Executive Summary: Northeast U.S. State Strategic Electrification Information Needs Assessment

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Acknowledgments

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This study builds on NEEP's Northeastern Regional Assessment of Strategic Electrification and Strategic Electrification Action Plan.

About NEEP

A Regional Energy Efficiency Organization

One of six REEOs funded in-part by U.S. DOE to support state and local efficiency policies and programs.

Northeast Energy Efficiency Partnerships

"Assist the Northeast and Mid-Atlantic region to reduce building sector energy consumption 3% per year and carbon emissions 40% by 2030 (relative to 2001)"

Mission

We seek to accelerate regional collaboration to promote advanced energy efficiency and related solutions in homes, buildings, industry, and communities.

Vision

We envision the region's homes, buildings, and communities transformed into efficient, affordable, low-carbon, resilient places to live, work, and play.

Approach

Drive market transformation regionally by fostering collaboration and innovation, developing tools, and disseminating knowledge

Introduction: Goals and Purpose of Strategic Electrification Information Needs Assessment

Many states in the Northeast have aggressive clean energy goals, and are doing good work to reach those goals. Reaching state level goals in the Northeast by 2050 will require advanced strategies beyond the established strategies of energy efficiency and renewable energy.

NEEP received funding to conduct a high level information needs assessment with the goal of helping states to achieve their energy goals, including facilitating strategic electrification in buildings.

The purpose of the research is to assess information – data, tools, resources - gaps and research needs in the region and to develop recommendations that can help support strategic electrification planning, forecasting and implementation in the region.

Strategic Electrification – 3 Key Elements

Advanced Electric Technologies

Deep Energy Efficiency

Grid Integration

Space & Water Heating And Electric Transport	Thermal Improvements	Flexible Use of Low-Carbon Electricity

