Building Partners

- **Platinum Partners:**
  - Robinson + Cole
  - Starion Energy

- **Silver Partners:**
  - Portland Natural Gas Transmission System
  - DePino, Nunez & Biggs
Building Partners

- **Individual Members:**
  - John Athas, Daymark Energy Advisors
  - Kent McCord, Solect Energy
  - Sabin Rossi, Fairbanks Energy Services
  - M. Anne Peters, Carmody Torrance Sandak & Hennessey, LLP
  - Pamela Elkow, Carmody Torrance Sandak & Hennessey, LLP
New Energy Professionals

Welcome First Time Attendees

- Benjamin Davis, Concentric Energy Advisors
- Bruce Douglas, Natural Systems Utilities
- Steve Horn, Dominion Resources
- Alec Lawson, Primacy
- Kent McCord, Solect Energy
- Sayen Moray, ERS
Upcoming Events

Tuesday, Dec 13, 2016
Holiday Party, The Society Room, Hartford

Wednesday, Jan 11, 2017
Legislative Preview, Courtyard Marriott, Cromwell
Addressing Connecticut’s Climate Change Goals

Policy, Electric Distribution and Generation Perspectives on Strategies

WEDNESDAY, NOVEMBER 9
Connecticut Department of Energy and Environmental Protection
2008 Global Warming Solutions Act
Public Act No. 08-98

Requires the state to meet economy-wide greenhouse gas emission reductions equal to:

- 10% below 1990 levels by January 1, 2020
- 80% below 2001 levels by January 1, 2050.
Comparison of Electricity Sector Generation and Consumption-based Accounting

Million metric tons of CO₂e


2020 Target
4% reduction (consumption)
9% reduction (generation)

2050 Target

*Targets shown in this graph utilize the consumption-based approach 1990 baseline of 44.7 MMTCO₂e. The generation-based approach 1990 baseline is 44.9 MMTCO₂e.
The generation-based approach indicates lower carbon emissions than the consumption-based approach, reflecting the fact that power plants operating within Connecticut have a “cleaner” generation mix than the region as a whole.

The consumption-based approach reflects significant historical and ongoing change in the mix of fuels used to generate electricity in New England. It also has the potential to better align Connecticut’s GHG inventory with actions the state has taken and can take to reduce emissions by investing in energy efficiency within our borders, and increasing generation of electricity from renewable energy sources both within the state and regionally through policies such as the Renewable Portfolio Standard and long-term contracting.
Connecticut’s largest reduction has occurred in the electric power sector — a 20.5 percent reduction under consumption-based accounting and a 39 percent reduction under generation based accounting.

The transportation sector continues to be the single largest source of emissions in the state, contributing 36 percent, principally from the use of fossil fuels in passenger cars and light-duty trucks.
Connecticut’s Policy Framework

- **2001**: CT signs NEG/ECP 2001 Climate Change Action Plan
- **2004**: An Act Concerning Climate Change (Public Act 04-252) sets GHG goals that align with NEG/ECP regional goals
- **2005**: GSC finalizes CT Climate Change Action Plan
- **2008**: 2008
- **2009**: Executive Order 46 on Climate Change
- **2010**: Creates the GC3
- **2013**: 2013 Comprehensive Energy Strategy
- **2014**: CT’s implementation of 1990 Amendments to Federal CAA continues
- **2014**: CT Global Warming Solutions Act (Public Act 08-98) reaffirms commitment to GHG targets for 2020 and 2050
- **2014**: Regional Greenhouse Gas Initiative
- **2014**: ZEV MOU
- **2014**: 2013 Comprehensive Energy Strategy
- **2014**: International ZEV Alliance
Comprehensive Energy Strategy (CES)

Guiding Principles
Cheaper, Cleaner, More Reliable and Sustainable… for Communities and Customers

The 2016 CES covers the same topics as the 2013 CES but recognizes buildings as critical elements of an integrated energy infrastructure.

2013 CES Chapters
- Electricity
- Energy Efficiency
- Industry
- Natural Gas
- Transportation

2016 CES Sectors
- Electricity
- Buildings and Processes
- Transportation
Governor’s Council on Climate Change

www.ct.gov/deep/GC3

The Council is to examine the effectiveness of existing policies and regulations designed to reduce greenhouse gas emissions and identify new strategies to meet the state’s greenhouse gas emissions reduction target of 80% below 2001 levels by 2050.

