# Discussion of 2012 Update to the 2005 Electric System Infrastructure Plan

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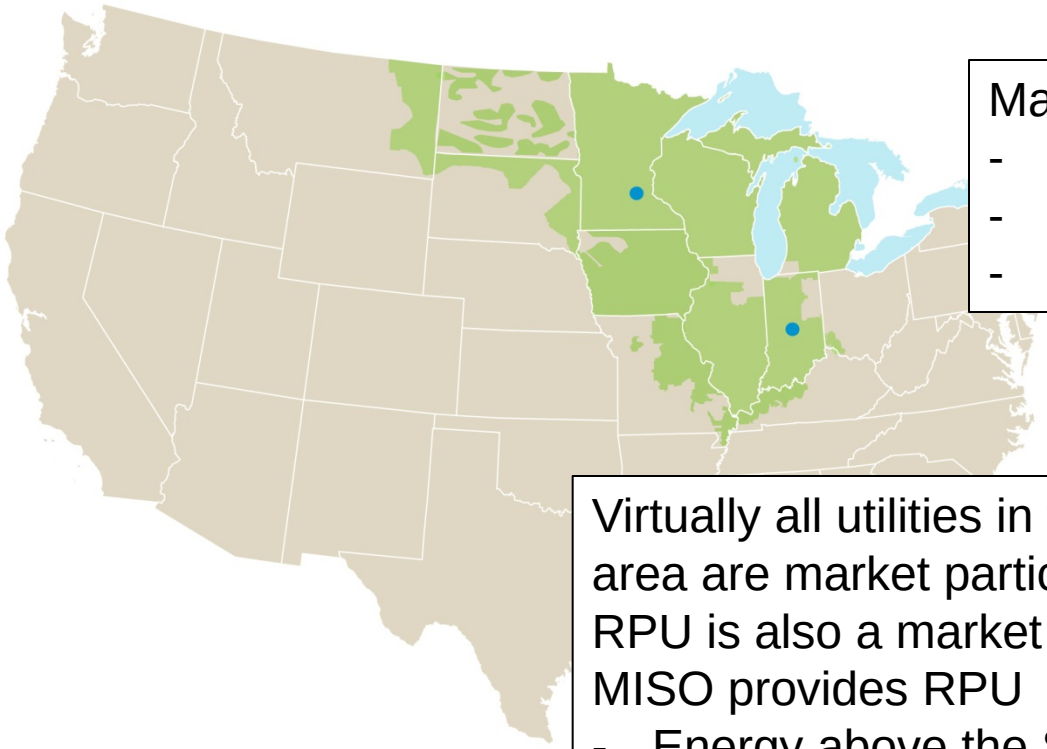
# Agenda

- Issues of Change Since Original Study
- Regulatory Issues
- Impact on Existing Resources
- Strategies for RPU

# MISO Market is a Significant Change to Utility Operations and Costs Since 2005



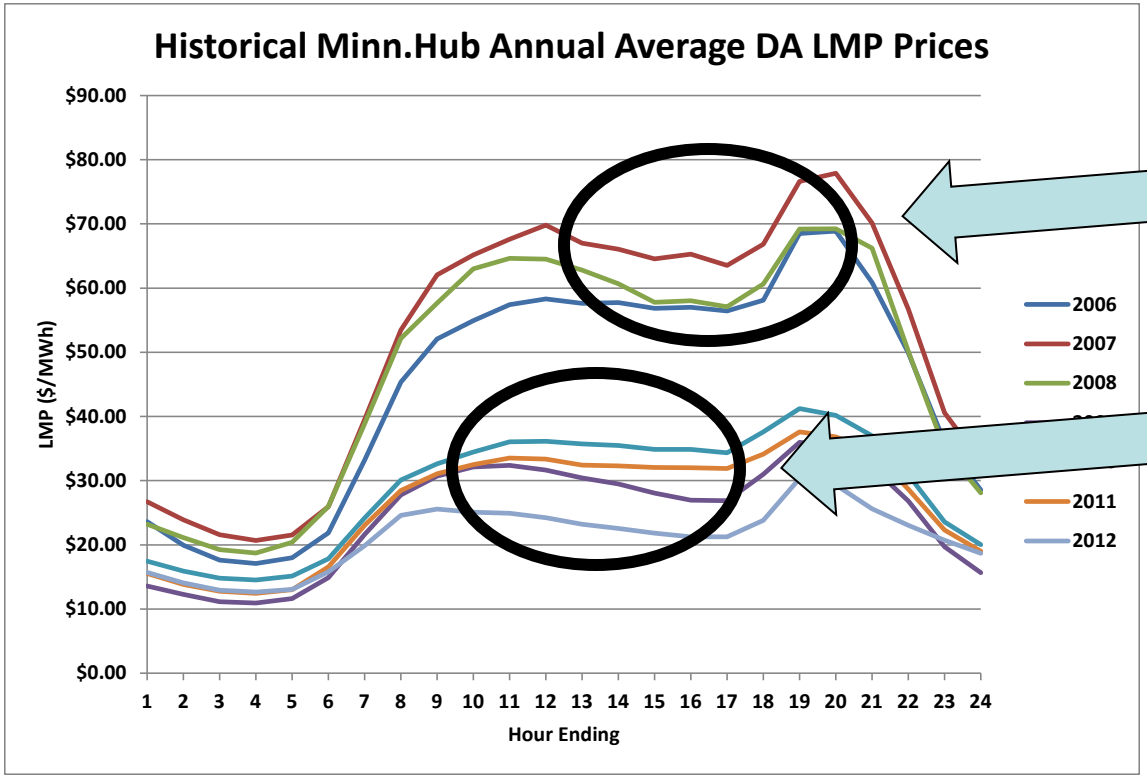
Market has matured and provides
- Energy to 98,000MW Load
- Resources of 131,000MW
- Over 7,000MW of wind resources

Virtually all utilities in the MISO area are market participants.
RPU is also a market participant.
MISO provides RPU
- Energy above the SMMPA CROD
- Opportunity sales from generating units.

# As a Utility and MISO Market Participant, RPU Must

- Provide capacity (MW) to meet MISO reserve margin requirements
  - Generating units (Silver Lake, Cascade Creek, etc)
  - CROD capacity from SMMPA
- Provide energy (MWh) to meet RPU customer loads.
  - CROD energy from SMMPA
  - MISO market
  - Local renewables (Zumbro Hydro, OWEF, distributed generation)

# Current Market Pricing is Significantly lower than 2005




2012 pricing through Q1

Pricing from 2006-2008

Pricing 2009 on

Attributed to:

- Economic downturn
- Lower fuel costs
- Additional wind energy
- More mature market

