scottmadden
MANAGEMENT CONSULTANTS

Smart. Focused. Done Right.®

# ScottMadden's Energy Industry Update: Saved by Zero?

Webinar

June 10, 2021

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

scottmadden
MANAGEMENT CONSULTANTS

Smart. Focused. Done Right.®

# 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, Cristin 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 more than 35 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

ENERGY MARKETS

TRANSMISSION & DISTRIBUTION

RATES & REGULATION

GRID EDGE

ENTERPRISE SUSTAINABILITY

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Massachusetts' 2050 Decarbonization Roadmap

scottmadden
MANAGEMENT CONSULTANTS

Smart. Focused. Done Right.®

# Josh Kmiec

Director

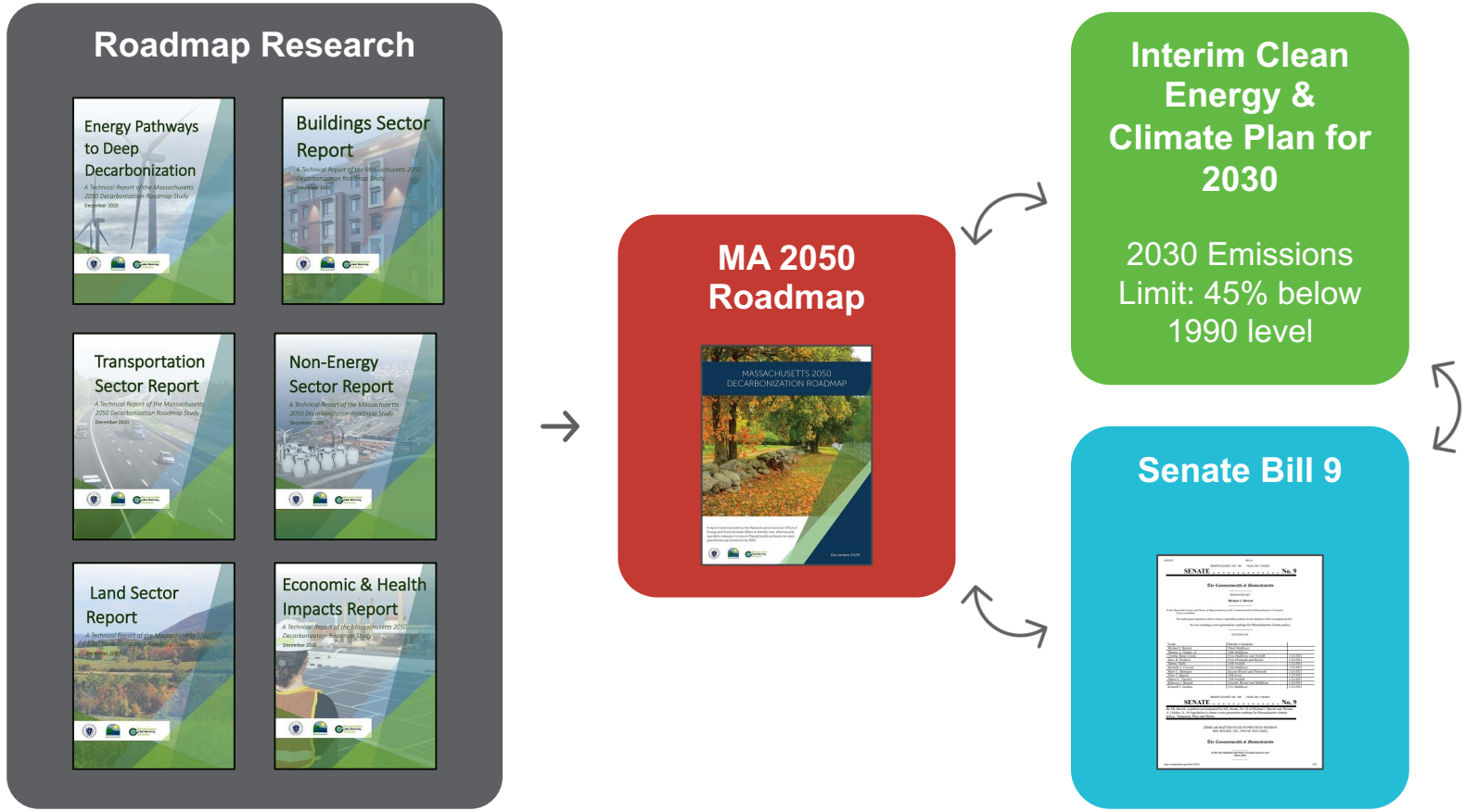
Josh Kmiec joined ScottMadden in 2014 after receiving an M.B.A. from the University of North Carolina Kenan-Flagler Business School, concentrating in consulting, sustainability, and marketing. His experience includes work in grid transformation and integration of distributed energy resources, regulatory 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. from the University of Massachusetts–Amherst, with a major in political science and a minor in history.

# The Road to 2050

**The Massachusetts 2050 Decarbonization Roadmap, produced by the Massachusetts Executive Office of Energy and Environmental Affairs (MA EEA), lays out potential pathways and strategies for the reduction of greenhouse gas emissions (GHG) by 85% by 2050 along with net-zero emissions.**

## 2050 Roadmap Study Goals:

- Identify cost-effective and equitable pathways and strategies for MA to reach net-zero emissions by 2050 and the priorities to achieve an on-pace interim goal by 2030
- Inform
  - 2030 GHG emission limit (to be set by EEA Secretary)
  - Clean Energy and Climate Plan for 2030

