

# MH Hydro Wind Synergy Study

## 5th TRG meeting

November. 5<sup>th</sup>, 2012

Jordan Bakke

# Agenda

- **Phase III Objective**
- **Phase III Base Model Overview**
- **Phase III Manitoba Hydro Expansion**
- **Transmission Plan Options**
- **Generation Differences**
- **Benefit Summary**
- **Conclusion**
- **Next Steps**

# Phase III Objective

**To evaluate the costs and benefits of adding additional transmission between MISO and Manitoba Hydro**



# Phase III Base Model Review

- **Using 2027 MTEP12 BAU future**
- **Models were presented at the 8/9/2012 ESMUG meeting**
- **Uses Ventyx's 2012 annual PowerBase release with MISO-specific data updates**
- **Major Database Updates**
  - MISO & External Queued Generation Updates
  - Demand & Energy updates
  - Commercial Model Updates
  - Unit Retirement and Maintenance Schedule
  - Fuel Price & Escalation
  - Event File



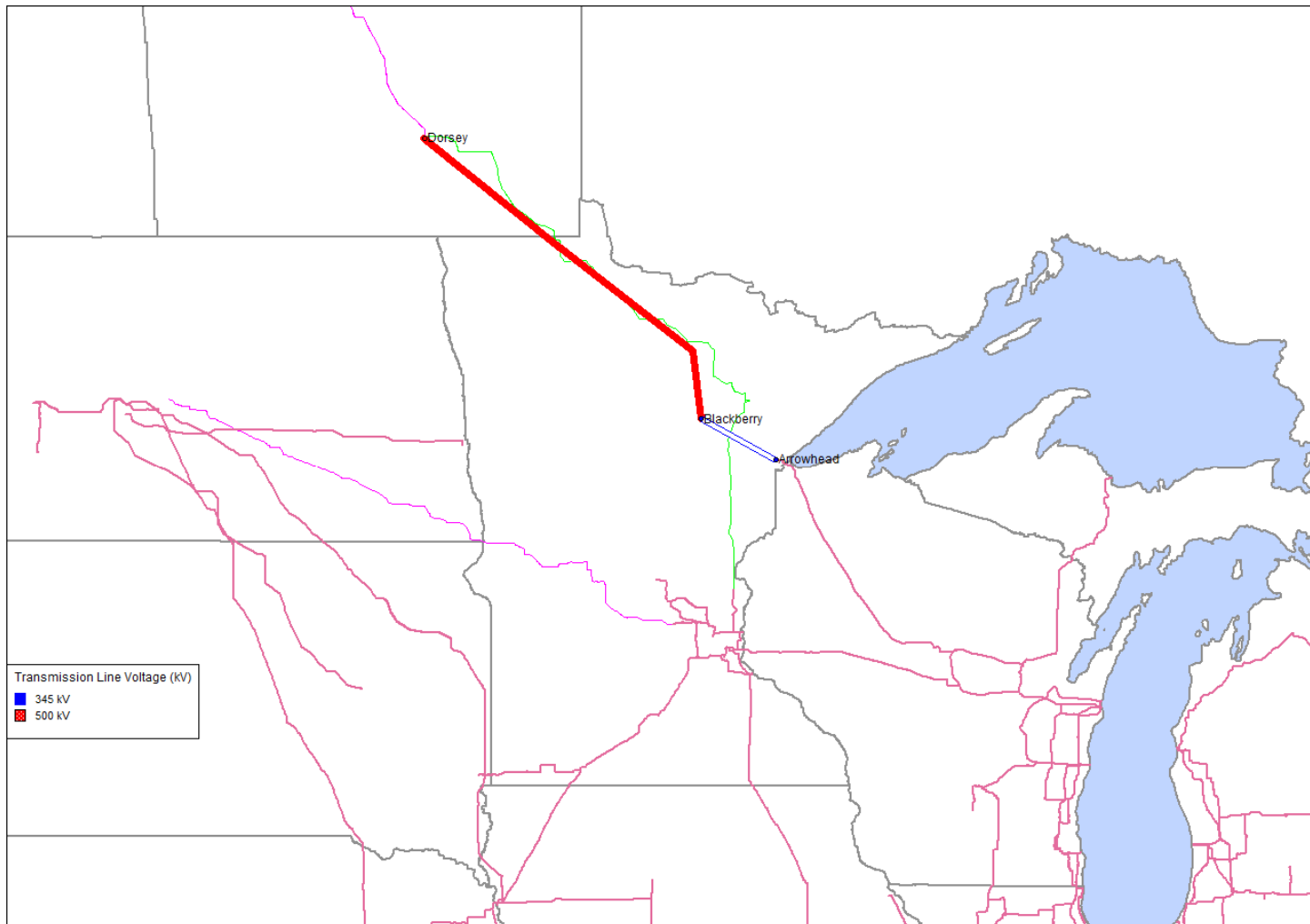
# Phase III Manitoba Hydro Expansion

- **Study is configured such that the base case corresponds to No New Tie-line to Manitoba.**
- **With New Tie-line to Manitoba cases include Keeyask (695 MW) and Conawapa (1485 MW), which is consistent with MH's Power Resource Plan**
- **The No New Tie-line to Manitoba case (base case) includes only Conawapa (1485 MW)**