# One Significant Impact to RPU is Dispatch of Silver Lake Units for Market

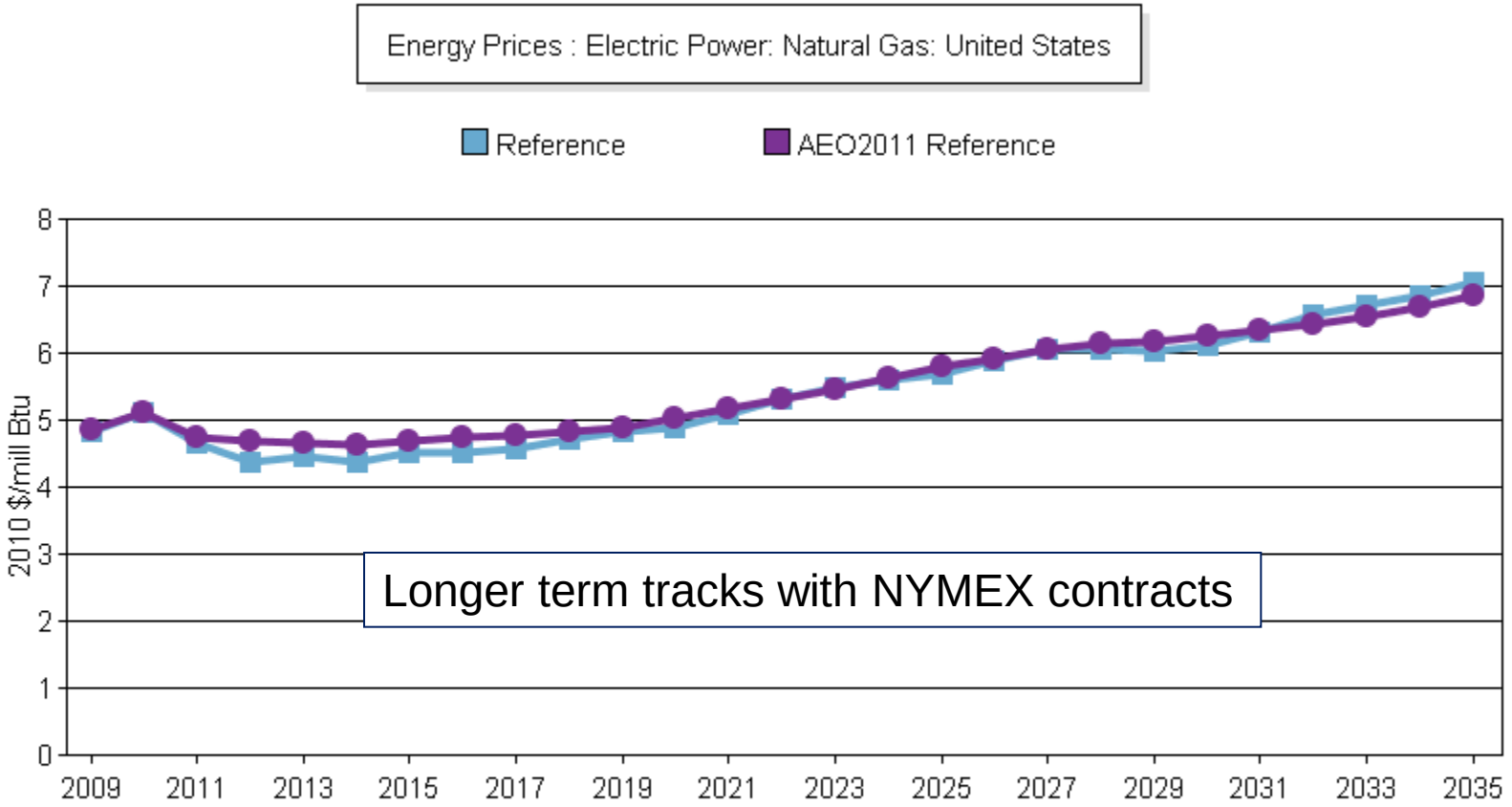
| Unit | Hours 2005 | Hours 2011 |
|---|---|---|
| SLP 4 | 5021 | 58 |
| SLP 3 | 4119 | 61 |
| SLP 2 | 2913 | 95 |
| SLP 1 | 4612 | 43 |
| CC 2 | 384 | 137 |
| CC 1 | 130 | 17 |

Market favors
- Low cost units to be on several days at a time
- Quick start units to be on for a few hours.
- RPU sees more margin from operation of CTs than Silver Lake Plant units

# Fuel Costs have Changed Significantly

- New Natural Gas production has dramatically altered forecasts of natural gas
  - Energy Information (DOE) forecasts of gas in 2005 were $7.93 per mmBtu for 2016. Current forecast is $4.71 per mmBtu.
- Coal for the SLP was forecast at $2.35 per mmBtu. Recent pricing is at $4.62 per mmBtu.

