



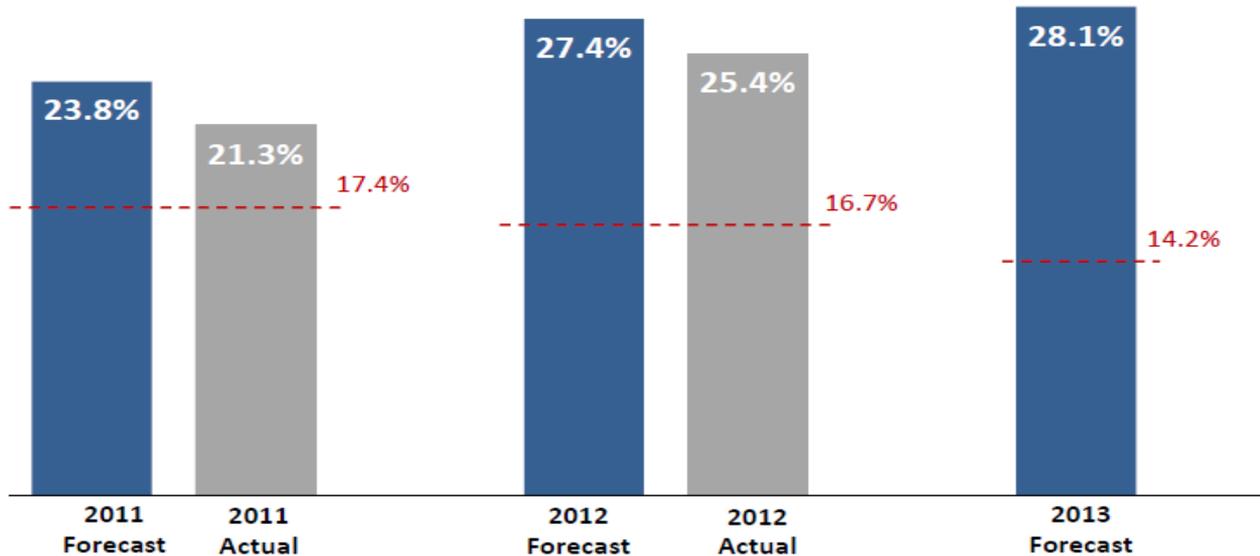
U.S. Environmental Protection Agency
Clean Power Plan - Proposed Rule
Initial Department Review

Resource Planning

- The question of how much EPA's new CO₂ regulation impacts Minnesota is a question of how well we've done resource planning.
- Resource plans are 15-year plans that balance four long-term goals:
 - reliability;
 - cost;
 - environmental impact; and
 - risk management.

Reliability Goal—Regional Reserve Margins (MISO Data from July '13)

Forecast v. Actual Reserve Margins (Installed Capacity)

