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# **Potential Cost Impacts of a Vermont Renewable Portfolio Standard**

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## Outline of Presentation

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- This presentation is a summary of the report, *Potential Cost Impacts of a Vermont Renewable Portfolio Standard*, prepared by Synapse for the Vermont Public Service Board, September 9, 2003.
- Methodology for the analysis.
- Assumptions used to estimate wholesale market prices.
- Assumptions used to estimate the cost and availability of renewables.
- Supply curve of renewables for the Vermont RPS
- Supply curve of renewables for the New England RPS market.
- Results: cost impacts of a Vermont RPS.

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## Overall Methodology

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- Estimate the wholesale market price in New England. This represents the revenues that renewable generators can get for the commodity portion of the electricity.
- Estimate the demand for renewables in VT and New England.
- Estimate the cost of building and operating renewable resources that are eligible for the VT RPS.
- Develop a supply curve of eligible renewable resources.
- Identify the mix and cost of renewables that would meet the RPS demand.
- The cost of the RPS is equal to the difference between the wholesale market price and the cost of the renewables.

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## Assumptions Regarding the Vermont RPS

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- Only new renewables will be eligible for the Vermont RPS.
- Renewable resources eligible for the VT RPS: wind, solar, landfill gas, hydro (<80 MW), and biomass (co-firing, expansion of existing facilities, dedicated biomass facilities).
- Renewable resources from New York and Canada are eligible. Assumes that there will be a satisfactory way to demonstrate compliance.
- Analyze three RPS targets:
  - Half percent per year, 2006-2015
  - One percent per year, 2006-2015
  - Two percent per year, 2006-2015

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## Demand for Renewables: Assumptions

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- Many of the renewable types are eligible in MA and CT RSP, as well as the VT RPS. Therefore, the market for these renewables types will be New England-wide.
- To determine the New England renewables demand, we add the RPS requirements of MA, CT, and VT. We also add an estimate of the demand for green power.
- We do not include the demand for the Maine RPS, because that allows existing renewables to be eligible, and there are enough existing to meet the entire RPS target.

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## Demand for Renewables: Results

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**Table 4.1 Renewable Energy Required By Three Illustrative Vermont RPS Targets (GWh)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Half Percent	30	60	91	124	157	191	226	262	299	336
One Percent	59	120	183	247	314	382	453	524	597	672
Two Percent	119	240	365	494	628	765	906	1,049	1,195	1,345

**Table 4.2 Renewable Energy Required to Meet New England Renewable Energy Demand (GWh)**

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
VT (One Percent)	59	120	183	247	314	382	453	524	597	672
Massachusetts	1389	1,689	1,999	2,318	2,942	3,585	4,246	4,915	5,601	6,304
Connecticut	644	1,142	1,655	2,016	2,387	2,425	2,462	2,493	2,526	2,558
Green Power	100	150	200	250	300	350	400	450	500	550
Total New England	2,193	3,101	4,036	4,831	5,943	6,442	7,560	8,383	9,224	10,085

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## Demand for Renewables: Vermont vs. New England

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- The VT RPS has a less restrictive eligibility definition than Massachusetts and Connecticut.
- VT-only renewables: small hydro, plus certain types of biomass (expansion of existing facilities, coal co-firing, anaerobic digestion).
- This creates a separate market for VT RECs for these renewable types.
- The VT-only renewables are expected to be plentiful and low-cost: enough to meet the entire VT RPS demand.
- We analyze the cost impacts if these VT-only renewables were to be excluded from the VT RPS.

## RPS Resource Eligibility in New England States

	Massachusetts	Connecticut Class I	Connecticut Class II	Vermont
Wind	✓	✓		✓
Solar PV	✓	✓		✓
Landfill Gas	✓	✓		✓
Biomass Gasification	✓		✓	✓
Biomass Co-Firing w/Coal			✓	✓
Biomass Co-Firing w/Natural Gas	✓		✓	✓
Biomass Direct Combustion		✓		✓
Inc. Capacity at Existing Biomass Plants			✓	✓
Manure Digestion			✓	✓
Waste to Energy			✓	
Fuel Cells	✓	✓		
New ROR Hydro <= 5 MW		✓	✓	✓
New Hydro <= 80 MW				✓
Hydro Upgrades and Repowering			✓	✓



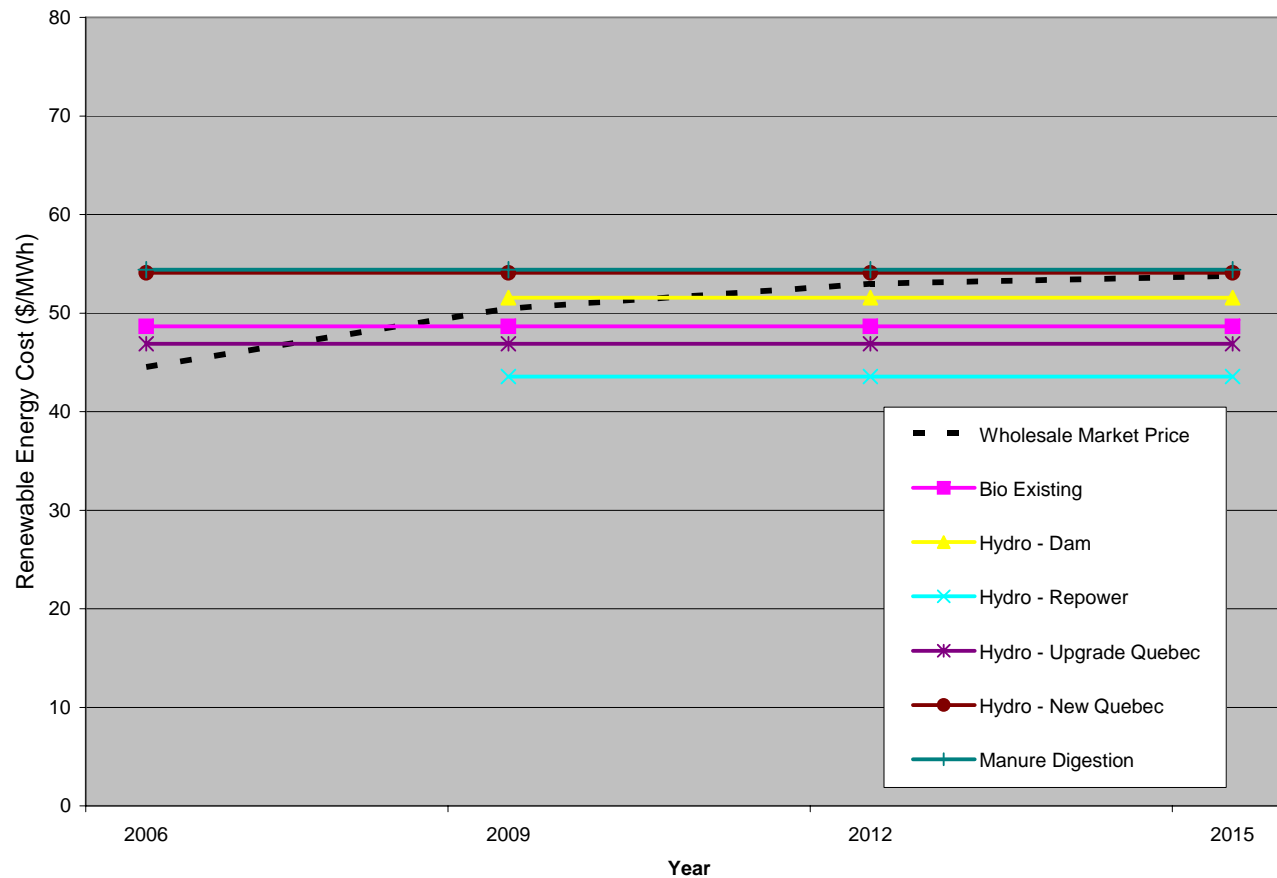
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## Wholesale Market Price Assumptions

