Energy Supply Technical Work Group
Summary List of Recommended High Priority Mitigation Options

August 17, 2007 – This version of the Options document includes feedback from the August 7th CAT meeting, updates to ES-7, and suggestions for Data Sources. We are asking TWG members to review this document (especially highlighted text) and provide your feedback to CCS. Written comments that are received by August 22 will be included in the next version of this document.

In particular,

ES-5 will need to be revised based on feedback from CAT.

ES-6 requires additional input in overall design

ES-7 has been updated following the July 30th TWG meeting (note that the Volunteer Group is planning to revise this option further prior to the August 30th TWG meeting)

Highlights also indicate sections where full TWG discussion and agreement have not yet occurred – please review and be prepared to discuss at the TWG meeting. Additionally, we have added some potential sources for cost and emission reduction information under Data Sources – again, please review these sources and provide any additional references to us.

#	Mitigation Option Name	Feedback from CAT
ES-1	Grid-based renewable energy incentives and/or barrier removal (originally 2.2)	CAT affirmed the development of the Straw Proposal as provided by TWG
ES-2	Distributed renewable energy incentives and/or barrier removal (originally 2.3)	CAT affirmed the development of the Straw Proposal as provided by TWG
ES-3	Efficiency improvements at existing renewable and power plants (originally 2.9 and 3.3)	CAT affirmed the development of the Straw Proposal as provided by TWG
ES-4	Technology Research & Development, plus Technology-Focused Initiatives (originally 1.6, 2.8, and 3.4)	CAT affirmed the development of the Straw Proposal as provided by TWG
ES-5	CCSR (including pre and post-combustion) incentives, requirements and/or enabling policies plus R&D (originally 5.1, 5.2, and 3.1a and b)	CAT called for revisions to Straw Proposal to ensure that actions do not overlap SB6001
ES-6	Transmission system capacity, access, efficiency, and Smart Grid (originally 6.1, 6.2, and 6.5)	Straw proposal in progress, to be reviewed by CAT in September

#	Mitigation Option Name	Feedback from CAT
ES-7	Combined Heat and Power (CHP) and Thermal Energy Recovery and Use (originally 2.5)	Straw proposal in progress, to be reviewed by CAT in September
ES-8	*Incorporated into ES-5* (originally 3.1a)	

The following options received significant interest from the TWG but were not considered high priority. Suggestions for follow up for some of the options are provided as well.

Catalog #	Mitigation Option Name	Comments
1.7	Climate change education initiatives	TWG suggests that the CAT should develop over-arching education policy
2.4	Green power purchases and marketing	Keep at moderate priority
2.7	Renewable energy development issues	Keep at moderate priority, limited ability for state actions
2.10	Use carbon offsets markets to promote additional renewable energy development	Include in other discussions on market based mechanisms (cap and trade, carbon tax)?
4.5b	Coal-to-gas production	Keep at moderate priority
4.7	LNG policies and infrastructure	Possibly consider needs for overall natural gas supply policies

The CAT expressed strong interest in education initiatives and is working on this aspect.

ES-1. Grid-based Renewable Energy Incentives and/or Barrier Removal

Based on ES Catalog Option 2.2

Mitigation Option Description

This policy option addresses the barriers to and possible incentives for expanding grid-based, or utility-scale, renewable resources. Renewable resources, be they grid-scale or small-scale, can provide an important contribution to achieving the overall emission targets for Washington State. "Barriers" in this context should be thought of as institutional barriers to developing cost effective renewable resources or actions that will lead to grid-scale renewable resource being more economic. Such institutional barriers may include wind integration, transmission policies, interconnection policies, or regulatory cost recovery policies, or economic policy drivers.

Policies that target non-or low-emission resources through financial incentives or command-control purchases should include financial safeguards to ensure that the most cost competitive resources are developed and that end-use customers are protected from paying unreasonable costs.

Mitigation Option Design

Financial incentives for grid-based renewables could include, among others: (1) direct subsidies for purchasing/selling renewable power and resources given to the buyer/seller); (2) tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (3) tax credits for each kWh generated from a qualifying renewable facility; and (4) regulatory policies that provide incentives and/or assurance of cost recovery for utilities and independent generators that invest in renewable energy systems.

Potential design elements are described below [*these suggestions have not been fully discussed by the TWG and are subject to revision*]:

Availability and Diversity of Resources: Legislative actions to target expanded sources of renewable resources and encourage investment and development of these resources. For example, new polices could expand the requirements for renewable resources and the definition of renewable to be more focused on non/low emitting resources. These targeted resources could include geothermal, solar, organic pulping by-products, tidal and ocean, and biomass, along with renewable resources from Canada or Southern Alaska. This can be accomplished in one of two ways. One would be to update the resource definitions and renewable targets in the RPS (I-937)—this would not represent a consensus recommendation by the TWG. A second way would be to add another layer to the existing legislation.

Regulatory Uncertainty

Development Costs: Legislation requiring the WUTC to develop policies and procedures to provide guidance to utilities on how different types of prudently incurred development costs will be recovered in rates before utilities make such expenditures.
Exceeding RPS Targets: Legislation that explicitly allows utilities to use excess revenue cap capacity to invest in additional renewable resources. For example, utilities could be allowed to retain revenue from selling RECs generated/acquired in excess of those needed to comply with the RPS.
Research Development and Demonstration Costs: The WUTC could be required to establish policies, guidelines, and procedures for reviewing, approving, and establishing accounting treatment for utility proposed RD&D projects. The process could clarify how costs of prudently managed, utility proposed RD&D projects may be recovered.

Incentives to directly support development of renewable resources*, which are in excess of I-937 (TWG members may differ on whether incentives can be applied to meet I-937).* This can be through some combination of tax supports to renewable developers, that may be bid into utility RFP's. The tax supports or other direct support could also be provided to utilities, that could be used for self-owned or non-utility renewable energy, which would help ensure energy and green attributes of such state-supported renewable resources stay in the state.

Transmission Cost Barriers: The state could provide no-interest loans or loan guarantees to utilities and non-utility generators for upfront transmission charges.

Transmission Siting Barriers: Ensure EFSEC has siting authority over some transmission and that projects are allowed to opt into EFSEC. [*TWG members noted that recent legislation may cover these concerns. In January 2006, EHSB 1020 passed "*Extending EFSEC Jurisdiction Over Transmission Lines".[1] *Further TWG discussion will determine if this legislation is sufficient]*

Avoided Cost Policies: When administratively determined avoided costs are used as the basis for acquiring grid-scale resources, such avoided costs should accurately reflect the full benefit marginal or incremental cost savings for particular resource types. When utilities use a competitive bidding process in lieu of administratively determined avoided costs for such resources, the WUTC (for IOUs) should ensure resource acquisition decisions accurately reflect costs and benefits savings from all non-utility generation, including renewable resources.

Policies/Strategies for Consumer Owned Utilities: *examples have not yet been discussed by TWG but members acknowledged the need to consider these.*

- **Goals:** *Ensure timely and cost-effective achievement of existing RPS targets [and exceed these targets by [XX aMW or XX%] by 2020]].*
- **Timing:**
- **Coverage of parties:**

[1] http://www.leg.wa.gov/pub/billinfo/2005-06/Pdf/Bill%20Reports/Senate/1020-S.SBR.pdf

- **Other:**

Implementation Mechanisms

Additional policy design elements for discussion

Incentives for Investor Owned Utilities: Resolving regulatory uncertainty is generally good public policy that will help allow utilities to move toward more renewable resources. Utilities should be encouraged to acquire renewable resources—owned or purchased. The RPS provides the WUTC the option to use positive incentives, but it would provide a clearer signal to the WUTC if it were required to adopt incentives. Potential Solution: Utilities could be allowed to retain revenue from selling RECs generated/acquired in excess of those needed to comply with the RPS. This would provide positive incentives to comply with physical RPS targets early and in the long-term. Such an incentive could be coupled with the process described in "exceeding the RPS" to provide a cap on expenditures. Alternatively, utilities could be provided a rate of return kicker (or financial equivalent for purchases) for renewable resources. Washington State already provides that utilities may earn a higher return on equity for conservation investments. A comparable mechanism could be applied to renewable resources. Utilities could be allowed to earn at least 2% more on renewable resource rate base or equivalent expense, comparable to what is currently allowed for conservation resources. New legislation should not take away this type of option for policy makers and regulators to give as an incentive to utilities.

Incentives for Non-Utility Generators—Combined Heat and Power incentives are discussed under ES-7

Incentives for Industrial, Non-Utility Generators—Other Resources: Incentives should be provided using investment and production tax credits, government loan guarantees, and low interest loans. Oregon's Business Energy Tax Credit system works well to encourage renewable energy generation and energy efficiency projects at commercial sites and industrial plants. Tax credits are given for projects up to $20 million. B&O tax credits can provide similar incentives. Changes in the current B&O tax system to create incentives similar to BETC could provide the tipping-force to more GHG reduction projects forward.

