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An Assessment of H.R. 2454 Cost Estimates by EPA and CBO

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Summary

Key findings from our assessment of H.R. 2454 cost estimates by EPA and CBO:

1. **Electrical sector is inadequately modeled by EPA:** EPA did not use its more realistic model of the electric sector, IPM, which found smaller emission reductions at EPA's estimated carbon prices, and which would have shown much higher costs to meet the cap.
2. **Discounting of future household costs significantly understates EPA's increases to cost-per-household estimates:** EPA's calculations understate household costs in the way most people would understand the impacts, which is relative to current income levels (the approach used by both CBO and CRA). If EPA had presented their cost estimates in this more appropriate manner their costs in 2020 would be 50% higher and in 2050 would be 280% higher.
3. **CBO has a lower estimate for permit prices than CRA:** CBO's permit price estimate is based on several models, almost all of which resemble EPA's model in lacking a realistic picture of the electric sector to capture all near-term costs, and as a result its cost estimates are biased downwards.
4. **CBO ignores broader impacts on GDP:** CBO admits it did not include impacts on GDP that would likely result from the enactment of H.R. 2454. These would include decreases in employment, wage reductions and potential reductions in the productivity of capital and labor as investment gets diverted to projects with lower economic returns.
5. **Both CBO and EPA highlight the large potential impact of non availability of international offsets.** CBO comments that it is unlikely that anything close to the amount of international offsets included in EPA's calculations will be available in the early years of the program.
6. **We believe that CRA's analysis contains the most reliable estimates of the household costs:** CRA's MRN-NEEM is the only model that contains the combination of a detailed technology representation within the electrical sector (where the majority of reductions are expected to take place) and a macroeconomic model that can capture the direct and indirect changes in the economy that would result from a policy such as H.R. 2454. We found that increased costs per household would range from \$600 to \$1,600 in 2020 and \$650 to \$1,900 in 2050.



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Analysis

EPA has recently released an updated analysis of H.R. 2454.¹ The Congressional Budget Office (CBO) has also released an analysis of the same bill.² Our review of these analyses has highlighted a few key issues that appear to lead to an understatement of the costs of complying with H.R. 2454.

Issues with EPA’s Analysis of H.R. 2454

Electricity model

The primary issue with EPA’s analysis of H.R. 2454 is related to a weakness in its model, ADAGE. ADAGE is a computable general equilibrium (CGE) model that lacks a detailed technology representation of the electric sector. Based on EPA’s own modeling it appears that carbon prices would need to be twice as high as estimated by ADAGE to induce enough emission reductions to satisfy H.R. 2454 caps.

To validate its modeling of the electric sector, EPA took the CO₂ allowance prices and percentage changes in electricity demand estimated by its ADAGE model and ran its detailed electric sector model, IPM. As shown in the table below, EPA’s own analysis shows that ADAGE overstates CO₂ reductions from the electric sector as compared with IPM, at the same CO₂ prices. Thus, if EPA had coordinated its IPM and ADAGE models to produce consistent electric sector results, we would expect that EPA would have found significantly higher CO₂ prices for H.R. 2454. Given that EPA says the IPM model is more realistic for the near-term, one can conclude that its ADAGE-based near-term impact estimates are not realistic until they are made consistent with their IPM model projections.

Power Sector CO₂ Reductions (MM metric tons)			
	IPM³	ADAGE⁴	ADAGE - IPM
2015	179	265	86
2020	381	650	269
2025	542	1,025	483
2030	NA	1,400	NA

Note: ADAGE 2025 number estimated as average of 2020 and 2030

¹ http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf

² <http://www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf> and <http://www.cbo.gov/ftpdocs/103xx/doc10327/06-19-CapAndTradeCosts.pdf>

³ See page 25 of EPA’s analysis.

⁴ http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis_Appendix.pdf, see page 60.



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Household costs

Many people have cited EPA's cost per household estimate. When using that number it is important to understand what it is, and is not. EPA's cost per household estimates are not comparable to similar measures calculated by CBO and CRA. EPA discounts future household costs at 5% per year, while CBO and CRA apply an estimated percentage change in the size of the economy in a given year to a base year's level of consumption (e.g., 2010) to provide an understandable estimate of impacts. EPA's approach understates the cost per household relative to measures reported by CBO and CRA because the discount rate (5%) is greater than the baseline growth rate in the economy (2.5%). Converting EPA's estimates of household costs to the same basis as CBO and CRA's estimates would increase EPA's estimates in 2020 by 50% (to \$100 in 2008\$) and in 2050 by 280% (to \$715 in 2008\$).

Issues with CBO's Analysis of H.R. 2454

CO₂ Prices

CBO does not use a model to estimate carbon prices, but rather a curve based on results from seven other models that relate required emission reductions to carbon prices. But only two of the models sampled – CRA's MRN-NEEM model and EIA's NEMS model – contain sufficiently detailed representations of the U. S. electric power sector to determine the full cost of achieving near-term reductions.

With a bottom-up representation of the electricity sector and regional representation of the U.S. economy, CRA's model (and EPA's IPM model) is well-suited to estimating the permit price of a cap-and-trade program applied to the electric power sector. CRA finds the 2020 permit price to be \$28 per metric ton of CO₂ in 2008 dollars. This price exceeds the CBO price of \$ \$22.5 in 2008 dollars and the EPA's price (using its ADAGE model) \$17.2 in 2008 dollars.

Household Costs

CBO calculates household costs in a way that leaves out effects of the cap-and-trade program on anything but energy costs, thereby excluding effects on wages and investment returns, which causes them to underestimate the full effect on real purchasing power.⁵ The entire reason for developing CGE models (like CRA's MRN-NEEM model

⁵ CBO points out this bias, stating that "The resource cost does not indicate the potential decrease in gross domestic product (GDP) that could result from the cap. The reduction in GDP would also include indirect general equilibrium effects, such as changes in the labor supply resulting from reductions in real wages and potential reductions in the productivity of capital and labor)."

<http://www.cbo.gov/ftpdocs/103xx/doc10327/06-19-CapAndTradeCosts.pdf>



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and EPA's ADAGE and IGEM models) is to provide a picture of all these interactions in the economy. When we apply the CBO method of calculating costs to the results of the CRA model, we find that CBO's method on average understates the cost of reducing emissions to meet the cap by about 50% between 2010 and 2050. In 2015 and 2020, the full consequences of cap and trade include reduction in real wages and a major shift of investment out of productivity-enhancing projects that are necessary for future growth into replacing prematurely retired electric generating capacity. This produces a much larger reduction in economic output than estimated by the CBO method.

Problems with cost projections - Uncertainty about international offsets

One lesson from debates about cost should be that there is no way to predict costs of a cap-and-trade program with any degree of certainty. EPA, CBO and CRA's analysis all agree that the greatest uncertainty with respect to the cost of H.R.2454 is the availability of international offsets. CBO comments that it is unlikely that anything close to the amount of international offsets included in EPA's calculations will be available in the early years of the program. CRA finds that without international offsets the cost of H.R. 2454 would almost triple compared to our Reference case, to \$1,600 per household in 2020, and EPA finds that eliminating all international offsets would increase marginal costs by 89% (such that the 2015 CO₂ allowance price would increase to \$26.50 in 2008\$) The likelihood that less than the full amount of offsets will be available is quite high, because many of the countries that will provide those offsets suffer from institutions and governance that are too weak to meet standards in the bill for verifiability and permanence.