Memo

Date: 28 November 2007

Re: Fuel import and job goals in the Washington State climate action process.

Introduction

Executive Order 07-02, Section 1, includes two goals that are not explicit reductions of greenhouse gases (GHGs). The *jobs goal* reads:

> By 2020, increase the number of clean energy sector jobs to 25,000 from the 8,400 jobs we had in 2004;

and the *fuel imports goal* reads:

> By 2020, reduce expenditures by 20% on fuel imported into the state by developing Washington resources and supporting efficient energy use.

This memo provides estimates of the extent to which recent climate policy actions, as well as options developed by the Washington Climate Advisory Team (CAT) process, satisfy the jobs and fuel imports goals.

The Jobs Goal

Background

Washington State clean energy sector jobs have been inventoried twice in the past. The first effort counted 3,802 jobs in fourteen subsectors, as of 1997 (ECONorthwest 1998). The second effort counted 8,373 jobs in a set of ten subsectors, as of 2004 (Suter 2005). The ten subsectors in the 2005 study were defined to encompass a broader definition of the clean energy industry than the fourteen narrower subsectors defined for the 1998 study.

1.	renewables
2.	fuel cells
3.	PV/solar
4.	geothermal
5.	small-scale hydro
6.	wind
7.	biomass
8.	efficiency
9.	smart
10.	unidentified

Table 1 – Clean energy sub-industries identified by Suter.

Methodology

In order to assess progress towards the Executive Order goal, a clear definition of the "clean energy sector" is needed. Since the Executive Order goal refers explicitly to the "the 8,400 jobs we had in 2004" in this sector, the most straightforward and consistent interpretation of this sector definition is to base it on the study from which this estimate was derived, i.e. the report by Suter in 2005. Suter (2005) defines the clean energy sector as consisting of the ten sub-industries listed in Table 1. This characterization of the clean energy sector places a focus on direct jobs

created by the expansion of renewable energy generation, "smart" energy systems, and energy efficiency.

It is important to underscore the limitations of this definition. It leaves uncounted the indirect jobs that support the listed sub-industries as well as the direct jobs arising from most of the GHG policy options affecting the agriculture, forestry and transportation sectors. It also does not consider any indirect job gains due to increased consumer spending (resulting from energy and other cost savings) or indirect job losses due to shifting away from emissions-intensive activities and products or due to any price increases that might occur.

For those recent actions and CAT options for which an estimate of spending in calendar year 2020 was possible, the spending estimates were multiplied by a jobs-per-dollar factor derived from data in the Suter study. For options deploying renewable energy, but for which spending estimates were not available, the quantity of renewable energy forecast for 2020 was multiplied by a jobs-per-aMW factor derived from the Suter study and from the Northwest Power and Conservation Council's database of power plants (NPCC 2007). For options inducing energy efficiency measures, but for which spending estimates were not available, the quantity of first-year energy efficiency forecast for 2020 was multiplied by a jobs-per-MWh factor derived from the Suter study and from Regional Technical Forum data on conservation (Regional Technical Forum 2007).

This methodology produced a jobs estimate for recent action I-937 larger than that reported in a Union of Concerned Scientists study specifically evaluating the economic impacts of I-937 (Deyette & Clemmer 2006).[1] In order to report the most conservative result here, the UCS result was favored.

sector	jobs
RCI	
recent actions	1,300
CAT options	7,300
Energy Supply	
recent actions	700
CAT options	3,000
Transportation	
recent actions	6,000
CAT options	--
Forestry	
recent actions	--
CAT options	1,900
Agriculture/Waste	
recent actions	--
CAT options	3,000
total	**23,100**
existing jobs	8,400
grand total	**31,500**

Table 2 – Direct clean energy jobs after accounting for selected Washington Climate Challenge measures, as of 2020. Totals may not equal sums due to rounding.

Results

Jobs impacts were not calculable for all measures due principally to the absence of appropriate job factors in the published literature.

sector	jobs
RCI	

[1] The methodology used by Deyette & Clemmer should count indirect jobs as well as direct, and report results only for 2025 (rather than 2020, the target year for the jobs goal), so the low numbers reported are particularly strongly in disagreement with the numbers derived from Suter's work. See further discussion in Section *Tracking Progress* below.

recent actions	1,300
CAT options	7,300
Energy Supply	
recent actions	700
CAT options	3,000
Transportation	
recent actions	6,000
CAT options	--
Forestry	
recent actions	--
CAT options	1,900
Agriculture/Waste	
recent actions	--
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total	**23,100**
existing jobs	8,400
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Table 2 shows jobs created by those recent actions and CAT options for which a reasonable estimate was possible.[2] All sectors contribute meaningfully to the job count, though RCI is the largest contributor, due in part to the fairly heavy job creation associated with manufacture and installation of energy efficiency-related equipment and construction practices.

