
# Avoided Costs: INU-2014-0001

DRAFT – May 27, 2014

**FILED WITH**
**Executive Secretary**

**May 27, 2014**

**IOWA UTILITIES BOARD**

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# Overview

- Background/Concepts
- Avoided Capacity Costs
  - Examples
- Avoided Energy Costs
  - Examples
- Summary Tables

# Background/Concepts



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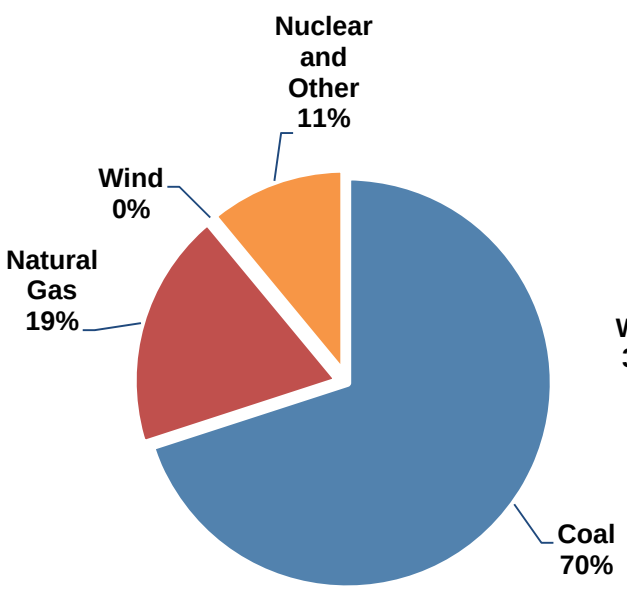
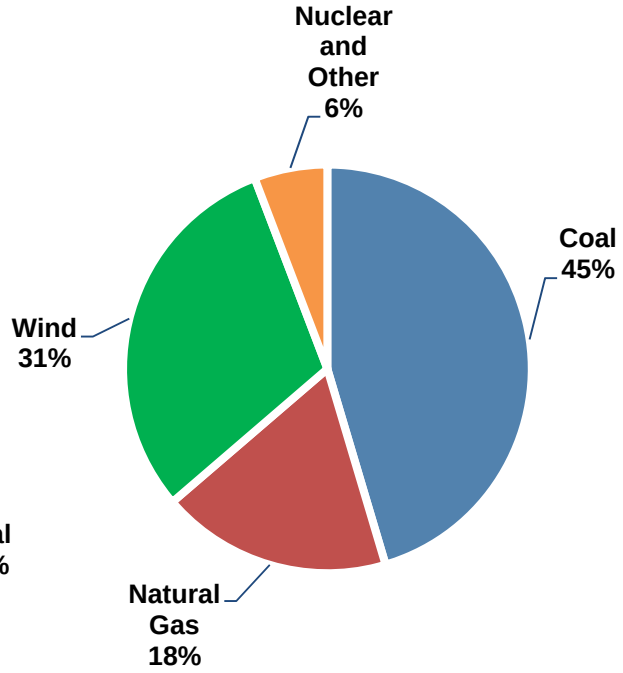
# Generating Capacity by Fuel Type

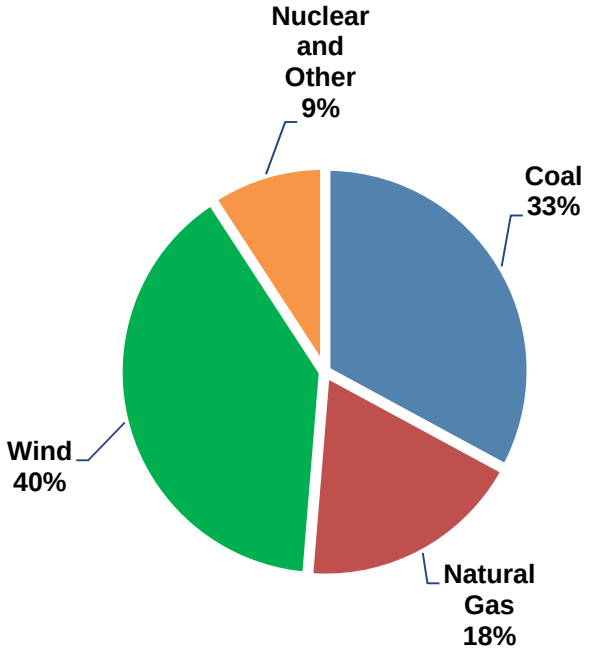
**Dec. 31, 2000**




**Dec. 31, 2013**




**Dec. 31, 2016**




*(1) Net MW owned and contracted*



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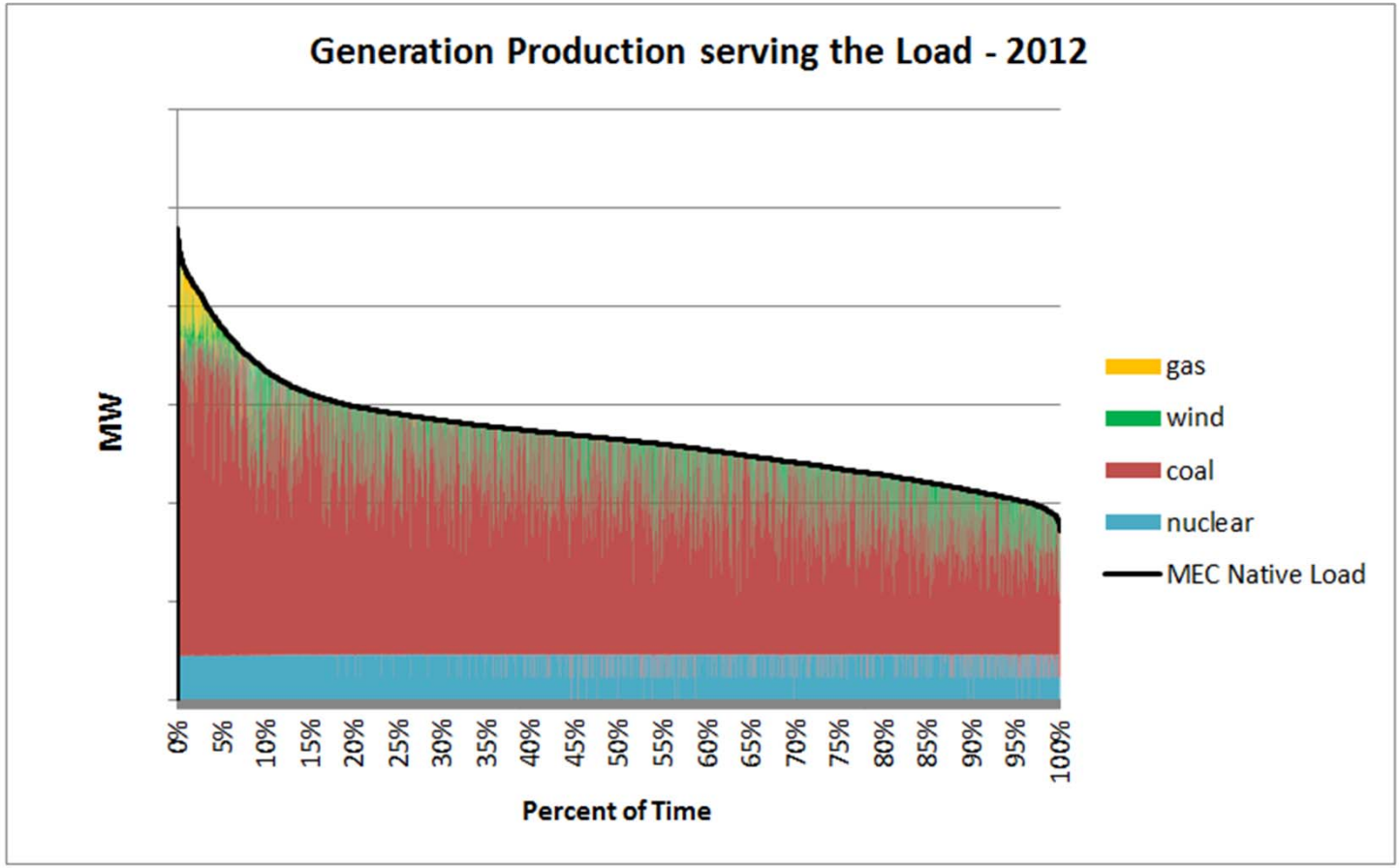
# Resource Mix

