Carbon Emissions Reduction Taskforce
Preliminary Economic Analysis – Update
October 2014

At the September 9, 2014 meeting of the CERT, the state's OFM modeling team presented preliminary economic analysis of two examples of carbon emission pricing. The analyses were intended to illustrate the models' capabilities and to spur CERT dialogue on how the State should design further analyses to inform policy design and the public debate. They were not calibrated to reflect any existing policy preferences of either the CERT or the Governor's office. Errors in the presentation of results reflecting the GDP impacts of the two pricing scenarios have been corrected and the updated presentation is available for public review at the Governor's CERT webpage.

Analysis Objective: The goal of the Washington State Office of Financial Management, working with consultants from ICF, was to identify a modeling approach that would improve understanding of the impacts to household income, job growth, state productivity and energy prices of putting a price on carbon through any of the policy mechanisms under consideration by the CERT (a carbon tax and a cap and trade program). CERT members also asked, what sectors will experience job growth or loss? Will there be impacts as the state transitions from more carbon-intensive processes to a greener economy? How might the revenues from a carbon policy be best used to create jobs or income, or both?

Model Selection: The State selected two models, which, when combined, can characterize the effects of a carbon price on emissions levels and the broader economy. These models were selected because they are the most current tools available to characterize the dynamic relationships between energy costs and the economy in a way that is sensitive to the particular dynamics of Washington's economy.

1. Carbon Tax Analysis Model (CTAM): This open-source Microsoft Excel-based model initially built for the Washington Department of Commerce is designed to forecast how energy consumption and CO2 emissions shift when the price of those emissions changes. CTAM calculates the price impact of a given price on carbon on each energy source in each sector of the economy and estimates the change in consumption levels for each energy source. CTAM captures economy wide price impacts and emissions reductions by modeling four main sectors of energy demand: residential, commercial, industrial, and transportation, and treats the electricity generation as an intermediate sector.

2. REMI is a best in class, dynamic forecasting and policy analysis tool. REMI is an econometric, input-output model that can characterize complex relationships between industries in an economy. REMI is being used here to analyze economic growth as well as income distribution impacts - negative to positive – of different carbon prices as well as different approaches to recycling revenue obtained through carbon pricing policy back into the economy. REMI uses the carbon pricing and emissions data generated by CTAM as inputs in its analysis of the broader economy.

Key Assumptions & Inputs: Two scenarios, a high and low carbon price, were modeled, starting in 2015 (for modeling purposes) and running through 2035 when the state must meet its second emission reduction limit. The following assumptions and source data are important to interpreting the results.

1. CTAM requires the input of carbon prices for each year in the model run. Carbon prices in the low price scenario began at $12 a ton (approximately the current price in the California market) and increased $.60 annually through 2020, and $2 annually thereafter through 2035. For the higher price scenario, prices began at $12 a ton and increase by $8 annually thereafter. The higher price scenario reflects the model's estimate of the price required to generate emissions sufficient to attain the emissions reductions limits set in statute for 2020 and 2035 as if price was the sole driver of emissions reductions.

2. CTAM also requires fuel costs be input. Fuel costs were derived from Pacific Region forecast of the Annual Energy Outlook published by the Energy Information Agency, an office of the US Dept. of Energy that generates some of the most sophisticated energy forecasts available. Regional gasoline and diesel prices were adjusted by modeling staff in the Commerce Department to estimate Washington prices.

3. The "business as usual" (BAU) reference scenario assumes that a number of federal energy efficiency policies that halt, or are set to sunset, during the modeled period, are in fact extended. It does not incorporate the impacts of new policies under consideration such as EPA's newly released Clean Power Plan proposal (111D).

4. Revenue estimates assume 100% of emissions are paid for, either in the form of a carbon tax or a in the form of 100% auction of allowances under a cap and trade program. .

5. Models do not provide for exceptional innovation or structural shifts in the economy that significantly shift energy demand and supply patterns.

6. Additional emissions reductions from spending of revenues is not estimated.

7. Revenue recycling formula used B&O tax cuts to simulate attempts to combat leakage through support to affected sectors. "Trade exposed industries" were identified through a preliminary consideration of businesses that produce sizable quantities of carbon dioxide; have significant outside competition not subject to the WA emission-reduction program or to an equivalent program implemented in other jurisdictions; and face a substantial percentage increase in its costs as a result of the emission-reduction program. The rest of the recycled revenues were allocated to addressing impacts on low income communities, transportation needs and clean electricity.

Key Findings:

- Economic: **The net effects of both scenarios are positive.** The net statewide economic impact on jobs, GDP and personal income under both pricing scenarios is, however, small.
- Results vary more at the industry level with some industries negatively affected and some positively affected. Again, the changes are small under both pricing scnearios.
- Fuel and Energy Costs: Increasing but at different rates: natural gas the most and gasoline increasing at a slower rate.
- Emissions Under Low Price Scenario: Under the low price scenario we do not reach the 2020 or 2035 emissions reduction limits.
- Emissions Under High Price Scenario: Under the high price scenario we hit both limits because the carbon price was chosen so that the limits were met.

- Sectors gaining most jobs (~6-20% over BAU) under both pricing scenarios include traditional industries such as construction, chemical manufacturing, electric power generation and transmission and iron/steel manufacturing; sectors losing jobs (~2-5% over BAU) include natural gas, pipeline transportation and apparel manufacturing.

Next Steps: The State is working with its consulting team to prepare a second round of analyses that may include additional pricing scenarios, model additional revenue recycling formulas and provide additional detail on impacts to households of various income levels. Round two analyses will ask what does the income distribution look like for the lower quintiles with energy prices up? And, to what extent do the rebates offset the increased energy prices, gas prices and other costs of transportation? Also, the analysis team is working to better understand the role of innovation in shaping demand, increasing the availability of new fuel options and lowering their cost. While these analyses will not be complete in time for CERT consideration, they will be made publicly available by the end of the year to support continued debate over carbon pricing in Washington State.