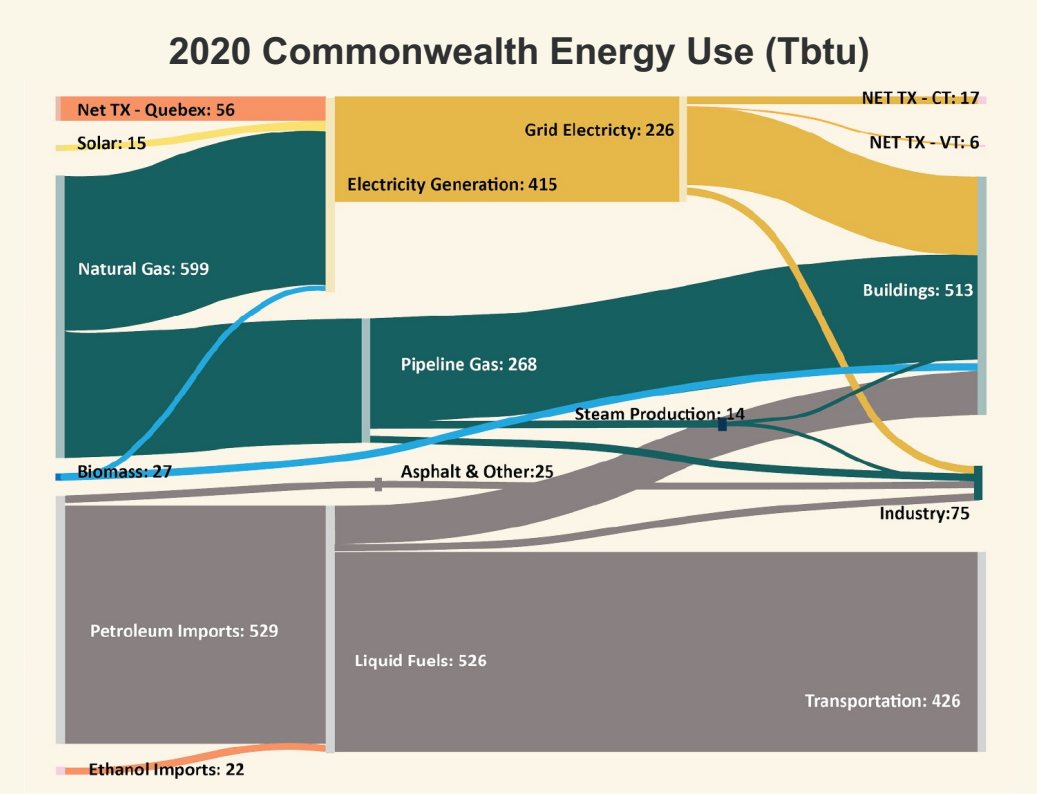


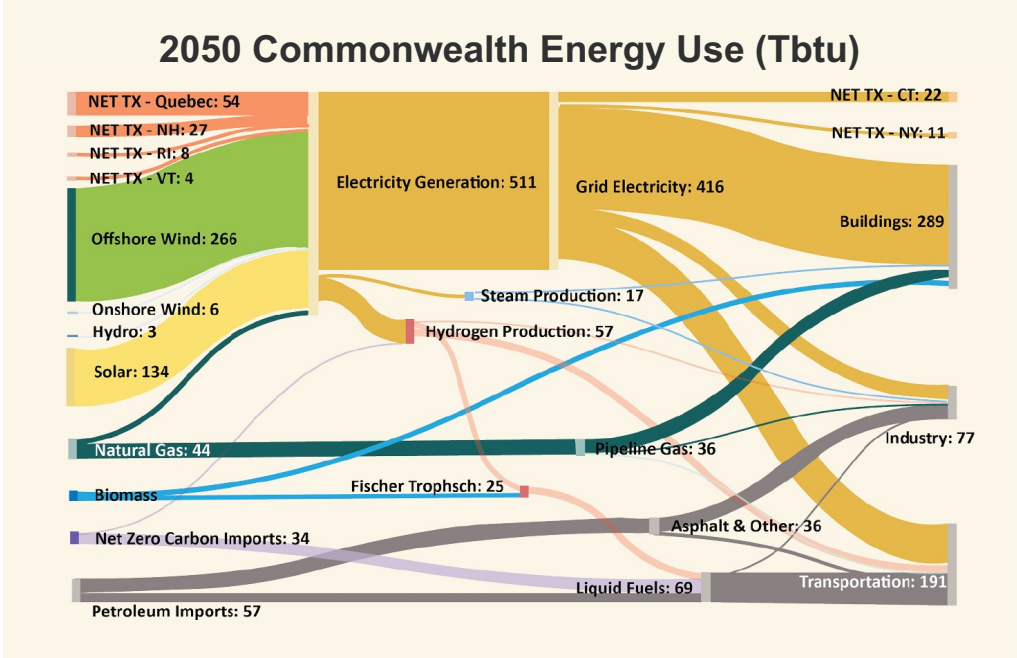

Sources: Massachusetts Executive Office of Energy and Environmental Affairs, ScottMadden

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# A View of 2050 – Energy Use

**The Massachusetts 2050 Decarbonization Roadmap depicts a future for the Commonwealth with a dramatic shift from fossil fuels to renewables as the main source of generation and the electrification for much of the end-use energy consumption. The roadmap also assumes significant gains in efficiency in buildings and transportation.**