# EIA Forecast Sees Minimal Upward Pressure on Nat Gas

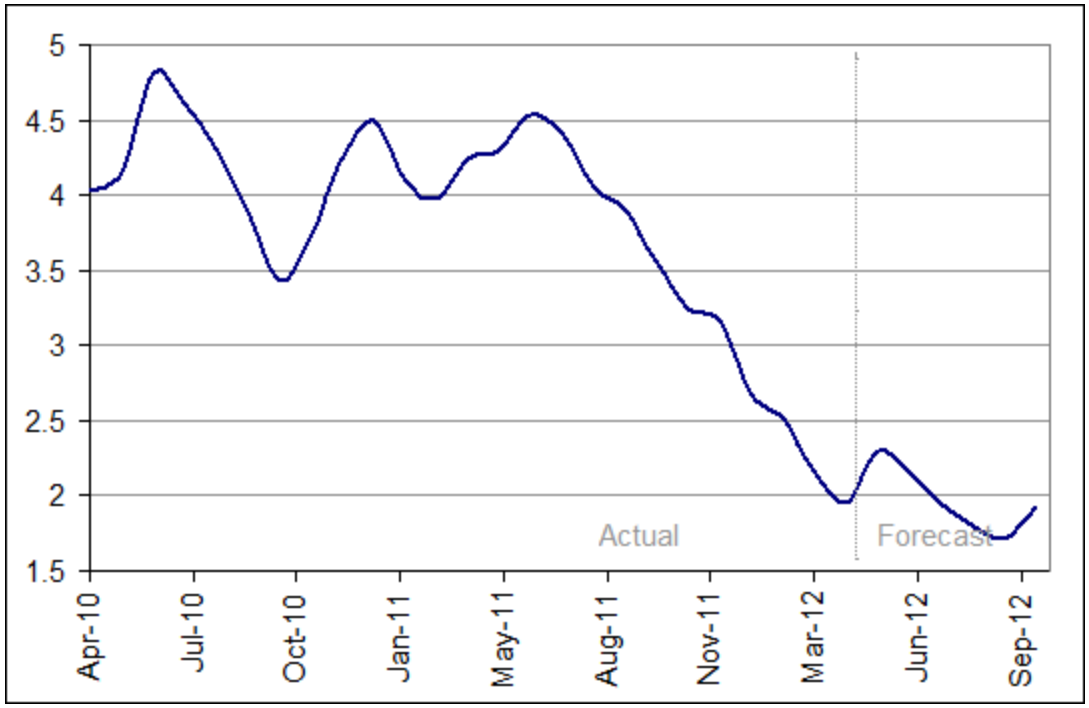



Source: AEO 2012

Independent Statistics & Analysis
U.S. Energy Information Administration

# Short Term Forecast is Really Low

**Natural Gas Prices**
**Past Trend Present Value & Future Projection**
**U.S. Henry Hub. US Dollars per Million BTU.**




**Source: the Financial Forecast Center**

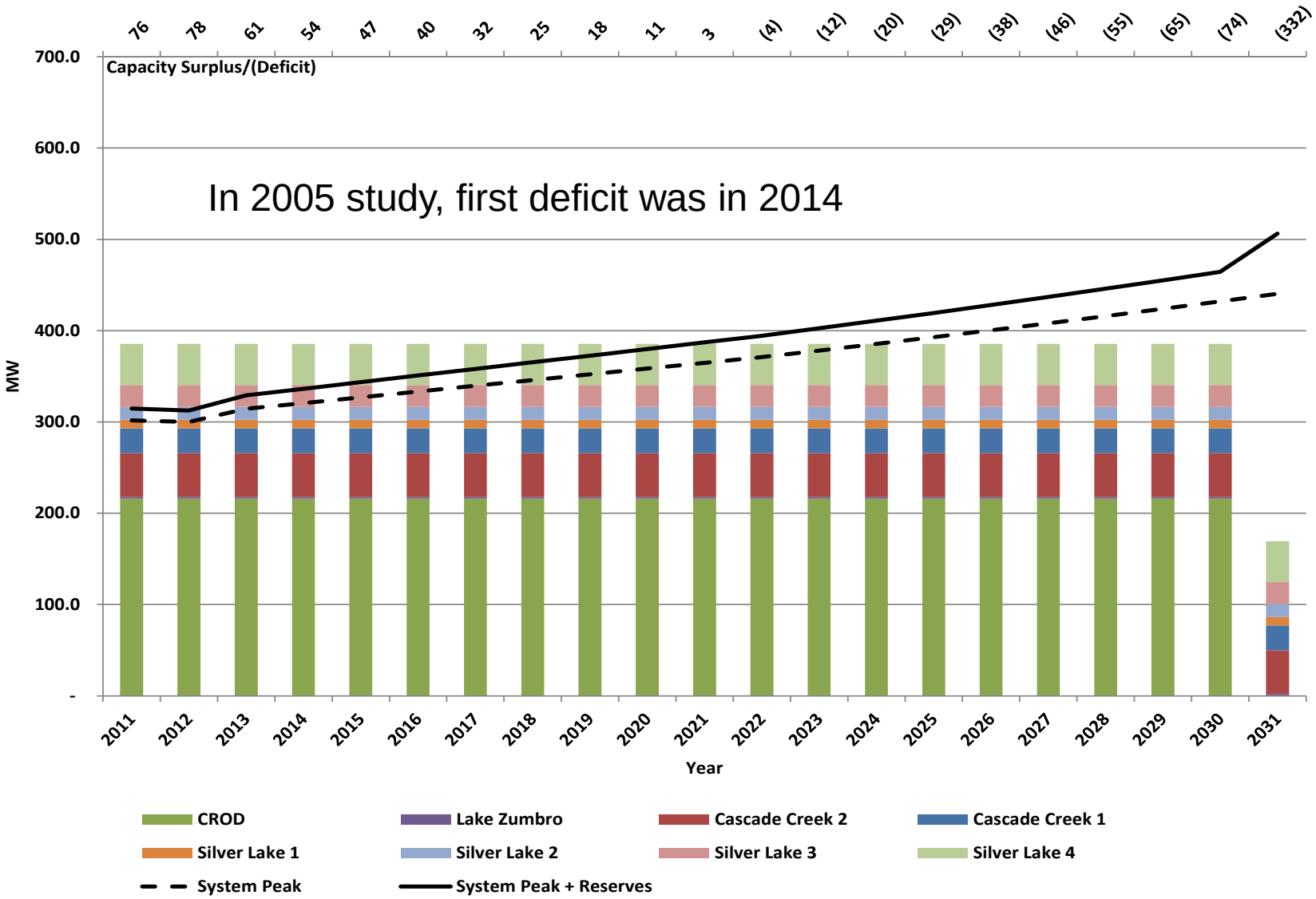
# Transmission System Upgrades Will Increase Firm Delivery

- Investment in CapX projects will increase RPU's ability to rely more on the market for capacity.

| **Operating Study-No RPU Units on line** | |
|---|---|
| **Case** | RPU Import Limit |
| **Existing System** | 148 MW |
| **Add North Rochester-Northern Hills 161 kV** | 292 MW |
| **Add North Rochester-Northern Hills 161 kV + North Rochester-Chester 161 kV** | 372 MW |
| **Operating Study - CT 2 On-line at 49.9 MW** | |
| **Case** | RPU Import Limit |
| **Existing System** | 148 MW |
| **Add North Rochester-Northern Hills 161 kV** | 357 MW |
| **Add North Rochester-Northern Hills 161 kV + North Rochester-Chester 161 kV** | 438 MW |

Limits are based on first contingency incremental transfer analysis

# Current Forecast Shows First Deficit in 2022



# Agenda

- Issues of Change Since Original Study
- **Regulatory Issues**
- Impact on Existing Resources
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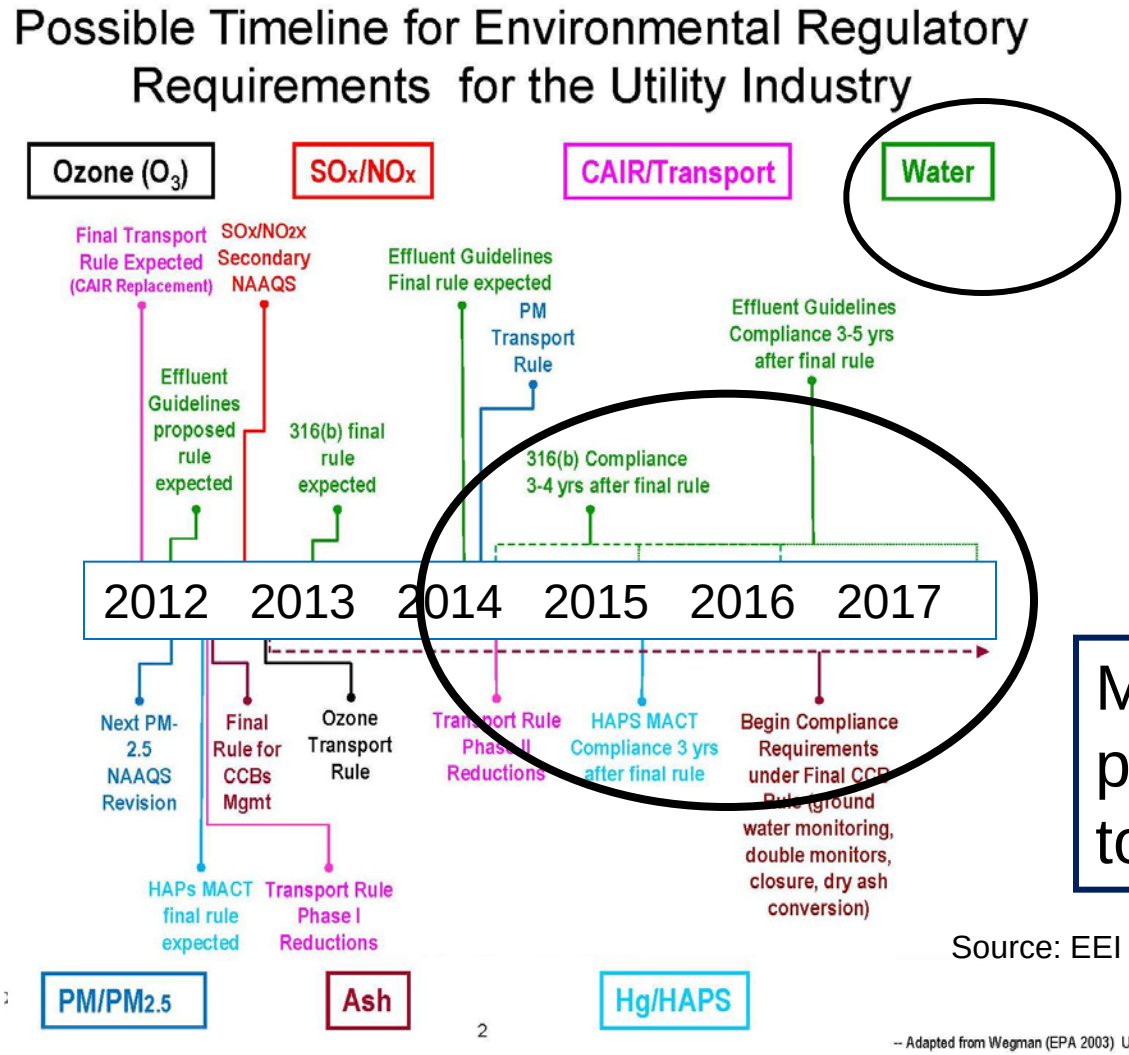
# Numerous Federal EPA Regulations In Force and Proposed

- Industrial Boiler MACT standards
- Utility Boiler MACT standards
- National Ambient Air Quality Standards (NAAQS) for ozone ($O_3$), sulfur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), and fine particulate ($PM_{2.5}$)
- Cross State Air Pollution Rule (CSAPR)
- Regional Haze Rule and Best Available Retrofit Technology (BART)
- Coal Combustion Residual Disposal Rule
- National Pollutant Discharge Elimination System (NPDES) Program effluent guidelines for power plants
- Clean Water Act (CWA) section 316(a) and 316(b) requirements
- Green House Gas proposal limits CO2 to 1000 lbs/MWh for new and modified baseload units

# Compliance Deadline is Looming Affects Many Coal Plants




Even nuclear and combined cycle affected.