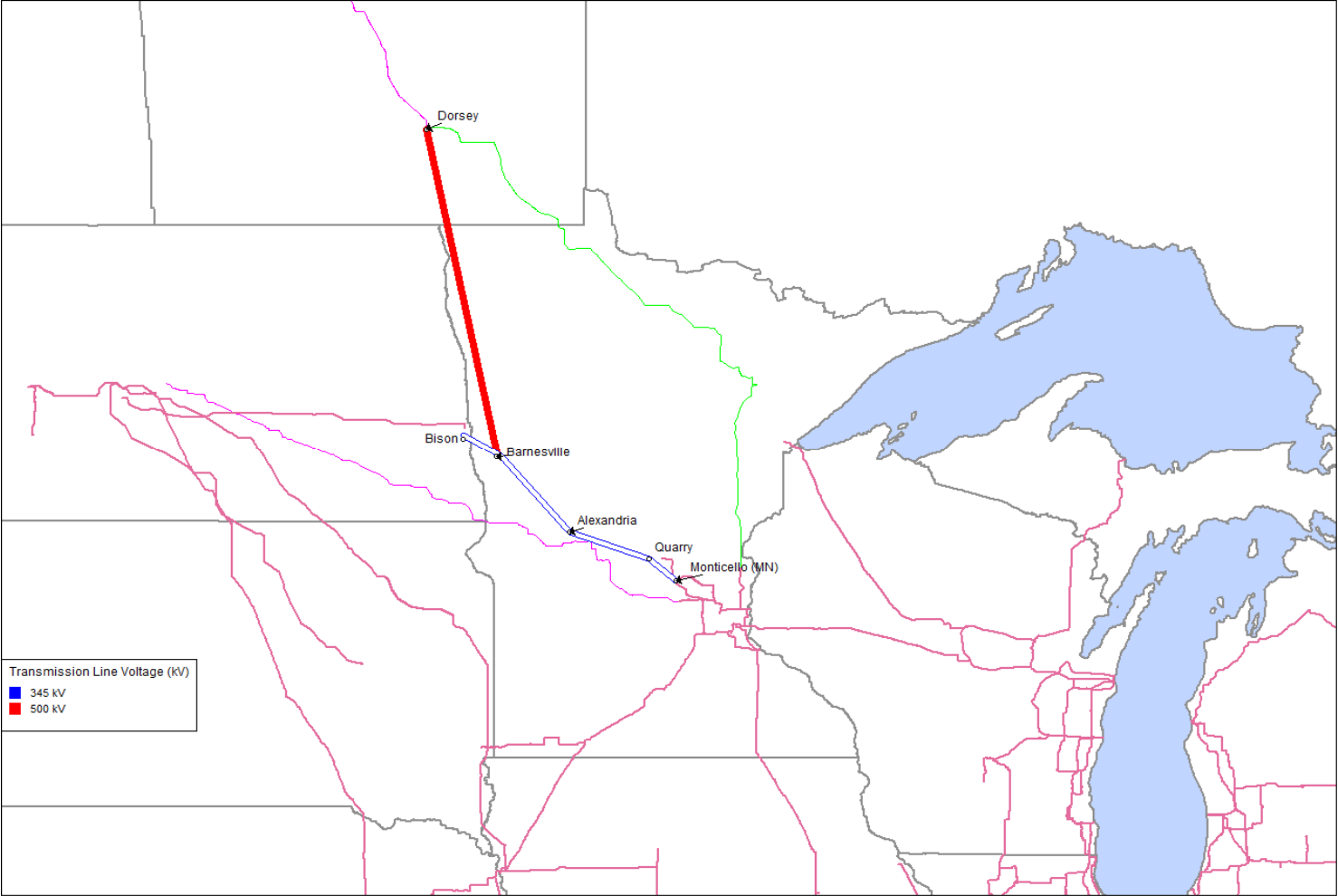
# Transmission Plan Options

- **Three transmission options have been studied**
  - Dorsey to Fargo/Moorhead Area
    - 500kV line from Winnipeg to Fargo/Moorhead Area
    - 345kV line from Fargo to Monticello
  - Dorsey to Blackberry
    - 500kV line from Winnipeg to Grand Rapids
    - 345kV double circuit line from Grand Rapids to Duluth
  - Dorsey to T-Blackberry,Bison
    - 500kV line from Winnipeg to T-Tap
    - 500kV line from T-Tap to Grand Rapids
    - 345kV double circuit line from Grand Rapids to Duluth
    - 345kV double circuit line from T-Tap to Fargo

