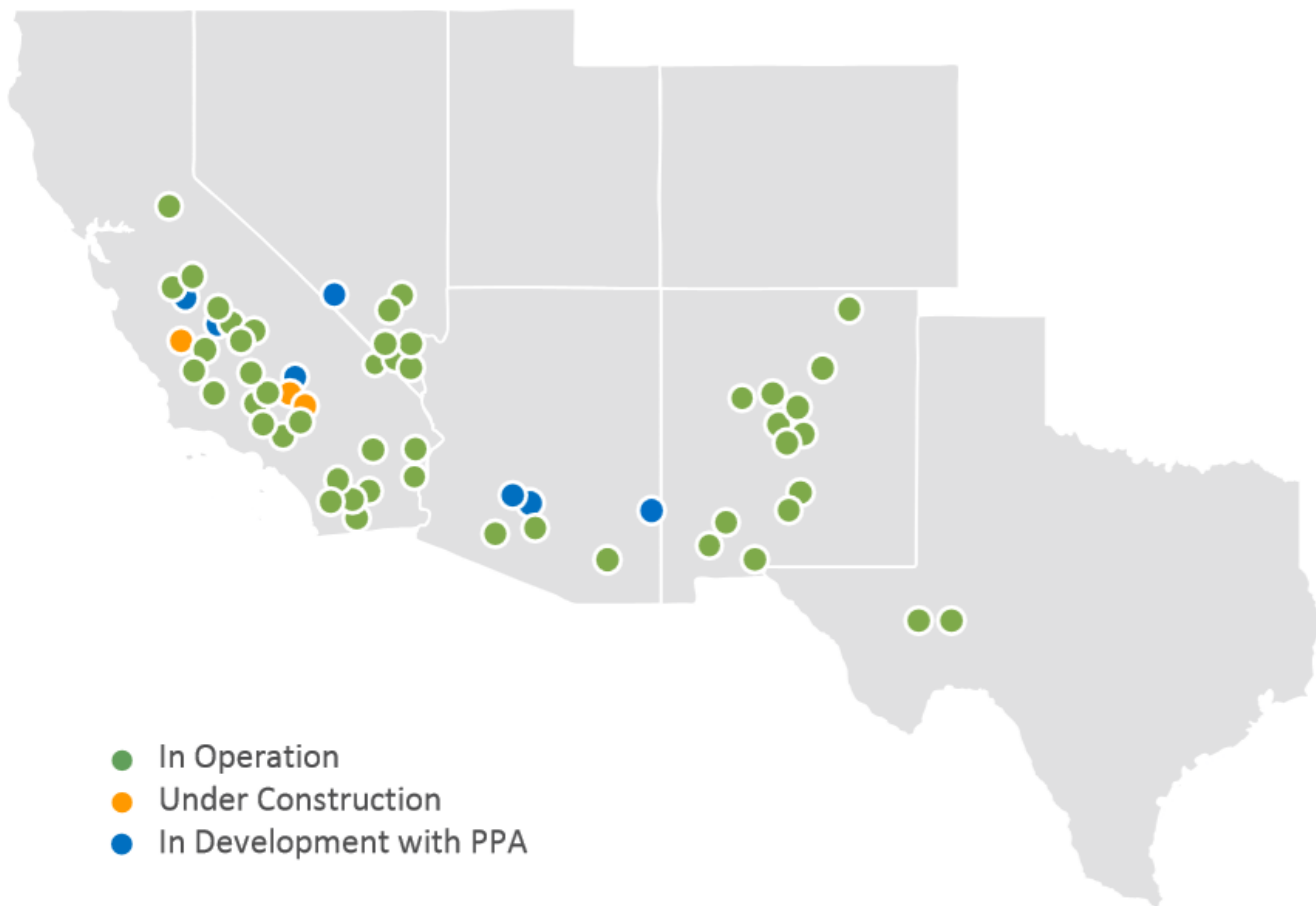
David Getts
General Manager
SouthWestern Power Group
dgetts@southwesternpower.com
602-808-2004

WESTERN REGIONALIZATION

Politics, Governance, and
Moving the Southwest Forward



FIRST SOLAR: LEADING THE SOUTHWEST SUSTAINABLE ENERGY FUTURE



- Largest U.S. manufacturer of PV modules
- > 17 GW sold worldwide
- 4.6 GW in operation throughout the Southwest
- > 500 MW in operation or under development in Arizona
- 99% power plant fleet availability

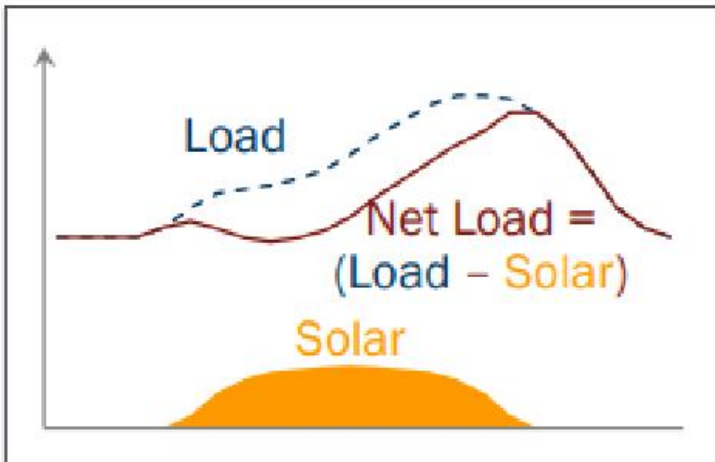
REGIONALIZATION IMPROVES GRID OPERATIONS

Grid 1.0

Grid Characteristics:

- Utility-scale solar is part of mid-day load, offsetting peak or near-peak demand
- Low adoption of DERs
- Renewables are a must-take resource
- Minimal curtailed energy

Solar Product Needed: Energy & Renewable Energy Credits (RECs)

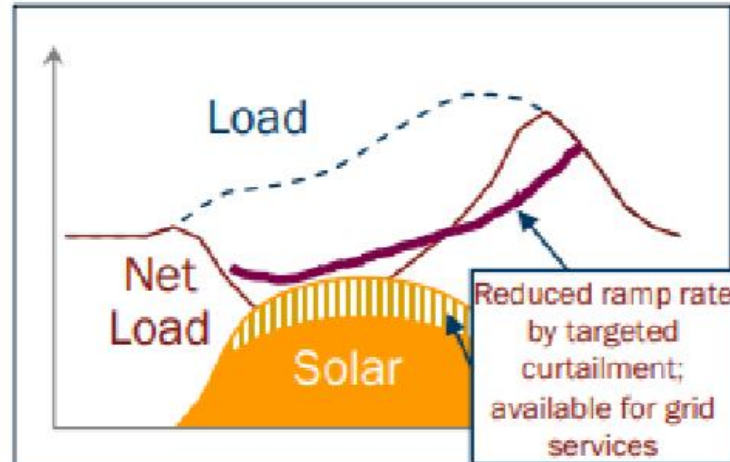


Grid 2.0

Grid Characteristics:

- Grid operators see evening ramp concerns and need for more flexible asset additions
- Growing adoption of DERs that have limited controllability
- Utility-scale solar transitions to a dispatchable resource

Solar Product Needed: Energy, RECs, & Grid Services

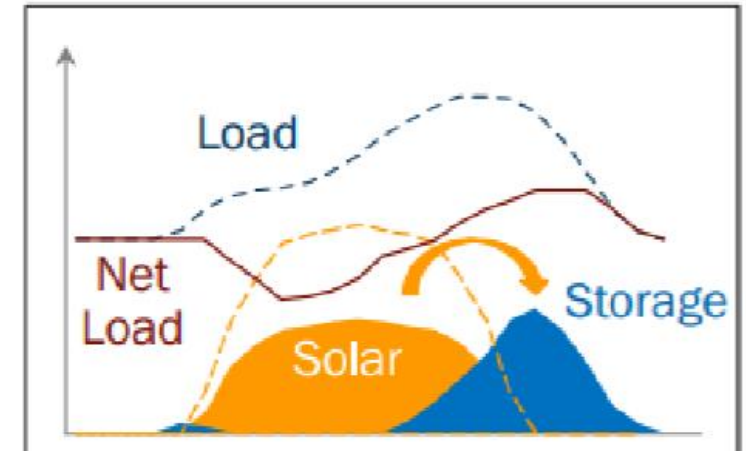


Grid 3.0

Grid Characteristics:

