

Energy Supply Technical Work Group

Summary List of Pending Priority Policy Options for Analysis

	Policy Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2008–2025 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total (2008–2025)			
ES-1	Generation Performance Standard						
	GPS affects unplanned capacity additions only	0.0	0.0	0.0	\$0	0.0	Pending
	<i>Sensitivity analysis - GPS affects all capacity additions</i>	4.7	4.8	61.8	-\$7,442	-120.4	Pending

Notes:

1. ES TWG recommendations in **bold** above.
2. Results are relative to the underlying assumption that electric expansion in MN proceeds with the recently legislated Conservation Improvement Program, Renewable Energy Standard and all planned additions including the Mesaba and Big Stone 2 stations.

ES-1: Generation Performance Standard

Policy Description

A generation performance standard (GPS) is a mandate that requires those entities that deliver electricity (load-serving entities [LSEs]) to acquire electricity, or power plant developers to build and operate new base load generation, with a per-unit emission rate below a specified mandatory standard.

Policy Design

Goals: The general goal of the policy is to prevent utilities from making long-term investments in high-carbon generation technology. In particular, the generation performance standard would prevent utilities from making a long-term financial commitment to base load generation plants with CO₂ emissions in excess of 1,100 pounds of CO₂ per megawatt-hour.

A long-term financial commitment would be defined to include either a new ownership investment in base load generation or a new contract with a term of five or more years, which includes procurement of base load generation. The TWG would like CCS to analyze the impact of two different approaches regarding the renewal of contracts procuring base load power from existing units—one approach that includes such contracts (if they are for five or more years) and one that excludes them.

The GPS would be designed to harmonize with policies that seek to reduce greenhouse gas (GHG) emissions by promoting greater use of biomass and combined heat and power (CHP). For purposes of compliance with the GPS, the CO₂ emissions attributed to biomass energy would be net emissions based on a full fuel-cycle analysis. For base load projects that are part of a CHP project, the GPS would be raised to 1300 pounds of CO₂/MWh.

Timing: Two alternative onset dates for the GPS— a) an immediate onset date that would apply to all base load projects not already in operation, and b) a delayed onset date that would exclude base load facilities currently under consideration in proceedings before the Public Utilities Commission. The ongoing need for a GPS would be reviewed after the implementation of a cap-and-trade system.

Parties Involved: The program would apply to any state LSE making long-term financial commitments to base load power.

Implementation Mechanisms

Implementation would be through the Public Utilities Commission, which would review all long-term financial commitments to base load generation made by Minnesota utilities to ensure compliance with the generation performance standard.

Related Policies/Programs in Place

None.

Type(s) of GHG Reductions

Reduces carbon dioxide emissions from fossil-fuel electric generators, and promotes low carbon alternatives to fossil fuel generators.

Estimated GHG Reductions and Net Costs or Cost Savings

Data Sources: The following data sources were used in the analysis of this mitigation option:

- Energy Information Administration, “Assumptions to the Annual Energy Outlook 2007, DOE/EIA-0554, April 2007, available at: <http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/electricity.pdf>
- National Energy Technology Laboratory, “Cost and Performance Baseline for Fossil Energy Plants, DOE/NETL-2007/1281, August 2007, available at: http://www.netl.doe.gov/energy-analyses/pubs/Bituminous%20Baseline_Final%20Report.pdf
- Plant-specific Minnesota capacity addition data are based on Form EIA-906, available at: http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html

Quantification Methods:

This option is a mandate requiring those entities that deliver electricity to acquire electricity, or power plant developers to build and operate new base load generation, with a per-unit emission rate below a specified mandatory standard (1,110 pounds of CO₂ per MWh for power stations; 1,300 lbs of CO₂ per MWh for combined heat and power (CHP) stations). The TWG has made the following key assumptions for the analysis of this option, as follows:

- The start year for the option is 2013.
- Two cases were analyzed:
 - *The GPS only affects new unplanned capacity.* This refers to part “b” under the Timing subsection of the Policy Design section above.
 - *The GPS affects all new capacity, planned and unplanned.* This refers to part “a” under the Timing subsection of the Policy Design section above.
- The need for replacement power to replace generation from capacity affected by the GPS should be subjected to an assessment of whether such power is needed, given projected MN electricity sales demand. If needed, replacement power comes from out-of-state with a mix of 75% natural gas-fired and the balance from wind.

