

Results of the 18 Month Emission Control Strategic Planning Process

RPU Utility Board Meeting
July 25, 2005

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Director of Power Resources



Contents

- Governance Direction
- Schedule
- Studies Performed
- RPU Infrastructure Plan
- Regulations & Baseline
- Compliance Based Strategy
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Governing Direction

- RPU Utility Board – “...have a consultant do a “screening process” for the Board that would provide a list of various SLP emission controls and the approximate costs to install and operate them..... Board members would then decide whether to perform a feasibility study on one or more of the alternatives. This would also require a regulatory analysis. ...The Board directed staff to start the screening process.”

Governing Direction

MPCA Citizen's Board Resolution – “**BE IT RESOLVED**, that RPU shall submit a report at the November, 2003, MPCA Board meeting. This report shall provide an analysis of control equipment options, including identification of options that would maintain emission levels at 1999-2000 baseline levels. The report shall include an analysis of the economic and technical feasibility of these options. The report shall also include an update on the status of federal regulations applying to unit four.”

Silver Lake Power Plant Emission Control Strategy - Phase II

Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05
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ICI MACT Finalized

Phase I Baseline Strategy for 2005-2030
Electric Infrastructure Plan

Phase II Infrastructure Plan - Demand and Supply Side Alternatives

Phase III Infrastructure Plan - 30 Year Pro Forma Model

Fuel Supply Option Study - Fuel Switch to PRB

SLP Emission Controls Conceptual Site Feasibility Plan

Utility MACT / CAMR / CAIR Finalized

SLP Baseline Investigation for MACT / CAMR / CAIR

SLP Emission Controls Business Case Analysis

Emission Control Decision



Studies Performed

- Analysis of Existing and Potential Regulatory Requirements and Emission Control Options for the Silver Lake Power Plant – R.W. Beck
- Electric Utility Baseline Strategy for 2005-2030 Electric Infrastructure – Burns & McDonnell

Studies Performed con't.

- RPU Fuel Switching Screening Level Study – Utility Engineering
- RPU Emission Control Feasibility Study – Utility Engineering
- Stack Test Results and Analysis – RBM Consulting and Research

Infrastructure Plan

- Phase I – Traditional resource options and risk analysis of resources using lowest cost approach to meet the RPU demand and energy requirements to the year 2030.

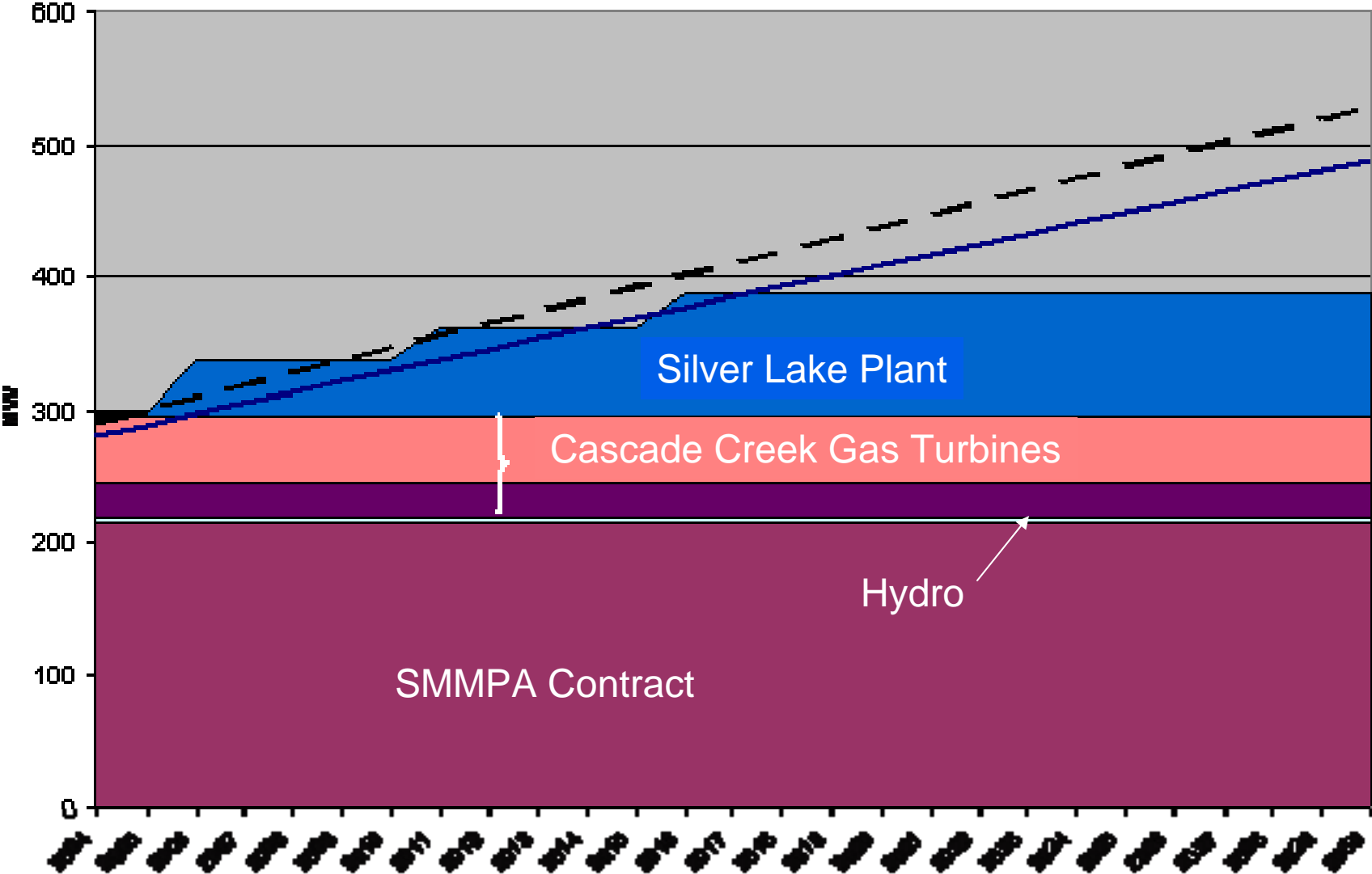
Infrastructure Plan con't.

