

# Matrix of CAT Policy Options - Analysis Results and Considerations

November 29, 2007 DRAFT

Sector/Policy Option		GHG Savings in 2020	Cumulative GHG Savings (2008-2020)	Net Present Value 2008–2020	Cost-Effectiveness	Analytical Considerations
		(MMtCO <sub>2</sub> e/yr)	(MMtCO <sub>2</sub> e)	(Million \$)	(\$/tCO <sub>2</sub> e)	
<b>Transportation</b>		<b>14.8</b>	<b>77.5</b>	<b>TBD</b>		
<b>Recent Actions</b>		<b>3.8</b>	<b>21.9</b>	<b>TBD</b>		
	Motor Vehicle Emissions Standards Act	3.4	18.3			
	Biofuels (Fuel Quality Standards Act)†	0.1	1.2			
	State Fleet Efficiency	0.0	0.6			
	Cleaner Energy Act	0.2	1.8			
<b>CAT Policy Options (after adjusting for overlaps)</b>		<b>11.0</b>	<b>55.6</b>	<b>\$3,360</b>		
T-0	New Funding Mechanisms	Not quantified				
T-1	Transit, Ridesharing, and Commuter Choice Programs	3.6	23.6	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act; public investment requirement is \$8.2 billion over 2008-2020
T-2	State, Regional, and Local VMT and GHG Reduction Goals and Standards	6.8	36.7	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act
T-3	Transportation Pricing	1.0	6.2	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act
T-4	Promote Compact and Transit-Oriented Development	1.6 / 3.8	8.9 / 20.8	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act; this option has a net cost savings to society
T-5	Quantification of GHG Impacts of Transportation Plans, Programs, & Projects	Not quantified				
T-6	Improvements to Freight Railroads and Intercity Passenger Railroads	0.1	0.7	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act; public investment requirement is approx. \$6 billion over 2008-2020
T-7	Diesel Engine Emission Reductions and Fuel Efficiency Improvements	1.0	5.1	\$170	\$33	Emission reductions split fairly evenly between efficiency improvements and biodiesel use; efficiency reductions yield cost savings (\$185 million NPV), while biodiesel has net costs (\$355 million, \$135/tCO <sub>2</sub> e)
T-8	Local Transportation Financing Tools and Bicycle and Pedestrian Infrastructure Improvements	0.2	1.3	Not quantified		GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act; public investment requirement is approx \$530 million over 2008-2020
T-9	Transportation System Management	Not quantified				
T-10	Actions to Accelerate and Integrate Plug-In Hybrid Electric Vehicle Use	1.0	5.3	\$2,007	\$380	GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act

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T-11	Low Carbon Fuel Standard	3.6	15.2	\$1,801	\$119	GHG benefits reflect overlap with Motor Vehicle Emissions Standards Act; lifecycle GHG benefits occur within and outside WA state.
T-12	Zero Emission Vehicle Standards	0.4	1.8	\$446	\$246	
Overlap among T options		-8.2	-49.3	-\$1,064		Reflects overlap between T-2 (VMT goals) and other options that reduce VMT (T-1, T-3, T-4, T-8); reflects contribution of hybrids (T-10), ZEVs (T-12), and biofuel element of T-7 (rail) to achievement of the Low Carbon Fuel Standard (T-10)
<b>Energy Supply</b>		<b>7.9</b>	<b>38.2</b>	<b>TBD</b>	<b>n/a</b>	
<b>Recent Actions</b>		<b>4.0</b>	<b>15.9</b>	<b>TBD</b>		
GHG Performance Standards (SB 6001)		0	0			Impact not readily estimated; benefits overlap heavily with other ES options
Energy Independence Act (I-937) RPS		4.0	15.9			Revised based on updated BAU projections.
<b>CAT Policy Options</b>		<b>3.9</b>	<b>22.3</b>	<b>\$210</b>		
ES-1	Grid-based renewable energy incentives and/or barrier removal	3.1	17.2	\$668	\$39	Estimated based on renewable generation that exceeds I-937
ES-2	Distributed renewable energy incentives and/or barrier removal	0.3	2.3	\$135	\$135	Overlaps with I-937 above; counts towards RPS compliance
ES-3	Efficiency improvements at existing renewable and power plants	0.7	4.9	Not quantified		Some overlap with I-937 above; hydro upgrades count towards RPS compliance
ES-4	Technology Research & Development, plus Technology-Focused Initiatives	Not quantified				
ES-5	CCSR (including pre and post-combustion) incentives, requirements and/or enabling policies plus R&D	Not quantified				
ES-6	Transmission system capacity, access, efficiency, and Smart Grid	Not quantified				
ES-7	Combined Heat and Power (CHP) and Thermal Energy Recovery and Use	2.1	12.1	-\$317	-\$26	
Overlap among ES options (and with recent actions)		-2.3	-14.2	-\$276		
<b>Residential, Commercial and Industrial</b>		<b>12.4</b>	<b>86.1</b>	<b>TBD</b>	<b>n/a</b>	
<b>Recent Actions</b>		<b>5.4</b>	<b>43.9</b>	<b>TBD</b>		
RCI-1: Existing Gas Utility DSM Spending		0.2	1.7			
State Green Building Standard		0.2	1.3			
Building Codes		0.5	4.5			

