

REMI Impacts for RGGI Policies based on the Std REF & Hi-Emission REF

Presented to
RGGI Stakeholders
(REMI Modeling Phone Call)

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What we're Examining

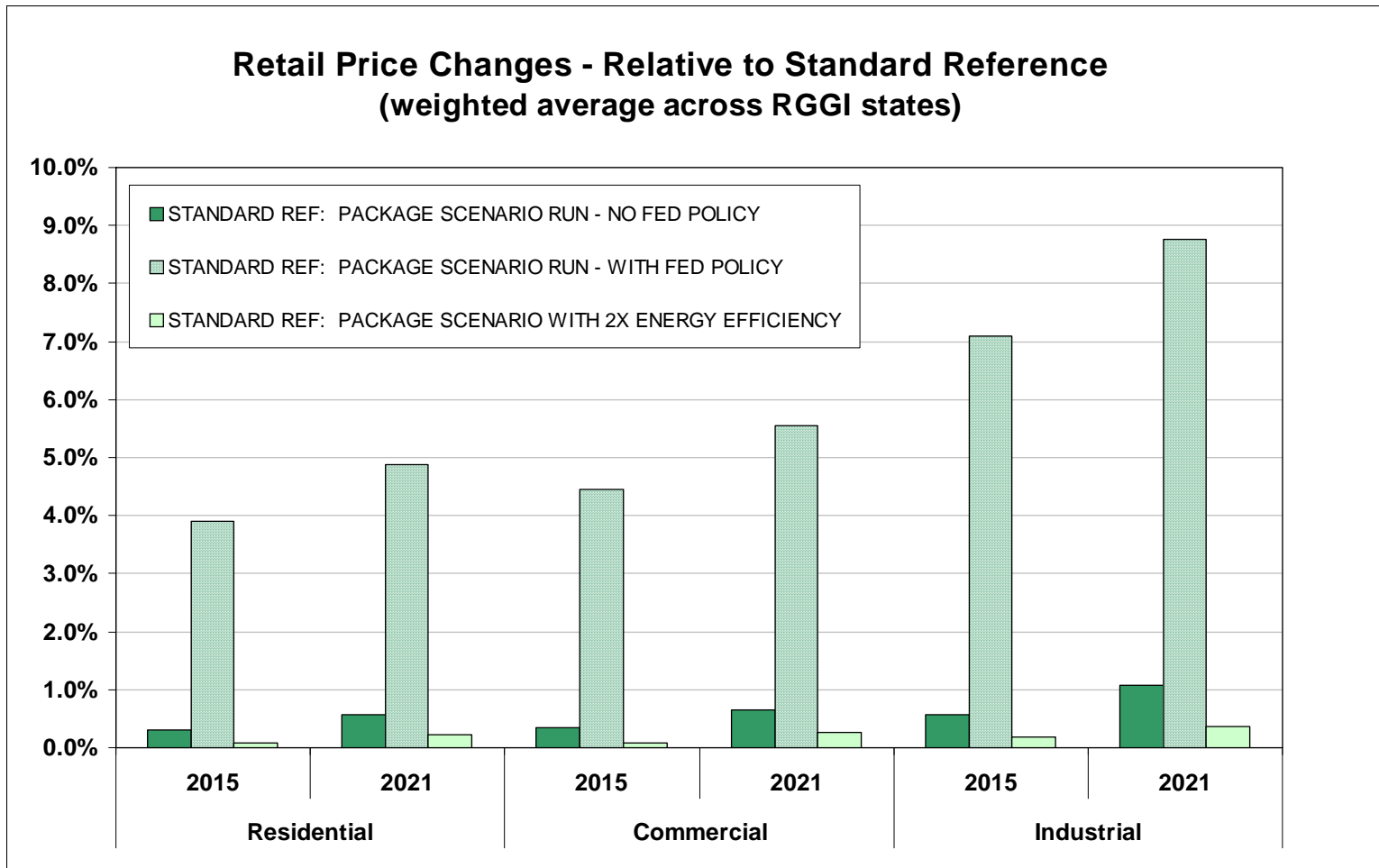
- Two sets of impact results relative to
 - (1) IPM's standard* reference run (*vin.* 9/27/05) &
 - (2) IPM's High-Emissions* REF (*vin.* 10/27/05)
- Both the Standard and Hi-Emissions REF Runs consider the *PCKG* policy & *PCKG + CN-FED* policy (*vin.* 9/27/05)
- The Standard REF Run has an additional policy examined off of it → *2 x Energy Efficiency* (*vin.* 9/27/05)
- All carbon policy scenarios embed end-use energy efficiency using assumptions developed by SWG and ACEEE.