Suter's definition of the clean energy industry did not include a public transportation subsector, so another 2,800 jobs that could be contributed by CAT options supporting public transportation do not appear in Table 2.

Also omitted from

sector	jobs
RCI	
recent actions	1,300
CAT options	7,300
Energy Supply	
recent actions	700
CAT options	3,000
Transportation	
recent actions	6,000
CAT options	--
Forestry	
recent actions	--
CAT options	1,900
Agriculture/Waste	
recent actions	--
CAT options	3,000
total	**23,100**
existing jobs	8,400

[2] All values reported in this document are rounded to two or three significant digits, except when they are quoted from other sources.

grand total	**31,500**

Table 2 are up to 13,000 jobs that could be generated by Transportation option T-11, the low carbon fuel standard, *if* all biofuels used to satisfy this option were grown in Washington State. These jobs are not included in the table because the location of the biofuel crops is not guaranteed to be in the state.

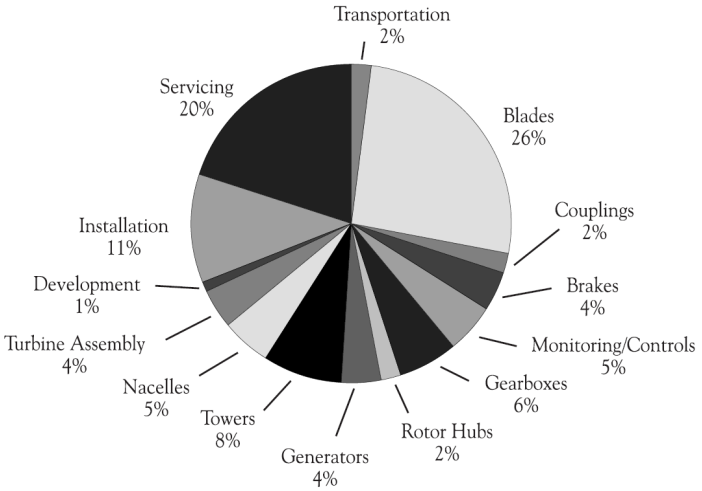

Figure 1 – Distribution of labor requirements for manufacture, installation and operation of new wind energy for ten years. From Singh (2001).

All five sectors taken together could deliver about 23,100 direct, Washington State clean energy jobs, if all recent actions and CAT options are fully implemented. Together with the 8,400 jobs counted previously, Washington can hence expect to boast some 31,500 jobs in this sector by 2020, well beyond the Executive Order goal. Of course, these estimates are subject both to implementation uncertainty as well as the uncertainties related to the limitations of forecasting direct, clean energy jobs. The estimates developed here are based on rather aggregate information about clean energy activity and jobs. They implicitly assume the same relationship between jobs and expenditures, or energy savings/production, as witnessed historically will hold through 2020. Changing technologies and production practices could well imply a somewhat different outcome.

Other approaches

The simplified methodology used here was selected given the timing of the CAT process and the very specific jobs goals as defined by the Executive Order. This approach differs from the broader and more involved studies that have assessed the broader direct and indirect job impacts of clean energy or climate mitigation strategies. These studies tend to employ input-output (I/O) models or more sophisticated macroeconomic tools that combine I/O with computable general equilibrium, econometric, or other models, such as REMI. Examples include a recent nationwide jobs analysis of clean energy policy (Scott & Siu 2006) and studies in various states (*e.g.* Energy Resources Center 2005; Kushler, York & Witte 2005).

Special Note: Manufacturing versus O&M

An important, uniform outcome of prior work on jobs creation in the energy supply subsector is that new capacity generates labor requirements (jobs) principally during manufacture of the relevant systems, rather than as a result of their operation and maintenance (O&M). See for example Figure 1, demonstrating that even including the

first ten years of operation, merely 20% of the labor benefits from new wind energy arise from O&M ("servicing" in the figure).

