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Energy Industry Update

The Waiting (Is the Hardest Part)

Webinar | November 15, 2023

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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. Since joining the firm in 1999, she has consulted with myriad clients on issues ranging from process and organizational redesign to merger integration to project and program management. Cristin led the firm's grid transformation practice for three years before becoming the energy practice lead. She is 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.

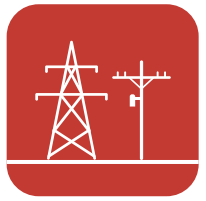
Energy Is Who We Are

ScottMadden is a management consulting firm with 40 years of deep, hands-on experience. We deliver a broad array of consulting services—from strategic planning through implementation—across the energy utility ecosystem.

Our energy practice covers the following areas:

GENERATION

RATES & REGULATION



TRANSMISSION & DISTRIBUTION

NATURAL GAS

GRID EDGE

ENERGY CORPORATE SERVICES

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TOPIC #1

Denmark's High Aspirations

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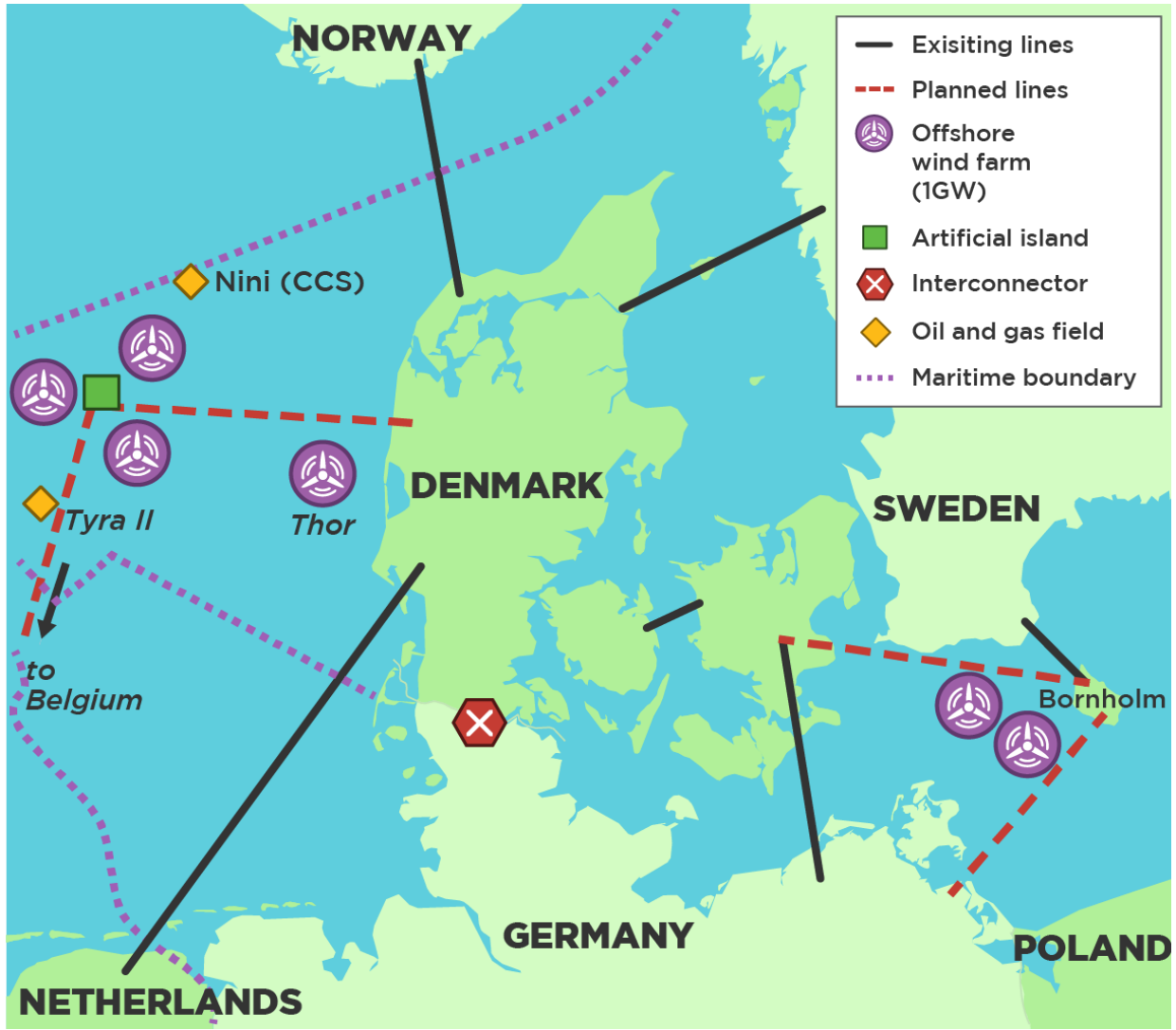
Kevin Hernandez

Partner

Kevin Hernandez is a partner with ScottMadden where he specializes in grid transformation, energy storage, and transportation electrification. Since joining the firm in 2012, he has consulted with a variety of utility and industry clients on issues ranging from fleet electrification to EV infrastructure planning. Kevin earned a B.A. from the University of Tennessee, Knoxville, an M.A. from the U.S. Navy War College in Newport, Rhode Island, and an M.B.A. from the Fuqua School of Business at Duke University. He is also an eight-year veteran of the United States Navy.

Denmark Is at the Center of Europe's Clean Energy Transition

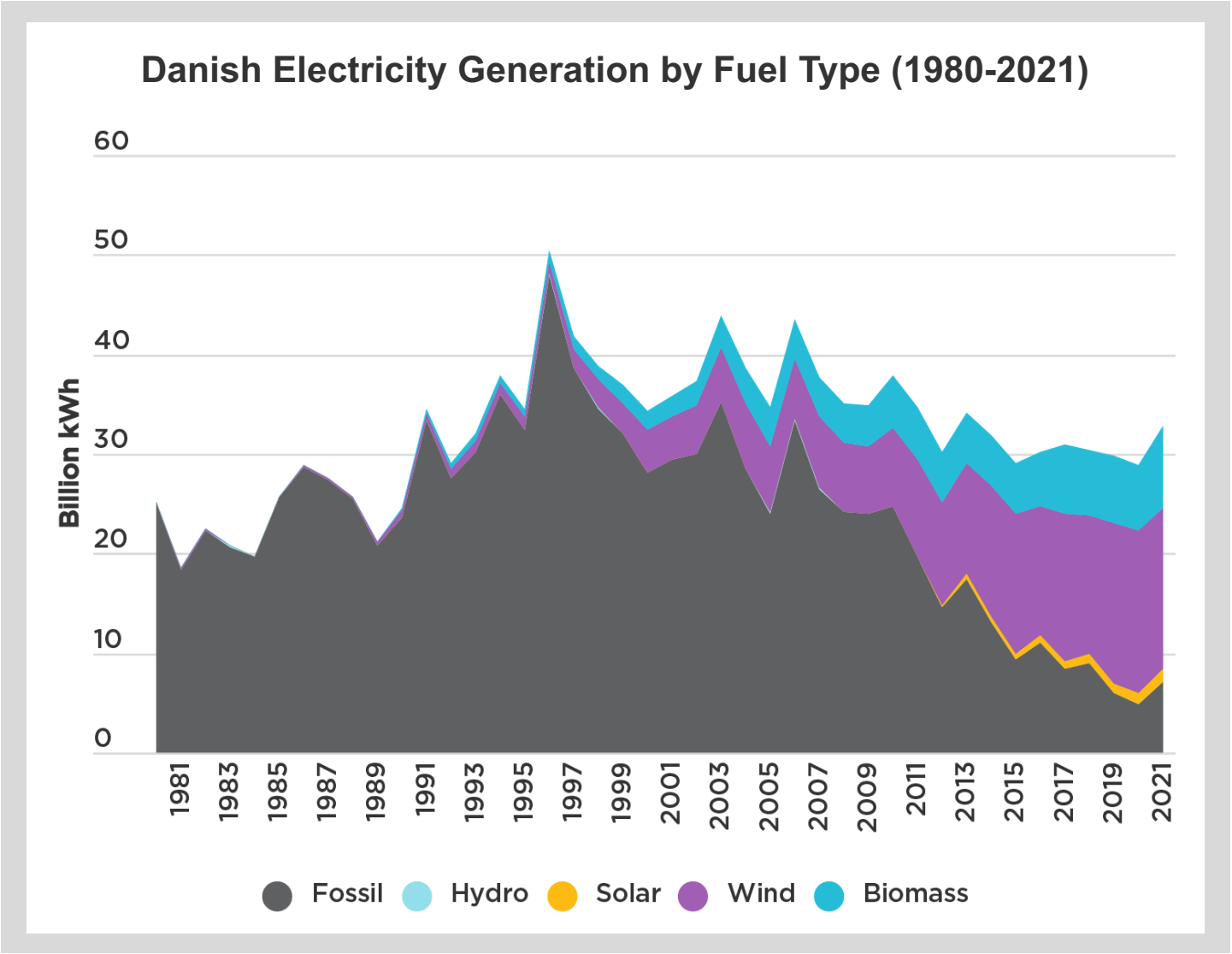
- More than 3,700 miles of transmission lines
- 5 international HVDC ties
- 7 additional interconnections
- Hourly winter peak demand 5.4 GW in 2023 – similar to a midsize U.S. state
- Goal of **110%** by 2050