- Capacity factors and production costs are considerations in developing the resource mix

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# Concepts – Avoided Capacity

- Capacity – MidAmerican determines the cost of capacity based upon the cost of new generation resources or capacity purchases
  - Peaker Method – determines the cost of capacity based upon the least-cost capacity option, a combustion turbine
    - MISO uses the cost of a new advanced combustion turbine for its Cost of New Entry (CONE)
  - Purchases – determines the near-term cost of capacity based upon market prices

# Concepts – Avoided Capacity

- Economic Carrying Charge – applied to the peaker method
  - Deferral cost only, not total installed capacity cost
  - The annual cost of not deferring an investment, recognizing inflationary effects
- Overnight Cost – assumes a generator can be constructed without inflation and interest costs
  - Represents the cost to construct a generator “overnight”
- Installed Cost –recognizes the time required for construction, including interest and inflationary impacts
  - Allowance for Funds Used During Construction (AFUDC)

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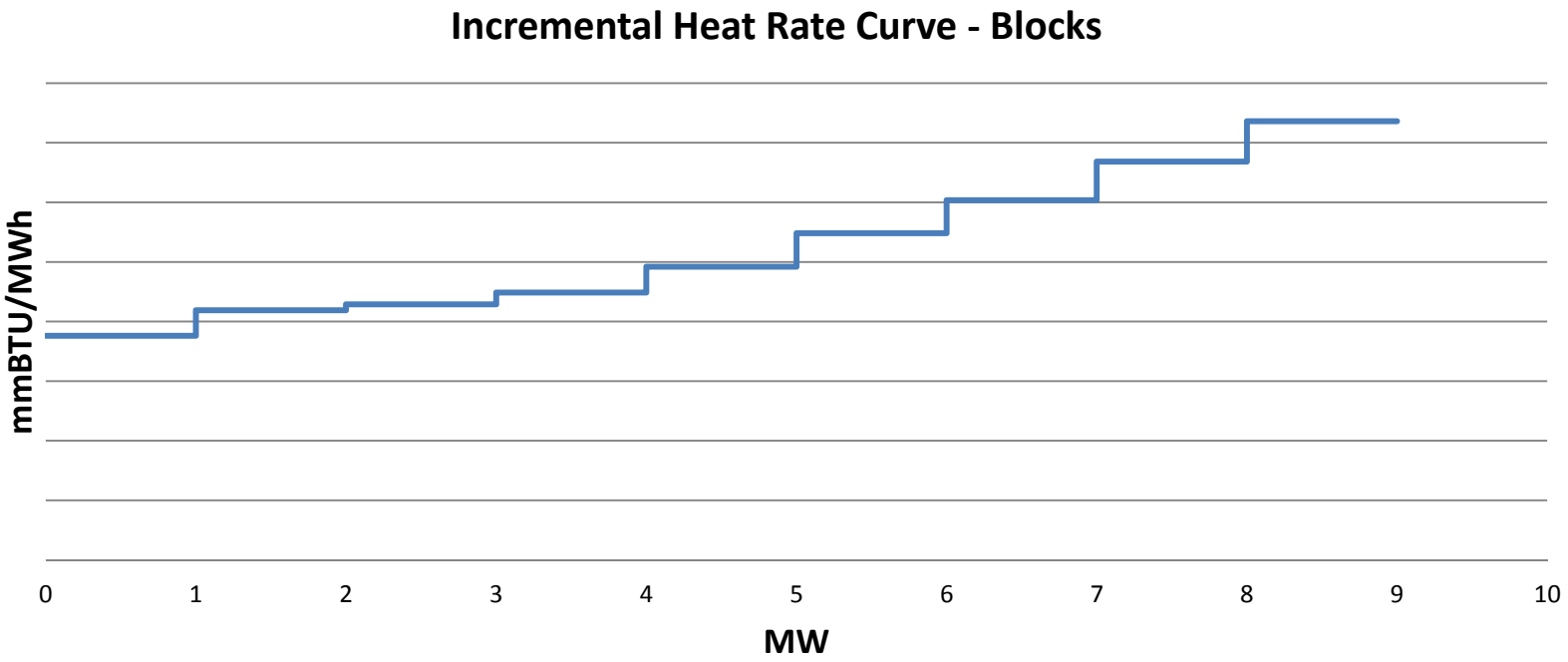
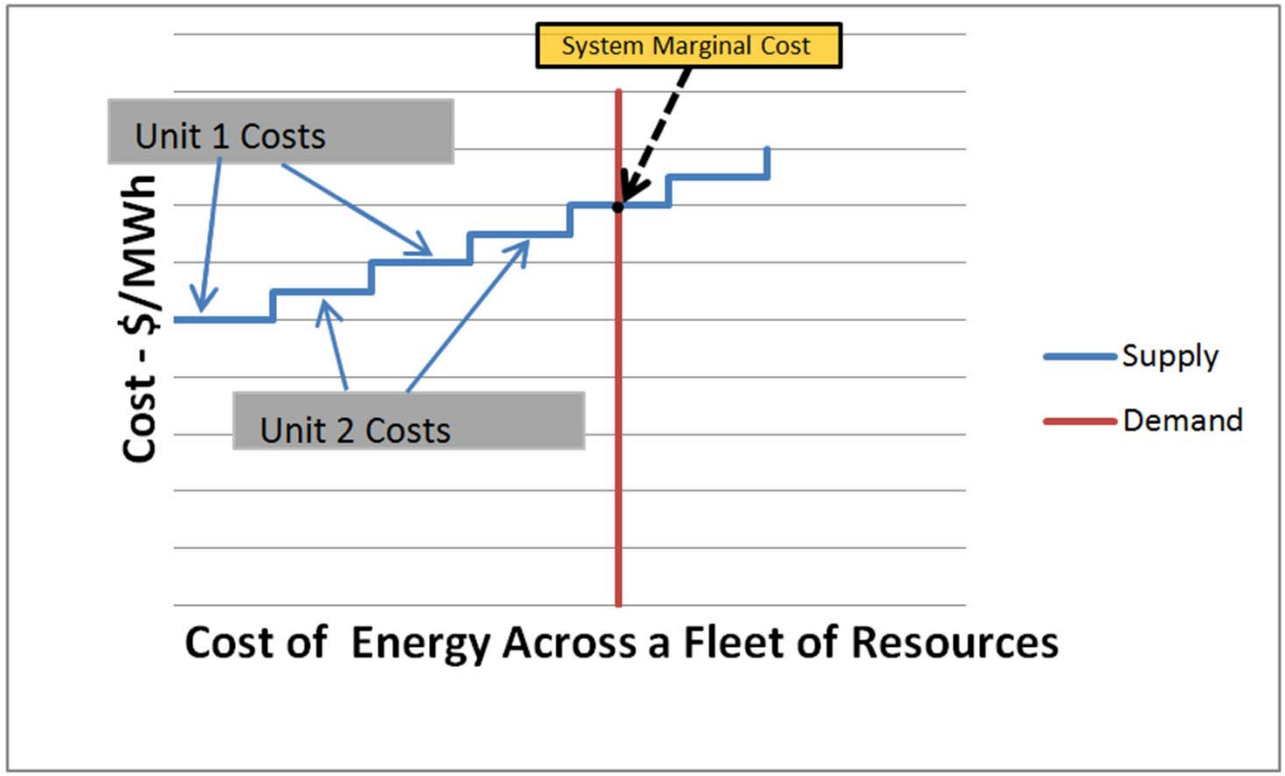
# Concepts – Avoided Energy

