Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY & ENVIRONMENTAL PROTECTION

GC3 Meeting

August 9, 2017
1:30 — 3:30 p.m.

Agenda

1:30	Welcome & Announcements
1:35	Overview of CT Comprehensive Energy Strategy (CES)
1:50	Review and discuss mitigation wedges and scenarios
3:00	Public comments

Overview of CT Comprehensive Energy Strategy (CES)

Mary Sotos

CT Comprehensive Energy Strategy

The 2017 CES seeks to achieve cleaner, cheaper, more reliable energy, with policies that:

- Align with and support the State's broader environmental policies to meet clean air, clean water, land conservation and development, and waste reduction goals;
- Put the State on a clear path to meet the Global Warming Solutions Act to reduce greenhouse gas emissions (GHG) 10 percent below 1990 levels by 2020 and 80 percent below 2001 levels by 2050;
- Focus on grid modernization, strategic electrification, increasing efficiency, and improving reliability and security;
- Increase energy affordability and economic security to help strengthen the State's economy now and into the future;
- Maintain equitable access to the benefits of clean and efficient energy generation and transportation options.

CT Comprehensive Energy Strategy

- The 2017 CES acknowledges the need to transform how we produce, distribute, and consume energy to achieve Connecticut's long-term vision of a zero-carbon economy. This transformation will take many years to implement and requires developing a forward thinking framework with specific plans and recommendations for the near term.

- Improving building efficiency, and reducing vehicle miles traveled will help decrease the use of carbon-intensive fuels. But ultimately, widespread electrification of building thermal loads and the transportation sector is required. By 2050 electricity becomes the dominant source for our energy supply and makes de-carbonization of the electric power sector the cornerstone to the success of achieving a carbon-free economy.

- The 2017 CES strategies and goals advance the State's long-term vision by calling for continued investment in clean energy resources, grid-modernization, increasing energy efficiency in buildings and transportation, and accelerating progress to decarbonize the energy sector.

CES Chapter Goals & Recommendations

Electric Supply

- Strategically and cost-effectively advance deployment of clean energy to meet Connecticut's policy goals. Continue to encourage competitive procurement models.

Buildings

- Focuses on deploying energy efficiency investments to achieve weatherization goal of 80% of all residential units by 2030, customized solutions, deeper measures, advancing codes and standards.

Transportation

- Strategic emphasis on decarbonizing transportation –federal emission standards ZEV MOU, EV deployment and regulatory framework, improving connectivity/mobility and reducing vehicle miles traveled.

Public Comment Schedule

Public meetings

August 14, 2017, 6:30 PM
Webb Hall, Room 110
Eastern CT State University
83 Windham Street, Willimantic, CT

August 16, 2017, 6:30 PM
Beacon Hall Events Center, Room 214,
Housatonic Community College
900 Lafayette Boulevard, Bridgeport, CT

August 21, 2017, 6:30 PM
Fort Trumbull State Park Conference Center
90 Walbach Street, New London, CT

August 29, 2017, 6:30 PM
Torrington City Hall Auditorium
140 Main Street, 2nd Floor, Torrington, CT

September 6, 2017, 4:00 PM
Gina McCarthy Auditorium
DEEP's Hartford Office
79 Elm Street, Hartford, CT

September 7, 2017, 6:30 PM
Jones Auditorium, Britton Building, 2nd Floor
CT Agricultural Experiment Station
123 Huntington Street, New Haven, CT

Technical Meetings

August 28, 2017, 9 AM
DEEP's New Britain Offices, Hearing Room 1
Ten Franklin Square, New Britain, CT

September 13, 2017, 11 AM
DEEP's New Britain Offices, Hearing Room 1
Ten Franklin Square, New Britain, CT

Comments on Draft CES Due:
September 25, 2017

Issuance of Final CES:
October/November, 2017

Mitigation Scenario Assumptions & Mid-Term Target Range

Jason Rudokas

Overview of Mitigation Scenarios

- This presentation documents the proposed input assumptions for **two riverbank mid-term target scenarios** of 35% and 55% below 2001 levels by 2030.
- Informed by GC3 guidance, the following set of slides outline the input assumptions for three sectors:
  - *Electric Sector*
    - Electric energy efficiency
    - Renewable and carbon free energy generation
  - *Buildings Sector*
    - Thermal energy efficiency
    - Renewable thermal
  - *Transportation Sector*
    - ZEV deployment
    - Heavy-duty electrification/alternative fuels
    - Passenger and freight rail electrification
    - Short haul trucks electrification/alternative fuels
    - VMT reductions

