MEMORANDUM

To: Energy Efficiency and Green Building Implementation Working Group (EE/GB IWG)

From: David von Hippel and Carrie Lee

Re: Overview of WA State GHG Inventory and the contribution of the RCI sector
Date: Wednesday, June 18, 2008

To provide IWG members with an overview of the Washington State GHG Inventory and the contribution of the RCI sector, we have compiled information and figures from the 2007 Final CAT Report and 2007 RCI TWG Recommendations in this memo. Both of these documents are posted on the EE/GB IWG website, and page numbers are provided here for further review of these references.

Based on the Washington State GHG Inventory, emissions from fuel use in the residential, commercial, and industrial (RCI) sectors contributed 19.4 MMtCO_2e in 2005 and are projected to produce 24.3 MMtCO_2e in 2020 under the reference case scenario (2007 Final CAT Report, p. 25). Emissions from the electricity sector, which are almost entirely linked to RCI electricity demand, are of a similar magnitude. The contribution of GHG emissions by sector, including the RCI sector, is shown for the US and Washington in Figure 1.

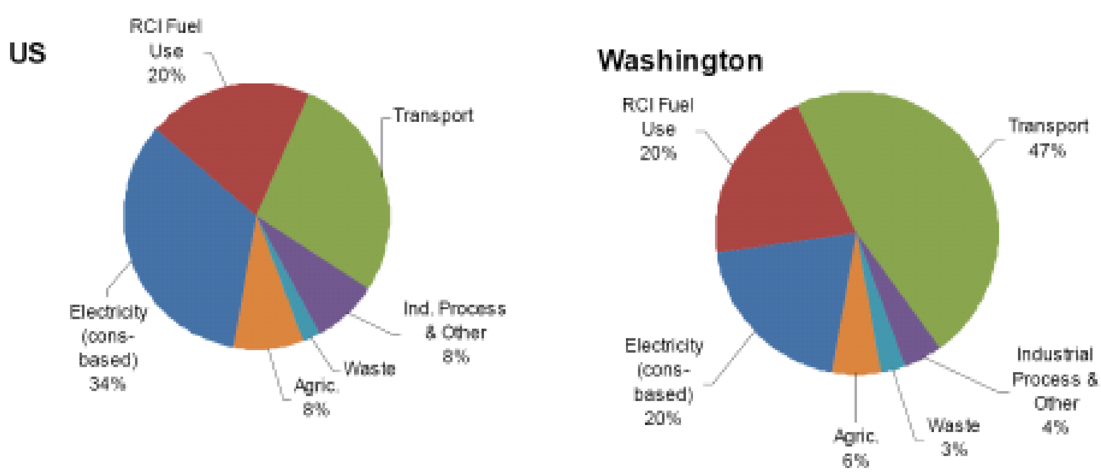

Figure 1. Gross GHG Emissions by Sector, 2005, US and Washington. (2007 Final CAT Report, p. 27)

As illustrated in Figure 2, together with recent actions already underway in Washington, and assuming full and timely implementation of all 45 proposed CAT strategies, actions recommended by the CAT (all sectors) could yield almost 50 MMtCO_2e in annual emission reductions by 2020 (2007 Final CAT Report, p. 36).

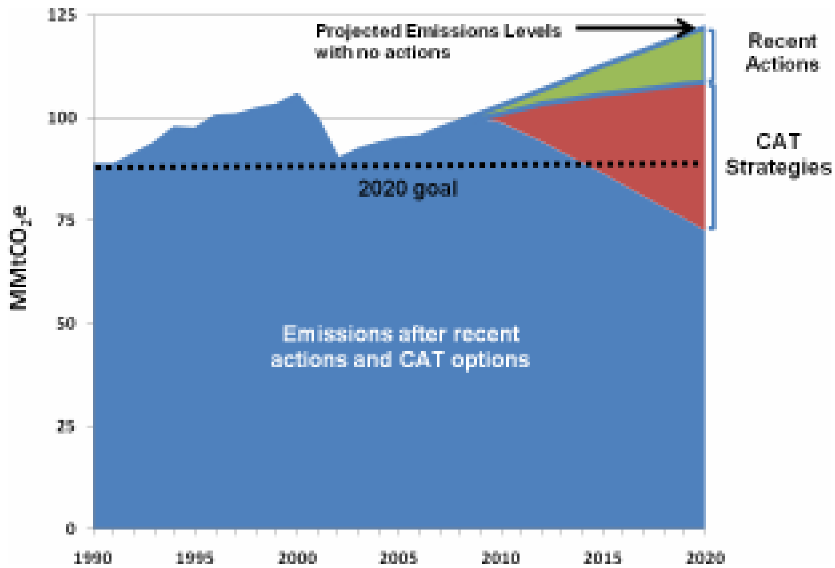

Figure 2: Projected GHG Emissions from Business-as-Usual and Anticipated Reductions from Recent Actions and CAT Strategies. (2007 Final CAT Report, p. 36)

