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# ScottMadden's Energy Industry Update – Everything Counts … In Large Amounts

**Webinar**

**November 15, 2019**

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# Cristin Lyons

## Partner and Energy Practice Leader

Cristin Lyons is a partner with ScottMadden and leads the firm's Energy practice. Until April of 2018, she led the firm's Grid Transformation practice, which helps clients adapt to the operational, planning, customer, and regulatory changes driven by the increasing penetration of distributed energy resources. Since joining the firm in 1999, Cristin has consulted with myriad energy clients on issues ranging from process and organizational redesign to merger integration to project and program management. She is also a frequent speaker and panelist at conferences across the country. Cristin earned a B.A. in political science and Spanish from Gettysburg College and an M.B.A. from the Cox School of Business at Southern Methodist University. She is also a member of Phi Beta Kappa.

# California Duck Curve

GROWING FAT IN THE CALIFORNIA SUN

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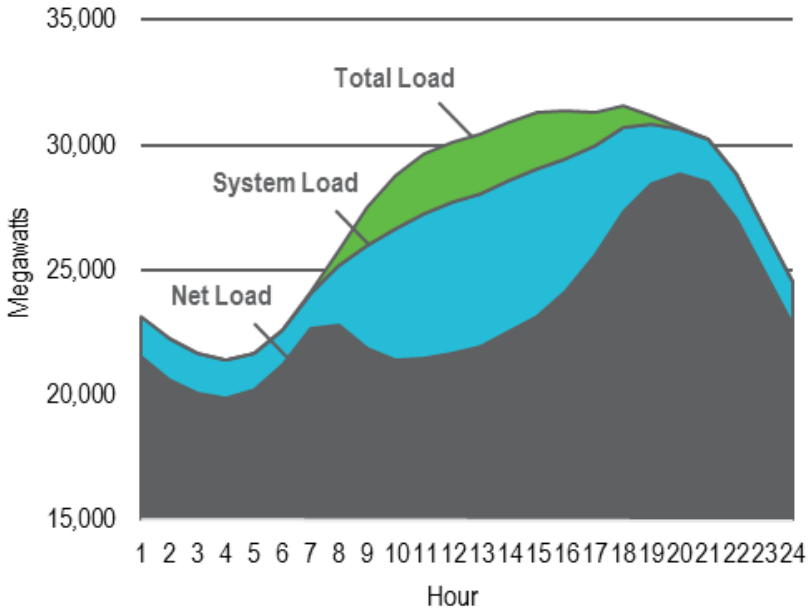
# Paul Quinlan

## Clean Tech Manager

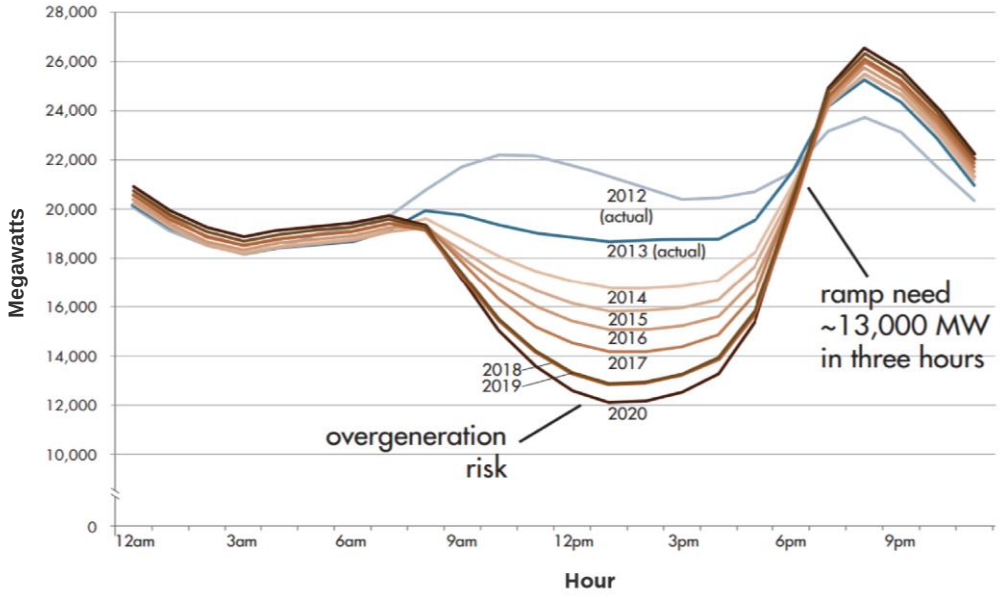
Paul Quinlan is a clean tech manager with ScottMadden. In this role, he assists clean energy and utility clients with market research, strategic planning, business planning, modeling, and due diligence evaluations. He also co-leads ScottMadden's Grid Edge community of practice. Prior to joining ScottMadden, he worked as managing director of the North Carolina Sustainable Energy Association, a nonprofit organization focused on renewable energy and energy efficiency policy issues. He has also taught energy courses at North Carolina State University, served on the board of directors of Clean Energy Durham, and served as a grand jury member for the Helsinki Challenge. Paul earned a master of public policy and a master of environmental management from Duke University and a B.S. from the University of Notre Dame.

# Key Terms and Background

## Total Load, System Load, and Net Load




## CAISO Actual and Projected Net Load on March 31 (2012–2020)




- **Total Load:** Total load regardless of supply source (behind-the-meter systems [e.g., rooftop solar PV] and the electric system [i.e., dispatchable generation, variable generation, and electricity imports])
- **System Load:** Load required to be supplied by the electric system (i.e., total load minus load served by behind-the-meter systems)
- **Net Load:** Load required to be supplied by the electric system from dispatchable resources, including imports (i.e., system load minus load served by utility-scale variable generation—wind, solar PV, and solar thermal)