- Utility-scale solar represents significant portion of resource portfolio; curtailments frequent
- Saturated DER market creates excess energy
- Resource Adequacy needs shift
- Storage becomes economic

Solar Product Needed: Capacity, Energy, RECs, & Grid Services



CAISO REGIONALIZATION: CALIFORNIA STAKEHOLDERS AND POLICY GOALS

Key Stakeholder Perspectives

Environmental NGO Opposition (local/grassroots)

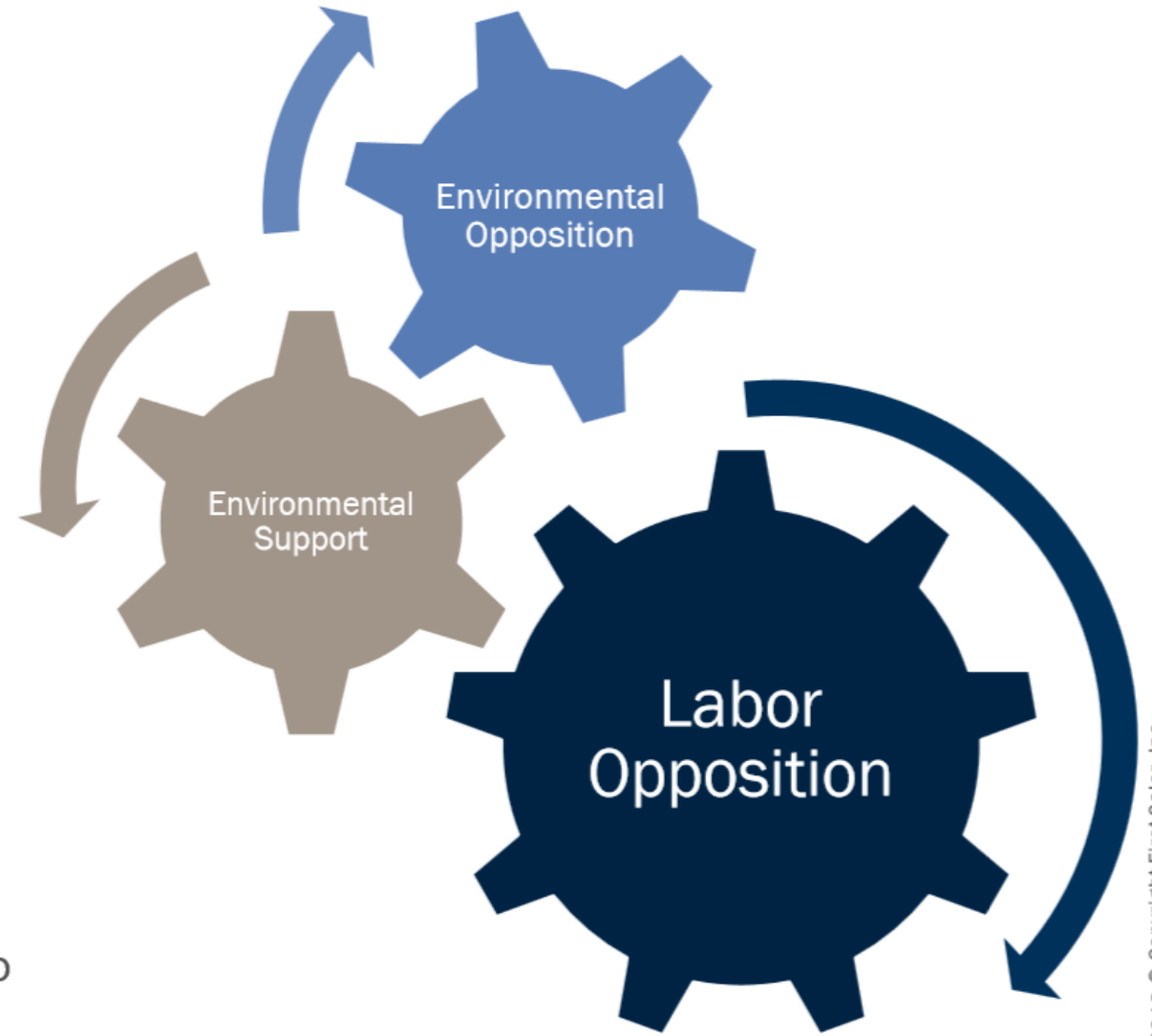
- Undermines GHG emissions goals from states with GHG-heavy resources
- Fear over loss over state governance control and FERC uncertainty

Environmental NGO Support (national, pro-market)

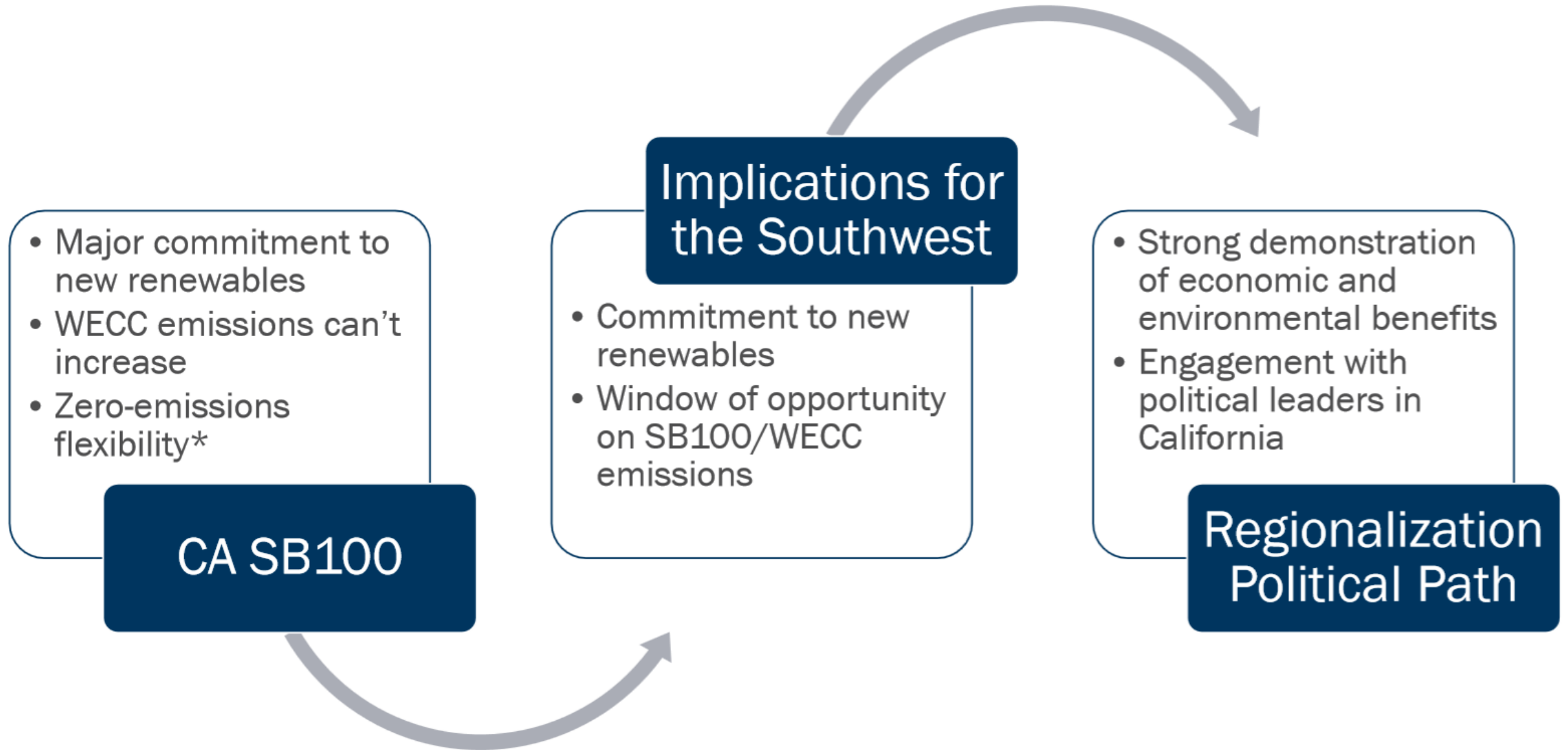
- Supports global environmental considerations (e.g. climate)
- Improves integration and access of renewables

