GC3 Analysis, Data, and Metrics Working Group Meeting

December 3, 2015
2:30—4:30 p.m.
Agenda

2:30  Welcome

2:40  Review and discussion of California emissions reduction strategy – *Presented by NESCSAUM*

3:25  Role of electric utilities in deploying electric vehicles
      *Guest speaker, Watson Collins, Eversource*

3:40  New items for discussion

4:00  Public Comments
Welcome

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4:00 Public Comments
Meeting Goals

• Review of GHG contributors and broad strategies for reducing emissions

• Summarize the foundation in place in CT to promote the technology transformation needed to achieve climate goals

• Insights from CA PATHWAYS analysis
CT GHG Emissions 2012

- Transportation: 40%
- Electric Power: 17%
- Residential: 18%
- Industrial: 10%
- Commercial: 8%
- Waste: 6%
- Agriculture: 1%
4 Key Energy Transitions

1. Efficiency and conservation across all energy use sectors (includes VMT, building energy use, vehicle efficiency, etc.)

2. Fuel switching in transportation/buildings

3. Decarbonize electricity

4. Decarbonize fuels (gas/liquids)

Source: E3, California PATHWAYS, 2015
CT Has Building Blocks in Place

• ZEV mandate and incentives programs
• RGGI
• Renewable portfolio standard
• Solar installations
• Energy efficiency programs
CT ZEV Purchasing Incentives

Point-of-Sale Consumer Incentives

- Up to $3,000 for purchase or lease of new ZEV
- $1 million dollar seed fund with an additional $1 million dedicated in November

Dealership Sales Incentives

- $300 for each ZEV sold or leased
CT Charging Infrastructure Incentives

Fleet and Workplace Charging Incentive Program

- Available to state agencies and municipalities
- A reimbursement of up to $15,000 per vehicle and up to $10,000 per charger

Charging Station Incentive Program for Businesses

- Awards of $2,000 to $5,000 per charging station
- Must be available to public free of charge
H2 Fueling Stations Incentives

- Allocation of state grant funds to leverage private investment
- Locate in the greater Hartford area
- Three bids for construction of two publically available fueling stations
- Expect awards by year’s end
- Stations projected to be operational in 2017
Role and Opportunities for Utilities in Transportation Electrification

- Charging infrastructure deployment
- Variable rate pricing
- New demand to make up for downward trend
- More efficient generation through load balancing
RGGI Power Sector CO₂ Emissions

Source: RGGI and UCS
## State Renewable Energy Targets

<table>
<thead>
<tr>
<th>State</th>
<th>Standard or Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>RPS: 33% by 2020</td>
</tr>
<tr>
<td>CT</td>
<td>RPS: 20.0% Class I + 3% Class I or II + 4% Class III by 2020</td>
</tr>
</tbody>
</table>
| MA    | RPS: Class I (New Resources): 15% by 2020 + 1% each year thereafter  
Class II (Existing Resources): 5.3% in 2014 (1.8% renewables and 3.5% waste-to-energy) and 5.5% in 2015 (2.0% renewables and 3.5% waste-to-energy) |
| RI    | RPS: 14.5% by 2019 |
| VT    | CEP sets goal of 90% renewable energy by 2050 |
| NY    | RPS: 50% by 2030 |
## State Solar PV Installation and Capacity Rankings

<table>
<thead>
<tr>
<th>State</th>
<th>National Rank Installed Systems</th>
<th>National Rank Capacity (MW)</th>
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Source: NREL, *The Open PV Project*, Dec. 2015
(https://openpv.nrel.gov/rankings)
## Table 2. Summary of state scores in the 2014 State Scorecard

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Utility &amp; public benefits programs &amp; policies (20 pts.)</th>
<th>Transportation policies (9 pts.)</th>
<th>Building energy codes (7 pts.)</th>
<th>Combined heat &amp; power (5 pts.)</th>
<th>State government initiatives (7 pts.)</th>
<th>Appliance efficiency standards (2 pts.)</th>
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## Table 4. Leading states in the State Scorecard, by years at the top

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<thead>
<tr>
<th>State</th>
<th>Years in top 5</th>
<th>Years in top 10</th>
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<td>Vermont</td>
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<td>Connecticut</td>
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</table>
Path Forward

• 2050 climate goals require fundamental restructuring of CT’s energy system

• Rate of GHG reductions must significantly increase to meet 2050 goal

• Insights from CA PATHWAYS approach
Key Assumptions in CA PATHWAYS

- Continuation of current lifestyle & economic growth

- Technological conservatism, plus key emerging technologies with low carbon intensity

- Natural retirement of equipment (not early replacement) and penetration of new technology consistent with history

- Biomass use is limited based on DOE estimate of sustainable supply

- Advanced biofuels are assumed to have net-zero carbon emissions
CA PATHWAYS Approach

Four major energy transformations needed to meet CA’s 2050 climate goals:

- Total energy-use efficiency needs to *improve* by additional 1.3%/year over 30 years
- Electricity supply is nearly decarbonized
- Most existing direct fuel use needs to be electrified
- Fuel-switching, with some “forks in the road”
  - Electrification vs. biogas in buildings?
  - All-electric vehicles vs. hydrogen fuel cell?