Source: Danish Energy Agency, S&P Global Commodity Insights

Renewables Have Dominated Since the Mid-1990s

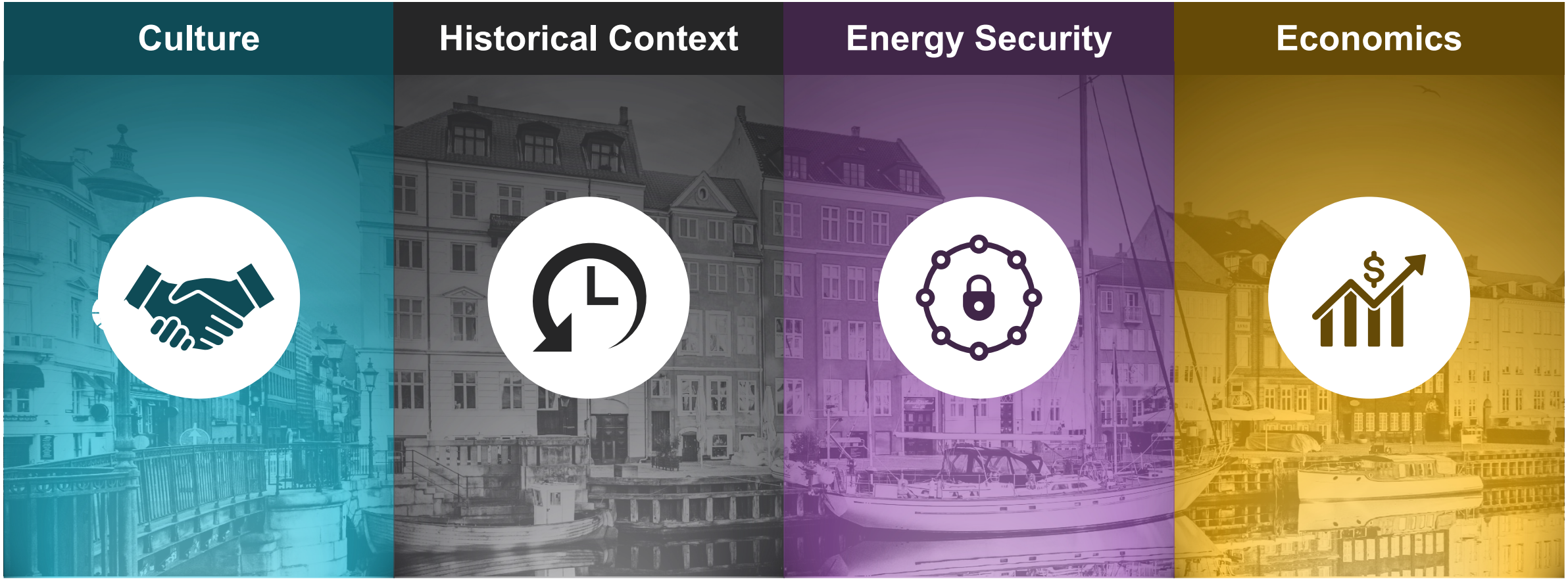
The Ostend Declaration, signed on April 24, 2023, expands cooperation in development of clean energy to include France, Ireland, Luxembourg, Norway, and the United Kingdom, setting a target of 120 GW of offshore wind by 2030 and 300 GW by 2050.



Source: U.S. Energy Information Administration

Key Factors

Four principal factors are driving its approach to decarbonization and energy transition:



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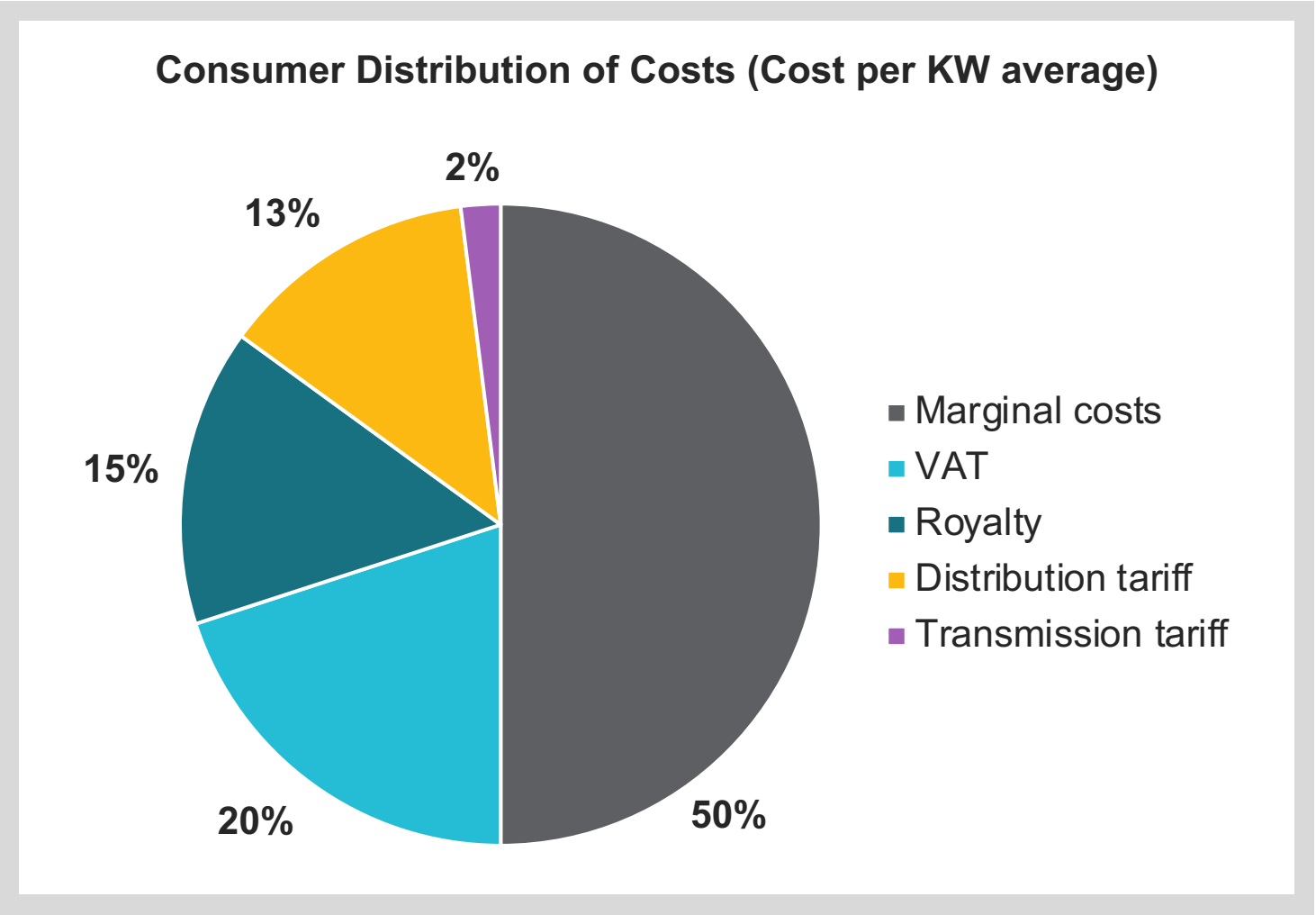
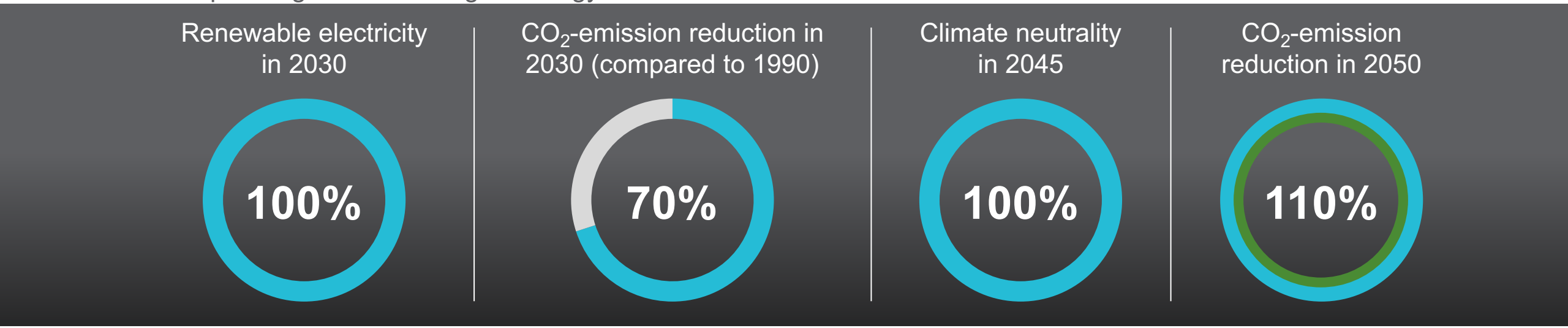
Danish Retail Electricity Cost Distribution