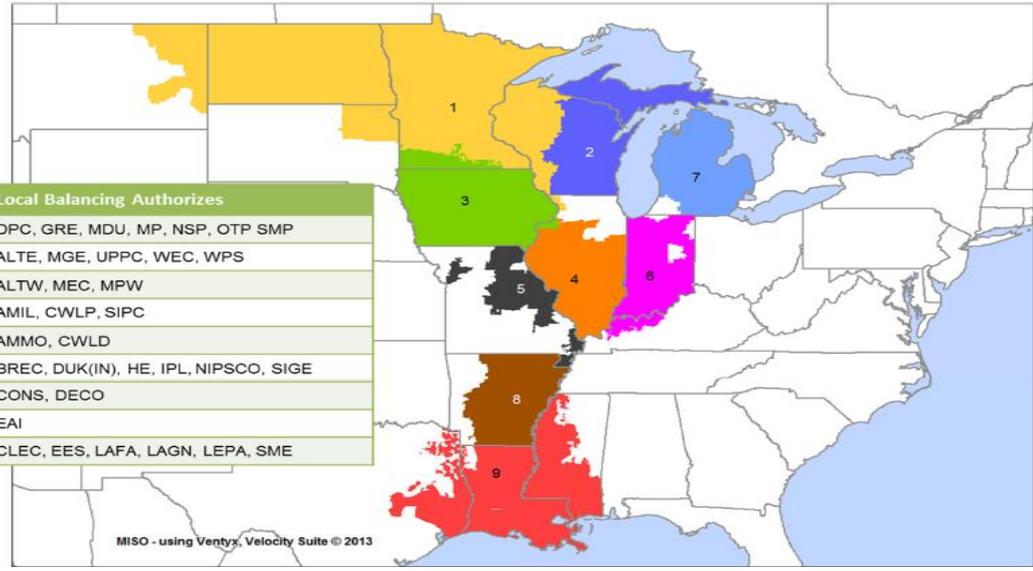


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- Red line shows required level of reserves.
- Resources are adequate now, but MATS has an impact...

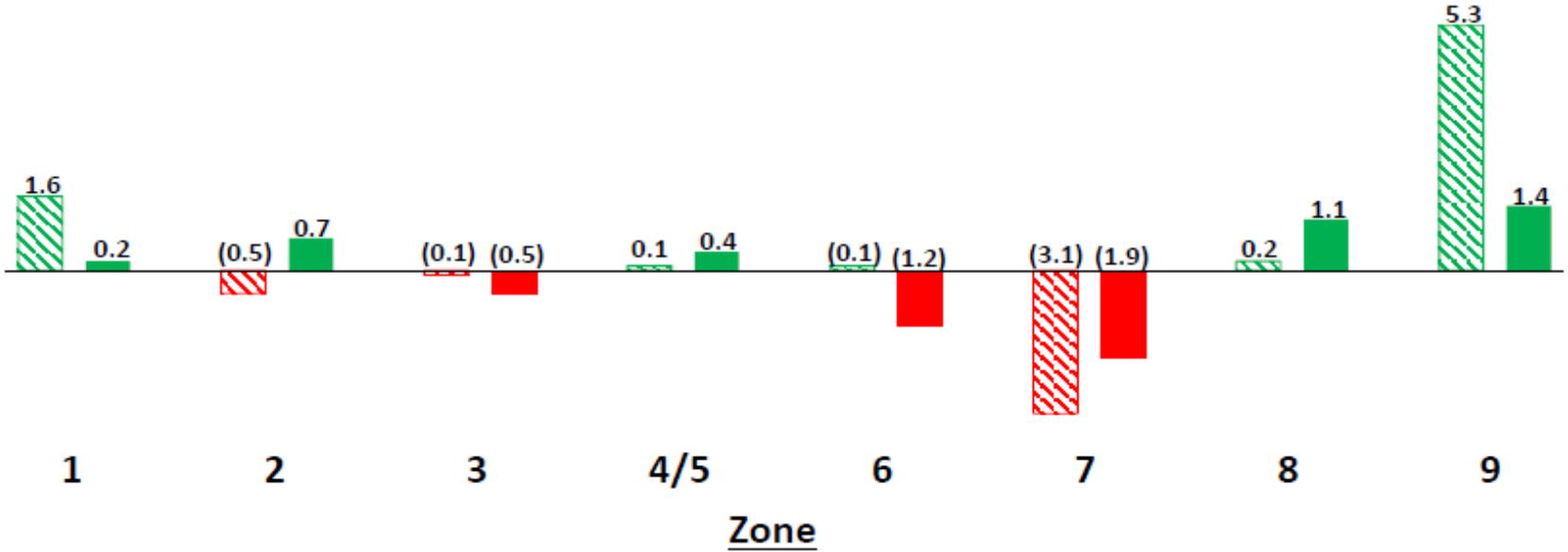
Reliability Goal—Regional Reserve Margins (MISO Data from June '14)