Major impacts to coal plants over next three to four years.

Source: EEI

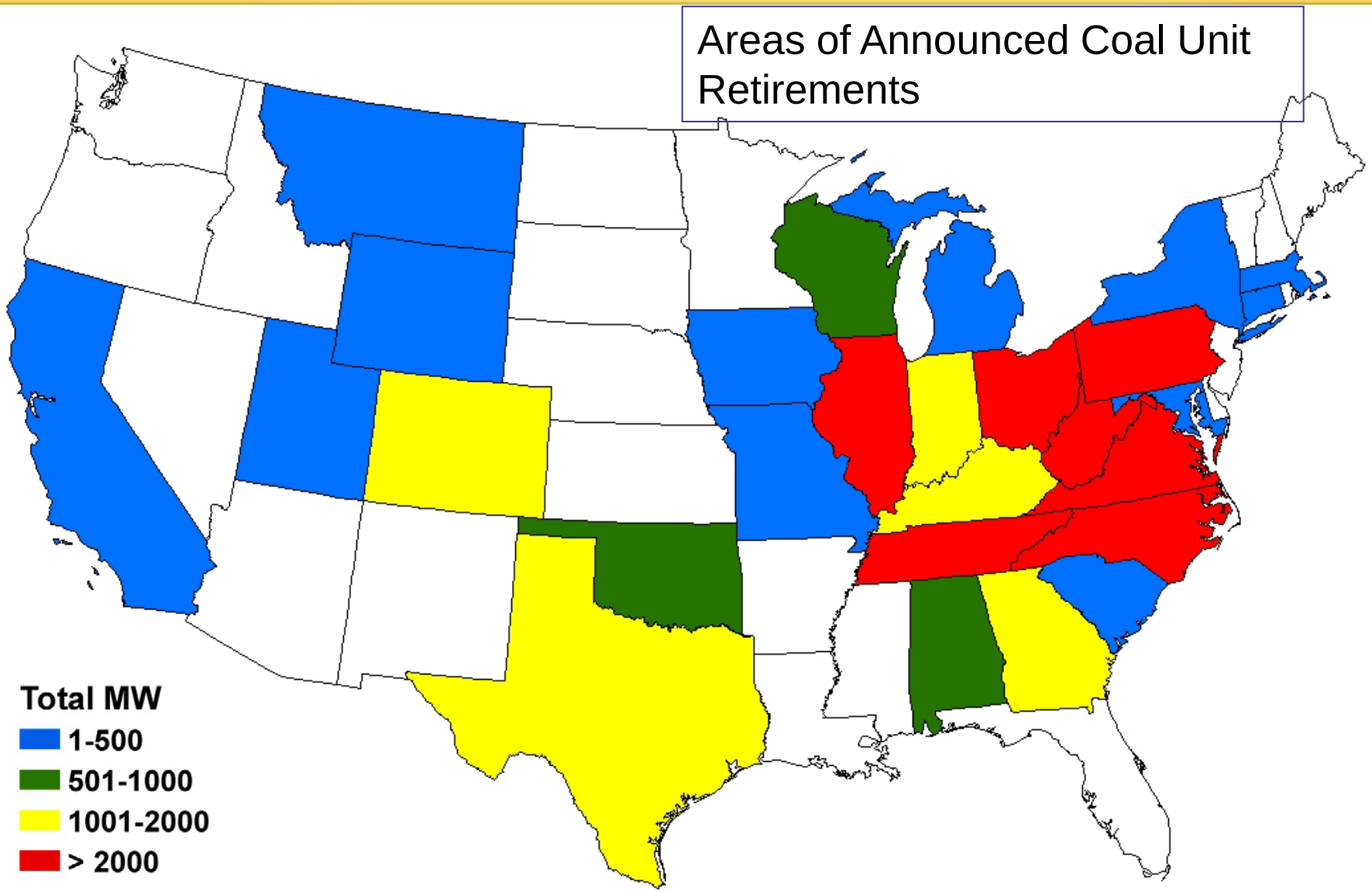
# At Minnesota Level

- PUC requiring IOUs to perform “base load diversification studies”
- State has history of limiting electricity from coal units
- Minnesota Power and Otter Tail were earlier in the process
- Xcel has been included
  - Already converted some smaller coal units to gas
  - Also have retired units due to other regulatory factors
- Dairyland was recently affected with an EPA settlement

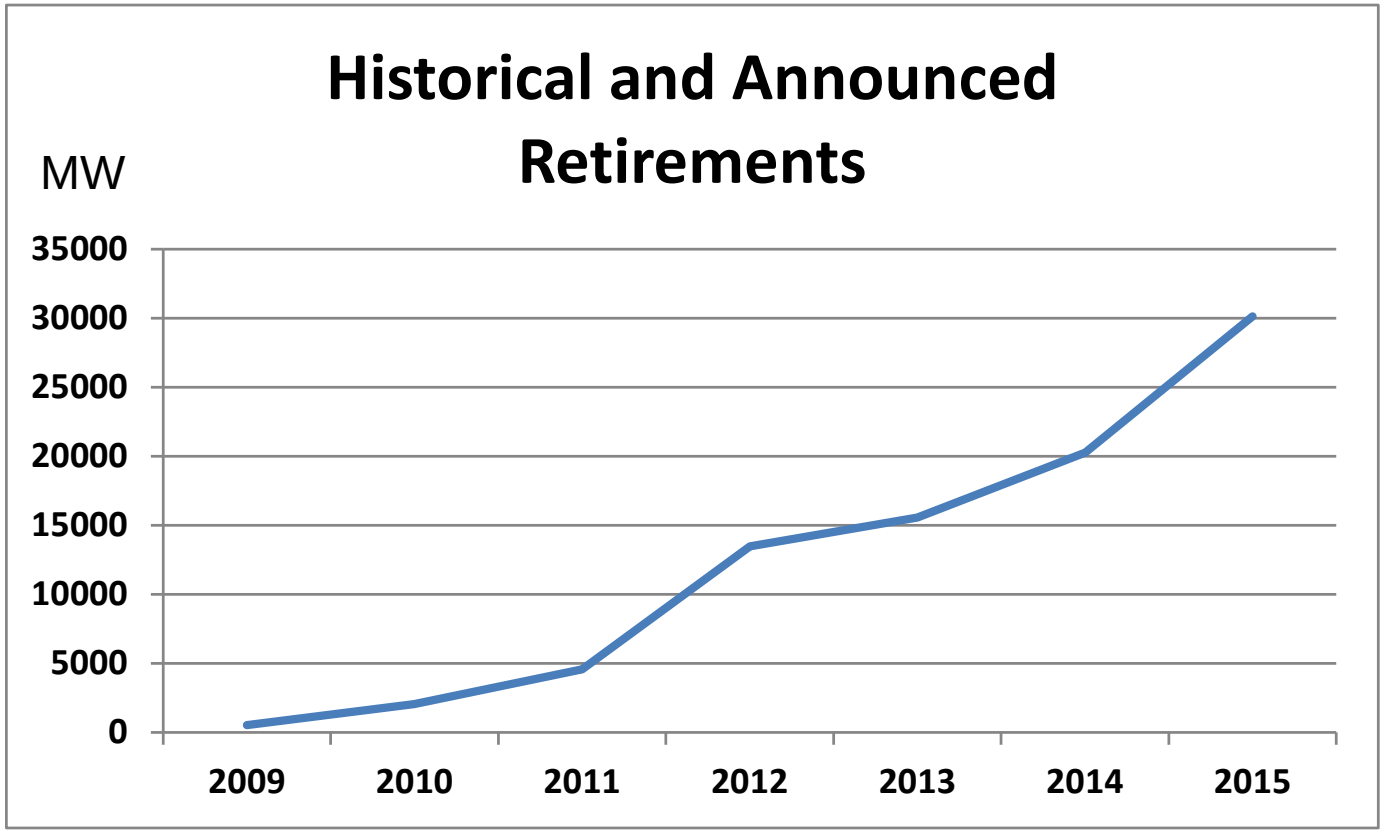
# At RPU Level

- In November 2010,
  - EPA notified RPU of a potential violation of the Clean Air Act under the Prevention of Significant Deterioration/New Source Review regulations.
  - Process was initiated through a Section 114 Information Request delivered to RPU on November 18, 2010.
- RPU proposed settlement, EPA provided settlement counter offer
  - Settlement counter offer will require additional equipment at SLP.
  - Conceptual budget estimate is about $90 million for both SLP 3 and 4 to remain on coal and operate at higher capacity factors.
  - Conversion of SLP to firm gas operation would require significant upgrades to interstate and local gas systems.