Source: Energinet

Decarbonization as an Economic Driver

- **Green economy as economic driver**
  - **Energy infrastructure to decarbonize Denmark and to export**
    - Export of energy
    - Relocation of select industries: wind, data centers
    - Export of green technologies/energy



  - **Crossroads of supply**
  - **Possible shift in European economic power**
  - **Shared view across government, the private sector, and universities**

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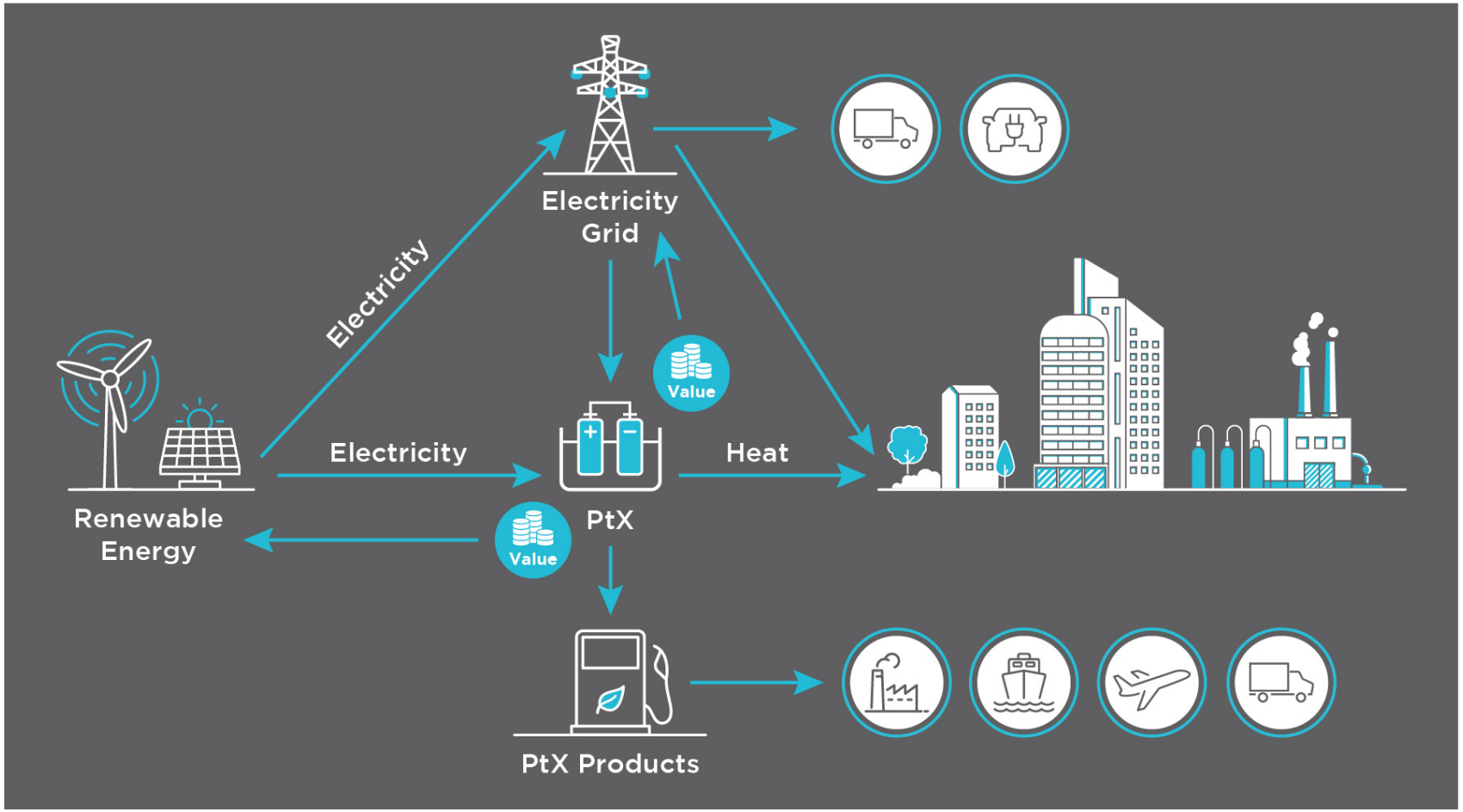
P2X and the Circular Economy

"**Green electrons** as input and **green molecules** as output"



Product Examples:

- **Hydrogen** (H_2)
- **Ammonia** (NH_3)
- **Methanol** (CH_3OH)
- **Methane** (CH_4)
- **Kerosene** ($C_{12}H_{26}$–$C_{15}H_{32}$)