MISO Local Resource Zones

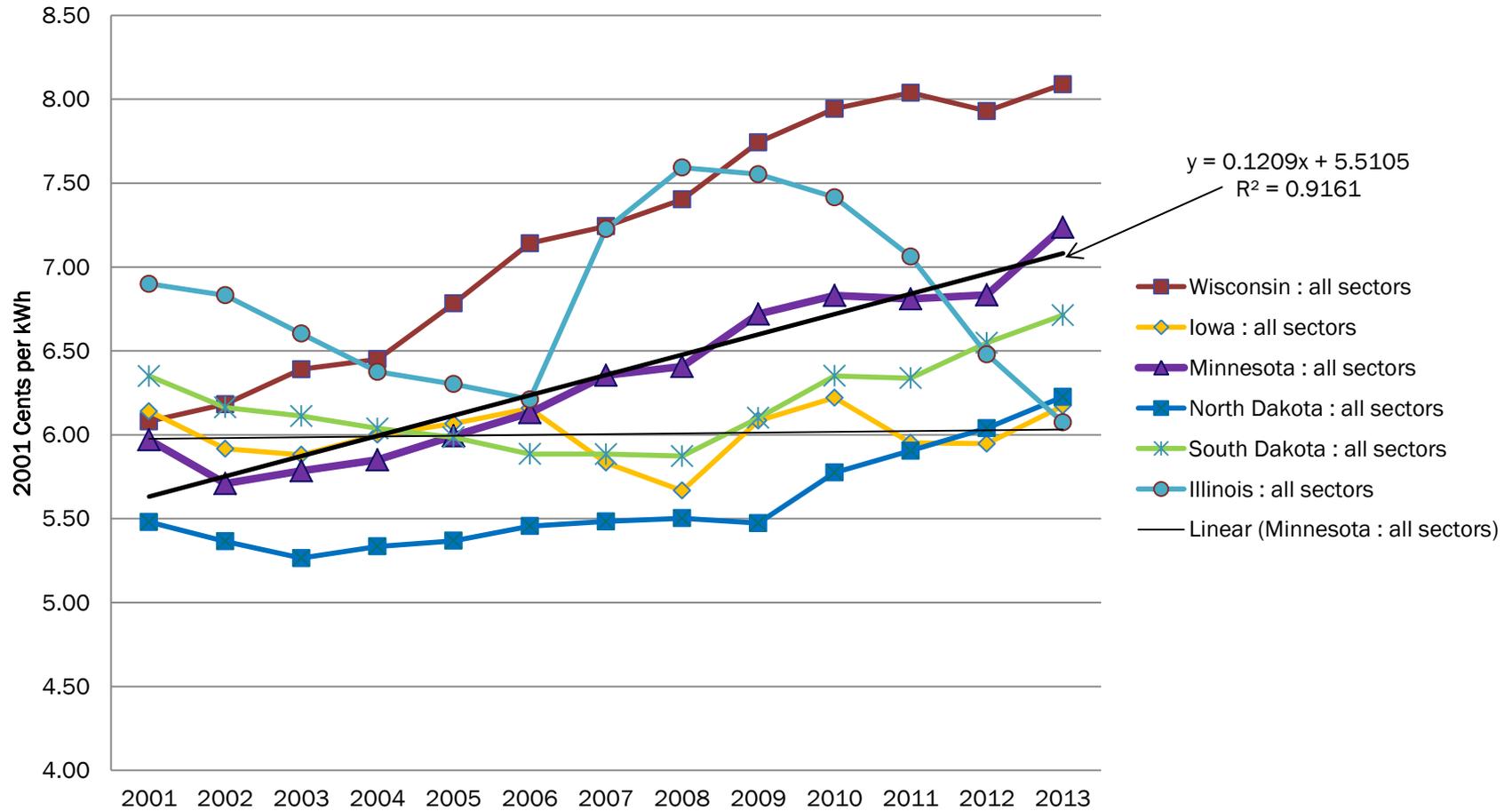


2016 Resource Adequacy Zone Summary