Barriers to Non-Utility Generators: High interconnection costs, power dispatchability and regulatory barriers need also to be removed similar to OR Public Utility Commission ruling under UM 1129.

Related Policies/Programs in Place

See ES-2 below. See Senate Bill 6001 (April 2007), section 4d) and 4e),

Type(s) of GHG Reductions

[Insert text here]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
  - Northwest Power Council 5th Power Plan (2005) and Biennial Monitoring Report (2007) – projections of costs and resource availability. http://www.nwcouncil.org/energy/powerplan/default.htm

  - Integrated Resource Plans from Utilities http://www.nwcouncil.org/energy/Biennial/(P4-3)IRP%20Status.doc
  - Union of Concerned Scientists. *The Washington Clean Energy Initiative: Effects of I-937 on Consumers, Jobs and the Economy.* http://www.ucsusa.org/clean_energy/clean_energy_policies/washington-clean-energy-i-937.html

- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-2. Distributed Renewable Energy Incentives and/or Barrier Removal

Based on ES Catalog Option 2.3 and RCI Catalog Option 6.1

This option will be considered jointly with the RCI TWG group.

Mitigation Option Description

Distributed electricity generation sited at residences and commercial and industrial facilities, and powered by renewable energy sources (typically solar, but also wind, small hydroelectric power sources, or biomass or biomass-derived fuels), displaces fossil-fueled generation and avoids electricity transmission and distribution losses, thus reducing greenhouse gas emissions. This policy can also encourage consumers to switch from using fossil fuels to using renewable fuels in applications such as water, process, and space heating. Increasing the use of renewable energy applications in homes, businesses, and institutions in Washington can be achieved through a combination of regulatory changes and financial incentives.

The TWG has not yet agreed on the definition of Distributed Generation. Some TWG members suggested that this option should consider defining distributed generation according to RCW 19.285.030(9), i.e., an eligible renewable resource where the generation facility or any integrated cluster of such facilities has a generating capacity of not more than five megawatts. Other members suggest that larger units should also be included (up to 100 MW). Potential technologies include: solar photovoltaic systems, solar water heating/space heating systems, wind power systems, particularly for rural areas, biomass-fired generation, space, or water heating systems.

There are numerous barriers to distributed renewable energy, including inadequate information, institutional barriers, community barriers, limited number of qualified contractors, high technology costs high transaction costs because of small projects, high financing costs because of lender unfamiliarity and perceived risk, "split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc. The lack of recognition for emissions reduction value provided also creates obstacles. Policies to remove these barriers could include: improved interconnection policies, improved rates and fees policies, streamlined permitting, recognition of the emission reduction value, financing packages and bonding programs, power procurement policies, education and outreach, etc.

Mitigation Option Design

Potential elements of this option could include [*these suggestions have not been fully discussed by the TWG and are subject to revision*]:

- The primary barrier to new small DG is the high initial cost which must be borne by the customer-generator. Mitigation could include: WA tax credits for commercial operations; WA-supported no-interest loans to residential customers; and WA state rebates for the purchase of specified technologies. Tax credits and other mechanisms to make distributed

renewable resources more economically viable are important to develop non-traditional resource alternatives.

- Washington already has uniform interconnection standards for small DG resources and net-metering laws. The existing regulatory construct can discourage direct utility capital investment in DG; those barriers should be examined, at least. Other "incentives" aimed at increasing market penetration of DG and certain energy efficiency technologies would be more effectively targeted at utilities, rather than individual consumers; utilities could be encouraged to create the market if they (IOUs) have the proper incentives to do so.
- Incentives should be utilized where appropriate (for example, to encourage renewable generation in excess of I-937 requirements). Utility rates of return should be increased for these investments.
- Conduct analysis to determine availability of DG supply. If it is determined that there are significant opportunities for DG, expand incentives and remove barriers to encourage deployment of these technologies.
- There is support among some members of the Energy Supply TWG to amend I-937 to include a broader variety of resources and waste-to-energy (WTE) as renewable fuels. I-937 proponents have concerns about opening up the initiative, in part because of the potential to undermine the original intent that now serves as a fundamental basis of GHG emission reductions in the energy supply sector. I-937 proponents also have concerns about air quality impacts of traditional methods of burning pulping liquors and even more so with WTE.
- Interconnection standards are based on federal, state and industry safety requirements. High interconnection costs and regulatory access barriers can be shifted from the customer-generator to the general population with appropriate legislation.
- Consider amending the net metering statute (RCW 80.60) to: (1) increase the size of qualifying [agricultural] systems from 100 kW to 200 kW (currently net metering is available generally up to 100 kW); (2) accelerate the timeline for increasing the cumulative generating capacity available to renewable net metered systems[2]; and (3) ensure a simplified process for customer-generators to utilize net metering. *[Note, as mentioned above, that the TWG has not yet agreed on appropriate size (kW) for this recommendation]*
- Consider requiring new connections representing a load greater than a certain threshold (x kW) to evaluate distributed generation options
- Simplify process for customer generators to utilize net metering

[2] 80.60.020(1) says: "… On January 1, 2014, the cumulative generating capacity available to net metering systems will equal 0.5 percent of the utility's peak demand during 1996. Not less than one-half of the utility's 1996 peak demand available for net metering systems shall be reserved for the cumulative generating capacity attributable to net metering systems that generate renewable energy".

- **Goals:** Overcome barriers posed by high up-front costs of distributed generation systems. Expand use of systems in Washington, and promote stronger market for Washington's solar energy industry. *Achieve XX% of identified [cost-competitive] distributed generation potential in Washington by 2020 or achieve XX aMW/BTU of [specific resource].*
- **Timing:** Many of the incentives, including loan subsidies, could be implemented in the 2009 legislative session, when the next biennial budget is drafted by the legislature.
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

- State incentive funds and low or no interest loan programs subsidized by the state.
- Expansion and/or extension of tax incentives provided under SB 5101 (2005).

[*The following are from RCI TWG comments and have not been fully discussed by the Energy Supply TWG*]

- Training/certification programs for installers/contractors
- Net metering and other pricing arrangement programs
- Improving interconnection standards and reducing costs
- Encouraging the creation of and support for biomass fuels markets.
- Encouraging small scale renewable systems including biomass boilers, small scale wind, and geo-thermal.
- Incentives and barrier elimination, including avoided cost barriers for CHP.
- Tax credits, and/or utility or other incentives to lower the first cost of distributed energy systems to users. This could include expanding incentives offered under the existing law to residential consumers to include commercial systems, offering B&O tax credits for commercial- scale systems, and offering low- or no-interest loans for commercial and residential systems.
- Efforts to simplify and standardize permitting for industrial and large commercial DG systems, as well as support for County and city land use prescreening efforts to facilitate siting.
- Possible amending of I-937, or other climate policies, to include a broader range of resources as renewable fuels. [Several TWG members have expressed concern about opening up I-937 in general and in particular with respect to pulping liquors and waste-to-energy].
- Consider legislation requiring utilities to adopt electric service connection standards that require customers who are adding new large loads (greater than X kW) to require those customers to mitigate that load with distributed generation (either on site or elsewhere.)

Related Policies/Programs in Place

In 2005, the Legislature enacted the Renewable Energy System Cost Recovery (RCW 82.16.110) and Tax on Manufacturers or Wholesalers of Solar Energy Systems (RCW 82.04.294). The legislation provides incentives for the purchase of locally-made renewable energy products and provides a preferential rate under the business and occupation tax. Furthermore, tax exemptions under RCW 82.08.02567 and RCW 82.12.02567 incent the purchase and use of machinery and equipment used directly to generate electricity using fuel cells, wind, sun, or landfill gas. Similarly, RCW 82.08.835 and RCW 82.12.835 incent the purchase and use of solar hot water systems.

Incentive payments are provided by electric utilities to customers generating renewable energy (i.e., solar, wind) on their property. For example, the Chelan County PUD Sustainable Natural Alternative Power Producers Program encourages customers to install power generators such as solar panels and wind turbines and connect them to the PUD distribution system; Avista Utilities provides a production credit of 14 cents per kWh for one year; Bonneville Environmental Foundation Green buys "tags" for five cents per kWh for up to five years (see additional information at end of this document).

Type(s) of GHG Reductions

[TWG has begun to provide input; to be discussed at next CAT meeting]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:** Western Governors Association's *Clean and Diversified Energy Initiative*; EIA *Annual Energy Outlook 2007 assumptions*; Energy Trust of Oregon *A Comparative Analysis of Community Wind Power Development Options in Oregon*.

- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):** Likely dependent on how key uncertainties noted below are resolved over time. Level of contribution to long term goals dependent on how broadly DG technologies are utilized, which are in turn highly dependent on per kW cost of systems.
- **Job Creation:** Washington is home to many companies, such as RES and Xantrex, that manufacture solar energy and other DG system components. Expansion of the market for DG systems should help grow this fledgling industry in Washington and create more jobs in places like Moses Lake, Arlington and Vancouver.
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

Growth in utilization of DG technologies will depend, in part, on new technologies, increased manufacturing efficiencies with existing technologies and increase in markets to drive economies of scale that will reduce system costs.

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

High level of consensus on incentives.

Renewable Energy -- tapping local renewable resources such as bio-energy. including abundant supplies in the NW and Canada.

- Bio-energy includes a range of biomass feedstocks and technologies for conversion of these materials into useful energy.
    - "Biomass" is a general term for organic materials, and encompasses woody materials such forest wood wastes, wood chips, urban waste wood (tree trimmings), sawmill residue, crop residues, organic portions of municipal waste. Encourage development of cellulosic ethanol via pro-active policies and incentives.
    - Increasing interest in bio-energy is driven by advances in technology, environmental benefits, energy supply and price stability, and the potential for significant spin-off employment in fuel procurement and processing.
    - For some biomass materials, using the biomass for energy also can eliminate a waste disposal and landfill saturation problem.
    - Biomass can be used directly to produce thermal energy and/or electricity. Liquid or gaseous fuels can be produced from biomass for combustion in reciprocating engines or gas turbines.
- Geothermal resources are found throughout most of the western continental U.S., Alaska, Hawaii, and, to a lesser degree, in areas of the south and east.
    - Power generation is only one aspect of geothermal resource development. Geothermal heating, especially when coupled with district energy systems, can contribute significantly to reduction in the use of conventional fuels.
    - There are 271 communities in 10 western states, including WA, with nearby geothermal resources that could provide a renewable source of heating. These cities represent a population of 7.4 million people.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-3. Efficiency Improvements, Capacity Additions and Fuel Switching at Existing Renewable and Fossil Power Plants

Based on ES Catalog Options 2.9 and 3.3

Mitigation Option Description

Efficiency improvements refer to increasing electric generation output at existing projects through incremental improvements at existing renewable projects (e.g. hydro, biomass, solar or wind) and at existing fossil plants (e.g., more efficient boilers and turbines, improved control systems, or combined cycle technology). Efficiency improvements at existing projects include incremental operational and equipment changes that result in more electric energy output using the same amount of fuel.

Capacity additions refer to adding electric generation capacity to any existing renewable projects. Fuel switching refers to switching to lower or zero emitting fuels at existing fossil plants. This may include the use of biomass or natural gas in place of coal or oil. (repowering is not fuel switching)

All of these (efficiency improvements, capacity additions and fuel switching) are effective ways of achieving lower GHG emissions and should be encouraged as part of state policy (*See additional information at end of this document*). Policies to encourage improvements at existing plants could include: new policies and principles, new laws and regulations, market-driven incentives, and financial incentives.

Mitigation Option Design

Potential elements of this option could include [*these suggestions have not been fully discussed by the TWG and are subject to revision*]:

- Policies and Principles – establish policies and principles through the Governor that define and promote efficiency improvements at existing projects. Encourage optimal use of our existing resources and investments in new resources.
- Laws and Regulations – develop implementing legislation or guidelines that provide the necessary market-driven incentive to accomplish overall goal.
- Market-driven incentives – provide incentives through future environmental attributes market (e.g. renewable energy credits, green power, and carbon offsets) that encourage and reward the efficient use of our energy resources.
- Financial incentives – provide incentives through reduced taxes and low-interest loans and other financial incentives.
- Explicit credit for GHG emission reduction could be a part of the prudence decision-making process, which could then result in more such improvements occurring.

  - Incentives should be provided using investment and production tax credits, government loan guarantees, low interest loans and grants. Oregon's Business Energy Tax Credit system works well to encourage renewable energy generation and energy efficiency projects at commercial sites and industrial plants.
  - To address potential efficiency improvements at plants under federal authority, the regional Governors and state delegations could, working with BPA, secure federal funding to first study and identify the potential efficiency improvements in the Bonneville hydro system and then obtain funding for implementation.

- **Goals:** *Implement the achievable, [cost-effective] efficiency potential at Washington's existing power plants. Reduce GHG emissions by substituting higher GHG fuels with lower GHG fuels [goal framing TBD].*
- **Timing:** To establish policies on or before January 1, 2009.
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

Additional Design Considerations [these have not been fully discussed by the full TWG and are subject to revision]

- Focus on efficiency improvements, capacity additions and fuel switching at existing renewable and fossil facilities. This could also include co-firing with biomass
- Need to clarify financial incentives. Favor utilizing incentives where appropriate.
- Under I-937, a utility cannot count against the renewable energy standard RECs from a hydro upgrade made by a qualifying utility, or the output from a hydro upgrade made by a non-qualifying utility. TWG members disagree on whether changes should be made within I-937 to address this restriction or new policy/legislation should be developed to encourage efficiency improvements at hydro plants.
- Establish market standards that prevent potential double-counting of renewable energy generation.
- Methods to recover capital expended on existing fossil-fueled resources while also facilitating a transition to lower GHG emitting resources could be explored.
- The eligible $/MWh for efficiency projects could be adjusted to reflect the value of avoiding GHG emissions during any pre-approval or prudence review.
- A system that incorporates changes in the Washington's B&O tax to provide tax incentive credits similar to BETC could provide the tipping-force to move GHG reduction projects forward.
- Need to ensure financial incentives are equally available to both private and publicly-owned utilities.

- Consider whether avoided GHG emissions attributable to efficiency improvements, capacity additions and fuel switching at existing plants prior to any mandate or that exceed an operating permit limitation could be creditable as early actions within the context of a regional mechanism to achieve GHG reductions.

Related Policies/Programs in Place

- Senate Bill 6001 (April 2007), sections 4c) and 11.
- Implementation of the Energy Independence Act (RCW 19.285)

Type(s) of GHG Reductions

[TWG has begun to provide input; to be discussed at next CAT meeting]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:** Western Governors Association's *Clean and Diversified Energy Initiative*; EIA *Annual Energy Outlook 2007 assumptions*; Energy Trust of Oregon *A Comparative Analysis of Community Wind Power Development Options in Oregon*.
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
  - Implementation of efficiency improvements will produce high-quality technical and trade jobs.
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

- The estimated percent of efficiency improvements needs to be confirmed. An energy audit of existing projects to identify operational and equipment efficiency improvements and to identify new generation resources needs to be completed. Potential energy savings (aMW) and expected costs associated with those savings needs to collected and compiled before informed decisions can be made.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-4. Technology Research, Development & Demonstration and Technology-Focused Initiatives

Based on ES Catalog Options 1.6, 2.8, and 3.4.

Mitigation Option Description

Drive advances in technologies that would develop cleaner energy supplies and make existing fossil fuel energy sources less GHG emitting. Encourage deeper investments in implementation opportunities for these new technologies. Establish an emerging energy technology program to set the stage for wider-scale adoption of these emerging and break through clean energy and efficiency technologies.

Mitigation Option Design

- Establish an emerging energy technology program to help develop and deploy advanced technologies:
  - Provide opportunities and incentives to invest in, test, and deploy new technologies.
  - Promote research and development of cost-effective breakthrough technologies.
  - Support technology demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use.
- Criteria for the Program
  - Program investments must target efforts that reduce GHG, reduce energy imports and create clean energy jobs and economic development.
  - Increase collaboration between existing institutions for RD&D on technologies and support public and private partnerships. Create centers of technology excellence.
  - Use an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology).
  - [*TWG members indicated some concern that R&D may not lead to actual GHG emission reductions. Suggest reviewing the achievements of other R&D programs to better understand the key components of successful R&D programs and seek to include these elements*]
  - Could consider opportunities for private sector companies to provide funding for this program
- The emerging energy technology program should be inclusive of legitimate technologies that among others, result in:
  - Efficiencies in power generation, fuel transport and co-firing
  - Efficiencies in power use
  - Advance energy storage systems

  - Carbon capture, storage and reuse
  - Alternative clean energy development

- **Goals:**
  - Build on existing state partnerships and initiatives. $10 million Emerging Energy Technology fund for advanced clean energy technologies.
  - Shared funding partnership with state, federal, and private sector partners to ensure the most effective deployment of these technologies.
- **Timing:**
  - Establish funding in the 2008 legislative session. First RFP issued January 2009.
- **Coverage of parties:**
  - State agencies, Washington Universities, private companies, utilities, Federal laboratories
- **Other:**

Implementation Mechanisms

- State program that partners with all levels of government, utilities, energy suppliers, and technology development companies.