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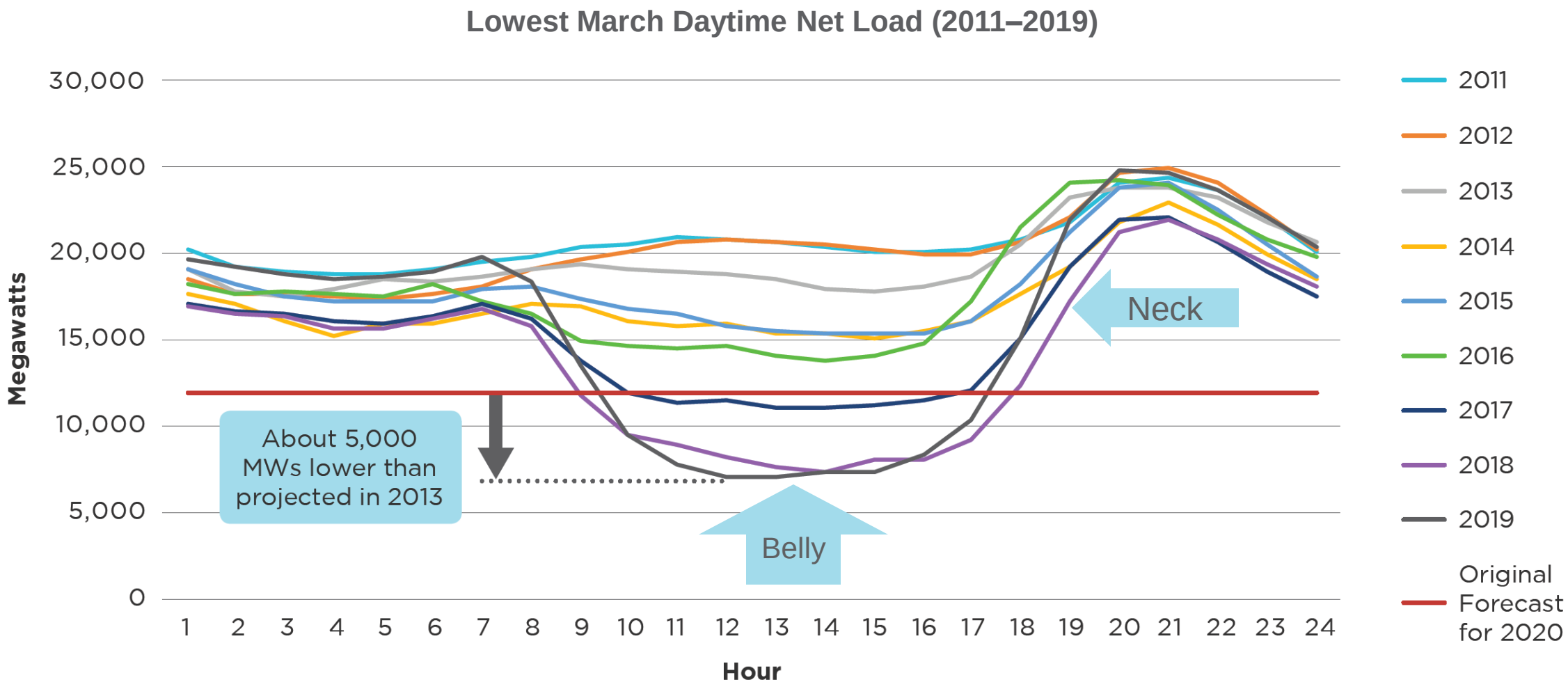
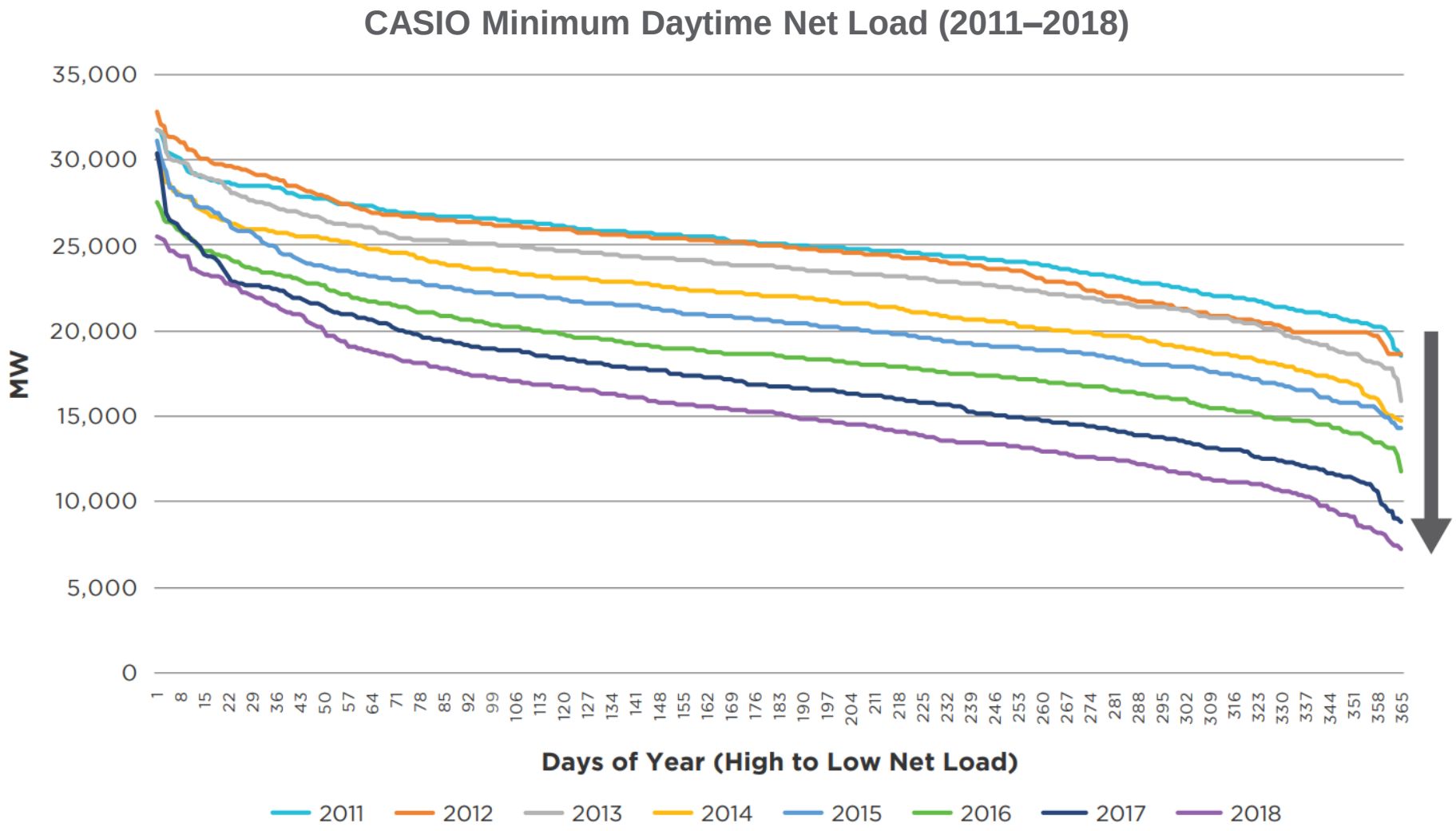
Sources: CAISO, ScottMadden