Labor Opposition (regional and state-level)

- Extremely influential on energy issues
- Concerned about losing infrastructure projects to other states

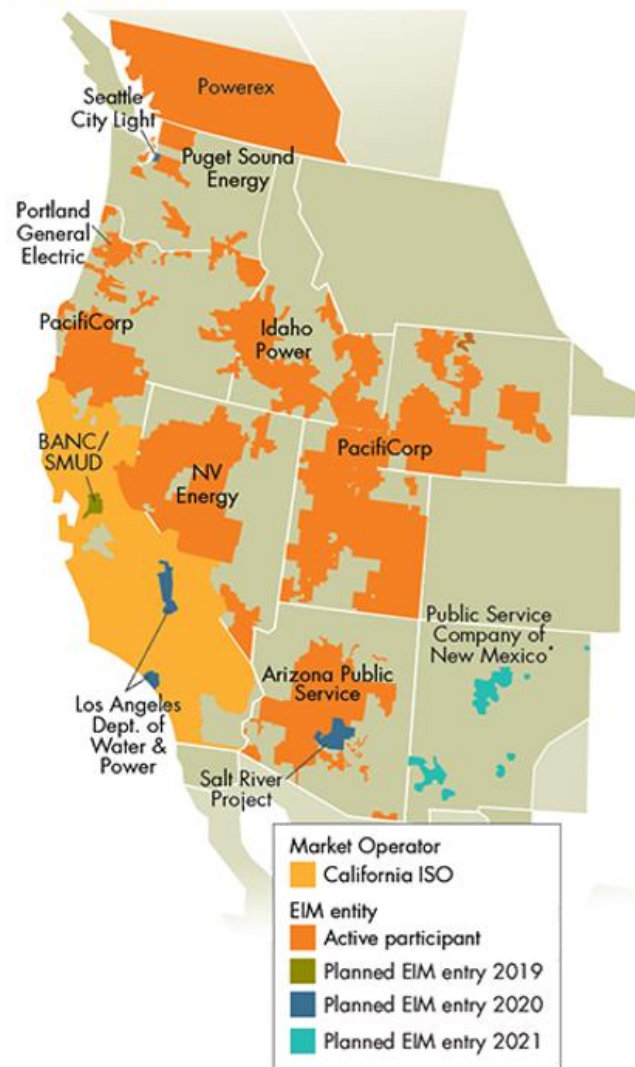


CA SB100: CREATING A PATH FOR REGIONALIZATION BY REDUCING EMISSIONS



REGIONALIZATION BY ANY OTHER NAME...

Western EIM active and pending participants

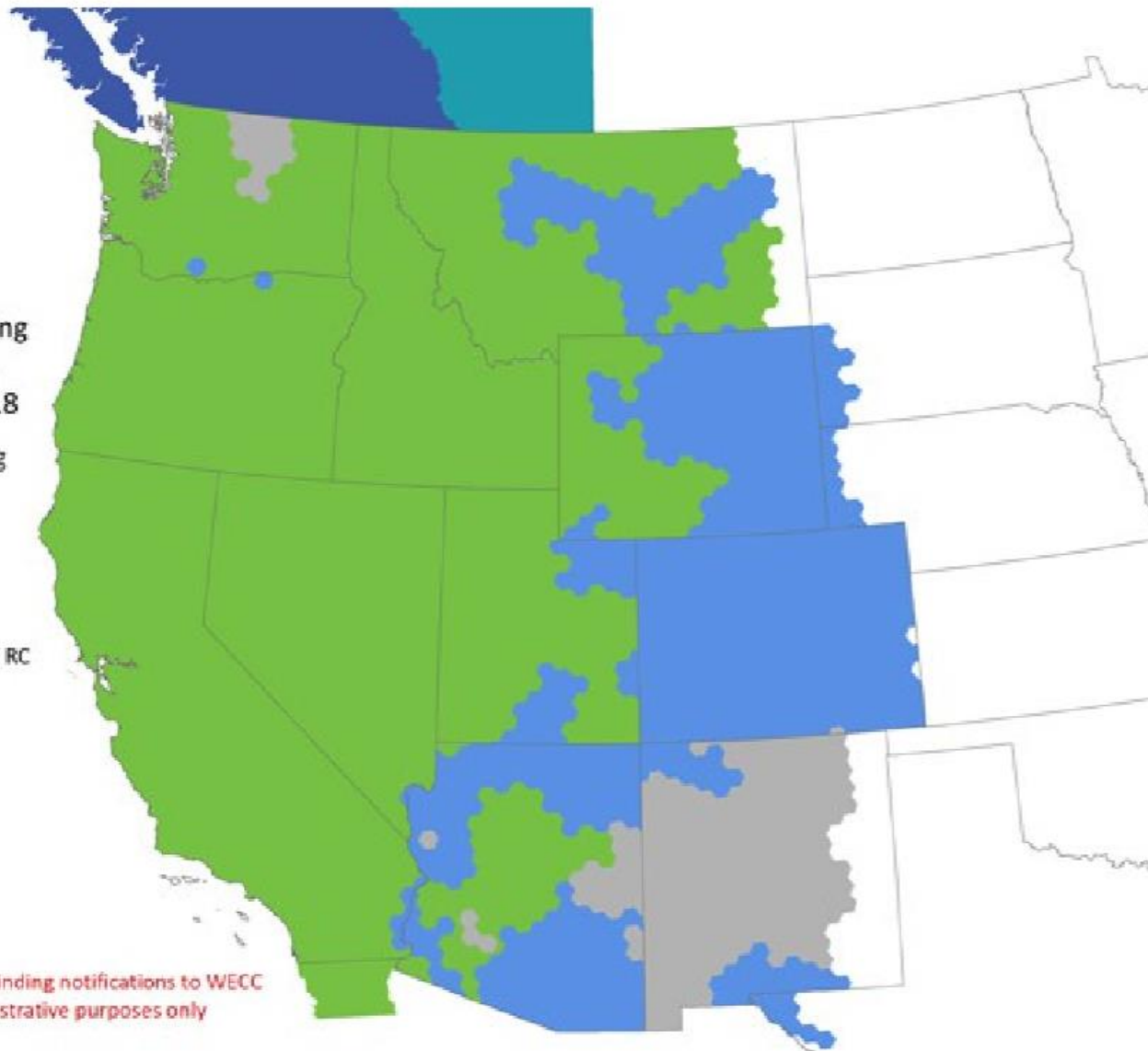


*Pending state commission approval

Draft, Non-binding
RC Footprints
as of: 9/12/2018

- BA - RC Mapping
- CAISO RC
 - SPP RC
 - AESO RC
 - BCH RC
 - Undeclared RC

Based on draft, non-binding notifications to WECC
Boundaries are for illustrative purposes only



THANK YOU

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Affairs
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SOUTHWEST ENERGY CONFERENCE

SEPTEMBER 20-21, 2018
HOTEL VALLEY HO | SCOTTSDALE, ARIZONA

How do cross-border and intrastate transactions impact the regional market?



Southwest Energy Conference Overview



Title Sponsor:  **ARCADIS**

How do cross-border and intrastate transactions impact the regional market?

