

Addendum to Analysis of a 10-percent Renewable Portfolio Standard

In May 2003, the Energy Information Administration released the report *Analysis of a 10-percent Renewable Portfolio Standard* which presents analysis carried out pursuant to a request by Senator Jeff Bingaman, ranking minority member of the Senate Committee on Energy and Natural Resources. Subsequently, Senator Bingaman requested that EIA analyze a modified RPS proposal¹. This addendum summarizes the results of this additional analysis.

For this additional analysis, EIA used the same assumptions as the aforementioned report, except to assume that the 1.5 cent per kilowatt-hour price cap on renewable energy credits be adjusted annually for inflation. The lack of inflation adjustment for the credit price cap in the program considered in our earlier analysis contributes to its targets for renewable generation not being met after 2015. By 2025, the last year for which we provide projections, non-hydro electric renewable generation achieves 5.6 percent of all U.S. electricity sales in that analysis. In this analysis with a real 1.5 cent per kilowatt-hour cap, the level of non-hydroelectric renewable generation is significantly higher, at 6.5 percent, as shown by the attached results in Table A1.

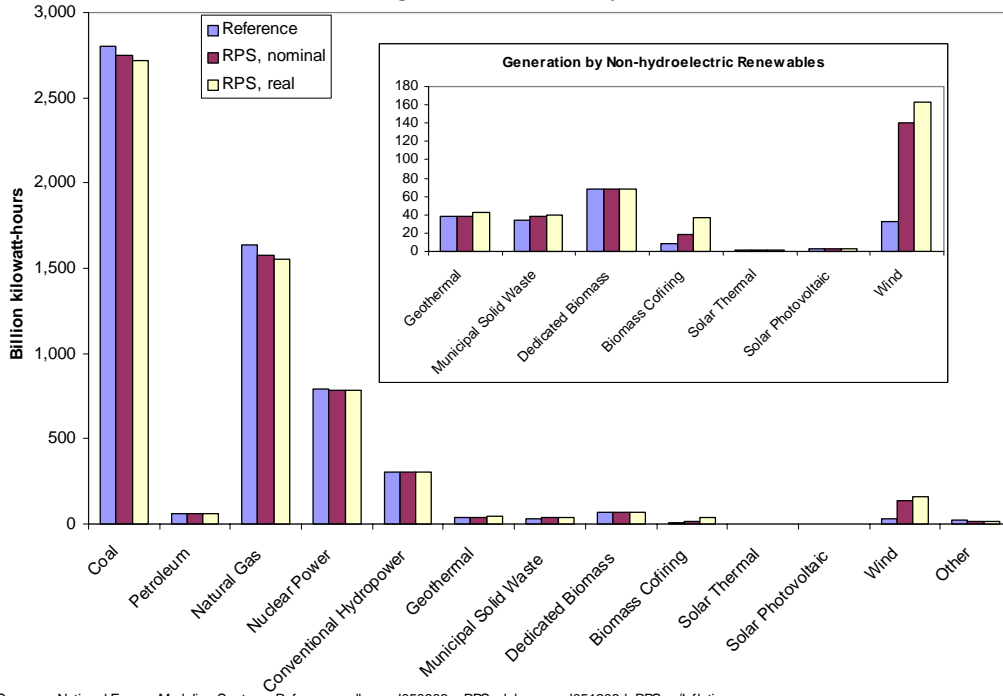
Compared to the RPS program previously reported, adjusting the cap for inflation spurs additional generation for wind and co-firing technologies, and also supports new generation from geothermal and landfill gas sources.

Capacity, Generation, Resource Cost and Emissions Impacts

Figures A1 and A2 compare generation and capacity results among the Reference case, the RPS case in the earlier report, and the RPS case with the real (inflation-adjusted) cost adjustment in the credit cap price. With inflation adjustment, wind and biomass co-firing capture additional market share, with modest additional gains from geothermal and landfill gas.