- Incremental cost of a single generator
  - Apply the fuel cost in $/mmBTU to the incremental heat rate to determine costs in $/MWh



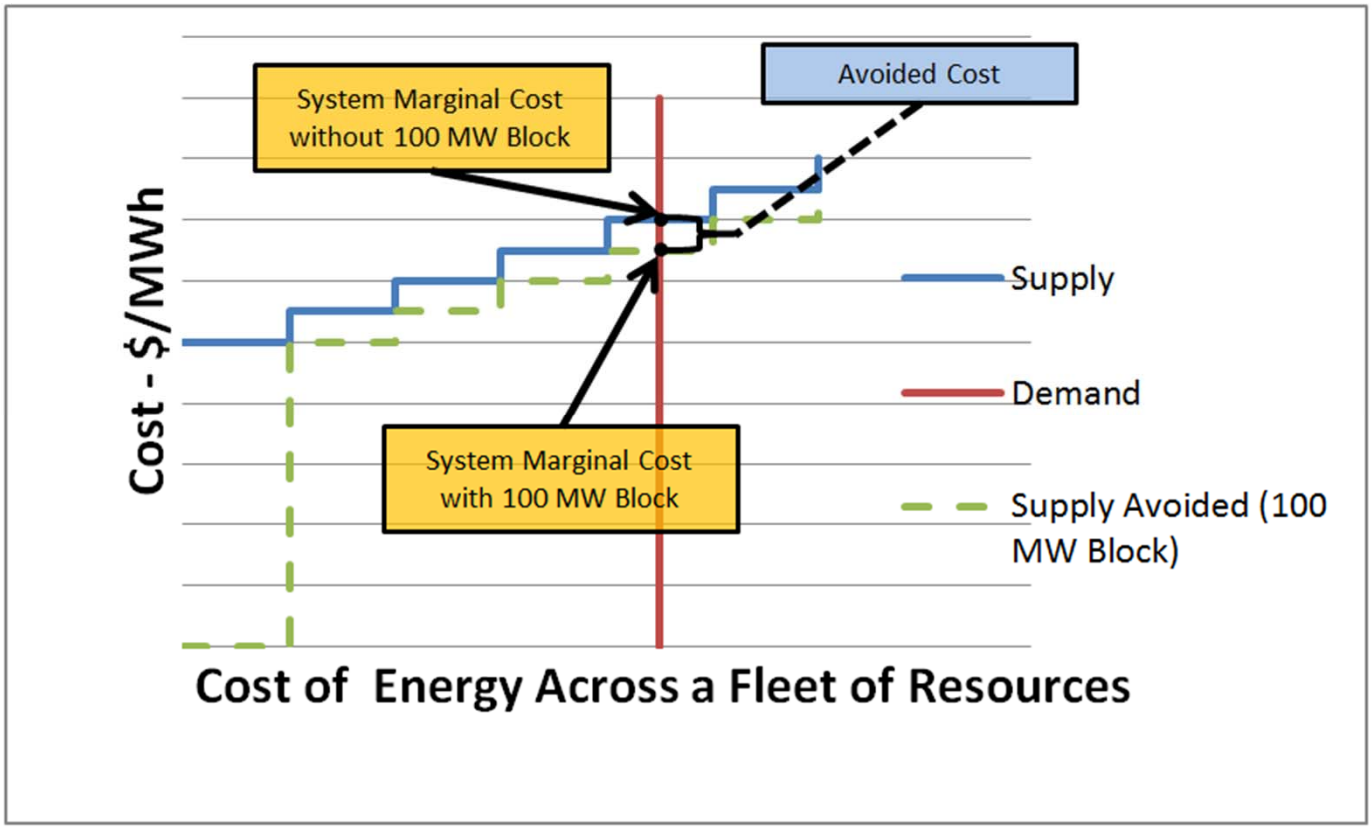
# Concepts – Avoided Energy

- Least Cost Dispatch - the fleet of resources is combined to develop a least-cost supply dispatch stack to meet the demand requirement each hour
- System Marginal Cost – at the intersection of supply and demand



# Concepts - Avoided Energy

- Avoided Cost – when evaluated as a block of energy avoided, the change in the system marginal cost caused by shifting the supply curve (e.g. 50 MW, 100 MW, 150 MW and 200 MW)



# Anticipated Changes for June 2014 Filing

- Avoided Capacity Cost
  - MISO CONE costs are now locational
  - The “bridging” period between market-based costs to peaker combustion turbine costs will be removed
    - In June 2012, insufficient market price data was available to represent the impact of upcoming environmental rule impacts
- Avoided Energy Cost – the methodology has been revised to address “minimum generation” periods within the model, where load falls below the lowest dispatch capability of MidAmerican resources
  - See Example 3 to follow

# Avoided Capacity Costs



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# Avoided Capacity Costs

- Near term prices – cleared capacity market prices
  - Utilizes the methodology posted to the MISO website by the Independent Market Monitor (IMM) to set the Initial Reference Level for the MISO Planning Resource Auction (PRA)[1]
  - Represents the opportunity cost for capacity sellers that may select either the MISO capacity auction or another market; two components:
    - Utilizes the MW-weighted average clearing prices for the PJM Base Residual Auction and available Incremental Auctions to develop the offer cap in the MISO PRA
    - Adjusts the weighted average price by adding the value of replacement capacity, which is the PJM daily deficiency charge (higher of 20% of the weighted average market clearing price or $20/MW-day)

[1] https://www.misoenergy.org/MarketsOperations/IndependentMarketMonitor/Pages/IndependentMarketMonitor.aspx

# Avoided Capacity Costs

- Out year prices – peaker method; the economic carrying charge for a new combustion turbine
  - Relies upon MISO's Cost of New Entry (CONE) as the basis for the avoided cost calculation
    - Publicly available
    - Determined by an independent authority
  - Converts the installed cost to an annual economic carrying charge based upon MidAmerican parameters
    - Weighted-average cost of capital
    - After tax discount rate
    - Tax life
    - Tax-depreciation basis
    - Book life
    - Inflation