# Transmission Option 1 – Dorsey to Blackberry

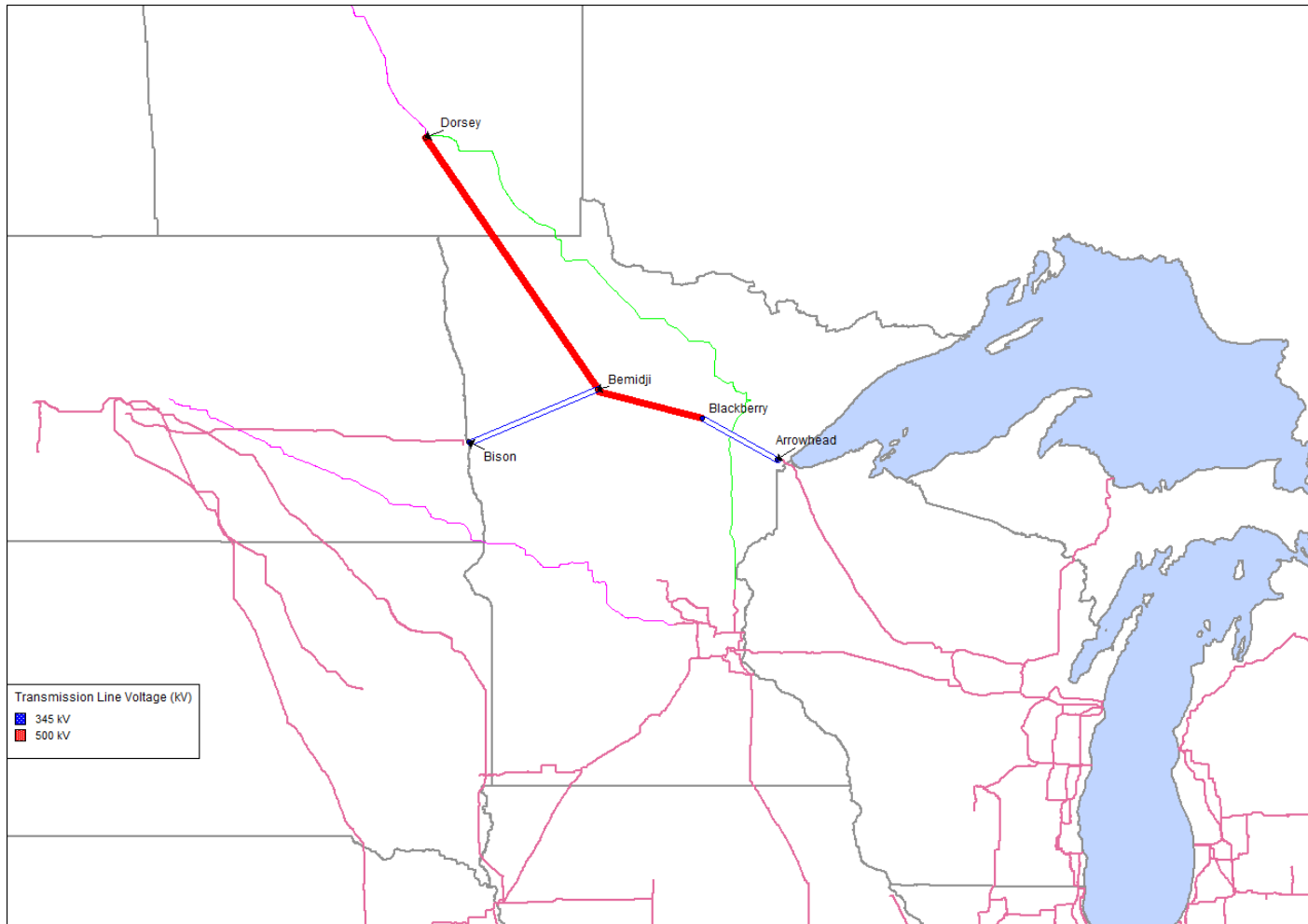