# Duck Curve Arrives Sooner and Is Fatter Than Expected



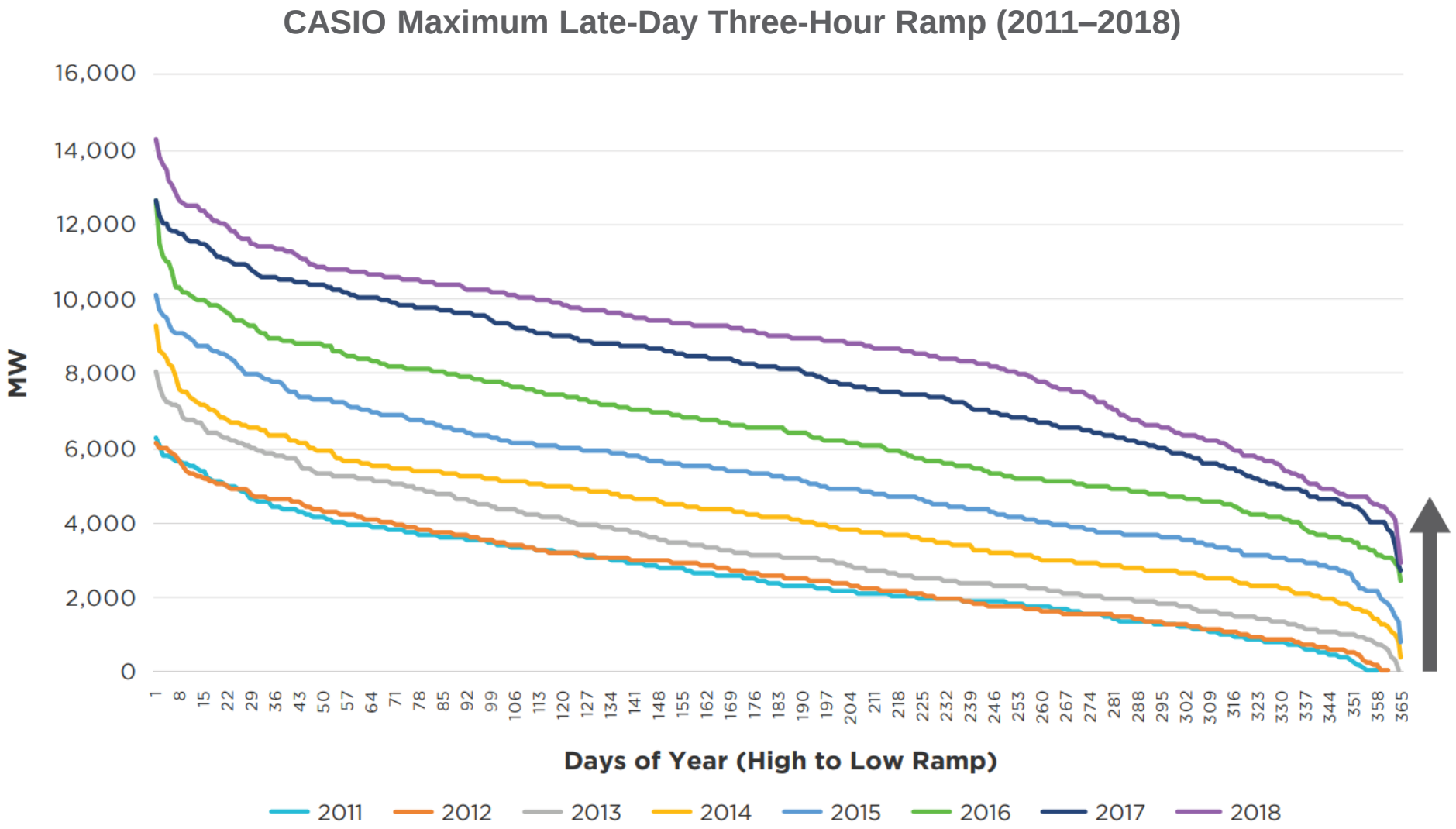

Sources: CAISO, ScottMadden analysis

# The Belly Grows Fatter...



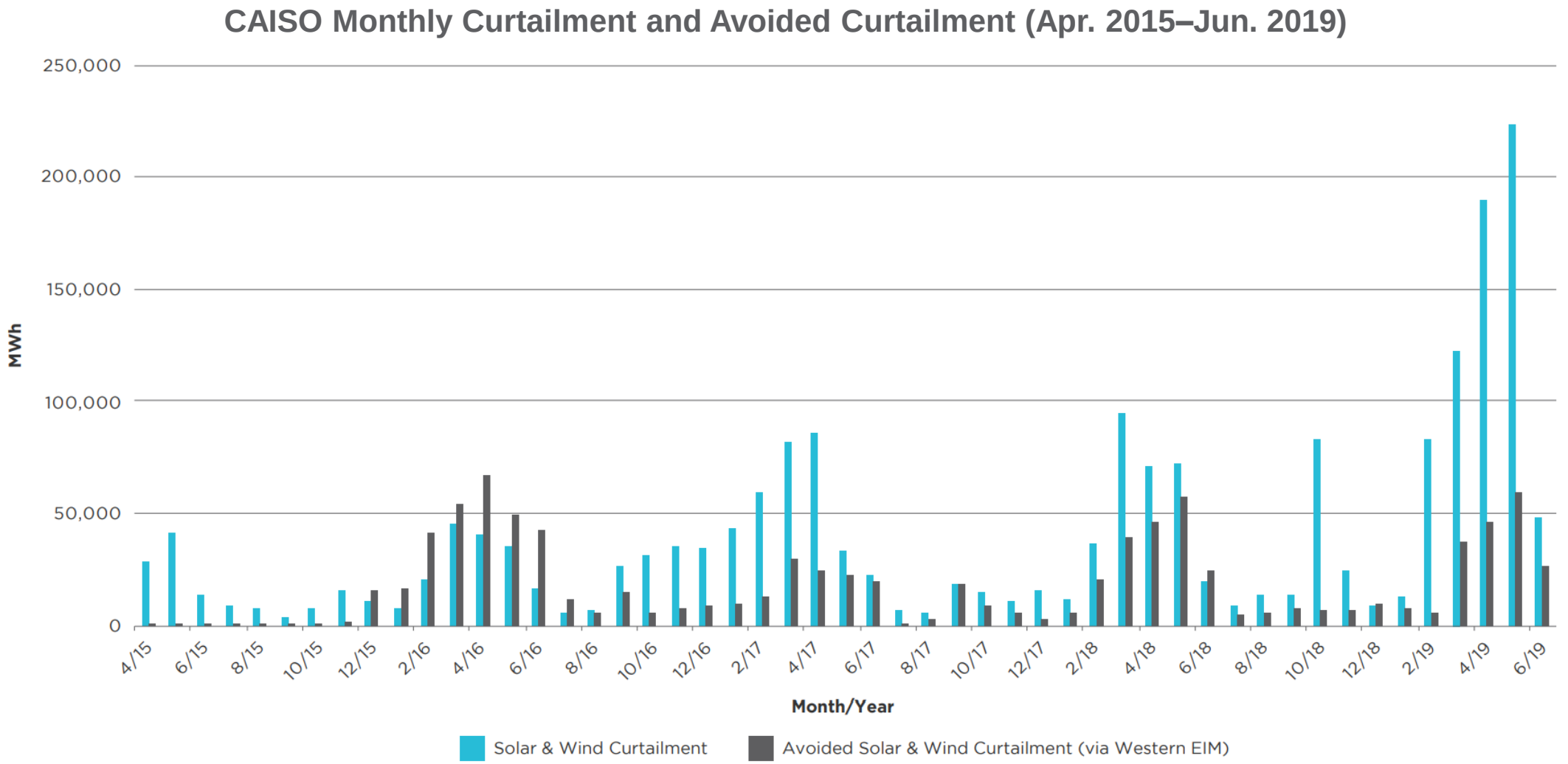

Sources: CAISO, ScottMadden analysis

# ...And the Neck Grows Longer




Sources: CAISO, ScottMadden analysis

# Renewable Oversupply Spikes in 2019

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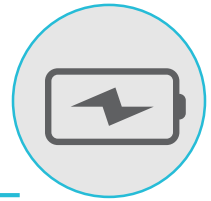
Sources: CAISO, ScottMadden analysis

# Duck Curve Mitigation Efforts

## Storage

Increase the effective participation of energy storage resources



## Western EIM Expansion

Expand the Western Energy Imbalance Market to include new participants

## Demand Response

Enhance DR initiatives to enable up and down adjustments in consumer demand when warranted by grid conditions

## Regional Coordination

Offer a more diversified set of clean energy resources through a reliable, cost-effective regional market

## Time-of-Use Rates

Implement TOU rates that match consumption with efficient use of clean energy supplies

## Electric Vehicles

Incorporate EV-charging systems responsive to changing grid conditions

## Minimum Generation

Explore operational opportunities to reduce minimum-operating levels for existing generators, thus making room for increased renewable production

## Flexible Resources

Invest in modern, fast-responding resources that can follow sudden increases and decreases in demand

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Source: CAISO

# Key Takeaways

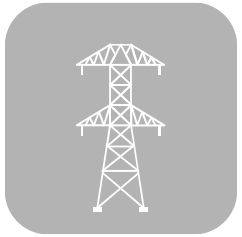