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# Avoided Capacity Costs
# Example 1: Near-term prices

| PJM Auctions for the June 2012 through May 2013 Period | "RTO" Clearing Prices and Quantities | |
|---|---|---|
| | MW | $/MW-Day |
| Base Residual Auction | 136,144 | 16.46 |
| First Incremental Auction | (1,233) | 16.46 |
| Second Incremental Auction | 2,073 | 13.01 |
| Third Incremental Auction | 1,979 | 2.51 |

| Calculation of Intial Reference Level | MISO Initial Reference Level | |
|---|---|---|
| | $/MW-day | $/MW-Year |
| Weighted Average Clearing Price (WACP) | 16.20 | |
| Opportunity Cost -Max{$20,20%*WACP} | 20.00 | |
| Transmission | (7.73) | |
| Total | 28.47 | 865.94 |

- MISO Posting of Initial Reference Price: https://www.misoenergy.org/Library/Repository/Report/IMM/2012-2013%20Inital%20Reference%20Level%20for%20Planning%20Resources.pdf
- PJM Posting of Capacity Auction Prices for the PJM for the planning year June 2012 through May 2013 : http://www.pjm.com/markets-and-operations/rpm/rpm-auction-user-info.aspx



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# Avoided Capacity Costs
# Example 2: Peaker Calculation June 2012

- MISO's annual CONE Filing in August 2011, Docket ER11-4185
  - MISO's study assumed capital costs of $704/kW and fixed operations and maintenance costs of $12.72/kW for a new 160 MW combustion turbine based upon Energy Information Administration (EIA) data for 2009 dollars, with an implicit price deflator of 1.028 to convert to 2011 dollars
- Calculation of net present value of revenue requirements
  - $1,273/kW ($2011)
- Calculation of economic carrying charge
  - $99.11/kW ($2015)

# Avoided Capacity Costs
# June 2012 PURPA Filing

| Avoided Cost Contribution Portion Year | Avoided Cost ($/kW-year) | |
|---|---|---|
| 2012 | 10.00 | Initial Reference Price |
| 2013 | 20.00 | Bridging period to CONE* |
| 2014 | 40.00 | |
| 2015 | 99.11 | Based On MISO CONE |
| 2016 | 101.59 | |
| 2017 | 104.13 | |

* Potential price changes associated with expected environmental impacts



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# Avoided Capacity Costs

- Anticipated changes for June 2014 filing
  - Utilize MISO's new locational Cost of New Entry (CONE) applicable to MidAmerican for Local Resource Zone 3 (LRZ3)
    - LRZ3: MidAmerican, Alliant, and Muscatine Power Local Balancing Areas
    - CONE value is filed annually with FERC each September[1]
    - Energy Information Agency (EIA) data is obtained for the initial combustion turbine installation and fixed operation and maintenance cost assumptions
    - Installed cost is adjusted for LRZ3 locational differences
  - Remove the bridging period

# Avoided Energy Costs
# Overview

- Calculation is based on the variable energy cost to dispatch MidAmerican Energy generating resources to serve MidAmerican Energy retail energy requirements
- Total company approach, not jurisdictional
- Resources are dispatched in merit order



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# Avoided Energy Costs



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# Avoided Energy Costs
# Production Cost Software

- PROMOD IV® Hourly Production Cost Software by Ventyx
  - Performs unit commitment and economic dispatch each hour based on the next available lowest cost segment of generation to serve the load utilizing resource and load parameters
  - Models six generator offer blocks per generator
  - Performs a Monte Carlo simulation for generator forced outage events
  - Allows for planned generator outages to be modeled
  - Parameters entered into PROMOD IV are updated annually for MidAmerican's ten year financial plan



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# Avoided Energy Costs
# Key Assumptions

- Total system approach
- Load Forecast
  - Peak, minimum, and hourly load forecast
  - The hourly profile is based on historical hourly profiles of the load scaled to produce expected annual load factors
  - Net of demand response and behind the meter generation
- Wind Production Forecast
  - Peak, minimum, and hourly wind forecast
  - The hourly profile is based on historical hourly profiles of each site's production scaled to produce expected net annual capacity factors
  - Forced outages and de-rates are contained within the historical data

# Avoided Energy Costs
# Key Assumptions

- Generating Unit Operating Parameters
  - Must Run Status
  - High/Low MW Operating Range
  - Ramp Rates
  - Minimum Run Times
  - Start Costs
  - Forced outage rates
- Delivered Fuel Costs
  - Wind ($0)
  - Nuclear
  - Coal
  - Natural Gas
  - Diesel



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# Avoided Energy Costs
# Key Assumptions

- Variable Operation and Maintenance Costs
- Environmental Regulations and Emission Costs
  - SO2, NOx, Mercury and CO2
- Bilateral unit-specific purchases
- Dispatchable Resources
  - Dispatchable generating units can adjust their hourly output, or can be turned on or off, to meet hourly retail load requirements
    - Coal generation
    - Natural gas generation
  - Non-dispatchable generation is less flexible
    - Nuclear generation
    - Wind generation where the fuel (“wind”) is intermittent in nature

# MidAmerican PURPA Filing, Exhibit A
## (2012 Filing – Costs were filed through 2017)

| MidAmerican Energy Company | | | | | | | |
|---|---|---|---|---|---|---|---|
| Avoided Energy Costs for Various Levels of Purchase from Qualifying Facilities | | | | | | | |
| Dollars Per MWH | | | | | | | |
| | | | | | | | |
| Year | 2012 | | | | | | |
| | Summer | | | | Winter | | |
| MW | Peak | Off-Peak | Season | | Peak | Off-Peak | Season |
| 0 | $ 31.69 | $ 24.47 | $ 27.86 | | $ 23.58 | $ 21.50 | $ 22.49 |
| 10 | 31.79 | 24.52 | 27.94 | | 23.66 | 21.76 | 22.67 |
| 20 | 31.90 | 24.58 | 28.02 | | 23.75 | 22.03 | 22.85 |
| 30 | 32.01 | 24.64 | 28.10 | | 23.84 | 22.30 | 23.03 |
| 40 | 32.12 | 24.70 | 28.19 | | 23.92 | 22.56 | 23.21 |
| 50 | 32.23 | 24.76 | 28.27 | | 24.01 | 22.83 | 23.39 |
| 100 | 32.61 | 24.74 | 28.44 | | 23.86 | 22.06 | 22.92 |
| 150 | 32.86 | 24.69 | 28.53 | | 23.94 | 22.05 | 22.95 |
| 200 | 32.93 | 24.78 | 28.61 | | 23.98 | 21.74 | 22.81 |



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# Avoided Energy Costs Examples