Maximizing jobs from clean energy may require efforts beyond those envisioned during the Washington Climate Challenge process to date. In particular, attracting more energy technology development and manufacturing to the state enables more jobs to be generated from CAT options (note that some CAT options would spur this, e.g. ES-4 to develop R&D programs; this potential benefit is hard to quantify). Furthermore, jobs in existing Washington clean energy industries can be enhanced by increasing the regional and international demand for their products.

The Fuel Imports Goal

Background

The statement of the fuel imports goal in the Executive Order requires some clarification before it can be evaluated. First, it is important to understand that fuel imports are understood as *state* imports; that is, fuel produced domestically in the U.S. but in another state will also be an import, unlike the traditional understanding of *import* as being from another nation.

Second, the goal does not explicitly state that "fuel" is to be understood as fossil fuel, so it can be presumed that import (versus in-state production) of biofuels is also to be minimized, and that biofuels are to be included when progress toward the goal is tracked.

Third, fuels that are technically imported into the state for the purpose of generating electricity are not necessarily energy imports into the state, since electricity generated in Washington State is often delivered outside the state. Segregating fuel imports used for in-state electric delivery versus out-of-state electric delivery is extremely difficult and hence changes in the electric generation sector cannot be tracked; these fuel imports are hence omitted from the analysis.

Finally, "expenditures" are interpreted at the point of sale to the ultimate consumer, to be consistent with the price data available from the U.S. Department of Energy.[3]

Methodology

Unlike the absolute jobs goal ("25,000") the fuel imports goal is relative ("...reduce...by 20%...") so it must be calculated against a counterfactual, or a business-as-usual scenario. The counterfactual projections of fuel expenditures were generated by multiplying fuel consumption trendlines drawn from 1990 through 2004 actuals from the State Energy Data System (U.S. DOE 2007), with price forecasts from the U.S. Annual Energy Outlook (U.S. DOE 2007a).

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[3] The U.S. DOE calls prices at the point of sale to the ultimate consumer "retail." U.S. DOE 2007b.

Projected, absolute reductions in fuel imports due to recent actions were extracted from prior estimates of the GHG impacts of recent actions (see draft memo dated 27 July 2007). Projected, absolute reductions in fuel imports due to CAT options were provided by the Technical Working Groups. Projected, absolute fuel expenditure reductions were calculated by multiplying the projected reductions in imports with the price forecasts from the Annual Energy Outlook. The simplifying assumption was made that all fossil fuel purchases in Washington State, except coal, are imports.

Results

Reductions in fuel imports are associated only with the RCI and Transportation sectors. The Forestry and Agriculture/Waste sectors are not associated with fossil fuel imports by definition, and the Energy Supply sector does not affect the fuel imports due to the explicit choice to exclude it from the tracked total.

sector	avoided fuel expenditures $ million
RCI	
recent actions	67
CAT options	340
Transportation	
recent actions	1,500
CAT options	3,000
total	**4,900**

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recent actions	67
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recent actions	1,500
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Table 3 – Avoided expenditures on fossil fuel imports as of 2020, except in the energy supply sector. Year 2000 dollars. Totals may not equal sums due to rounding.

Table 3 lists avoided expenditures in the RCI and Transportation sectors.

The counterfactual calculation estimates that in 2020, Washington residents and businesses would have spent $13.3 billion on fossil fuel imports under a business-as-usual scenario, excluding fuels being used for electric generation. A 20% reduction corresponds to $2.6 billion of avoided expenditures. The recent actions and CAT options taken together achieve at least $4.9 billion of avoided expenditures, as seen in Table 3, easily achieving the 20% target. However, this result is once again highly sensitive to the source of the biofuels used to replace the imported fossil fuels. Some of the options in the Transportation sector depend on displacement of fossil fuels with biofuels; if these biofuels are produced outside the state then fuel imports will simply be replaced with other fuel imports, and the goal may not be met.

Tracking Progress

Fuel prices are highly volatile, as shown in Figure 2. The drivers of change of fuel prices are beyond the control of state-level policy, so tracking the fuel imports goal will require real-time adjustment of the target expenditures in order to respond to the changing fuels market. Tracking this goal will also require augmenting the convenient and federally-administered State Energy Data System with careful tracking of the imports and in-state production of biofuels, neither of which is tracked as accurately in the State Energy Data System as the fossil fuel imports.