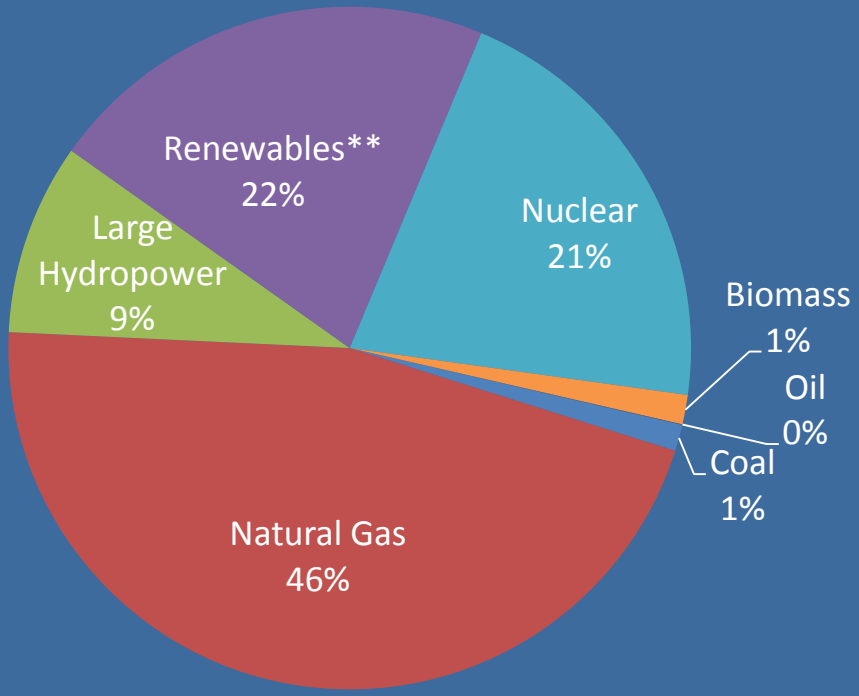
Electricity Sector Technology Penetration Rates and Assumptions

Electric Sector Inputs Assumptions

- Reference case electricity generation trends are based on the 2017 EIA Annual Energy Outlook (AEO) forecast for New England
- The AEO projections were scaled to CT electric load using the 2017 ISO-NE Capacity, Energy, Loads, and Transmission Report (CELT)
- Assumes regional nuclear electricity generation facilities do not retire prior to end of license expiration.

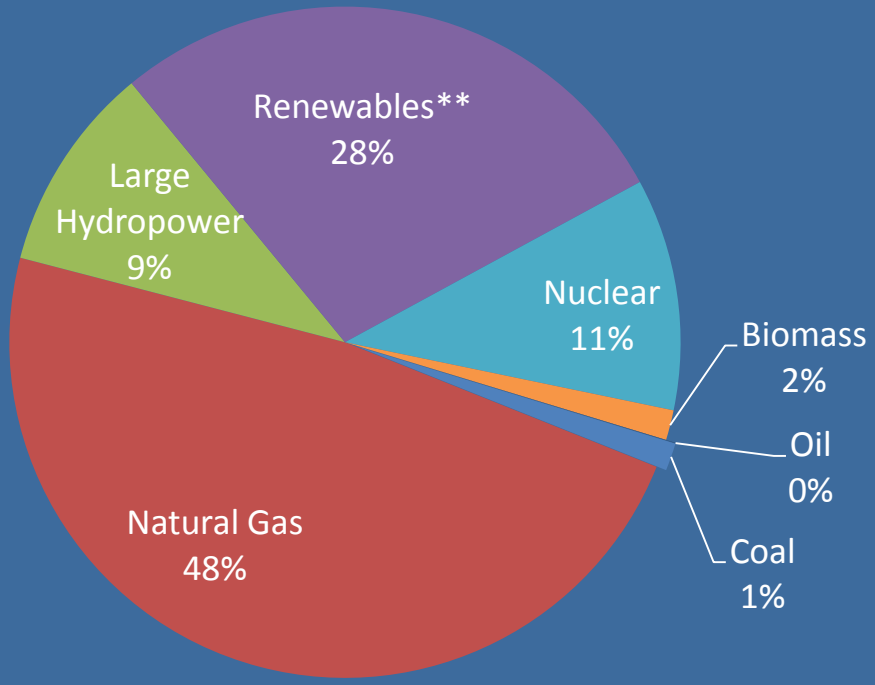
Electric Power Generation Mix for Reference Case