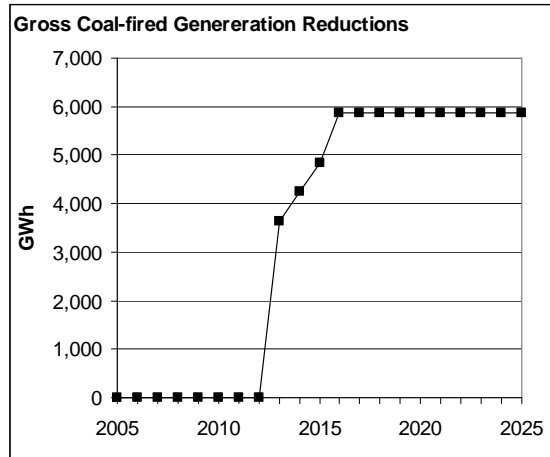
Case 1: The GPS only affects new unplanned capacity

In this case, there are no GHG reduction benefits from the implementation of the GPS in MN as there are no unplanned capacity additions that exceed the emission intensity threshold.

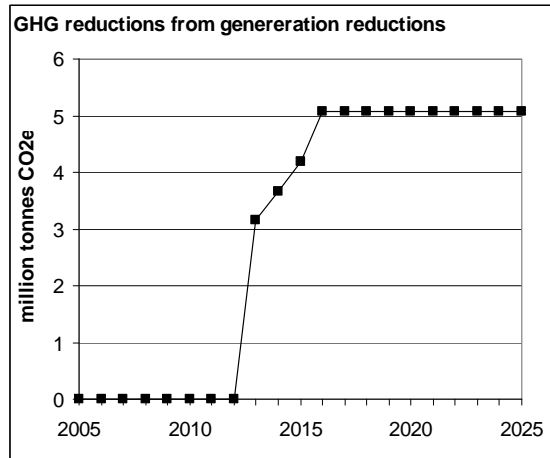
Case 2: The GPS affects all new capacity, planned and unplanned

The application of the GPS leads to the elimination of new planned coal capacity in MN. No replacement power needed due to the fact that electricity demand can be met by the combination of existing MN generation and forecasted levels of imports.

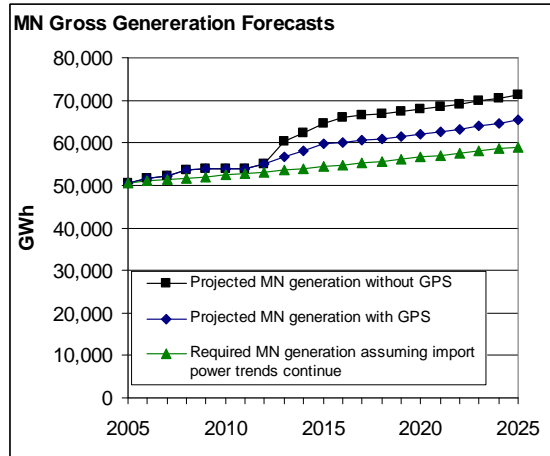
The impact of the option generation is summarized in the chart below. The curve represents the total annual reductions associated with the elimination of new planned coal-fired generation for MN.



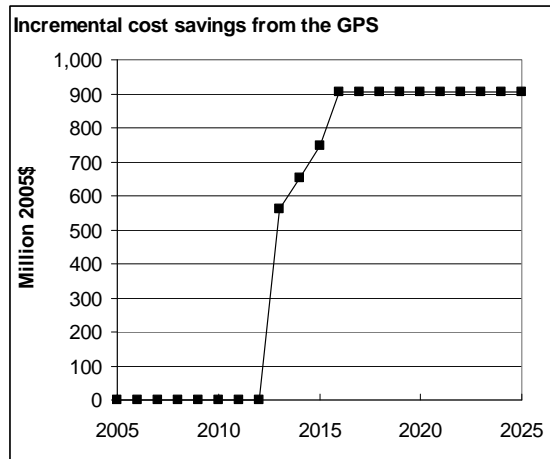
Regarding CO₂-equivalent (CO₂e) emission reductions, the impact of the option is summarized in the chart below. The curve represents the annual CO₂e reductions associated with the elimination of new planned coal-fired generation. The annual emission reductions in 2015 and 2025 are 4.1 and 5.1 million tonnes CO₂e, respectively. The cumulative emission reductions over the 2013-2025 period are 61.8 million tonnes CO₂e.



Regarding the need for replacement power, the impact of the option is summarized in the chart below. The middle curve is the projected gross generation in MN after the implementation of the GPS. The lower curve is the “required” MN gross generation under the assumption that the share of imported power to total power evident in 2005 continues through the end of the forecast period. As projected gross generation in MN after implementation of the GPS always exceed “required” MN gross generation, no replacement power is needed.