- Phase II - Assessment of conservation, other demand side alternatives and renewable energy options and how they may reduce the needs identified in Phase I.

Infrastructure Plan con't.

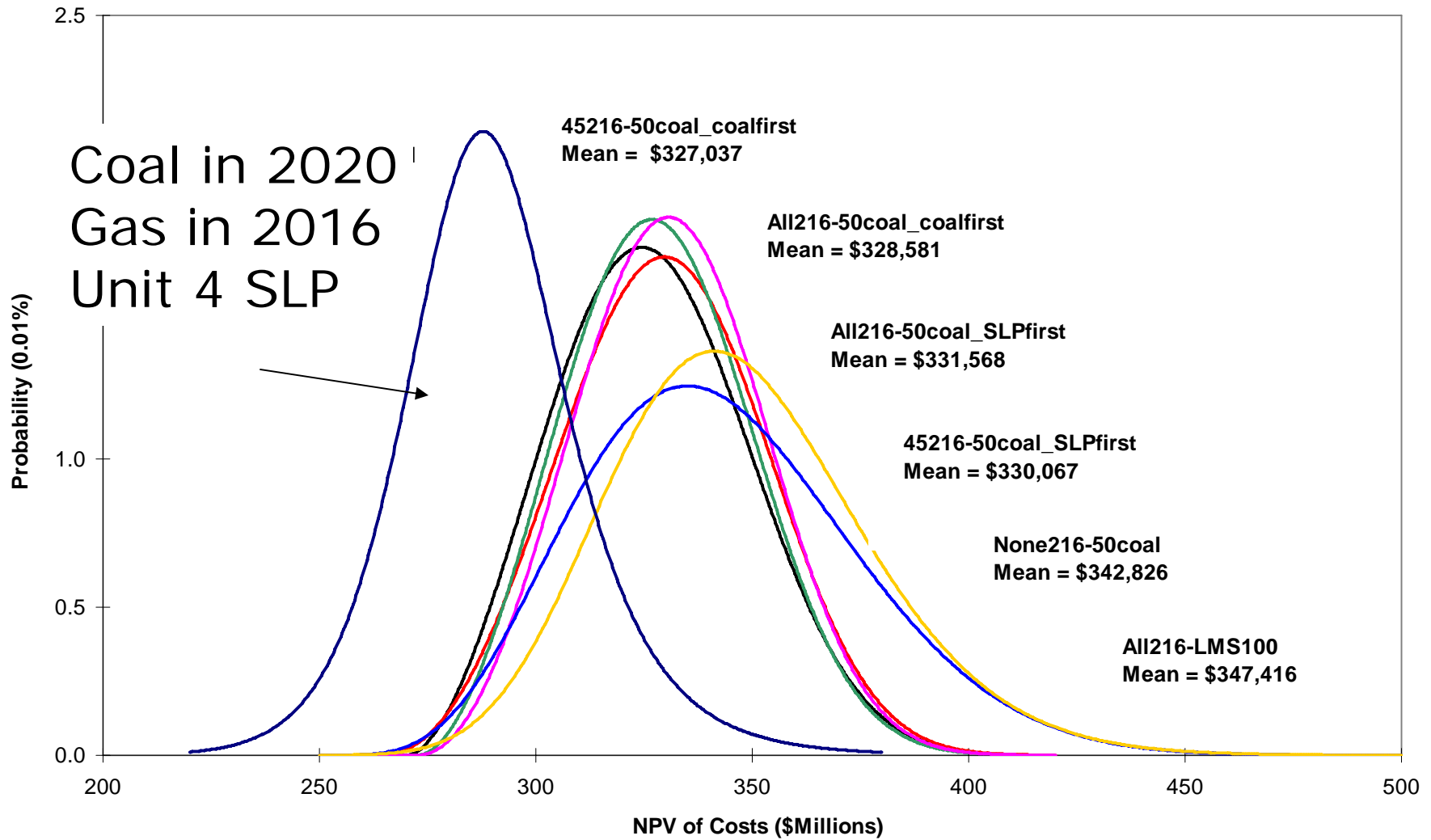
- Phase III – Modeling tool developed to calculate impact of capital expenditures and operating costs to the financial profile of RPU.