Related Policies/Programs in Place

See Senate Bill 6001 (April 2007), various sections.

Northwest Energy Technology Collaborative

Washington Technology Center

Washington State University Energy Extension Service

Community Trade and Economic Development - Energy Policy Division

Pacific Northwest National Laboratory

Type(s) of GHG Reductions

Carbon Dioxide

Methane

Sulfur hexafluoride

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**

- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-5. Carbon Capture, Storage, and Re-use Incentives, Requirements and/or Enabling Policies and Research & Development (including pre-combustion technologies)

Based on ES Catalog Options 5.1, 5.2, and 3.1b.

Mitigation Option Description

Carbon dioxide (CO_2) capture and storage or reuse (CCSR) is a process consisting of the separation of CO_2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere. The CO_2 from large point sources can be compressed and transported for storage in geological formations, in the ocean, in mineral carbonates, or for reuse in industrial processes. Captured carbon can be reused for enhanced recovery of oil and gas extraction or as a feedstock for industrial processes. Technological and financial barriers exist to implementation of CCSR. While separation, capture and transport of CO_2 are mature technologies only three industrial-scale storage projects are currently in operation. Further R&D funding to improve CCSR technologies and evaluation studies to identify geologically sound reservoirs will be needed.

Key components of this option would include:

- Identify and develop pre-combustion and post-combustion carbon capture technologies
- Identify and develop potential carbon sequestration technologies reservoirs
- Use algal biomass to capture carbon dioxide from exhaust gases that has been absorbed in water, probably with sequestration or reuse of algal biomass
- Identify and develop CO_2 transmission and reuse technologies
- Identify and recommend policies for permanent CO_2 storage that consider the implications of future liability - including state permitting, issues regarding short and long term liability

For electricity generation, a key technology today appears to be Integrated Gasification Combined Cycle (IGCC) combined with carbon capture and storage (CCS) technology. A significant advantage for IGCC when compared to conventional pulverized coal with amine-based carbon capture is the reduced cost of capturing CO_2 from the process. Carbon capture technologies have the potential to remove approximately 90 percent of a coal plant's CO_2 emissions.[3]

See additional information provided at end of this document

Mitigation Option Design

[3] PacifiCorp's 2007 IRP at 98, located at http://www.pacificorp.com/Navigation/Navigation23807.html.

The key element of this option is an Executive Order or legislation directing state agencies to identify regulatory and legal barriers to the commercialization of CCSR projects. The final product could be a report to either the Governor or the legislature.

Feedback from the CAT: Senate Bill 6001 includes requirements on sequestration plans. The CAT directs the TWG to consider policy design elements that do not overlap with SB6001. (see SB 6001 excerpt below under Related Policies). The public will have the opportunity to provide input to SB6001 rule-making.

- CCSR raises new legal and regulatory risks associated with siting and permitting projects, CO_2 transportation, injection and storage.[4] These risks are not yet fully understood, nor are uniform standards or government regimes in place to address and mitigate them. Among the key questions to be addressed in the development of a consistent regulatory framework for CCS are: potentially applicable criminal and civil environmental penalties; property rights, including the passage of title to CO_2 (including to the government) during transportation, injection and storage; long-term CO_2 liability, insurance coverage for short-term CO_2 liability; the licensing of CO_2 transportation and storage operators, intellectual property rights related to CCS, and monitoring of CO_2 storage facilities.

- California recently adopted AB 1925, directing the California Energy Commission to recommend standards to accelerate the adoption of long-term management of industrial CO_2.[5] Washington should similarly develop guidelines for addressing the emerging legal and regulatory issues associated with carbon capture and sequestration. Among the options it should explore is that adopted by Texas, which transfers the title (and any liability post-capture) to CO_2 captured by CCS to the Railroads Commission of Texas.[6] New Mexico Governor Richardson's Executive Order 2006-69 required the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) to coordinate with a stakeholder group to explore and identify statutory and regulatory requirements needed to geologically sequester anthropogenic CO_2. The group recently published an interim report[7] that identifies the issues and challenges that must be addressed by potential statutory and regulatory changes, to identify questions, concerns and recommendations made by the stakeholder group, and to present preliminary findings and research to date for further policy development. A final

[4] Robertson, K., Findsen, J., Messner, S., Science Applications International Corporation. June 23, 2006. "International Carbon Capture and Storage Projects Overcoming Legal Barriers", prepared for the National Energy Technology Laboratory (see http://www.netl.doe.gov/energy-analyses/pubs/CCSregulatorypaperFinalReport.pdf)

[5] California AB 1925 (2006), located at http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_1901-1950/ab_1925_bill_20060926_chaptered.

[6] Texas H.B. 149 (2006).

[7] See, http://www.emnrd.state.nm.us/OCD/documents/InterimReportCO2Sequestration.pdf

report, with findings and recommendations, is due on December 1, 2007. The approach and process undertaken in New Mexico could be easily replicated in Washington.

[*Other Design Considerations – these have not been fully discussed by the TWG and are subject to revision:*

- *Consider modifying the traditional least cost/least risk regulatory standard for IOUs in order to advance the use of IGCC and other CCSR technologies.*
- *Washington could enact state or jointly advocate for federal tax incentives to encourage new IGCC and CCSR project development to serve Washington customers. The most effective combination of tax incentives for IOU development of CCSR technologies is a tax credit plus accelerated depreciation.*
- *Consider an Executive Order or legislation directing the Washington Utilities and Transportation Commission to implement changes to Washington's "used and useful" statute, mandating "pay as you go" cost recovery for IGCC and CCSR technologies, in order to advance their commercialization*
- *Consider whether avoided GHG emissions attributable to IGCC and CCSR technologies placed into operation prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a state or regional mechanism to achieve GHG reductions.*
- *Verification and monitoring technologies and systems are needed*

- **Goals:**
- **Timing:**
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

[Insert text here]

Related Policies/Programs in Place

See Senate Bill 6001 (April 2007), sections 4b, 7 and 5

"**Sec. 5.** (1) Beginning July 1, 2008, the greenhouse gases emissions performance standard for all baseload electric generation for which electric utilities enter into long-term financial commitments on or after such date is the lower of:

(a) One thousand one hundred pounds of greenhouse gases per megawatt-hour; or

(b) The average available greenhouse gases emissions output as determined under section 7 of this act.

…

(7) The following greenhouse gases emissions produced by baseload electric generation owned or contracted through a long-term financial commitment shall not be counted as

emissions of the power plant in determining compliance with the greenhouse gases emissions performance standard:
(a) Those emissions that are injected permanently in geological formations;
(b) Those emissions that are permanently sequestered by other means approved by the department; and
(c) Those emissions sequestered or mitigated as approved under subsection (13) of this section.
(8) In adopting and implementing the greenhouse gases emissions performance standard, the department of community, trade, and economic development energy policy division, in consultation with the commission, the department, the Bonneville power administration, the western electricity coordination council, the energy facility site evaluation council, electric utilities, public interest representatives, and consumer representatives, shall consider the effects of the greenhouse gases emissions performance standard on system reliability and overall costs to electricity customers.
(9) In developing and implementing the greenhouse gases emissions performance standard, the department shall, with assistance of the commission, the department of community, trade, and economic development energy policy division, and electric utilities, and to the extent practicable, address long-term purchases of electricity from unspecified sources in a manner consistent with this chapter.
(10) The directors of the energy facility site evaluation council and the department shall each adopt rules under chapter 34.05 RCW in coordination with each other to implement and enforce the greenhouse gases emissions performance standard. The rules necessary to implement this section shall be adopted by June 30, 2008.
(11) In adopting the rules for implementing this section, the energy facility site evaluation council and the department shall include criteria to be applied in evaluating the carbon sequestration plan, for baseload electric generation that will rely on subsection (7) of this section to demonstrate compliance, but that will commence sequestration after the date that electricity is first produced. The rules shall include but not be limited to:
(a) Provisions for financial assurances, as a condition of plant operation, sufficient to ensure successful implementation of the carbon sequestration plan, including construction and operation of necessary equipment, and any other significant costs;
(b) Provisions for geological or other approved sequestration commencing within five years of plant operation, including full and sufficient technical documentation to support the planned sequestration;
(c) Provisions for monitoring the effectiveness of the implementation of the sequestration plan;
(d) Penalties for failure to achieve implementation of the plan on schedule;
(e) Provisions for an owner to purchase emissions reductions in the event of the failure of a sequestration plan under subsection (13) of this section; and
(f) Provisions for public notice and comment on the carbon sequestration plan.
(12)(a) Except as provided in (b) of this subsection, as part of its role enforcing the greenhouse gases emissions performance standard, the department shall determine whether sequestration or a plan for sequestration will provide safe, reliable, and