It will do so, in part, by developing interim statewide greenhouse gas reduction targets for years between 2020 and 2050 and by identifying short- and long-term statewide strategies to achieve the necessary reductions.
Connecticut Reference Case
Projections by Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>2050 GHG Share</th>
<th>2010-2050 Avg. Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>16%</td>
<td>-1.3%</td>
</tr>
<tr>
<td>Transportation</td>
<td>41%</td>
<td>-0.8%</td>
</tr>
<tr>
<td>Residential</td>
<td>17%</td>
<td>-1.1%</td>
</tr>
<tr>
<td>Industrial</td>
<td>13%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Commercial</td>
<td>13%</td>
<td>0.3%</td>
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</tbody>
</table>
Evaluation of three alternative interim 2030 targets

8 MMT difference in 2030 between 35 and 55 percent scenarios
Hypothetical Emission Reduction Scenarios

Scenario 1

<table>
<thead>
<tr>
<th>Year</th>
<th>% Reduction</th>
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</thead>
<tbody>
<tr>
<td>2030</td>
<td>40%</td>
</tr>
<tr>
<td>2040</td>
<td>65%</td>
</tr>
<tr>
<td>2050</td>
<td>80%</td>
</tr>
</tbody>
</table>

Economy Wide GHG Emissions

Regional Electricity Generation

Scenario 2

<table>
<thead>
<tr>
<th>Year</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2030</td>
<td>40%</td>
</tr>
<tr>
<td>2040</td>
<td>65%</td>
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<tr>
<td>2050</td>
<td>80%</td>
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Economy Wide GHG Emissions

Regional Electricity Generation

80% below 2001 levels
Hypothetical Emission Reduction Scenarios

**Scenario 3**

<table>
<thead>
<tr>
<th>Year</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>2030</td>
<td>40%</td>
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<tr>
<td>2040</td>
<td>63%</td>
</tr>
<tr>
<td>2050</td>
<td>80%</td>
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</tbody>
</table>

**Economy Wide GHG Emissions**

- Reference Case
- State EE Programs
- Behind the Meter Solar PV
- Utility-Scale Renewables
- Electric Passenger Cars / Trucks
- Residential Renewable Thermal
- Commercial Renewable Thermal
- Heavy-Duty Electrification
- Clean Long Haul & Rail
- VMT Reduction Measures

80% below 2001 levels

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**Scenario 4**

<table>
<thead>
<tr>
<th>Year</th>
<th>% Reduction</th>
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<tbody>
<tr>
<td>2030</td>
<td>55%</td>
</tr>
<tr>
<td>2040</td>
<td>69%</td>
</tr>
<tr>
<td>2050</td>
<td>80%</td>
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</tbody>
</table>

**Economy Wide GHG Emissions**

- Reference Case
- State EE Programs
- Behind the Meter Solar PV
- Utility-Scale Renewables
- Electric Passenger Cars / Trucks
- Residential Renewable Thermal
- Commercial Renewable Thermal
- Heavy-Duty Electrification
- Clean Long Haul & Rail
- VMT Reduction Measures

80% below 2001 levels
Electricity demand is 22% higher by 2050 in the ZEV scenarios. The grid mix has a large impact on the efficacy of vehicle electrification.
# GC3 Process Timeline: 2016-2017

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Refine and finalize GHG reduction scenarios in LEAP.</td>
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<tr>
<td>Economic Analysis of Scenarios (REMI).</td>
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<tr>
<td>Review and discuss midterm target(s) and policy options for achieving GHG reduction targets.</td>
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<tr>
<td>Develop a policy narrative around GHG mitigation scenarios.</td>
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### Upcoming Meetings:

- **GC3 Meeting November 14, 2016**  3:00 – 5:00 PM
- **GC3 Meeting December 15, 2016**  1:30 – 3:30 PM
Thank You!