Balance of Loads and Resources – No Retirements



Probability Distribution of Net Present Values

Rochester Public Utilities



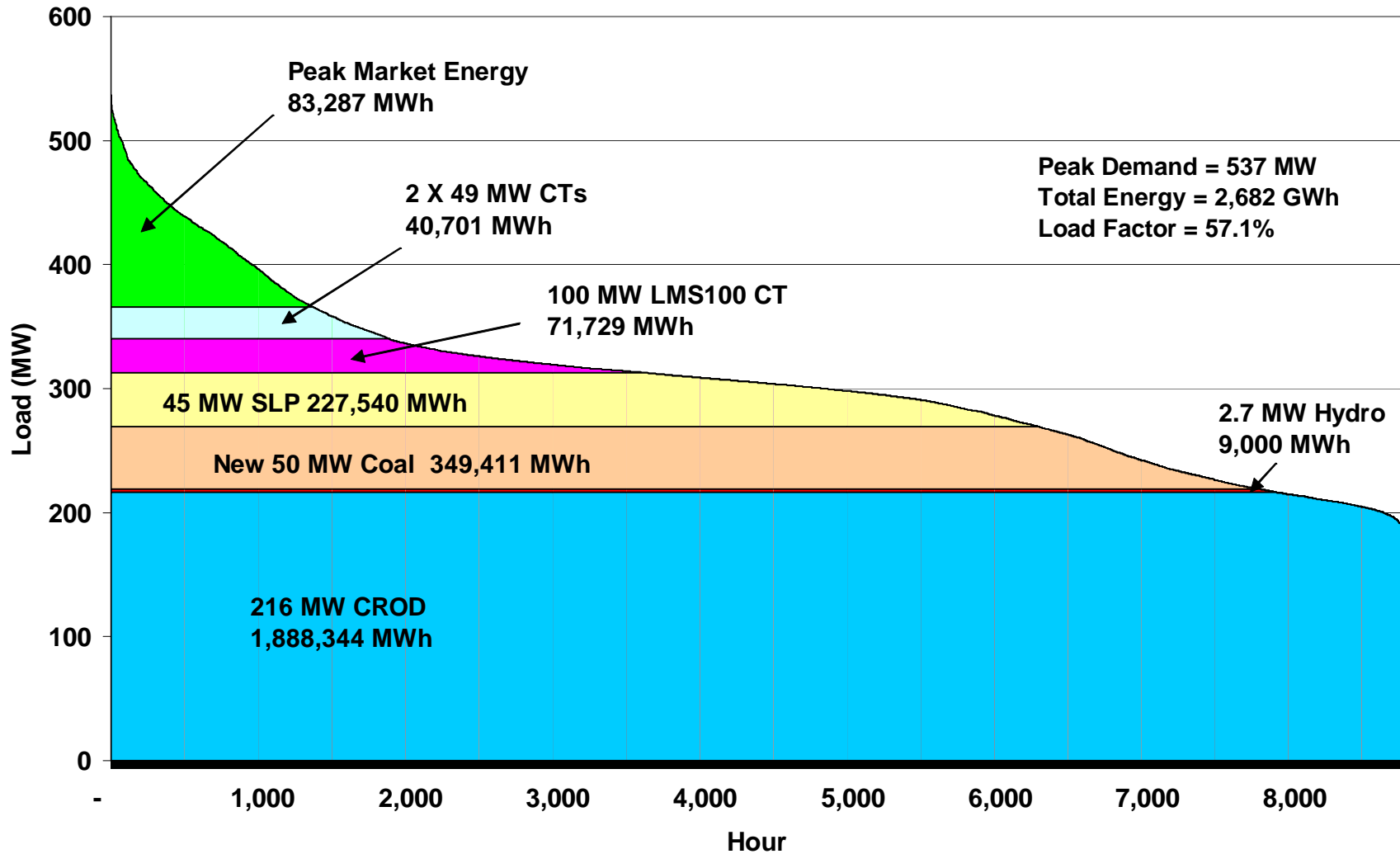
Coal in 2020 |
Gas in 2016
Unit 4 SLP

Included in Evaluation

- Unit 4
 - Investment of \$3,500,000 in one time recommended maintenance work
 - Investment of \$25,000,000 in emission control equipment

Sources of Energy RPU 2030 – Lowest Evaluated Plan

Figure
2030 Load Duration Curve & Modeled Resource Energy Dispatch
45216-LMS100-50Coal



RPU Uses Renewable Energy From...

Solar energy from residential array



Hydro energy from Zumbro River unit since 1919.