permanent protection against the greenhouse gases entering the atmosphere from the power 23 plant and all ancillary facilities.
(b) For facilities under its jurisdiction, the energy facility site evaluation council shall contract for review of sequestration or the carbon sequestration plan with the department consistent with the conditions under (a) of this subsection, consider the adequacy of sequestration or the plan in its adjudicative proceedings conducted under RCW 80.50.090(3), and incorporate specific findings regarding adequacy in its recommendation to the governor under RCW 80.50.100.
(13) A project under consideration by the energy facility site evaluation council by the effective date of this section is required to include all of the requirements of subsection (11) of this section in its carbon sequestration plan submitted as part of the energy facility site evaluation council process. A project under consideration by the energy facility site evaluation council by the effective date of this section that receives final site certification agreement approval under chapter 80.50 RCW shall make a good faith effort to implement the sequestration plan. If the project owner determines that implementation is not feasible, the project owner shall submit documentation of that determination to the energy facility site evaluation council. The documentation shall demonstrate the steps taken to implement the sequestration plan and evidence of the technological and economic barriers to successful implementation. The project owner shall then provide to the energy facility site evaluation council notification that they shall implement the plan that requires the project owner to meet the greenhouse gases emissions performance standard by purchasing verifiable greenhouse gases emissions reductions from an electric generating facility located within the western interconnection, where the reduction would not have occurred otherwise or absent this contractual agreement, such that the sum of the emissions reductions purchased and the facility's emissions meets the standard for the life of the facility.

Type(s) of GHG Reductions

[Insert text here]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
  - Pacificorp White Paper
  - Recently released MIT report, "The Future of Coal" (2007) [8] which provides estimates of costs and emissions savings from various coal technologies with and without carbon capture and storage.
  - The IPCC Special Report on Carbon Dioxide Capture and Storage (2006)[9] which provides other estimates, including rough estimates of the costs of CO_2 transport and storage.

[8] http://web.mit.edu/coal/

- EPA report, "Environmental Footprints and Costs of Coal-Based Integrated Gasification Combined Cycle and Pulverized Coal Technologies," July 2006, which contains cost and performance estimates for various coal plant types and CO_2 capture, accounting also for high elevation issues with IGCC as might be encountered in Montana.
- Advanced Coal Task force report and spreadsheets from Western Governor's Association 2006 (WGA 2006) *Clean and Diversified Energy Initiative*[10]
-

- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

[9] http://www.ipcc.ch/activity/srccs/index.htm

[10] http://www.westgov.org/wga/initiatives/cdeac/index.htm

ES-6. Transmission System Capacity, Access, Efficiency, and Smart Grid

Based on ES Catalog Options 6.1, 6.2, and 6.5.

Option needs review by TWG, Volunteer group requests further input from TWG

Mitigation Option Description

This option comprises three main elements: 1) improving access and limiting barrier to the grid by distributed, small-scale and other clean energy technologies for electricity generation; 2) increasing energy efficiency measures to reduce the transmission and distribution line losses of electricity; and 3) using technology to optimize the electricity grid through devices that control electricity demand and supply based on events throughout the grid.

[Recent article highlighting transmission system concerns can be found at:

> Greenwire, 24 August 2007 - A huge problem awaits electric utilities scrambling to tap more clean power: a dearth of transmission lines to move energy from remote wind farms and solar panels to customers in cities and suburbs.
> ---
> http://www.wbcsd.org/includes/getTarget.asp?type=DocDet&id=MjU5ODM]

Mitigation Option Design

- Issues associated with "access" and "planning" are subject to FERC jurisdiction and may not be appropriate to explore in the CAT venue.
- Increased transmission system capacity is critical for the development and integration of renewable energy. Although transmission is regulated at the federal level, state policies should encourage such investments.
- According to the Wind Integration Study conducted by the Northwest Power Planning and Conservation Council, the amount of transmission capacity that is currently available to Northwest wind projects is only sufficient to support anticipated development through 2009. Additional transmission capacity will be needed to achieve the 6,000 MW of wind envisioned in the Council's plan and to open up new areas for wind development that will diversify wind production. This diversity can reduce total variability and therefore lower the cost of wind integration on a $/MWh basis. It can also provide access to higher capacity factor wind resources, which can lower the busbar costs of wind generation.
- Products and strategies that make better use of existing transmission lines, such as conditional firm and voluntary economic redispatch, may enable new wind projects to

come on line before new transmission lines are constructed, or extend the time until transmission construction is required.

- It is critical that Washington policies not create barriers to new transmission "capacity", which is especially critical for renewables. Initiatives should be especially focused on intermittent resources
- Elements of smart-grid technology are needed to unlock additional renewable resource alternatives.
- *[from Energy Supply Catalog Descriptions] Initiatives include conditional firm pricing for clean/distributed energy and planning for additional intermittent (wind) generation.*
- *Utilities use a variety of components throughout the transmission and distribution system to reduce losses. Increasing the efficiency of these components can further reduce losses. Vermont State, for example, offers a rebate to encourage users to install energy efficient transformers. Regulations, incentives, and/or support programs can be applied to achieve greater efficiency of transmission and distribution system components.*
- *Measures to improve transmission systems to reduce bottlenecks and enhance throughput may be required to satisfy long-term electricity demands. Opportunity exists to increase transmission line carrying capacity as much as threefold through the implementation of new construction and retrofit activities on the transmission grid including incorporating advanced composite conductor technologies, capacitance technologies, and grid management software. Siting new transmission lines can be a difficult process given their cost and their actual or perceived impact on health, environment, and the use, enjoyment, and value of property. Policy measures in support of this option could provide incentives to utilities to upgrade transmission systems and reduce barriers to siting of new transmission lines. This option could also include reductions in use and leakage of SF_6 from distribution system transformers, plus efficient transformers and other materials and equipment.*
- *Smart Grid technologies can involve devices that "turn off" non-essential power when demand, and subsequent electricity prices, are high. Also technologies are used to co-ordinate a range of small scale distributed generation (including electric vehicles) and/or intermittent power, such as wind.*[11]]
- **Goals:**

- **Timing:**
- **Coverage of parties**
  - Electric Utilities
  - Utility and Transportation Commission
  - Bonneville Power Administration

[11] www.climatesolutions.org/pubs/pdfs/PoweringtheSmartGrid.pdf

- Northwest Power and Conservation Council
- Northwest Power Pool or other regional transmission authorities and regional control area operators.
- Coordinate with:
  - Northwest Energy Technology Collaborative
  - Northwest Center for Electric Power Technologies
  - Western Regional Climate Action Inititive
  - Energy Facility Site Evaluation Council

- **Other:**

Implementation Mechanisms

- Regulatory obstacles exist for IOUs, especially if deploying new technologies means retiring resources that have not been fully depreciated or that are still operating cost-effectively. These obstacles could be examined and removed. Financial incentives could also be made available for utilities to deploy their capital on significant T&D efficiency measures.

Incentives should be established to encourage deployment of capital for T&D efficiency improvements, including smart-grid technologies.

The information below is from the Poised for Profit in Clean Energy Report: Powering Up the Smart Grid, by Patrick Mazza.

- Today's power grid is dramatically underutilized compared to its capacity:
  Generation - U.S. power plants number over 9,000 and have a 2001 book value of $570 billion. They can produce up to 819 gigawatts of power but are only utilized at 53% of that capacity.
  Transmission - The U.S. transmission network, over 700,000 miles of line worth $64 billion, is used at 50% of capacity.
  Distribution - Local wire networks totaling over one million miles and worth $160 billion have utilization rates under 30%.
- The electric power industry is saddled with an aging infrastructure, approximately 60% of which will need to be replaced in the next 10-15 years at a huge cost to companies.

Policy Recommendations

- **Provide financial incentives for implementing smart energy technologies** – Utilities are often hesitant to apply the latest technologies due to risk factors. One way to overcome this is to provide higher returns for bringing new smart energy solutions on line, including distributed generation, combined heat and power, load management and end-use efficiency. Utility regulators should work with utilities to identify smart energy technologies with ratepayer benefits including improved reliability and efficiency, and

environmental benefits in terms of reduced emissions. In recognition of these broad benefits, regulators should allow or provide utilities financial incentives for implementing new technologies sufficient to overcome risk factors.