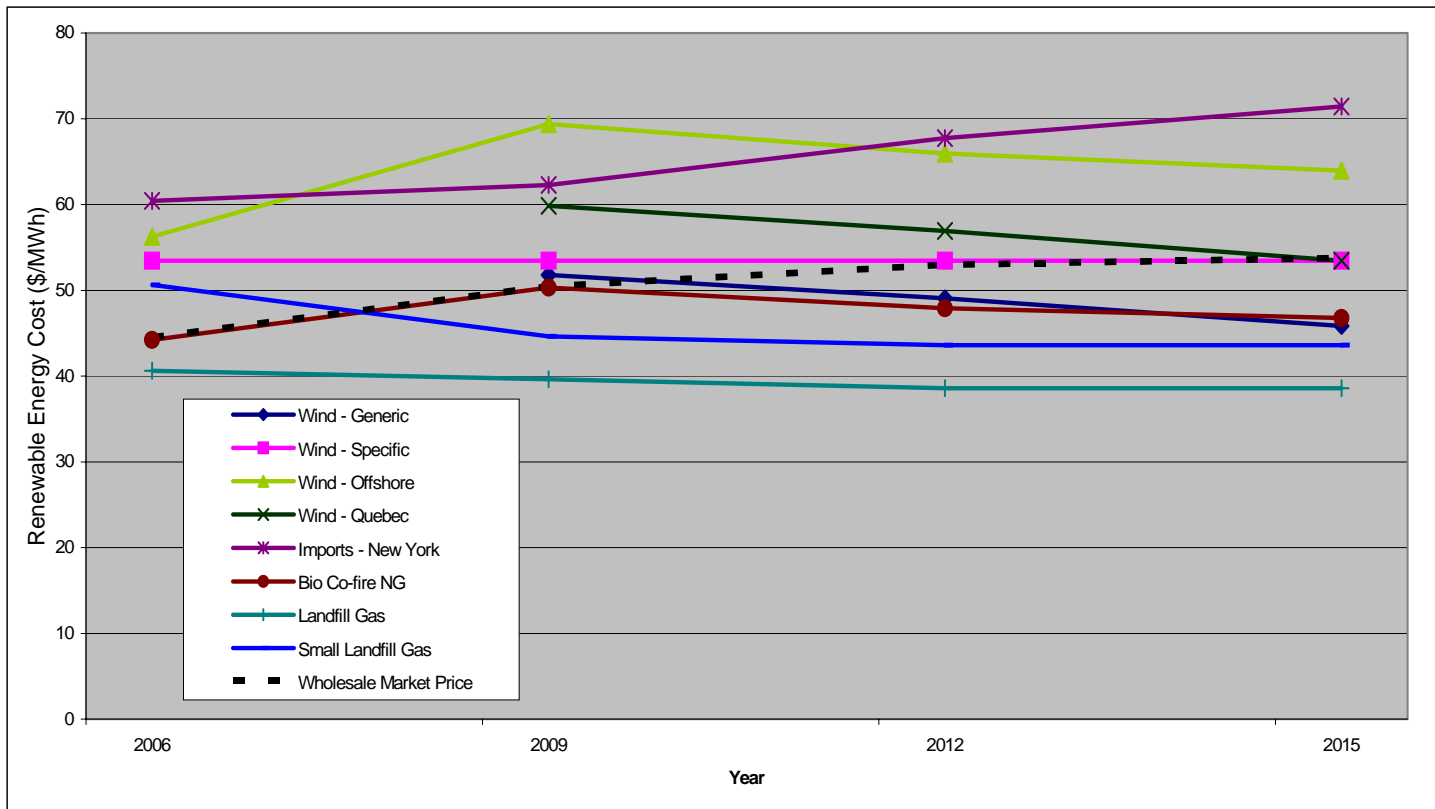
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- Estimate the 2004 market price using the futures market. Natsource data for the energy market: \$40.6/MWh.
- Assume that a generic new natural gas combined-cycle plant will need to be built in New England in 2010, and that this plant represents a proxy for the wholesale price in that year.
- Natural gas forecast: 2004-2009 based on NEMX futures for Henry Hub, adjusted for New England. Growth thereafter based on AEO 2003 forecast.
- Cost of new NGCC in 2010: \$52.4/MWh.
- Assume that market prices increase linearly from 2004 through 2010, with modest growth rate after 2010.