# Many Utilities are Deciding to Retire Older Coal Units Due to EPA Requirements



# Historical and Announced Coal-Fired Unit Retirements to 2015




Units range in Age from 50 to 62 years

Source: Energy Information Agency, DOE

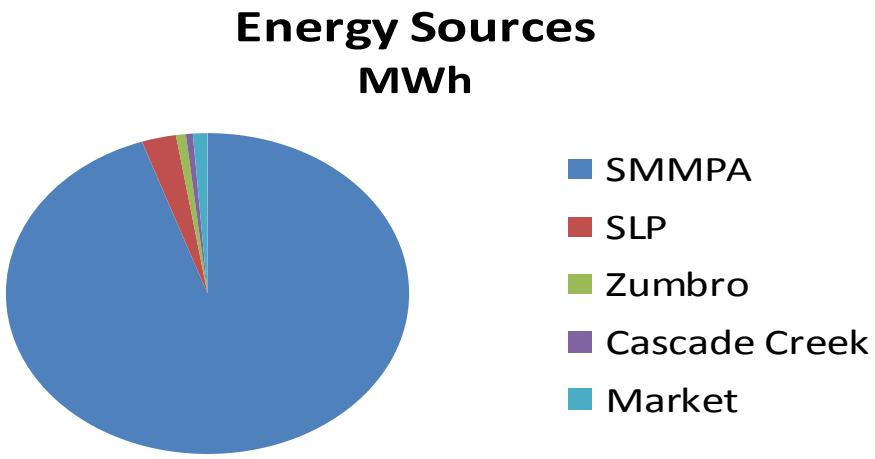
# Agenda

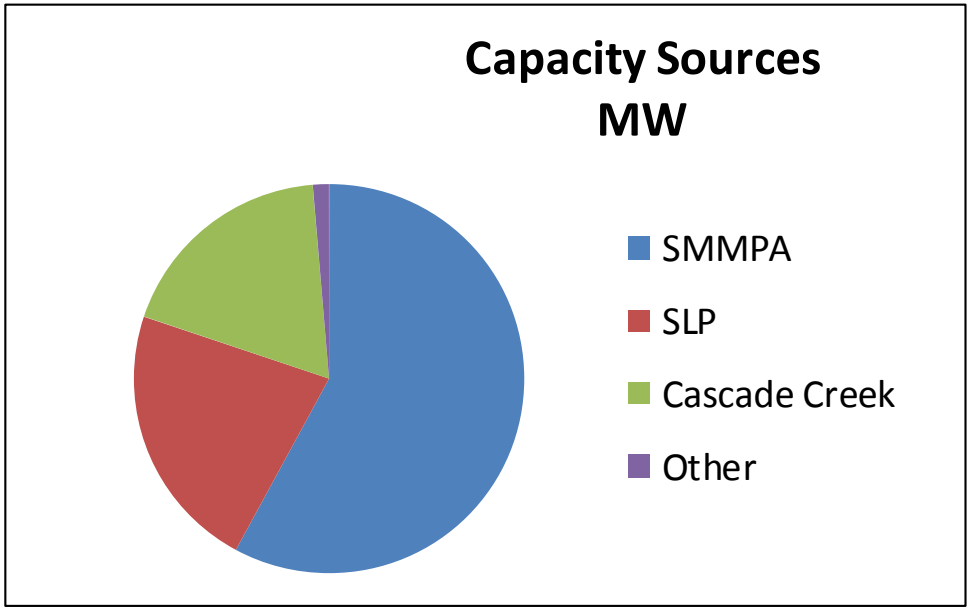
- Issues of Change Since Original Study
- Regulatory Issues
- **Impact on Existing Resources**
- Strategies for RPU

# As an Electric Utility in MISO, RPU is Obligated to

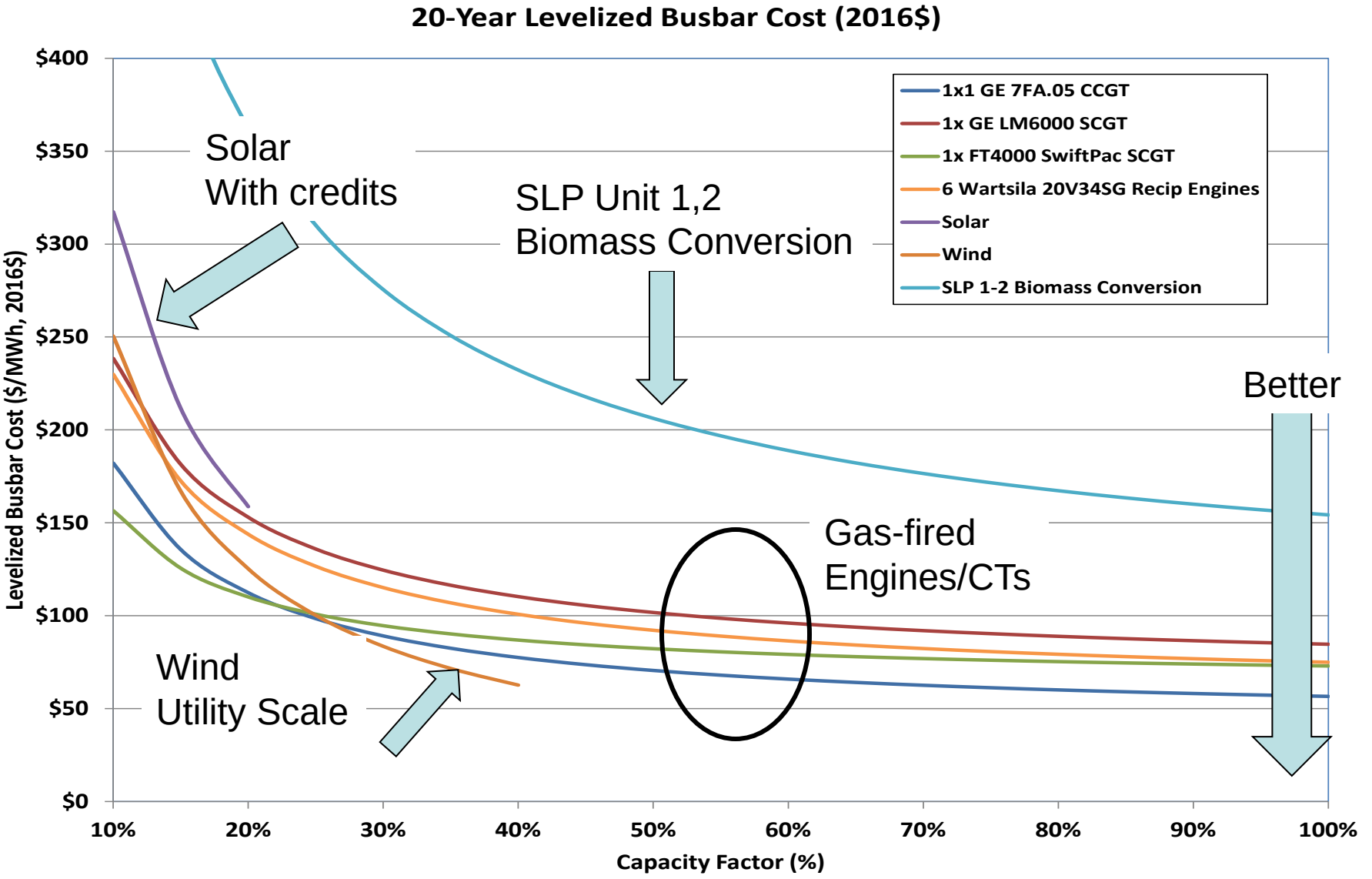
- Provide sufficient capacity to meet MISO Module E and other regulations regarding reserve capacity (MW) requirements
  - Comes from units that RPU builds or contracts for through a PPA or demand side management
- Provide sufficient energy (MWh) to meet load demands of customers
  - Comes from units that RPU builds, contracts for (SMMPA), net metering, DSM, MISO market