**California Duck Curve: Growing Fat in the California Sun**

1. The California duck curve, introduced by CAISO, illustrates how increasing solar capacity can change net load or the load served by dispatchable generation.

2. Driven primarily by utility-scale solar, the deepening “belly” of the duck curve poses operational challenges stemming from the risk of daytime oversupply and steep evening ramps for dispatchable generation.

3. Our analysis finds that duck curve impacts not only exceed original forecasts, but they are also pervasive and growing year-round.

4. CAISO is pursuing multiple solutions to operational issues presented by the duck curve—ranging from an energy imbalance market to storage—but more innovation may be needed.



# Western Energy Imbalance Markets

MARKETS AND MARKET OPTIONS CONTINUE TO GROW

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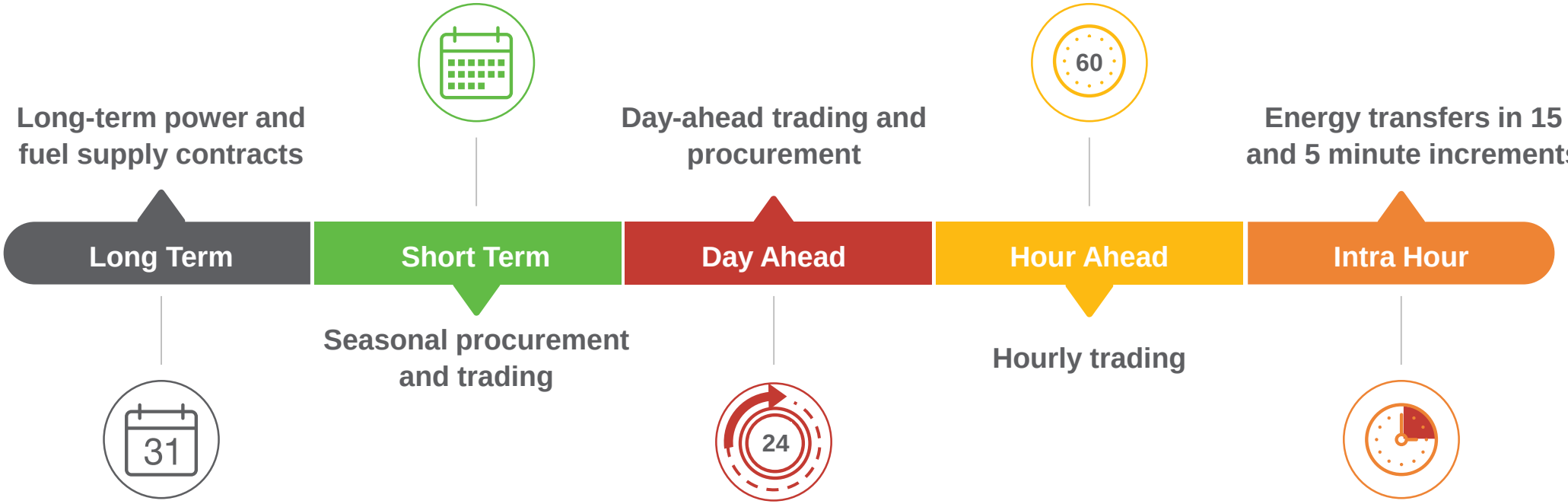
# Subba Nishtala

## Director

Subba Nishtala returned to ScottMadden in 2019 as a director, having previously worked for the firm for three years from 2006 until 2009. Subba comes to ScottMadden with more than 17 years of experience in the electric utility industry, having worked in a number of mission-critical roles and business transformations at Arizona Public Service (APS) and Progress Energy (now Duke Energy). These roles included director of strategic procurement, director for strategic initiatives on wholesale markets, director for fuels procurement and business support on the energy trading floor, and director for IT resource planning and strategy. Subba earned an M.B.A. from the University of North Carolina at Chapel Hill and an M.S. in civil engineering from North Carolina State University.