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Appliance Standards		0.5	5.1			
Energy Independence Act (I-937) - Efficiency		3.9	31.3			
<b>CAT Policy Options (total after adjusting for overlap)</b>		<b>7.0</b>	<b>42.2</b>	<b>-\$878</b>	<b>-\$21</b>	
RCI-1	Demand-Side Management (DSM) Energy Efficiency Programs, Funds, or Goals for Natural Gas, Propane, and Fuel Oil	2.7	15.6	-\$498	-\$32	
RCI-2	Targeted Financial Incentives and Instruments to Encourage Energy Efficiency Improvements (Business Energy Tax Credit and Private/Public Efficiency Funds)	Not quantified separately				Supports several other RCI options, so not evaluated separately.
RCI-3	Promotion and Incentives for Improved Community Planning and Improved Design and Construction in the Private and Non-State Public Sectors	2.0	11.5	-\$193	-\$17	
RCI-4	Energy Efficiency Improvement in Existing Buildings, with Emphasis on Building Operations	4.2	24.2	-\$529	-\$22	
RCI-5	Rate structures and Technologies to Promote Reduced GHG Emissions (including Decoupling of Utility Sales and Revenues)	0.4	2.9	-\$226	-\$78	Many elements support other RCI options. Only implementation of tiered rates (where not now offered) and "smart meter" pilot program evaluated quantitatively.
RCI-6	Provide Incentives to Promote and Reduction of Barriers to Implementation of Renewable Energy Systems	Quantified in coordination with ES TWG. See ES-2.				
RCI-7	Provide Incentives and Resources to Promote and Reduction of Barriers to Implementation of Combined Heat and Power and Waste Heat Capture	Quantified in coordination with ES TWG. See ES-7				
RCI-8	Consumer Education Programs, Including Labeling of Embodied Life-cycle Energy and Carbon Content of Products and Buildings	Not quantified				Supports all other RCI options and many options in other TWGs.
RCI-9	Identify GHG Emissions Impacts and Measures to Avoid, Minimize, or Mitigate them for Projects Requiring Government Review, and in Designing Government Rules and Regulations	Not quantified				Supports most other RCI options and many options in other TWGs.
RCI-10	More Stringent Appliance/Equipment/ Lighting Efficiency Standards, and Appliance and Lighting Product Recycling and Design	3.2	26.6	-\$1,075	-\$40	Evaluation includes package of new appliance/equipment standards, lighting standards, television standards.
RCI-11	Policies and/or Programs Specifically Targeting Non-energy GHG Emissions	1.5	7.8	\$5	\$1	Evaluation includes reduction of CO <sub>2</sub> from cement manufacture, reduction of SF <sub>6</sub> emissions from electricity T&D, reduction in use of high-global warming potential substitutes for CFCs.