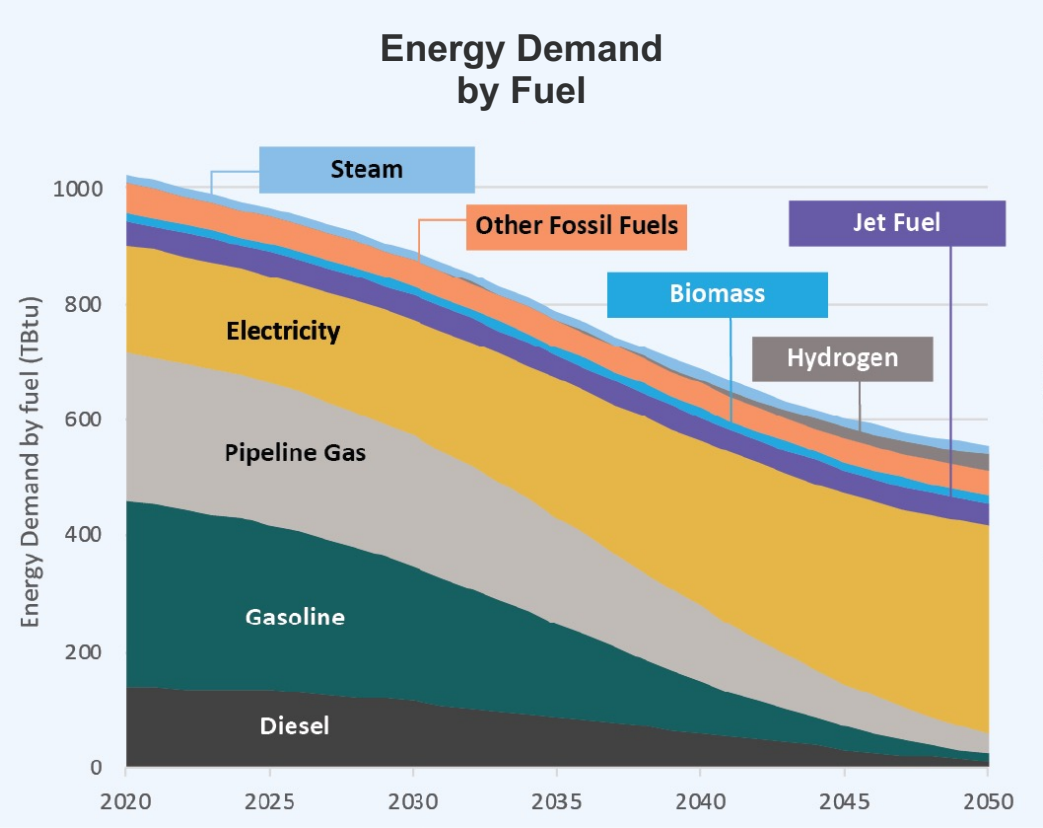



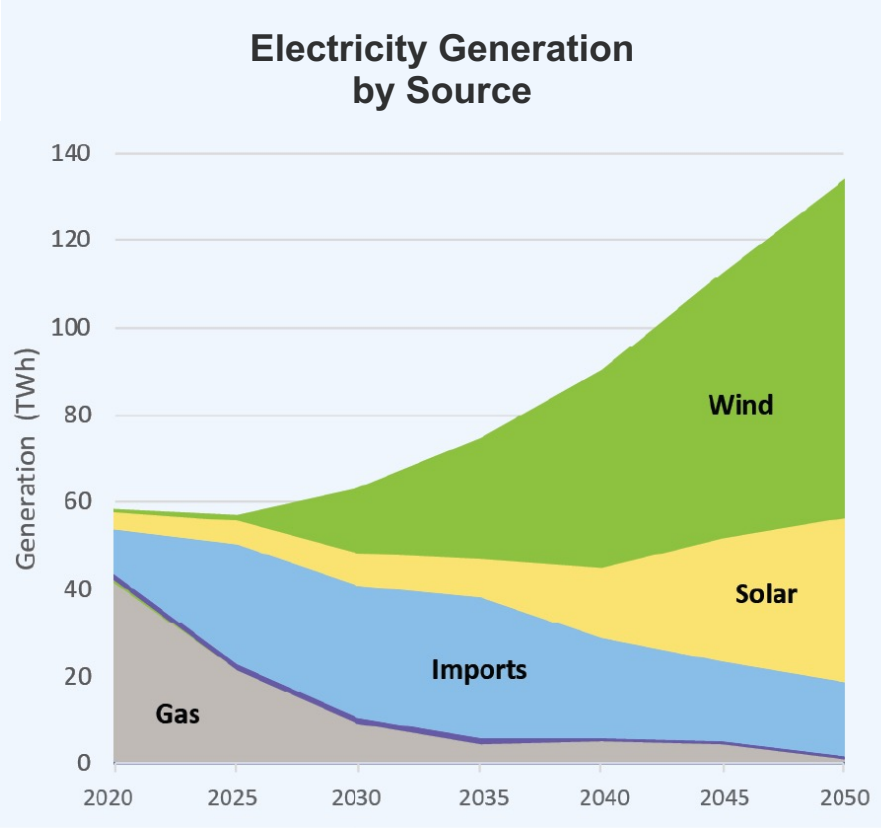

Source: Massachusetts' 2050 Decarbonization Roadmap

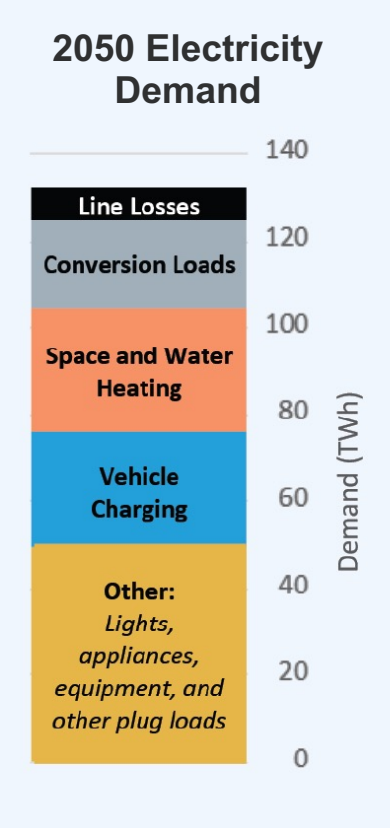
Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# A View of 2050 – Energy Supply and Demand

**Key elements of the Massachusetts 2050 Decarbonization Roadmap include the overall decrease in energy demand, remaining energy demand being met by electricity, and electricity being generated by clean renewable sources.**



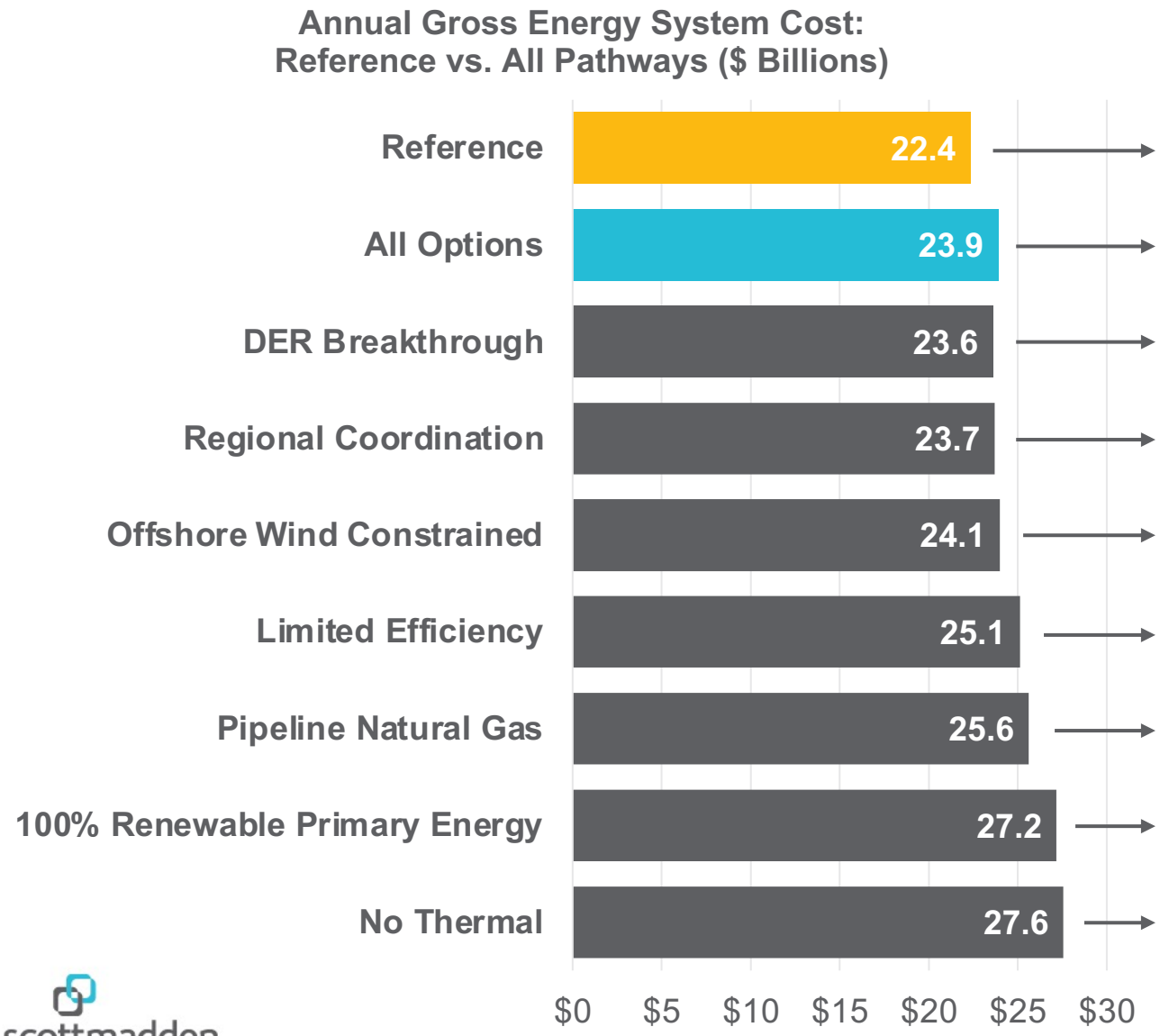




Source: Massachusetts' 2050 Decarbonization Roadmap

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Pathways and Estimated Annual Energy System Cost




**Pathways**

| | |
|---|---|
| Reference | *Baseline assuming minimal changes in energy system between the present and 2050* |
| All Options | *The key "benchmark" reference pathway. Uses midpoint assumptions* |
| DER Breakthrough | *17 GWs of behind-the-meter solar deployed in MA in 2050 as opposed to 7 GWs. Higher level of flexible end uses, especially vehicle-to-grid* |
| Regional Coordination | *Lower transmission costs. Captured carbon exports allowed for geological sequestration outside of New England* |
| Offshore Wind Constrained | *Capped regionally at 30 GWs* |
| Limited Efficiency | *Efficiency gains are reduced to about one-third in buildings and aviation* |
| Pipeline Natural Gas | *Limited to conversion from oil in the near-term with slower rates of gas-to-heat pump conversion in the long-term* |
| 100% Renewable Primary Energy | *No fossil fuels allowed; zero-carbon combustion fuels allowed for electricity generation by thermal power plants* |
| No Thermal | *All thermal capacity retired by 2050* |

scottmadden
MANAGEMENT CONSULTANTS

Source: Massachusetts' 2050 Decarbonization Roadmap

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Key Takeaways

## Massachusetts' Decarbonization: The Road from Today to 2050

**Coordinated Effort**

The Massachusetts 2050 Decarbonization Roadmap is part of a wider ecosystem of interim goals, legislation, and regulatory action to meet goals.

