

Proposed Quantification Approaches for Washington Climate Action Team (CAT) Energy Efficiency/Green Buildings Implementation Working Group (EE/GB IWG) Actions for Greenhouse Gas Emissions Reduction

[Draft, for review at EE/GB IWG Conference Call, 9/3/08]

NOTE TO IWG:

During the CAT meeting on August 14th, the facilitation team for the IWG agreed to prepare an initial draft approach to “quantification” (analysis of estimated net costs and greenhouse gas emissions reduction benefits) of the Actions proposed by the EE/GB IWG. Note that this is intended to be a “first cut” for discussion during our conference call on 9/3. Below are 1) a set of common assumptions that will be needed to model all options—many of these are available from the 2007 CAT Residential, Commercial and Industrial Technical Working Group process, 2) a table showing the “market coverage” of the EE/GB actions currently considered, and 3) a draft “quantification approach”, including ideas regarding data and assumptions needed, for each of the three options now under consideration. We look forward to your comments, either before or during the upcoming call!

For All Actions:

Common assumptions/data needed:

- Discount rate (5%/yr, real basis)
- Calculation years (probably present through 2020, though we will likely do projections to 2025 or 2030 as it is likely those figures will be needed eventually)
- Reporting years (2012 and 2020)
- Future rate of inflation (if needed—based on recent trends)
- Emission factors for non-electric fuels
- Emission factors for electricity generation
- Avoided costs for electricity generation
- Avoided costs for natural gas and other fuels
- Transmission and distribution losses as a fraction of generation

Summary of Coverage (Markets/Measures) of Actions

Market/Measures	Public or Private?	Action/Element		
		EE/GB-1: Energy Efficiency Quality Investment Program (EEQIP)	EE/GB-2: Public Building Operation and Building Standards	EE/GB-3: 2009 State Energy Code Improvements, Establishment of WA Continuous EE Improvement Program for Buildings
Existing Residential Buildings	Private	Sales, Property Tax Incentives; Local Government EE Funding ¹	Section D, Building Materials Stds ²	Continuous EE Improvement Program for Buildings.
	Public (Housing)			
Existing Commercial and Industrial Buildings	Private	PUT Incentives, Local Government EE Funding	Section D	Continuous EE Improvement Program for Buildings.
	Public		Section B, O&M and other EE improvements; Section D	
New/Substantially Rennovated Residential Buildings	Private	Sales, Property Tax Incentives, Local Government EE Funding	Section D, Building Materials Stds ³	Revise WSEC ⁴ ; Continuous EE Improvement Program for Buildings
	Public (Housing)			
New/Substantially Rennovated Commercial and Industrial Buildings	Private	Sales Tax Incentives, Local Government EE Funding	Section D	Revise WSEC; Continuous EE Improvement Program for Buildings
	Public		Section C, EE improvements; Section D	
Appliance/Equipment Standards				Add 5 appliance categories to 19.260 RCW
CHP/Distributed Energy		B&O ⁵ and Sales Tax Incentives? Local Government EE Funding?		Continuous EE Improvement Program for Buildings?

¹ Would local government funding be applicable to public housing? Does it depend on who pays the utility bills, and whether the units are publicly or privately held?

² Was Section B of EE/GB-2 intended to cover public housing as well?

³ Was Section C of EE/GB-2 intended to cover public housing as well?

⁴ Washington State Energy Code

⁵ Business and Operations

Initial Proposals for Analysis of Emissions Impacts and Costs by Proposed EE/GB Action

EE/GB-1: Energy Efficiency Quality Investment Program (EEQUIP)

Proposed Quantification Approach:

The tax incentive elements of EE/GB-1 can be seen as supporting the achievement of goals for improvement of existing and new buildings expressed in EE/GB-3. The proposal is therefore to NOT quantify the emissions impacts or total resource costs (which are presumably a net of near zero in most instances, in any case, as incentives paid and the corresponding reduction in state funds are transfer payments that occur within the state) associated with these elements, with the possible exception of estimating the net state government funding implications.

PLEASE NOTE, however, that a EE/GB Co-lead suggests that it may be important to quantify this option, and the IWG should discuss the merits of options for doing so during its 9/3 teleconference.

The combined heat and power/distributed energy (CHP/DE) elements of EE/GB can be quantified based on goals for implementation of CHP/DE systems. As an initial set of assumptions, the proposal is to use the inputs/analysis developed during the Fall 2007 CAT process by the Energy Supply (ES) Technical Working Group (specifically, for ES-2, “Distributed renewable energy incentives and/or barrier removal” and ES-7, “Combined Heat and Power (CHP) and thermal energy recovery and use”.