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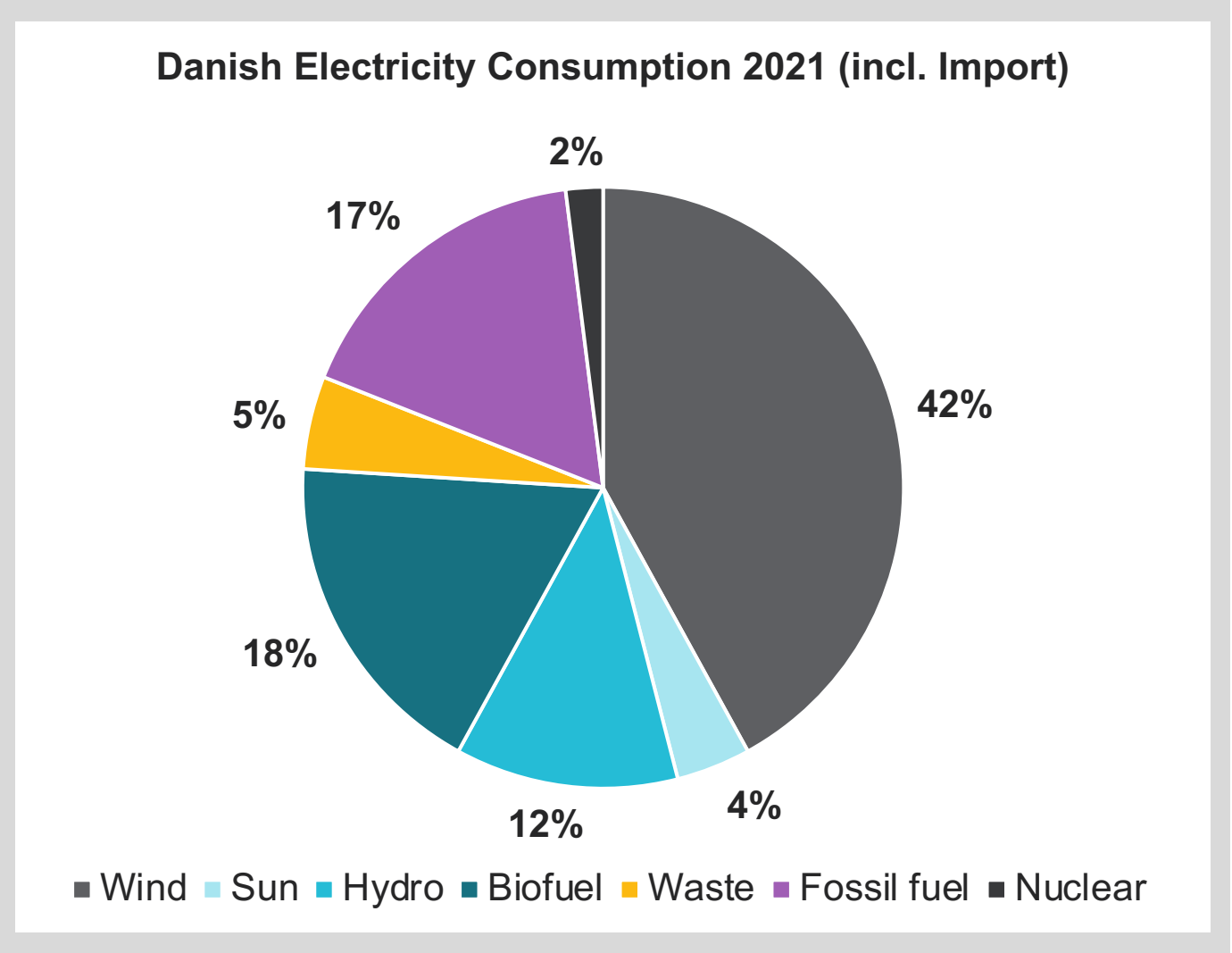
Energy Security

- Energy-only wholesale market with Danish resources and interties to neighbors
- Diversity of supply (including nuclear energy from Sweden)
  - Enabled management of intermittency
  - Grid as battery
  - Interties enable balancing, facilitated by NordPool market
  - Storage not a factor
- Very good reliability—they have never shed load
- Most distribution is underground
- Investments both in wires and generation enabled by the cultural construct



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Key Takeaways

What does this mean for U.S. utilities?

Broad commitment is needed

- Explore partnerships across multiple stakeholders – build consensus
- Consider how green industry can benefit a region, including workforce development and export potential

Through electrification, the energy industry can lead an economy-wide transition

- Presents opportunity to do well and do good
- Consider energy as economic development vs. energy for economic development
- Determine where energy fits into a broader value chain

Consider value chain opportunities through hydrogen or e-Fuels

- Prioritize decarbonization of generation through other means
- Identify the best-use cases for hydrogen, understanding that it is an energy-intensive way to decarbonize

Utility industry can reposition itself as driving the clean energy transition

- Be willing to move forward without knowing all the answers
- Enable risk-taking and occasional failure in service to the larger strategy
- Facilitate alignment across the various stakeholders that will be needed to facilitate this transition

TOPIC #2

FERC Developments

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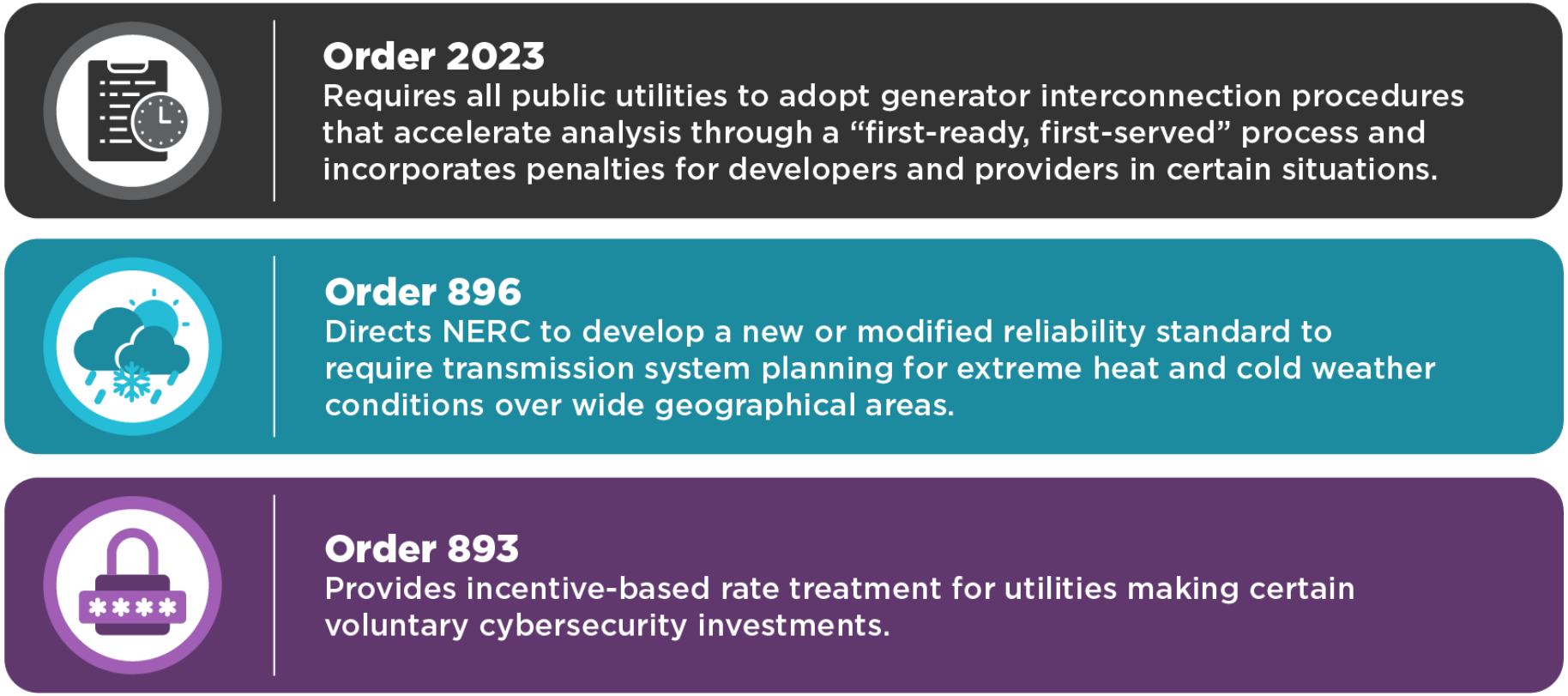
Josh Kmiec

Partner

Josh Kmiec joined ScottMadden in 2014 after receiving an M.B.A., with concentrations in consulting, sustainability, and marketing, from the University of North Carolina Kenan-Flagler Business School. His experience includes work in grid transformation and integration of distributed energy resources, regulatory reform, grid modernization, energy efficiency, post-merger integration, and electric vehicles. Prior to working at ScottMadden, Josh served as an intelligence officer in the U.S. Air Force for eight years. In addition to an M.B.A., he received an M.A. in international relations from the University of Oklahoma and a B.A., with a major in political science and a minor in history, from the University of Massachusetts – Amherst.