**Renewables, Electrification, and Efficiency**

While an economy-wide effort, much of what's laid out in the roadmap relies on a dramatic increase in renewable generation, electrification of a significant portion of energy end uses, and deep efficiency.

**Utilities' Role**

Many of the sectors and strategies outlined in the roadmap will require actions or support from utilities in the Commonwealth.

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Transmission and Transition

scottmadden
MANAGEMENT CONSULTANTS

Smart. Focused. Done Right.®

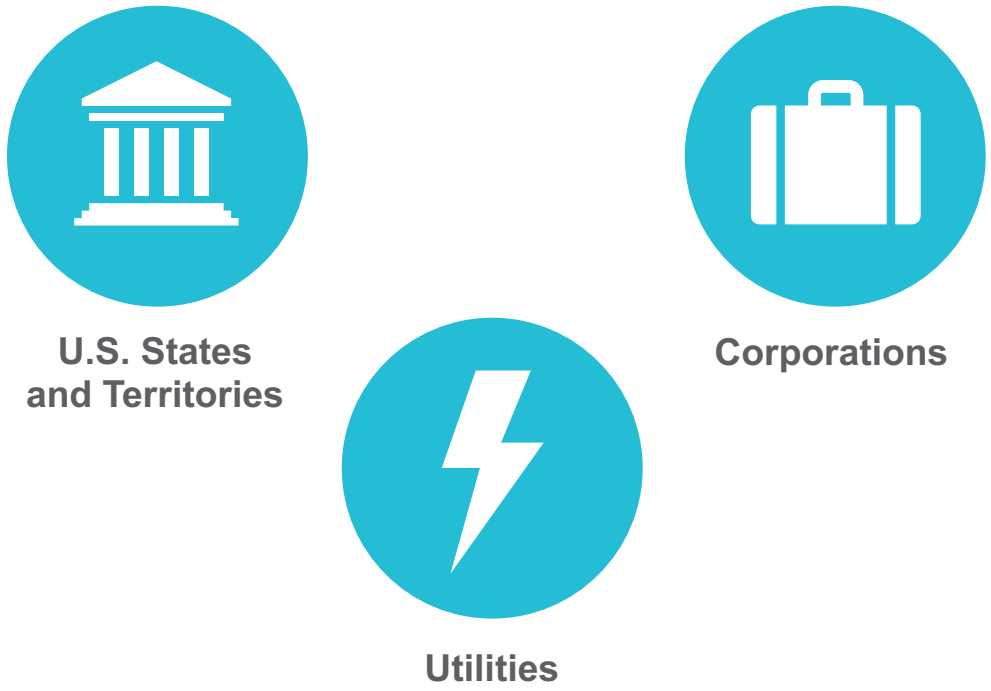
# Farzeen Tejani

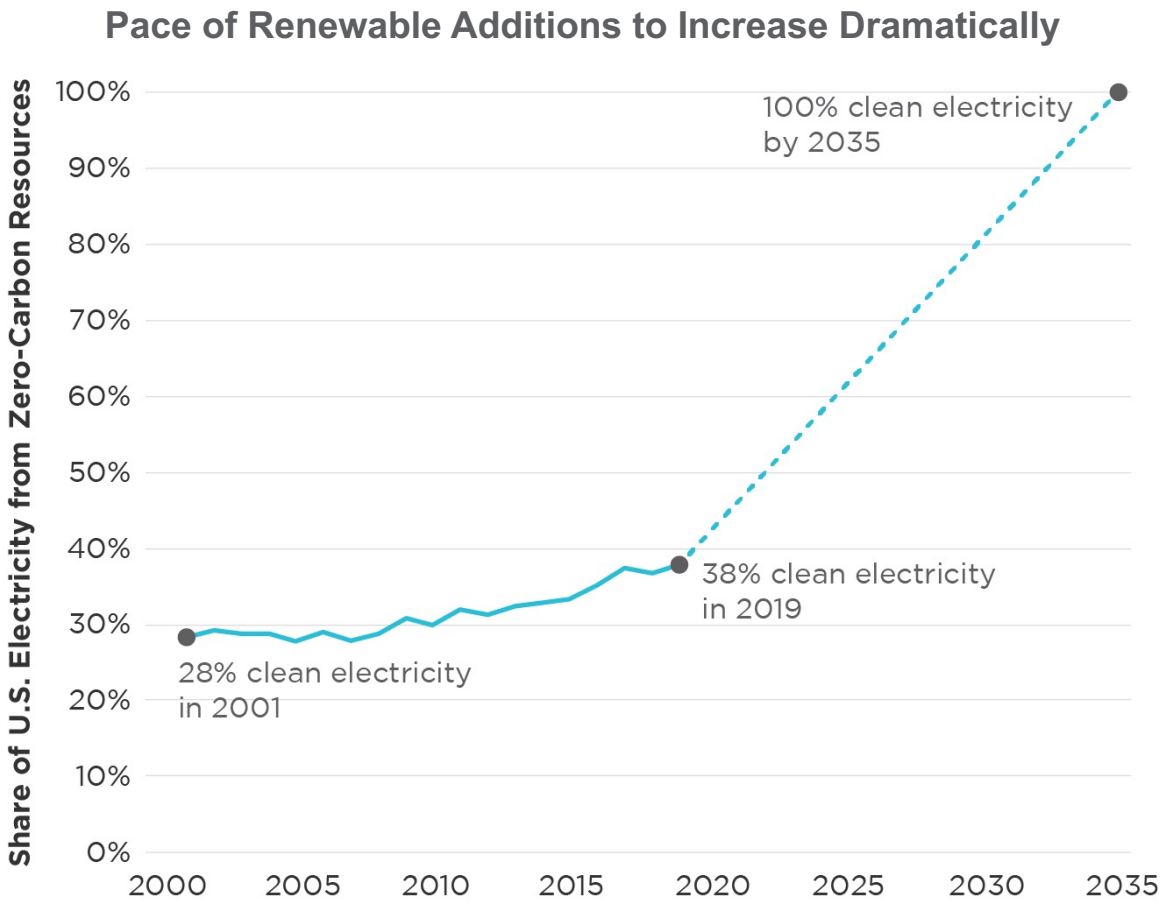
## Manager

Farzeen Tejani first joined ScottMadden in 2016 as a summer intern and then began full-time in 2017 after receiving an M.B.A., with concentrations in strategy, operations, and sustainability, from the Scheller College of Business at Georgia Tech. Prior to ScottMadden, Farzeen worked as an account manager at an eCommerce start-up where she ran the client services department, a content coordinator at a marketing firm where she coordinated with Coca-Cola's international business units to create and publish content, and a conservation architect at a not-for-profit agency where she created the long-term management plan for the historical site. Farzeen also received a B.S. in architecture from the Georgia Institute of Technology.

