

GHG Reduction Strategies for Connecticut



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Process

- NESCAUM is supporting CT DEP through a process to focus, prioritize, and assess the many good candidate measures that have been identified to date.
- Several key measures have been quantified in terms of GHG emission reduction potential
 - This is the focus of the current effort
- Stakeholder feedback and information will help to analyze these measures in an integrated assessment framework to provide economic, environmental, and public health benefits, where feasible
 - This is what we want from you!
- A list of recommended strategies to be published – based on these results – by July 2011 to achieve target of **6-7 Million Metric Tons (MMT) CO₂e** by 2020

IRP Process

- IRP analysis is being conducted parallel to GWSA analysis
- Multi-stakeholder process focused on electric system cost, reliability, and environmental performance
- Products from this effort feed into the GWSA process

IRP Process

- 2008 IRP established an approach to planning process with near-term detail + long-term analysis
- 2010 IRP provides analysis of reliability, environmental and economic metrics
- 2010 IRP looks at objectives, drivers, and options
- 2010 IRP provides sound analytic basis for assessing power sector opportunities

Current work : Identify Measures

- Initial list of measures has been developed through CT Climate Action Plan, stakeholder dialogue and review of NJ, NY, CA plans.
- Very broad list including about 150 measures spanning all sectors
- Identified key strategies with significant reduction potential that lend themselves to quantification (21 measures in all spanning many sectors)

Scope of Analysis

- Identify and quantify several potential reduction opportunities...

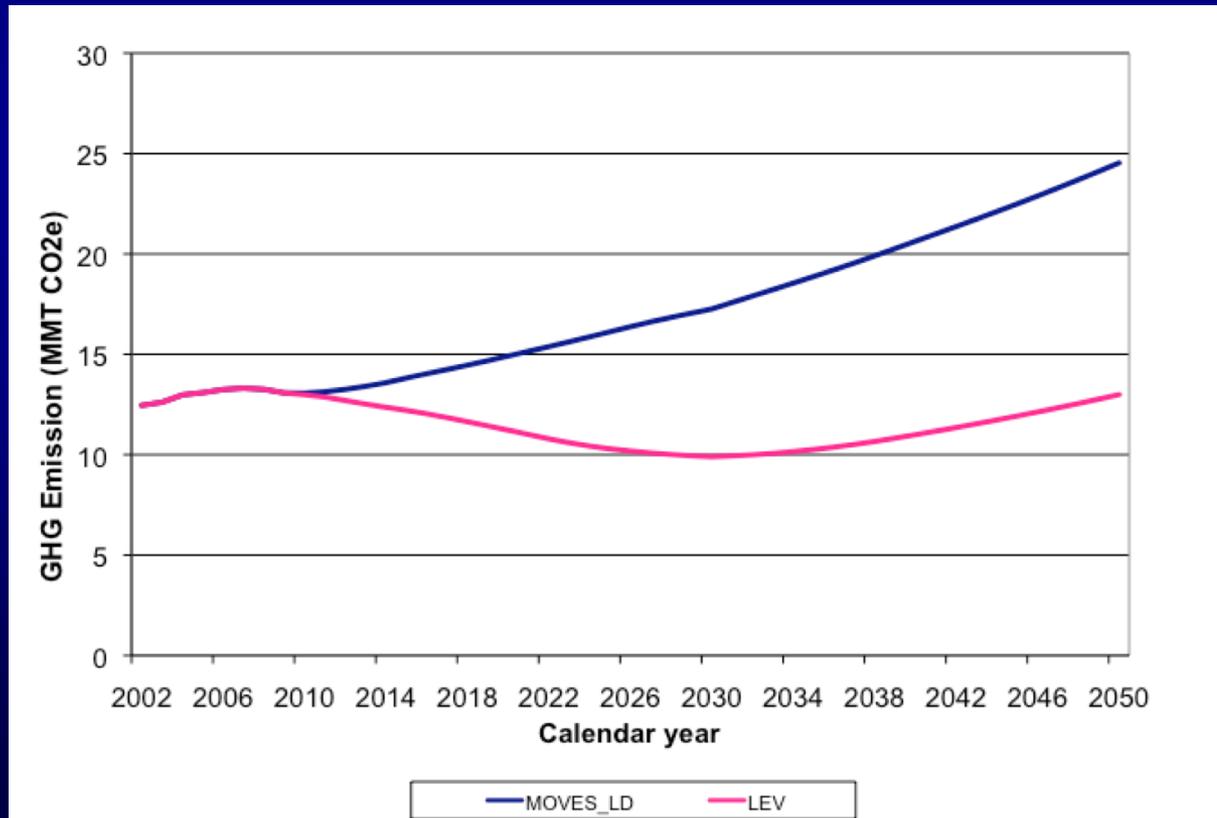
BUT!