2030



Zero Carbon 2030: 51%

2050

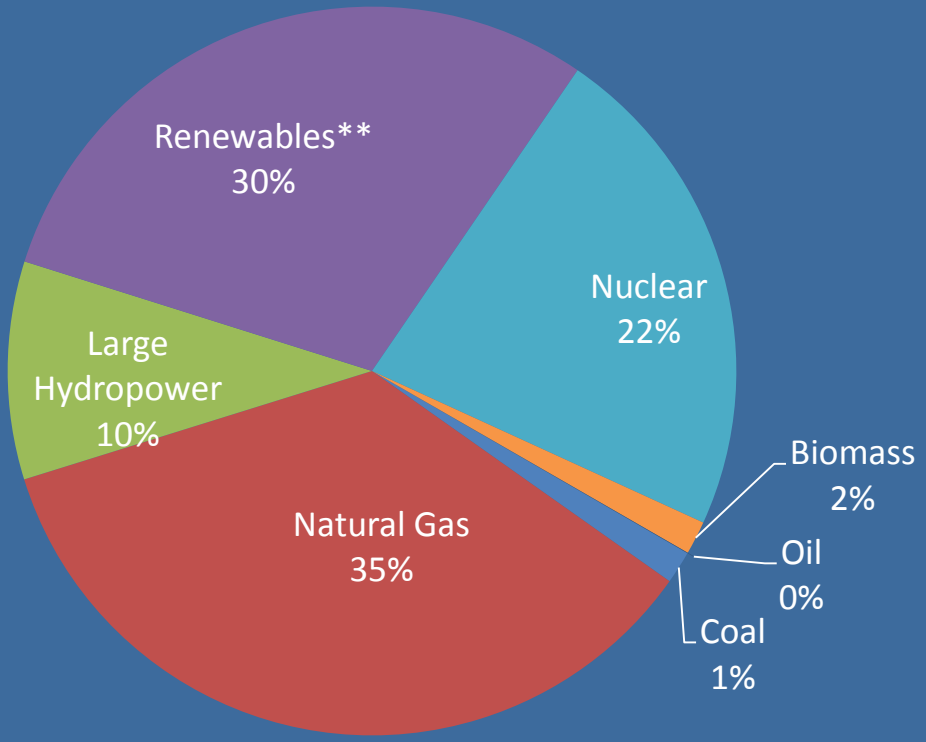


Zero Carbon 2050: 49%

* Generation mix represents CT's portion of the regional electric grid.
** Renewables are defined as CT Class I resources

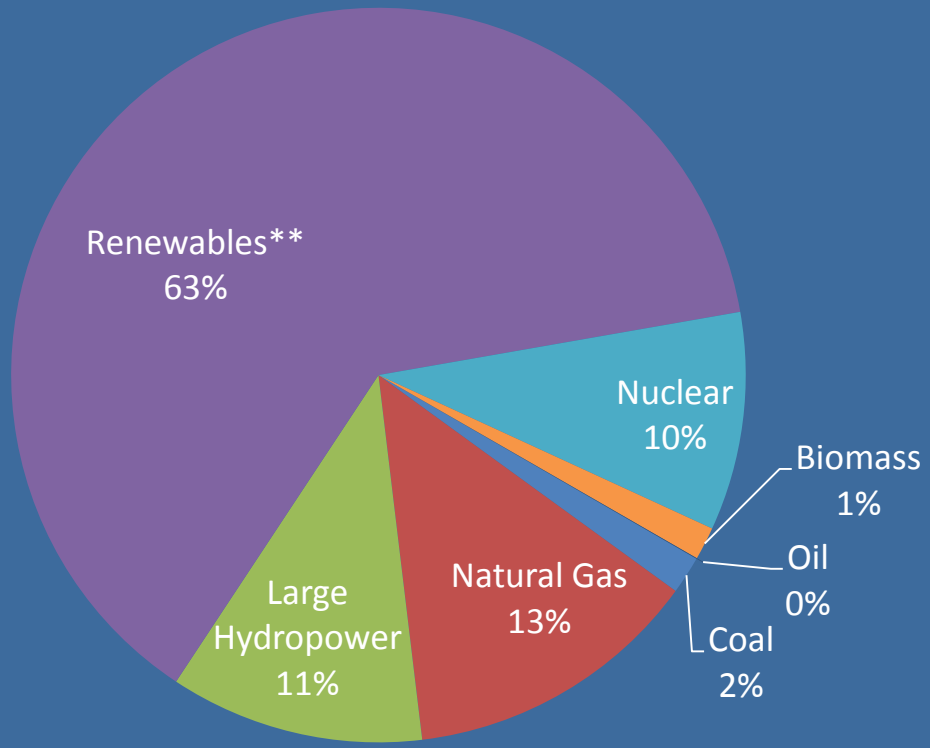
Electric Power Generation Mix for 35% Mid-term Target and 80% 2050 Target