# What Is an Energy Imbalance Market (or EIM)?

**Resource Optimization**: The selection of optimal generation commitment and dispatch plans to serve electric load while maintaining reliability




**Solving Real-Time Imbalances:** EIMs' advanced systems automatically solve for, transact, and transfer the lowest-cost energy to serve real-time electricity demand across a wide geographic area.

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# Multiple Benefits from EIMs

**There are benefits for every stakeholder.**

## Operational Benefits

- Additional fuel and resource options to meet emergent needs
- Increased situational awareness across a wider geographic footprint

## Organizational Benefits

- Participating organizations make significant systems and operational improvements to join an EIM
- Active participation improves organizational knowledge of energy markets and regulatory policies

## Financial Benefits

- Use of lower-cost generation across a very broad footprint
- More efficient use of available transmission capacity

## Environmental Benefits

- Increased integration of renewable generation
- Reduced curtailment of renewables
- Displacement of electricity from fossil fuels

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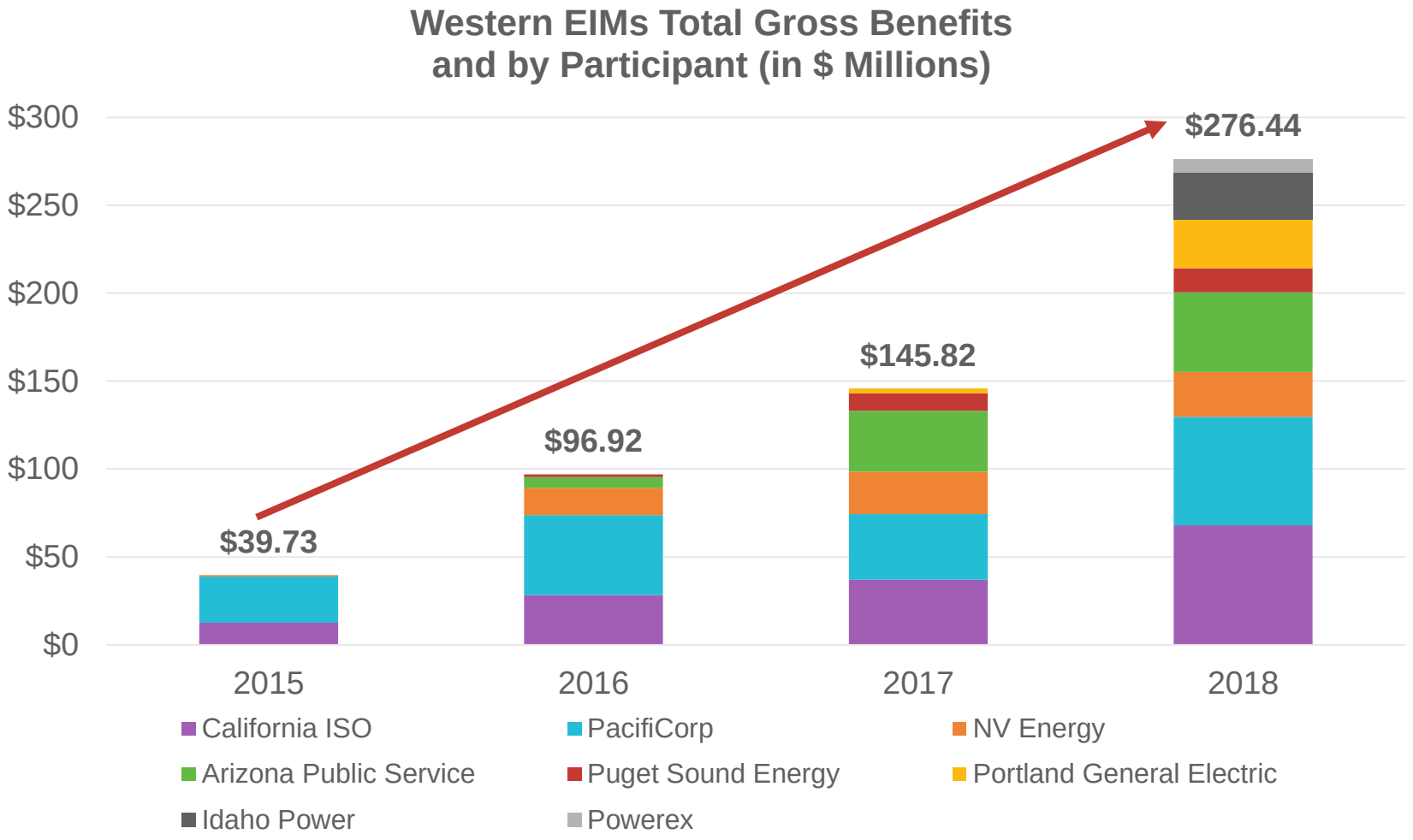
# What Drives Benefits Realization in EIMs?

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# Western EIM's Newest Members

**In recent months, four organizations have announced they are joining the Western EIM.**

## Bonneville Power Administration

**Timing**: Fall 2021 – Final Decision
**Generation**: 87.9 TWh
**Resources**: 11,416 MWs

## Tacoma Power

**Timing**: Joins in 2022
**Generation**: 3.1 TWh
**Resources**: 883 MWs

## Avista

**Timing**: Joins April 2022
**Generation**: 7.4 TWh
**Resources**: 1,858 MWs

## Tucson Electric Power

**Timing**: Joins April 2022
**Generation**: 11.9 TWh
**Resources**: 2,413 MWs

# SPP's Alternative – Western Energy Imbalance Service

**Southwest Power Pool's Western Energy Imbalance service launches in 2021.**

- Three western entities have committed to joining:

Western Area Power Administration

Operates in 15 states in southwestern U.S.
**Generation**: 10,500 MWs

TRI-STATE

Provides transmission and generation to co-ops in Colorado
**Generation**: 4,025 MWs

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Provides services to 9 western states
**Generation**: 6,860 MWs

**Entities who might have an interest in this market:**

**Transmission connection with SPP**

**Operations and interests aligned with SPP**

**Worked previously with SPP**

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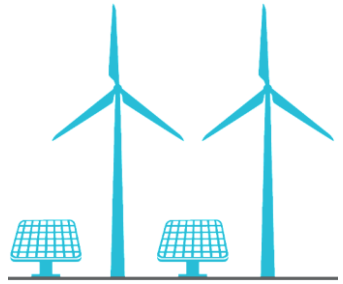
# Important Considerations for Entrants

**Western utilities now have a choice for imbalance markets. Some considerations in choosing an imbalance market include:**

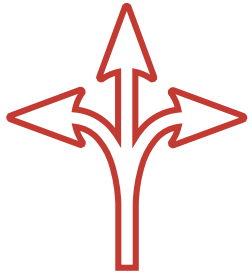
**Governance Structure**

**Cost and Ease of Participation**



**Diversity of Resources**

**Market Structure and Rules**



**Ease of Entry and Exit**

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# Key Takeaways

## Western EIMs: Markets to Optimize Resources

1. Expanding the market footprint by attracting non-RTO members to participate in such offerings as an EIM not only improves the integration and use of renewables, but it also adds an important operational tool for CAISO and SPP.