# Summary of Renewable Costs: Vermont-Only



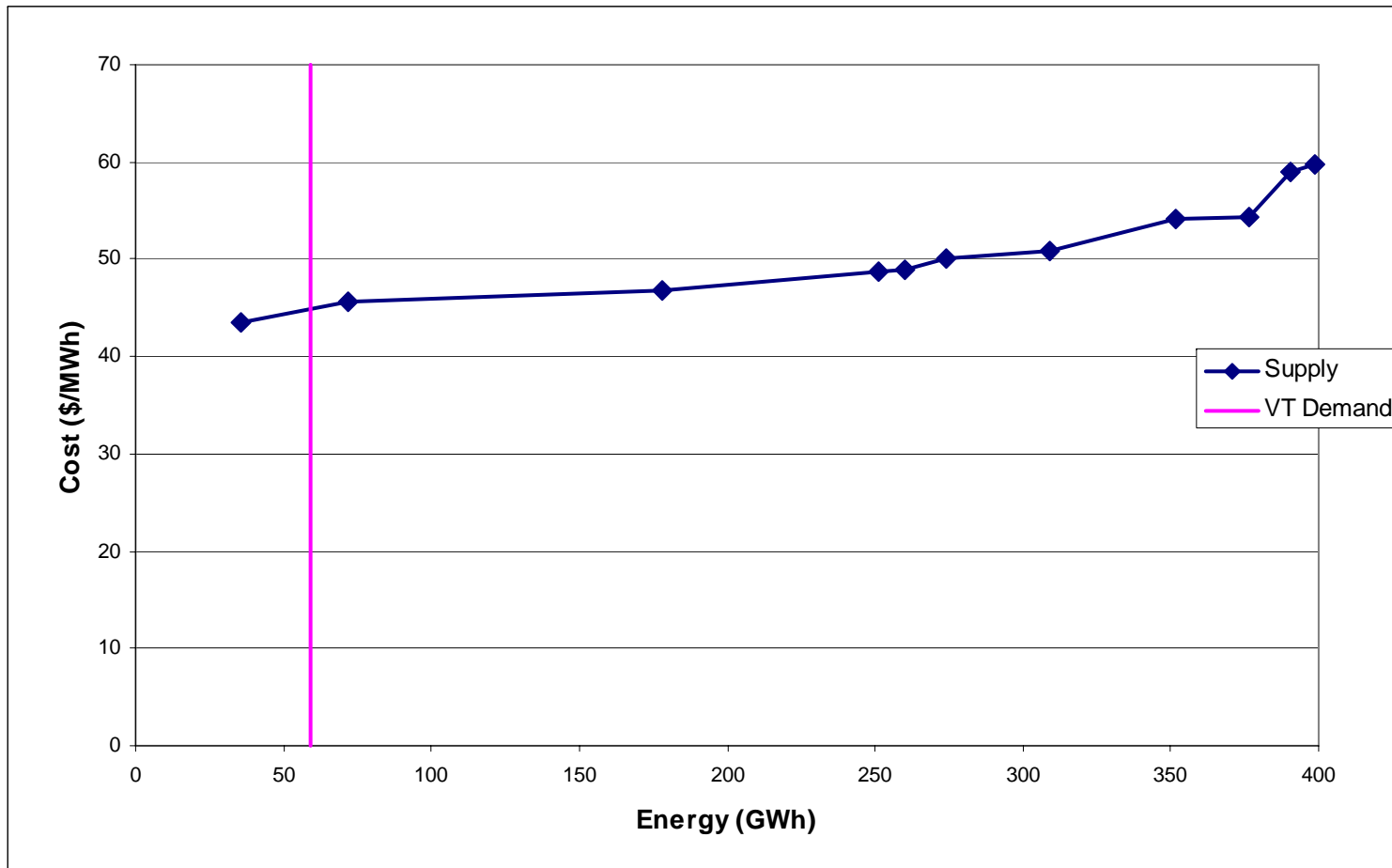
# Summary of Renewable Costs: New England RPS



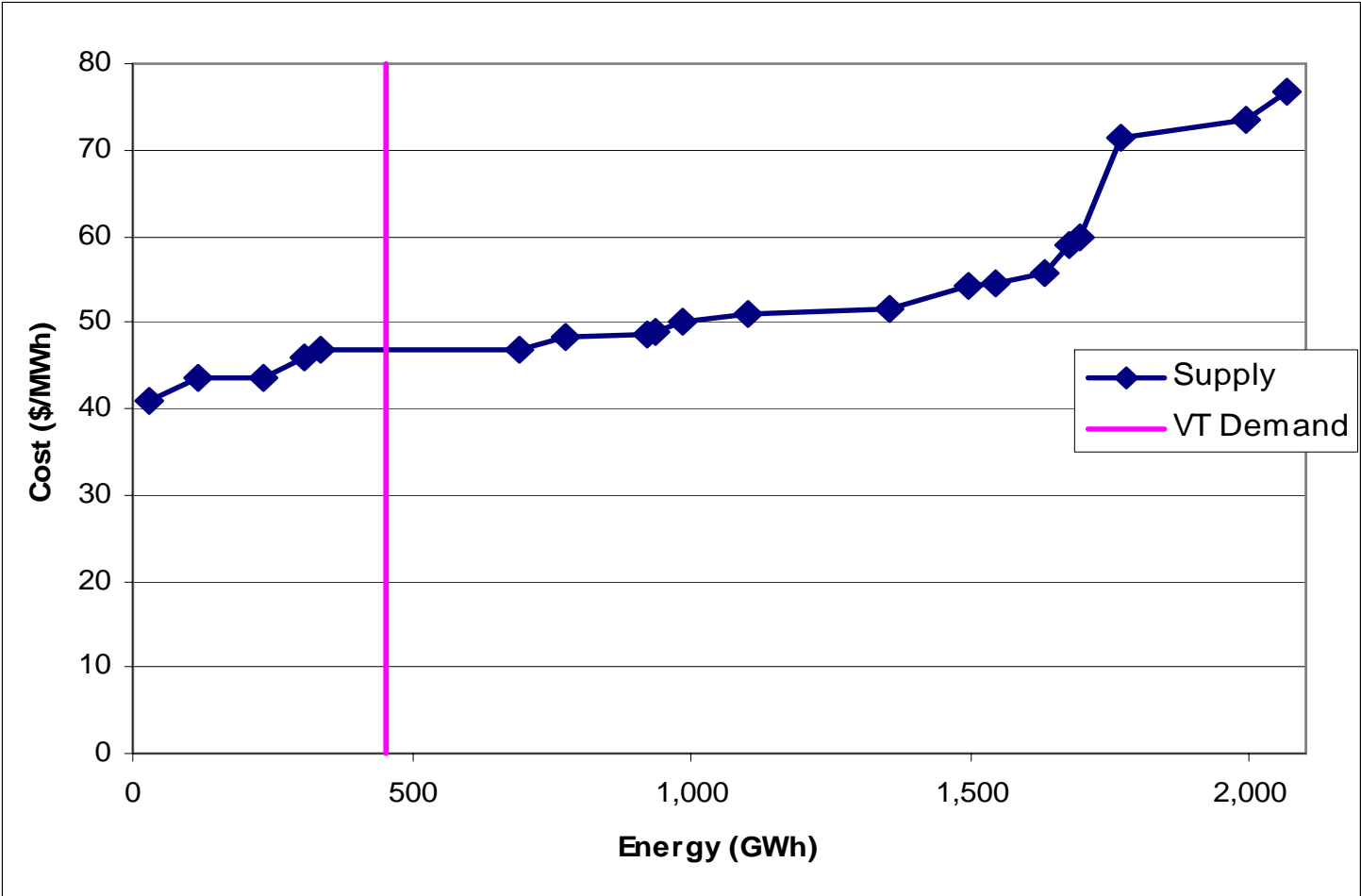
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## Vermont Renewable Supply Curve in 2006