- Many of these identified opportunities overlap and therefore these measures are not necessarily additive
- Some represent sinks or reductions off future projected emissions and so reduction potential can be greater than current emissions

Transportation Measures

California Low Emission Vehicle Program

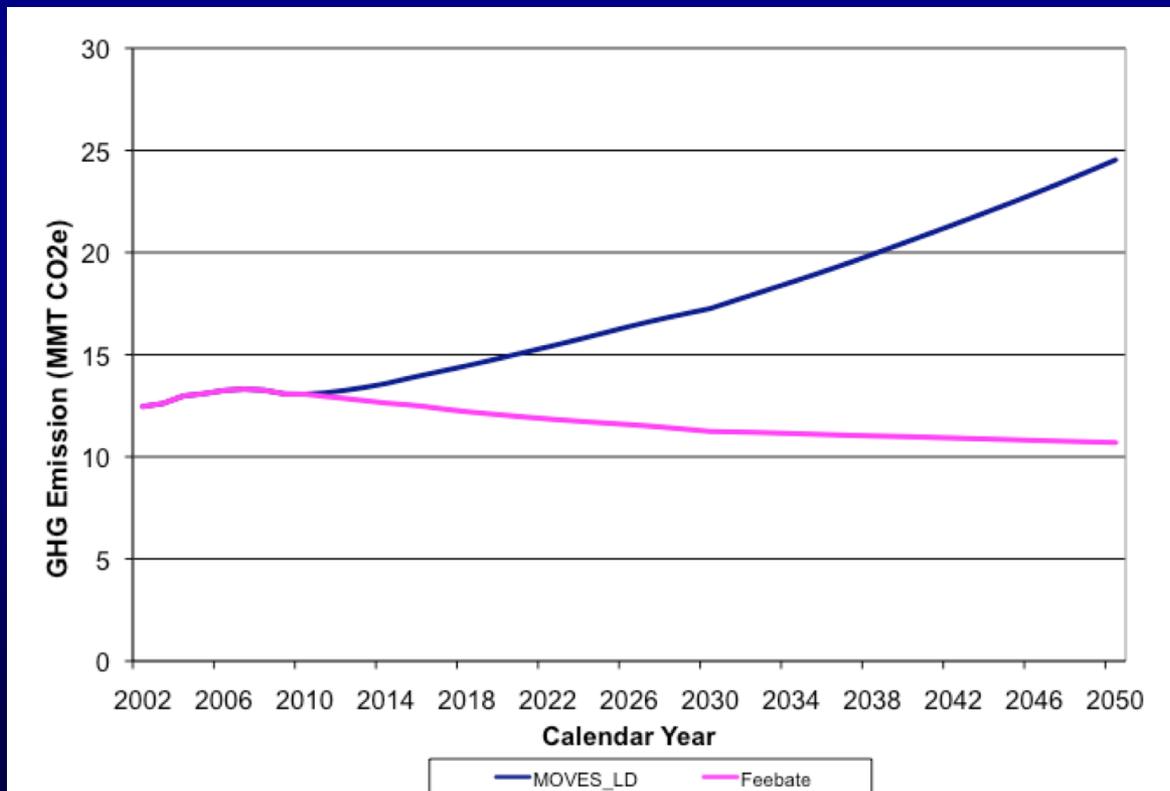
- CA LEV II with LDV GHG Standard with extension
 - 27% reduction in fleetwide GHG emissions by 2016
 - Additional 4 percent/year reduction through 2022; then held fixed