# Transmission Option 2 – Dorsey to Fargo/Moorhead Area

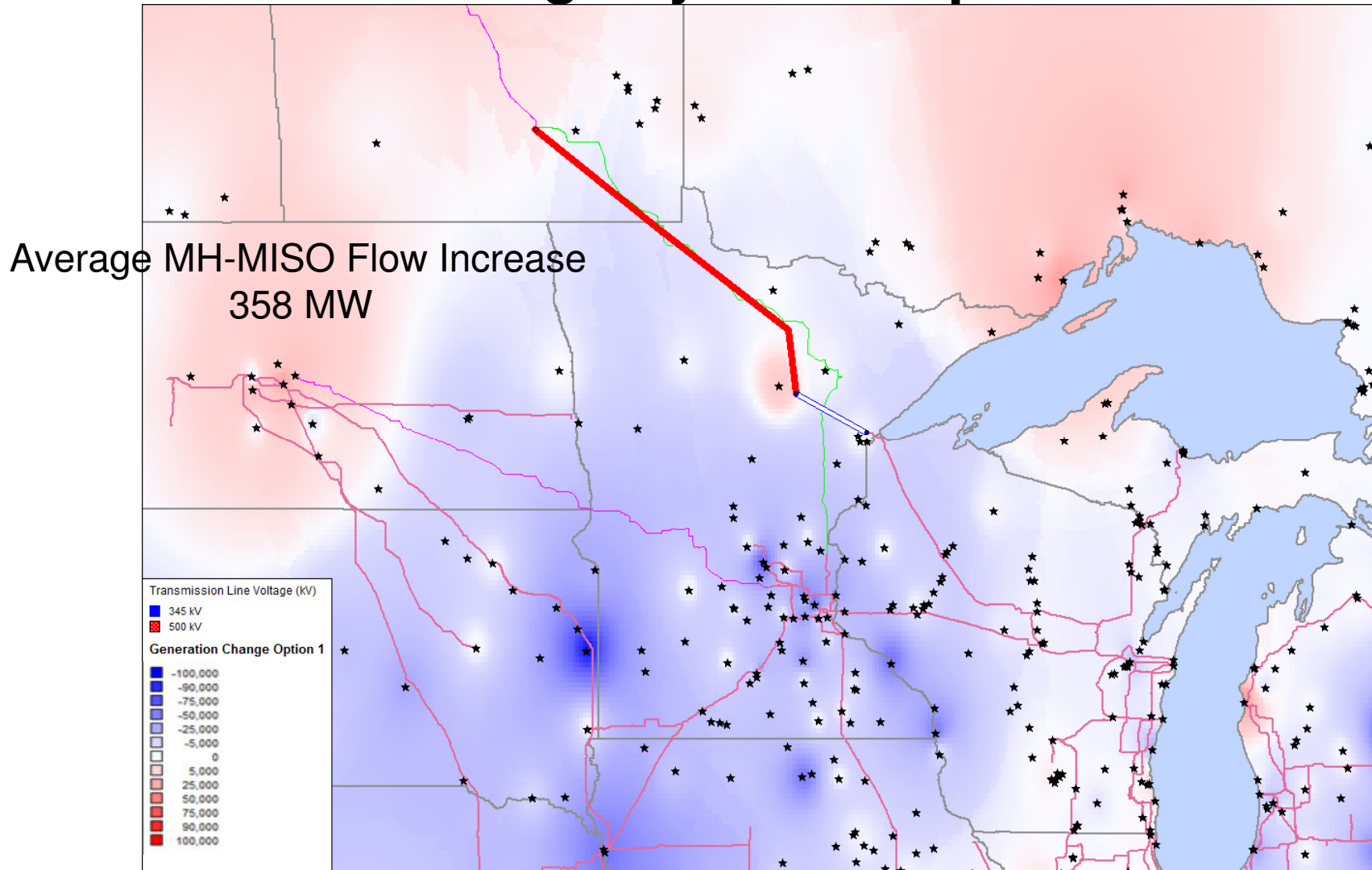