Key Elements and Required Data/Parameters

- Implementation rates for CHP/DE systems. At present, ES estimates call for an additional 0.8% of WA homes with solar hot water by 2015, an additional 30 MW of distributed wind power, 20 MW of distributed solar PV, 50 MW of distributed biomass/landfill gas/biogas systems by 2020, and an additional 976 MW of CHP by 2020 (about 25% of estimated WA potential).
- Estimated capital, fuel, and operating costs of CHP/DE systems.
- Data on the number of homes in WA, and expected growth in the number of homes.
- Fuel input to and fuel avoided by CHP systems (current assumption is 100% natural gas for both).
- Assumptions, if desired, regarding district heating/cooling. These would include the number and/or floor area of homes and other buildings connected to district energy systems, the fuel input types and fuel types avoided, the cooling/heating system capital costs, and individual household capital costs avoided, and the relative efficiencies of district versus individual systems. Presumably, the working assumption would be that all district energy systems would utilize CHP.
- To estimate state revenue implications of the tax incentive measures, a combination of assumptions regarding the extent of the various programs (number/floor area/fraction of buildings affected annually), and about the size of the incentive (fraction of tax rebated) will be needed.

EE/GB-2: Public Building Operation and Building Standards

Proposed Quantification Approach:

The elements of EE/GB-2 are targeted at improving the energy efficiency in new and existing public buildings (elements B and C), with the exception of element D, “Building Materials” (Certification). Elements B and C can be quantified by estimating the area of buildings upgraded annually and the improvement in building energy use—relative to new (EE/GB-3) energy codes in the case of new buildings—for those buildings upgraded.

The “Building Materials” element of this Action can be seen as largely supporting the achievement of goals for improvement of existing and new buildings expressed in EE/GB-3. The proposal is therefore to NOT quantify the emissions impacts or total resource costs of element D of this Action. Until and unless the Building Materials element is substantially more detailed—which probably would happen after the CAT process—it appears very difficult to ascribe particular savings to the element. If quantitative analysis of this element seems crucial, two possible approaches might be A) to specify a target reduction in the average embodied energy in building materials produced by the policy, or B) to adapt an existing study (not yet identified) that estimates the benefits of building materials certification in a suitably similar setting.

Key Elements and Required Data/Parameters

- Is it the intention of the IWG that public housing be covered by this Action? If so, then an estimate/assumption (number of units, or fraction of units) of the existing and new public housing to be covered by this Action will be required.
- For other public buildings, estimates or assumptions regarding the fraction of new buildings covered by the Action (100%?) and of existing buildings addressed annually will be needed.
- For public buildings in general, we will need estimates of floor area by size class for the new and existing public building stock (rough estimates were prepared during the 2007 CAT process, and can be used as a starting point for calculations).
- For new public buildings, an estimate of the fraction of building energy use improvement through this action for buildings participating, based on Architecture2030 goals (net of new building codes in EE/GB-3).
- For existing public buildings, an estimate of the fraction of building energy use improvement through this action for buildings participating, which may be, in part, possible to derive from goals in the Action.
- Estimates of the fraction of existing buildings undergoing substantial renovation (enough to trigger codes and new-building provisions of EE/GB-3).
- Estimates of the net cost of building energy efficiency improvements for new and existing buildings, ideally expressed as costs of saved electricity (\$/MWh) and of gas and other fuels (\$/MMBtu).
- Assumptions regarding the use of on-site renewable energy-based generation, space/water heating, and “green power” purchases needed to meet Architecture2030

goals in new buildings, and the costs of those technologies over time (assumptions as used in 2007 CAT RCI estimates are available as a starting point).

EE/GB-3: 2009 State Energy Code Improvements and the Establishment of the Washington State Continuous Energy Efficiency Improvement Program for Buildings

Proposed Quantification Approach:

Estimate the difference between recommended building energy efficiency codes in this option for the residential and commercial sectors with codes already in place in WA. Estimate the savings from new and existing buildings built or renovated to continuous energy efficiency improvement program targets. Estimate the potential savings for appliances/equipment standards for devices covered that are more efficient than US standards.

Key Elements and Required Data/Parameters

- Estimates of energy savings from new building energy efficiency codes included in EE/GB-3 relative to codes currently in place.
- Estimates of the rates of compliance with new codes (may vary over time).
- Estimates of the growth in the number of residential units, and in the floor area of commercial-sector buildings.
- Estimates of the fraction of existing buildings undergoing renovation sufficient to trigger code compliance.
- Estimate of industrial-sector energy use that is related to building conditioning/lighting, rather than process energy (include this fraction in the estimate of commercial-sector savings through code improvement).
- Adapt an approach used for a number of US states by the Building Code Assistance Project to estimate savings from code improvements.
- Estimates of the fractions of new and existing buildings in each sector that annually will participate in the program to meet continuous energy efficiency improvement program targets
- Estimates of the costs of energy saved due to improved building codes.
- Estimates of the costs of energy saved in going beyond codes to meet continuous energy efficiency improvement program targets.
- Assumptions regarding the use of on-site renewable energy-based generation, space/water heating, and “green power” purchases needed to meet Architecture2030 goals in new buildings, and the costs of those technologies over time (assumptions as used in 2007 CAT RCI estimates are available as a starting point).
- As an initial approach, apply approaches used by the Appliance Standards Assistance Project (ASAP), as appropriate, to estimate savings from standards from the devices specified in the Action. Use results of 2007 RCI TWG process (option RCI-10) as applicable.

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- Estimate the annual sales of devices specified in the Action (from national data, WA population, and/or device lifetime, if necessary).
- Estimates of the average additional costs for devices meeting standards covered by the Action, or weighted-average cost of saved energy.