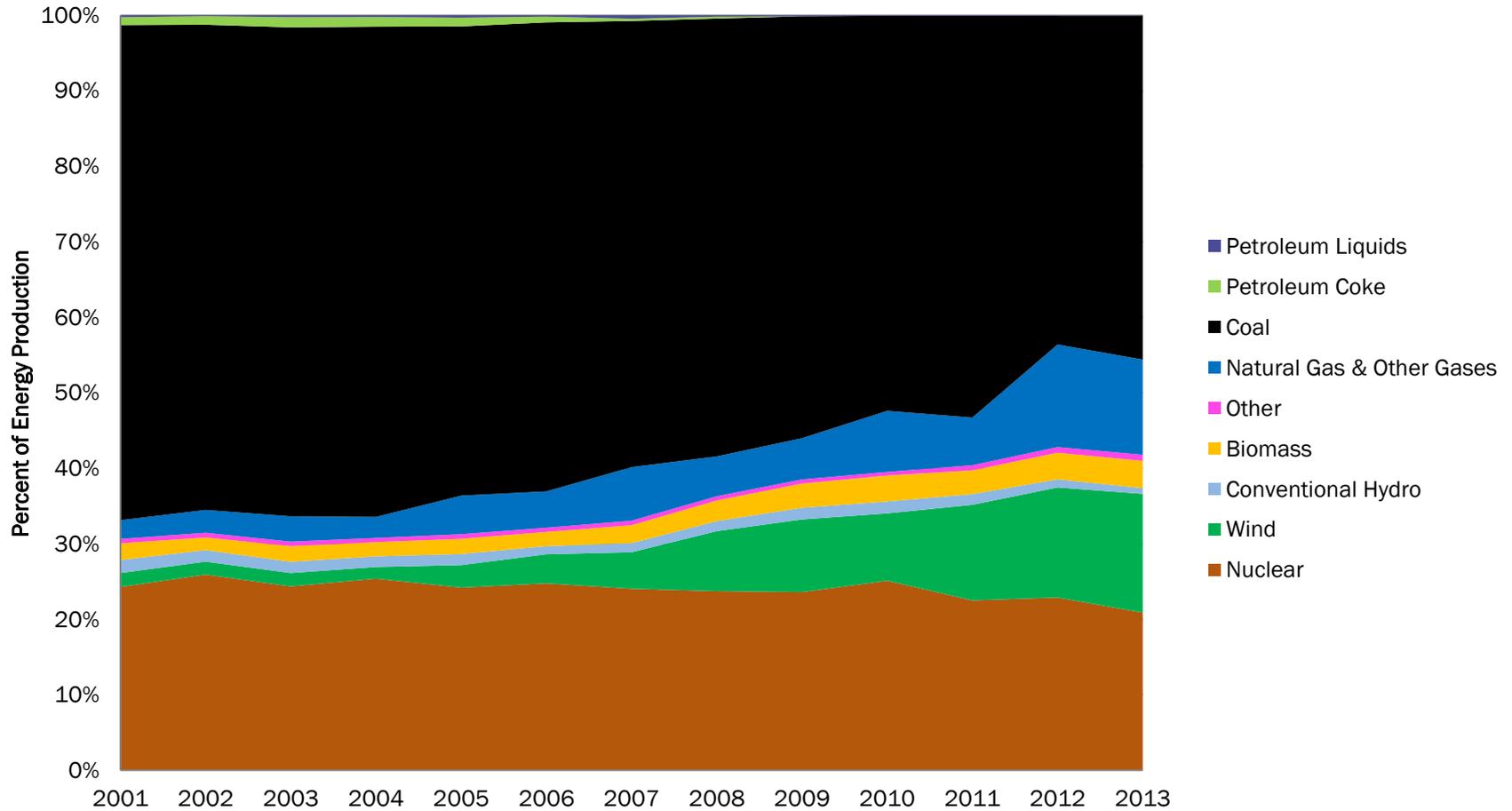
January 2014 Survey (3.6 GW Surplus)
 June 2014 Survey (0.2 GW Surplus)