2. Western organized markets will continue to evolve to include new members and newly developed market services from CAISO and SPP. Entities should monitor regulatory impacts and changes in the underlying assumptions made when joining a market.

3. For participants in the western market, this evolution of energy markets presents new opportunities along with an increased focus on building organizational capabilities for managing market participation and forging regulatory relationships to maximize benefits.

4. Imbalance markets may represent a toehold for other reliability coordination services and markets or roles for CAISO and SPP. Each has left open the door for expansion into day-ahead markets, where larger dollar and energy volumes are transacted.

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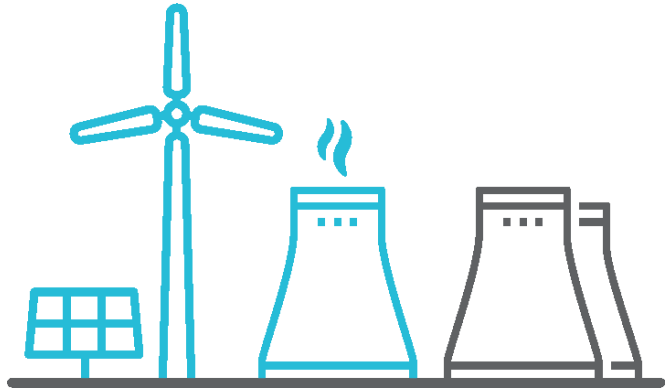

# One Step Forward, Two Steps Back

THE UNNOTICED LOSS OF CARBON EMISSIONS-FREE GENERATION IN THE UNITED STATES

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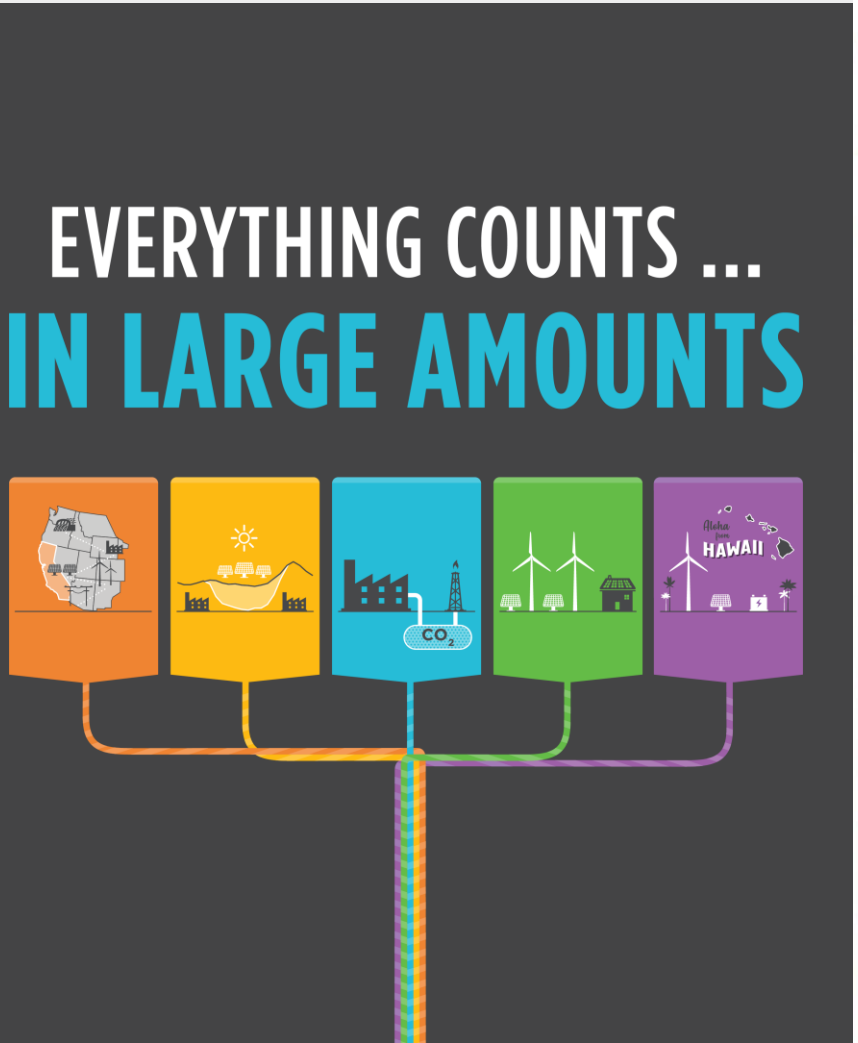