GHG emission savings in 2020 from recent actions and CAT strategies are shown in Figure 3 for each sector. As shown in Table 1 by 2020, potential GHG emissions savings by 2020 in the RCI sector totaled 12.4 $MMtCO_2e$ per year, of which and estimated 5.4 $MMtCO_2e$ are from recent actions, and 7.0 $MMtCO_2e$ are achieved through CAT policy options (2007 Final CAT Report, p. 76).

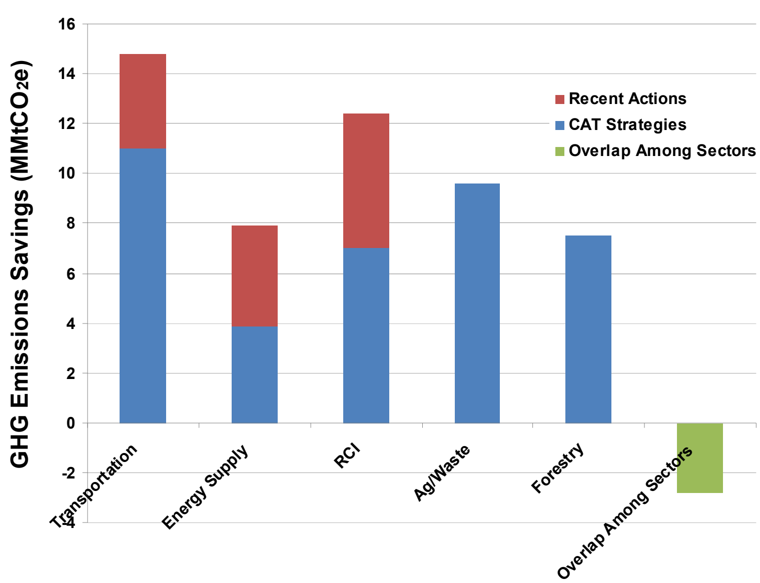

Figure 3: Annual GHG Emissions Savings in 2020 from Recent Actions and CAT Strategies, and Overlap in Reductions among Sectors

Projected GHG emission savings in the RCI sector from recent actions and CAT strategies, relative to the reference baseline for emissions in the RCI sector, are shown in Figure 4.

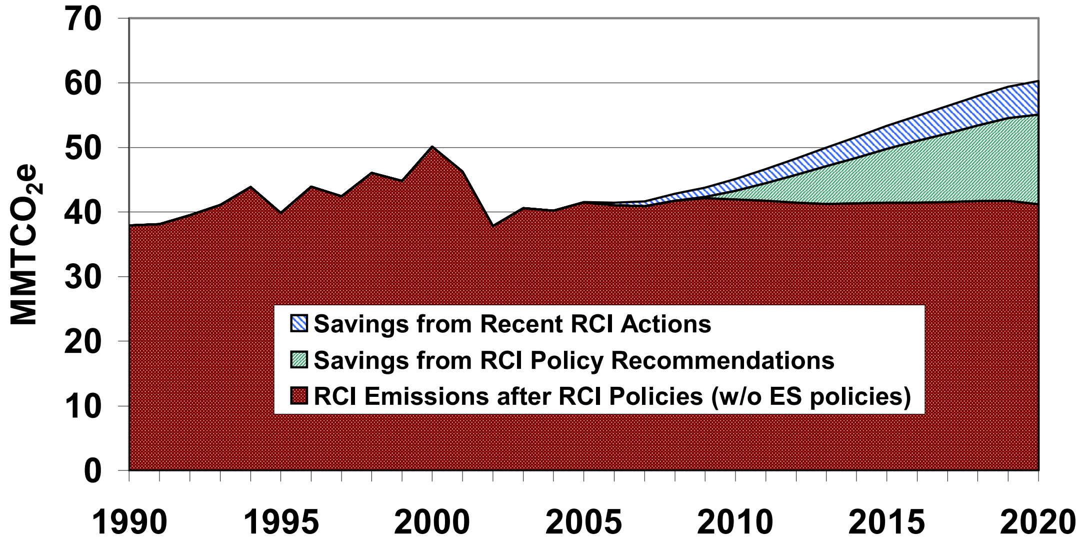

Figure 4. RCI Sector GHG Emission Savings Projections. Source: RCI Final Recommendations, p. 75

GHG savings, the estimated net present value (NPV) of the options considered, and cost-effectiveness results for each policy option evaluated by the RCI TWG are shown in Table 1. Analysis of options RCI-6 and RCI-7, quantified in coordination with the Energy Supply TWG, are shown in Table 2. Note that the sum of the individual options do not add to the RCI total ("**TOTAL: Residential, Commercial, and Industrial**") as shown in the first section of Table 1 because the considerable overlap among the actions, and with recent actions, has been taken into account in calculating the total net impact of the RCI options.