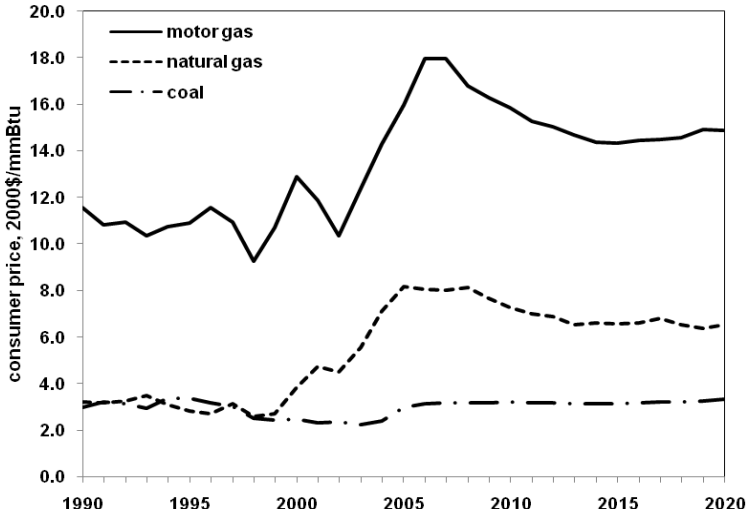

Figure 2 – Historical and forecast fossil fuel prices.

Bibliography

Deyette, J & Clemmer, S, *The Washington Clean Energy Initiative: Effects of I-937 on Consumers, Jobs and the Economy*, Cambridge, MA: Union of Concerned Scientists 2006, available at http://www.ucsusa.org/clean_energy/clean_energy_policies/washington-clean-energy-i-937.html.

ECONorthwest, *The Next Generation of Energy: The Energy Efficiency and Renewable Energy Industries in Washington State*, 1998, available at http://www.cted.wa.gov/energy/archive/DOWNLOAD.HTM.

Elliott, R N et al, *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands*, report no. E072, Washington, DC: American Council for an Energy Efficient Economy 2007.

Energy Resources Center, University of Illinois at Chicago, *The Economic and Environmental Impacts of Clean Energy Development in Illinois*, Illinois Department of Commerce and Economic Opportunity, 2005.

Kushler, M; York, D; Witte, P, *Examining the Potential for Energy Efficiency To Help Address the Natural Gas Crisis in the Midwest*, report no. U051, Washington, DC: American Council for an Energy-Efficient Economy 2005.

Laitner, J; Eldridge, M; Elliott, R N, *The Economic Benefits of an Energy Efficiency and Onsite Renewable Energy Strategy to Meet Growing Electricity Needs in Texas*, report no. E076, Washington, DC: American Council for an Energy Efficient Economy 2007.

Northwest Power and Conservation Council, *POWER PLANTS IN THE PACIFIC NORTHWEST*, http://www.nwcouncil.org/energy/powersupply/existingprojects.xls (accessed 11/15/2007).

Regional Technical Forum, *Summary of 2004 survey results*, http://www.nwcouncil.org/energy/rtf/consreport/2004/summary.htm (accessed 11/15/2007).

Scott, R E & Siu, B A, *Clean Energy Development for a Growing Economy: Employment Impacts of the Clean EDGE Act*, Washington, DC: Apollo Alliance 2006.

Singh, V, *The Work that Goes into Renewable Energy*, report no. 13, Washington, DC: Renewable Energy Policy Project 2001.

Suter, Catherine, *A 2005 Look at the Renewable Energy, Energy Efficiency, and Smart Energy Industries in Washington State*, Olympia, WA: Washington State, Community, Trade and Economic Development 2005, available at http://www.cted.wa.gov/_CTED/documents/ID_3543_Publications.pdf.

U.S. DOE, Energy Information Administration, *State Energy Data System*, http://www.eia.doe.gov/emeu/states/state.html?q_state_a=wa&q_state=WASHINGTON (accessed 09/06/2007).

U.S. DOE, Energy Information Administration, *Annual Energy Outlook 2007 with projections to 2030*, Washington, DC: National Energy Information Center 2007a.

U.S. DOE, Energy Information Administration, *Assumptions to the Annual Energy Outlook 2007*, Washington, DC: National Energy Information Center 2007b.