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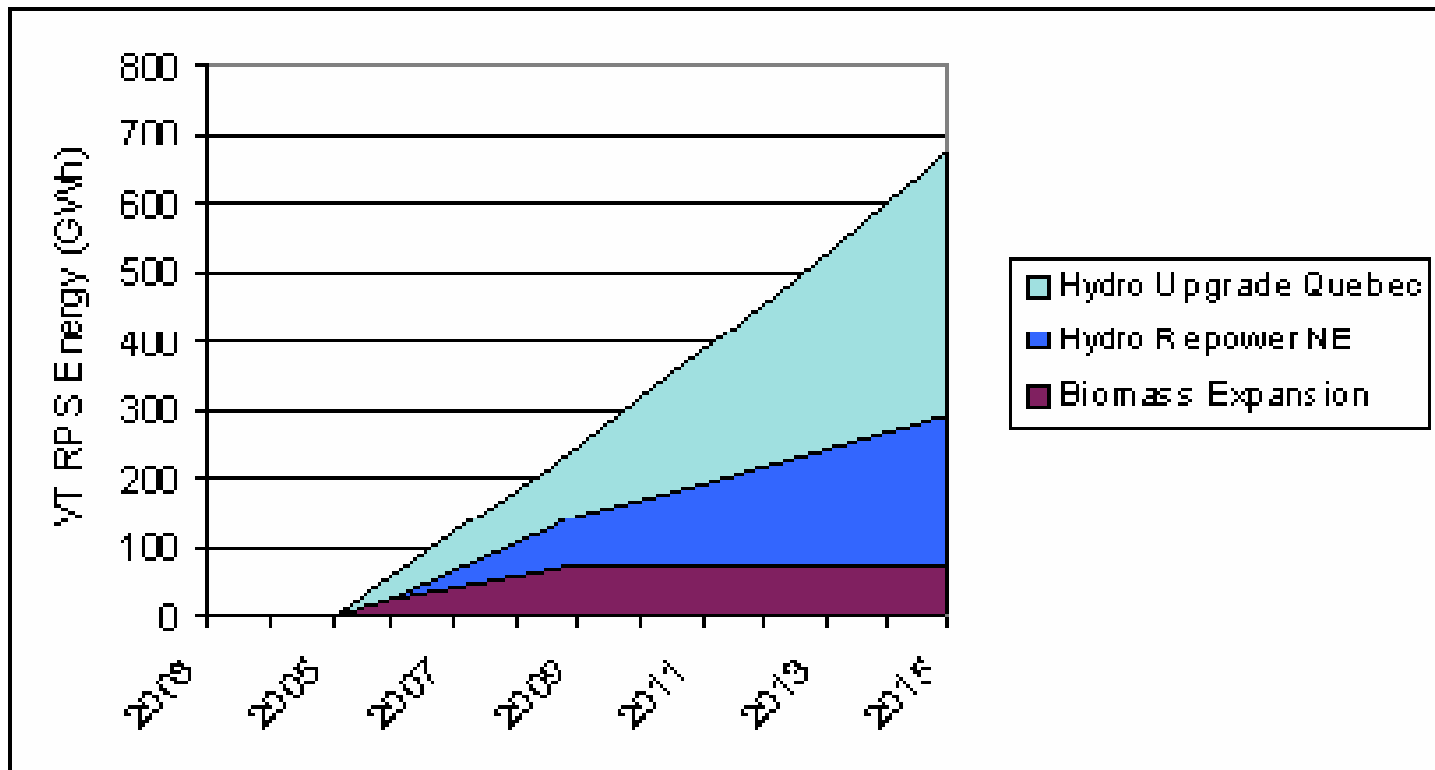
# Vermont Renewable Supply in 2012