MidAmerican Energy Company
Marginal Energy Cost
Illustrative Examples

| | | | Example 1A/2 | Example 1B | | | Example 1C | | Example 3 | Example 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wind 5% | Wind 40% | Wind 85% | Wind 40% | Wind 75% | Wind 46% | Wind 70% | Wind 60% |
| | 2014 Variable Costs Per MWh | 2014 Capability Values with Wind VIII | Example Hour Summer Peak | Example Hour Winter Peak | Example Hour April Peak | Example Hour Average 2014 On Peak | Example Hour Average 2014 Off Peak | Example Hour Minimum 2014 Off Peak | Example Hour Winter Peak | Example Hour Winter Peak |
| Retail Energy Requirement | | | 4,575.0 | 3,737.0 | 3,196.0 | 3,093.0 | 2,496.0 | 1,513.0 | 3,737.0 | 3,737.0 |
| Wind Production | $0.00 | 3,335.6 | 166.8 | 1,334.2 | 2,835.3 | 1,334.2 | 2,496.0 | 1,534.4 | 2,334.9 | 2,001.4 |
| Nuclear Production | $7.50 | 453.9 | 453.9 | 453.9 | 453.9 | 453.9 | - | - | 453.9 | 453.9 |
| Large Unit Coal Production | $20.25 | 2,702.7 | 2,702.7 | 1,948.86 | - | 1,304.86 | - | - | 948.18 | 1,281.74 |
| Small Unit Coal Production | $21.50 | 653.9 | 653.9 | - | - | - | - | - | - | - |
| GDMEC | $32.34 | 484.4 | 484.4 | - | - | - | - | - | - | - |
| Combustion Turbines | $72.00 | 813.1 | 113.3 | - | - | - | - | - | - | - |
| Marginal Energy Cost Per MWh | | | $72.00 | $20.25 | $7.50 | $20.25 | $0.00 | $0.00 | $20.25 | $20.25 |

Wind MEC Owned (Nameplate MW July 2013) = 2,284.6
Wind VIII MEC Owned Nameplate MW December 2015 = 1,051.0
Capability Values MISO ICAP 2013-2014 Planning Year
MEC Net Peak Demand (July 2014) = 4,575 MW
Large Unit Coal Production - Must Run Minimum Operating Level = 1,175 MW