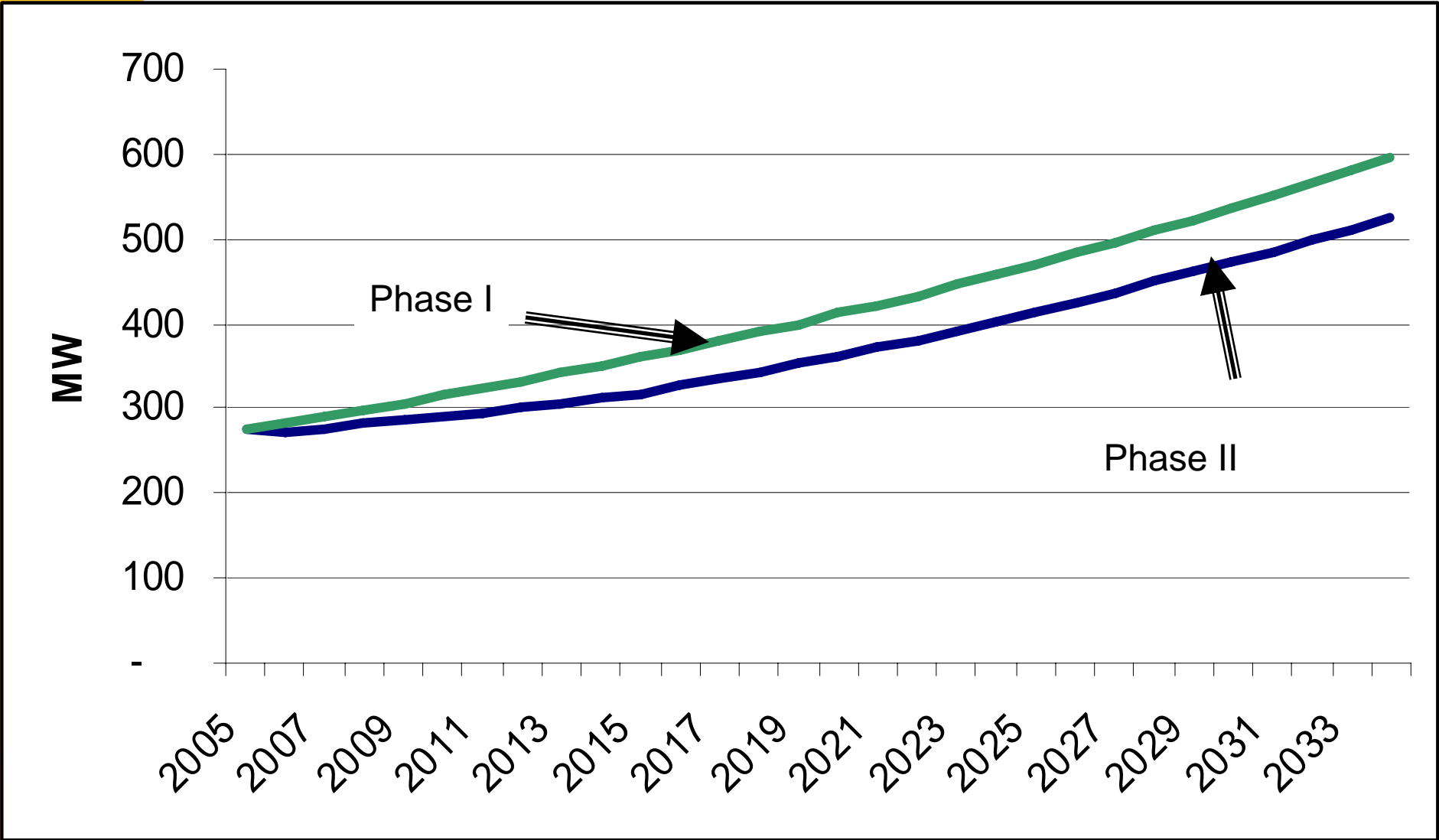


Waste To Energy from OWEF for biomass

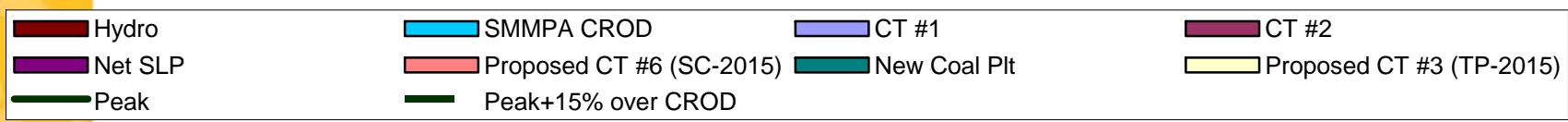