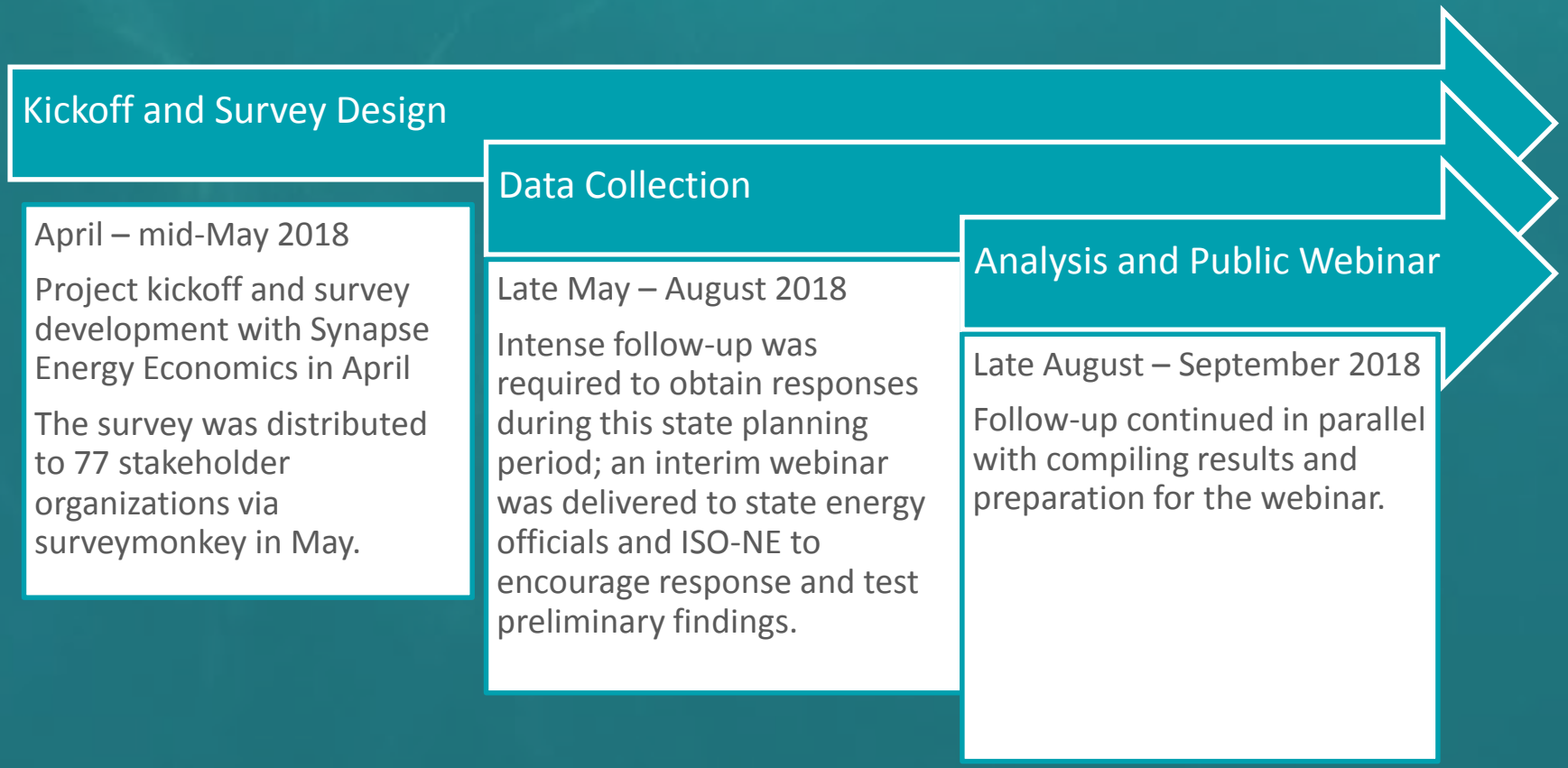
Method

A high level survey with open-ended questions was designed and delivered to relevant stakeholders (all state energy offices, some local governments, program administrators, air regulators and NGOs) in the seven state New England and New York region. Informed by NEEP's Regional Assessment of Strategic Electrification, it asked about tools, data and information resources used, valued and needed in three major sectors: buildings, transportation, and industry.

Qualitative analysis included: comparison of responses by state, program administrator and local government; compilation of responses by sector; and assessment of accessibility and transferability of sources of information (e.g. public versus proprietary, or location-specific).

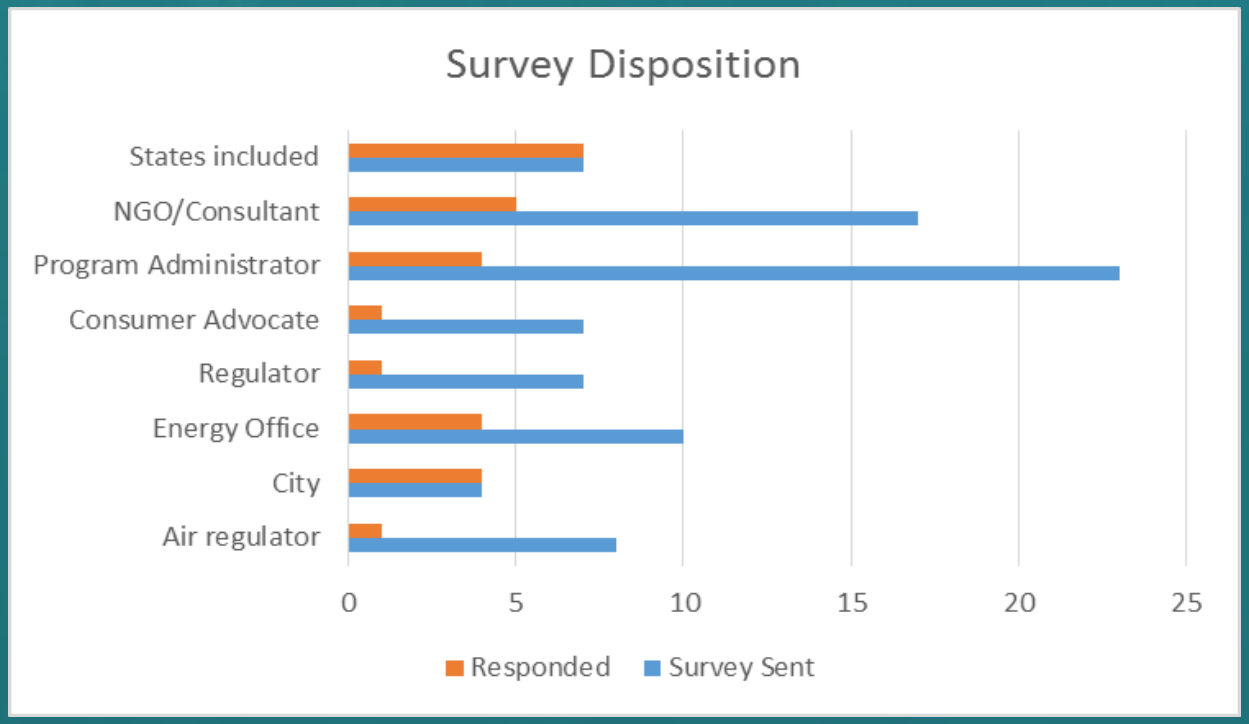
Conclusions and recommendations focused on categorizing types of information needs and considering what needs can be met at an aggregate (regional or national) level.

