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

Please note that the option descriptions and straw proposals are initial drafts. They are under development, and will receive further consideration by TWG members in upcoming meetings. Additional draft material for options not ready for CAT review can be viewed at the Energy Supply TWG website (http://www.ecy.wa.gov/climatechange/cat_twg_energy.htm) under the most recent TWG meeting (July 30, 2007).

#	Mitigation Option Name	Straw Proposal Development Status
ES-1	Grid-based renewable energy incentives and/or barrier removal (originally 2.2)	Developed by TWG, ready for CAT review
ES-2	Distributed renewable energy incentives and/or barrier removal (originally 2.3)	Developed by TWG, ready for CAT review
ES-3	Efficiency improvements at existing renewable and power plants (originally 2.9 and 3.3)	Developed by TWG, ready for CAT review
ES-4	Technology Research & Development, plus Technology-Focused Initiatives (originally 1.6, 2.8, and 3.4)	Developed by TWG, ready for CAT review
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)	Developed by TWG, ready for CAT review
ES-6	Transmission system capacity, access, efficiency, and Smart Grid (originally 6.1, 6.2, and 6.5)	In progress
ES-7	Combined Heat and Power (CHP) and Thermal Energy Recovery and Use (originally 2.5)	In progress
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

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

Straw Proposal Development Status: Developed by TWG, ready for CAT review

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

[Insert text here]

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:**
- **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

Straw Proposal Development Status: Developed by TWG, ready for CAT review

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

[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".

  - Simplify process for customer generators to utilize net metering

- **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:**
- **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.

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

Straw Proposal Development Status: Developed by TWG, ready for CAT review

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 $MtCO_2e$

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

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

Straw Proposal Development Status: Developed by TWG, ready for CAT review

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)

Straw Proposal Development Status: Developed by TWG, ready for CAT review

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.

- 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 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.

[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

[*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.

Type(s) of GHG Reductions

[Insert text here]

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

Straw Proposal Development Status: Being developed by TWG, not ready for CAT review

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

For additional draft text for this option please see

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

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.

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

Straw Proposal Development Status: Being developed by TWG, not ready for CAT review

Based on ES Catalog Option 2.5.

For additional draft text for this option please see

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.

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.

District energy systems can also provide a key infrastructure for conveying this "recycled" energy from the sources to energy consumers. 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.

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.[8] 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).

[8] 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.