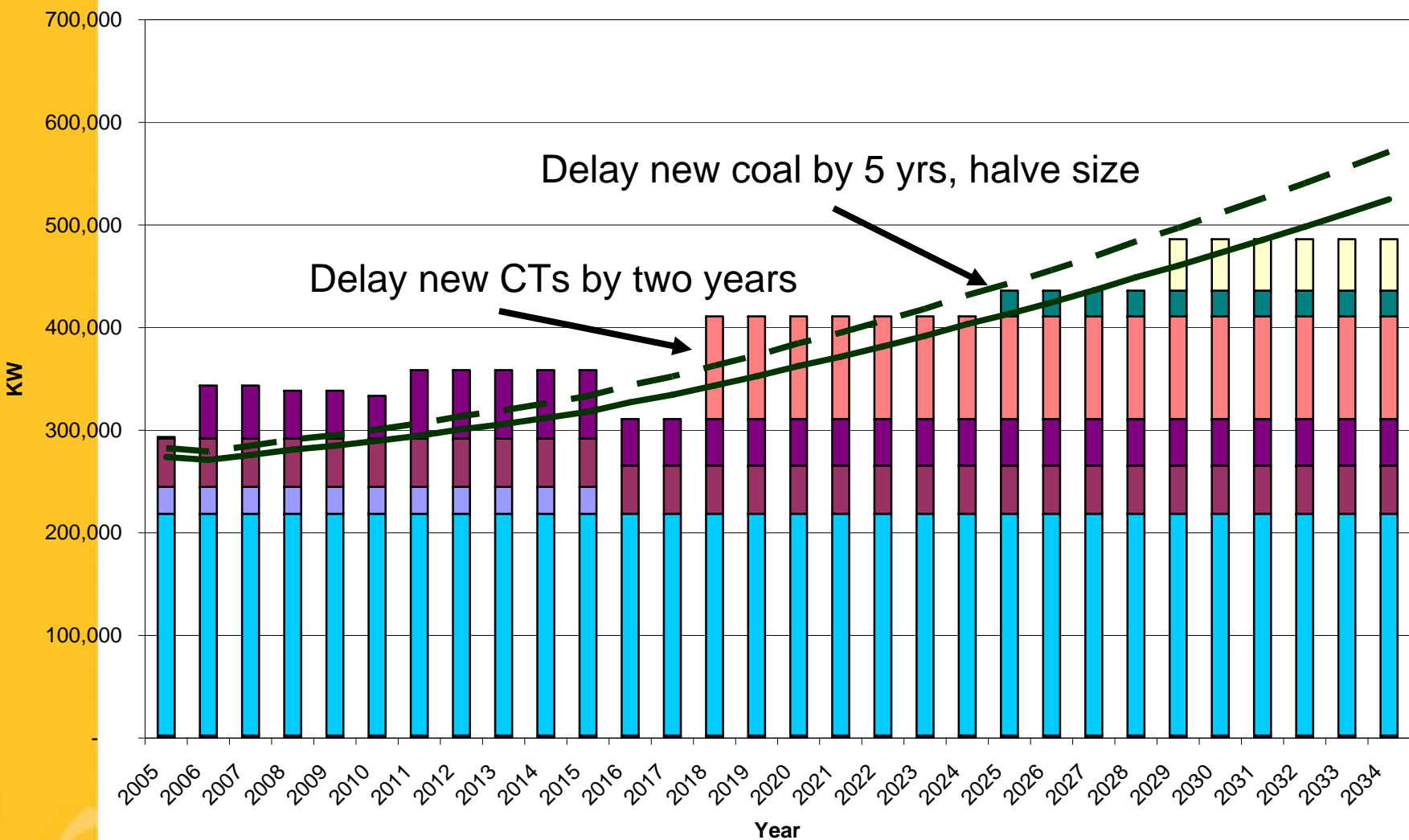
Wind energy from Minnesota wind generators through SMMPA