FERC Homes In on Transmission

FERC issues three significant orders addressing interconnection, weather preparedness, and cybersecurity.



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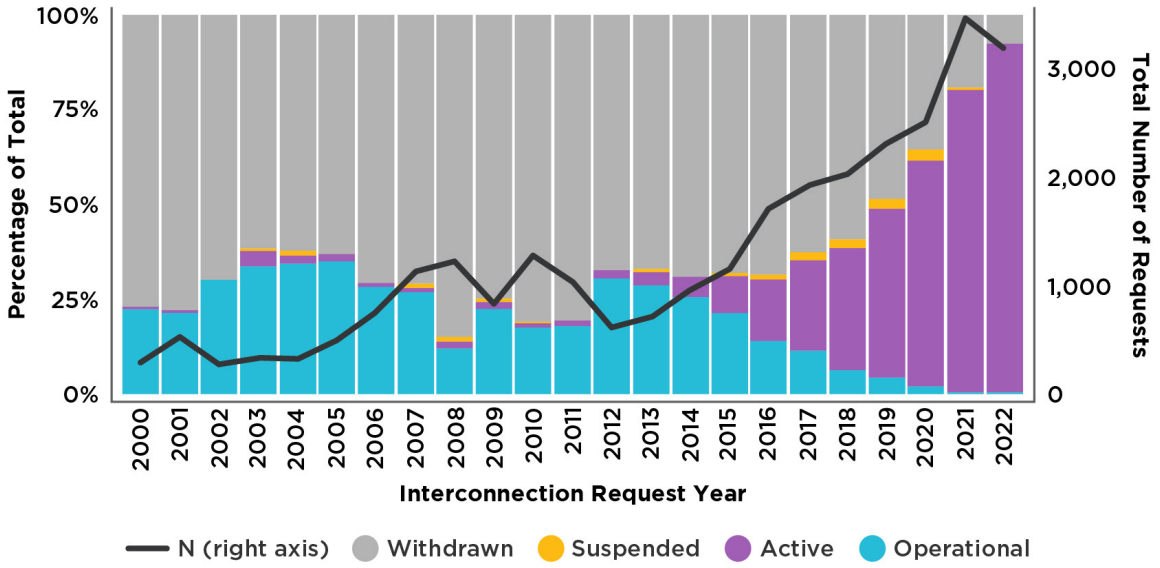
The State of Interconnection in the United States

Challenge: Only 21% of all projects proposed from 2000-2017 had reached commercial operations by the end of 2022—72% had withdrawn from queues.

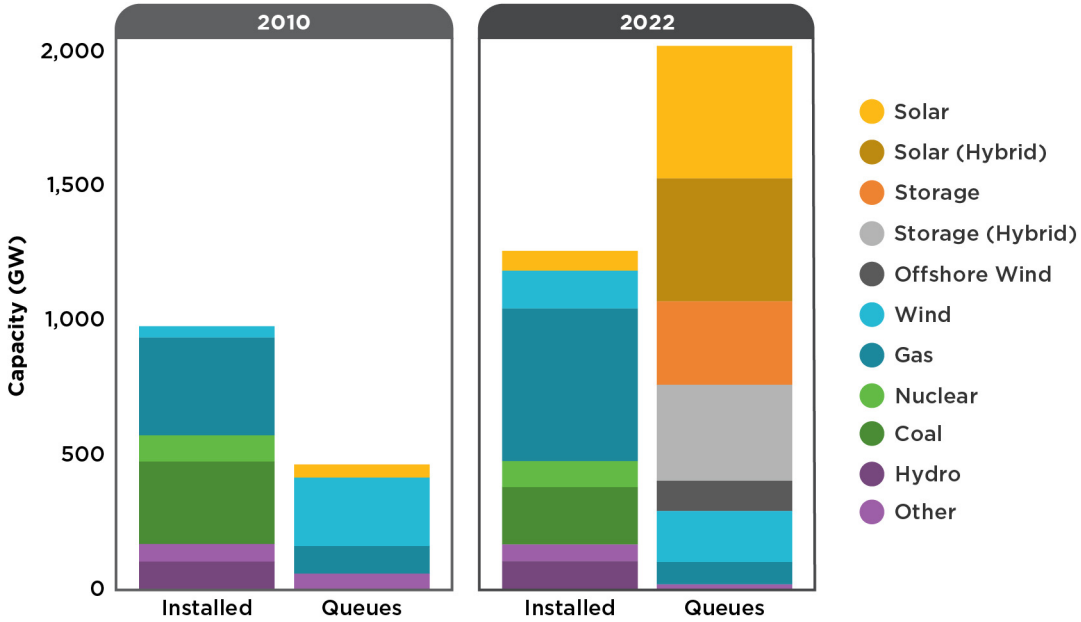
Projects Proposed for Transmission Interconnection (2000-2017) and Their Disposition (as % of Total) of Year-End 2022



Note: Limited to data from 7 ISO/RTOs and 26 utilities

Source: Lawrence Berkeley National Laboratory

U.S. Installed Capacity vs. Capacity in Active Interconnection Queues (Year-End 2010 vs. 2022) (GW)



Note: (a) Hybrid storage in queues is estimated for some projects. (b) Total installed capacity from EIA-860, December 2022. (c) RTO installed capacity from FERC Annual State of the Markets Report (https://www.ferc.gov/media/report-2021-state-markets).

Source: Lawrence Berkeley National Laboratory

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Order 2023

FERC Order 2023: Seeks to improve process and cost allocation while reducing speculative applications.

First-Ready, First-Served Cluster Process

- 150-day cluster study process
- Requests submitted within time window are processed together

Increased Financial Commitments and Commercial Readiness Requirements

- 90% site control required at time of interconnection request

FERC Order 2023 may bring meaningful improvements to some interconnection queues, but it is likely not the watershed moment some have touted it as.

Cost Allocation

- Cluster study costs may be allocated on a per-capita basis and pro rata basis
- Network upgrade costs allocated based upon “proportional impact”