2030



Zero Carbon 2030: 62%

2050

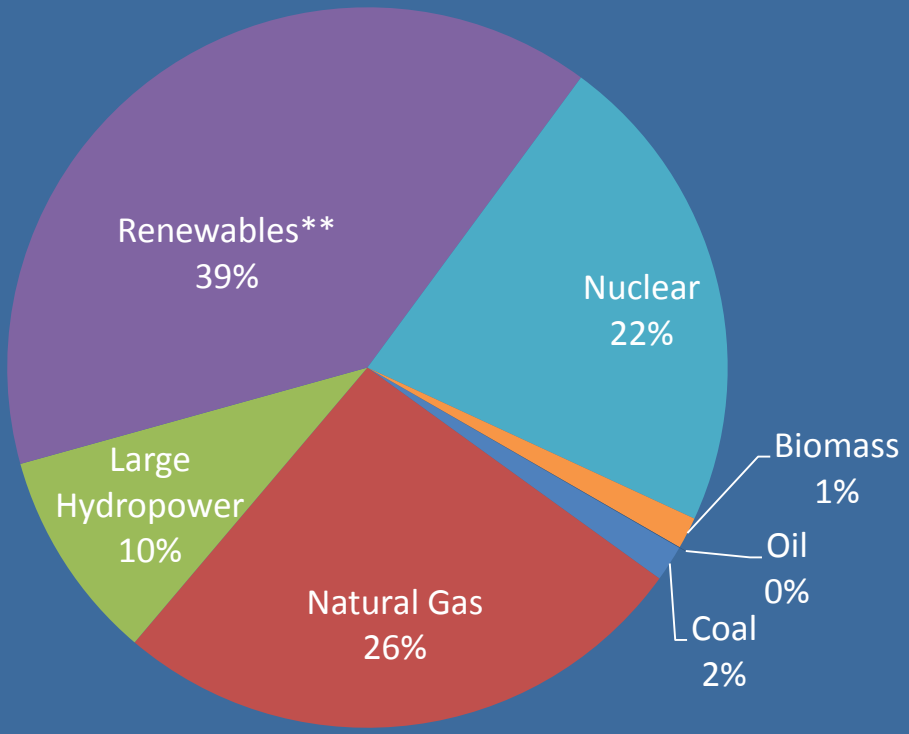


Zero Carbon 2050: 84%

* Generation mix represents CT's portion of the regional electric grid.
* * Renewables are defined as CT Class I resources

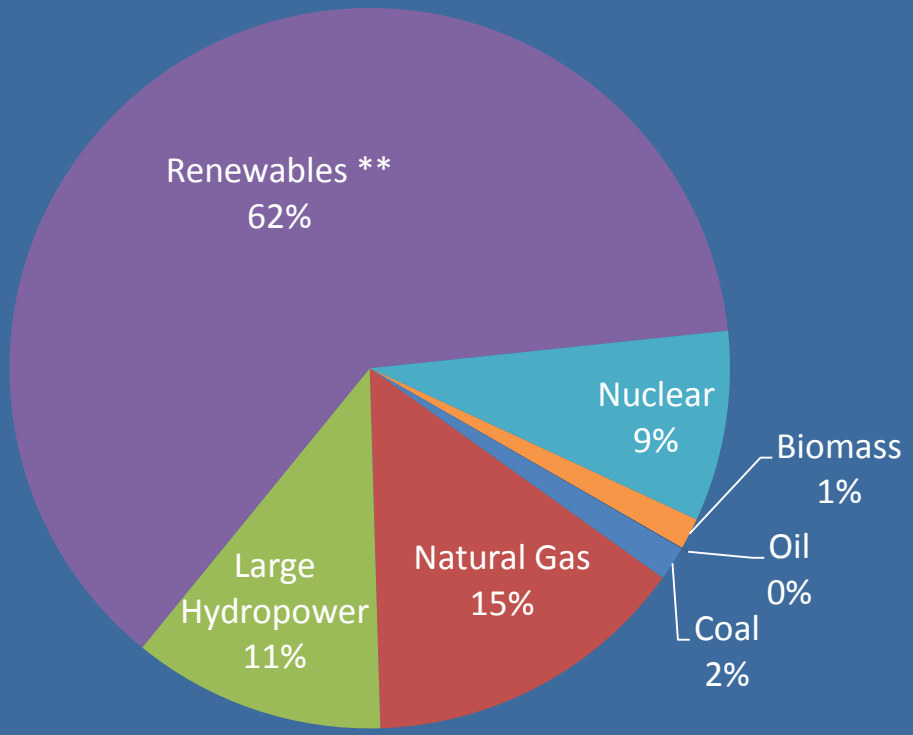
Electric Power Generation Mix for 55% Mid-term Target and 80% 2050 Target

2030



Zero Carbon 2030: 71%

2050



Zero Carbon 2050: 82%

* Generation mix represents CT's portion of the regional electric grid.
* * Renewables are defined as CT Class I resources