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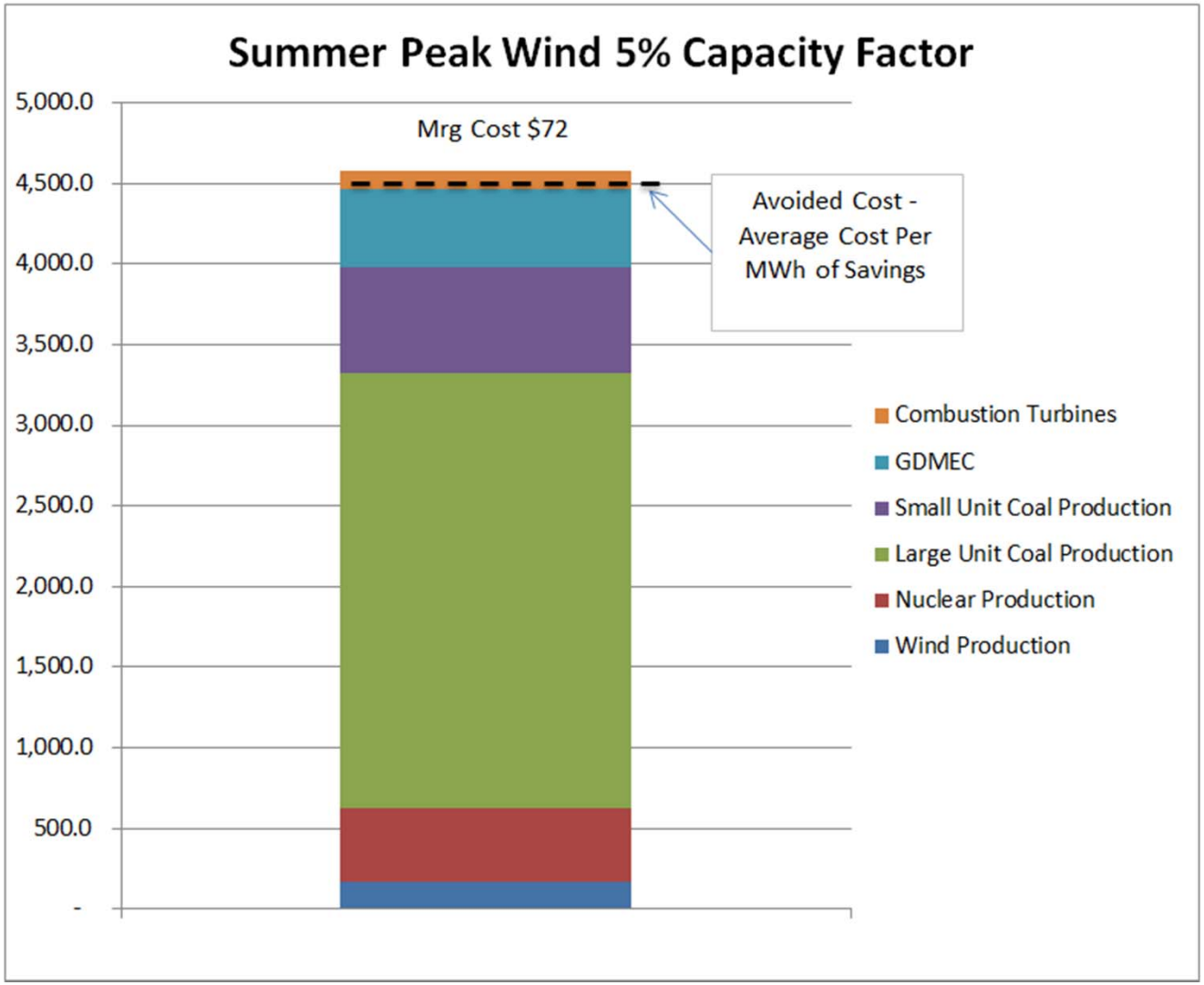
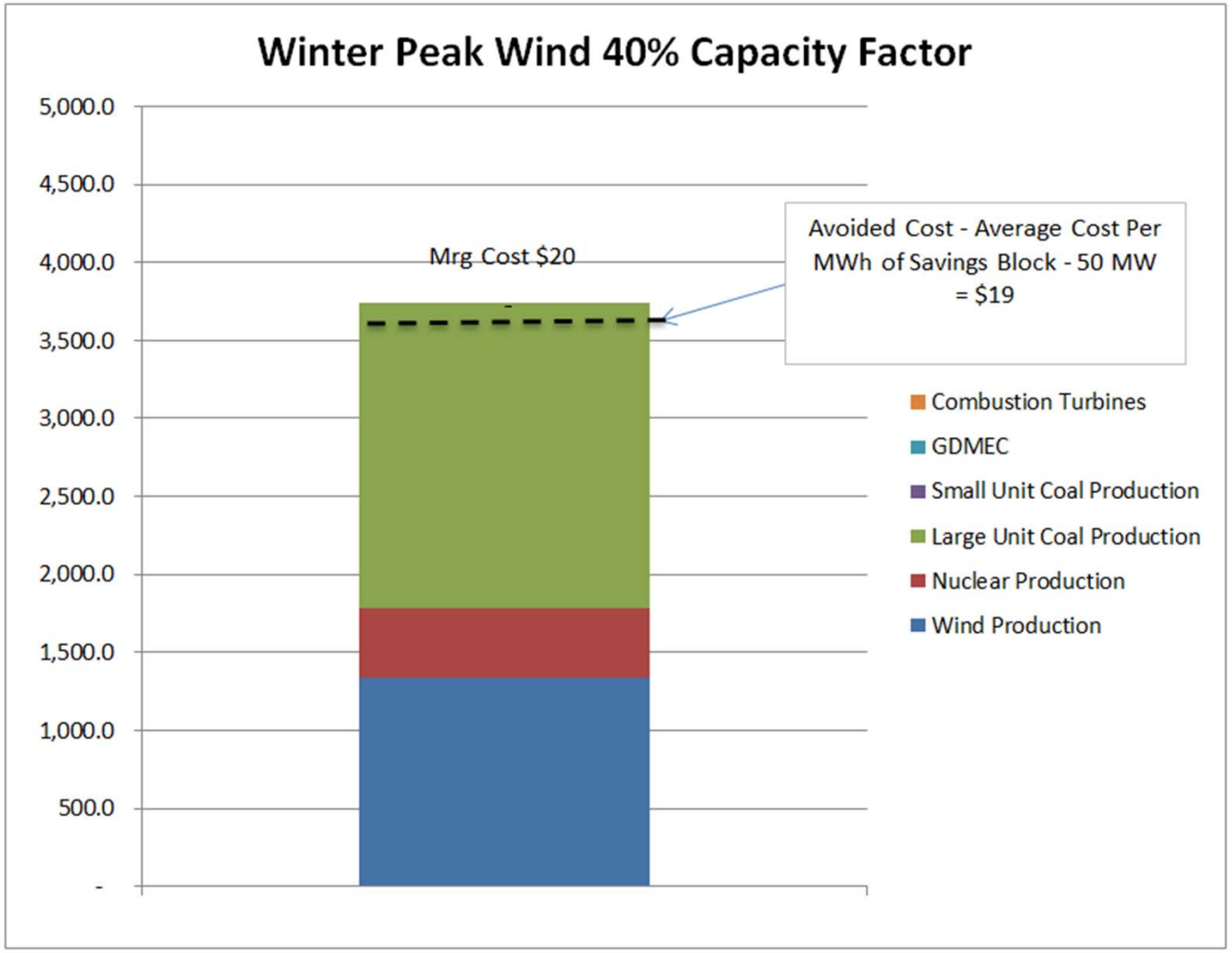
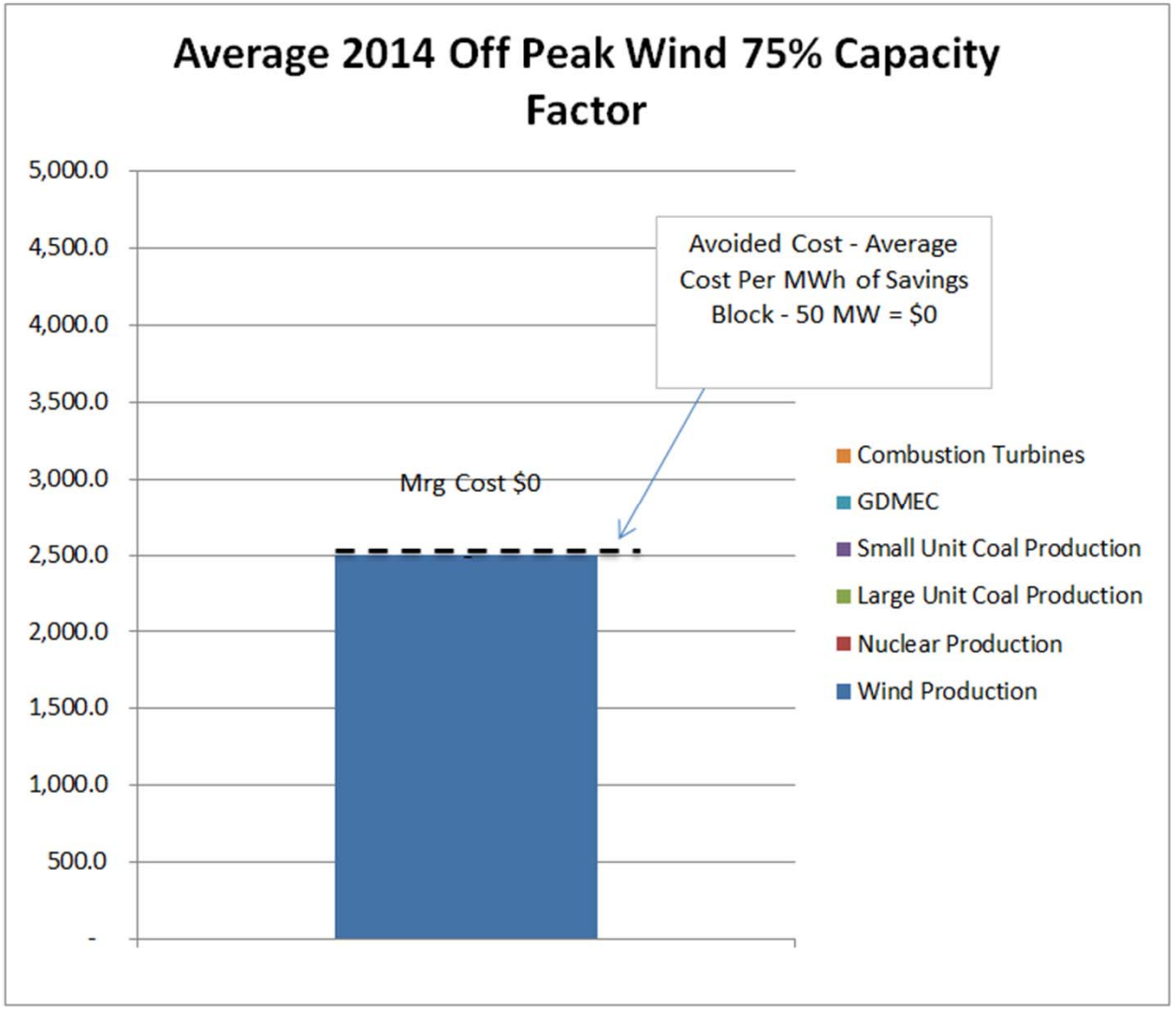
# Avoided Energy Costs
# Example 1a



