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Catalog of State-Level GHG Reduction Policy Options Agriculture, Forestry, and Waste Management

Prepared by the Center for Climate Strategies (CCS) for the Vermont Governor’s Commission on Climate Change Plenary Group (GCCC-PG) and the Technical Work Group (TWG) based on actions undertaken or considered by all US states.

Key to Future Rankings of Options in the Table that Follows:

Potential Emission Reductions ^{1/}	Potential Cost or Cost Savings ^{1/ 2/}
High (H): At least 100,000 Metric Tons (Mt) carbon dioxide equivalent (CO ₂ e) per year by 2020 (~1% of current MT emissions)	High (H): \$50 per Metric Ton CO ₂ e (MtCO ₂ e) or above
Medium (M): From 10,000 to 100,000 Mt CO ₂ e per year by 2020	Medium (M): \$5-50/MtCO ₂ e
Low (L): Less than 10,000 Mt CO ₂ e per year by 2020, or 100,000 Mt CO ₂ e by 2050	Low (L): Less than \$5/MtCO ₂ e
Uncertain (U): Not able to estimate at this time	Uncertain (U): Not able to estimate at this time
^{1/} Several measures may overlap in terms of emissions reductions and/or cost impacts. Estimates assume measures would be implemented independently from other measures.	
^{2/} Costs are denoted by a positive number. Cost savings (i.e., “negative costs”) are denoted by a negative number.	

Definition of “Priorities for Analysis”:

- **High:** High priority options will be analyzed first.
- **Medium:** Medium priority options will be analyzed next, time and resources permitting.
- **Low:** Low priority options will be analyzed last, time and resources permitting.

Notation of Options: Options will be marked with an asterisk (*) at a later date to indicate options that are at least partially “base case” policies, i.e., that have been considered or undertaken at some level in Vermont.

Potential State Actions - Agriculture, Forestry, & Waste Management (AFW)

Option No.	GHG Reduction Policy Option	Priority for Analysis	Potential GHG Emissions Reduction	Potential Cost or Cost Savings	Additional Impacts, Feasibility Considerations	Notes
AFW-1	AGRICULTURE – PRODUCTION OF FUELS AND ELECTRICITY					
1.1	Manure Digesters/Other Waste Energy Utilization *				•	• CVPS “Cow Power” & other smaller projects
1.2	Biodiesel Production (incentives for feedstocks and production plants)				•	• Being looked at by Vermont Biofuels Assoc.
1.3	Biomass Feedstocks for Electricity or Steam/Heat Production *				•	•
1.4	Ethanol Production				•	•
AFW-2	AGRICULTURE – FERTILIZER AND MANURE MANAGEMENT					
2.1	Nutrient Management (improve efficiency of fertilizer use) *				•	• Agency of Agriculture programs
2.2	Manure Management (improve application methods) *					• Agency of Agriculture programs
2.3	Manure Composting *				•	• Agency of Agriculture programs
2.4	Change Feedstocks (optimize nitrogen for N ₂ O reduction and enteric CH ₄ reduction)				•	•
2.5	Reduce Non-Farm (Residential and Commercial) Fertilizer Use				•	•

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AFW-3	AGRICULTURE – SOIL CARBON MANAGEMENT					
3.1	Conservation Tillage/No-Till (carbon sequestration and reduced energy use)				•	•
3.2	Reduce Summer Fallow (increase soil C content, reduce N ₂ O emissions)				•	•
3.3	Increase Winter Cover Crops (increase soil C and/or N content)				•	•
3.4	Improve Water and Nutrient Use (to minimize soil C loss)				•	
3.5	Rotational Grazing/Improve Grazing Crops and/or Management				•	
3.6	Incentives for Maintenance of Conservation Reserve Program (CRP) Acreage				•	•
3.7	Incentives for Establishing Windbreaks				•	•
AFW-4	AGRICULTURE – LAND USE CHANGE					
4.1	Convert Land to Grassland or Forest or Woody Shrubs				•	•
4.2	Preserve Open Space/Agricultural Land				•	
4.3	Promote “No Net Loss” of Agricultural Land				•	
AFW-5	AGRICULTURE – FARMING PRACTICES					