# RPU Sources of Capacity & Energy- 2015 Prediction

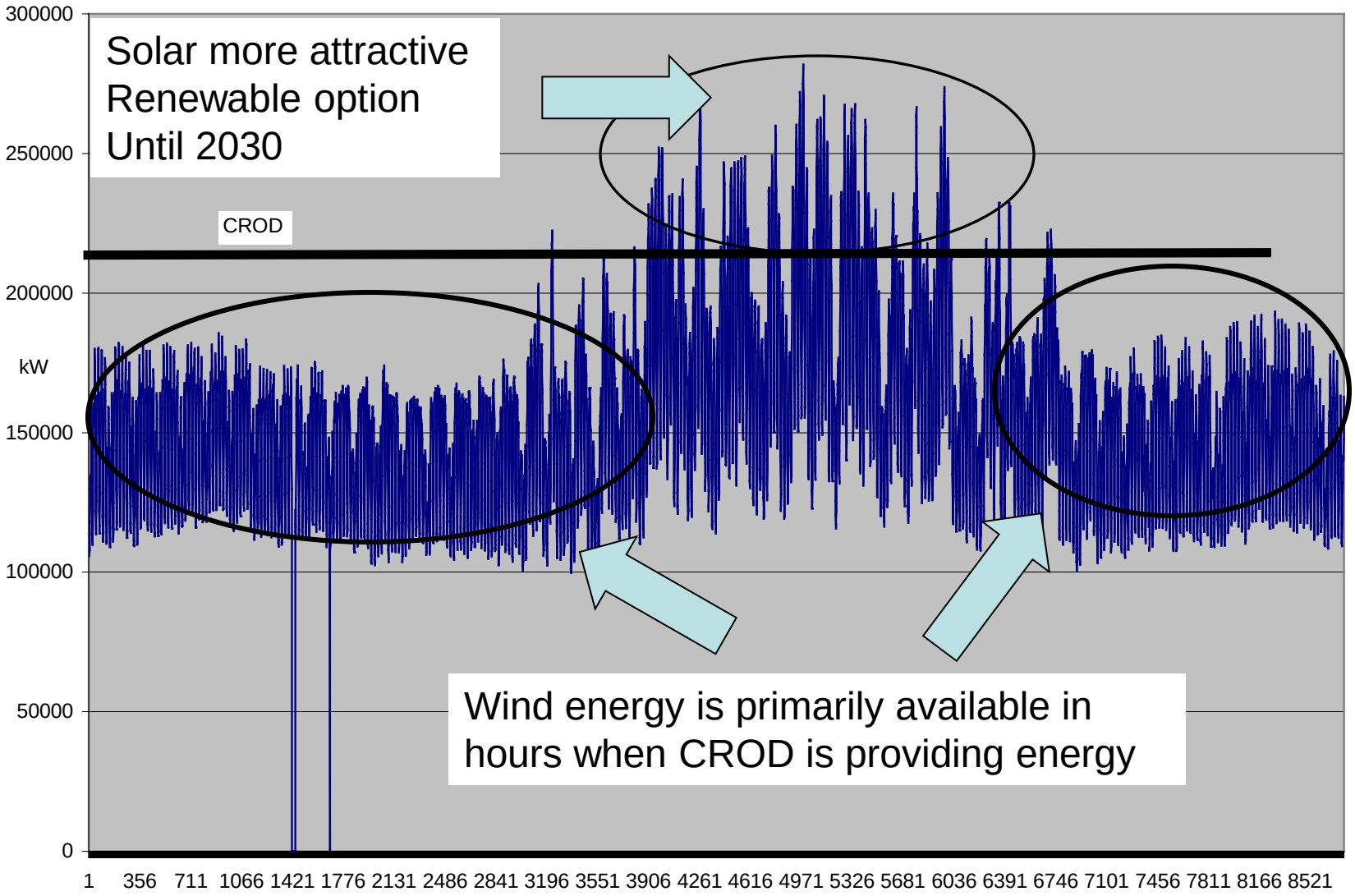


# Busbar Costs of Potential Options for RPU



# Renewable Energy Only Beneficial Above CROD/Net metered



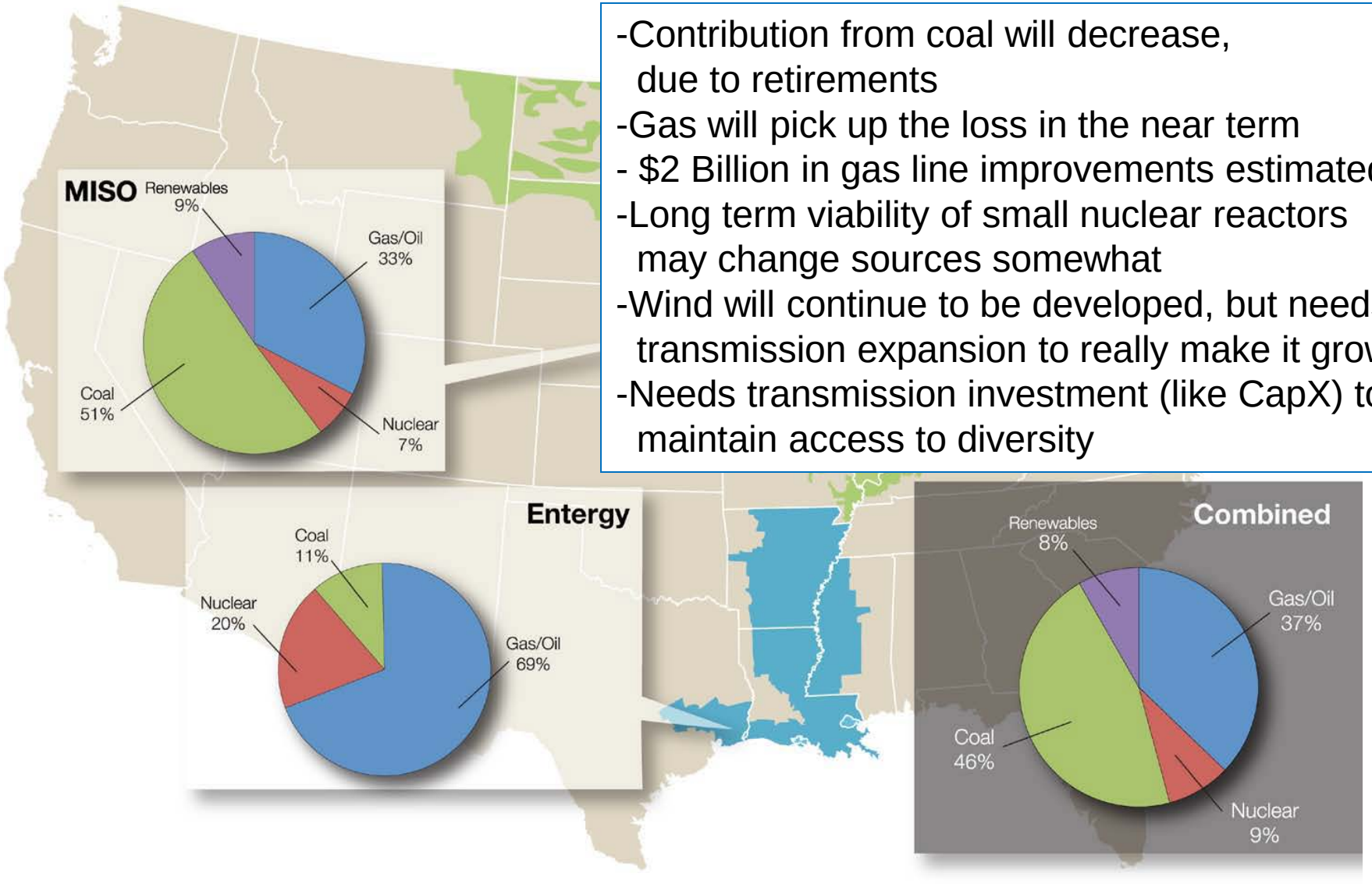
# Typical Resource Strategy for Utilities Similar to RPU