- **Break the link between energy throughput and profits** – Utilities are hesitant to apply new technologies because they reduce the gross amount of energy throughput, either by improvements in efficiency or customer-side power generation. Utility ratemaking fortifies the hesitancy by setting pricing and revenues on the basis of cents per kilowatt hour. This ratemaking generally gives utilities a financial incentive to increase kilowatt throughput even if measures to reduce throughput reduce the total cost of providing service. Utility regulatory commissions should remove these disincentives by breaking the link between utilities' electricity and gas sales and their profits. This can be accomplished through small annual trueups in rates to ensure that unexpected changes in sales do not affect the utility's ability to recover costs approved by its regulators. This involves comparing actual sales to those predicted when rates were set, and adjusting rates up or down to ensure that authorized revenues are collected (no more, no less). This is also known as decoupling. Any such system must be carefully designed to avoid unintended consequences and provide returns that are fair to all parties. Decoupling plans can and should be designed to provide winwin solutions for utilities and ratepayers. The Northwest has one operating model of decoupling in gas rates set for Northwest Natural.
- **Employ performance-based ratemaking to provide positive incentives –** Decoupling removes disincentives for utilities to implement measures that reduce energy throughput. Performance-based ratemaking is a complementary measure that offers positive financial incentives for utilities to promote such measures. Utilities and regulators target specific accomplishments such as an amount of energy to be saved through efficiency programs. For meeting or exceeding goals utilities gain rewards on the bottom line. Rhode Island, Massachusetts, New Hampshire and Kentucky have set up notable efforts in this area.32
- **Improve grid efficiency with incentives to reduce line losses –** Power systems generally involve line losses, but if utilities are authorized to collect 100% of line loss costs from customers, there is little incentive to run the grid for top efficiency. Utility regulatory commissions should mandate that utilities optimize transmission and distribution networks for minimum line losses. Commissions should deny cost recovery for losses above this level.
- **Apply least cost planning to power delivery as it has been applied to generation** – Planning to identify least cost options for power supply, whether generation or efficiency, was pioneered in the Northwest. But least cost planning has not yet fully come to power delivery systems. Utility regulatory commissions should update rules governing Integrated Resource Plans (IRPs) to require gas and electric utilities to apply least-cost planning principles to proposed transmission and distribution investments. Rules should ensure that utilities fairly and transparently assess non-wires options including clean distributed generation, combined heat and power, demand response and peak shaving. The Washington Utilities and Transportation Commission has opened a rulemaking process to update the integrated resource planning rules and request for proposals rules

(UE-030311 / UE-030423 / UG-030312). This is a key opportunity for input and influence.

- **Make sure utilities account for climate change and other risks to bottom lines** – Integrated Resource Plans are beginning to take into account potential costs for emitting carbon into the atmosphere. Notable examples are IRPs created by PacifiCorp, Puget Sound Energy and Idaho Power. When carbon emissions carry a price, it levels the playing field for clean generation and efficiency technologies. Utility regulators should insist all IRPs assign a cost to carbon dioxide emissions based on risk of future regulation and take into account fuel price volatility. The WUTC rulemakings mentioned above will also consider inclusion of guidelines for evaluation of additional risk factors such as fossil fuel and wholesale electric market price volatility, fossil fuel supplies, hydroelectric supply and other significant power rate spike threats. The Oregon Public Utility Commission has a rulemaking open to update its IRP rules to include more evaluation of risk (UM 1056).

Public utility governing bodies have policy options to unleash smart energy benefits for their ratepayers. Smart energy technologies bring many benefits to ratepayers including improved reliability and rate control. Public utility governing bodies can take a number of steps to secure those benefits:

- Designate staff to track and recommend emerging technologies of potential benefit to ratepayers including distributed generation, combined heat and power, load management and end-use efficiency.
- Place these "non-wires" technologies on a level playing field when considering upgrades in traditional pole and wire infrastructure. Study all options in a least-cost planning format.
- Place a priority on employing smart grid technologies such as voltage reduction to optimize delivery networks for minimal line losses.
- Work with public utility organizations, clean energy advocates and Bonneville Power Administration to overcome obstacles to local generation created by interconnection rules and losses of BPA power allocations.
- Public utilities involved in fossil-fired generation should assess risk of future costs on carbon emissions in their long-term planning.

Northwest Wind Integration Action Plan, conducted by the Northwest Power and Conservation Council: http://www.nwcouncil.org/energy/Wind/library/2007-1.pdf
Major findings related to transmission:

- Control area cooperation and improved markets will lower cost and increase availability of integration services.

- Existing transmission capacity can support anticipated wind development (~3000 - 3800 MW) through 2009.
- Transmission expansion, firm/non-firm products and new regulatory policies needed to serve 6000 MW and to increase diversity.

There are steps we can take to increase integration capability and to lower integration costs. The cost of wind integration services can be reduced through generally four types of actions: (1) developing more cooperation between regional utilities to spread the variability of wind more broadly; (2) developing markets that will reward entities who choose to market their surplus flexibility; (3) making more low-cost flexibility such as that provided by hydroelectric resources available; and (4) development and application of new flexibility technologies. Achieving these goals will require coordinated actions similar to those required to establish the Pacific Northwest Coordination Agreement of the Columbia River Treaty. Fortunately, the region has a long history of forging cooperative agreements designed to increase the size of the pie for all regional consumers that can provide a model for what will be needed over the next several years to address wind integration issues.

One of the action items from the Wind Integration Action Plan call for the "four Northwest state regulatory commissions to review and amend as necessary regulatory policies to remove barriers to more efficient use of transmission for wind and other renewable resources." The plan also states the "Northwest Power and Conservation Council, working with BPA and other interested organizations, should establish a Northwest Wind Integration Forum to facilitate implementation of the actions called for in this *Action Plan.*"

Related Policies/Programs in Place

Type(s) of GHG Reductions

There are emissions reductions related to improved operations of electric power generation and improved access for renewables. By some estimates, the power grid is utilizing about 50% of available capacity. Additionally, the electric power transmission and distribution system releases significant amounts of SF_6 (sulfur hexafluoride), which has the highest 100-year Global Warming Potential of any gas (23,900 times that of CO_2).

Emissions of SF_6 related to electric power transmission and distribution from WA GHG inventory (Million Metric tons CO_2 equivalents):

1990	0.8
1991	0.8
1992	0.7
1993	0.8
1994	0.7
1995	0.6

1996	0.6
1997	0.5
1998	0.4
1999	0.5
2000	0.4
2001	0.3
2002	0.3
2003	0.3
2004	0.3

Nationwide and statewide, SF_6 emissions have fallen since 1990. The downward trend in SF_6 emissions since 1990 is the result of industry efforts to reduce emissions from electrical power systems, as well as the rising cost of SF_6. In contrast, emissions of SF_6 from uses in the semiconductor manufacturing industry doubled from .02 $MMTCO_2e$ to .04 $MMTCO_2e$ since 1990.

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
  - Poised for Profit in Clean Energy Report: Powering Up the Smart Grid, by Patrick Mazza
  - Northwest Wind Integration Action Plan, conducted by the Northwest Power and Conservation Council: http://www.nwcouncil.org/energy/Wind/library/2007-1.pdf
  - Smart Meters: Commercial, Policy and Regulatory Drivers, by Gill Owen and Judith Ward, which reports on experience with smart meters in the UK, and reports one to several percent net savings in electricity consumption from implementation of smart meters, as well as peak reduction impacts. Dated March 2006, Published by Sustainability First, and available as http://www.sustainabilityfirst.org.uk/docs/smart%20meters%20pdf%20version.pdf
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:** The Poised for Profit II Partnership found at least 225 companies in the Northwest representing 14% of the $15 billion global smart energy market. Additionally, the high regional concentration of software, semiconductor and wireless companies could find new opportunities and innovation in the energy sector.
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

- Could eliminate $46-$117 billion in US peaking infrastructure investments over the next 20 years. (Poised for Profit in Clean Energy Report: Powering Up the Smart Grid, Climate Solutions, pg 8)
- Improves reliability of power grid
- Reduces losses from power lines
- Improves ability to utilize waste heat from power generation.
- Improves utilization of renewable generation

Feasibility Issues

[*Text below moved by CCS from "Barriers to Consensus" section, which is reserved for reporting on barriers to consensus by the CAT]*

- Reliance on new technologies which require extensive field testing.
- Can create shift from centralized power production to localized power production.
- Can have disruptive impacts on traditional utility business models that base revenue flows on gross throughput. Regulatory and ratemaking framework could create disincentives for adopting new technologies.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-7. Combined Heat and Power and Thermal Energy Recovery and Use

Based on ES Catalog Option 2.5.

Option needs review by TWG, the Volunteer group is planning to meet on August 24th or 27th to discuss further revisions

http://www.ecy.wa.gov/climatechange/TWGdocs/ene/073007ESpriorities.pdf

Mitigation Option Description

Combined heat and power (CHP) and thermal energy recovery and distribution can reduce GHG emissions by increasing the overall efficiency of fuel use. There are opportunities to recover thermal energy from CHP, industrial or municipal waste heat or renewable energy sources. District energy systems provide a key infrastructure for conveying this "recycled" energy from the sources to energy consumers.