State Electric Energy Efficiency Savings Methodology

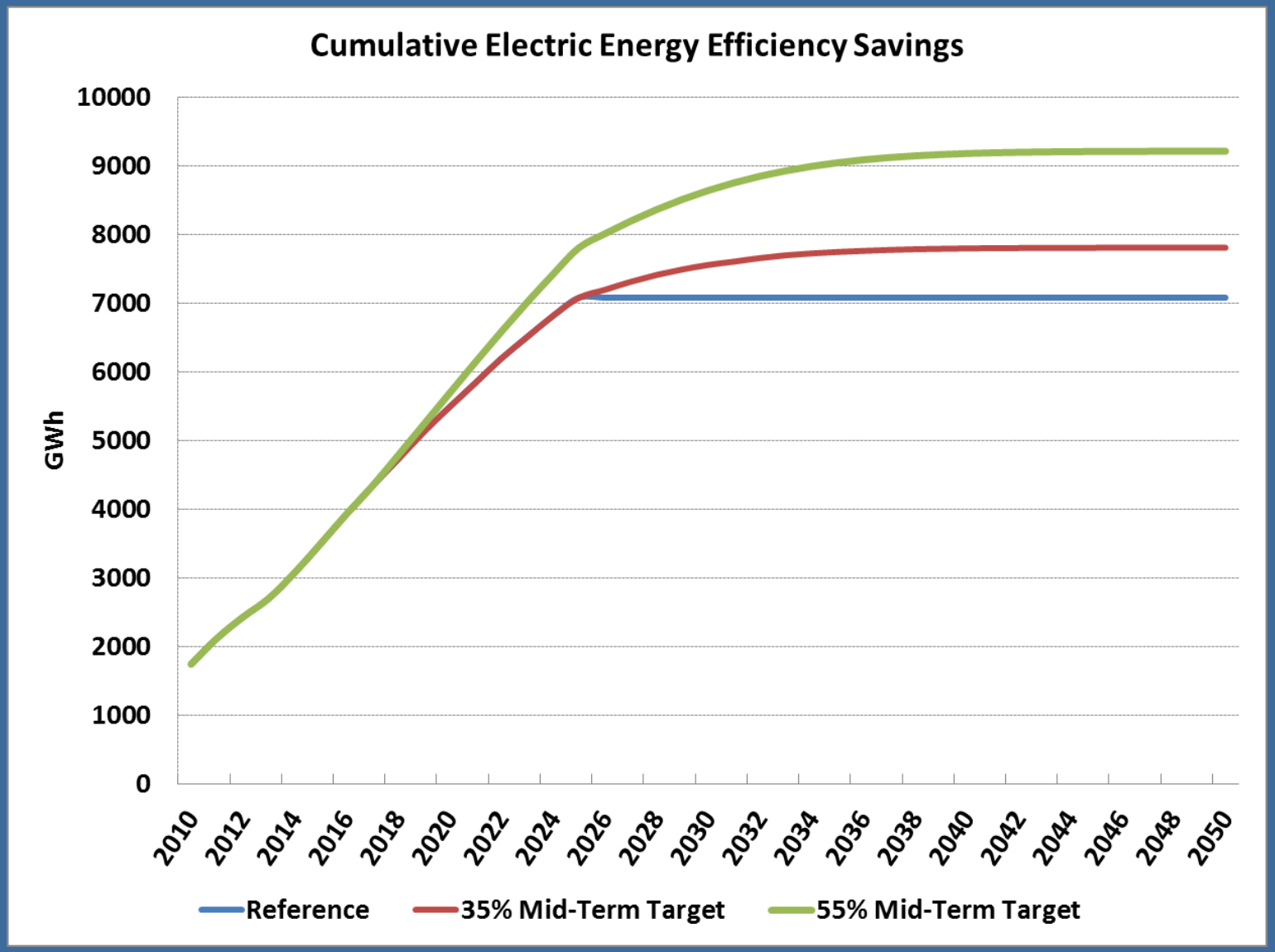
	C&I			Residential		
Year	1 Year Savings (MWh)	Annual Spending ($)	Savings (MWh) / Dollar	1 Year Savings (MWh)	Annual Spending ($)	Savings (MWh) / Dollar
2006	220,537	35,322,718	0.0062	107,885	22,297,928	0.0048
2007	320,574	60,208,849	0.0053	119,833	23,483,810	0.0051
2008	235,684	70,049,618	0.0034	113,549	25,757,329	0.0044
2009	145,460	34,790,783	0.0042	80,182	27,666,731	0.0029
2010	156,615	53,613,150	0.0029	243,094	56,990,762	0.0043
2011	152,261	56,639,187	0.0027	224,690	46,508,737	0.0048
2012	178,757	49,688,032	0.0036	128,957	43,248,762	0.0030
2013	154,893	55,317,896	0.0028	117,236	43,567,880	0.0027
2014	213,337	76,439,517	0.0028	161,465	68,408,851	0.0024
2015	235,507	80,778,799	0.0029	184,449	66,525,603	0.0028
2016	250,511	90,505,145	0.0028	181,086	74,561,319	0.0024
(2014-2016) average		82,574,487	0.0030		69,831,924	0.0025

- Inputs in the table above are from the public performance reports on the CT energy dashboard
- Annual savings (MWh) = Annual Spending ($) * (MWh) Savings / ($)
- Measures are assumed to have a 12 year life
- Savings per dollar invested is assumed to decrease at a compound amount of 1.25% each year. The same value ISO-NE assumes in the 2017 energy efficiency forecast

Electric Energy Efficiency Savings

- Reference Case:
  - Program spending remains at average 2014 – 2016 levels through 2050
  - When maximum cumulative savings are achieved based on a 12 year measure life, existing EE measures are replaced or maintained at an equivalent level
- 35% Mid-Term Target Scenario:
  - Program spending remains at average 2014 – 2016 levels through 2050
  - When maximum cumulative savings are achieved based on a 12 year measure life, EE measures are replaced by higher efficiency, higher cost measures
- 55% Mid-Term Target Scenario:
  - Program spending is increased to remain a constant share of CT GDP through 2050
  - When maximum cumulative savings are achieved based on a 12 year measure life, EE measures are replaced by higher efficiency, higher cost measures