BLAIR LOFTIS – TERRACON POWER GENERATION & TRANSMISSION







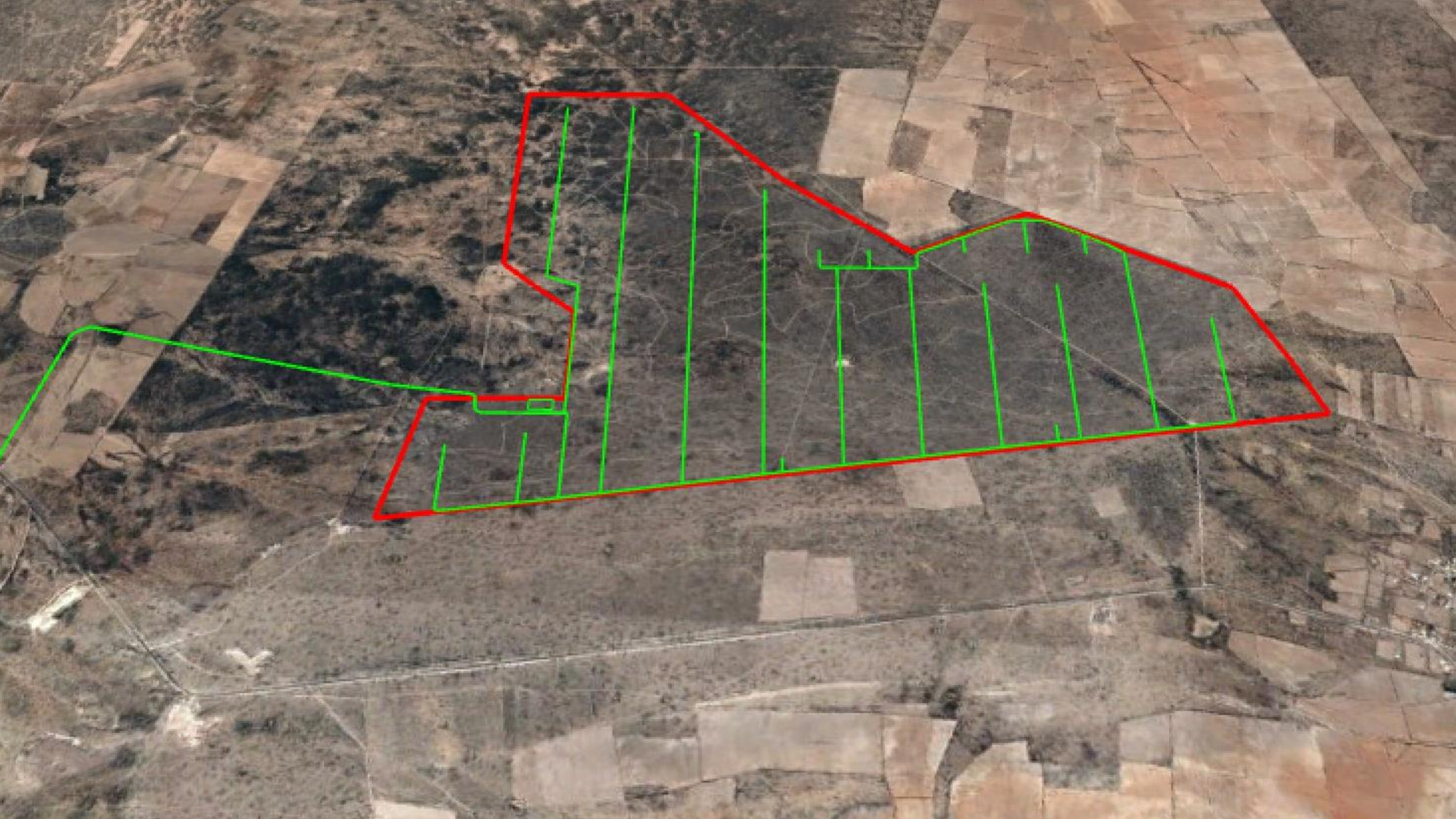


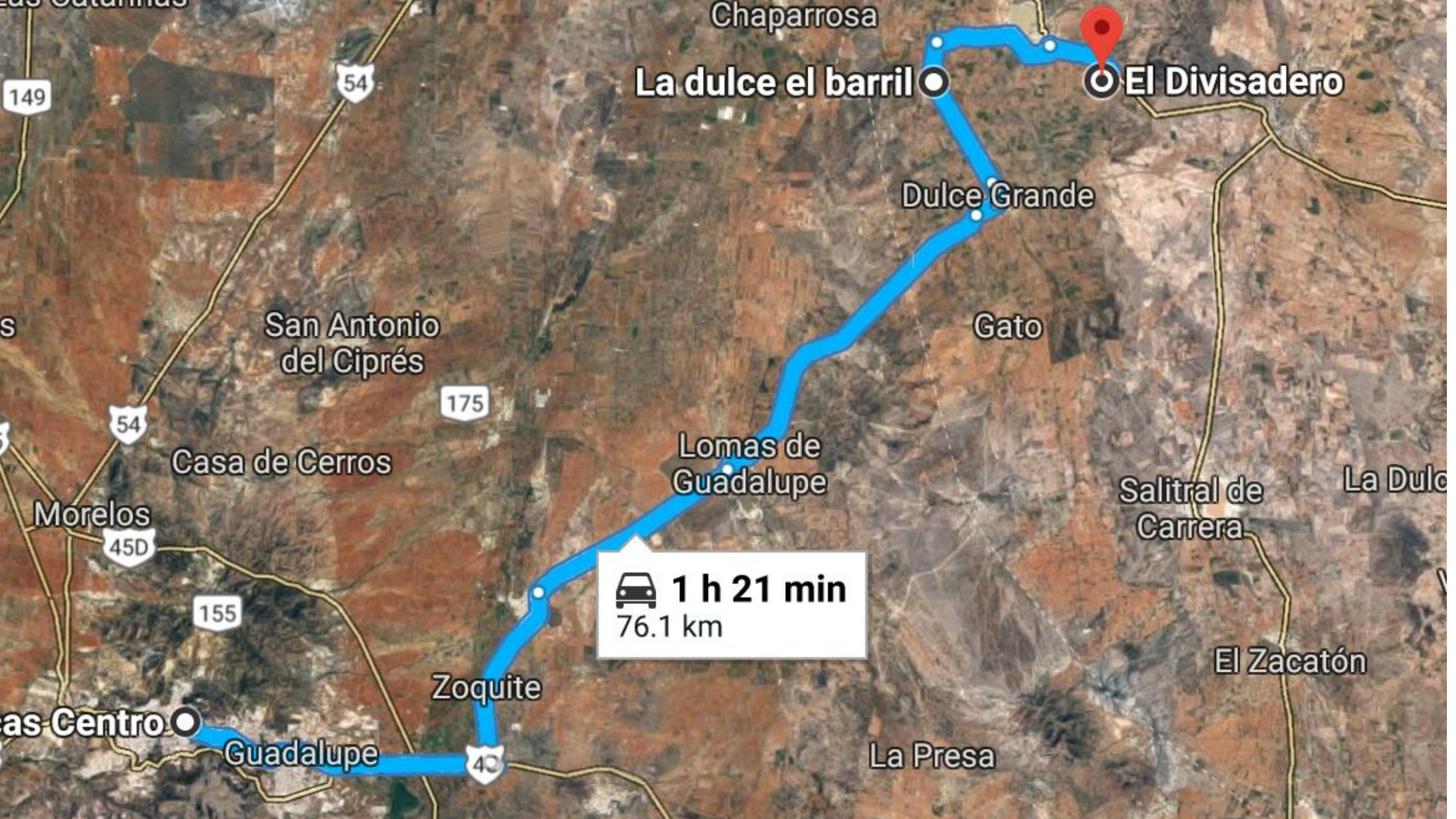












Chaparrosa
La dulce el barril ● **El Divisadero** ●

Dulce Grande

San Antonio del Ciprés

Gato

Casa de Cerros

Lomas de Guadalupe

Salitral de Carrera

La Dulce

Morelos

 **1 h 21 min**
76.1 km

155

El Zacatón

Zoquite

Las Casas Centro ●

Guadalupe

La Presa

149

54

54

175

45D

40













**Leverage
your
connections
!**

Kayenta Solar Projects and Transmission Overview

Navajo Tribal Utility Authority

NTUA Generation, Inc.