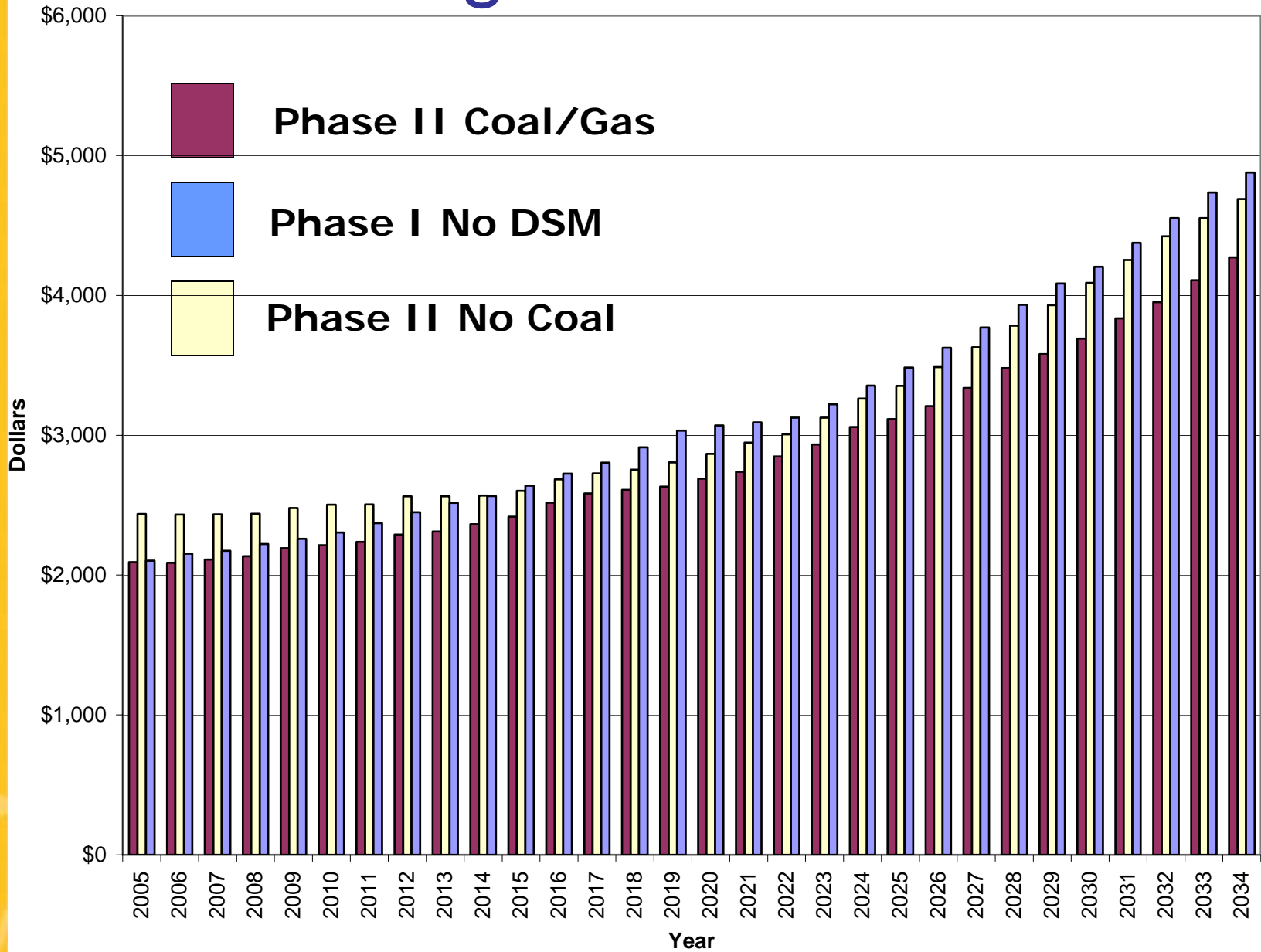
Phase I vs Phase II Demand Forecasts



Sources of Capacity for RPU – Phase II Effects



Average Annual Bill



Key Results of Infrastructure Plan

- Unit 4 should be kept in operation with investments made in emission controls and recommended maintenance
- Aggressive DSM programs are beneficial and should be pursued
- Transmission system limitations must be corrected to allow firm delivery of energy for CROD and market opportunities
 - potential for 2008 gas turbine

New Regulations

- SLP Unit 1, 2 & 3
 - Hazardous Air Pollutants: ICI Boiler MACT
Compliance deadline:
 - September 13, 2007

New Regulations

- SLP Unit 4
 - Clean Air Mercury Rule (CAMR) – Compliance deadline:
 - Phase 1 - 2010
 - Phase 2 - 2018
 - Clean Air Interstate Rule (CAIR)(PM2.5) – Compliance deadlines:
 - NOX Phase 1 - 2009
 - NOX Phase 2 - 2015
 - SO2 Phase 1 - 2010,
 - SO2 Phase 2 - 2015.

State Implementation

- State of Minnesota must submit to EPA a plan to implement CAMR and CAIR by September, 2006.
- MPCA issued “Request for Comments” on possible rule-making to implement CAMR and CAIR. Published in State Register on May 23, 2005.

SLP Baseline Investigation

Conclusions - SLP Units 1, 2 and 3:

- Mercury emissions are substantially less than MACT limits.
- Total Selected Metals (TSM) emissions are below MACT limits.
- Opacity is <20% during steady-state operation. Deviations occur soot blowing and load changes.

SLP Baseline Investigation

Conclusions - SLP Unit 4:

- Hg emissions are approximately equal to assumed CAMR allowance allocation for Phase I. Additional reductions will be required for CAMR Phase II.
- Unit 4 will have to achieve substantial reductions in emissions of SO₂ and NO_x to meet CAIR caps:

Anticipated reductions

- SO₂ reductions Phase I 50%, Phase II 65%
- NO_x reductions Phase I 67%, Phase II 73%

Compliance-Based Strategy

Unit 4

- Installation of Spray Dryer Absorber SO₂ Scrubber
- Installation of Fabric Filter
- Installation of Selective Non Catalytic Reduction NOx Control System
- Installation of Activated Carbon Injection

Compliance Based Strategy con't.

Unit 4

- Project Capital Cost - \$22,000,000
- Incremental Annual O&M Costs - \$1,100,000
- Based on SLP Unit 4 coal burn of 170,000 tons per year

Compliance Based Strategy con't.

Unit 4

- SO₂ Removal Efficiency – 93.1%
- NO_x Removal Efficiency – 50%
- Particulate Control – ~99%
- Mercury Removal Efficiency – 90%

Compliance Based Strategy con't.

Unit 3

- Particulate control optimization program following modeling and engineering evaluation.
- Electrostatic precipitator expansion.