- Satisfy reserve margin with lowest capital cost approach available
  - Typically low capital cost per MW gas-fired combustion turbines, engines
  - Use of existing resources with low fixed operations and maintenance costs
  - Market capacity purchases
  - Minimal consideration of efficiency of units for this issue since very seldom dispatched
  - If asset built, how can it participate in revenues from MISO?
  - Lowest cost capital outlay
- For MISO members, satisfy energy through
  - MISO purchases at utility's load node
    - Diversity in energy mix (wind, hydro, coal, nuclear, gas)
    - Typically better efficiencies at a lower cost than the utility could build
  - Renewables from market and customers

# Typical Resource Strategy for Utilities Similar to RPU (cont'd)

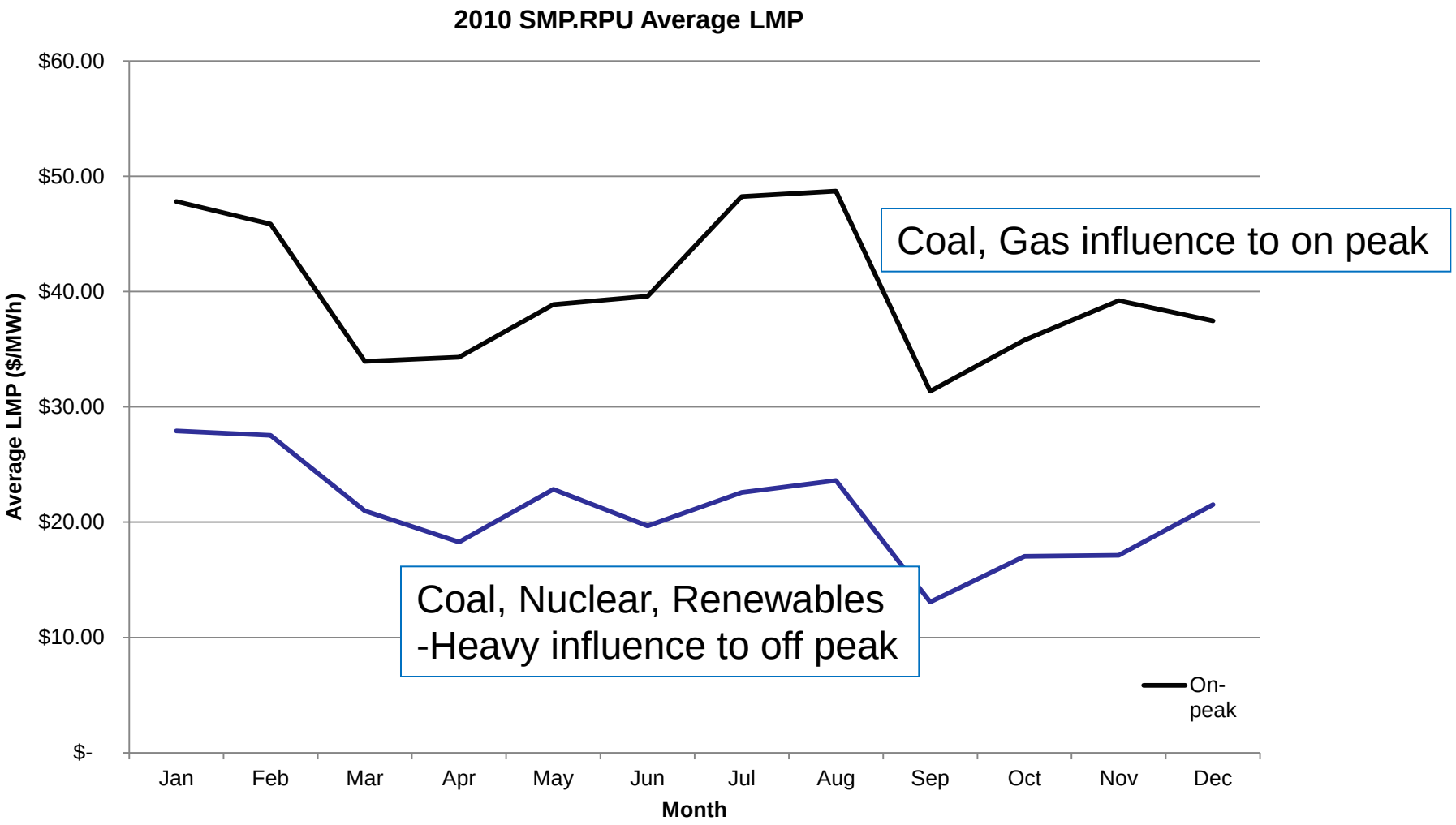
- Use of resource planning tools, like Strategist, allows review of thousands of combinations of market and build options to help arrive at attractive future for utilities.
  - Optimize market and owned options to meet capacity requirements based on assumptions
  - Produce the lowest cost evaluated futures that are robust with regards to sensitivities
  - Allows balancing of transmission import issues, reliability of the system, etc.
  - Identify potential MISO market revenues
- Optimal energy mix comes from continual adjustment of MISO market bids.

# In Reality MISO is the Main Source- Diversity of Market is Important




-Contribution from coal will decrease, due to retirements
-Gas will pick up the loss in the near term
- $2 Billion in gas line improvements estimated
-Long term viability of small nuclear reactors may change sources somewhat
-Wind will continue to be developed, but needs transmission expansion to really make it grow.
-Needs transmission investment (like CapX) to maintain access to diversity

# Diversity Shows in MISO Pricing



# Final Scenarios Considered for RPU

- Keep all of SLP operational
  - Retrofit SLP Units 3 and 4,
  - Operate Units 1 and 2 on gas
  - High investment cost in older units and fixed operations and maintenance
- Retrofit SLP Unit 4 and retire Units 1-3
  - High investment cost in older unit and slight reduction in fixed operations and maintenance
- Retire SLP
  - Relies on market for shortfalls in capacity
  - Investment in gas units (like Cascade Creek) if needed
  - Lowest fixed operations and maintenance cost
- All scenarios have issue of SMMPA CROD expiring in 2030