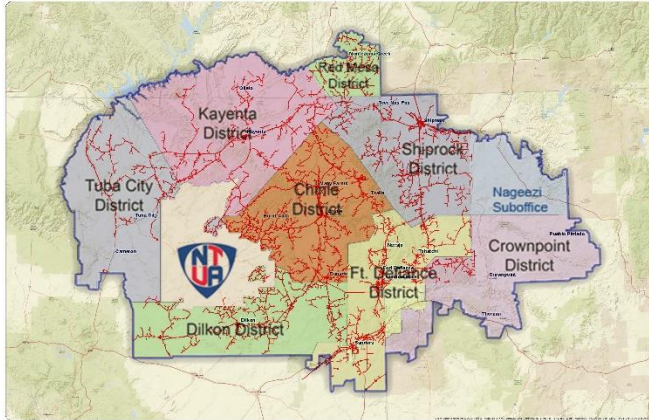
Ft. Defiance, AZ

Glenn Steiger – Executive Consultant



History

- The Navajo Tribal Utility Authority (NTUA) has continuously served the Navajo people for more than 59 years.
- NTUA was established on January 22, 1959, and today is the largest tribally-owned and operated multi-utility company in the United States.
- NTUA was created to address the absence of utilities on the Navajo Nation



Kayenta I Solar Project

Mission

- Since inception, NTUA has grown into a thriving tribally-owned enterprise delivering a portfolio of services to a service area of more than 27,000 square miles.
- Currently serving over 41,000 electric customers, NTUA is organized for the operation, maintenance and expansion of electric, communications, natural gas, water, wastewater, and generation, including photovoltaic (solar) services for the Navajo people at a low and reasonable cost.
- NTUA seeks to promote economic development, and employment opportunities on the Navajo Nation, and to improve the health and welfare of the residents of the Navajo Nation.
- *Most Importantly, NTUA's ultimate mission is to serve the approximate 14,000 families on Navajo Nation who are currently not provided electric service!*

Summary

- NTUA created NTUA Generation, Inc. for the purpose of investing in and developing wholesale energy projects within and outside of the Navajo Nation.
- NGI is currently owns the Kayenta I solar project, a 27.3 MW facility, located within the Navajo Nation.
- NGI is in the process of initiating construction of Kayenta II solar project, a 27.8 MW facility, also located in Kayenta, AZ.
- NGI has secured a term sheet for the development of 100MW of solar and environmental attributes for a California municipal entity.
- NGI is in early development stage for the development of over 1GW of renewable energy (solar, wind, and pumped storage) generation within the Navajo Nation.



Kayenta I Solar Project

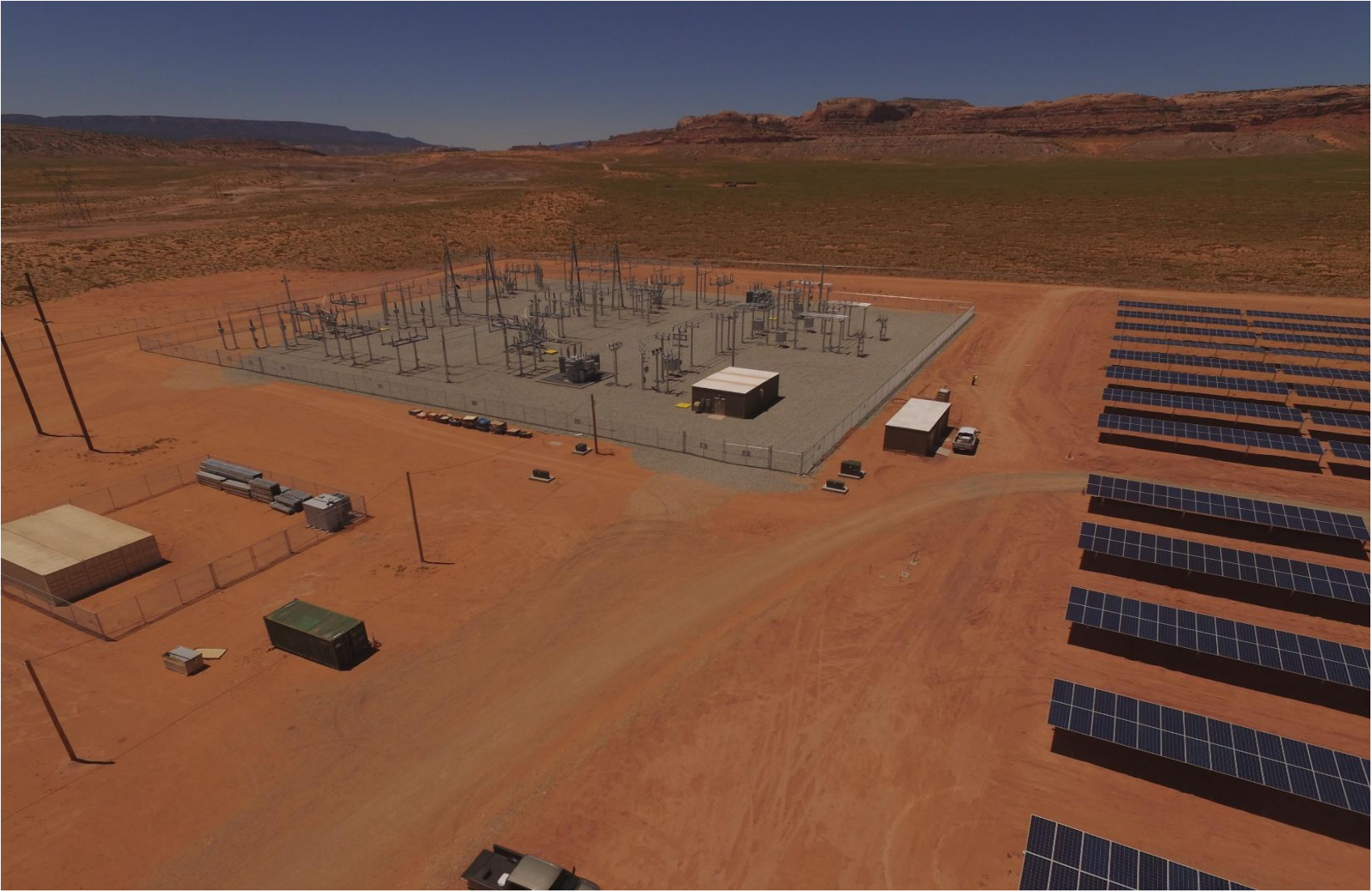
NGI Successfully Developed, Constructed, and Commissioned in 2017

- **27.3MWac, single-axis tracker solar generating facility located approximately 4 miles from the township of Kayenta, Arizona**
- **Sited on approximately 195 acres of land adjacent to the proposed Project site**
- **During development and construction of the plant created over 230 jobs for Navajo residents and nearly \$15.6 million in local benefits**
- **Kayenta I is interconnected to NTUA's Kayenta Substation sells its energy output and environmental attributes via a long-term power purchase agreement ("PPA") with NTUA.**
- **Project execution demonstrates NGI's experience and focus in developing a similarly sited and sized power generating facility (Kayenta I) near the proposed site for Kayenta II.**
- **Kayenta II will duplicate the KI project on an additional 165 acres and be put into commercial operation by June 1, 2019**