Table 1. Residential, Commercial and Industrial Sector Policy Strategies. Source (2007 Final CAT Report, p. 76)

RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL Sector Policy Options	GHG Savings in 2012 (MMtCO2e/yr)	GHG Savings in 2020 (MMtCO2e/yr)	Cumulative GHG Savings 2008-2020 (MMtCO2e)	Net Present Value 2008–2020 (Million $)	Cost-Effectivenes s ($/tCO2e)
Recent Actions					
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	TBD	
Appliance Standards		0.5	5.1	TBD	
Energy Independence Act (I-937)—Efficiency		3.9	31.3	-$1,400	
TOTAL Recent Actions	**2.6**	**5.4**	**43.9**	**$1,400**	
CAT Policy Options (total after adjusting for overlap)	**2.0**	**7.0**	**42.2**	**-$878**	**-$21**
TOTAL: Residential, Commercial, and Industrial	**4.6**	**12.4**	**86.1**	**-$2,278**	

Residential, Commercial, and Industrial Sector Policy Options Detail					
RCI-1: **Demand-Side Management (DSM) Energy Efficiency Programs, Funds, or Goals for Natural Gas, Propane, and Fuel Oil *‡**	0.6	2.7	15.6	-$498	-$32
Employs a number of different program, funding, and incentive mechanisms to increase the investment in demand-side management programs for natural gas, propane, and fuel oil. Among the key recommendations are that gas utilities obtain 100 percent of cost-effective, achievable DSM savings in their service territories by the year 2020, and that DSM programs for LPG and fuel oil customers be instituted so as to achieve a similar level of performance. These DSM activities can work in concert with other RCI strategies to encourage energy efficiency gains across the residential, commercial and industrial sectors.					
RCI-2: **Targeted Financial Incentives and Instruments to Encourage Energy Efficiency Improvements (Business Energy Tax Credit and Private/Public Efficiency Funds) ‡**	Not quantified separately				
Establishes targeted financial incentives and instruments to encourage energy efficiency in the development, design, and construction of new and existing energy-using buildings and building systems. Two primary vehicles are suggested—business energy tax credits and private/public efficiency funds—that support implementation of programs to improve energy efficiency in new and existing buildings (RCI-3 and RCI-4).					
RCI-3: **Promotion and Incentives for Improved Community Planning and Improved Design and Construction in the Private and Non-State Public Sectors *‡**	0.5	2.0	11.5	-$193	-$17
Uses a combination of financial and other incentives, plus regularly-revised performance targets, to encourage and promote the use of climate-friendly products in both commercial and residential buildings, in building materials and in building operational processes. This includes using informational approaches, certifications, and other means to support the consideration of life-cycle emissions in the building sector (reductions of 50% or more by 2020 are anticipated), to promote and provide incentives for community planning that incorporates GHG emissions considerations, and to discourage the construction of communities that do not support GHG emissions reduction goals.					
RCI-4: **Energy Efficiency Improvement in Existing Buildings, with Emphasis on Building Operations *‡**	1.0	4.2	24.2	-$529	-$22
Promotes and provides incentives for the improvement of the resource (energy, water, and other) efficiency of the existing building					

RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL Sector Policy Options	GHG Savings in 2012 (MMtCO$_2$e/yr)	GHG Savings in 2020 (MMtCO$_2$e/yr)	Cumulative GHG Savings 2008-2020 (MMtCO$_2$e)	Net Present Value 2008–2020 (Million $)	Cost-Effectivenes s ($/tCO$_2$e)
stock, emphasizing both retrofitting of existing systems and building operations, maintenance, and occupant behavior. A variety of approaches to measuring, monitoring, and providing information on the efficiency of buildings are used in this option, together with incentives for building owners and others, in order to induce a reduction in GHG emissions of an average of 20 percent in 50 percent of Washington buildings by 2020.					
RCI-5: **Rate structures and Technologies to Promote Reduced GHG Emissions (including Decoupling of Utility Sales and Revenues) *‡**	0.1	0.4	2.9	-$226	-$78
Supports other RCI options by implementing cost recovery rules that "decouple" the level of sales from net revenues earned by investor-owned utilities. The goal is to remove disincentives for utilities to investment in energy efficiency. Other recommendations focus on other elements of utility rate design and related technologies—such as tiered (increasing block) rates for electricity and natural gas use and "smart metering"—that are geared toward reducing greenhouse gas emissions, often with other benefits as well, such as reducing peak power demand.					
RCI-6 [See ES-2]: **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 [See ES-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				
Provides for enhanced public education and outreach to support the long-term success of Washington's mitigation actions. Education and certification programs for professionals involved in delivering services in support of RCI and other policy options considered by the CAT should also be developed and implemented. "Carbon labeling" of products and buildings should be considered and evaluated, including consideration of how this might be done in a consistent and verifiable manner, possibly on a regional or federal level.					
RCI-9: **Identification of 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				
Requires identification of the net impacts on GHG emissions of new government rules and regulations, and the identification of measures to avoid, minimize or mitigate increases in emissions. This option would additionally require SEPA (State Environmental Policy Act) review to quantify GHG emissions and identify measures to avoid, minimize, or mitigate emissions for state-funded and/or privately funded projects, and would emphasize the incorporation of GHG emissions consideration in community planning and zoning decisions.					
RCI-10: **More Stringent Appliance/Equipment/ Lighting Efficiency Standards, and Appliance and Lighting Product Recycling and Design *‡**	1.7	3.2	26.6	-$1,075	-$40
Increases energy efficiency through strengthened standards for new lighting, equipment, appliances and consumer electronic products and encourages product recycling and reuse, thus avoiding the generation of solid waste and the production and emissions of toxic materials. New energy-efficiency standards are included for devices not covered by existing federal or state standards, or in some cases to provide standards higher than current federal standards.					
RCI-11: **Policies and/or Programs Specifically Targeting Non-energy GHG Emissions**	0.3	1.5	7.8	$5	$1
Combines voluntary industry agreements with new equipment specifications to reduce the emissions of greenhouse gases from industrial processes and specialized uses (refrigeration, insulation, etc.). A variety of implementation mechanisms are suggested to					

RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL **Sector Policy Options**	GHG Savings in 2012 (MMtCO_2e/yr)	GHG Savings in 2020 (MMtCO_2e/yr)	Cumulative GHG Savings 2008-2020 (MMtCO_2e)	Net Present Value 2008–2020 (Million $)	Cost-Effectivenes s ($/t$CO_2$e)
achieve reduction of process emissions of carbon dioxide from the cement and aluminum industries, emissions of products used in refrigeration applications (hydrofluorocarbons), and emissions of sulfur hexafluoride used in electricity transmission and distribution equipment.					
Overlap among RCI options (and with recent actions)	-2.2	-6.9	-46.2	$1,637	

Key * denotes an option with net cost savings
‡ denotes an option determined to be most promising

Table 2. Relevant Energy Supply Policy Option Strategies. Source: 2007 Final CAT Report, p. 74-75

ES-2: **Distributed Renewable Energy Incentives and/or Barrier Removal ‡**		0.3	2.3	$135	$59*
Establishes targets for, and helps to overcome specific barriers faced by, distributed renewable energy systems, and thereby spurs markets and job creation in Washington State. Sited at, and directly serving, residences and commercial and industrial facilities, distributed renewable energy technologies include, among others, solar photovoltaic systems, solar water heating and space heating systems, wind power systems in rural areas, and geothermal and biomass heat and generation systems.					
ES-7: **Combined Heat and Power (CHP) and Thermal Energy Recovery and Use *‡**		2.1	12.1	-$317	-$26
Promotes incentives, communications, and permitting procedures to capture the efficiency and emissions benefits of CHP and thermal energy recovery and use in the State. By increasing the overall efficiency of fuel use and by reducing energy losses where facilities are located near heat and power demands, CHP and thermal energy recovery and use can provide significant GHG emission savings. Policies can be adopted to encourage these resources through streamlined permitting (without compromising other environmental goals), by ensuring that the full cost (including related electric energy transmission and distribution infrastructure costs plus transmission losses) of the alternative technology generation is compared to the cost of generating electricity at a CHP site. Other policies include financial incentives, such as loan guarantees and tax credits; Oregon's Business Energy Tax Credit (BETC) program and recent updates to Oregon's UM1129 provide useful examples for Washington to consider.					

* Note that the cost-effectiveness value for ES-2 shown here differs from that found in the corresponding table in the February 1, 2008 CAT report—it corrects an typographical error in the latter.