→ *Without electrification, no feasible way to meet the GHG reduction target*

Sources: Williams, J. *et al.* 2011; Energy + Environmental Economics 2015
CA PATHWAYS Electricity Supply

Three forms of decarbonized electricity each of which has potential to dominate CA electricity production:

- Renewable energy (intermittent) - 74% max. feasible
- Nuclear (baseload)
- Carbon capture and storage (CCS) (dispatchable)

Each source also has varying need for: supporting infrastructures, transmission, energy storage, land/water, and siting

- RE has highest needs for installed capacity, transmission, and storage
- Nuclear needs largest export market and fuel cycle infrastructure
- CCS requires construction of CO2 transport and storage
Core analysis uses conservative estimates of future costs of technology.

Key uncertainties exist in future costs of technologies, fossil fuels, and cost of capital:

- Solar PV: -50%
- Electric heat pumps: -20%
- LED lighting: -20%
- Grid electrolysis: -20%
- Wind power: -5%
- Fuel cell vehicles: -5%
- Battery and plug-in electric vehicles: -5%
- Electric boilers: -5%
CA PATHWAYS Costs for 2030 and 2050

**2030**

- Slower Com. Adoption: 0 (billion$)
- Straight Line: 2 (billion$)
- Early Deployment: 15 (billion$)

**2050**

- Slower Com. Adoption: 50 (billion$)
- Straight Line: 40 (billion$)
- Early Deployment: 60 (billion$)
CA Vision 2 Scenario (2015)

• 100% ZEV sales share by **2050**
• 2050 LDV in-use fleet mix:
  - 67% FCVs, BEVs, and PHEVs
  - 33% high-efficiency ICEs
• Slower introduction of ZEVs, but still meets 2050 GHG targets
• PHEVs play greater role, but require high all-electric range
• Assumes more efficient ICEs based on recent NAS estimates
Concluding Thoughts

• CT has developed a strong foundation to build upon

• CT’s approach parallels California’s

• Deeper efficiency across all sectors and decarbonization of fuels is necessary

• Sequencing of strategies can lead to lower costs

• A regional approach will help to tackle difficult to implement strategies
Agenda

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Role of electric utilities in deploying electric vehicles

Governor’s Council on Climate Change (GC3)
Analysis, Data and Metrics Working Group Meeting

December 3, 2015
Regional discussion around carbon has focused on power generation, the largest source of GHG emissions in the US...but only the third largest source of emissions in New England and Massachusetts.

2013 Energy Carbon Emissions by Source
New England vs. US

- **New England**
  - Power generation: 47.5%
  - Space heating: 28.5%
  - Industrial: 17.4%
  - Transportation: 6.6%

- **US**
  - Power generation: 39.0%
  - Space heating: 33.3%
  - Industrial: 18.3%
  - Transportation: 9.5%

Source: EIA.
Since 1990, New England has already reduced emissions by 11%, driven primarily by a reduction of power generation sector emissions of 40%. In the same time, the transportation sector has increased emissions by 13%.
Plug-in Electric Vehicles (PEVs) are important in reducing carbon emissions.
PEVs Will Lead to Deep Reductions in Carbon Emissions

Figure 3
Relative vehicle emissions for the passenger car class for 2015 and 2050

* PEV emissions include battery-manufacturing emissions and full-fuel-cycle emissions for electricity and gasoline, averaged over a 150,000-mile vehicle lifetime. The utility factor for the PEV is 87%.

Source: EPRI & NRDC
The infrastructure and integration with the grid is different for each of these segments.
Home: EV Integration Pilot

Pilot Description

- Pilot for 105 residential customers in the eastern Massachusetts service territory
- Participants get a “grid aware” charging station for a discounted price of $500
- The “grid aware” charging station can manage the timing of charging (hour of the day) but more importantly it can also manage the speed of charging (kW).
- Now two aspects of PEV charging, timing and speed of charging, can be used combination to integrate PEVs into the grid.
- While not the focus of the pilot, the Plug My Ride @ Home hardware can also be used for demand response

Enables the PEV to be made grid friendly today while still being future ready
Workplace & DC Fast Charging: Infrastructure and EV Integration

- Over 30 charging spots at Eversource locations, 25 added in 2015
- Deploying DC Fast Chargers in collaboration with Connecticut DEEP and DOT
- DC Fast Charger Technical Planning Study in Massachusetts
- Rate Pilot for DC Fast Chargers in Connecticut
Outreach

Get connected!

A new generation of plug-in vehicles (EVs) has arrived here in the northeast. The extended-range Chevy Volt, the all-electric Nissan Leaf and several other models are now available to purchase, lease or test drive at area dealerships.

Our "Plug My Ride" website is a resource for you with the information you need about electric vehicles and electric vehicle charging technology to make informed decisions that will benefit your family, business and community.

News and Events

EverSource is launching an Electric Vehicle Rate Pilot and EverSource customers in eastern Massachusetts may be eligible to purchase a Level 2 charging station at a reduced cost. Call 1-855-463-6438 for more information.

Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) of up to $2,500 for the purchase or lease of new electric vehicles, including battery electric, plug-in hybrid electric and fuel cell electric vehicles.

CT Dept. of Energy & Environmental Protection is accepting applications to fund publicly accessible EV charging stations.

Resources

- Charging Station Locator
- Electric Car Cost Calculator
- EV Showroom
- Electric Generation - Share your story!
- EV Connecticut
- Massachusetts Department of Energy Resources

Websites

- Plug My Ride
- Plug My Ride
- Plug My Ride

Tweets

- Plug My Ride
- Plug My Ride
- What is Level 3 Charging? bit.ly/1N3uWd

www.PlugMyRide.org

855-463-6438

@PlugMyRide
Moving Forward

- Achieving scale
- Threshold issues
- Infrastructure needs
- Economic value
- EV grid integration
- Awareness
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