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5.1	Convert Diesel Farm Equipment to LNG/CNG, Hybrid Technology, or Biodiesel				•	•
5.2	Organic Farming *				•	•
5.3	Programs to Support Local Farming/Buy Local *				•	•
5.4	Policies to Promote Non-Irrigated Cropland				•	•
AFW-6	FORESTRY – BIOMASS PROTECTION AND MANAGEMENT					
6.1	Forest Protection – Reduced Clearing and Conversion to Nonforest Cover				•	•
6.2	Increase Maintenance of Urban and Residential Trees				•	•
6.3	Afforestation and/or Restoration of Nonforested Lands				•	•
6.4	Reforestation/Restoration of Managed Stands				•	•
6.5	Increased Stocking of Poorly Stocked Lands				•	•
6.6	Age Extension of Managed Stands				•	•
6.7	Thinning and Density Management of Managed Stands				•	•

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6.8	Fertilization and Waste Recycling				•	•
6.9	Expand Short Rotation Woody Crops (for fiber and energy)				•	•
6.10	Expanded Use of Genetically Preferred Species				•	•
6.11	Modified Biomass Removal Practices (reduced decay and energy use)				•	•
6.12	Fire Management and Risk Reduction Programs				•	•
6.13	Ecosystem Health Risk Reduction Programs (pest/disease, invasive species) *				•	• Agency of Natural Resources
6.14	Drought Management Programs (tree selection, placement, protection) *				•	• Agency of Natural Resources
6.15	Flood and Riparian Management Programs (tree selection, placement, protection) *				•	• Agency of Natural Resources
6.16	Watershed Management Programs (stand retention, enhancement and management) *				•	• Agency of Natural Resources

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6.17	Habitat Management Programs (stand retention, enhancement and management) *				•	• Agency of Natural Resources
6.18	Promote Use of Fuel-Efficient Equipment or Alternative Fuels				•	•
AFW-7	FORESTRY - WOOD PRODUCTS AND WASTE					
7.1	Improved Mill Waste Recovery and Use				•	•
7.2	Improved Logging Residue Recovery				•	•
7.3	Expanded Use of Wood Products for Building Materials				•	•
7.4	Expanded Use of State and Locally-Grown Wood Products				•	•
7.5	Residential Slash/Open Burning Alternatives				•	•
AFW-8	FORESTRY - ENERGY PRODUCTION					
8.1	Expanded Use of Forest Biomass Feedstocks for Electricity (fuel switching)				•	•
8.2	Expanded Use of Forest Biomass Feedstocks for Residential, Commercial, Institutional, or Industrial Heating *				•	• Schools, etc.

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8.3	Improved Efficiency of Wood Burning Stoves and Direct Heat				•	•
8.4	Improved Energy Capture from Wood Waste Combustion				•	•
8.5	Expanded Landfill Methane Recapture (wood products waste)				•	•
8.6	Improved Commercialization of Biomass Gasification and Combined Cycle *				•	•
8.7	Biofuels Production from Forest Residue				•	•
AFW-9	WASTE MANAGEMENT – WASTE MANAGEMENT STRATEGIES					
9.1	Advanced/Expanded Recycling and Composting				•	•
9.2	Advanced Municipal Solid Waste Management Practices (e.g., bioreactors)				•	•
9.3	Source Reduction Strategies				•	•
9.4	Resource Management Contracting				•	•
9.5	Pricing Programs to Reduce Waste Generation				•	•
AFW-10	WASTE MANAGEMENT – LANDFILL GAS STRATEGIES					
10.1	Flare Landfill Methane at non-NSPS (smaller) sites *				•	•

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10.2	Convert Landfill Methane to Electric Power, Space Heat, or LNG *				•	•
AFW-11	WASTE MANAGEMENT – WASTEWATER ACTIVITIES					
11.1	Energy Efficiency Improvements *				•	• Efficiency Vermont-funded turbine at Essex Junction wastewater treatment facility
11.2	Lower Waste Processing Needs (lower water consumption, waste production) *				•	• Lower water consumption component of water supply plans
11.3	Install Digesters and Turbines *				•	• Efficiency Vermont-funded turbine at Essex Junction wastewater treatment facility
11.4	Install Fuel Cells				•	•