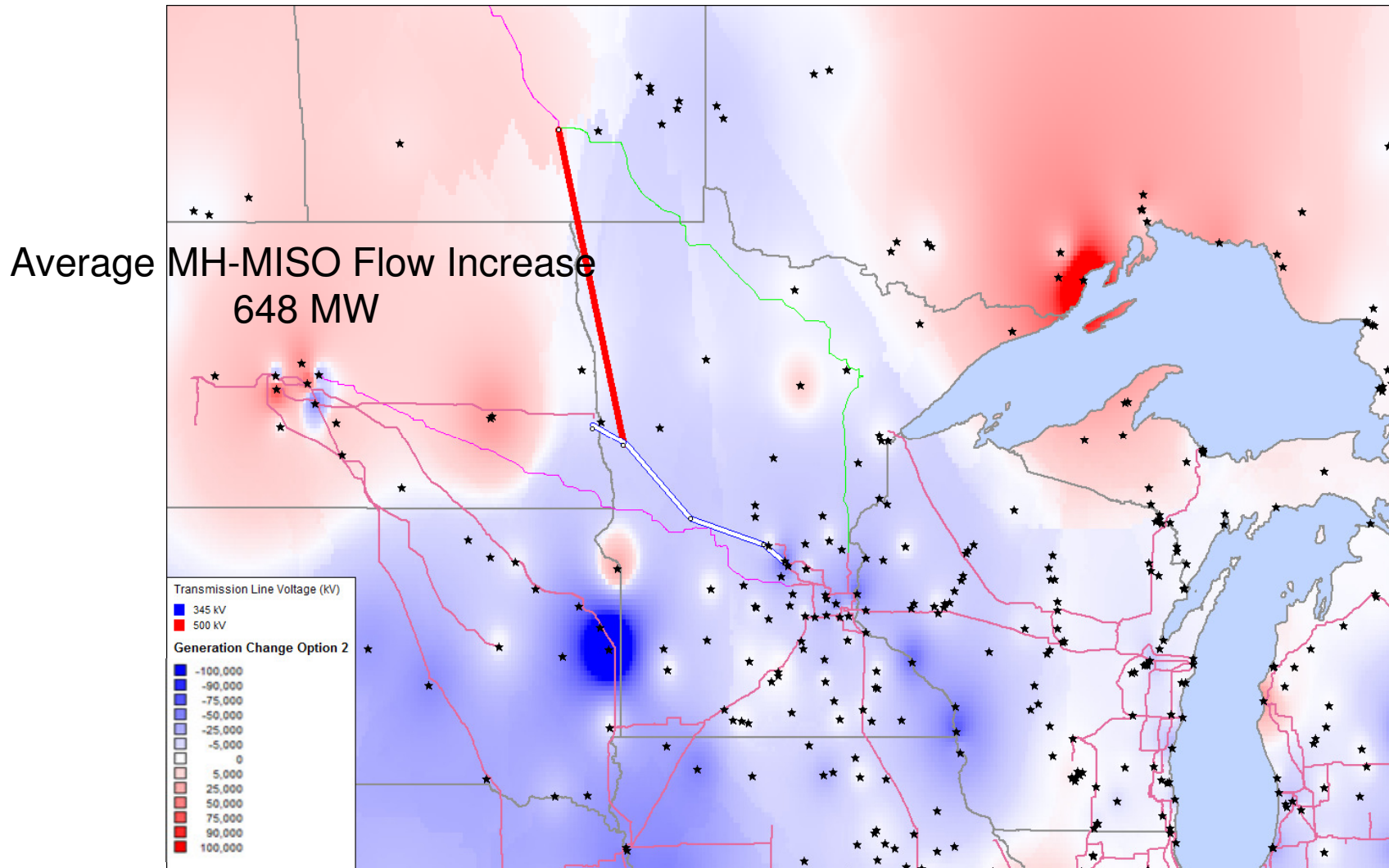
# Transmission Option 3 – Dorsey to T-Tap Blackberry/Bison