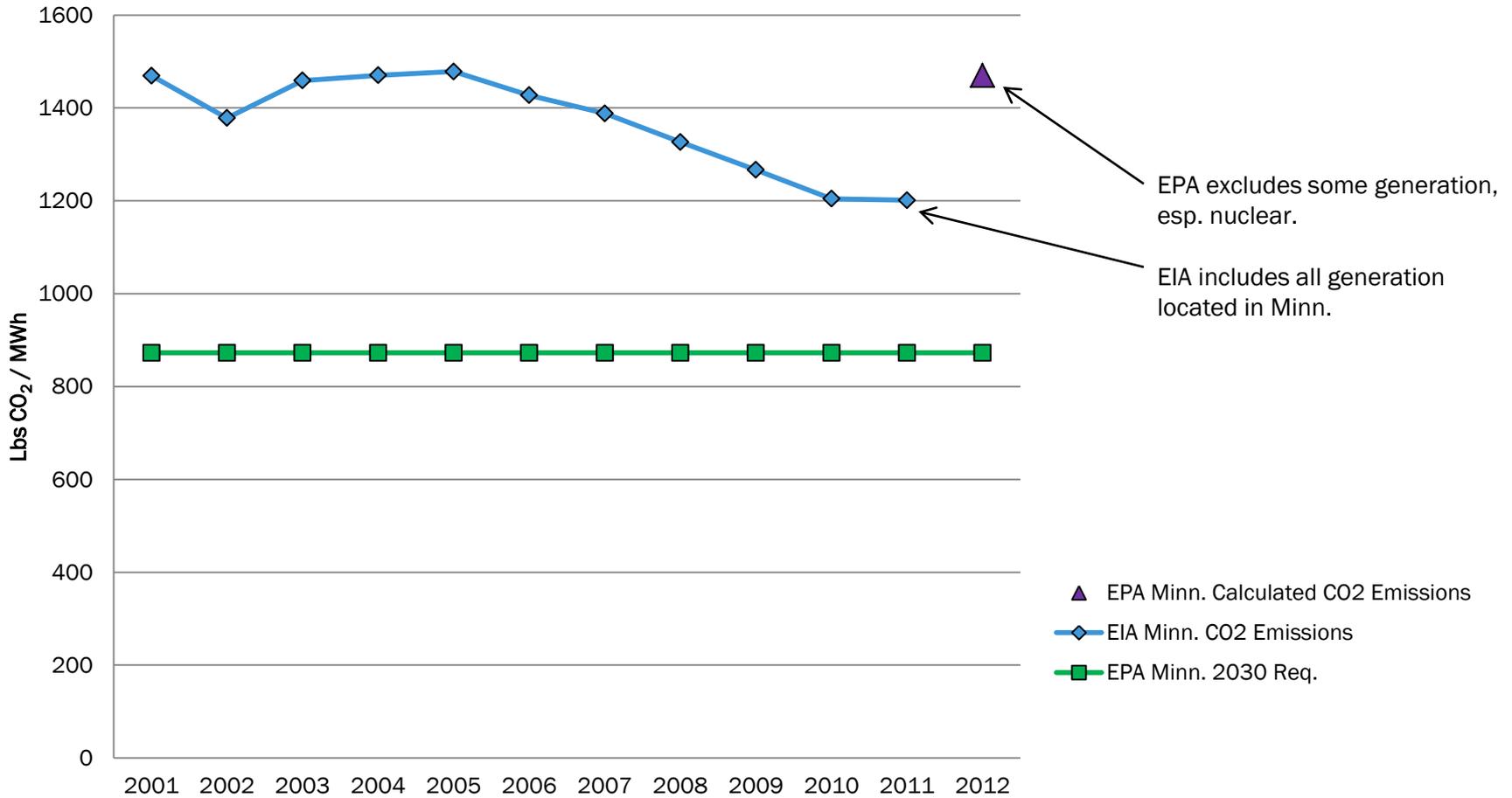
Cost Goal—Real Price of Electricity (U.S. EIA Data, All Customers)



Impact Goal—Historical Minnesota Generation Mix (U.S. EIA data)



Impact Goal—CO₂ Intensity, Minnesota Generation (U.S. EIA/EPA Data)



NOTE: EIA Calculation is not consistent with EPA goal formula.