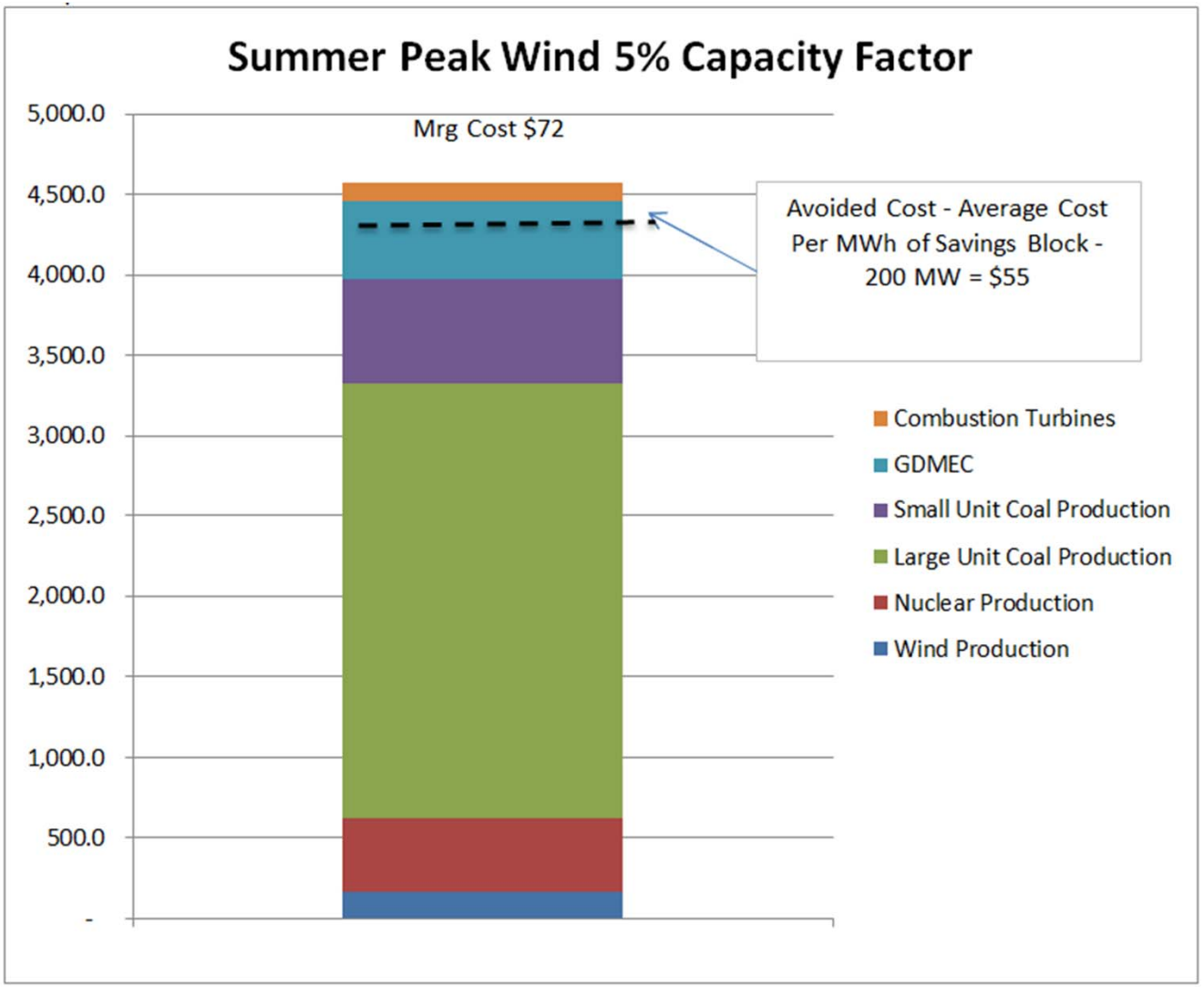
# Avoided Energy Costs
# Example 1b



# Avoided Energy Costs
# Example 1c



# Avoided Energy Costs
# Example 2



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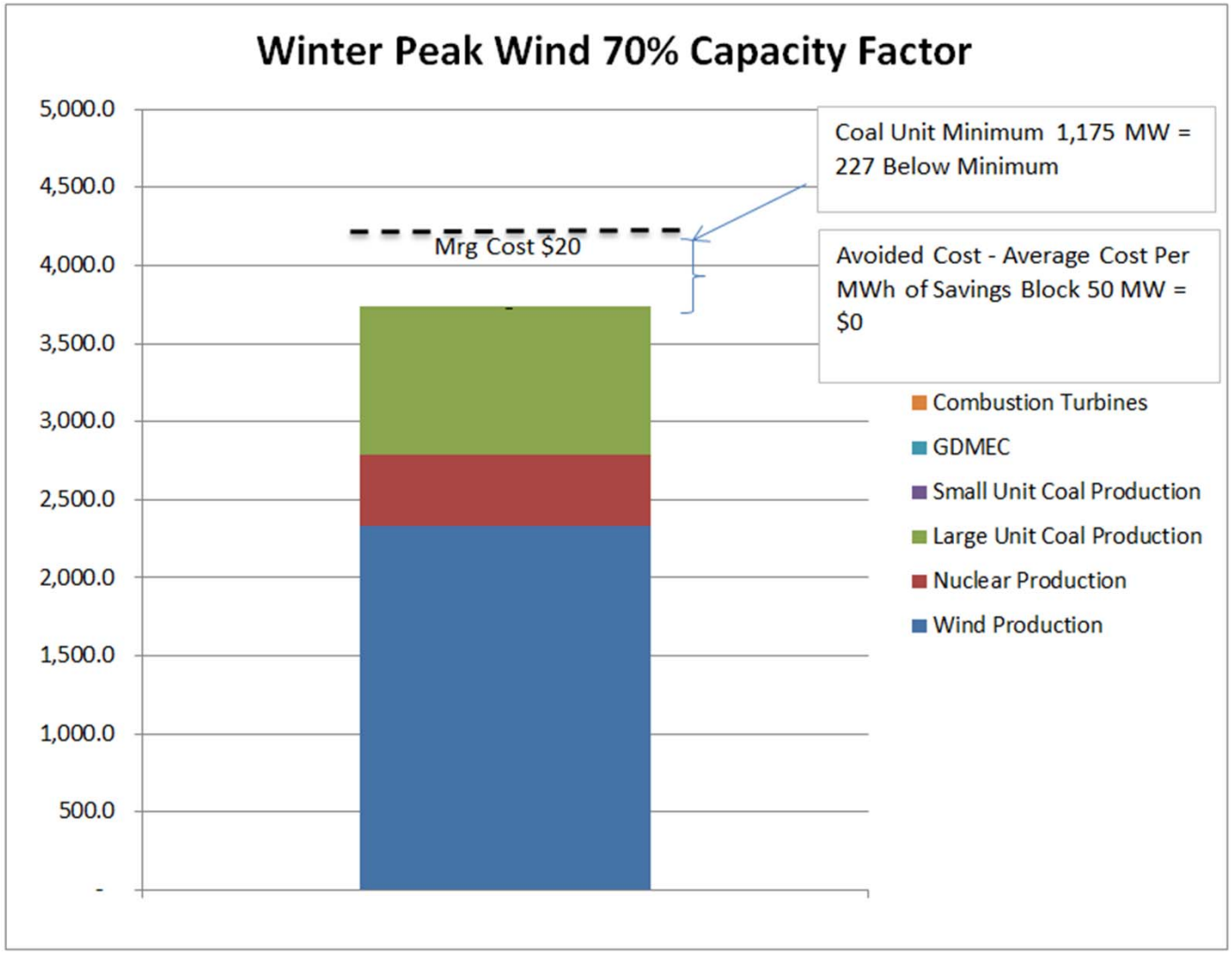
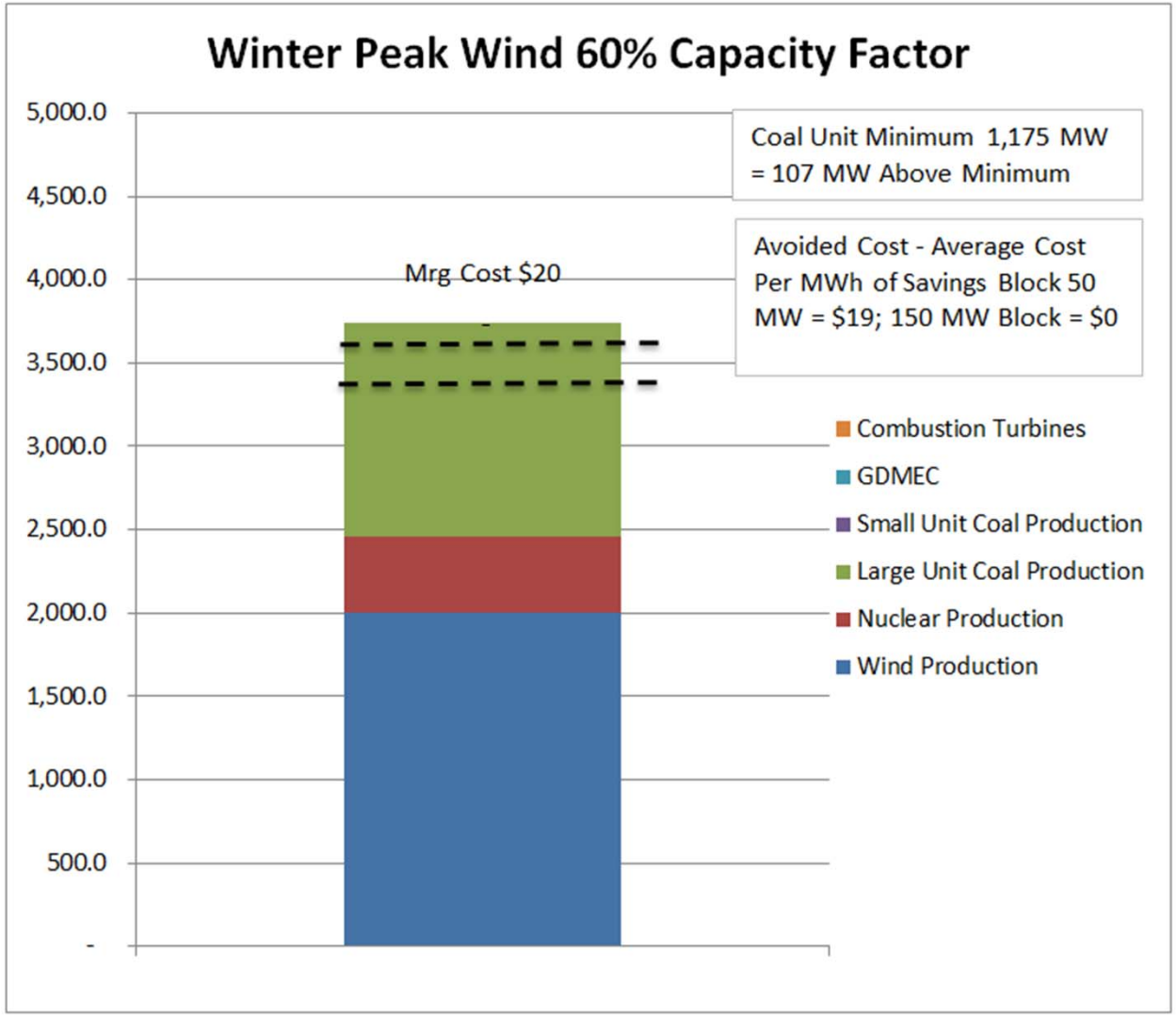
# Avoided Energy Costs
# Example 3