In addition, electric energy transmission and distribution infrastructure costs plus transmission losses are generally eliminated with CHP because these facilities are located on-site at the load centers, or relatively close by.

Mitigation Option Design

CHP -- Recovery ("recycling") of waste heat from power generation (through combined heat and power or CHP) can be encouraged through the adoption of policies to increase CHP generation at a cost that is equivalent to the cost of CCT technology. For example, consider the full cost (including related electric energy transmission and distribution infrastructure costs plus transmission losses) of the alternative CCT technology generation as a base for the cost of generating electricity at a CHP site; then the cost of heat sales to the thermal energy consumer has to carry the burden of any additional capital and operating expenses. This also defines the relative merits of each potential CHP site.

Suggestions for policies include

1. CHP could be the presumptive model for new fossil-fuelled power plants.

- Power dispatch could be provided on a case-by-case basis with reasonable protections within the power supply contract, options that give balanced desired operating flexibilities for both CHP generator and the power purchaser.
- Utilities could be required to demonstrate that CHP opportunities do not exist to meet the load. That is to say, the utility would have to demonstrate to the regulator (i.e. for IOU's the WUTC) that a financially competent CHP site was not available to meet their service requirements.

2. Establish favorable economic incentives and policies to increase existing capacity through repowering of existing CHP generation capacity.

3. Use incentives to encourage, both existing and new CHP generation

Current avoided costs are too low to incent CHP and the associated reduction in GHG emissions. WA could establish CHP tax credits under existing B&O tax system or form other sources to provide investment incentives. For example, in Oregon there is a $20 million per project tax incentives program established under BETC system. Examples of incentives for CHP for avoided cost calculations include:

- Thermal efficiency - $7/MWh.
- GHG savings of 1092 pounds of CO2 - $ 8/MWh.
- T&D incremental cost savings plus 8% loss - $ 10/MWh.
- Credit for not needing hydro backup compared with wind- $12/MWh.
- Renewable fuel credit - $ 10/MWh.
- System security distributed energy credit – $5/MWh.
- Avoided fuel (natural gas price risk adjustment) UM 1129 (Oregon State Ruling)

- Other potential financial incentives to implement CHP programs include:
  - Siting Incentive Programs;
  - Low-cost bonding or loan guarantee programs;
  - Tax credits for investment in CHP;

4. Design any GHG trading under a cap and trade program so that CHP systems are recognized for total emission reduction benefits of CHP (both the heat and power production); any allowance allocations (if/as might occur) should seek to recognize these benefits, even if the legal entity implementing CHP is separate from the entities purchasing the CHP power and heat output.;

5. Amend procedures for streamlined permitting of CHP facilities.

6. Regulate air emissions and GHGs based on useful energy output rather than fuel input.

7. Amend I-937 to include organic pulping byproducts as renewable fuels and thermal energy production as well as electricity. *note that there is not consensus within the group on this point.*

Waste Heat Recycling -- Recovery (recycling) and reuse of waste heat from industrial processes or municipal operations (eg. waste to energy) should be encouraged to increase energy efficiency of systems. A variety of industries, such as pulp and paper mills, saw mills, steel mills, and aluminum smelters, alternative fuel generation plants, cement plants and other facilities, produce waste heat at temperatures suitable for building heating. Additionally, municipal operations produce byproduct energy in the form of landfill gas (which can be combusted in CHP engines or turbines) or sewage effluent (which can be converted to usable heat with heat pumps).

Use of low-grade waste thermal energy should be encouraged through development of thermal energy distribution (district energy) systems.

Policies to encourage waste heat recycling could include:

1. Financial incentives to implement district energy thermal distribution infrastructure, waste heat recovery and renewable thermal energy systems through a variety of programs including:

- Property owner incentives to join waste heat based district heating systems;
- Low-cost bonding or loan guarantee programs;
- Tax credits for *investment* in thermal energy projects, and/or for *production* of recycled energy;
- Incentives for buildings to connect to district energy systems established to use or convert to renewable energy or recover waste energy; and
- Incentives to upgrade existing steam district energy systems to hot water district energy distribution to enhance system performance and improve efficiencies.

2. Design any GHG trading under a cap and trade program so that --

- District energy systems be credited for avoided building boiler emissions in any allowance allocation process.
- CHP and District Energy systems could be credited for their impact on total emissions by issuing allowances for both the heat and power production.

3 Amend procedures for streamlined permitting of thermal energy recovery facilities.

4. Regulate air emissions and GHG based on useful energy output rather than fuel input.

Other Measures to Remove Barriers

Pro-active information/education/outreach communications are needed to address the importance of removing barriers to optimizing existing and CHP generation and district energy development. We need to overcome real or perceived barriers about such important issues as avoided cost barriers, regulatory barriers, lack of integrated community energy planning, and lack of financial sector misunderstanding of these systems.

- **Goals:** *Likely to be expressed in terms of fraction of technical or economic potential (see Assumptions section below)*
- **Timing:**
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

Related Policies/Programs in Place

PURPA, 1978.
B & O Taxes.
Business Energy Tax Credits (BETC) in Oregon.

Senate Bill 6001 includes language to recognize the output of cogeneration, which could be modified for other policy design elements:
Section 5 (6) The department shall establish an output-based methodology to ensure that the calculation of emissions of greenhouse gases for a cogeneration facility recognizes the total usable energy output of the process, and includes all greenhouse gases emitted by the facility in the production of both electrical and thermal energy. In developing and implementing the greenhouse gases emissions performance standard, the department shall consider and act in a manner consistent with any rules adopted pursuant to the public utilities regulatory policy act of 1978 (16 U.S.C. Sec. 824a-3), as amended.

Senate Bill 6631 – Thermal Energy Companies – Exemption from Utilities and Transportation Commission Authority.

House Bill 114 – Regulation of District Heating Systems and Services

Chapter 35.97 RCW – Heating Systems

UM1129 Oregon Public Utilities Commission final order issues August 20th, 2007

Types(s) of GHG Reductions

By recovering waste heat and reusing it, the equivalent amount of new fossil-based energy will be displaced resulting in a more energy efficient energy production program and significantly less GHG production per MWh generated.

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**

State wide IRP used to determine potential for CHP.

CHP market potential

- **Combined Heat and Power in the Pacific Northwest: Market Assessment** This 2004 report provides: 1) A comprehensive review of current CHP capacity in the Pacific Northwest including a database by each state; 2) A review of the economic and technical market potential for additional CHP; 3) A review of barriers and incentives to CHP; and 4) Recommended actions to increase CHP deployment.
  http://www.chpcenternw.org/NwChpDocs/Chp_Market-Assessment_In_PNW_EEA_08_2004.pdf

- **Washington State CHP Technical Potential (2002-2022) MW:**

	Existing Facilities	New Facilities	Total	Economic Potential
Large Industrial	1,230	57	1,287	**High**
On-Site *Export*	*360* *870*	*57* *N/A*	*417* *870*	
Small Industrial	745	304	1,049	**Low to Moderate**
Commercial	2,885	2,473	5,358	**Low**
Resource Recovery	27		27	**Moderate to High**

Estimated Economic Potential (using 10-year payback):

731 MW (Business as Usual assumptions – current cost and performance specs, $3-4 /kW/month CHP Stand-by charges, no financial incentives)

2,847 MW (Accelerated Case assumptions – 2020 cost and performance specs, no stand-by charges, financial incentives equal to about 15% of capital costs)

Source: *Combined Heat and Power in the Pacific Northwest: Market Assessment* (Energy and Environmental Analysis Inc. 2004)

Technical Market Potential for CHP in the Pacific Northwest. This is an overview of CHP market potential by sectors.
http://www.chpcenternw.org/NwChpDocs/CHP_Market_Potential_in_PNW_Eng_Int_ORNL_rpt_07_2003.pdf

Waste Heat Recovery Market Potential

- Turbosteam looked at the waste heat potential of just 5 key waste heat potentials in a number of states including Washington. This report reviews the potential for generating electricity from waste heat processes and determined that 235 MW and 1553 GWh's annually could be achieved by 2020. This would result in an annual reduction of almost one million tCO2e. (Turbosteam Corporation 161 Industrial Blvd. Turners Falls, MA 01376)

  SEE WORKSHEET POSTED ON ENERGY SUPPLY TWG WEBSITE FOR AUGUST 30TH MEETING http://www.ecy.wa.gov/climatechange/cat_twg_energy.htm

- There does not appear to be a similar comprehensive analytical study of all the waste heat potential not used for electricity generation in Washington.