# Scenario Analysis Shows…

| Scenario | 1 | 2 | 3 |
|---|---|---|---|
| Plan Year | Retire All SLP 2015 | Retire SLP 1,2,3 2015 | No Retirements |
| 2015 | | | |
| 2016 | DEF(48) | DEF(4) | |
| 2017 | DEF(54) | DEF(10) | |
| 2018 | DEF(61) | DEF(17) | |
| 2019 | DEF(67) | DEF(24) | |
| 2020 | DEF(74) | DEF(30) | |
| 2021 | LM6000 DEF(35) | DEF(37) | |
| 2022 | DEF(42) | DEF(43) | DEF(4) |
| 2023 | DEF(49) | DEF(51) | DEF(11) |
| 2024 | DEF(57) | DEF(58) | DEF(19) |
| 2025 | DEF(64) | DEF(66) | DEF(26) |
| 2026 | DEF(72) | DEF(74) | DEF(34) |
| 2027 | LM6000 DEF(35) | LM6000 DEF(36) | DEF(42) |
| 2028 | DEF(43) | DEF(45) | DEF(50) |
| 2029 | DEF(51) | DEF(53) | DEF(59) |
| 2030 | DEF(60) | DEF(61) | DEF(67) |
| 2031 | 7FA Combined Cycle | 7FA Combined Cycle | 7FA Combined Cycle |
| 2039 | | | DEF(4) |
| 2040 | DEF(7) | DEF(9) | DEF(15) |
| 2041 | DEF(18) | DEF(19) | DEF(25) |
| 2042 | DEF(28) | DEF(30) | DEF(36) |
| 2043 | DEF(39) | DEF(41) | DEF(46) |
| 2044 | DEF(50) | DEF(52) | DEF(57) |
| NPV UTILITY COST (@ 6.0%) | With CROD | With CROD | With CROD |
| PLANNING PERIOD ($000) | $2,289,340 | $2,385,414 | $2,373,307 |
| % DIFFERENCE | 0.00% | 4.20% | 3.67% |

Reliance on capacity from market.

Installation of combustion turbine type capacity

Use of same asset to replace CROD

Benefit to retiring SLP

# Annual Budgeted Cost Reductions with Scenario 1

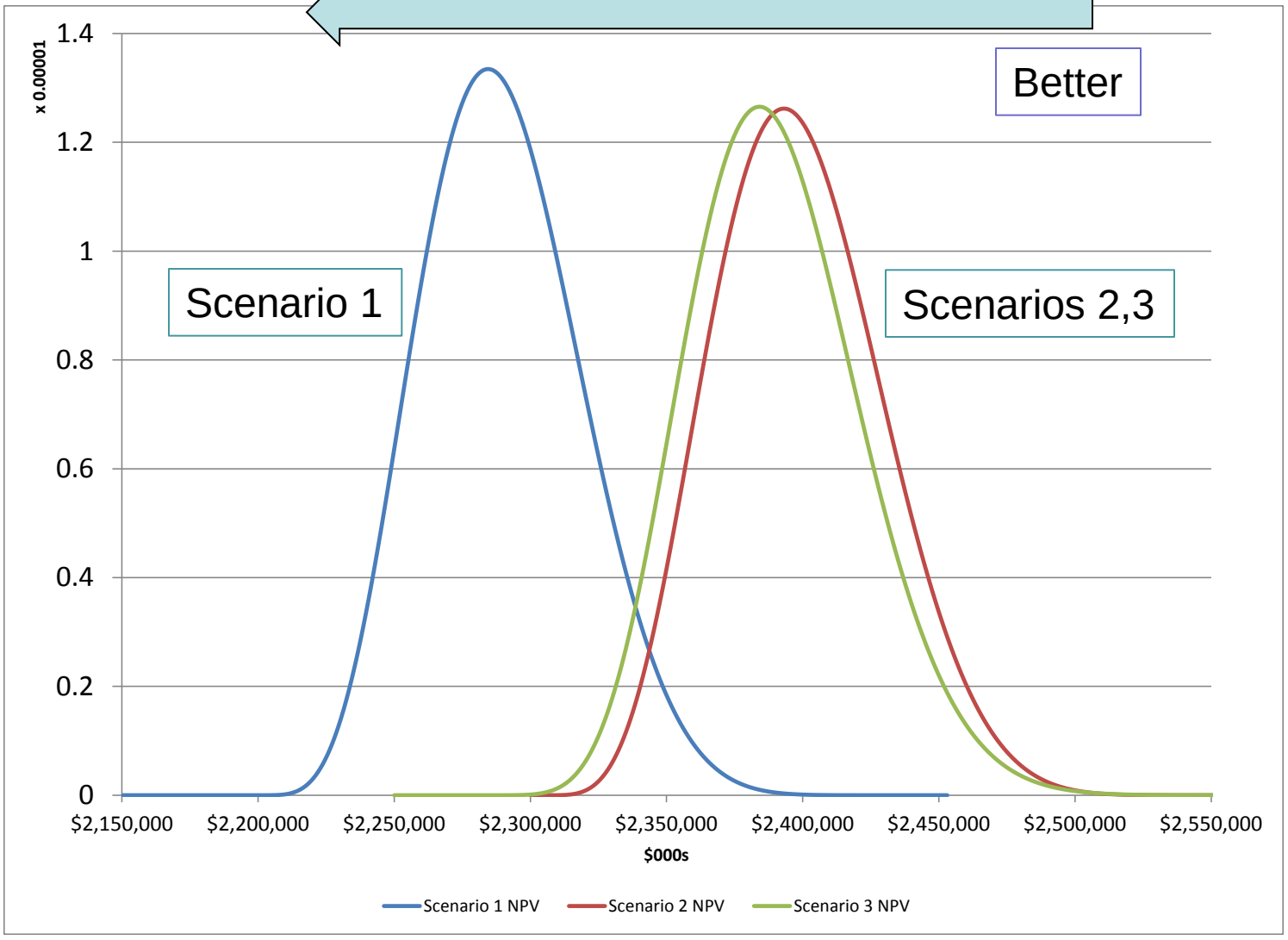
($000s)

| Savings from | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| Scenario 2 | $5,078 | $5,176 | $5,394 | $5,644 | $5,863 |
| Scenario 3 | $5,654 | $5,485 | $5,605 | $5,581 | $5,660 |

# Sensitivity Analysis Changed Assumptions used in Scenarios

- Natural gas forecast – Increase up to $2 per mmBtu above the 2015 price with same escalation
- EPA associated capital cost – Adjust across the range of -30 percent to +20 percent
- Interest Rates – Increase up to 2 percent above current assumption
- Market capacity cost – Adjust across the range of +/- 20 percent
- Generator capital cost – adjust across the range of +/- 20 percent
- SLP coal – increase up to 5 percent

# Sensitivity Analysis Shows Scenario 1 is Robust to Assumption Changes



# Conclusions

- EPA aggressively targeting coal-fired electrical generating units with general industry regulations tightening the allowed emissions from the units and through pursuing suspected violations of existing regulations under New Source Review of the Clean Air Act.
- More onerous EPA action which affects RPU is complying with the proposed EPA NSR Enforcement Action settlement counter offer provided to RPU in June, 2011.
- RPU is confronted with considering additional investments needed for emission controls at SLP units due to the proposed EPA NSR Enforcement Action settlement counter proposal and the need to acquire capacity for its obligations in the 2021 time frame.
- Analysis of various retirements versus retrofit scenarios indicates retiring the SLP and acquiring replacement capacity from the market in the short term reduces the annual revenue requirements associated with RPU resources when compared to the two retrofit scenarios.

# Conclusions

- SLP Unit 4 is not anticipated to operate at any significant capacity factor in the future to meet RPU energy requirements or for energy sales into the MISO market. Cost of maintaining SLP capacity is higher than cost of capacity from market.
- Units developed in the future as replacements for SLP would help in positioning RPU for its post 2030 operations without the CROD. Would position RPU with assets more valued in the MISO market than SLP Units 3 and 4.
- RPU resource deficits occurs in approximately 2021 with the current resources and load forecast. RPU has several options to obtain capacity to fill this deficit at reasonable cost.
- RPU investment in CapX transmission upgrade projects provides increased, firm access, to the area market. Reduces level of generation relative to load RPU deems necessary to maintain high reliability to its customers.
- RPU should continue to update the analysis of its future resource plans as major changes in the industry occur or as assumptions change from those used herein.

# Summary

- Based on the analysis developed by Burns & McDonnell and discussion with RPU management, the recommendation is that the RPU Board direct management to develop plans to decommission the Silver Lake Power Plant on or before December 31, 2015.