2020 Reduction
Potential: **3.7 MMT**

California LDV Feebate Program

- Based on CARB (U. of CA) analysis using CA-footprint (fleet mix) for revenue-neutral \$20/g/mi feebate scenario for developing CT-specific reductions due to consumer response only



2020 Reduction
Potential: **2.9 MMT**

Low Carbon Fuels Standard

- Region-wide 10 percent reduction in carbon intensity of transportation fuels; no set compliance path!
- U.S. DOE GREET model provides emission factors

•Analysis: bounding scenarios favor EVs, CNG, or renewable fuels (greatest to least benefit) but program is not determinative, so market outcome is unknown...

60% EV
20% Renewable Fuel
20% CNG

Point for comment:
How to credit upstream reductions?

2020 Reduction
Potential: **0.6-1.2 MMT**
+ 1.2-1.9 MMT upstream

20% EV
60% Renewable Fuel
20% CNG

20% EV
20% Renewable Fuel
60% CNG

Smart Growth

- *Growing Cooler*
 - National review of program opportunities and potential applied to CT
 - Analyzed by type of measure and level of deployment



2020 Reduction
Potential: **0.04-0.2 MMT**

VMT Reduction/Public Transit

- *Moving Cooler*
 - National review of program opportunities and potential applied to CT
 - Analyzed by type of measure and level of deployment



2020 Reduction
Potential: **0.04-0.12 MMT**

Highway Speed Limit Reduction

- EPA analysis of emissions *increase* for speed limit increases in the 90s was applied to CT-specific highway VMT data by speed bin
 - 65 to 60 mph
 - 65 to 55 mph



2020 Reduction
Potential: **0.45-0.9 MMT**

Clean Diesels

- 60 Auxiliary Power Units on long-haul CT fleets
- Potential DPF retrofit/replacement program for 50% of CT nonroad IC engines



2020 Reduction
APU Potential: **550 MT**
nonroad Potential: **0.1-0.3 MMT**

Electric Power Generation

Renewable Portfolio Standard

- Current RPS calls for 27% of electric demand to be serviced by renewable generation by 2020
- Absolute generation – and therefore CO2 emissions – are dependent on demand forecasts; relative reduction still valid
- Updated forecasts may change reduction estimate