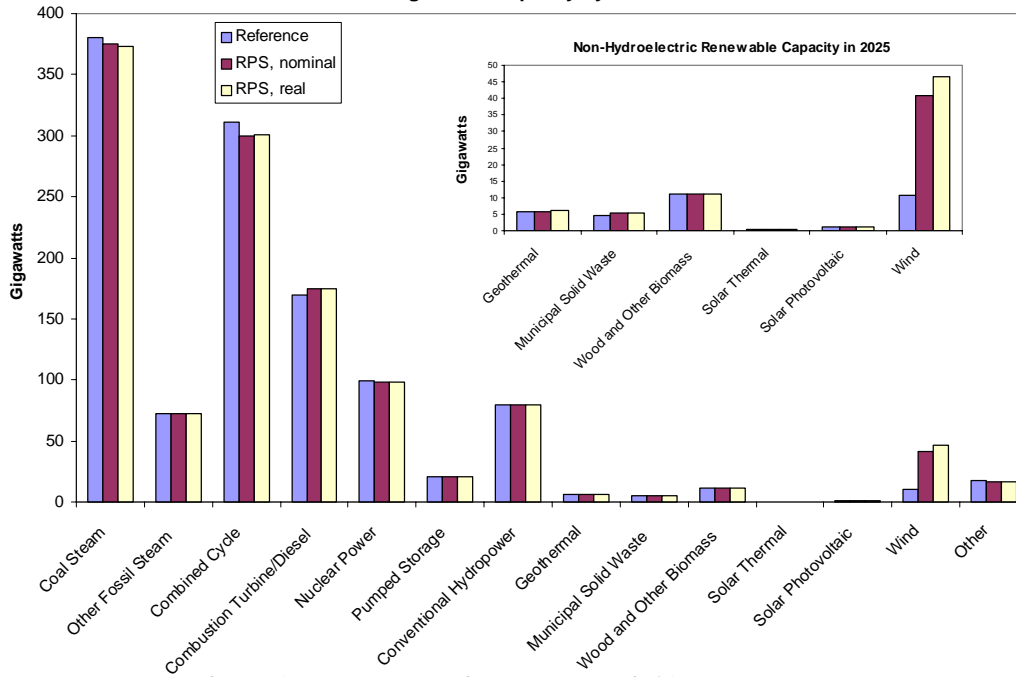
¹ Letter from Senator Bingaman to EIA Administrator Guy Caruso dated June 5, 2003, See Addendum Appendix A.

Figure A1. Generation by Fuel in 2025



Sources: National Energy Modeling System. Reference mbase.d050303a, RPS ml_brpssm.d051203d, RPS w /Inflation

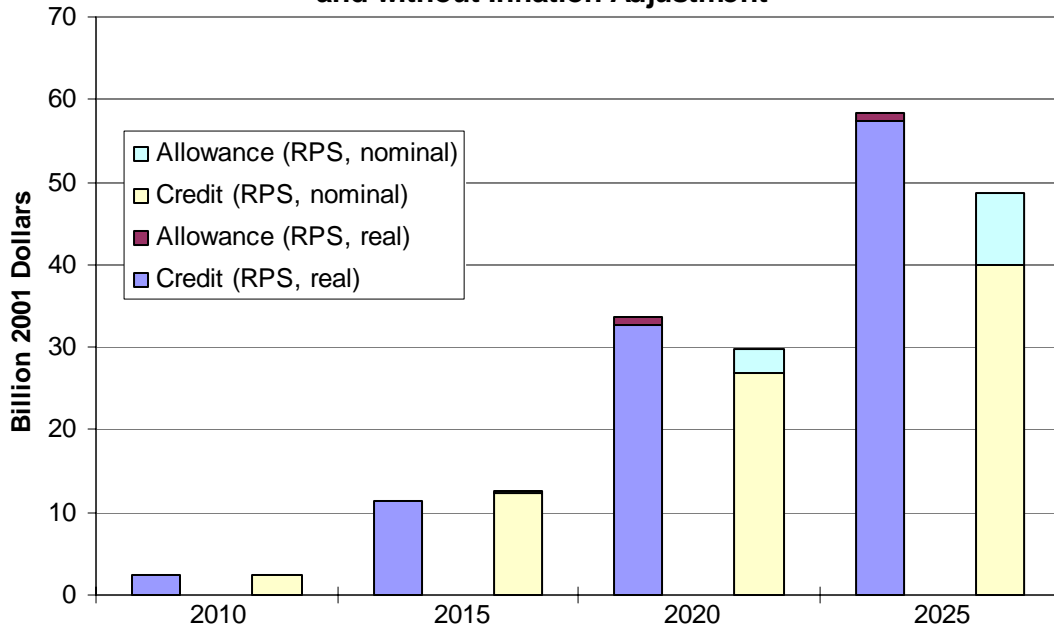
Figure A2. Capacity by Fuel in 2025



Sources: National Energy Modeling System. Reference mbase.d050303a, RPS ml_brpssm.d051203d, RPS w /Inflation

Through 2025, the additional cost of compliance in the electricity sector with the inflation-adjusted cap results in higher cumulative resource costs of \$4.9 billion compared to \$3.6 billion with no inflation adjustment. Some allowances are purchased from the government in the early years, but this mechanism of compliance does not become significant until after 2020 with the inflation adjusted cap (Figure A3). Additional compliance costs would occur between 2025 and 2030, after which utilities would no longer be required to hold credits. However, these additional costs are incurred beyond the forecast horizon of NEMS.