Electric Energy Efficiency Savings Trends

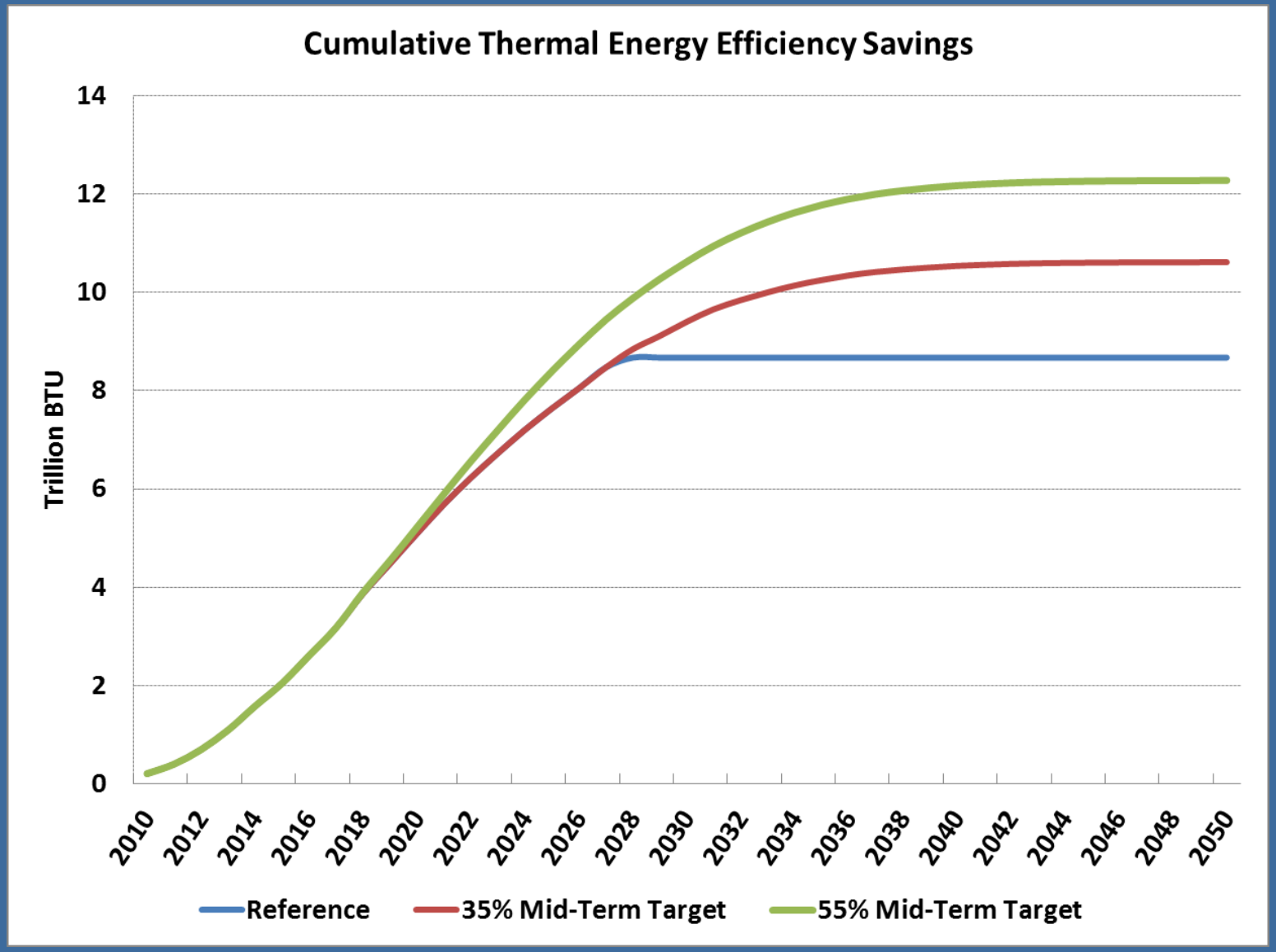


Buildings Sector Technology Penetration Rates and Assumptions

Thermal Energy Efficiency Savings

- Reference Case:
  - Program spending remains at average 2014 – 2016 levels through 2050
  - When maximum cumulative savings are achieved based on a 15 year measure life, existing TE measures are replaced or maintained at an equivalent level
- 35% Mid-Term Target Scenario:
  - Program spending remains at average 2014 – 2016 levels through 2050
  - When maximum cumulative savings are achieved based on a 15 year measure life, TE measures are replaced by higher efficiency, higher cost measures
- 55% Mid-Term Target Scenario:
  - Program spending is increased to remain a constant share of CT GDP through 2050
  - When maximum cumulative savings are achieved based on a 15 year measure life, TE measures are replaced by higher efficiency, higher cost measures

Thermal Energy Efficiency Savings Trends



Residential & Commercial Renewable Thermal*

Residential RT	2020	2030	2050
35% below 2001 levels by 2030			
% of Thermal Load	10%	18%	87%
55% below 2001 levels by 2030			
% of Thermal Load	13%	39%	87%

Commercial RT**	2020	2030	2050
35% below 2001 levels by 2030			
% of Heated Sq. ft.	5%	10%	69%
55% below 2001 levels by 2030			
% of Heated Sq. ft.	17%	39%	69%

*Renewable thermal refers to air and ground source heat pumps.