# Avoided Energy Costs
# Example 4



# Summary



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# Summary

| Filing Periodicity and Annual Periods | | | | | |
|---|---|---|---|---|---|
| **Filing Description** | **Filing Frequency** | **Due Date** | **Applicable Period** | **Annual Period** | **Start Date for the New Rate** |
| PURPA Avoided Cost Biennial Filing | Bi-annual | June 30 | Five Years | Calendar Year | when filed |
| Standard QF Rate (Under 100 kW) | Annual | June 30 | One Year | August Through July | August 1 |
| Energy Efficiency | Every Five Years with option to update mid-plan | Energy Efficiency Plan Filing Date (varies by state) | Ten Years modeled data + 25 Years interpolated data | Calendar Year (data is summarized by month, day type, and hour) | January 1 of first plan year |



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# Summary

| Capacity Calculation Method | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Filing Description | Capacity Calculation Method | Reasoning | Capacity Avoidance Determined in Blocks? | Demand Loss Factor? | Reserve Margin | Externality Factor? | Market-based Capacity Cost | Installed Capacity Cost | Economic Assumptions |
| PURPA Avoided Cost Biennial Filing | Market-based determination transitioning to peaker method | Market prices show the near term value. Over the long run, prices move toward to cost of new CT capacity | No | No | No | No | MISO IMM Methodology | FERC filing by MISO utilizing Energy Information Agency | Updated Annually |
| Standard QF Rate (Under 100 kW) | Peaker CT method | Over the long run, prices move toward to cost of new CT capacity | No | No | No | No | MISO IMM Methodology | FERC filing by MISO utilizing Energy Information Agency | Updated Annually |
| Energy Efficiency | Peaker CT method | Over the long run, prices move toward to cost of new CT capacity | No | Yes, Percentage Varies By Program | Yes, 12% | Yes, 10% | MISO IMM Methodology | FERC filing by MISO utilizing Energy Information Agency | Updated Annually |



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# Summary

| Energy Calculation Method | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Filing Description | Energy Calculation Method | Reasoning | Modeled Using PROMOD IV®? | Energy Avoidance Determined in Blocks? | Linear Interpolation to Obtain Other Values? | Energy Externality Factor? | Energy Loss Factor | Load and Wind Forecasts | Generator Operational Parameters & Fuel Costs |
| PURPA Avoided Cost Biennial Filing | Least-cost dispatch of MidAmerican resources to serve MidAmerican load | Accounts for the use of MidAmerican assets to serve MidAmerican's load obligation | Yes | Yes, at 50 MW, 100 MW, 150 MW and 200 MW | Yes | No | Yes, distribution | Updated Annually | Updated Annually |
| Standard QF Rate (Under 100 kW) | Least-cost dispatch of MidAmerican resources to serve MidAmerican load | Accounts for the use of MidAmerican assets to serve MidAmerican's load obligation | Yes | No, Marginal Cost Only | Yes | No | Yes, distribution | Updated Annually | Updated Annually |
| Energy Efficiency | Least-cost dispatch of MidAmerican resources to serve MidAmerican load | Accounts for the use of MidAmerican assets to serve MidAmerican's load obligation | Yes | Yes, at 25 MW | No | Yes, 10% | Yes, program-specific | Updated Annually | Updated Annually |



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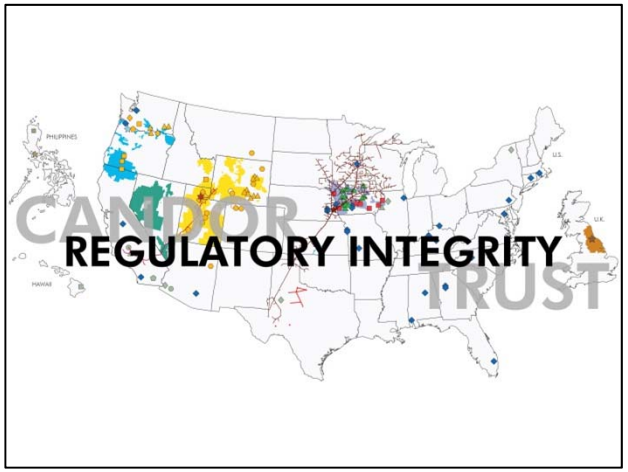




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