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Overlap among RCI options (and with recent actions)		-6.9	-46.2	\$1,637		Reflects substantial analytical overlap with I-937, appliance standards, building standards, RCI-1, RCI-3, RCI-4, RCI-10.
<b>Agriculture / Waste</b>		<b>9.8</b>	<b>56.5</b>	<b>-\$77</b>		
<b>CAT Policy Options</b>		<b>9.8</b>	<b>56.5</b>	<b>-\$77</b>	<b>-\$1</b>	
AW-1	Manure Digesters/Other Waste Energy Utilization	0.9	5.1	-\$20	-\$4	
AW-2	In-State Production of Biofuels and Biofuels feedstocks	1.5	4.6	\$264	\$57	Overlap with T-11. 100% of T-11 Cellulosic goal applied to AW-2 (accounted for in Totals worksheet)
AW-3	Significantly Expand Source Reduction, Reuse, Recycling and Composting	4.8	29.2	-\$353	-\$12	Lifecycle GHG reductions occur both within and outside of WA state.
AW-4	Agricultural Carbon Management	1.2	6	-\$110	-\$18	
AW-5	Agricultural Nutrient Management	0.2	0.9	-\$2	-\$2	
AW-6	Reductions In On-Farm Energy Use and Improvements in Energy Efficiency	0.1	0.3	-\$23	-\$77	
AW-7	Preserve Open Space/Agricultural Land	1.1	10.4	\$167	\$16	GHG emissions from this source ARE not included in I&F baseline
AW-8	Support for an Integrated Regional Food System	Not quantified				
Overlap among AW options		0	0	\$0	0	
<b>Forestry</b>		<b>7.5</b>	<b>46.4</b>	<b>\$298</b>		
<b>CAT Policy Options</b>		<b>7.5</b>	<b>46.4</b>	<b>\$298</b>	<b>-\$93</b>	
F-1	Improved Forest Health	0.5	7	-\$376	-\$54	
F-2	Reduced Conversion to Nonforest Cover	4.7	26.8	\$556	\$4	
F-3	Enhanced Carbon Sequestration in Forests	0.6	4	\$107	\$26	
F-4	Enhanced Carbon Sequestration in Harvested Wood Products	0.01	0.1	Quantified in coordination with F-3		
F-5	Expanded Use of Wood Products for Building Materials	Not quantified				
F-6	Expanded Use of Biomass Feedstocks for Electricity, Heat and Steam Production	0.6	3.4	-\$85	-\$25	Overlap with ES-7
F-7	Improved Commercialization of Advanced Lignocellulosic Processes	0.9	3.7	\$261	\$70	Overlap with T-11
F-8	Urban and Community Forests	0.2	1.4	-\$165	-\$114	Overlap with RCI-3
Overlap among F options		0	0	0	0	

† – As revised from Recent Actions Memo. See discussion under option T-11.

n/a – not applicable (since some options are analyzed for emission reductions, but not costed, sector-wide cost-effectiveness would be misleading)

## Total Emission Reductions across Sectors, Including Cross-Sector Overlaps

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Recent Actions	3.8	21.9	TBD	
CAT Policy Options	11.0	55.6	\$3,360	
<b>Energy Supply</b>	<b>7.9</b>	<b>38.2</b>	<b>TBD</b>	
Recent Actions	4.0	15.9	TBD	
CAT Policy Options	3.9	22.3	\$210	
<b>RCI</b>	<b>12.4</b>	<b>86.1</b>	<b>TBD</b>	
Recent Actions	5.4	43.9	TBD	
CAT Policy Options	7	42.2	-\$878	
<b>Agriculture / Waste</b>	<b>9.8</b>	<b>56.5</b>	<b>-\$77</b>	
CAT Policy Options	9.8	56.5	-\$77	
<b>Forestry</b>	<b>7.5</b>	<b>46.4</b>	<b>\$298</b>	
CAT Policy Options	7.5	46.4	\$298	
<b>Overlap among sectors</b>	<b>-2.8</b>	<b>-28.3</b>	<b>-\$809</b>	
Biofuels (AW-2, F-7, T-11)	-2.4	-8.3	-\$907	Ag and forestry biofuel targets (AW-2 and F-7), if achieved by 2020, could contribute about two-thirds of the emissions reductions required by a low carbon fuel standard (T-11). Cost savings reflect a proportionate reduction in the estimated costs of LCFS compliance. .
Net electricity supply/demand interactions between ES, RCI, and Transportation (T-10 hybrid-electric vehicle) options	0.2	-16.5		Highly sensitive to assumptions regarding potential displacement of existing electricity sources. Reflect the average of two possible scenarios, which vary +/- 6 MMtCO <sub>2</sub> e from the value shown for 2020. See discussion in ES document.
Combined Heat and Power in Forest industries (F-6) and Overall (ES-7)	-0.6	-3.4	\$85	The ES option for CHP fully subsumes the contribution from forest industries, so the latter option (F-6) is fully overlapping
Urban forestry (F-8) and Residential/Community energy efficiency (RCI)	-0.02	-0.1	\$13	Energy savings benefit of urban trees is reduced as homes become more energy efficient
<b>Totals</b>	<b>49.6</b>	<b>276.4</b>	<b>TBD</b>	