Kayenta I Overview – Site Prior To Construction



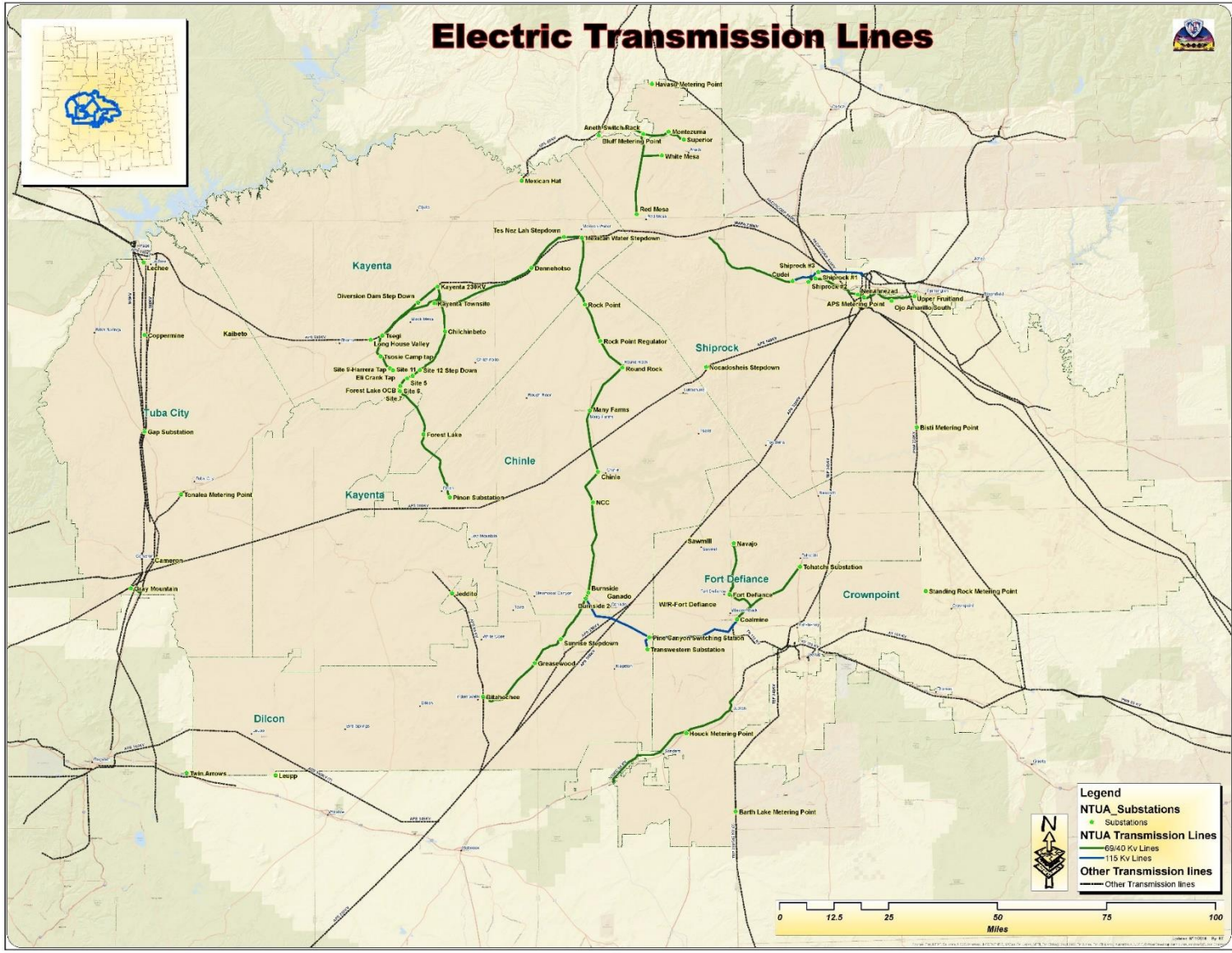
Kayenta I Overview – On-Site Interconnection Substation (During Construction)

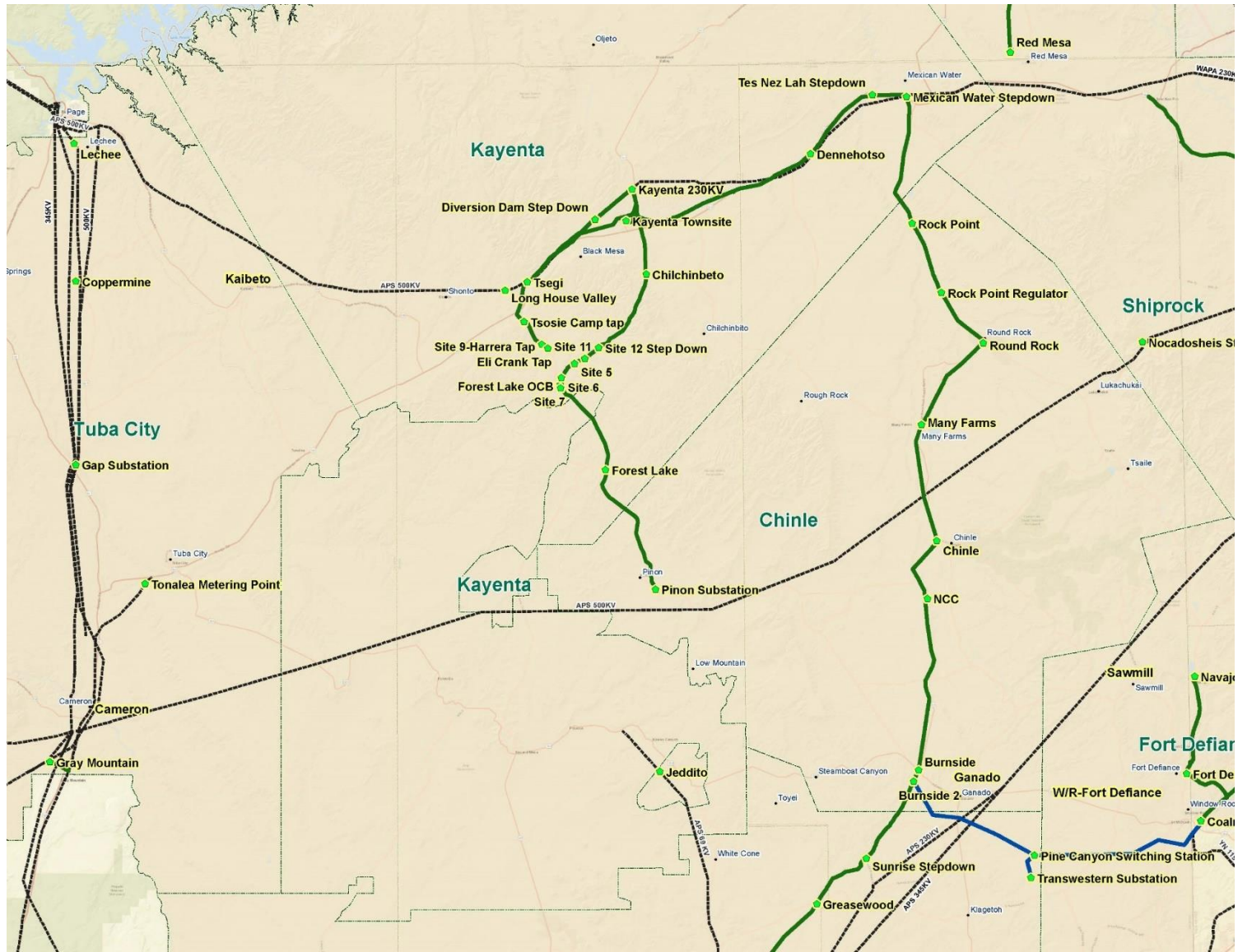


Kayenta I Overview – Completed Project



Electric Transmission Lines







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SEPTEMBER 20-21, 2018
HOTEL VALLEY HO | SCOTTSDALE, ARIZONA

What impacts will innovation and technology have on the Southwest market?



“Necessity is the Mother of Invention”

- Lets start the discussion with problems that are impacting the southwest energy – Why southwest can lead in energy innovation (Heat Intensity, Growth, Collaboration)
- Themes
 - Local vs Global
 - Macro vs Micro
 - Collaborative Approach
 - Purchaser driven innovation



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Impacts innovation and technology have on the Southwest market?