State of the Art Option

Unit 4

- Wet Limestone Forced Oxidation Scrubber – 95.4% Removal Efficiency
- Larger Fabric Filter - ~99% Removal Efficiency
- Selective Catalytic Reduction NOx Control System – 76.4% Removal Efficiency
- Capital Cost - \$29,650,000
- Incremental Annual O&M Cost - \$1,100,000 based on 1% sulfur coal

Unit 4 Options Comparative Cost

93.1% DRY & 95.4% WET SCRUBBER SO₂ REMOVAL

	Dry Scrubber	Wet Scrubber
Total Installed Capital Cost	\$7,302,706	\$12,678,245
Total Fixed & Variable O&M Cost	\$889,882	\$856,229
Total Annualized Cost	\$1,650,534	\$2,328,615
Design Control Efficiency	93.1%	95.4%
Tons SO₂ Generated per Year	3,393	3393
Tons of SO₂ Removed per Year	3,160	3238
Cost per Ton Removed (\$/ton)	\$522	\$719
Annualized Cost Difference	----	\$678,081
Annualized Cost Difference for Fabric Filter	----	\$14,704
Additional Tons of SO₂ Removed	----	78
Incremental Cost Effectiveness per Additional Ton of SO₂ Removed	----	\$8,882

Unit 4 Option Comparative Cost

50% SNCR & 76.4 % SCR NO_x REMOVAL

	SNCR	SCR
Total Installed Capital Cost	\$1,444,145	\$3,230,318
Total Fixed & Variable O&M Cost	\$162,665	\$325,975
Total Annualized Cost	\$333,292	\$627,443
Design Control Efficiency	50%	76.4%
Tons NO_x Generated per Year	577	577
Tons of NO_x Removed per Year	288	441
Cost per Ton Removed (\$/ton)	\$1,157	\$1,423
Annualized Cost Difference	----	\$294,151
Additional Tons of NO_x Removed	----	153
Incremental Cost Effectiveness per Additional Ton of NO_x Removed	----	\$1,923

Staff Recommendation

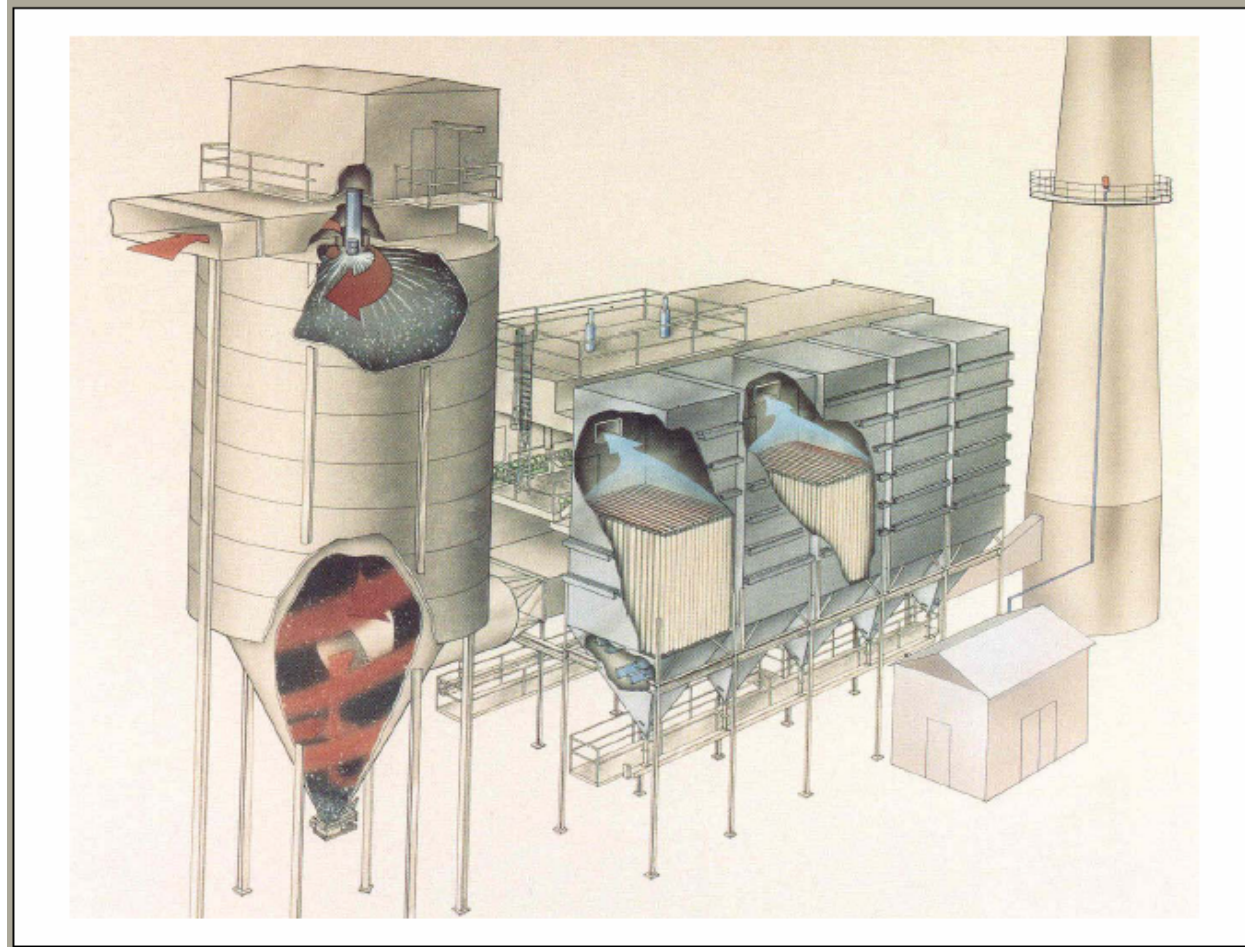
Unit 4

- Spray Dryer Absorber & Fabric Filter for SO₂ Control
- SCR for NO_x Control
- Activated Carbon Injection System for Hg Control
- Project Capital Costs - \$23,800,000 - an increase of \$1,800,000
- Annual O&M Costs - \$1,200,000 - an increase of \$100,000