Other potential data sources

- Western Governor's Association 2006 (WGA 2006) *Task Force Reports from the Clean and Diversified Energy Initiative,*[12] Energy Information Administration,[13]; and, Energy Trust of Oregon.[14]
- **Quantification Methods:**
- **Key Assumptions:**

CHP is typically 1/3 more efficient than conventional stand-alone generating systems, where electric energy is generated and transmitted long distances from a centrally located generation facility. On-site CHP equipment is used to meet process system requirements, heating and cooling loads. The most efficient CHP systems provide generation efficiencies of 70-80%, a dramatic improvement over conventional power generation that currently averages 31% nationwide with associated reductions in GHG emissions. In addition, transmission and distribution infrastructure costs plus transmission losses are generally eliminated with CHP because these facilities are located on-site at the load centers.

Natural gas fuel savings for CHP include a an estimate by the California Cogeneration Council (testimony before the California Energy Commission) that 5,000 MW's of new CHP would reduce California's natural gas demands by 9%. The thermal efficiency for a CHP plant can be as high as 89%, significantly better than the 57% thermal efficiency associated with generating plant with a stand-alone steam boiler. [Need to check the above assumptions with the 2004 CHP report]

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

No significant CHP capacity has been built during the past 15 years due to a number of important economic and policy barriers that need to be overcome:

- Dispatchabilty control by utilities can be a concern for the plant owner. Mutually agreeable dispatch protocols should be negotiated between the plant owner and the host utility.
- Grid interconnection standards and associated costs should be streamlined by Washington State where applicable.

[12] http://www.westgov.org/wga/initiatives/cdeac/index.htm
[13] http://www.eia.doe.gov/oiaf/aeo/assumption/index.html

[14] *A Comparative Analysis of Community Wind Power Development Options in Oregon*
http://www.oregon.gov/ENERGY/RENEW/Wind/docs/CommunityWindReportLBLforETO.pdf

- High transaction costs associated with CHP projects, high financing costs because of lender unfamiliarity and perceived risk,
- "Split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc.
- Consistent, long term clear incentives supporting CHP and waste energy recovery.

Need for a pro-active public information campaign to educate and inform the public of the benefits of CHP to Washington and the NW economy.

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-8. Advanced Fossil Fuel Generation and Pre-Combustion Sequestration Technologies

Based on ES Catalog Option 3.1a.

Based on TWG suggestions at the latest TWG meeting, this option is now being incorporated into ES-5.

ADDITIONAL INFORMATION FOR SPECIFIC OPTIONS PROVIDED BY TWG MEMBERS

ES-2. Distributed Renewable Energy Incentives and/or Barrier Removal

PSE offers two incentive programs that provide ongoing, annual benefits. Net Metering (Schedule 150) allows the energy produced by a customer's renewable-energy system to offset the customer's usage of PSE-provided electricity over the course of a year at the retail rate of ~9 cents per kWh. For months in which a customer's self-generated renewable energy exceeds the amount of PSE electricity consumed, that excess production is rolled over to offset PSE power usage in other months. Typically, high summer production of renewable energy can offset high winter usage of PSE-provided power. In addition to Net Metering, PSE elected to create a separate incentive program as authorized by State Senate Bill 5101 (2005) and Washington Administrative Code 458-20-273. PSE provides all of the consumer benefits allowed under the state law. The PSE program (called the Renewable Energy Advantage Program under Schedule 151) provides a payment for Production Metering. The purpose of this program is both to encourage small-scale renewable-energy generation and to induce in-state production of renewable-energy system components. The Production Metered payments to customers can range from 12 cents/kilowatt hour (kWh) to 54 cents/kWh if the parts of a particular renewable energy system were manufactured in Washington. The law set an annual cap of $2,000 in incentive payments per installation.

ES-3. Efficiency Improvements, Capacity Additions and Fuel Switching at Existing Renewable and Fossil Power Plants

- In Washington State, the overall energy load was approximately 9,500 aMW and the overall energy generation was 11,000 aMW. Approximately 70 percent of the energy generation was from non-emitting resources and 30 percent was from natural gas and coal. If existing projects were able to increase energy generation by approximately 10 percent through efficiency improvements, an additional 1,100 aMW would be available to replace the use of fossil fuels. This is equivalent to about 10,000,000 MWh – enough power to serve about 1,000,000 homes annually.
- In the Pacific Northwest, there are more than 20 projects currently being built and expected to be completed in the next two years. These projects total over 2,500 MW of capacity of which 1,300 MW is wind and other renewable generation. Many NW utilities (including all utilities operating in Washington) are in the process of developing integrated resource plans to evaluate their power needs for the next 10 to 20 years. Additional non-emitting or low-emitting generation resources from existing projects need to be encouraged.

- Although Washington State gets about 30 percent of its energy from GHG emitting resources, there are ways to reduce GHG emissions by switching high-emission fuels to other fuels sources or cleaner fuel types.

ES-5. Carbon Capture, Storage, and Re-use Incentives, Requirements and/or Enabling Policies and Research & Development (including pre-combustion technologies)

A broad regulatory framework is required that supports the identification, development and deployment of technologies that capture, sequester or reuse CO_2. For Washington State, and the USA, to achieve CO_2 goals a multi sector approach is required, but within the electricity supply sector three technologies are emerging as near term scalable technologies.

- **Pre and Post CO_2 Combustion Capture**
  - Technologies
- Do not try to pick a single winning technology. It is important to create a framework in which industry will invest in a broad range of low emitting technologies. It will take a sum total of all technologies to achieve long-term CO_2 reduction roles
- Proper incentives allow and encourage industries to take early risks inherent in new technologies. A broad range of incentives should be pursued which will apply to different technologies, and technologies at different stages of deployment.
- In the absence of long-term clarity, higher emitting generation will likely continue to be built, and may face extraordinary environmental costs later in life. Effort must be made to avoid stranding assets due to the financial implications on utility companies and the end customers.
- Current and new policies must be able to adapt to the latest changes, and continue to adapt as technology continues to be developed and implemented. Failure to do so is likely to stall, if not impede, the construction of billion of dollars of productive infrastructure in the US.
- Three technology branches appear to offer the best near-term solution to low-GHG emitting base load electricity:
  - Ultra supercritical [*coal-fired generation*] with carbon capture
  - IGCC [*integrated gasification combined-cycle plants using coal, sometimes with biomass co-firing*] with carbon capture
  - Nuclear [*power*] *[TWG members are not in agreement about including nuclear power here]*
- The net reduction of emissions to the atmosphere through CCSR depends on the fraction of CO_2 captured, the increased CO_2 production resulting from loss in overall efficiency of power plants or industrial processes due to the additional energy required for capture,

transport and storage, any leakage from transport and the fraction of CO_2 retained in storage over the long term. The most viable of these technologies today appears to be Integrated Gasification Combined Cycle (IGCC) combined with carbon capture and storage and reuse (CCSR) technology. There are also emerging CCSR technologies that show promise for capturing carbon emissions from traditional pulverized coal fired boilers. These emerging technologies include chilled ammonia scrubbing and oxy-fuel combustion. Carbon capture technologies have the potential to remove approximately 90 percent of a coal plant's CO_2 emissions.

- R&D for the CCSR technologies is also vital for their larger scale commercialization. R&D funding can also be made available to CCSR technologies through an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology.) Funding can also be given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. Funding could be provided to increase collaboration between existing institutions for R&D on these technologies.
- The important role of advanced clean coal technology is recognized in the Western Public Utility Commissions' Joint Action Framework on Climate Change, signed on December 1, 2006 by the Washington, Oregon, California and New Mexico public utility commissions.[15] The Framework's Statement of Shared Principles includes five principles, the second of which is "Development and use of low carbon technologies in the energy sector." The third of six Action Items is: "Explore ways to remove barriers to development of advanced, low-carbon technologies for fossil fuel-powered generation capable of capturing and sequestering carbon dioxide emissions."

- **CO_2 Storage**
  - Technologies
  - Liability
- There are significant legal barriers to carbon sequestration related to environmental and other legal liability and property rights. Many of these fall into areas traditionally governed by state law and, hence, must be addressed if carbon sequestration is to become reality in the state.
- Avoided GHG emissions attributable to CCS equipment placed into operation prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a regional mechanism to achieve GHG reductions
- Emphasize the need for Washington to support near term CCS demonstration projects (Similar to the arguments in the PacifiCorp white paper).

[15] Western Public Utility Commissions' Joint Action Framework on Climate Change (December 1, 2006), located at http://www.puc.state.or.us/puc/news/2006/2006026jointaction.

- Washington's large basalt formation may hold significant CO_2 sequestration capacity. Developing a carbon sequestration industry in Washington will bring long-lasting benefits. Industries created around reusing CO_2 should also have a high priority.
- There are significant technological challenges associated with post-combustion capture. Consequently, if this technology is going to emerge it will require much broader support than simply a state-led initiative.