Block Chain Accounting

- Reduces Cost
- Speeds Transactions
- Reduces Bulks Power Transaction Reconciliations

Utilities becoming more customer-centric

- Social Media & Other Real Time Information Sources During Catastrophic Emergency Restoration Response
- Increased Customer Demand for Southwest Market Players to share Resources within an ISO and even across Multiple ISOs
- Increased Customer Knowledge Regarding Outage Count vs Resources Deployed
- More Feedback to PUCs and FERC Regarding Major Restoration Efforts

Growing load defection

- Micro grids and other DER causing less need for power transfer
- Utilities buying into storage
- Utility Business Models are Changing, Tariffs etc..



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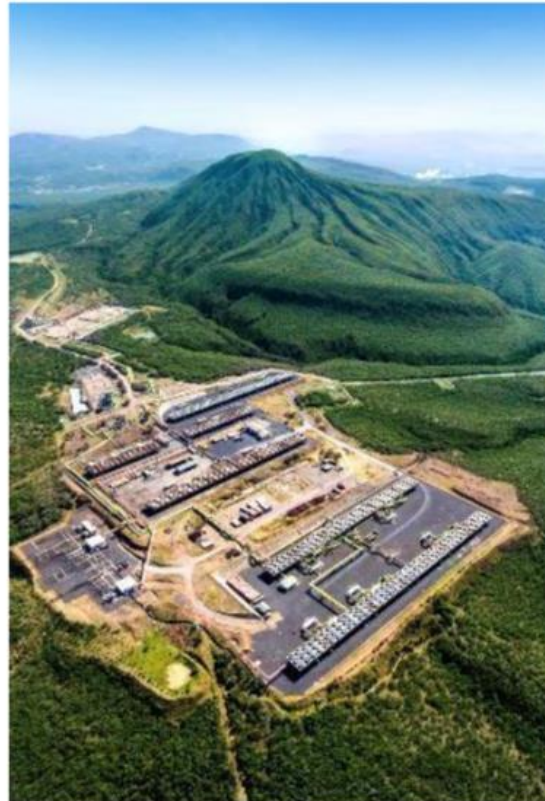
ORMAT



Own & operate
862 MW



1,300
Employees



693 \$M
FY2017 revenues



344 \$M
FY2017 adj. EBITDA⁽¹⁾



53 years
of experience



(1) See appendix for reconciliation of non-GAAP financial measures .



MHPS

Power & Energy Solutions

CHANGE IN POWER.

DELIVERED



Power & Energy Solutions

*“...delivering comprehensive solutions in the areas of **digital power**, **energy storage**, and **low carbon power generation**.”*



Expanded **digital** offerings:
MHPS-TOMONI™
& Energy Cloud

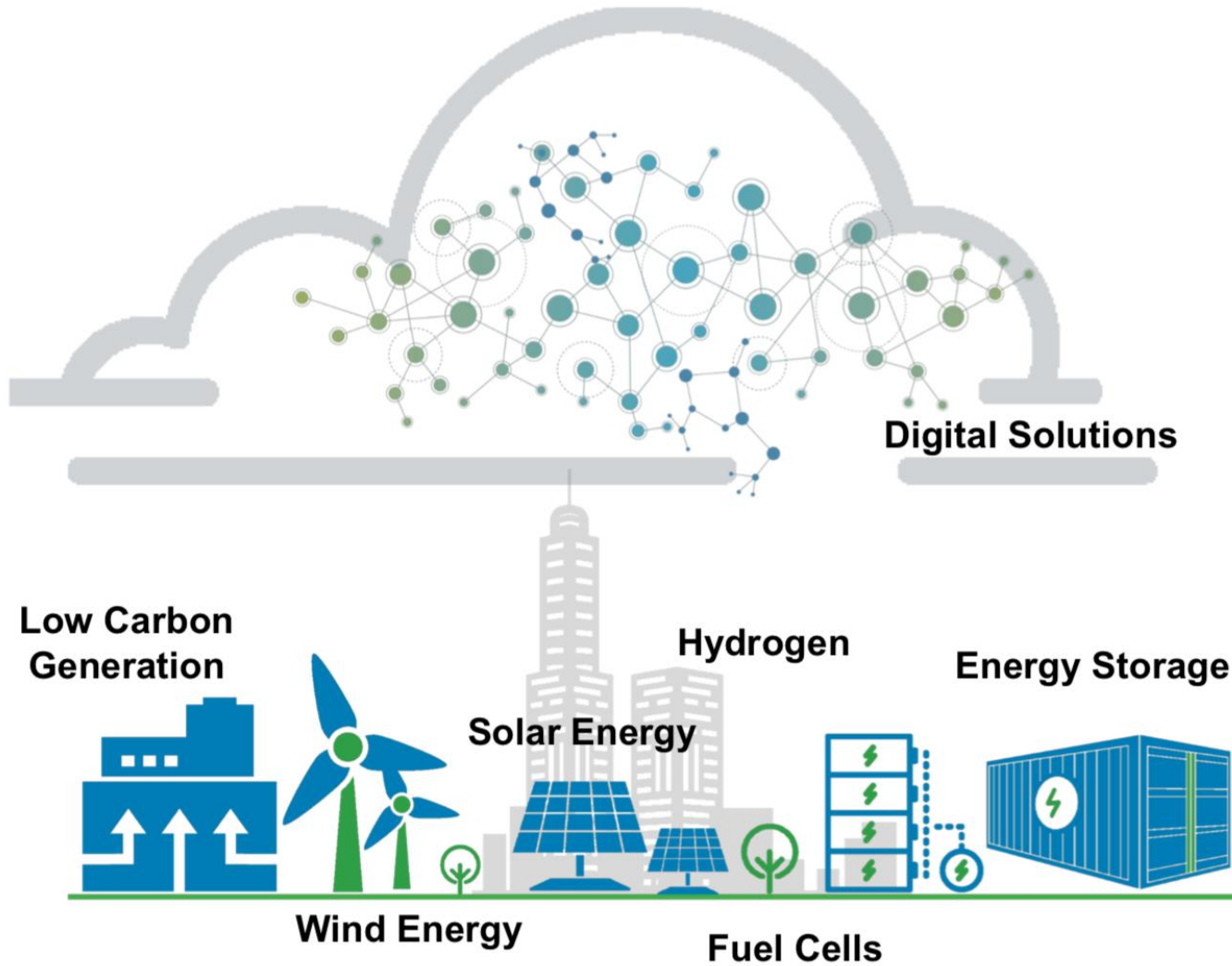


Next generation
battery **storage**
technology



Zero & Low
carbon power
generation

Grid Scale, Micro Grid, & Renewable Generation Solutions



Business Solutions

Equipment & Services
Long Term PPA's
Build Own Operate
Build Own Transfer
Financing



Impacts innovation and technology have on the Southwest market?

Digitization of Data

- **Arcadis Data Integrator**
 - Optimized modeling of system
 - 3D visualization of remote assets
 - Improved Safety and Outage Response
- **SEAMS**
 - Optimized decision making with asset maintenance
 - Optimized Capex and Opex expenditures
 - Reduced outage time for maintenance and extended cycles

Block Chain Accounting

- Reduces Cost
- Speeds Transactions
- Reduces Bulks Power Transaction Reconciliations