Figure A3. Cumulative Credit and Allowance¹ Cost for RPS with and without Inflation Adjustment

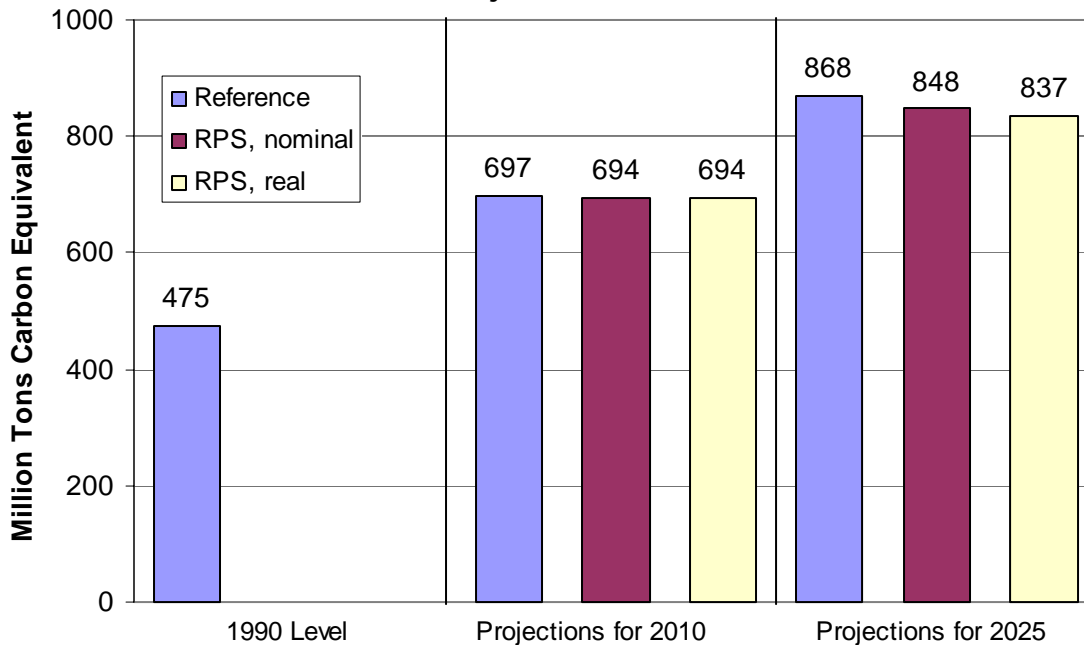


1- For this report, credits are purchased from private markets and allowances are purchased from the government, the proposed legislation only uses the term "credit" to describe both types of purchases.

Source: National Energy Modeling System. no inflation: ml_brpssm.d051203d, w/inflation ml_brpssmr.d060403b

Reductions of carbon dioxide emissions increase slightly with the real 1.5 cent per kilowatt-hour price cap for the RPS, as shown in Figure A4. As in the earlier analysis, sulfur dioxide emissions are unchanged from the Reference case, but with somewhat lower compliance costs (\$88 per ton with inflation adjustment compared to \$105 per ton for the earlier RPS case or \$110 per ton in the Reference case). Adjusting the price cap for inflation has little impact on nitrogen oxide emissions or compliance costs.

Figure A4. Electricity Sector Carbon Dioxide Emissions, 1990 and Projected for 2010 and 2025



Sources: National Energy Modeling System. Reference mlbase.d050303a, RPS ml_brpssm.d051203d, RPS w/Inflation