* *assumes no energy efficiency program funding*

REMI – RGGI Region *Forecasts without Policies*

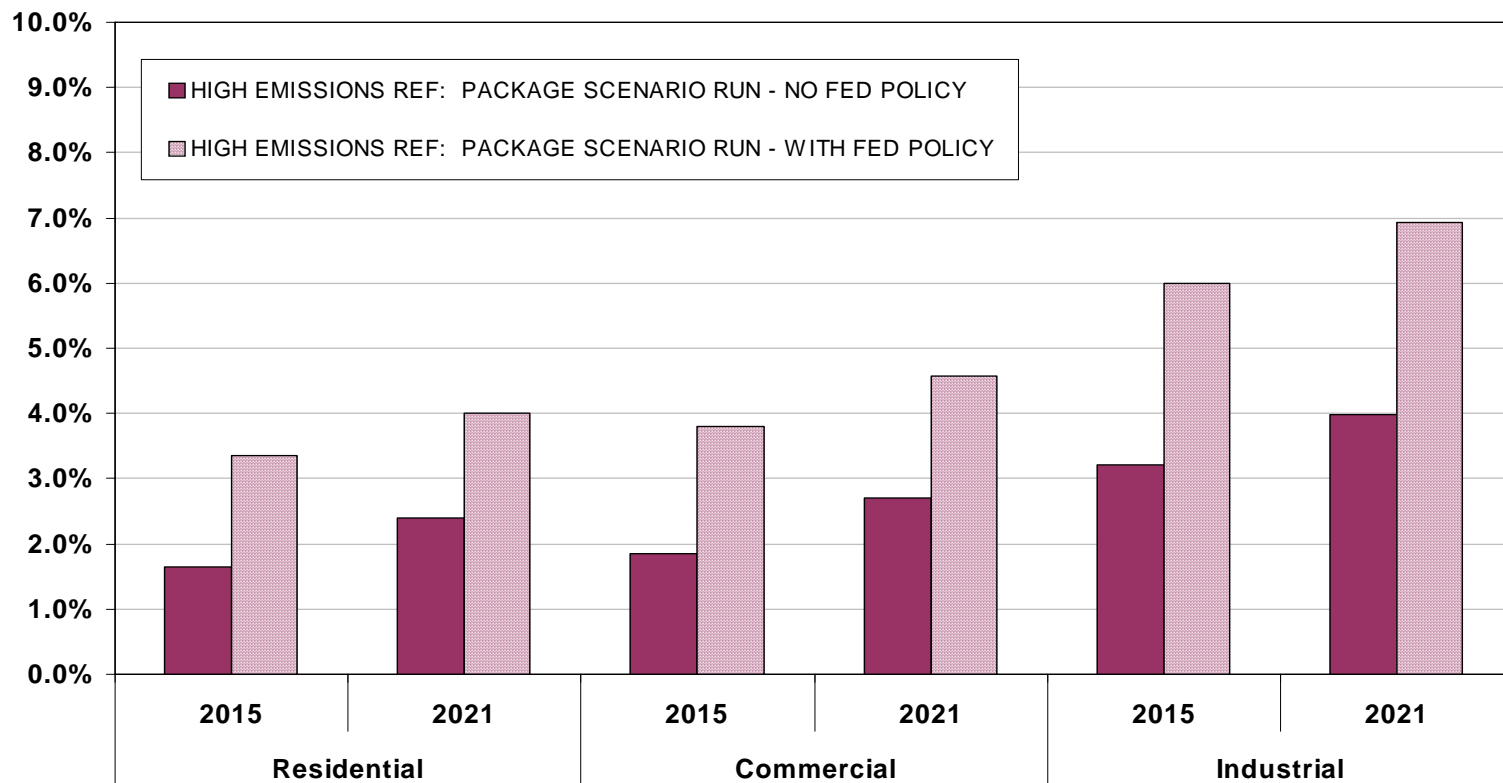
9-State Region		2009	2015	2021
Std REF Forecast	Total GRP (Bil Fixed 96\$)	\$2,135.3	\$2,426.6	\$2,698.4
	Real Pers Inc (Bil Fixed 96\$)	\$1,702.6	\$1,948.7	\$2,203.6
	Private Sector Jobs (thous.)	22,302	23,369	24,060
High-Emissions Forecast	Total GRP (Bil Fixed 96\$)	\$2,137.0	\$2,427.3	\$2,697.3
	Real Pers Inc (Bil Fixed 96\$)	\$1,705.0	\$1,949.5	\$2,202.5
	Private Sector Jobs (thous.)	22,323	23,374	24,048