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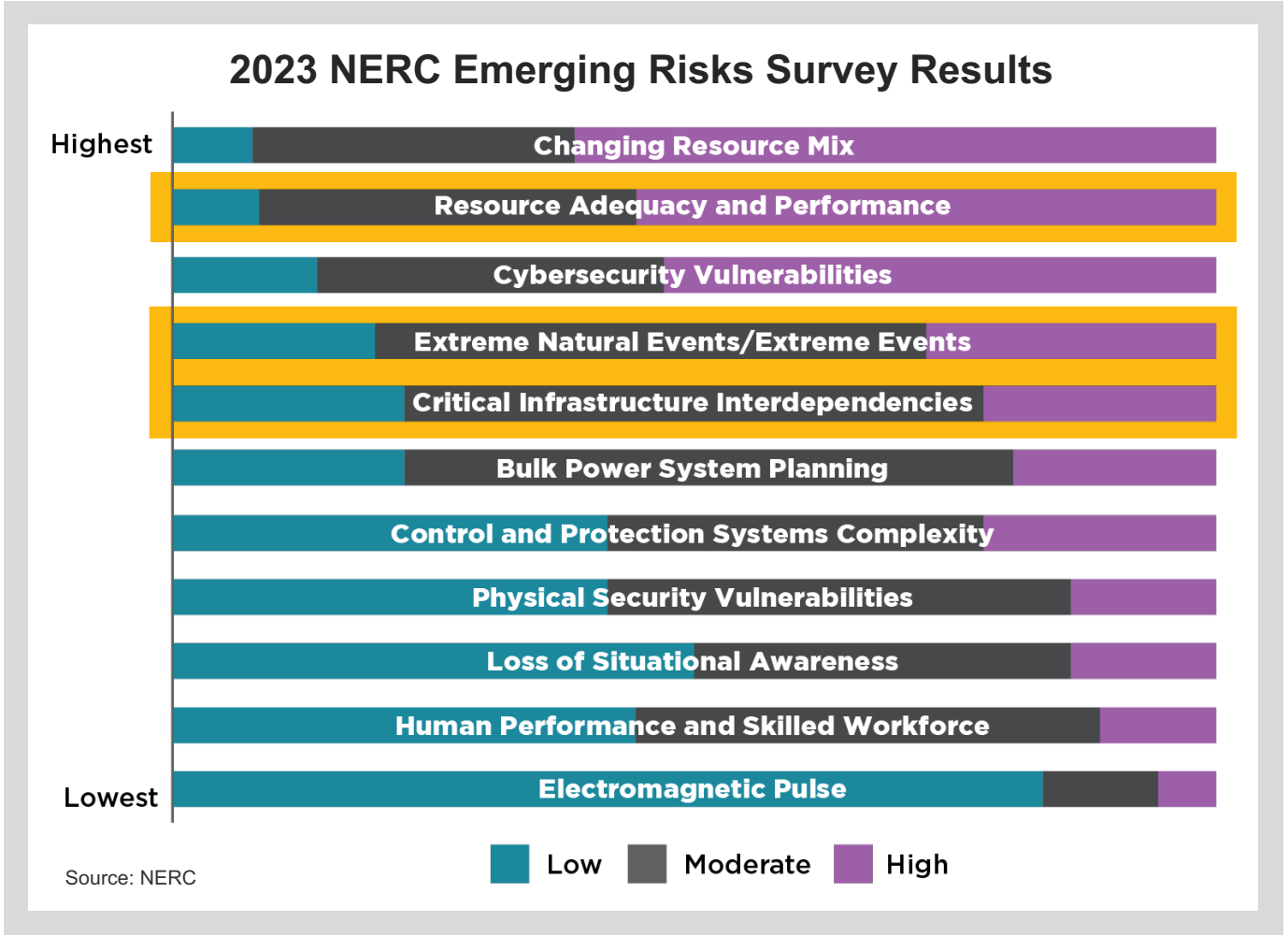
Sources: Order 2023; Troutman Pepper; Foley & Lardner; Bracewell; Midcontinent ISO

Order 896 Overview

FERC has found that extreme weather events have occurred with greater frequency in recent years and are projected to occur with even greater frequency in the future.

Order 896 directs NERC to developing an extreme weather planning standard that requires:

- A new or modified reliability standard that includes transmission system planning for extreme heat and cold (EHC) weather conditions over wide geographic areas
- EHC weather "benchmark events" and "benchmark planning cases"
- Studies examining the impact of concurrent transmission and generation failures
- Corrective action plans when the standard is not met



NERC's compliance filing is due in December 2024. The updated standard becomes mandatory no more than a year after FERC approves it, although NERC may authorize a phased-in implementation.

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Order 893 Overview

The Infrastructure Investment and Jobs Act of 2021 (IIJA) directs FERC to provide a framework for incentives:

- For utilities' investments in advanced cybersecurity technologies
- For participation in cybersecurity threat information-sharing programs

In April 2023 FERC released Order 893, which provides:

- A "carrot" in the form of incentives for proactive investment in Advanced Cybersecurity Technology (as defined in the order)
- Augments FERC's traditional "stick" approach, which focuses on compliance

Advanced Cybersecurity Technology (Defined)

"Any technology, operational capability, or service, including computer hardware, software, or a related asset, that enhances the security posture of public utilities through improvements in the ability to protect against, detect, respond to, or recover from a cybersecurity threat (as defined in section 102 of the Cybersecurity Act of 2015)"

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Sources: Order 893; Morgan Lewis; Davis Wright Tremaine; Akin Gump Strauss Hauer & Feld; ScottMadden analysis

Order 893 Eligibility

Eligible Utilities	Eligible Investment Types
▪ Both public and non-public utilities and ▪ Have or will have a cost-of-service FERC-approved rate	▪ "Materially improve" cybersecurity through investment or threat information-sharing program participation ▪ Are voluntary, i.e., not already mandated or agreed to in some way

Incentive Offered

- Regulatory asset treatment for eligible expenses (including O&M, labor costs, implementation costs, network monitoring, training costs, and SaaS expenses)
- Deferred cost recovery of investment, allowing costs into rate base with allowed return on unamortized portion
- Amortization of regulatory asset over period up to five years

Order 893 incents innovation and collaboration as it relates to cybersecurity; however, FERC's case-by-case consideration of applicable investments and incentive awards will be watched by utilities for signals of preferred investments.

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Sources: Order 893; Morgan Lewis; Davis Wright Tremaine; Akin Gump Strauss Hauer & Feld; ScottMadden analysis

Key Takeaways

FERC orders in 2023 may bring meaningful improvements, but there's potentially much more to come.

Orders aim to address current challenges

- Orders 2023, 896, and 893 all serve to guide utilities to solutions to problems being faced today
- The requirements, guidance, and incentives included in the orders address real problems, some of which have been long standing, but none are a panacea for the myriad challenges the transmission grid will face in the decades to come

Implementation will not be immediate

- Compliance with Order 2023 will not be required until 2024, standards resulting from Order 896 will not be mandatory until at least 2025, and clarity on Order 893 will take place gradually over time
- Utility and ISO/RTO efforts to comply with these Orders will be on top of current ongoing efforts such as Orders 881 and 2222 compliance

Transformative orders and legislation may be on the horizon

- Orders considering issues of long-term transmission planning and cost allocation may come in 2024
- The elephant in the room remains, permitting reform for infrastructure siting, and Congress has several bills under consideration. But movement on those proposals is halting

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TOPIC #3

Virtual Power Plants

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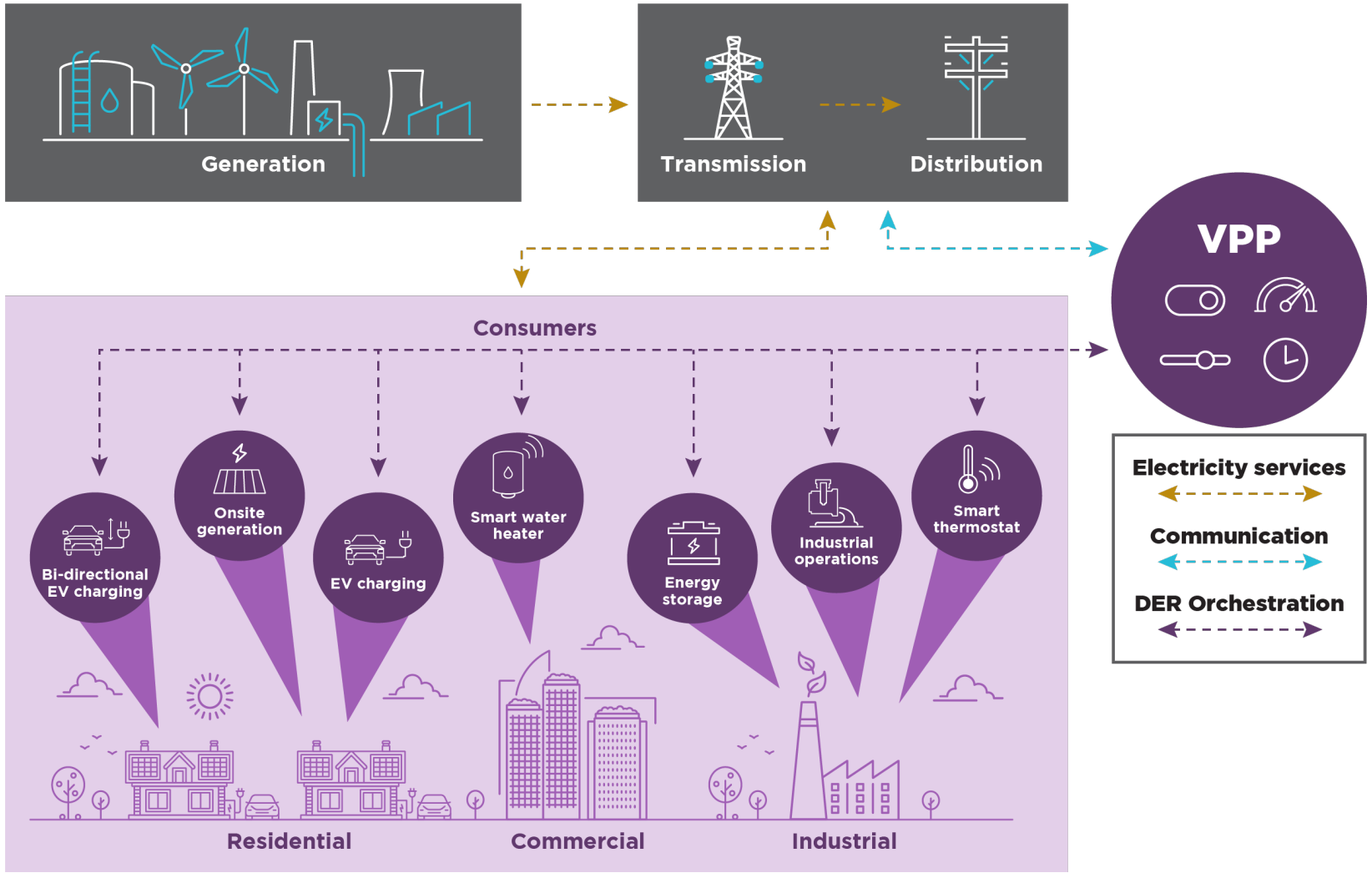
Sarah Vondracek