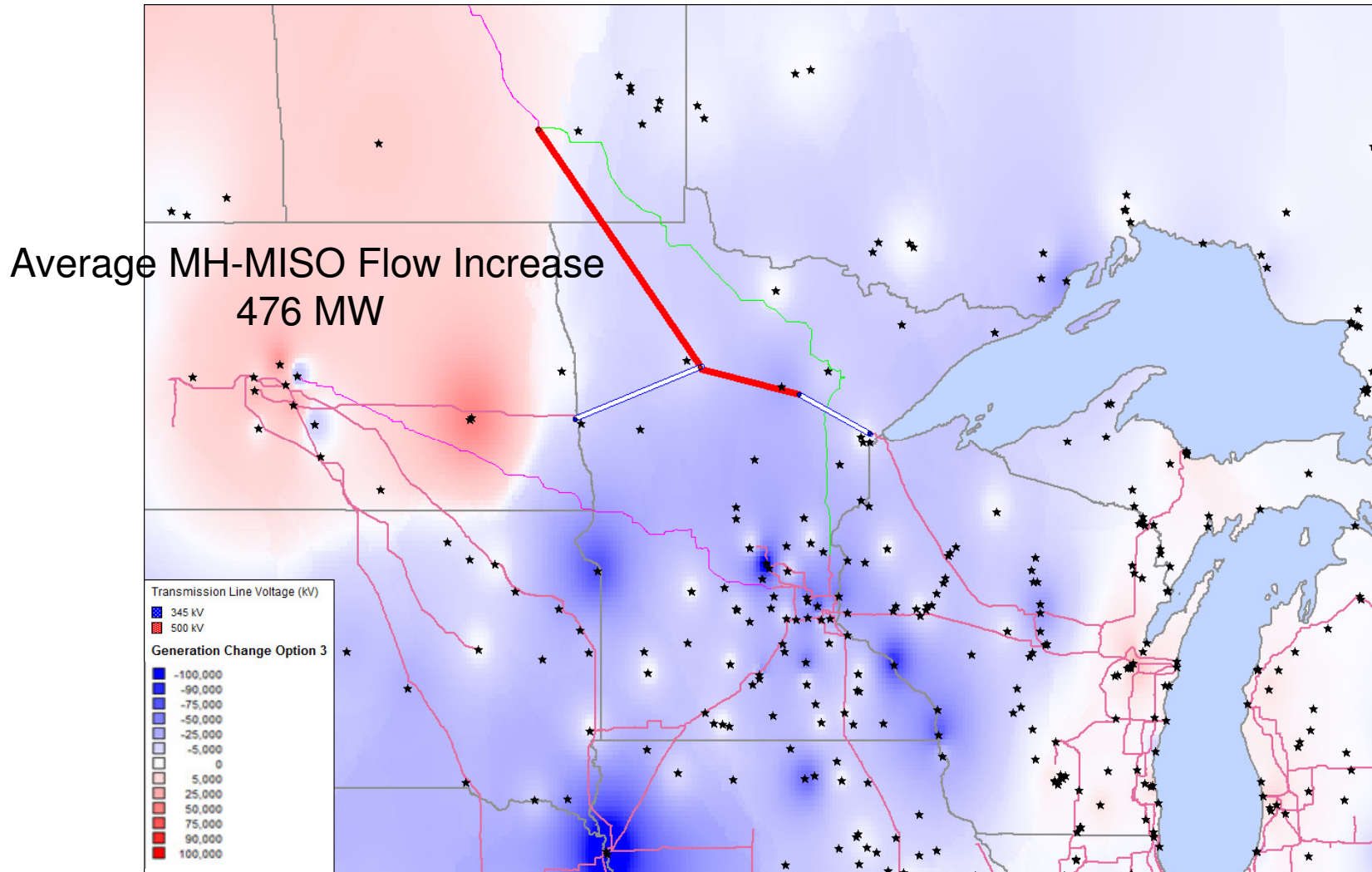
# Generation Change by Unit – Option 1- East