Where Are We Going? (Recent Resource Plan Results)

- Near Term (2014 to 2020) actions:
 - Minnesota Power
 - Add Bison 4 wind farm;
 - Add Manitoba Hydro Purchase;
 - Retire Taconite Harbor 3 coal unit;
 - Convert Laskin coal plant to natural gas.
 - Otter Tail Power
 - Retire Hoot Lake coal plant;
 - Add natural gas-fired (and potentially wind) capacity.
 - Xcel Energy
 - Retire Black Dog 3 and 4 coal units;
 - Add natural gas-fired capacity;
 - Add 750 MW of Wind.
 - All Three Utilities:
 - 1.5% Solar Energy Goal;
 - 1.5% Conservation Goal.

Build a Model—Step 1, Define Affected Units (from draft PCA unit list, EIA capacity data)

Coal Plants	Owner	MW
Sherburne County	Xcel, SMMPA	2,430.6
Clay Boswell	MP	1,072.5
Allen S King	Xcel	598.4
Taconite Harbor 1, 2	MP	168.0
Austin Northeast	Austin	31.9
Total		4,301.4

Natural Gas Combined Cycle Plants	Owner/PPA	MW
High Bridge	Xcel	644.0
Riverside	Xcel	585.9
Calpine-Mankato	Xcel	530.0
Faribault Energy Park	MMPA	334.5
Black Dog 2, 5	Xcel	324.8
LSP-Cottage Grove	Xcel	283.5
Total		2,702.7

Coal Power Plants Not Included in Analysis

Coal Plants Scheduled to Shut Down	Owner	MW
Black Dog 3, 4	Xcel	293.1
Hoot Lake	Otter Tail	129.4
Taconite Harbor 3	MP	84.0
Silver Lake	Rochester	79.0
Total		585.5

Build a Model—Step 2, Obtain Data on Affected Units

- Faribault Energy Park (MMPA) not included in analysis—No model data
- Austin Northeast (SMMPA) not included in analysis—No model data & might be retired
- Hibbard (MP) not included in analysis—Biomass
- Fox Lake (Alliant) not included in analysis—No longer burns coal

Build a Model—Step 2, Obtain Data on Affected Units Cont'd

- Existing nuclear units—fixed at the ‘at risk’ amount (840 GWh per EPA)
- Existing wind and solar units—fixed at 2012 amount (8,121 GWh per MRETS)
- Existing coal and gas—fixed at Dept. model output in last resource plan

Developing a Model—Step 3, Compliance Formula (U.S. EPA Rule)

- EPA 2030 Minn. Goal Calculation:
 - Starting Point CO₂/MWh (2012): 1,470
 - After Block 1: heat rate improvements: 1,389
 - After Block 2: redispatch existing NGCC: 999
 - After Block 3: “at risk” nuclear & renewables: 1,042
 - After Block 4: Energy Efficiency: 873
- EPA: These block-by-block values are purely illustrative and meant to assist in the understanding of the state goals.
- EPA State Goal =

$$\frac{\{(coal\ gen.\ x\ coal\ emission\ rate) + (OG\ gen.\ x\ OG\ emission\ rate) + (NGCC\ gen.\ x\ NGCC\ emission\ rate) + Other\ emissions\}}{Coal\ gen.\ +\ OG\ gen.\ +\ NGCC\ gen.\ +\ "Other"\ gen.\ +\ Nuclear\ gen._{uc + ar} + RE\ gen.\ +\ EE\ gen.}$$

Where:

OG = Oil and Natural Gas Turbines

RE = Renewable Energy

UC = Under Construction

NGCC = Natural Gas Combined Cycle

EE = Energy Efficiency

AR = At Risk

NOTE: “Other” includes fossil sources that are likely subject to 111(d) rulemaking, but not subject to building block abatement measures (e.g., IGCC, high utilization CTs, useful thermal output at cogeneration units).

Disclaimer

- We are not advocating any particular alternative at this time.
- This information is based upon preliminary, spreadsheet analysis.
- Detailed analysis is the next step, incorporating stakeholder input.

Developing a Model—Step 4, Initial Model Base Case Results

**Carbon Intensity of Affected Units,
Current IRPs of GRE, MP, SMMPA and Xcel**
(Affected Unit CO₂ / [Affected Unit GWh + 'at risk' Nuclear + Renewables + New DSM])