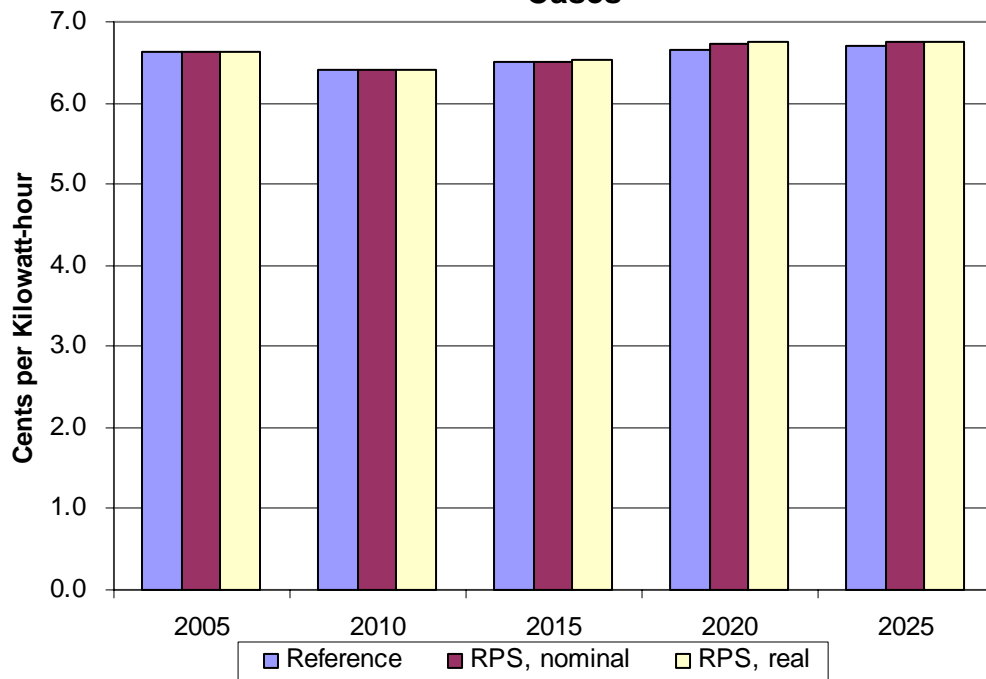
Price and Expenditure Impacts

Compared to the Reference case, price impacts in electricity markets are effectively the same with or without an inflation-adjusted price cap (Figure A5). With an inflation-adjusted cap, total residential expenditures on electricity in 2025 increase by \$680 million; total commercial sector electricity expenditures in 2025 increase by \$660 million, (0.5 percent); and total industrial sector electricity expenditures increase by \$460 million (0.7 percent).

Natural gas prices with the inflation-adjusted price cap are similar to the prices without the inflation adjustment, and they are 1.5 percent below the reference case in 2025. Wellhead natural gas prices in the Reference case are \$3.95 per thousand cubic feet in 2025 (year 2001 dollars), and \$3.89 per thousand cubic feet for the RPS with or without the inflation adjusted price cap.

In 2025, the total residential natural gas bill is projected to be \$420 million (0.8 percent) lower with the inflation-adjusted cap RPS than in the Reference case. For the commercial and industrial sectors the bills in 2025 are, respectively, \$230 million (0.7 percent) and \$410 million (0.6 percent) lower with the inflation-adjusted cap RPS than in the Reference case.

Figure A5. Retail Electricity Prices in the Reference and RPS Cases



Sources: National Energy Modeling System. Reference mlbase.d050303a, RPS ml_brpssm.d051203d, RPS w /Inflation