Staff Recommendation

- Unit 3
 - Particulate Control Optimization and Expansion Program
 - Project cost up to \$6,000,000
 - Incremental Annual O&M Costs - \$75,000
 - Represents a range of options

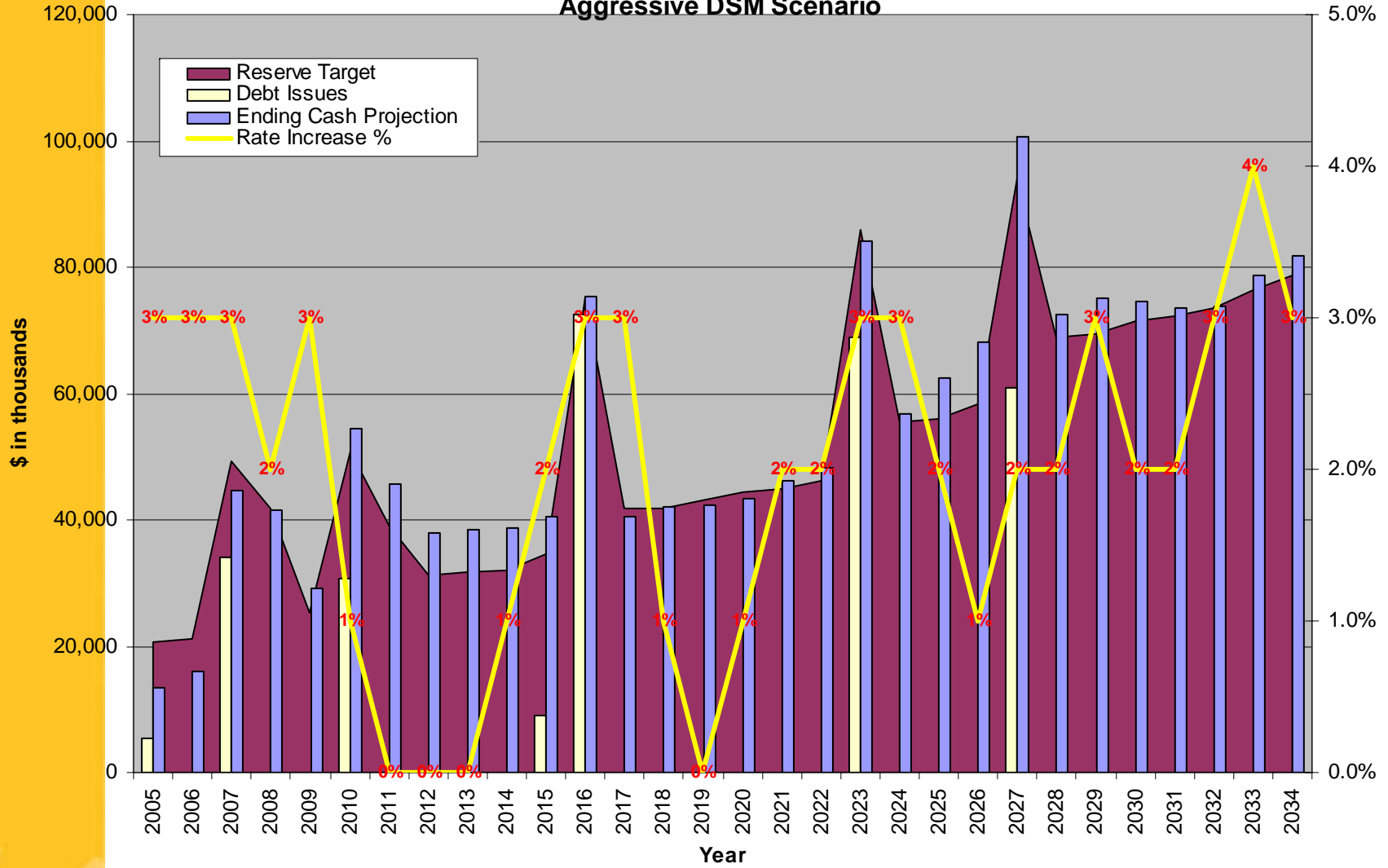
Graphical Representation



ROCHESTER PUBLIC UTILITIES

Ending Cash Projections-Electric Utility

Aggressive DSM Scenario



Board Action Requested

- Accept the recommendation of the Infrastructure Plan to be used as a guideline for power supply planning
- Proceed with staff recommendation for emission control projects to allow for permitting, engineering and design to proceed

Acknowledgement

- Burns & McDonnell – Kiah Harris
- R.W. Beck – Ivan Clark, Bill Stark
- Utility Engineering – Dick Ellis, Darin Schottler, Luther Raatikka, Roger Anderson, Randy Larson
- Rochester Citizens Task Force
- RPU – Environmental Team, Customer Relations Team, Accounting Team