Building an Electrification Strategy and Roadmap

Featuring New E Source Consulting Tools

Bryan Jungers
Lead Analyst, Customer Energy Solutions

Spencer Sator
Senior Consultant

Web conference
Today’s speakers

Bryan Jungers
Lead Analyst
Customer Energy Solutions

Spencer Sator
Senior Consultant
Strategy, Technology & New Products
Why electrification?

- Provide load growth and generate revenue
- Advance energy-efficiency and demand-response programs
- Boost customer satisfaction
- Meet new regulatory challenges
- Reduce customers’ energy expenditures
- Reduce carbon emissions
- Create opportunities to serve disadvantaged communities
- Enhance grid resiliency and emergency preparedness
- Facilitate adoption of distributed energy resources (DERs), storage, and microgrids
What we’re not talking about today

Gas versus electric

- We inform; we don’t advocate
- Many electric and dual-fuel utilities have internal or external mandates to electrify
- Remember: We also conduct a lot of work on advancing efficient gas technologies
Current state of the industry
Many forces are pushing electrification

- High-quality products are finally available (heat pumps, induction stoves, electric vehicles [EVs])
- The grid is becoming decentralized and more reliant on DERs
- Greenhouse gas mandates mean gas is viewed unfavorably by some ...
- ... and increased renewables are a cleaner alternative
- Cheaper in new residential constructions
- Stagnating load growth and a need for new revenue-generation opportunities

**Internal strategic electrification drivers**

- Load building: 35%
- Revenue generation: 29%
- Carbon reductions: 21%
- Flexible load and grid management: 13%
- Legislative/policy directive: 0%

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Interest among utilities is skyrocketing

Last fall we polled utility members, and

69%

said they have an electrification strategy or are planning on developing one.

When we asked a similar question in 2017,

almost no utilities

said they were pursuing electrification.
Poll: Do you have an electrification strategy?

- Yes, it’s in place
- We’re currently developing one
- We don’t have one
So how do we develop (or improve) our electrification strategy?

- Learn from the best in the business
- Make sure it’s customer-focused
- Create a roadmap

Source: media.defense.gov
Learn from the best in the business
Lessons from existing programs: Strategies to achieve electrification goals

1. Pursue aggressive advertising campaigns for EVs
2. Be the trusted energy advisor; direct to helpful resources
3. Streamline customer participation; offer in-person consultation and application assistance
4. Establish partnerships with influential stakeholders
5. Leverage demand response with electrification
6. Capitalize on funding from the Volkswagen emissions settlement
Electrification isn’t a new trend

Source: Electrification Futures Study (PDF), National Renewable Energy Laboratory
What’s left to electrify?

Source: Electrification Futures Study (PDF), National Renewable Energy Laboratory
The anticipated second wave

Source: Electrification Futures Study (PDF), National Renewable Energy Laboratory
We’re in the transformation phase

Breaking the Limits on Electricity Value

- Electric Light
- Refrigeration

Transformation

Networked Digital Economy

Investment

Source: Electricity Technology Roadmap (PDF), Electric Power Research Institute
Electric vehicles: An efficient choice

Source: U.S. National Electrification Assessment (PDF), Electric Power Research Institute
Heat pumps are also quite efficient

Source: U.S. National Electrification Assessment (PDF), Electric Power Research Institute
This is not a VHS versus Betamax story

U.S. Historical Shipments: Air-Source Heat Pumps vs. Competing Technologies

Source: Heat Pumps in North America—2017 Regional Report (PDF), Oak Ridge National Laboratory
The outlook in Canada looks similar ...

Source: Heat Pumps in North America—2017 Regional Report (PDF), Oak Ridge National Laboratory
And the path to EVs is even steeper

We’re here
Where are the big, near-term wins?

- Seaport electrification
  - Source: Cavotech

- Bus electrification
  - Source: iStock

- Airport electrification
Transportation electrification, in stages

- Not competing directly against natural gas
- Significant market momentum already exists
- Several green initiatives support electrification
- Easily targeted, well-defined market segments
- Easier to reach customers, explain project benefits
- Per-project load growth and decarbonization potential
- Additional benefits, like supporting disadvantaged communities
Make sure your plan is customer-focused
Electrification is a nascent, abstract concept

- Why should electrification matter to customers?