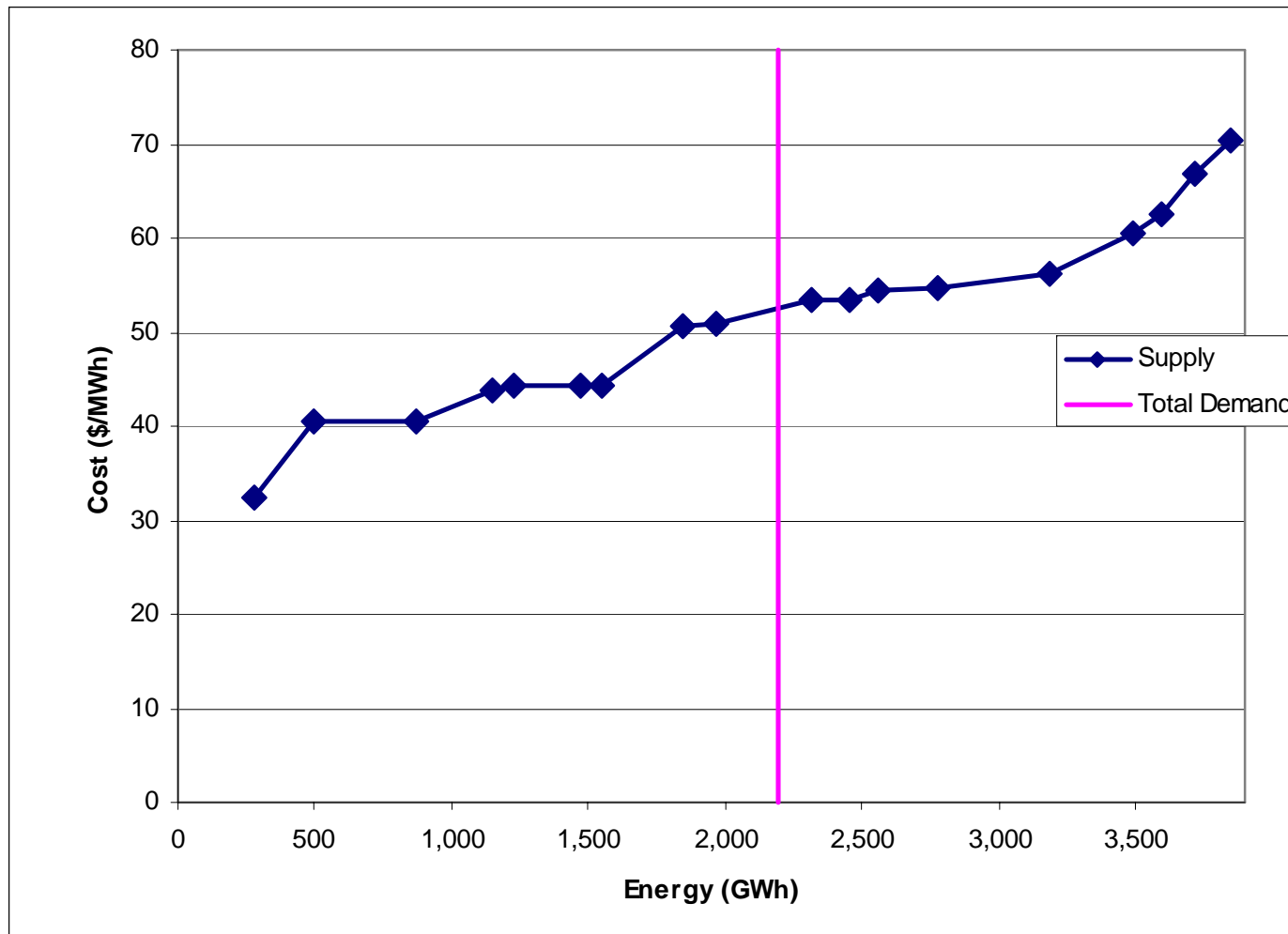
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## Mix of Renewables Supplying the Vermont RPS

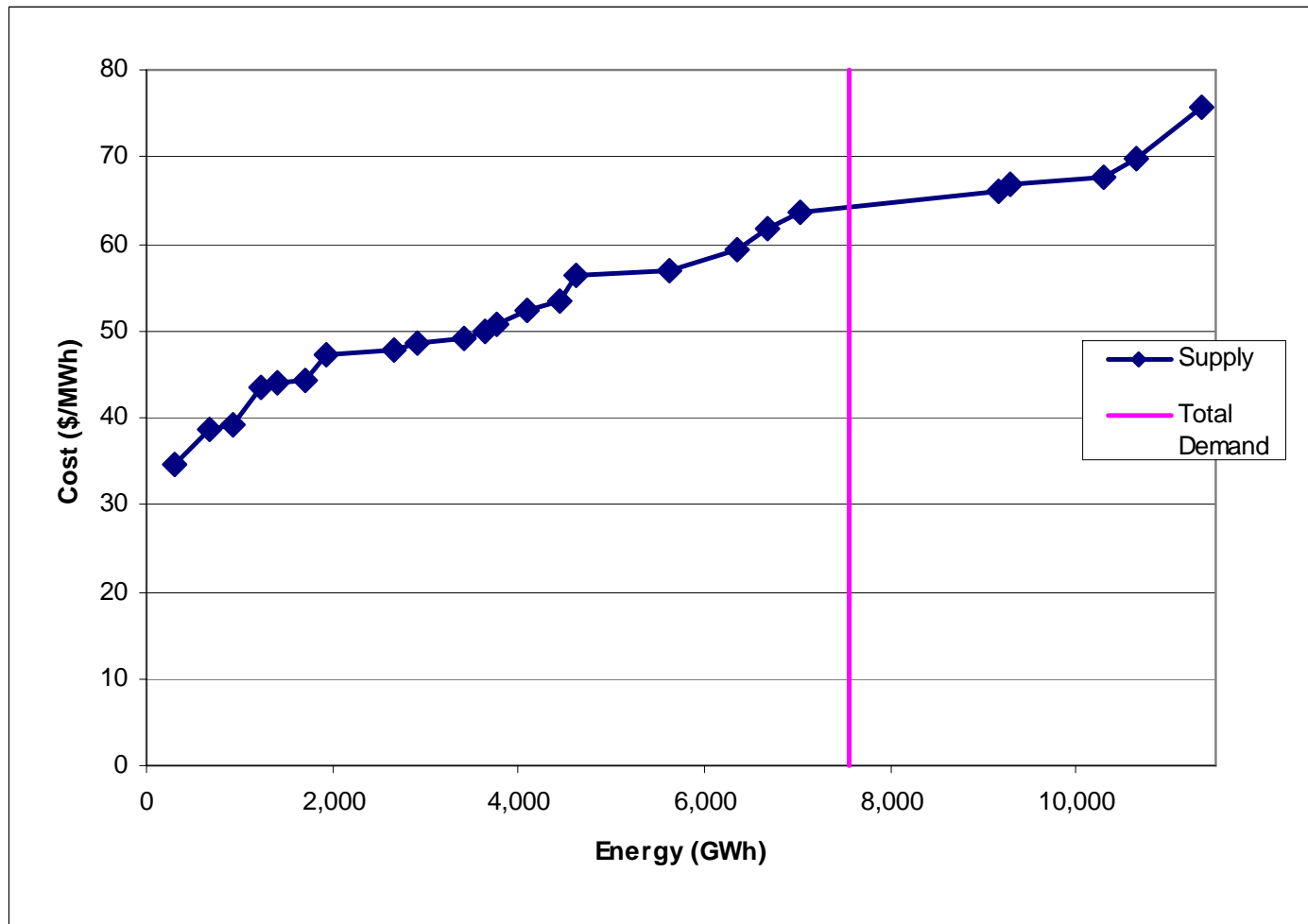
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# New England Renewable Supply in 2006