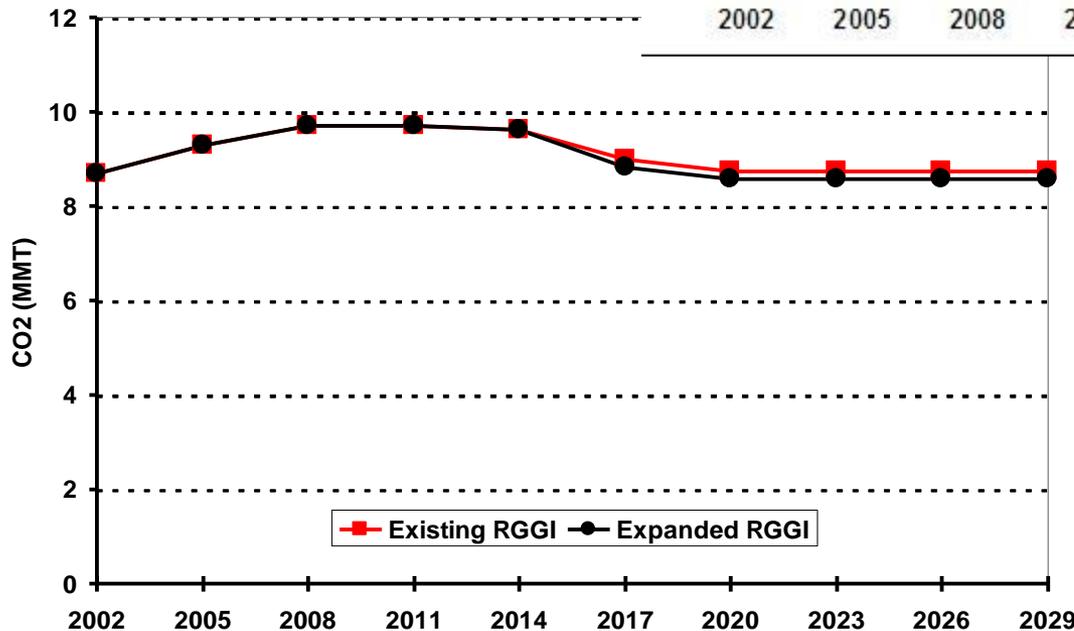
2020 Reduction
Potential: **2.6 MMT**

RGGI

- Regional Greenhouse Gas Initiative calls for stabilization between 2009 and 2014; then 10% reduction in CO₂ cap by 2018
- Extend RGGI:
 - Additional 10% reduction of GHG cap by 2028
- Expand RGGI:
 - EGUs >15 MW (current limit is >25 MW)
 - ICI Boilers > 250 MMBtu/hr
 - 10% reduction in cumulative emissions between 2014 and 2023; implemented as single cap covering all sources

Extended RGGI

2020 Reduction
Potential: **0.2 MMT**
(1 MMT in 2030)



Expanded RGGI

2020 Reduction
Potential: **0.15 MMT**

CO₂ Performance Standard

- Establishing an output-based CO₂ standard for power generation is consistent with EPA approach to stationary source permitting
- *DOE, NETL: “Cost and Performance Baseline for Fossil Energy Plants”, August 2007* identifies CO₂ emission levels for new clean technologies
- ~1500 lb/MWh (gross output) would prevent new coal/oil, but allow IGCC and cleaner

2020 Reduction

Potential: **No net reductions**

Residential, Commercial, Industrial Sector

Conservation Funds

- Fiscal Incentives for Energy Efficiency
 - CT Energy Efficiency Fund, Natural Gas Efficiency Fund, and Fuel Oil Conservation Board
 - Assess CO₂ reduction achieved from 2008 expenditures; assume equivalent reductions for equal funding moving forward
 - Agnostic on source of future funding

2020 Reduction Potential:

CEEF: **1.0 MMT**

NGEF: **6,250 MT**

FOCF: **625 MT**

Appliance Standards

- Appliance Standards
 - 50% of new appliances sold in CT must meet EnergyStar™ or better efficiency ratings by 2014
 - All new appliances sold in CT must meet EnergyStar™ or better efficiency ratings by 2029



2020 Reduction
Potential: **3.0 MMT**

Building Codes

- Architecture 2030 Challenge: All new buildings and major renovations meet a standard of 50% reduction in fossil fuel compared to regional average
 - 60% by 2010
 - 70% by 2015
 - 80% by 2020
 - 90% by 2025
 - Carbon-neutral buildings by 2030

2020 Reduction

Potential: ??

NEED

INFORMATION

RE: # Construction

Permits

“Top 20” from Study on CT Energy/Gas Efficiency Potential

- KEMA Consulting/Schlegel et al (2009): *Energy Efficiency Potential: Results of Studies by ECMB*
- “Top 20” technologies surveyed for residential, commercial, and industrial sector
- Likely overlap with mechanistic approaches already listed (i.e. CEEF)

2020 Reduction Potential:
Residential: **1.8 MMT**
Commercial: **2.2 MMT**
Industrial: **4.5 MMT**

Heat Pumps

- Heating and cooling consume 43% of residential and commercial energy
- Assume that 20% of residential and commercial heating and cooling demand satisfied by ground-source and air-source heat pumps by 2020

2020 Reduction
Potential: **2.3 MMT**

Weatherization

- Department of Energy eQUEST tool used to assess efficiency savings associated with upgrades to typical Hartford house
- Quantified GHG reductions associated with low-e double pane windows and improved insulation for 50,000 homes in the state