Manager

Sarah Vondracek first joined ScottMadden in 2019 as a summer intern and then began full-time in 2020 after receiving an M.B.A., with a concentration in sustainable enterprise, from Kenan-Flagler School of Business at the University of North Carolina at Chapel Hill and a master of environmental management, with a concentration in energy and environment, from the Nicholas School of the Environment at Duke University. Before graduate school, she worked as an environmental specialist at NRG Energy where she managed the chemical storage and water compliance programs for approximately 20 electricity generating stations and tracked environmental regulations. In addition to her masters degrees, Sarah holds a B.A. in biology and environmental studies from Colgate University.

What Are Virtual Power Plants (VPPs)?

VPPs are aggregations of distributed energy resources that can balance power supply and demand like a traditional power plant.



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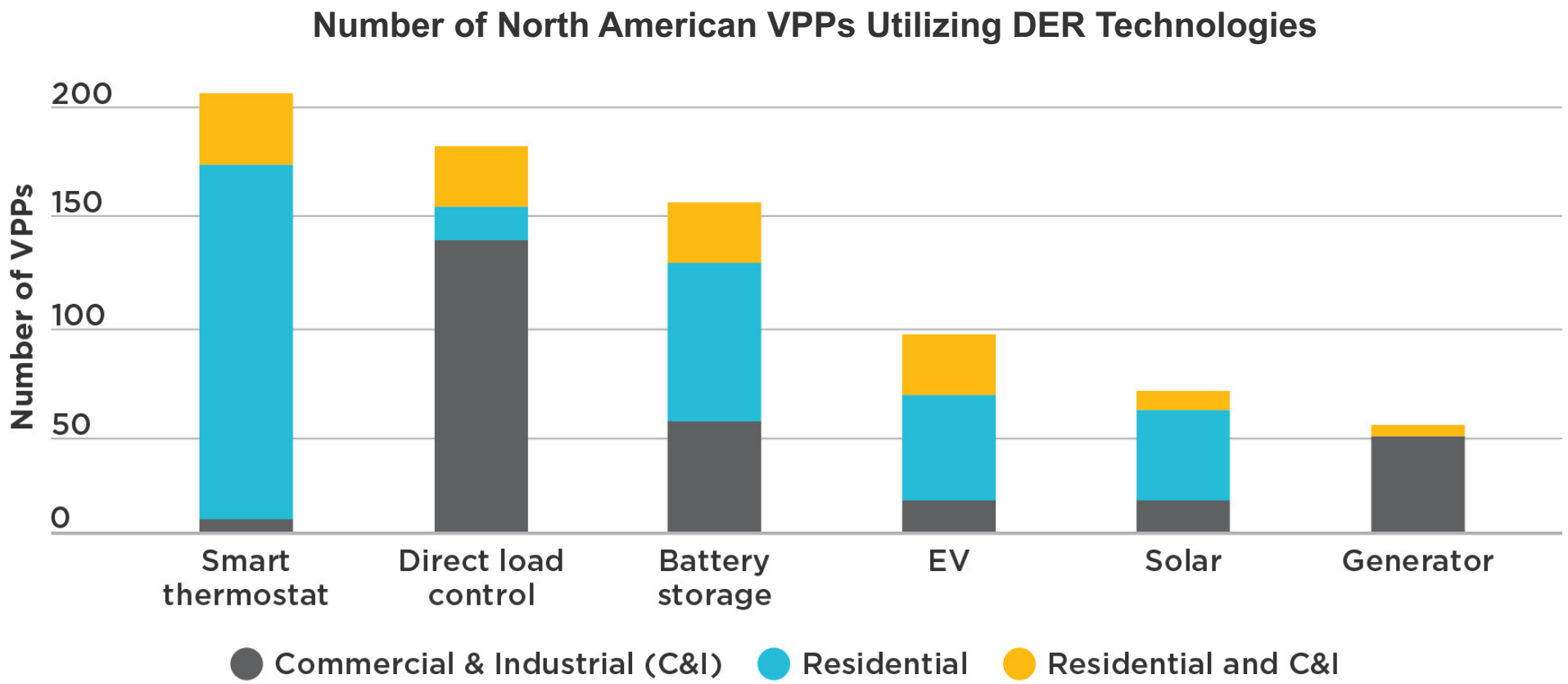
VPPs Are Diverse and Already Providing Grid Services



DOE estimates current VPP capacity in the United States to be 30 GW to 60 GW.

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Sources: Wood Mackenzie; DOE VPP Liftoff Report

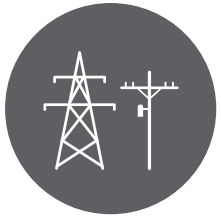
VPPs Offer Broad Value Proposition

Resource Adequacy

Affordability

Reliability & Resilience

Decarbonization & Air Pollution Reduction



T&D Infrastructure Relief

Community Empowerment

Versatility & Flexibility

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Source: DOE VPP Liftoff Report 2023

Many Drivers Create Strong Tailwinds for VPP Growth

- Early Success
- Market Access
- Diverse Technology
- Federal Tax Credits
- Critical Mass
- Reliability Concerns