Regarding costs, there are capital, transmission, variable O&M, fixed O&M and fuel savings associated with the planned capacity additions that would be built were the GPS not in effect. The levelized capital costs for a pulverized coal and integrated gasification combined cycle (IGCC) station coming online in 2005 were assumed to be \$69/MWh and \$84/MWh, and were escalated by a factor of 1.29 to account for real escalation assumptions. The annual product of real levelized costs and displaced generation is an estimate of the annual cost savings. This is summarized in the chart below. The net present value of these annual costs are -\$7.4 billion over the 2013-2025 period (2005\$).



Regarding cost effectiveness, it was calculated as the quotient of the NPV and cumulative GHG emission reductions, -\$120/tCO₂e (2005\$) (i.e., -7.4 billion divided by 61.8 million tonnes and multiplied by a conversion factor of 1,000).

Key Assumptions: See Annex 2

Key Uncertainties

The GPS would expand PUC oversight to certain transactions or projects not currently subject to PUC review under the Certificate of Need or other laws, but only for the purpose of screening those transactions or projects for compliance with the GPS. It is uncertain how many additional projects would be subject to PUC approval. It is expected that the GPS approval process would be far more streamlined than the typical Certificate of Need review process.

Other uncertainties noted by the Technical Working Group include a) the need to consider whether a GPS is necessary if the state enacts a cap-and-trade program covering electric generation; b) whether the 1,300 pounds per megawatt hour threshold is set at the right level to encourage efficient CHP installations; c) whether natural gas peaker units could reasonably be included in the policy in addition to base load generation; and d) whether offsets would be allowed for compliance flexibility.

Additional Benefits and Costs

Reduced air pollution

Feasibility Issues

The feasibility of a GPS would need to be examined if the state enacts a cap-and-trade program covering electric generation.

Status of Group Approval

The ES TWG recommends, by majority vote, that the application of the GPS exempt all planned capacity additions that are already at some stage of the regulatory process in MN.

Level of Group Support

The ES TWG support is unanimous in its support for the option, differing only in its appropriate coverage.

Barriers to Consensus

TBD – [blank until final vote by the MCCAG]

Annex 2: Key Assumptions

ES-1. Generation Performance Standard

Start year for GPS

2013

CO2e emission intensity threshold assumptions

	lbs CO2 per MWh	tonnes CO2e/MWh
MN power stations	1,100	0.50
contracts with out-of-state power stations	1,100	0.50
MN CHP stations	1,300	0.59
contracts with out-of-state CHP stations	1,300	0.59

Effect of the GPS on planned additions in MN that are already in the pipeline

1

- 1 GPS has **no** effect on MN planned capacity already in the pipeline (default)
- 2 GPS **affects** MN planned capacity already in the pipeline

Effect of the GPS on imports that are already in the pipeline

1

- 1 GPS has **no** effect on out-of-state imports already in the pipeline (default)
- 2 GPS **affects** out-of-state imports already in the pipeline

Replacement power from new utility/NUG capacity in MN to meet GPS (if needed)

1

- 1 75% natural gas CC; 25% wind (default)
- 2 user-defined

Replacement power from new CHP capacity in MN to meet GPS (if needed)

1

- 1 100% natural gas CC (default)
- 2 user-defined

Sensitivities for replacement power from imports from out-of-state utilities/NUGs to meet GPS (if needed)

2

- 1 100% natural gas CC
- 2 user-defined (default)

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Resource		Percent
Coal	insert value >>>	0%
Hydroelectric	insert value >>>	0%
Natural Gas CT	insert value >>>	0%
Natural Gas CC	insert value >>>	75%
Nuclear	insert value >>>	0%
Other	insert value >>>	0%
Other Gas	insert value >>>	0%
Geothermal	insert value >>>	0%
MSW	insert value >>>	0%
Landfill Gas	insert value >>>	0%
Biomass	insert value >>>	0%
Solar	insert value >>>	0%
Wind	insert value >>>	25%
Petroleum	insert value >>>	0%
Pumped Storage	insert value >>>	0%
Total		100%

Levelized cost raw inputs (2005\$/MWh)

	Capacity	Transmission	Fixed O&M	Variable O&M	Fuel	Total
Pulverized coal	68.8	2.3	5.9	8.5	23.1	108.7
IGCC	84.2	2.5	8.8	11.4	22.6	129.5

Natural gas fuel price projection

midpoint between the SAIC and high LBL projection