# New Energy Priorities

**Across the United States, there has been a growing level of commitment to clean energy goals. To maintain grid reliability while decarbonizing the power system, significant amounts of utility-scale and distributed zero-carbon generation will be needed.**



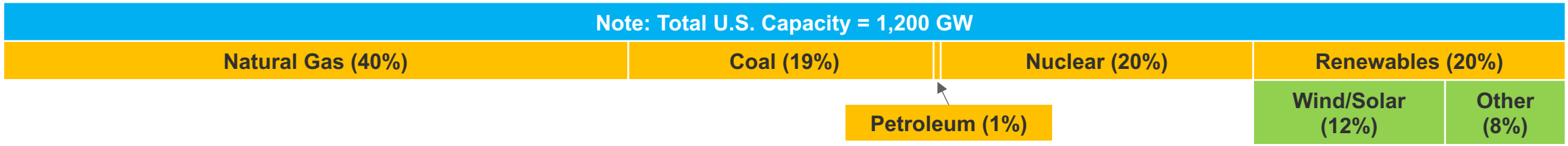

Source: ESIG Study

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Benefits of Inter-Regional Transmission Development

**Numerous studies have assessed the renewable generation required to meet clean energy levels by key target years. Though varying in specific capacity, they all indicate the need for a significant increase of renewable generation to be added to the grid.**

## U.S. Electricity Generation (GWh) by Fuel Type in 2020




## Selected Energy Transformation Studies' Assessment of Renewable Needs

| Study | Renewable Capacity | Clean Energy Level(s) | Target Year | Expected Demand |
|---|---|---|---|---|
| **The 2035 Report** | 1,100 GWs (wind and solar) | 90% clean electricity | 2035 | 4,500 TWhs |
| **MIT Study** | 1,200 GWs (wind), 1,100 GWs (solar) | 100% clean electricity | 2040 | 5,000 TWhs |
| **Interconnection Seam Study** | 600–900 GWs (wind and solar) | 63% to 95% carbon-free electricity | 2038 | 4,900 TWhs |

**Achieving clean energy goals may require doubling or even tripling the size and scale of today's U.S. transmission system.**

scottmadden
MANAGEMENT CONSULTANTS

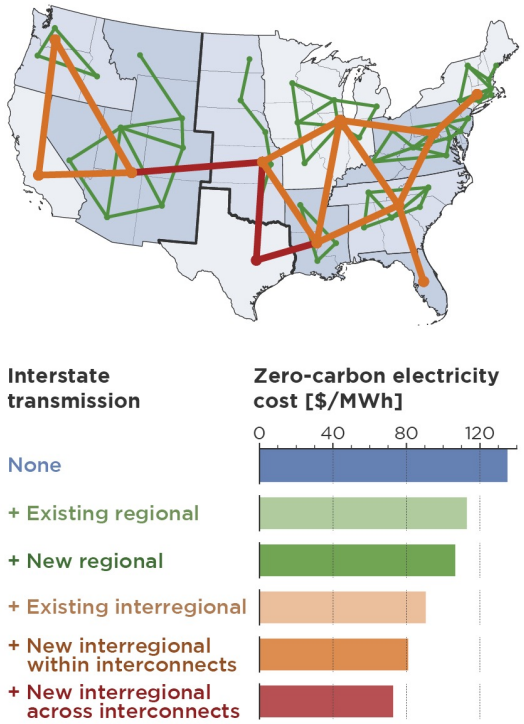
Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Benefits of Inter-Regional Transmission Development (Cont'd)

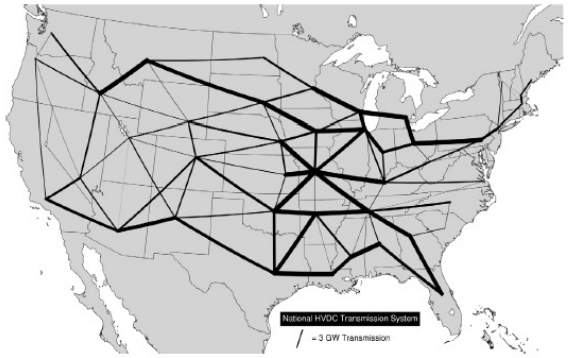
**Numerous studies have pointed to some important benefits of long-haul, high-voltage transmission, many significantly outweighing the cost of developing new transmission.**

## Conceptual Maps of High-Voltage Transmission in a Low-Carbon Grid from Recent Studies

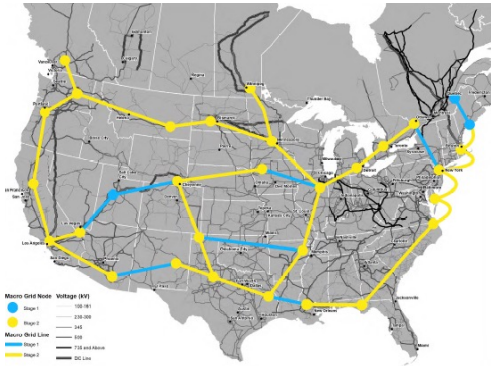
### MIT Study (2021)