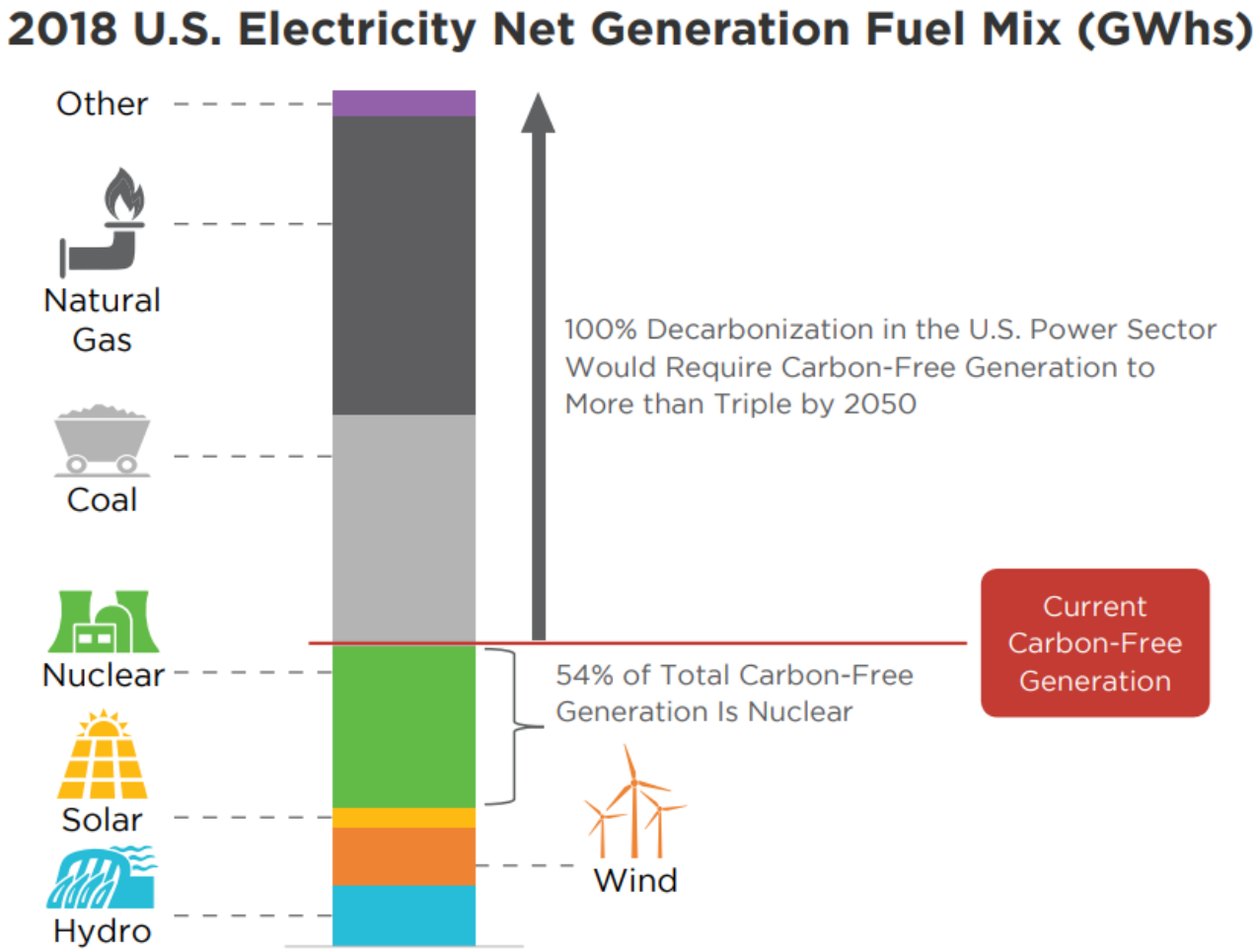

# Sean Lawrie

## Partner

Sean Lawrie joined ScottMadden in 2005. He possesses expertise across a broad range of functions within the energy generation sector. Sean has successfully completed more than 150 projects for over 30 energy generation clients in nuclear operations, fossil, and gas generation. Sean specializes in process improvement, organizational design and staffing, cybersecurity, and plant modernization. Prior to joining ScottMadden, Sean worked for several General Electric businesses, including GE Capital and GE Energy. He earned an undergraduate degree from the University of Guelph and an M.B.A. from the Babcock Graduate School of Management at Wake Forest University.

# The Issues

**Were the United States to meet Paris Agreement goals of 80% decarbonization of the entire economy by 2050, the U.S. electric generation sector would need to more than triple the amount of carbon-free generation currently provided by wind, solar, hydro, and nuclear.**