Table A1. Key Results

	2001	2010	2010	2010	2020	2020	2020	2025	2025	2025
		Reference	RPS, nominal	RPS, real	Reference	RPS, nominal	RPS, real	Reference	RPS, nominal	RPS, real
Generation (billion kilowatt-hours)										
Coal	1904	2293	2284	2279	2568	2497	2461	2803	2745	2708
Petroleum	125	50	49	49	56	55	54	61	59	57
Natural Gas	618	946	939	943	1441	1379	1365	1637	1578	1564
Nuclear Power	769	790	783	783	793	786	786	793	786	786
Conventional Hydropower	218	305	305	305	304	304	304	305	305	305
Geothermal	14	22	25	25	33	37	41	38	38	42
Municipal Solid Waste/Landfill Gas	22	31	35	35	34	38	39	34	39	39
Dedicated Biomass	36	50	50	50	62	62	63	68	68	68
Biomass Co-firing	2	9	13	14	9	24	49	9	18	40
Solar Thermal	0	1	1	1	1	1	1	1	1	1
Solar Photovoltaic	0	1	1	1	2	2	2	3	3	3
Wind	6	23	37	37	29	141	160	32	141	161
Ocean ¹	--	--	--	--	--	--	--	--	--	--
Other	6	13	13	13	17	17	17	20	19	19
Total	3721	4534	4535	4534	5349	5343	5342	5803	5798	5792
Renewable Portfolio Standard										
Electricity Sales	3382	4080	4079	4078	4820	4810	4808	5214	5203	5197
% Qualifying Renewables	0.0	0.0	3.7	3.7	0.0	6.1	7.1	0.0	5.6	6.5
% Renewables Required	0.0	0.0	3.8	3.8	0.0	8.7	8.7	0.0	8.8	8.8
Capacity (Gigawatts)										
Coal Steam	310	315	315	314	349	341	341	381	375	373
Other Fossil Steam	135	79	79	79	73	74	74	72	73	72
Combined Cycle	66	181	180	181	266	258	259	311	300	300
Combustion Turbine/Diesel	102	132	132	133	153	157	156	170	175	175
Nuclear Power	98	99	98	98	99	98	98	99	98	98
Pumped Storage	20	20	20	20	20	20	20	20	20	20
Conventional Hydropower	79	80	80	80	80	80	80	80	80	80
Geothermal	3	4	4	4	5	6	6	6	6	6
Municipal Solid Waste/Landfill Gas	4	4	5	5	5	5	5	5	5	5
Wood and Other Biomass	6	8	8	8	10	10	10	11	11	11
Solar Thermal	0	0	0	0	0	0	0	0	0	0
Solar Photovoltaic	0	0	0	0	1	1	1	1	1	1
Wind	4	8	12	12	10	41	47	11	41	47
Ocean ¹	--	--	--	--	--	--	--	--	--	--
Other	0	2	2	2	12	11	11	18	17	17
Total	828	933	936	936	1083	1102	1108	1185	1202	1207
Prices (2001 cents per kilowatt-hour)										
Credit Price	0.0	0.0	5.4	5.4	0.0	9.8	14.5	0.0	8.4	14.5
Retail Electricity Price	7.3	6.4	6.4	6.4	6.7	6.7	6.8	6.7	6.8	6.8

	2001	2010	2010	2010	2020	2020	2020	2025	2025	2025
		Reference	RPS, nominal	RPS, real	Reference	RPS, nominal	RPS, real	Reference	RPS, nominal	RPS, real
Electric Sector Emissions (million metric tons)										
Nitrogen Oxides	4.75	3.90	3.90	3.90	4.02	3.99	3.97	4.08	4.04	4.04
Sulfur Dioxide	10.63	9.69	9.73	9.69	8.95	8.95	8.95	8.95	8.95	8.95
Carbon Dioxide ²	611.57	697.42	694.33	693.58	802.47	779.69	768.23	867.76	847.67	836.53
Fuel Prices										
Gas Wellhead Price	4.12	3.39	3.38	3.38	3.70	3.71	3.70	3.95	3.89	3.89
Coal Minemouth Price	17.59	15.06	15.03	15.01	14.34	14.28	14.36	14.39	14.42	14.49
1- Ocean energy technologies are not represented in NEMS 2- Million metric tons carbon equivalent Source: EIA Office of Integrated Analysis and Forecasting. National Energy Modeling System (NEMS) runs mlbase.d050303a (Reference case), ml_brpssm.d051203d (RPS nominal case), and ml_brpssmr.d060402b (RPS w/inflation case)										

Addendum Appendix A

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United States Senate

COMMITTEE ON
ENERGY AND NATURAL RESOURCES

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June 5, 2003

The Honorable Guy Caruso
Administrator
Energy Information Administration
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, DC 20585

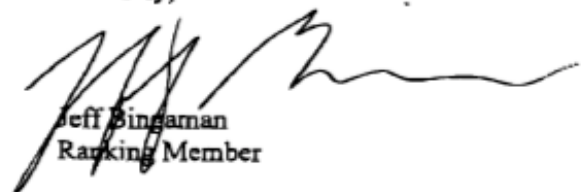
Dear Mr. Caruso:

I appreciate EIA's timely response to my request for analysis of the proposed RPS Amendment. The report was thorough and informative. As a follow-up to the report, I would like to request an RPS case run with the 1.5 cent/kWh credit cap adjusted for inflation. All other assumptions should remain the same.

I ask that the requested case run be made available as soon as possible. I also ask that my staff be briefed prior to any release of information.

If you have any questions regarding this request, or need clarification, please contact Leon Lowery with my Senate Energy and Natural Resources Committee staff at 202-224-2209. I thank you in advance for your timely attention to this request and objective analysis to inform the current Energy Bill debate.

Sincerely,



Jeff Bingaman
Ranking Member