Schedule


Kickoff and Survey Design
April – mid-May 2018
Project kickoff and survey development with Synapse Energy Economics in April
The survey was distributed to 77 stakeholder organizations via surveymonkey in May.
Data Collection
Late May – August 2018
Intense follow-up was required to obtain responses during this state planning period; an interim webinar was delivered to state energy officials and ISO-NE to encourage response and test preliminary findings.
Analysis and Public Webinar
Late August – September 2018
Follow-up continued in parallel with compiling results and preparation for the webinar.

Survey Response

20% response rate with coverage from 7 states (mix of state energy and consumer advocate offices) and 4 cities.



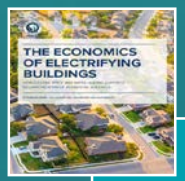
Caveats on Survey Response

Transportation

- The transportation sector is underrepresented, likely due to less follow-up effort and potentially less focus on strategic electrification in this sector.

Industry

- No information on industrial sector needs or resources was obtained. We hypothesize this is due to small size; 10% of fossil fuel use in the region. Aside from power plants, industry has a relatively small presence in the region and is not a priority focus of state planning.



Information Sources

- The information sources useful to states and identified by this study is conservative; the number of reports and studies related to setting goals and planning is growing rapidly and some that were not captured became available during the course of this study.

Findings: How, if at all, does your organization incorporate electrification into your work?

40% - Planning Focus (state/local government respondents - setting policies, goals, tariff design)

40% - Program Deployment Focus (program administrators - program marketing and design)

20% - Little Consideration Given (government/program administrators in some states - fuel neutral or early stage planning)

Building Sector Findings - Data

Used and Valued by Regional Strategic Electrification Stakeholders

- State Energy Plans and collected data
  - New Hampshire 10 Year Energy Strategy
  - CT Comprehensive Energy Strategy
  - MA 2015 Update Clean Energy & Climate Plan for 2020 and 2018 Comprehensive Energy Plan
  - VT, RI, NY and CA plans
- Heat Pump Resources
  - MA Clean Energy Center (CEC) rebates
  - EE program evaluations and avoided costs
  - Technical Reference Manual deemed impacts
  - NEEP Cold Climate Heat Pump specifications
  - Manufacturing/sales information

Building Sector Findings – Data continued

Used and Valued by Regional Strategic Electrification Stakeholders

- Locally Specific
  - Advanced Metering Infrastructure (AMI) loadshapes, heat pump metering data and customer billing data
  - Green communities reporting from towns and cities in MA
  - Market segmentation of NYC buildings
- Regional/National
  - ISO-NE electricity sales forecast
  - EIA Annual Energy Outlook for baseline assumptions
  - EIA data on fuel costs
  - Experiences of projects implemented in comparable geographic or climate conditions