- Communicating about it will be a challenge akin to grid modernization

- Focus on the larger narrative of electrification, not on explaining technologies or the power system
What’s the larger narrative?
Answer these questions

- What *problem will electrification solve* in customers’ lives?

- What *difference will electrification make* in customers’ lives?

“Society should use less oil, coal, and natural gas ...”

US respondents
n = 33,050
67%
(7 or higher)

Canadian respondents
n = 1,980
70%
(7 or higher)
“Renewables can replace fossil fuels ...”

US respondents
n = 33,050
66%
(7 or higher)

Canadian respondents
n = 1,980
68%
(7 or higher)
“My utility should source more renewables ...”

US respondents
n = 33,050

67%
(7 or higher)

Canadian respondents
n = 1,980

68%
(7 or higher)
Whatever your end goal ...

Key takeaways

• Understand customers by starting with market research
• Design marketing with customers in mind
• Market to and communicate with specific customer segments

Next steps

• Use E Source market research and tools to paint a picture of your customers
• Market through customer-preferred channels (email and phone)
• Expect customer responses through those channels
• Prepare for customer service
Develop a roadmap
Plenty of technologies, but which ones?

- **Transportation:**
  - Plug-in electric vehicles
  - Forklifts
  - Electric standby for refrigerated trucks
  - Airport ground support equipment
  - Medium- and heavy-duty vehicles
  - Specialized industry transport equipment
  - Port electrification

- **Manufacturing:**
  - Industrial Induction Surface Treating
  - Industrial Infrared Process Treating
  - Industrial Vacuum Furnace
  - Industrial Induction Melting
  - Process Heat and Steam Generation

- **Commercial Buildings:**
  - Heat pumps
  - Electric thermal storage
  - Heat pump water heaters

- **Residential Buildings:**
  - Electric baseboard heating
  - Electric furnace heating
  - Heat pumps
  - Radiant heat
  - Hydronic heating with electric water heater
  - Electric thermal storage
  - Heat pump water heaters
  - Electric resistance
  - Electric ovens
  - Electric grills
  - Induction cooking
  - Electric clothes dryers
  - Ultrasonic clothes dryers
How to prioritize and plan? A roadmap!

- A roadmap connects long-term strategic goals with short-term tactical activities that will get you there.
- It should identify areas of highest and lowest priority.
- It incorporates technological goals and is customer-focused.
- It acts as a planning document internally and a communication piece for external stakeholders.
  - Includes other utility teams, regulators, intervenors, partners, etc.
Benefits of a roadmap

- Resource planning is easier
- You can proactively identify risks and obstacles
- It keeps staff and stakeholders in communication and on the same page
- It’s an easy way to set goals and monitor progress
- It’s the most cost-effective planning tool
- It facilitates clear, easy, and effective prioritization
- It facilitates partnerships and resource pooling
- It’s a powerful tool for justifying budgets and activities
A few industry examples

Source: ATMO.org

Source: Bonneville Power Administration
Roadmap: Types of data

- End goal (usually 5 to 15 years)
- Annual utility interventions required to meet goals
- Intermediate goals and milestones
- Obstacles and risks
- Impact of each technology in meeting goals
- Unmet customer needs and non-energy benefits
- Tie-ins to demand-response, energy-efficiency, or other utility programs
- Nonutility forces impacting the technology
# Variable capacity HVAC systems