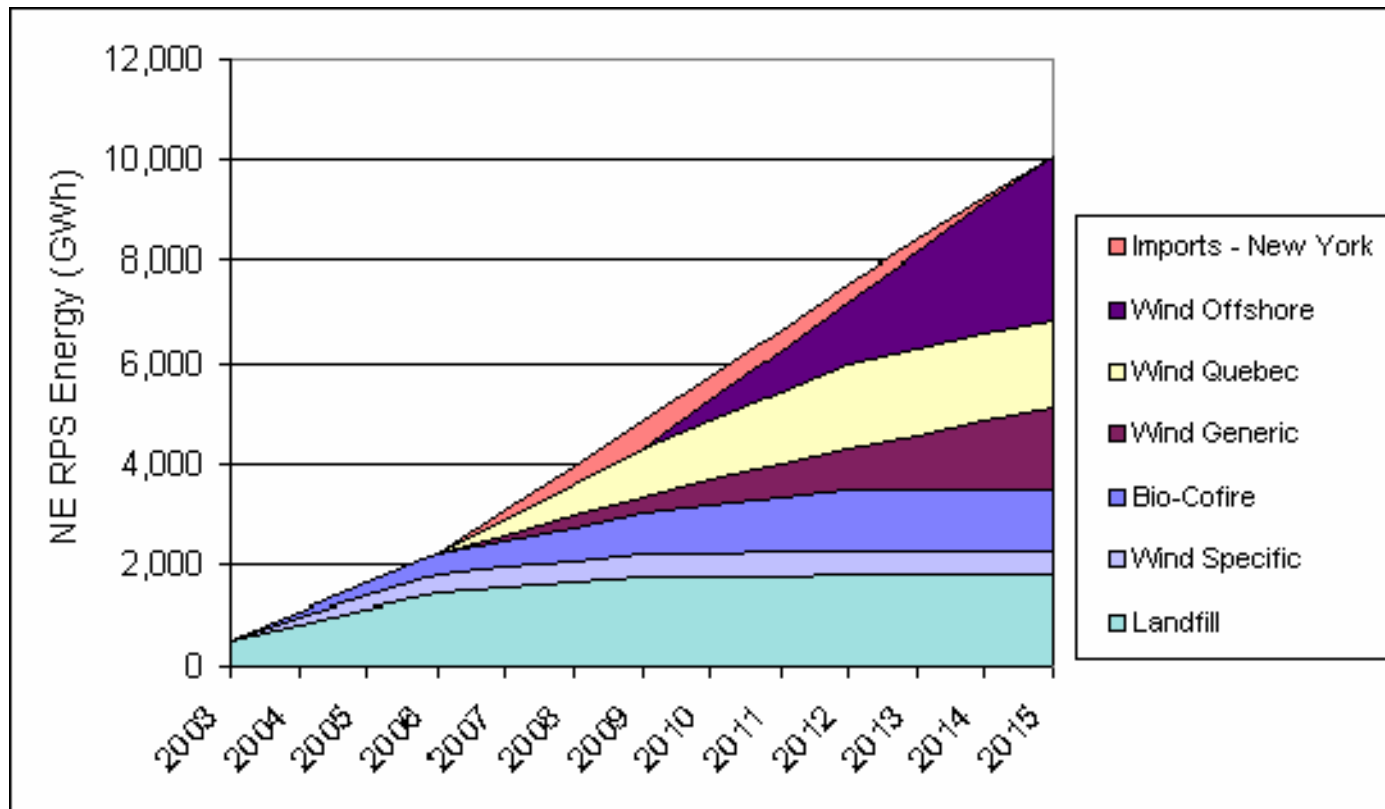


# New England Renewable Supply in 2012





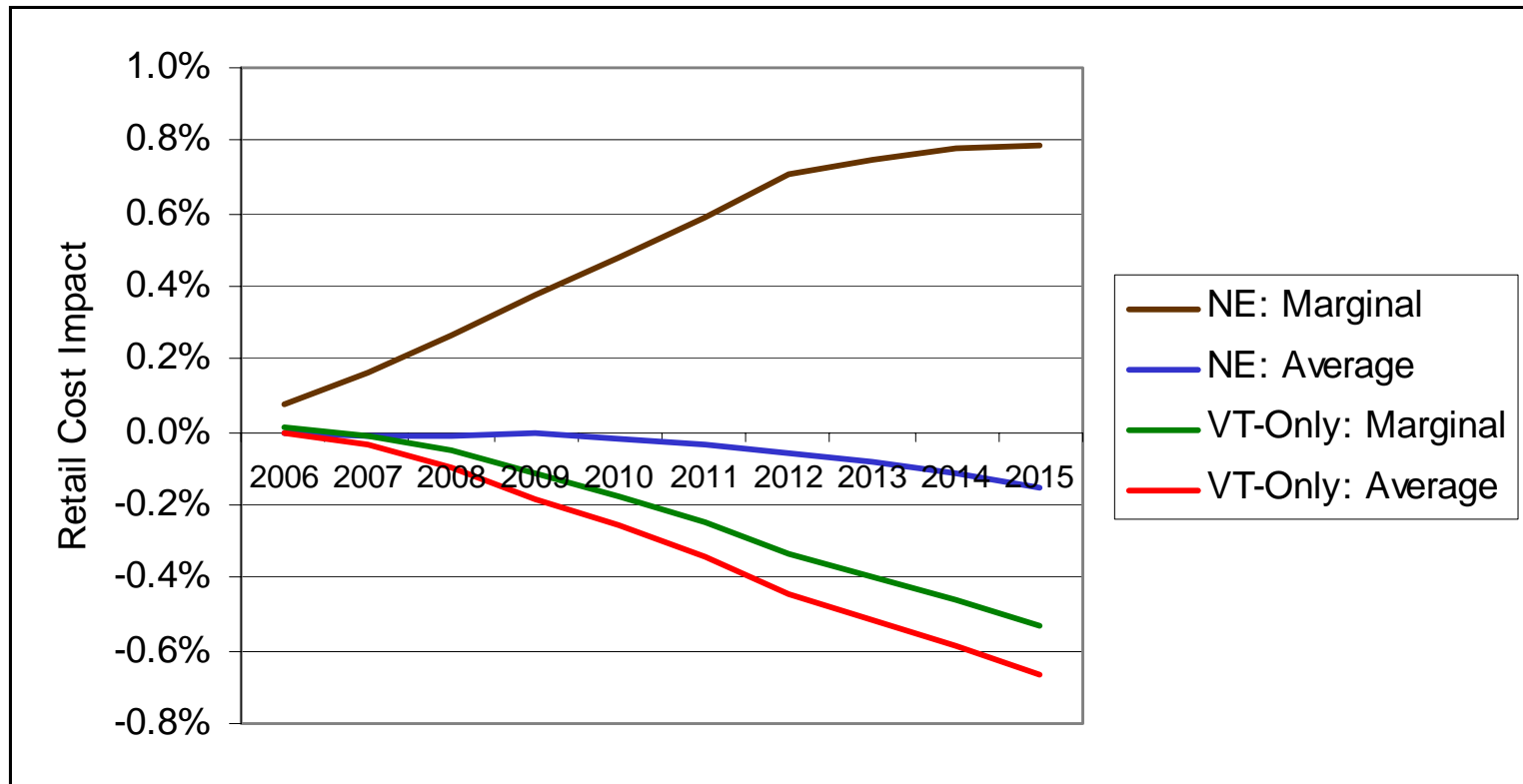
# Mix of Renewables Supplying the New England RPS