Building Sector Findings – Tools & Models

Used and Valued by Regional Strategic Electrification Stakeholders

- Building–level analytical tools
  - Building modeling tools (REM/*Rate*™)
  - Building labeling tools (HERS®) for home energy ratings
  - Market segmentation analysis of NYC residential buildings
- Heat pump-specific analytical tools
  - Model to estimate Heat Pump benefits based on EIA and state-collected energy statistics and costs
  - Proprietary GHG calculator to estimate GHG reductions from air source heat pump (ASHP) retrofits in NY buildings
- Cost-benefit analysis
  - Traditional cost-benefit analysis from societal and utility-specific perspectives

Transportation Sector Findings - Data

Used and Valued by Regional Strategic Electrification Stakeholders

- EV sales and fleet data
  - MOR-EV – MA state rebate program on EVs
  - State DMV records
  - EValuateNY – NY database of data sources on EVs
  - Manufacturing/sales information
- DSIRE database – state incentives for EE and renewables
- Alternative Fuel Data Center – national comprehensive data source pertaining to fleets and vehicles
- DOE EV Project - nationally funded demonstration project on charging stations, EVs and customer behavior in 18 cities

Transportation Sector Findings – Tools & Models

Used and Valued by Regional Strategic Electrification Stakeholders

- Plans
  - ZEV MOU and ZEV Action Plan – multistate agreements developed with Northeast States for Coordinated Air Use Management (NESCAUM) to coordinate on goals and plans for zero emission vehicle programs

- Models
  - MOVES - EPA Motor Vehicle Emission Simulator Model to estimate emissions by time and geographic area
  - EVI – Pro - NREL Electric Vehicle Infrastructure Projection Model for forecasting charging stations and EVI-Pro Lite - a simplified version to plan charging station needs at the state or city level

Other Valuable Resources

- National Models
  - AVERT – EPA Avoided Emissions and generation modeling tool
  - COBRA – EPA Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool
- Reports and Guidelines (*see Resource List)*
  - Regional (NEEP, Governors Council on Climate Change, NEEA)
  - Utility reports on business model transition
  - National (EPRI, LBNL)
  - Private (Bloomberg, Stanley, Deloitte, MJ Bradley, RMI, RAP, MJ Bradley, ICF)
- City Case studies

Assessment of Findings

- State and local government are still predominantly in planning stages
- NY, RI, VT's aggressive clean energy goals and National Grid's multistate (NY, RI, MA) presence help set the bar
- Some very specific needs were expressed by local governments (e.g. public transportation; HVAC training)
- Barriers to SE or SE planning include regulatory requirement of fuel neutrality in some states (e.g. NH) and concern about the impact of SE on system loads
- Some information is commonly needed by many respondents

Building Sector Information Needs: Heat Pump Data, Tools and Resources

- Equipment Performance
  - Benefit cost analyses of ASHP and GSHP to help with including these in base building codes
  - Case studies of ASHP retrofits
- Market Intelligence
  - Average prices of ASHPs and GSHPs
  - Penetration rates and forecasts by state for heat pumps and other heating systems
  - Consumer data and specific building inventory data
  - ASHP models
  - Number of certified installers by state
  - Licenses/certifications needed to install the product by state
- Training Resources
  - For installers
  - For 3rd party inspections
- Improvements to Existing Tools
  - Analysis of technology versus soft costs
  - Better data collection on renewable thermal installations

Transportation Sector Information Needs

- Equipment Performance
  - In-use performance of Medium and Heavy Duty EVs
  - O&M impacts of EVs
- Market Intelligence
  - Market data on average price of EVs
  - Vehicle shipments and availability and attributes (range, battery capacity, model, year)
  - When to expect electric school buses on the market
- Training Resources
  - Training on NREL's EVI-Pro
- Improvements to Tools
  - Development of a tool for the public on how to choose a charging station to install
  - Benefit-cost analyses of EV charging infrastructure (to help include these in building codes)

Other Information Needs

- Planning and Analysis Support
  - Loadshapes under different time and location-based incentives and rates
  - Actual performance of zero energy buildings
- National Resources
  - National database on best practices
  - Marginal emissions from ISOs across the US
- Other
  - Battery storage providers with product information
  - Product information on load control communications infrastructure
  - Analysis of impact of CA vehicle electrification on electricity rates and load factors
  - System operators' perspective on strategic electrification planning