2020 Reduction Potential:

Windows: **0.13 MMT**

Insulation: **1.16 MMT**

Smart Meters

- Northeast Utilities Pilot Program
 - 1000 smart meters deployed in 2009
 - Provides consumer information on usage
- National study used to assess potential benefits of 50% penetration



2020 Reduction

Consumer Info: **0.34 MMT**

Smart Grid Diagnostics: **0.37 MMT**

Advanced Voltage Control: **0.17 MMT**

High GWP Gas Measures

- Emissions are low now, but projected to grow as HFCs continue to be phased in
- Reductions relative to baseline through recycling and recovery programs in SIT model
- Assume that 50% of current emissions could be captured by 2020



2020 Reduction
Potential: **1.5 MMT**

District Heating

- Connecticut Academy of Science and Engineering has examined potential for district heating and cooling and CHP
- Identified 11 EGUs in high density locations suitable for district heat/AC
- Assume that half of the waste heat from these facilities could be utilized to offset current heat/AC demand

\$\$\$ 2020 Reduction
Potential: **8.1 MMT**

Waste and Land Use

CT Solid Waste Management Plan

- Solid Waste Plan has 8 objectives and 75 strategies that result in diversion of up to 58 percent of solid waste by 2024
- Assess GHG reductions from four scenarios corresponding to different rates of solid waste diversion using EPA WASTE Reduction Model (WARM)

2020 Reduction
Potential: **1.6 MMT**

Forest and Ag Land Preservation

Terrestrial Carbon Sequestration in the Northeast - The Nature Conservancy, 2007

- Land-use sector in CT is currently an emitter
- Report reviews a number of land-use options (including afforestation of agricultural land and restocking forest lands)
- Stratifies opportunities by cost/ton

Cumulative (over lifetime of forest) Reduction @ <\$7/ton
Restocking Forest Land: **0.046 MMT**
Cumulative (over lifetime of forest) Reduction @ <\$20/ton
Agricultural Tillage: **varies by county**

Summary

Measure	2020 Reduction (MMT CO ₂ e)
Transportation	
CA LEV II	3.7
Feebate Program	2.9
Low Carbon Fuel Standard	0.6-1.2 (+1-2 upstream)
Smart Growth	0.04-0.2
VMT Reduction/Public Transit	0.04-0.12
Speed Limit Reduction	0.45 (5 mph)/0.9(10 mph)
Clean Diesel Programs	0.0005 (APUs)/0.1-0.3(nonroad)
Power Generation	
Renewable Portfolio Standard	2.6
Extend RGGI	0.2 (1.0 by 2030)
Expand RGGI	0.15
Performance Standard	0 (backstop)
Residential, Commercial, Industrial Sectors	
Conservation Funds	1-2 (electric); 0.006-0.012 (gas); 0.001-0.002 (oil)
Appliance Standards	3
Building Codes	2.7
"Top 20" efficiency opportunities (Residential, Commercial, Industrial)	1.8 (R), 2.2(C), 4.5(I)
Heat Pumps	2.3
Weatherization	0.2(windows)/1.2(insulation)
Smart Meters	0.34
High GWP gas collection	1.5
District Heating	8.1
Waste/Land-Use	
Solid Waste Management Plan	0.046 (cumulative)
Fields and Forests	0.046 (cumulative)

**Update
Baseline
Assumptions**

**Potential
Overlap
Projected
Reduction**

**Economic
Analysis**

Sink



Next Steps

- Identify emission targets (2009 GHG Inventory)
- Identify reduction strategies (This document)
- Analyze and recommend strategies (including economic analysis and analysis of federal measures that contribute to goal – July 2011)
- Report to Assembly on reductions achieved, schedule for policies, and scientific assessment (January 2012)
- Schedule of regulatory actions (July 2012)

THANK YOU!

Comments Due:

Tuesday, October 12:

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For Questions:

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