Changes in Retail Electric Prices – relative to Std REF Run



Changes in Retail Electric Prices – relative to Hi-Emissions REF

**Retail Price Changes - Relative to High Emissions Reference
(weighted average across RGGI states)**



Implied Annual Household Bill Changes

Before Energy Efficiency Savings	Household Bill Impact (\$/yr)		After Energy Efficiency Savings	Household Bill Impact (\$/yr)			
	2015	2021		Participating Households*		If all EE savings distributed equally across all households	
Direct Impact of RGGI due to retail price change			Impact of RGGI after assumed EE Programs resulting in reduction in household energy usage	2015	2021	2015	2021
Standard REF Case			Standard REF Case				
Package	2.90	5.45	Package	-92.54	-153.67	-30.51	-50.24
Package + Fed	36.84	45.99	Package + Fed	-61.95	-119.81	2.26	-12.04
Package + 2X EE	0.77	2.16	Package + 2X EE	-189.59	-314.99	-65.85	-108.84
Hi Emissions REF Case			Hi Emissions REF Case				
Package	16.02	22.44	Package	-86.15	-147.43	-19.74	-37.02
Package + Fed	31.93	38.04	Package + Fed	-71.60	-133.97	-4.31	-22.17

* Assumes 35% Participation rate across households reached over time

EE Programs under RGGI Scenarios are assumed to be incremental to EE in IPM REF case.

Incremental end-use energy efficiency savings were modeled as part of the RGGI policy scenarios for multiple reasons. There is uncertainty regarding how much of current and future energy savings due to ratepayer funded energy efficiency programs are incorporated into and fully captured by the ISO load forecasts used in the reference cases. A number of RGGI participating states have also enacted or are moving to enact improved building codes and energy efficiency standards for appliances that will reduce load growth and also lower household electricity bills. The SWG has also proposed that RGGI allowance revenue could be used to fund additional support for end-use energy efficiency programs.

Bill impact considers change in residential retail price and reduction in energy expenditures by the residential sector due to Energy Efficiency measures as projected by the corresponding IPM scenario run.

Household data (typical bills, households) from 2003 EIA at: www.eia.doe.gov/cn_eaf/electricity/esr/table1abcd.xls#Table1!A1. Analysis does not consider escalation in energy expenditure or number of households over time.

IPM Capacity Additions 2005-2025, mil. \$

	2005 -2025	Differential Investment_ New Capacity		
		Scenario		
Technology	Std. Ref. Run (mil. \$)	PCKG	PCKG+	2 x Effic.
Biomass Cofiring	\$408	\$4	\$46	\$4
Nuclear Uprate	\$433	\$0	\$0	\$0
Pollution Control	\$1,702	-\$71	-\$335	-\$65
New CC	\$12,445	-\$3,818	-\$1,610	-\$5,642
New CT	\$2,027	\$388	-\$1,461	-\$73
New IGCC	\$164	-\$55	-\$74	\$0
New Nuclear	\$0	\$0	\$505	\$0
New Scrubbed Coal	\$0	\$0	\$0	\$0
New Biomass	\$0	\$0	\$0	\$0
New Hydro	\$190	\$0	\$0	-\$16
New Wind	\$8,114	-\$123	\$3,679	-\$646
New LFG	\$779	\$0	\$0	\$0
New Solar PV	\$1,179	-\$45	-\$45	-\$90
New Fuel Cell	\$97	\$0	\$0	\$0
Efficiency*	\$0	\$7,014	\$7,014	\$14,027
Total	\$27,538	\$3,293	\$7,718	\$7,500

* Excludes 40% of the program cost component that supports program administration