Conclusions

- Industry Context
  - The field is nascent and dynamic
    - Needs range from simple information to complex tools
    - New, potentially helpful resources have emerged since this study (e.g. NREL Electrification Futures Study and RAP Beneficial Electrification White Paper)
  - Industrial sector electrification is not a major priority to meet Northeast States' clean energy goals
  - State and local government are aligned on many but not all priorities for information needs
    - Local governments priorities include designing programs for EV fleets, public buildings, heat pump installer training

Conclusions continued

- Priorities
  - The most frequently cited need was for information on real world equipment performance (vehicles and heat pumps) and market data (product sales and customer preferences), comparisons with fossil-powered equipment, and larger sample sizes where some data exists
- Access
  - Some heat pump performance and market conditions data resources are proprietary which hinders information sharing
  - AMI penetration is limited and some loadshape data is proprietary
  - There is no comprehensive central repository for electrification plans, reports, tools and data

Conclusions continued

- Leveraging Planning Tools and Resources
  - Improvements to various existing tools and training on existing models can make existing resources more useful
  - Multiyear metrics and milestones for electrification are needed by state officials
  - Transportation resources are more readily available and familiar to state energy officials
  - Frameworks to enable electrification through EE program platforms are needed
  - Tariff and incentive designs addressing SE are needed

Recommendations

1. Transportation

   Further engage with transportation state officials to better understand their planning and information needs

   Support state transportation planners and energy planners to coordinate electrification information needs and share data inputs and modeling results regionally and nationally

2. Building Sector

   Reduce barriers to access to information on building sector resources – heat pump performance, use cases, costs, other market indicators

3. Best practice Development
   - Support consistency in electrification data sources, modeling and planning approaches within and among states
   - Develop and distribute to local government energy planners, building and transportation electrification planning, policy and program case studies and exemplars

4. Access to Existing and New Information to Kickstart Market Transformation
   - Increase awareness of all available resources across the region and nation
   - Fill data gaps with new studies with publicly available results

List of Resources

Resources - 1

Organization and Resource Link	Synopsis
RAP webinar: Beneficial Electrification: Ensuring Electrification in the Public Interest (June 2018)	This RAP webinar outlines principles regulators can follow to ensure that electrification initiatives benefit customers, grid management, and the environment.
NESCAUM: Multi-State ZEV Action Plan – 2018 Update (June 2018)	This new action plan is intended to propel rapid adoption of the cleanest passenger cars on the road today, including battery-electric, plug-in hybrid electric, and fuel cell electric vehicles. It focuses on accelerating ZEV adoption by mainstream consumers. The Plan was developed by nine states (New Jersey joined in 2018) and addresses priorities for action through 2021.
National Grid: Northeast 80x50 Pathway (June 2018)	This paper presents National Grid's integrated blueprint for New York and New England to reduce greenhouse gas emissions deeply below 1990 levels while supporting economic growth and maintaining affordability and customer choice.
NEEP: Action Plan to Accelerate Strategic Electrification in the Northeast (March 2018)	Regional Action Plan and recommended research to accelerate long-term market transformation for strategic electrification to displace the use of carbon intensive fuels with a focus on thermal renewable solutions coupled with deep efficiency and grid integration for home and building heating, and the advancement of electric vehicles.
RMI: The Economics of Electrifying Buildings (2018)	This report analyzes the economics and carbon impacts of electrifying residential space and water heating both with and without demand flexibility—the ability to shift energy consumption in time to support grid needs. It compares electric space and water heating to fossil-fueled space and water heating for both new construction and home retrofits under various electric rate structures in four cities.
NEEP: Northeastern Regional Assessment of Strategic Electrification (July 2017) and Blog: Driving Electrification	Regional analysis of the important role of electrification of fossil fuel use to achieve state and regional greenhouse gas emission reduction goals 80% by 2050. Developed with the assistance of Synapse Energy Economics and Meister Consulting Group.