Keri Enright-Kato
Director of Climate Change, Technology & Research, CT DEEP
Keri.Enright-kato@ct.gov
Utility Perspective

Tracy A. Gionfriddo, Eversource Energy
Eversource Has Smaller Footprint Than Most Peers

2013 Carbon Footprint of Select Peer Companies (metric tonnes CO2e)
Corporate Focus on Reducing Regional Emissions Intensity

- Renewable energy
- Energy efficiency
- Natural gas heating
- Alternative fueled vehicles
- Adaptation and resiliency
CPES – Addressing Connecticut’s Climate Change Goals

November 9, 2016
Dominion Profile
Power and Natural Gas Infrastructure

Leading provider of energy and energy services in the U.S.

- **25,700 MW** of electric generation
- **6,500 miles** of electric transmission
- **14,400 miles** of natural gas transmission, gathering and storage pipeline
- **1 trillion cubic feet** of natural gas storage operated
- **Cove Point LNG Facility**
- **2.5 million** electric customers in VA and NC
- **2.3 million** natural gas customers in OH & WV; and UT, WY, ID (not shown)
- **1.2 million** non-regulated retail customers in **14** states (not shown)
Dominion Profile
Renewable Power Generation Portfolio

Notes:
- 82.5 MW of utility-scale solar to be developed in partnership with the Commonwealth of Virginia, not illustrated.
- At least 150 MW of additional utility-scale solar under development in Virginia, not illustrated.
- Kitty Hawk Microgrid’s MW capacity shown does not include the onsite battery storage.
- Bridgeport powered by natural gas; qualifies as a renewable energy facility in Connecticut.

* Capacity reflects Dominion ownership percentage.
Comparison of Life-Cycle Emissions

Tons of Carbon Dioxide Equivalent per Gigawatt-Hour

Source: Annex III. Technology-Specific cost and performance parameters. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Edenhofer, O., et.al., Cambridge University Press, 2014. The numbers shown are the median of studies examined by the IPCC in grams CO2e per kWh and are converted to tons CO2e per GWh.
Dominion Profile in New England
Changing Landscape the last few years – Dominion microcosm of region

Changing Landscape:
• Divested Merchant Coal plants
• Divested Electric Retail business
• Acquired Renewable Energy Projects

Sold Salem Harbor
August 2012
Coal
738 Mw

Sold Brayton Point
August 2013
Coal, Oil, & Gas
1538 Mw

Acquired Bridgeport Fuel Cell Park
December 2012
15 Mw

Acquired Somers Solar Center
October 2013
5 Mw

Manchester Street
Natural Gas CC (3 Units)
465 Mw

Millstone
Nuclear (2 Units)
2100 Mw
Largest Generating Facility in Connecticut and New England:

- Safe, reliable, carbon-free, base load power
- 2,111 MWs; ~17 million MWhs annually
- Typically produces the equivalent of 55-60 percent of Connecticut’s power needs and 10-15 percent of New England’s
- More than $1.2B capital investment in safety and efficiency since 2001
Carbon-free Sources of Electricity

Billions of kilowatt-hours

Source: Energy Information Administration, 2015.
Market Pressures
For Existing Nuclear Resources

- Prolific supply of low-cost shale gas
- Low growth (in some cases, no growth) in electricity demand
- State and federal incentives for other resources
- Market design issues
  - Failure of markets to recognize valuable attributes
  - Price suppression in energy markets
“Dominion says Kewaunee nuclear plant will shut down for good” – Milwaukee Journal-Sentinel October 22, 2012

“Entergy announces plans to close Vermont Yankee” – WCAX.com August 27, 2013

“Entergy to close FitzPatrick nuclear plant in Oswego County” – Syracuse Post-Standard November 2, 2015
Market Pressures Realized
Recent Premature Retirements of Nuclear Plants Based on Economics

“Exelon Shutting Two Nuclear Plants After Legislation Fails” – Bloomberg June 2, 2016

“'Simply an economic decision': OPPD to close Fort Calhoun nuclear plant by end of 2016” – Omaha World Herald June 17, 2016

“PG&E to close Diablo Canyon, California's last nuclear power plant” – Los Angeles Times June 21, 2016
Conclusion/Contact

– Conclusion: Existing nuclear is critical for Connecticut to achieve its carbon goals. Will policies align acknowledging that?

– Contact information:
  • Kevin Hennessy  
    Director, State Policy – New England  
    Dominion Resources, Inc.  
    860-444-5656 (office)  
    860-912-5124 (mobile)  
    Kevin.R.Hennessy@dom.com