Differential Capacity Additions between REF Runs, mil. \$

	2005 -2025	
Technology	Std. Ref. Run (mil. \$)	delta High- Emission REF
Biomass Cofiring	\$408	-\$200
Nuclear Uprate	\$433	\$0
Pollution Control	\$1,702	-\$50
New CC	\$12,445	-\$7,551
New CT	\$2,027	-\$1,866
New IGCC	\$164	\$27,851
New Nuclear	\$0	\$0
New Scrubbed Coal	\$0	\$0
New Biomass	\$0	\$0
New Hydro	\$190	\$0
New Wind	\$8,114	\$2,647
New LFG	\$779	\$0
New Solar PV	\$1,179	\$0
New Fuel Cell	\$97	\$0
Efficiency	\$0	\$0
Total	\$27,538	\$20,830

IPM Capacity Additions 2005-2025, mil. \$

	2005 -2025	<i>Differential Investment_ New Capacity Scenario</i>	
		PCKG	PCKG+
Technology	Hi-Emissions Ref. Run (mil. \$)		
Biomass Cofiring	\$208	\$31	\$200
Nuclear Uprate	\$433	\$0	-\$4
Pollution Control	\$1,652	-\$71	-\$242
New CC	\$4,894	-\$1,215	-\$1,272
New CT	\$161	\$98	\$436
New IGCC	\$28,015	-\$12,827	-\$8,639
New Nuclear	\$0	\$0	\$0
New Scrubbed Coal	\$0	\$0	\$0
New Biomass	\$0	\$0	\$0
New Hydro	\$190	\$0	\$6
New Wind	\$10,761	\$1,970	\$2,128
New LFG	\$779	\$0	\$0
New Solar PV	\$1,179	-\$45	-\$45
New Fuel Cell	\$97	\$0	\$0
Efficiency*	\$0	\$7,014	\$7,014
Total	\$48,369	-\$5,046	-\$416

* Excludes 40% of the program cost component that supports program administration

RGGI – Region Macro Impacts (%) *rel. Std REF*¹

Impacts on 9-State Region		2009	2015	2021
Package	Total GRP (Bil Fixed 96\$)	0.01%	0.01%	0.01%
	Real Pers Inc (Bil Fixed 96\$)	0.00%	0.01%	0.02%
	Private Sector Jobs	0.01%	0.02%	0.02%
Package w/ 2 x <i>Efficiency</i>	Total GRP (Bil Fixed 96\$)	0.04%	0.05%	0.06%
	Real Pers Inc (Bil Fixed 96\$)	0.01%	0.05%	0.09%
	Private Sector Jobs	0.05%	0.06%	0.08%
Package + CN-FED Policies	Total GRP (Bil Fixed 96\$)	-0.04%	0.07%	0.08%
	Real Pers Inc (Bil Fixed 96\$)	-0.07%	0.12%	0.13%
	Private Sector Jobs	-0.04%	0.10%	0.09%

Economic impacts of RGGI policies are small & generally positive – roughly one-hundredth to one-tenth of 1 percent.

The reported impact is the *change* in the growth that would have otherwise occurred in the “do nothing” forecast.