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## Results: VT RPS target of 1% per year

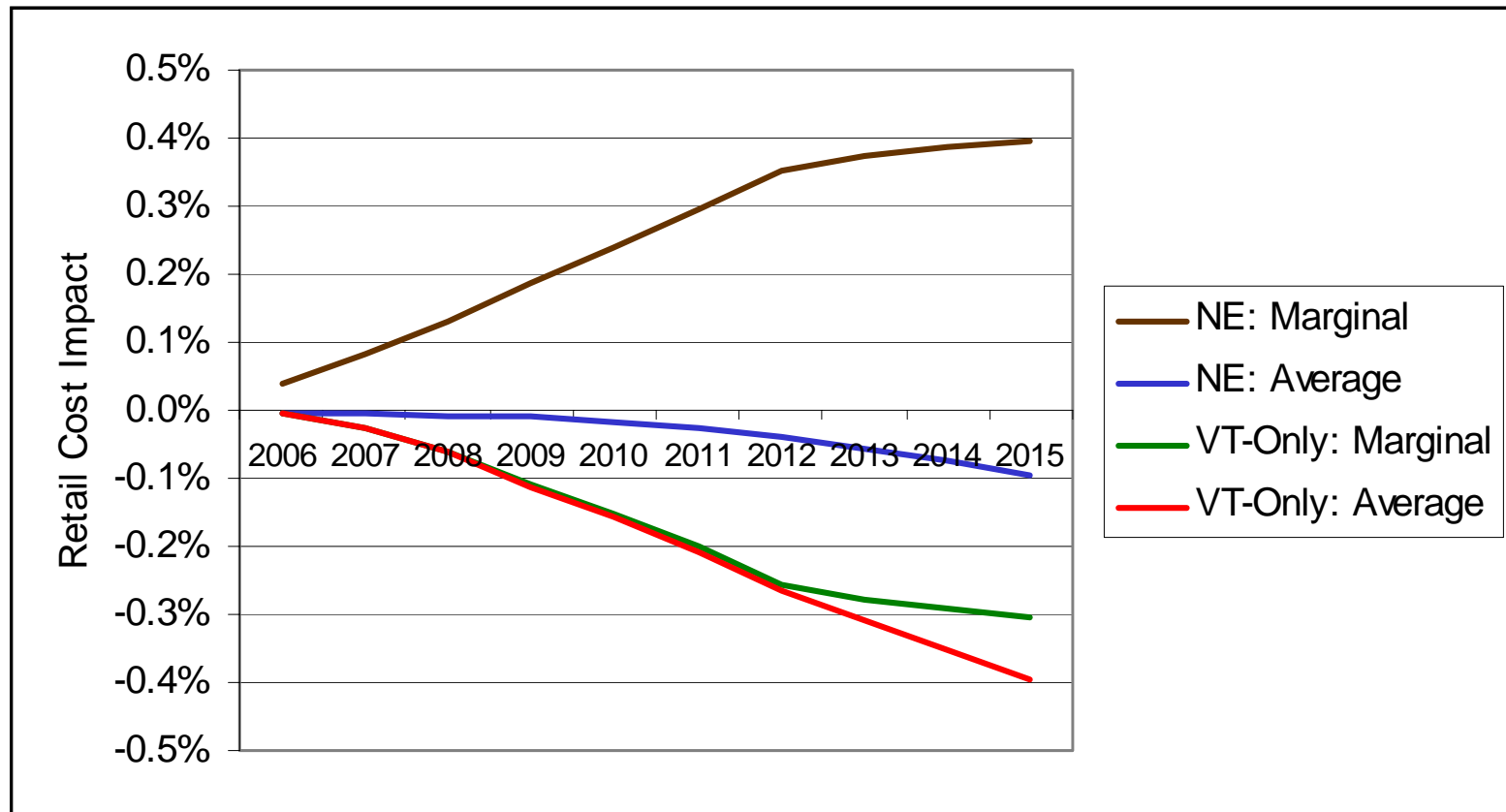
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## Results: VT RPS target of 0.5% per year