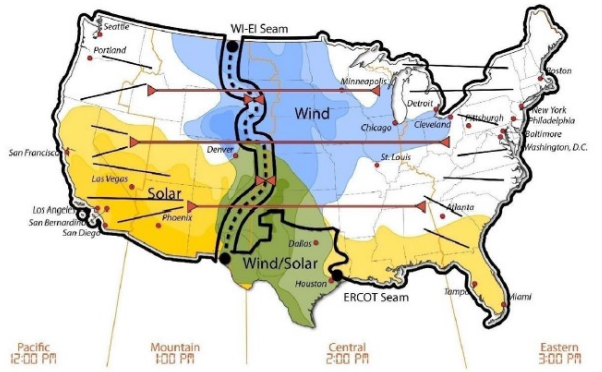

### VCE ZerobyFifty (2021)

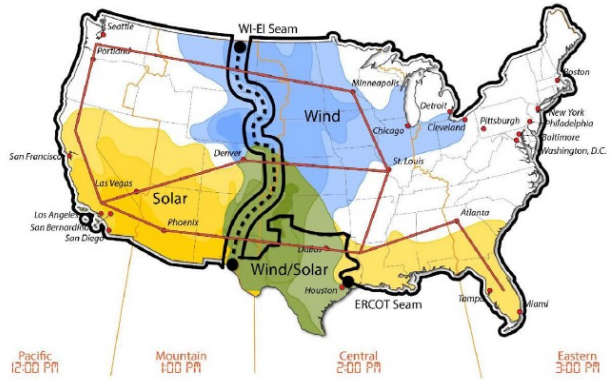



### ESIG (2021)



### Interconnection Seams Study (2018)



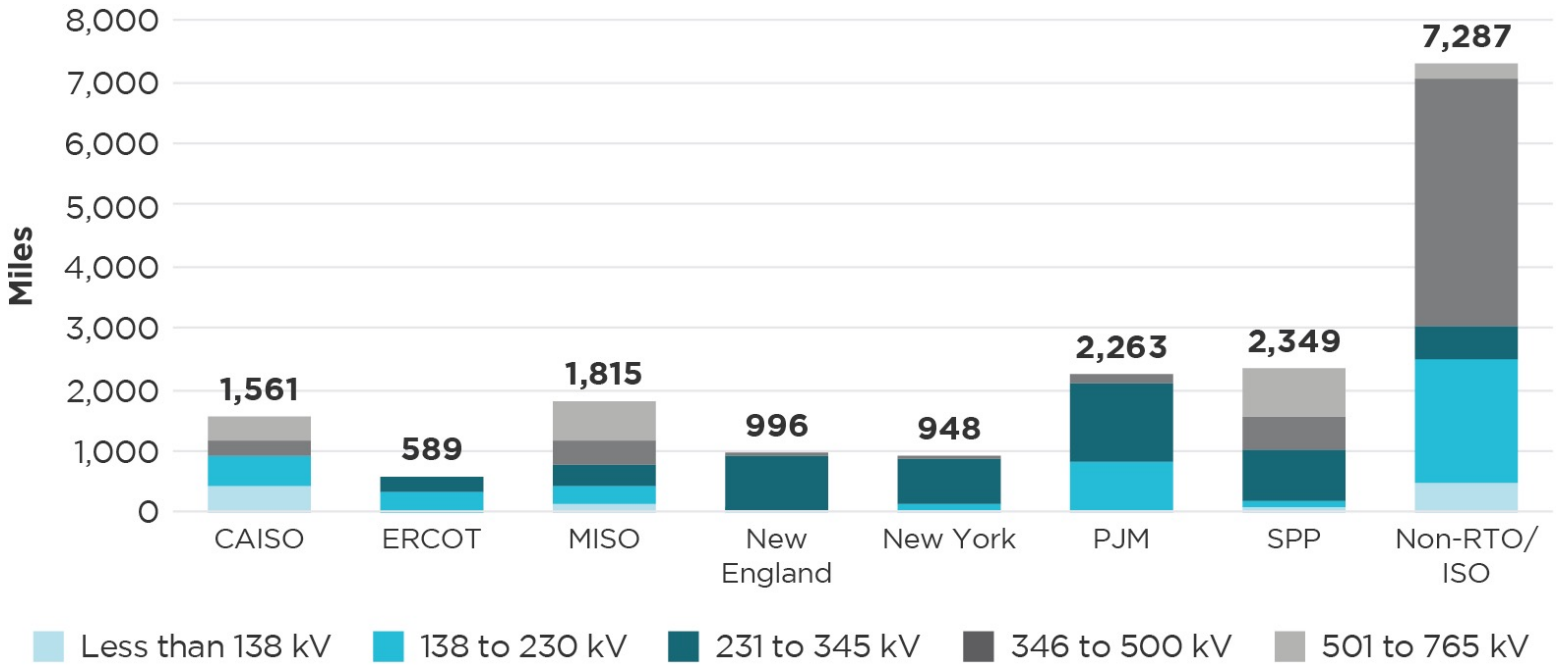

Sources: MIT Study; VCE Study; ESIG Study; Interconnection Seams Study

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Pace of Transmission Development

**If recent history has been any indicator of the pace of transmission development moving forward, significant incentivization and acceleration may be required to achieve policy objectives related to clean energy deployment.**

## Miles of New Transmission Planned in the U.S. Today by Originating Region and Voltage




## MISO Data Points

**278** Wind, solar, and battery projects withdrawn between 2016–2020

Days projects spend in the generation interconnection process **505**

**132** Days saved in the revised process currently in development

Sources: S&P Global Market Intelligence; ScottMadden analysis

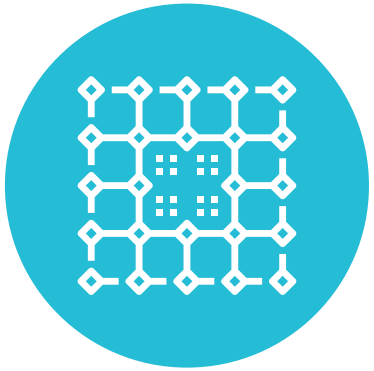
Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Key Transmission Development Enablers

**Introducing Grid-Enhancing Technologies (GETs) can increase capacity, efficiency, and/or reliability of the transmission system and can increase the amount of renewable generation that can be integrated onto the system.**

**Advanced Power Flow Control**

**Dynamic Line Ratings (DLRs)**



**Topology Optimization**

scottmadden
MANAGEMENT CONSULTANTS

Source: EEI

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Key Takeaways

## Transmission's Role in the Energy Transition

**Importance of Transmission**

Transmission development is a critical piece of the clean energy transition. Those seeking to achieve aggressive clean energy goals are becoming aware of the complementary roles of clean energy and new transmission.

**Pace and Scale of Development**

The pace and scale of transmission development may be insufficient to build-out a long-haul, high-voltage transmission grid capable of integrating renewable resources as they continue to dominate power supply additions.

**Role of FERC**

FERC has expressed a willingness to play an active role in facilitating transmission development to support clean energy agendas by embracing a more muscular role for the federal government in clearing the logjam of transmission development.

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Fleet Electrification

scottmadden
MANAGEMENT CONSULTANTS

Smart. Focused. Done Right.®

# Kevin Hernandez

## Partner

Kevin Hernandez is a partner with ScottMadden where he specializes in the grid edge and transportation electrification. Since joining the firm in 2012, he has consulted with a variety of transmission and distribution utility clients on issues ranging from energy storage to electric vehicle integration. 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 a veteran of the United States Navy.

# What Fleets Are in Your Service Territory?

**Fleets range from passenger vehicles to heavy-duty trucks and can be found in nearly every zip code in the country.**

**Light-Duty**
Class 1–2 (<10,000 lbs.)

- Passenger vehicles
- Pickup trucks
- Delivery vans

- Ride share/taxi
- Service technicians (electricians, etc.)
- Police

**Medium-Duty**
Class 3–6 (10,001–26,000 lbs.)

- Delivery vehicles
- Service vehicles
- Box trucks

- Last-mile delivery (UPS, FedEx)
- Local delivery (florists, laundry, etc.)

**Heavy-Duty**
Class 7–8 (>26,001 lbs.)

- Semi-trucks
- Transit buses
- Refuse trucks

- Long-haul trucking
- Waste collection
- Regional trucking

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Why Will Fleets Electrify?

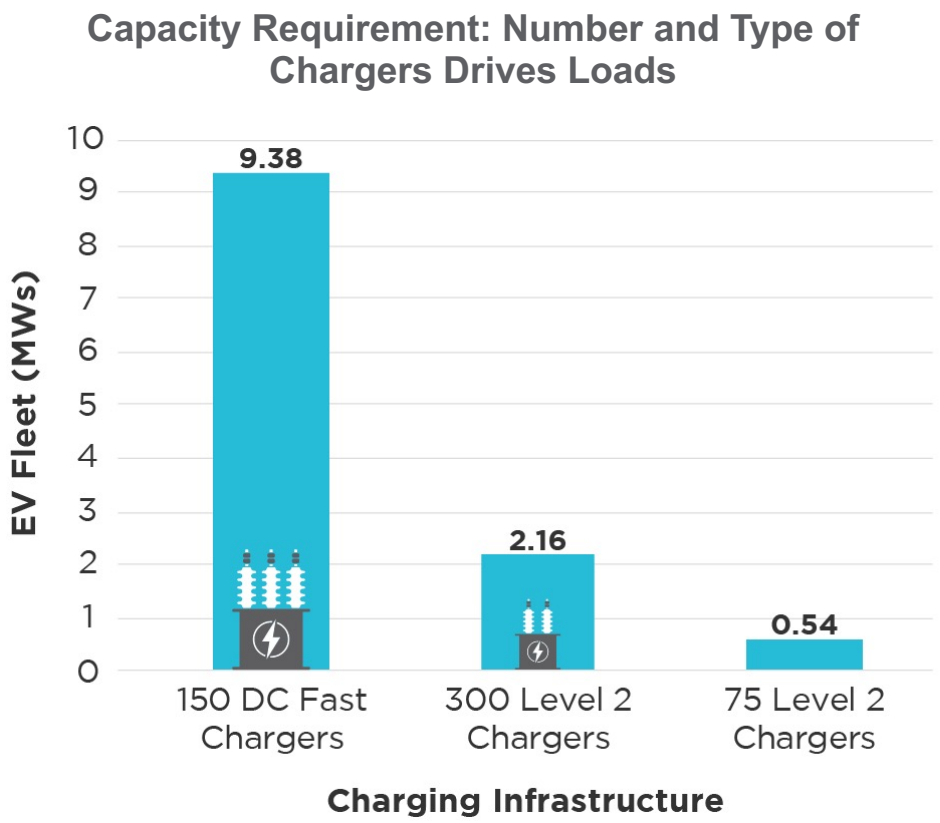
**Several factors may cause fleets to electrify more quickly than anticipated, boosting electric vehicle adoption.**