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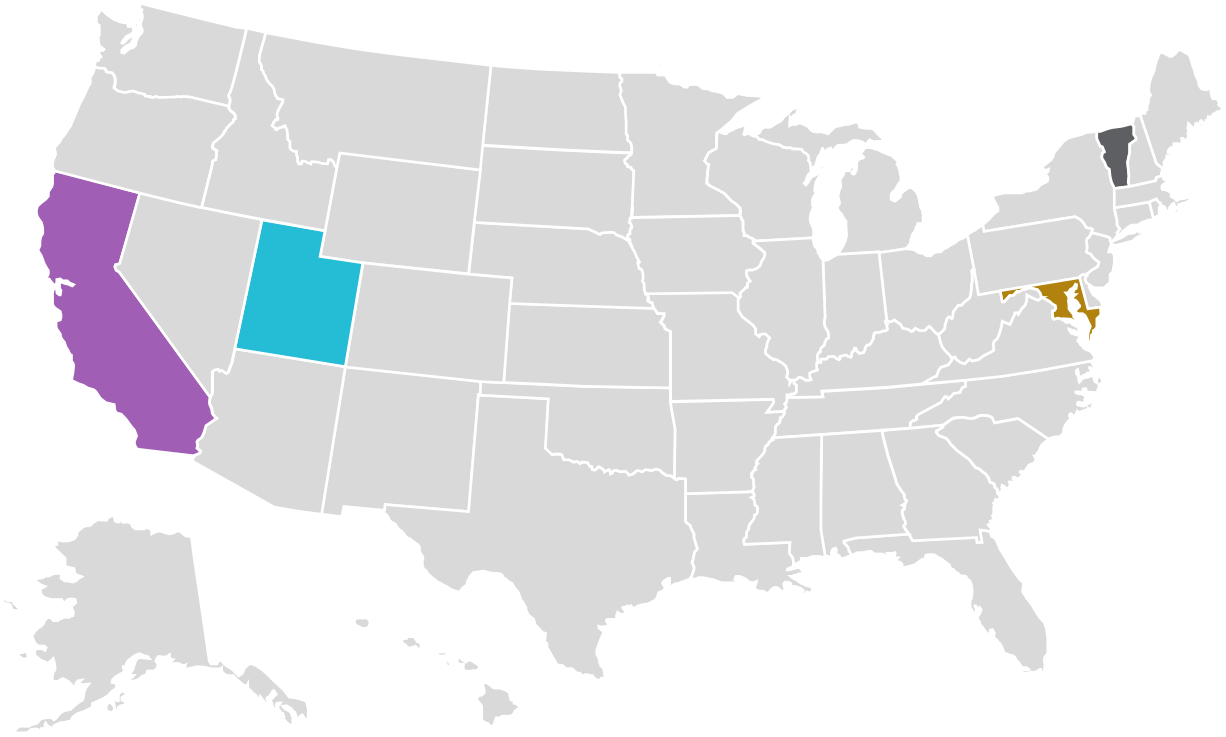
VPPs Span Geographies and Technologies (Some Examples)



Utah

Rocky Mountain Power's customers can receive an upfront incentive and ongoing bill credits to install batteries integrated with customer-sited solar PV.

Vermont

GMP has ~5,000 batteries located at ~3,000 customer homes to provide energy during peak demand periods. In August 2023, GMP received approval to expand the Tesla Powerwall program.

California

SDG&E's pilot VPP leverages multiple brands and types of devices and successfully provided support to the grid during three peak events in August 2023.

Maryland

BGE's Smart Residential EV Program uses vehicle-based telematics to support an electric vehicle time-of-use rate.

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Source: ScottMadden Research

Key Takeaways

VPPs have evolved from basic demand response programs to dynamic offerings capable of leveraging a diverse range of technologies, including rooftop solar PV, battery storage, and electric vehicles.

VPPs Are Proliferating Today

- Electric utilities are enrolling customers and deploying DERs as VPPs in large numbers across the country
- Implementation of FERC Order 2222 will expand market access for VPPs by allowing aggregated DERs to participate in wholesale markets

Strong Tailwinds Suggest Future Growth

- Multiple drivers—ranging from success of early programs to growing reliability concerns—are creating strong tailwinds for further growth of VPPs
- In addition, DERs are also poised for significant growth in the coming years. For example, behind-the-meter batteries could grow from 2 GW to 27 GW by 2030

VPPs Offer Broad Value Proposition

- Based on the availability of DERs in a service territory, VPPs can function as demand, generation, and storage
- VPPs are also highly configurable and capable of being designed to deliver grid services tailored to a specific time, location, and scale. In addition, VPPs can be adapted over time to meet the changing needs of the electric grid

Utilities Can Take Steps To Prepare for More VPPs

- Utilities can introduce or expand VPPs with a strategic plan focused on:
  - Assessing how VPPs may provide value
  - Engaging with regulators and market stakeholders
  - Identifying proactive investments that prepare systems for high DER penetrations

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Your Webinar Presenters

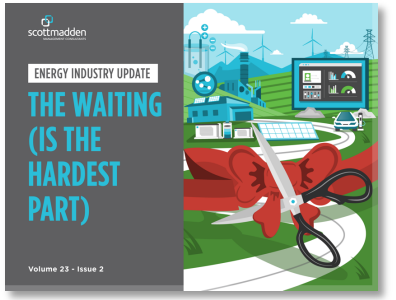
Cristin Lyons
Partner and
Energy Practice Leader

Kevin Hernandez
Partner

Josh Kmiec
Partner

Sarah Vondracek
Manager

Visit the link or scan the QR code for our latest Energy Industry Update:
https://publications.scottmadden.com/energy-industry-update-v23-i2/



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ScottMadden's EIU: The Waiting (Is the Hardest Part)

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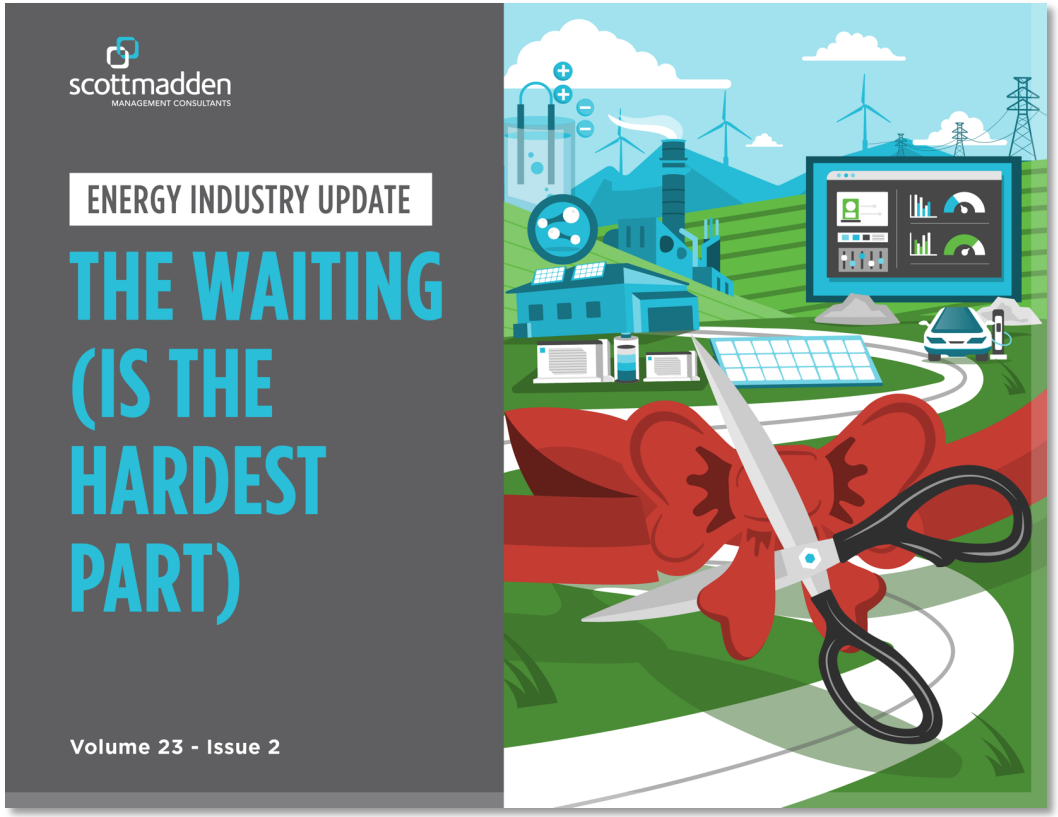

All topics covered in our latest issue:

1. EPA's Proposed Power Plant Rule: Third Time's the Charm?
2. Denmark's Clean Energy Transition
3. Virtual Power Plants
4. Natural Gas Utility Decarbonization
5. Gas-Power Coordination
6. FERC Homes in on Transmission
7. The Energy Industry in Charts (focus on Electric Vehicles)

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