Resources - 2

Organization and Resource Link	Synopsis
NEEP: Regional cold climate Air Source Heat Pump Market Transformation Initiative, Strategy, 2017 Regional ASHP Workshop Summary: It Takes a Village; Product Specification and List and Best Practice ccASHP Installer Resources	Growing multi-year regional project involving over 200 stakeholders – manufacturers, state energy offices, efficiency programs and advocates from northeast states and Eastern Canadian Provinces to speed the introduction and broad market adoption of quality, efficient cold climate ASHPs to displace carbon intensive heating fuels.
LBNL: Electrification of buildings and industry in the United States; Drivers, barriers, prospects, and policy approaches (March 2018)	This study reviews the possible benefits and barriers to greater electrification in U.S. buildings and industry, the technical and economic potential for electrification, and policy and programmatic approaches for regions that may want to explore beneficial electrification.
RAP webinar: Beneficial Electrification: What's Hot, and What's Not (March 2018)	Discussion of criteria to assess whether electrification is "beneficial" and how to quantify the energy, environmental, and consumer benefits of electrification.
EPRI: A Preview of the U.S. National Electrification Assessment (February 2018)	This document frames the discussion of the pivotal role efficient electrification, including analysis, creation of an electrification technology pipeline, and expansion of R&D collaborations, will play in the future energy system.
VEIC: Driving the Heat Pump Market: Lessons Learned from the Northeast (February 2018)	This report reviews the policy, regulatory, and program frameworks in Northeast states – New England plus New York – to identify the key factors driving program success and overcoming barriers to ASHP adoption.
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Resources - 3

Organization and Resource Link	Synopsis
CERES: Accelerating Investment in Electric Vehicle Charging Infrastructure (November 2017)	This analysis evaluates the total need for electric vehicle charging infrastructure—including private chargers at vehicle owners' homes and publicly accessible chargers—to accommodate plug-in electric vehicles (PEV) in the twelve largest utility service territories in the states of California, Georgia, Maryland, Massachusetts, New York, Ohio, and Pennsylvania.
NRDC: America's Clean Energy Frontier: The Pathway to a Safer Climate Future (September 2017)	NRDC's groundbreaking analysis demonstrates clearly that with bold action on energy efficiency, renewable energy, electrification of vehicles and buildings with clean power, and electric grid enhancements, the United States can reach its 80 percent by 2050 climate goal.
US DOE: Quadrennial Energy Review: Transforming the National Electricity System: (January 2017)	Section detailing necessity of electrifying non-electric end uses in buildings, industry, and transportation (Chapter 2, p 28-32).
The Brattle Group: Electrification Emerging Opportunities for Utility Growth (January 2017)	The Brattle whitepaper provides an alternative paradigm for the U.S. utility industry where electricity sales break out of the often-cited "utility death spiral" through beneficial electrification.
RAP: Beneficial Electrification: Opportunity Knocks for Utilities (January 2017)	Most recent in a series of articles authored by RAP's Ken Colburn on the benefits of strategic electrification. (related webinar available here)
RAP/NRECA: Environmentally Beneficial Electrification: The Dawn of Emissions Efficiency (August 2016)	Coins the term "Emiciency" to indicate the importance of emissions efficiency going forward.

Resources – 4

Fraunhofer: What Will the Energy Transformation cost: Pathways for Transforming the German Energy System by 2050 (November 2015)	Identifies electrification of transportation as a key variable in moving Germany toward a clean energy grid.
Keith Dennis: "Environmentally Beneficial Electrification: Electricity as the End-Use Option" (November 2015)	Proposes applying a systems approach to end use efficiency (et al.)
Acadia Center: EnergyVision2030 (February 2014)	Identifies electrification as a priority in the shift towards a cleaner energy system.
NESCAUM: Zero Emission Vehicle Action Plan (May 2014)	Outlines steps forward for promotion of zero emission vehicles and ultimately transportation electrification.
LBNL's Scenarios for Meeting California's 2050 Climate Goals: Volume I, Non-Electricity Sectors and Overall Scenario Results (September 2013)	Provides technical analysis identifying widespread electrification of passenger vehicles, building heating, and industry heating as a requirement of meeting California's 2050 emission reduction goal of 80%.

Link to Public Webinar and Slides (9/20/18)

https://neep.org/events/strategic-electrification-planning-and-forecasting-northeast

Link to the slides here.
Link to a video of the recording here.

For more information:

www.neep.org

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