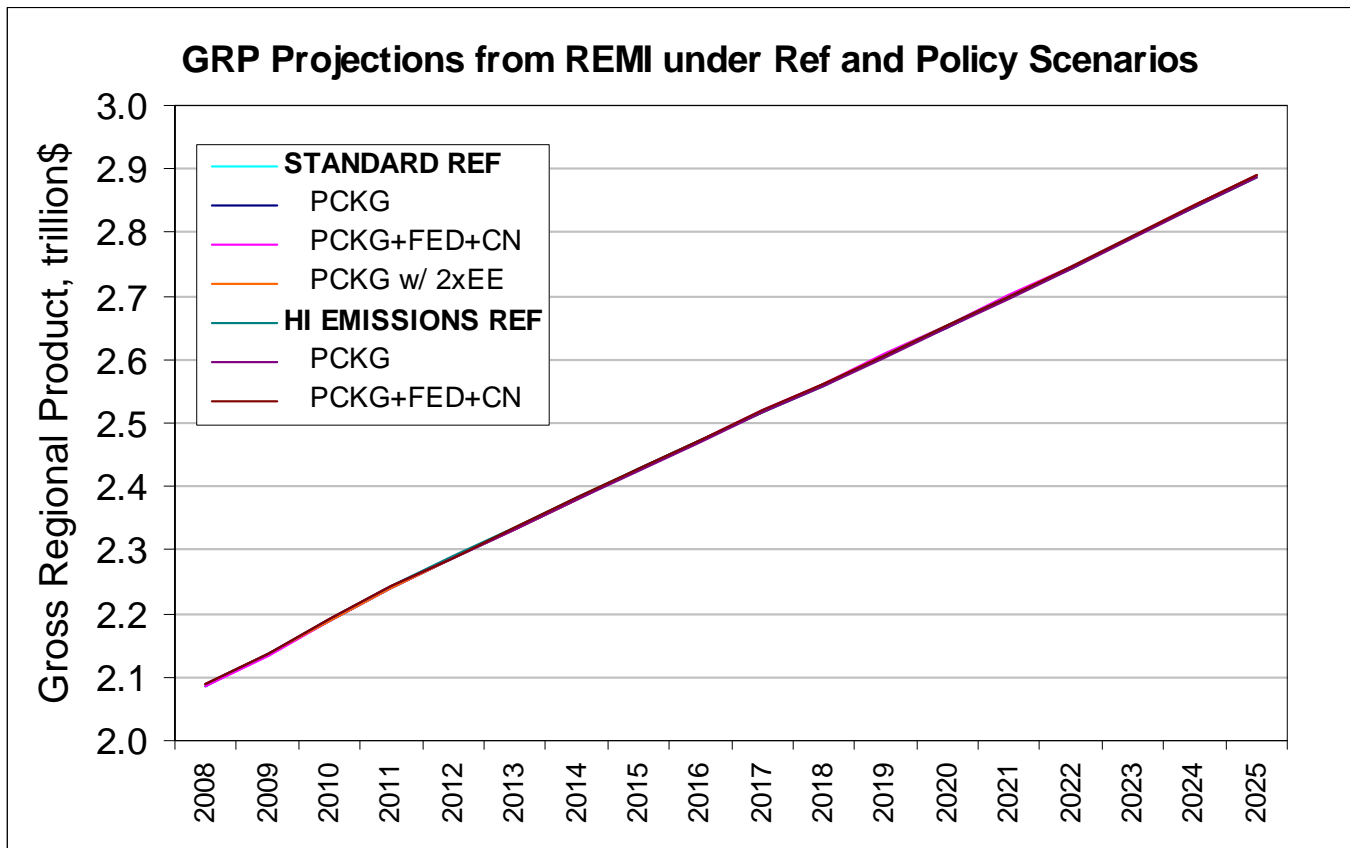
RGGI – Region Macro Impacts (%) *rel. Hi-* Emissions REF Run¹

Impacts on 9-State Region		2009	2015	2021
Package	Total GRP (Bil Fixed 96\$)	-0.01%	-0.05%	-0.07%
	Real Pers Inc (Bil Fixed 96\$)	-0.03%	-0.06%	-0.08%
	Private Sector Jobs	-0.01%	-0.04%	-0.05%
Package + CN-FED Policies	Total GRP (Bil Fixed 96\$)	-0.03%	0.05%	0.10%
	Real Pers Inc (Bil Fixed 96\$)	-0.05%	0.10%	0.15%
	Private Sector Jobs	-0.02%	0.08%	0.11%

Economic impacts of RGGI's PCKG + policy are small – roughly one-hundredth to one-tenth of 1 percent.

The reported impact is the *change* in the growth that would have otherwise occurred in the “do nothing” forecast.

RGGI – Region GRP Projections for REF and Policy Scenarios



Differences in regional Economic Growth are hard to discern between REF cases and RGGI Policies

Putting Impact Results in Context

- Forecasting models are validated by their ability to *reproduce* an outside of sample (known) value
- REMI's published* diagnostics (*MAPE's*) indicate the model's structure performs best (low cumulative errors) when predicting over long intervals rather than a few years (e.g. *avg. annual error* of 0.61% employment & 0.74% on GSP)
- All resulting REMI impacts represent solutions that *converged*.

* *IRSR Vol. 14 No. 3, MAPE = mean absolute percentage error*

RGGI Impact Results *Benchmarked*

- Based on EDR Group's experience with the REMI model these results aptly reflect the combined influence of (a) rising electric & natural gas prices; (b) investment stimulus for traditional, renewable & energy efficiency generation; and (c) savings for energy-users tied to energy efficiency adoption.
- Less than 100% of rising energy costs impact onto the bottom-line of C & I users – due to gradual substitution effects in the short-run
- Households incur 100% of their energy cost change against their budgets.

Upcoming Goal

- Develop Comprehensive Report on RGGI's Economic Impact Modeling