<table>
<thead>
<tr>
<th>Technology</th>
<th>Description</th>
<th>Industry Considerations</th>
<th>Barriers</th>
<th>Time to maturity</th>
<th>Interventions</th>
<th>Team Priority Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable refrigerant flow (VRF)</td>
<td>Ability of space conditioning system to modulate heating or cooling output in response to the thermal loads of the conditioned space and user input of occupants.</td>
<td>Not currently cost effective. Not openADR compatible. Low market penetration.</td>
<td>Cost effective optimized VRF systems with improved controls</td>
<td>5 years</td>
<td>Engage manufacturers as new products are developed.</td>
<td></td>
</tr>
<tr>
<td>Variable speed drive (VSD) compressors</td>
<td>Ability of space conditioning system to modulate heating or cooling output in response to the thermal loads of the conditioned space and user input of occupants.</td>
<td>Some are variable speed drives, some are multi-speed, most common is constant speed.</td>
<td>All new products have VSD; limited market</td>
<td>6-8 years</td>
<td>Develop design guidelines with EPRI, DOE. Field test products for performance, interoperability, installation and maintenance. Engage with standards committees (ASHRAE). Enable connectivity to utility.</td>
<td>8 - MEDIUM</td>
</tr>
<tr>
<td>Fan motors (ECM)</td>
<td>Ability of space conditioning system to modulate heating or cooling output in response to the thermal loads of the conditioned space and user input of occupants.</td>
<td>Not commonly integrated in products. Limited to small motors.</td>
<td>Integration in all products by equipment makers</td>
<td>12 years</td>
<td>Engage with standards committees (ASHRAE). Enable connectivity to utility.</td>
<td></td>
</tr>
<tr>
<td>Geothermal systems with variable refrigerant flow (VRF)</td>
<td>Ability of space conditioning system to modulate heating or cooling output in response to the thermal loads of the conditioned space and user input of occupants.</td>
<td>Not cost-effective. Limited by geography.</td>
<td>None identified</td>
<td>5+ years</td>
<td>Support wider adoption of variable through incentives.</td>
<td></td>
</tr>
<tr>
<td>Next generation heat pumps</td>
<td>Ability of space conditioning system to modulate heating or cooling output in response to the thermal loads of the conditioned space and user input of occupants.</td>
<td>Marketplace very limited; innovation is slow.</td>
<td>Ability to provide heating and cooling and operate in a variety of climatic conditions. Facilitate zero carbon efforts.</td>
<td>10 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What next?

Two approaches, and we can help you with either!
## DIY with E Source subscription services

### Distributed Energy Resource Strategy

- Utility DER and Electrification Benchmark
- Strategic Electrification: Insights to Spark Your Interests
- Business Case for Electrification
- How Utilities Are Taking Charge of Electric Vehicle Adoption

### Demand-Side Management

- Beneficial Electrification Programs
- How to Evolve Your DSM Portfolio in a DER World
- DSM Programs and the Smart Home: The Journey Beyond Smart Thermostats
- Developing a Successful Strategic Electrification Program

### Technology Assessment

- How Will Electrification Affect the Grid?
- Electric Vehicle Technology, Implications for the Grid, and Promotion Strategies
- Electrification Technologies for Commercial Customers
- Induction-Cooking Efficiency

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**Ask E Source: Small research-on-demand projects**

Events, including web conferences, meetings, and major conferences
And now we can fish for you!

- Full-service electrification strategy development from E Source Consulting & Advisory Services

- Includes:
  - Technology penetration and potential evaluation
  - Long-term strategy development; identify short-term tactics
  - Customer-centric innovation
  - Any other features you need to be successful

- All based on best practices, with the latest technologies and the best research team around

- Fully customizable to meet your goals, regulatory concerns, local climate, and customer base
Why we’re excited about fishing for you

- Much faster development (months, not years)
- Not a huge new additional responsibility for your team
- Typically far cheaper than in-house roadmap development
- Plans are not developed in a vacuum
  - Incorporates all industry best practices
  - Can help you identify opportunities and partnerships to leverage
- We can update plans annually
- Customized to the specific goals of your department
E Source DSM consulting solutions

1. Innovation beyond current offerings
2. Insight into evolving competitive business models
3. Development of portfolio-gap analysis
4. Holistic visibility into peer utilities’ programs
5. Deep understanding of the utility residential and commercial customer landscape
Poll: Now that you’ve seen some of our approaches, how would you classify your electrification strategy?

- It’s great—among the best in class
- Good, but it could probably be improved
- We need a lot of help!
- We don’t have a strategy or might have to start over
Thank you! Questions?

Cindy Schweitzer
Vice President, Customer Solutions, E Source
303-345-9130
cindy_schweitzer@esource.com

Have a question? Ask E Source!
Submit an inquiry: www.esource.com/question

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