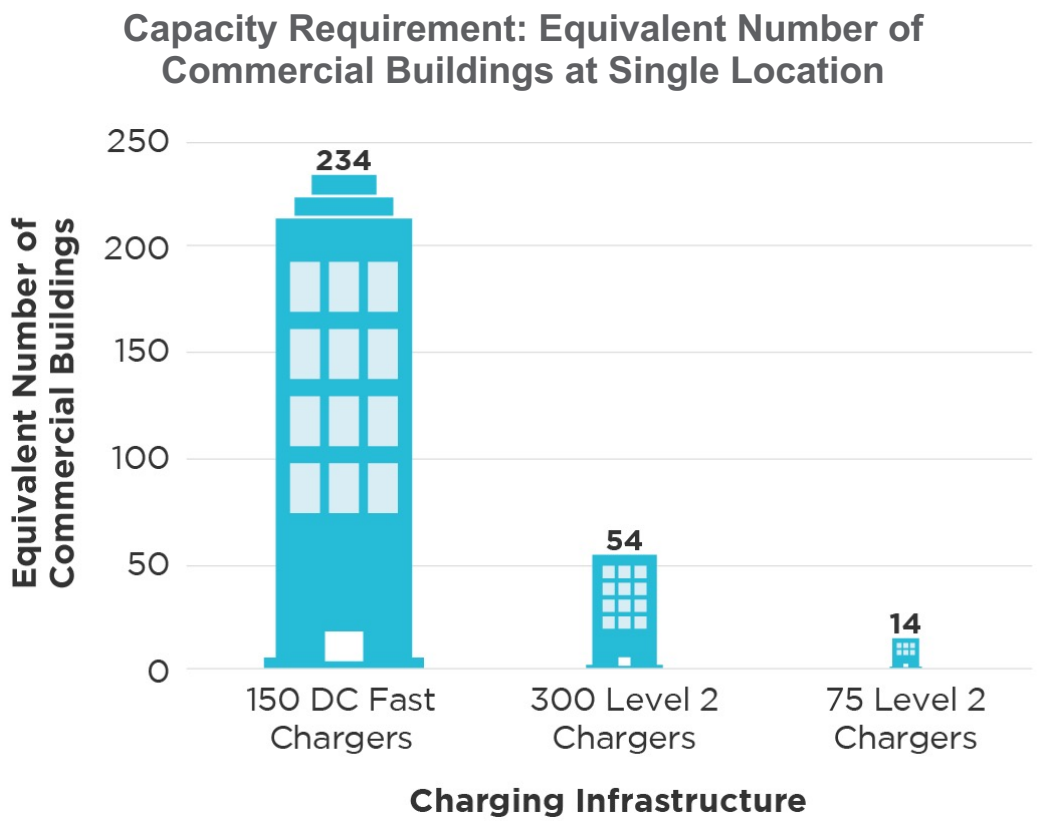
**Suitable Duty Cycles** + **Model Availability** + **Sustainability Goals** + **Business Case**

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Fleet Charging Loads May be Significant




**In some charging scenarios, fleet charging may greatly exceed traditional commercial loads.**

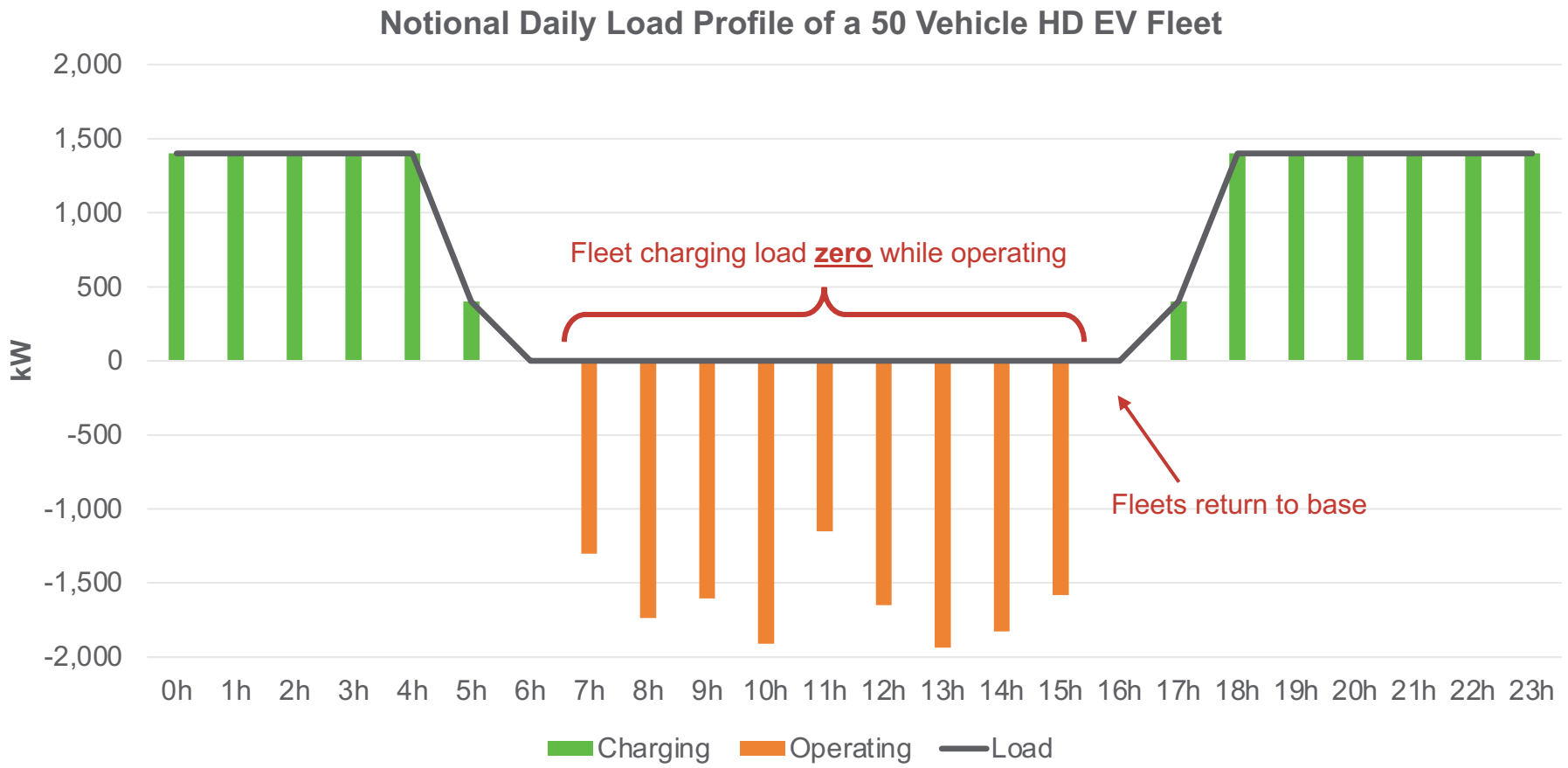
scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Fleet Operations will Drive Timing of Load