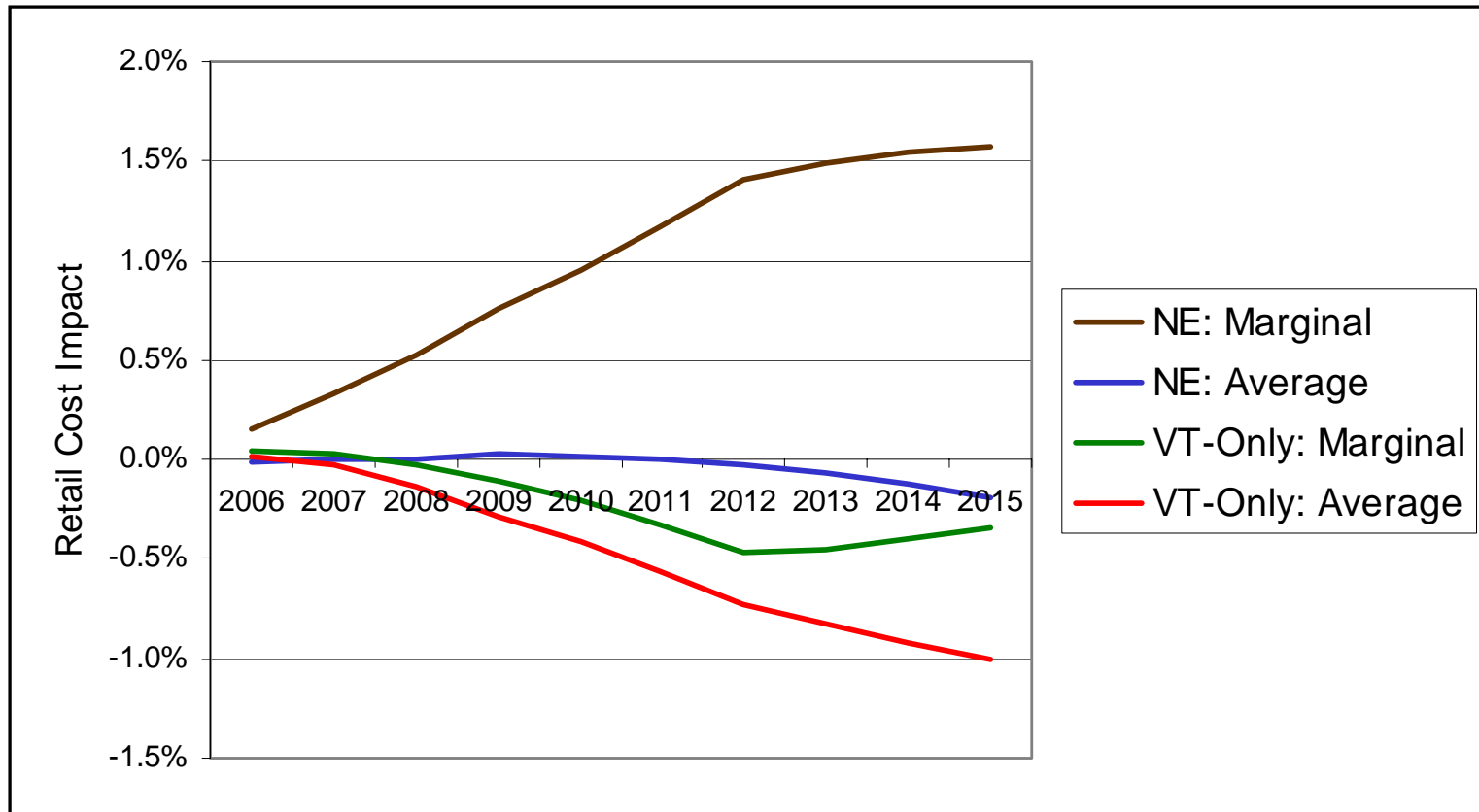
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## Results: VT RPS target of 2% per year

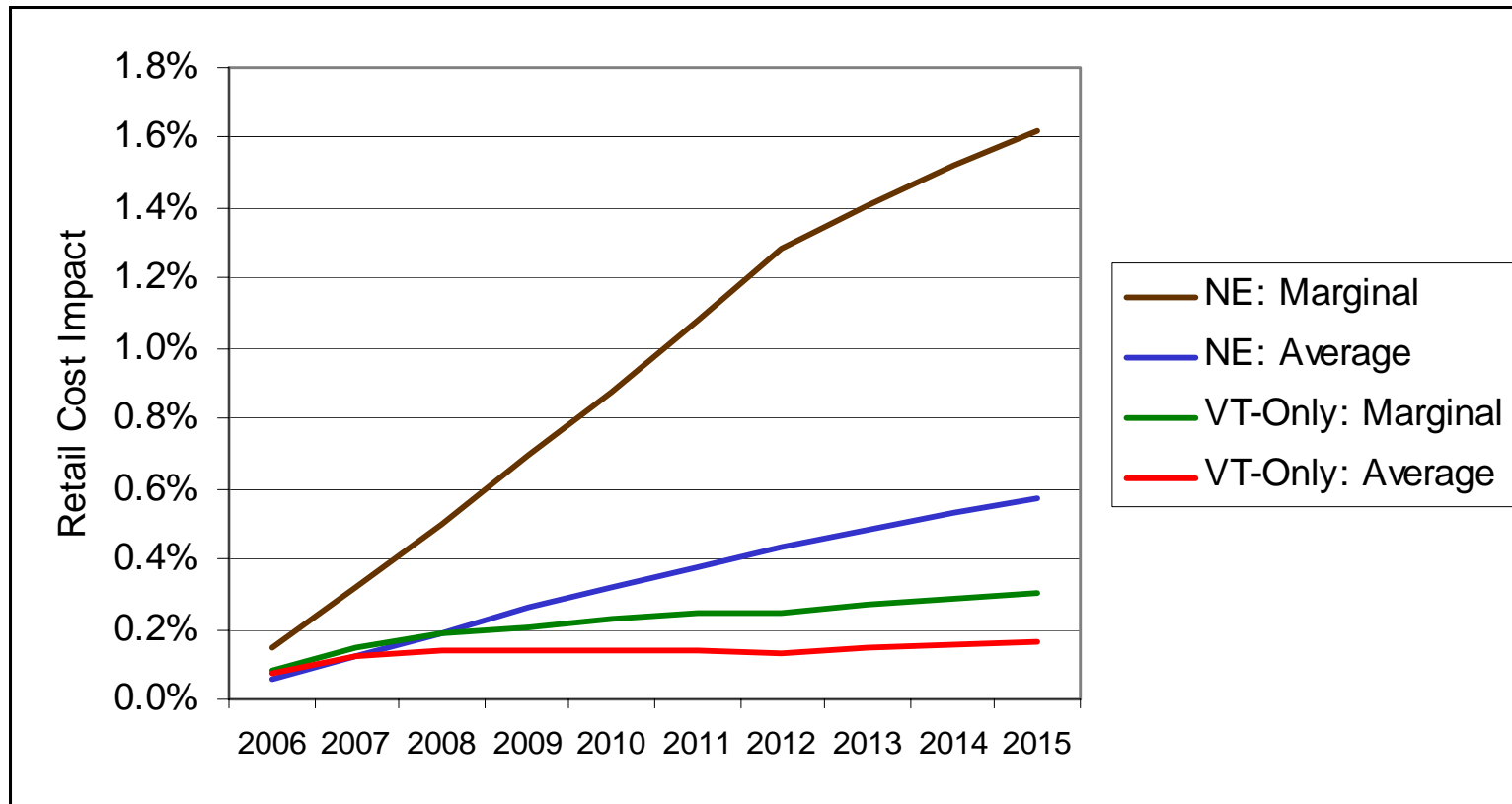
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## Results: VT RPS target 1%; Low Wholesale Prices

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## Results: VT RPS target 1%; High Wholesale Prices

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