**Percentages represent the % of heated floor space provided by heat pumps.

Transportation Sector Technology Penetration Rates and Assumptions

Electrification of Passenger Vehicles

	2020	2030	2050
35% below 2001 levels by 2030			
# of ZEVs	20,000	340,000	2,610,000
% of Fleet	1%	13%	95%
% of Sales	2%	44%	100%
55% below 2001 levels by 2030			
# of ZEVs	70,000	750,000	2,610,000
% of Fleet	3%	32%	95%
% of Sales	5%	72%	100%

- In each scenario ZEV sales are ~ 100% by 2050
- # and % of ZEVs are rounded
- % of sales refers to annual sales

Heavy-duty Vehicle & Rail Electrification

Heavy-duty Vehicle Electrification	2030	2050
Light Commercial Trucks and Transit Busses	30%	80%
School Busses & Refuse Trucks	30%	80%
Single Unit Short Haul Trucks	35%	80%

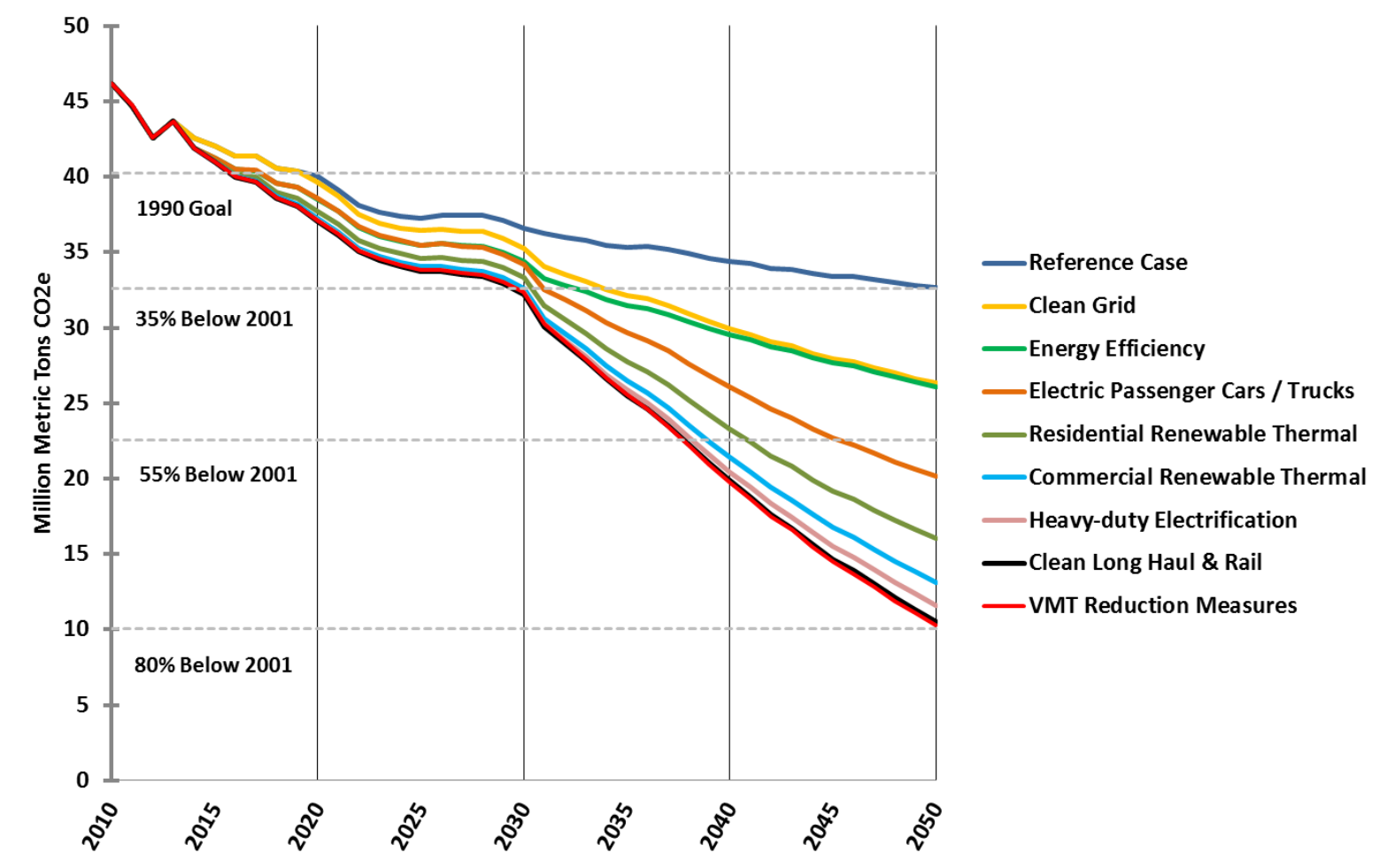
Passenger and Freight Rail Electrification	2030	2050
Passenger	45%	95%
Freight	45%	95%