**Fleet charging loads may be significantly larger than commercial customers and more dynamic subject to fleet operational cycles.**

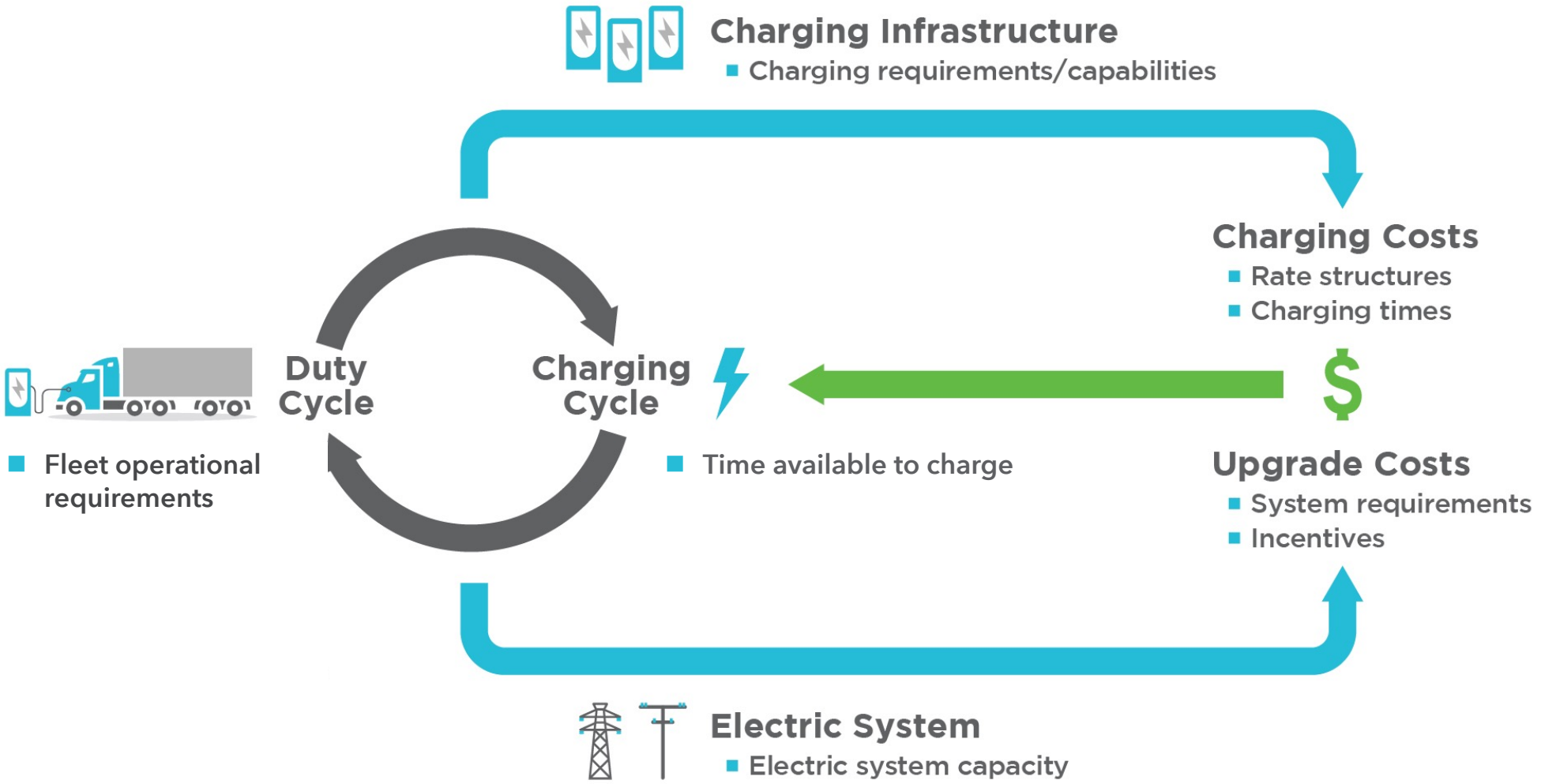
- Left unmanaged, fleet peak may appear after working hours, coincident with evening peak.
- Concentrated loads may shift system peak in some areas.




scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Right-Sizing Infrastructure Key to Managing Costs




scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Rate Structures Will Need to Evolve to Serve Fleets

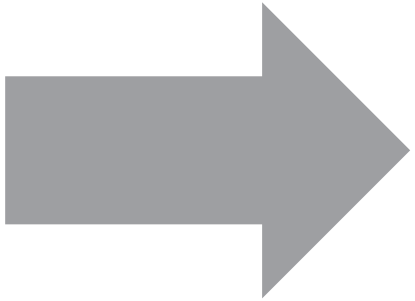
## Conventional

### Bulk fuel contracts

- Fuel pre-purchased in bulk to reduce price volatility
- No time or demand variability

### Fuel cards

- Purchase agreements made with commercial providers
- Fuel cards used to make/track enroute purchases



## Electric

### Fleet EV Tariffs

- Alternatives to demand charges
  - kW block subscriptions
  - Time-of-use (TOU) rates
  - Critical peak pricing

### Networked charging

- Electric-charging agreements made with charging network providers for enroute charging

**Utilities will come under pressure to develop rates structures that more closely resemble traditional fuel contracts.**

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# Key Takeaways

## Fleets Represent a Distinct Customer Class Offering Utilities New Opportunities

**Large and Dynamic**

Large fleets of electric trucks could rival large commercial customers in terms of size but introduce much more dynamic load shapes, which may alter system peak in some areas.

**Utility Opportunity**

Electric fleets present opportunities for utilities both in terms of load growth and in developing the robust infrastructure needed to fuel the transportation industry.

**Preparing for Fleets**

Electric utilities can begin planning to serve these customers by including fleet charging infrastructure in future rate cases and establishing teams to manage fleet and other transportation customers.

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# YOUR WEBINAR PRESENTERS

**Cristin Lyons**
Partner and
Energy Practice Leader

**Josh Kmiec**
Director

**Farzeen Tejani**
Manager

**Kevin Hernandez**
Partner

**See the link below for the latest Energy Industry Update**
**scottmadden.com/energy-industry-update/**

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.

# ScottMadden's Energy Industry Update – Saved by Zero?


**See the link below for the latest Energy Industry Update**
**scottmadden.com/energy-industry-update/**

scottmadden
MANAGEMENT CONSULTANTS

Copyright © 2021 by ScottMadden, Inc. All rights reserved.