Southwest Energy Conference

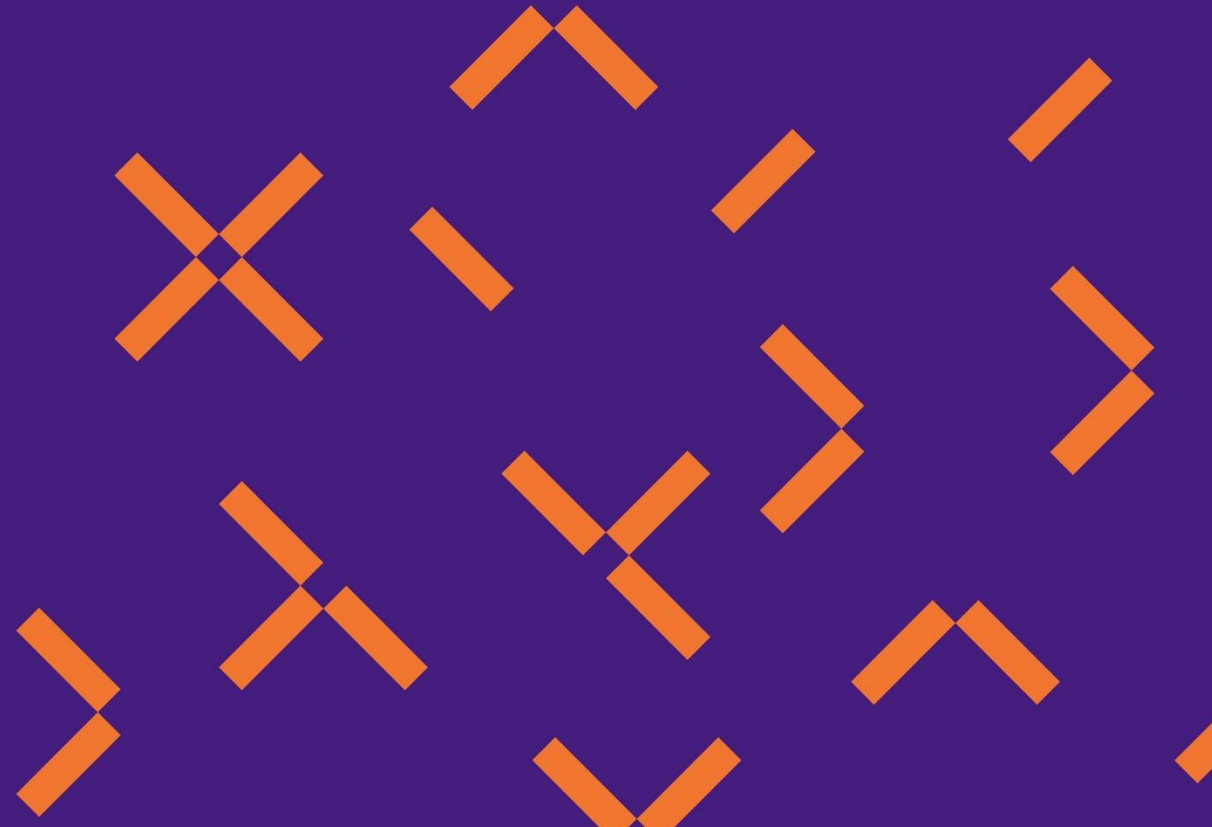
September 21, 2018

Mona Tierney-Lloyd

Senior Director, Regulatory Affairs

Flexibility Solutions

Enel X



Enel X: Flexibility Solutions Business

We are integrating and aligning....



To optimize grid and retail “flexibility services”...



Using all types of distributed energy assets



Real-time Variable Loads



PV & Other Distributed Generation



EV Charging



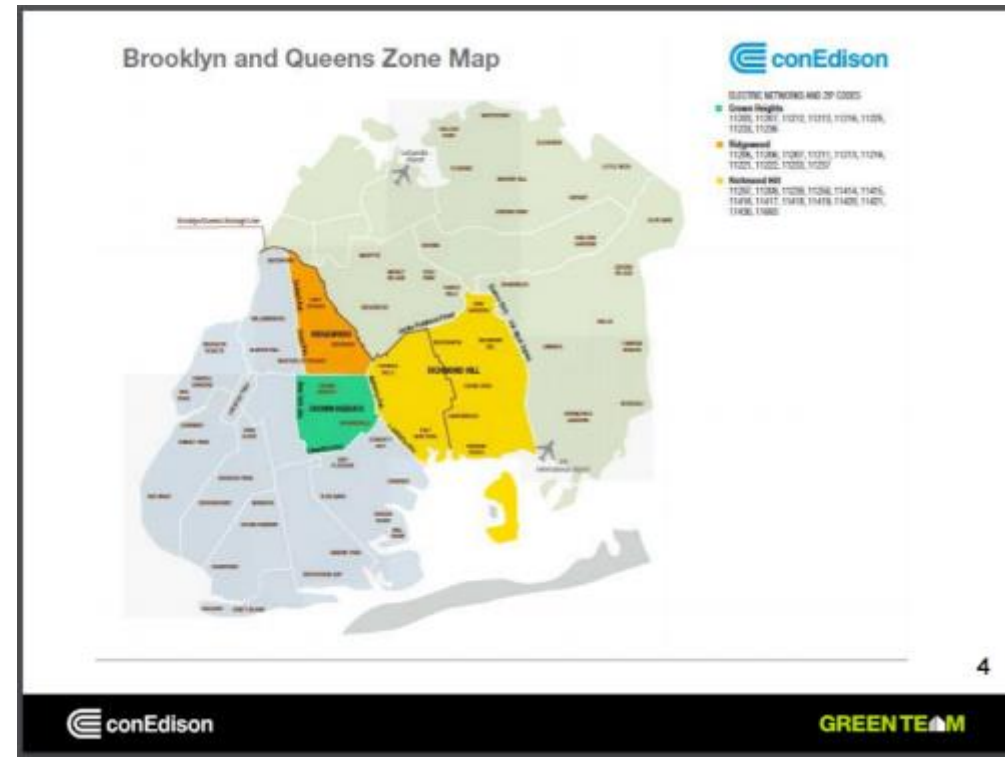
Energy Storage

Market Dynamics Driving Transformation

- Top Down (Wholesale):
 - Market Penetration and Declining Prices of renewable resources
 - Coal Retirements (baseload)
 - Changing Demand Shape, Need for Flexibility
 - Declining storage prices
 - Resiliency
 - Market Integration (EIM)
- Bottom Up (Retail Prosumer):
 - Customer adoption of energy technologies (rooftop/onsite offsite solar, energy efficiency, demand response, energy storage, electric vehicle charging, controllable thermostats)
 - Integration of capabilities
 - Cost management, resiliency, grid services provider, better data access

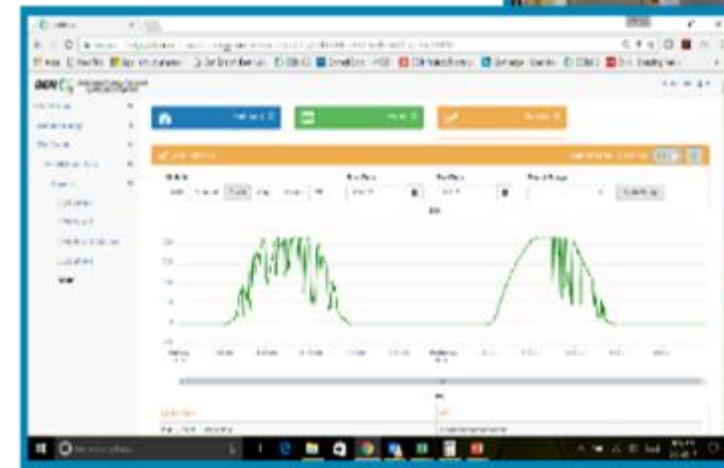
Brooklyn Queens Demand Management (BQDM)

- Substation Upgrade Deferment= \$ 1.2 B
- PSC Approved \$200M Non-Wires Alternative (NWA)
- Program cost allowed in Rate Base
- Reverse Auction- Drove Market Based Response > \$1992/kW-2 year program
- Drives Better system utilization
- Framework for future market based – *Non Wire Solutions*



Establishment Labs Medical Device Manufacturer

Establishment Labs	
Site	San Jose, Costa Rica
Load Profile	~1.4 MW Peak load
Configuration	Storage - 500 kW/1000 KWh Solar - 272 kW
Applications	Multi-DER Aggregation Critical Load Backup Power TOU Energy Arbitrage TOU Demand Charge Reduction



- Storage + Solar + Back Up Power/Microgrid for Critical Loads for this biomedical company
- Solar + Storage System designed to support Critical loads in the medical manufacturing clean room. Maintains all systems to ensure the room stays “clean” during an extended outage