- These mitigation wedges do not change based on the mid-term reduction target

CT VMT Reduction Scenarios

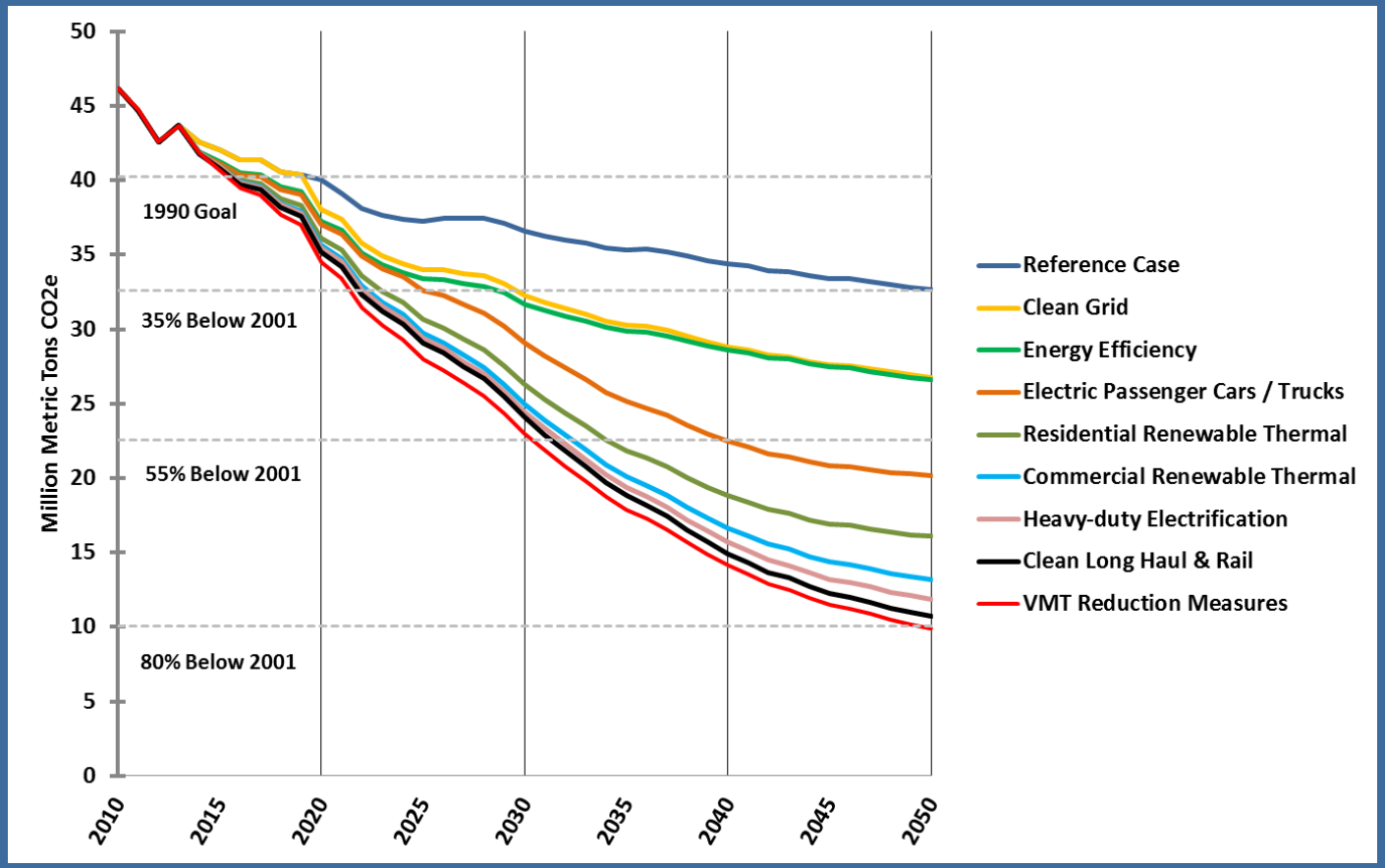
- VMT reduction scenarios apply only to passenger cars and passenger trucks
- **35% Mid-Term Reduction Scenario:** 2% reduction in VMT in 2050 relative to reference case.
- **55% Mid-Term Reduction Scenario:** 4% reduction in VMT in 2050 relative to reference case.

35% Reduction Target Mitigation Wedges



- All mitigation scenarios are dependent on electrification and a clean grid
- Contribution of largest 2050 GHG % reduction measures:
  - Clean Grid = 28%
  - Electric Passenger Cars / Trucks = 26%
  - Residential RT = 18%
  - Commercial RT = 13%

55% Reduction Target Mitigation Wedges



- All mitigation scenarios are dependent on electrification and a clean grid
- 35% target achieved by 2023 in the 55% mid-term scenario
- Contribution of largest 2050 GHG % reduction measures:
  - Electric Passenger Cars / Trucks = 28%
  - Clean Grid = 26%
  - Residential RT = 18%
  - Commercial RT = 13%

Public Comments