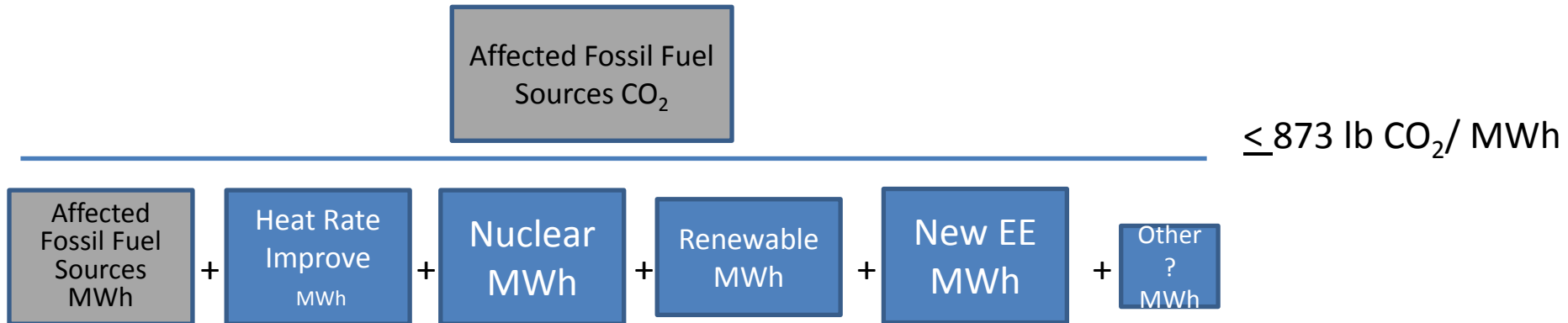


# Where Minnesota stands on 111(d): Estimating MWh and CO<sub>2</sub> shortfalls

August 11, 2014

# EPA Compliance Equation



Solve the inequality by:

- subtracting tons of CO<sub>2</sub> from the numerator and/or
- adding MWh of zero-emitting, eligible, electricity generation to the denominator

# Assumptions for MPCA Analysis

- Analyzes EPA's final targets, but uses projections through 2025
  - 2030 projections will be incorporated later this month
- Uses affected-unit data
- Alternate target calculations assume EPA would accept MPCA's corrections to baseline data
- Fossil unit CO<sub>2</sub> and MWh are for affected units only, but all other calculations are statewide

# Calculations for Compliance Scenarios

	Scenario 1: No baseline corrections; no hydro; no out-of-state RE	Scenario 2: No baseline corrections; no hydro; out-of state RE
Million tons CO <sub>2</sub> @ 2025	34.58	35.58
<b>Emissions rate target (lbs/MWh)</b>	<b>873</b>	<b>873</b>
Needed denominator (million MWh)		
coal, natural gas units	36.05	36.05
heat rate improvements (2% coal ST)	0.58	0.58
in-state renewable energy (RE)	16.32	16.32
in-state nuclear	0.84	0.84
new energy efficiency savings	9.39	9.39
out-of-state non-hydro RE	-	2.78
new Manitoba hydro (MHEB-MP)	-	-
other	-	-
<b>Deficit (million MWh)</b>	<b>16.03</b>	<b>13.26</b>
Deficit as % of forecasted net generation plus credited out-of-state generation:	0.25	0.20
Needed CO <sub>2</sub> level at given denominator (million tons)	27.58	28.79
<b>Difference between forecast and target: CO<sub>2</sub> mass (million tons) reduction needed</b>	<b>7.00</b>	<b>5.79</b>
<b>Difference as % of forecasted: Percentage CO<sub>2</sub> reduction needed</b>	<b>0.20</b>	<b>0.17</b>

# MN Compliance Scenario 1:

No baseline corrections; No hydro; No out-of-state RE

Emission rate target level	873 lbs/MWh
Generation deficit	-16.03 million MWh
% Generation deficit from currently planned	-25%
CO <sub>2</sub> mass reduction needed	-7.00 million tons
% CO <sub>2</sub> reduction needed	-20%

## MN Compliance Scenario 2:

No baseline corrections; No hydro; Includes out-of-state RE

Emission rate target level	873 lbs/MWh
Generation deficit	-13.26 million MWh
% Generation deficit from currently planned	-20%
CO <sub>2</sub> mass reduction needed	-5.79 million tons
% CO <sub>2</sub> reduction needed	-17%

# MN Compliance Scenario 3: No baseline corrections; No hydro; Includes out-of-state RE; Incorporates net EE gain after retirements

Emission rate target level	873 lbs/MWh
Generation deficit	-17.53 million MWh
% Generation deficit from currently planned	-26%
CO <sub>2</sub> mass reduction needed	-7.65 million tons
% CO <sub>2</sub> reduction needed	-22%

# MN Compliance Scenario 4: Partial baseline correction; No hydro; Includes out-of state RE

Emission rate target level	1,000 lbs/MWh
Generation deficit	-3.20 million MWh
% Generation deficit from currently planned	-5%
CO <sub>2</sub> mass reduction needed	-1.60 million tons
% CO <sub>2</sub> reduction needed	-5%



# MN Compliance Scenario 5: Partial baseline correction; Includes out-of-state RE; Incorporates 250MW new MHEB hydro

Emission rate target level	1,000 lbs/MWh
Generation deficit	-1.61million MWh
% Generation deficit from currently planned	-2%
CO <sub>2</sub> mass reduction needed	-0.81 million tons
% CO <sub>2</sub> reduction needed	-2%

# MN Compliance Scenario 6: Target level set with EPA's alternative RE goal; Full baseline correction; No hydro; Includes out-of-state RE

Emission rate target level	871 lbs/MWh
Generation deficit	-13.44 million MWh
% Generation deficit from currently planned	-20%
CO <sub>2</sub> mass reduction needed	-5.85 million tons
% CO <sub>2</sub> reduction needed	-17%

# MN Compliance Scenarios - Summary

	Scenario 1: No baseline corrections; no hydro; no out-of-state RE	Scenario 2: No baseline corrections; no hydro; out-of-state RE	Scenario 3: No baseline corrections; no hydro; out-of-state RE; net EE gain after retirements	Scenario 4: Partial baseline correction; no hydro; out-of-state RE	Scenario 5: Partial baseline correction; out-of-state RE; 250MW new MHEB hydro	Scenario 6: Alt RE goal; full baseline correction; no hydro; out-of-state RE
Emission rate target level (lbs/MWh)	873	873	873	1,000	1,000	871
Generation deficit (million MWh)	-16.03	-13.26	-17.53	-3.20	-1.61	-13.44
% Generation deficit from currently planned	-25%	-20%	-26%	-5%	-2%	-20%
CO <sub>2</sub> mass reduction needed (million tons)	-7.00	-5.79	-7.65	-1.60	-0.81	-5.85
% CO <sub>2</sub> reduction needed	-20%	-17%	-22%	-5%	-2%	-17%

# Sources of 2025 Parameter Estimates

Fossil CO <sub>2</sub> (tons) for all EGUs	MN ICM*
Fossil generation (MWh)	MN ICM
Nuclear generation (MWh)	Given
In-state RE generation (MWh)	MN ICM forecast
EERS savings (MWh)	MN ICM forecast
Heat rate improvement	MN ICM forecast
Out-of-state RE (MWh): non-hydro RECs	MN ICM forecast

\*Minnesota Integrated Ciorowski Model