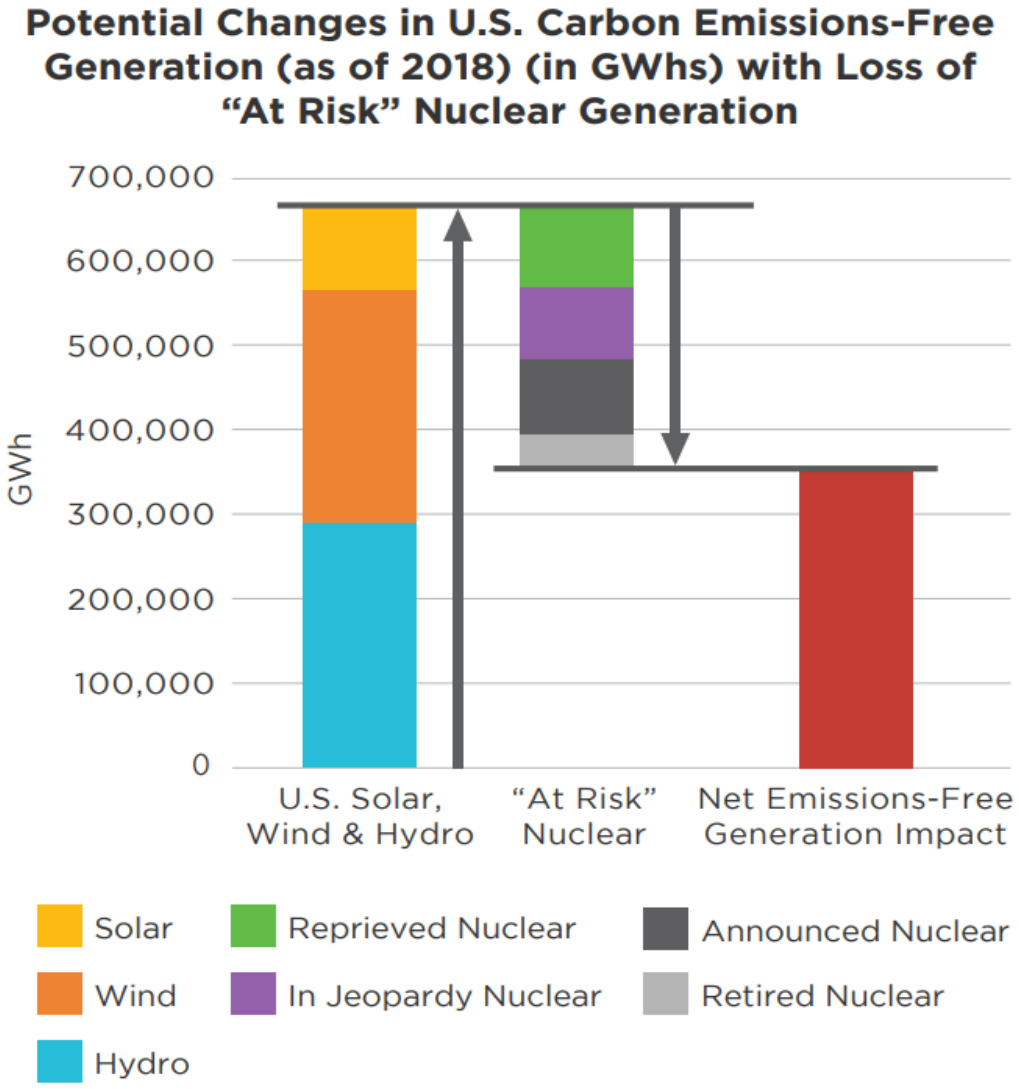



Note: 2050 target illustration based upon 2018 fuel mix

Sources: EIA; ScottMadden analysis

# The Original Analysis

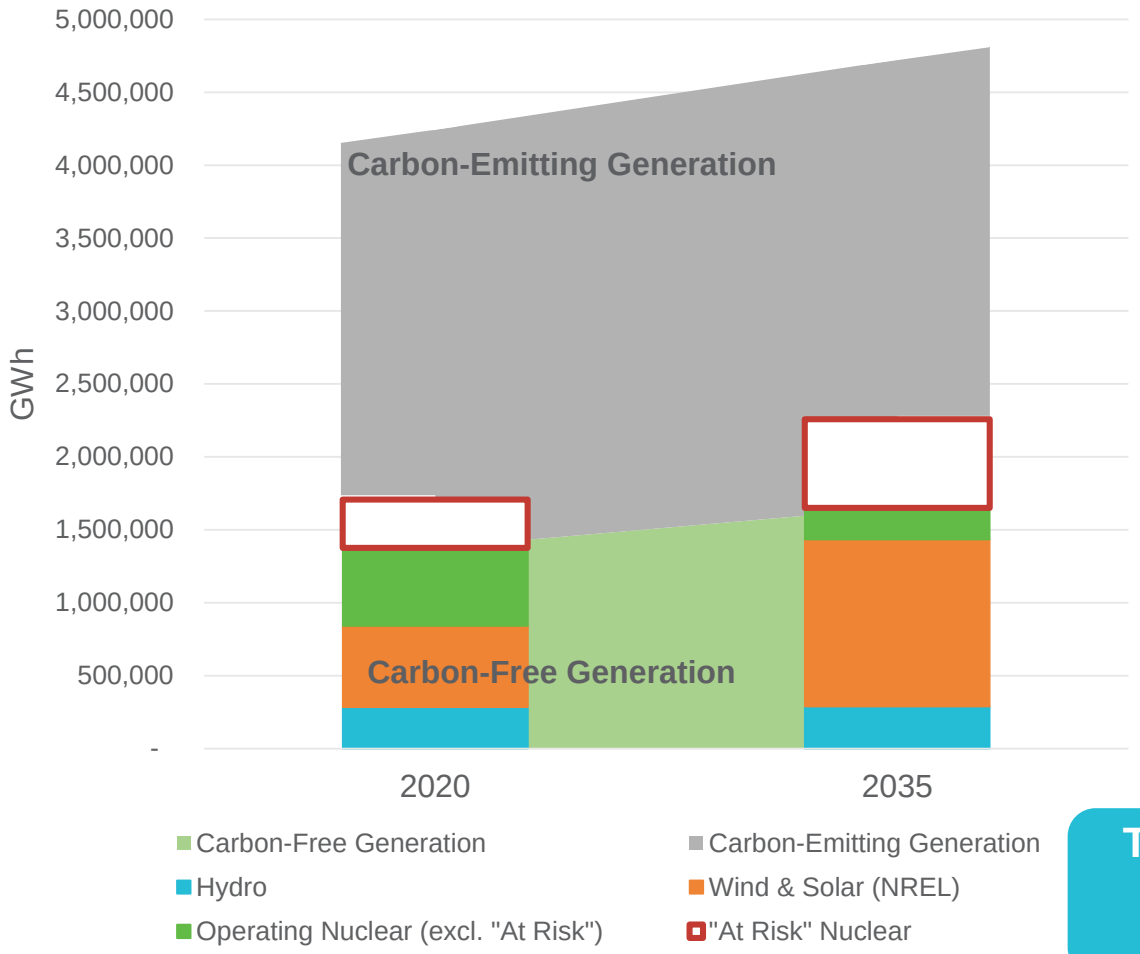
**Despite significant renewable capacity growth in the past decade, meaningful gains in carbon-free generation are in jeopardy due to the risk of early nuclear plant retirements.**




Sources: EIA; NREL; ScottMadden analysis

# The New Analysis

**Estimated U.S. Carbon Emissions-Free Power Generation (2020–2035) (in GWhs)**




## What Are Potentially "At Risk" Plants?

Announced retirement

Owner has indicated possible early closure

Plants "reprieved" via state support

Plants whose license expires in the next 20 years

**Total carbon-free generation barely grows 20% by 2035; a far cry from the more than doubling of such generation needed to meet Paris goals.**

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Sources: NEI; EIA; NREL; ScottMadden analysis

# What Can Be Done?

1. **Recognize Value**
   Recognize the value of the current nuclear plants toward decarbonization of the power sector, both financially and emotionally
2. **Accelerate Wind and Solar**
   Accelerate construction of wind and solar to meet renewable portfolio standards (RPS) or greenhouse gas emission reduction goals
3. **Small Modular Reactors**
   Support the development of small modular reactors which have gained renewed interest as a potential, scalable non-emitting resource
4. **Modernization**
   Continue modernization efforts which have improved the efficiency and effectiveness of existing plants, enabling a significant reduction in operating expenses

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# Key Takeaways

**The Unnoticed Loss of Carbon Emissions-Free Generation in the United States**

1. More than 74,000 MWs of nuclear capacity face early retirement, a significant potential reduction in carbon-free power production.

2. Licenses of 35 nuclear reactors will expire in the next 15 years (2020–2035), jeopardizing the nation's ability to achieve a deep, realistic, near-term decarbonization.

3. Early retirements of all "at risk" nuclear plants would represent a giveback of 607,122 GWhs in 2035 or roughly 16% of 2018 electricity sales.

4. This loss of nuclear generation represents more than 430 million tons of $CO_2$. This is equivalent to the total emissions of roughly 85 million cars, or one-third of all cars on the road today.

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# Greg Litra

## Partner and Director of Research

Greg Litra is a partner with ScottMadden, with principal expertise in financial, economic and regulatory analysis, strategic planning, corporate governance, risk management, and transaction support. He specializes in the energy and utilities business sectors. He also leads the firm's energy, clean tech, and sustainability research activities and spearheads the publication of ScottMadden's Energy Industry Update. Prior to joining the firm in 1995, Greg was a corporate lawyer and business litigator on Wall Street and in Atlanta. As a lawyer, Greg worked with utilities, investment banks, and other companies in equity and debt offerings, project and secured financings, corporate litigation, and transaction due diligence.

# YOUR PROJECT TEAM

**Cristin Lyons**
Partner and Energy Practice Leader

**Greg Litra**
Partner and Director of Research

**Sean Lawrie**
Partner

**Subba Nishtala**
Director

**Paul Quinlan**
Clean Tech Manager

**See the link below for the latest Energy Industry Update**

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