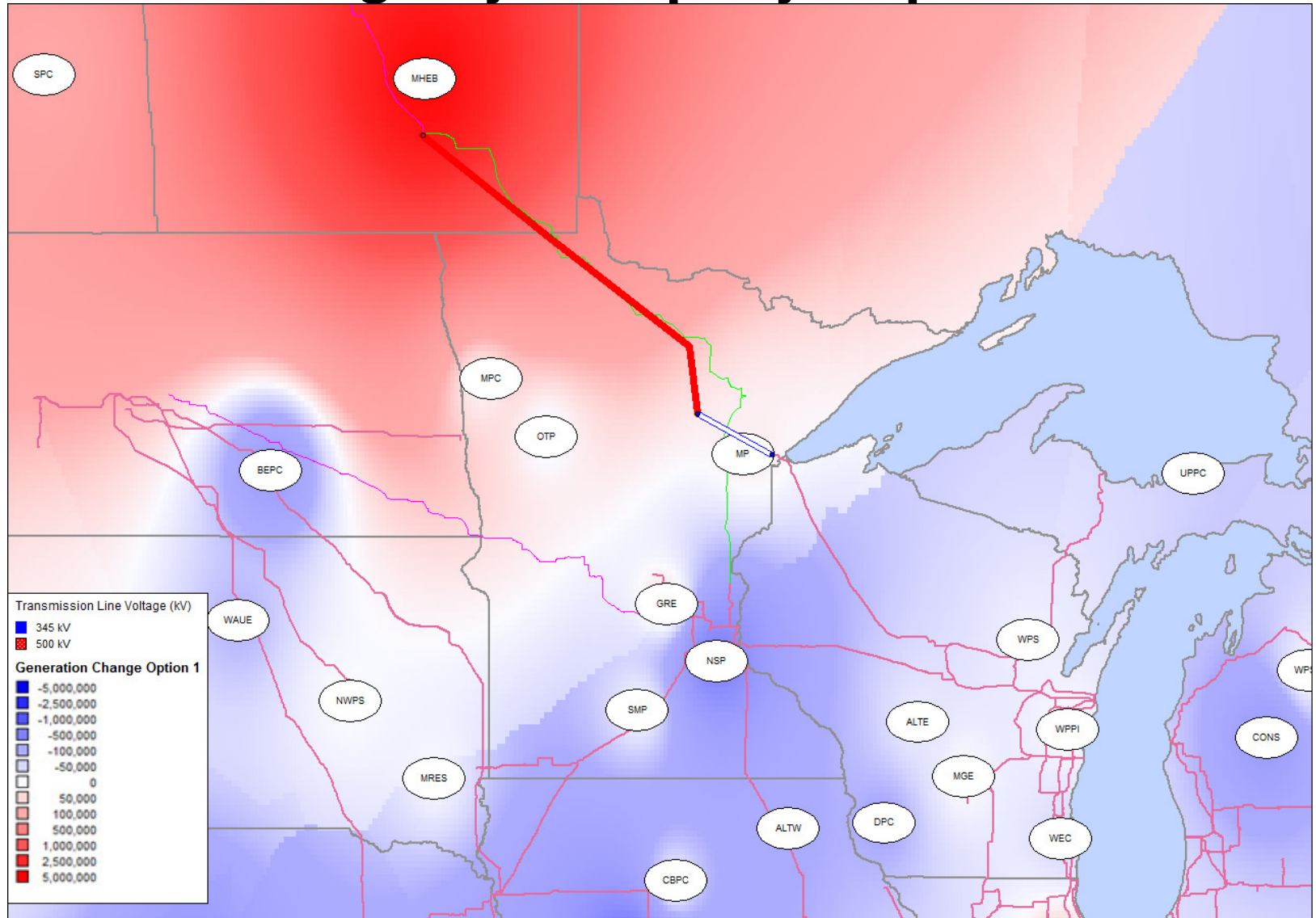
# Generation Change by Unit – Option 2 - West



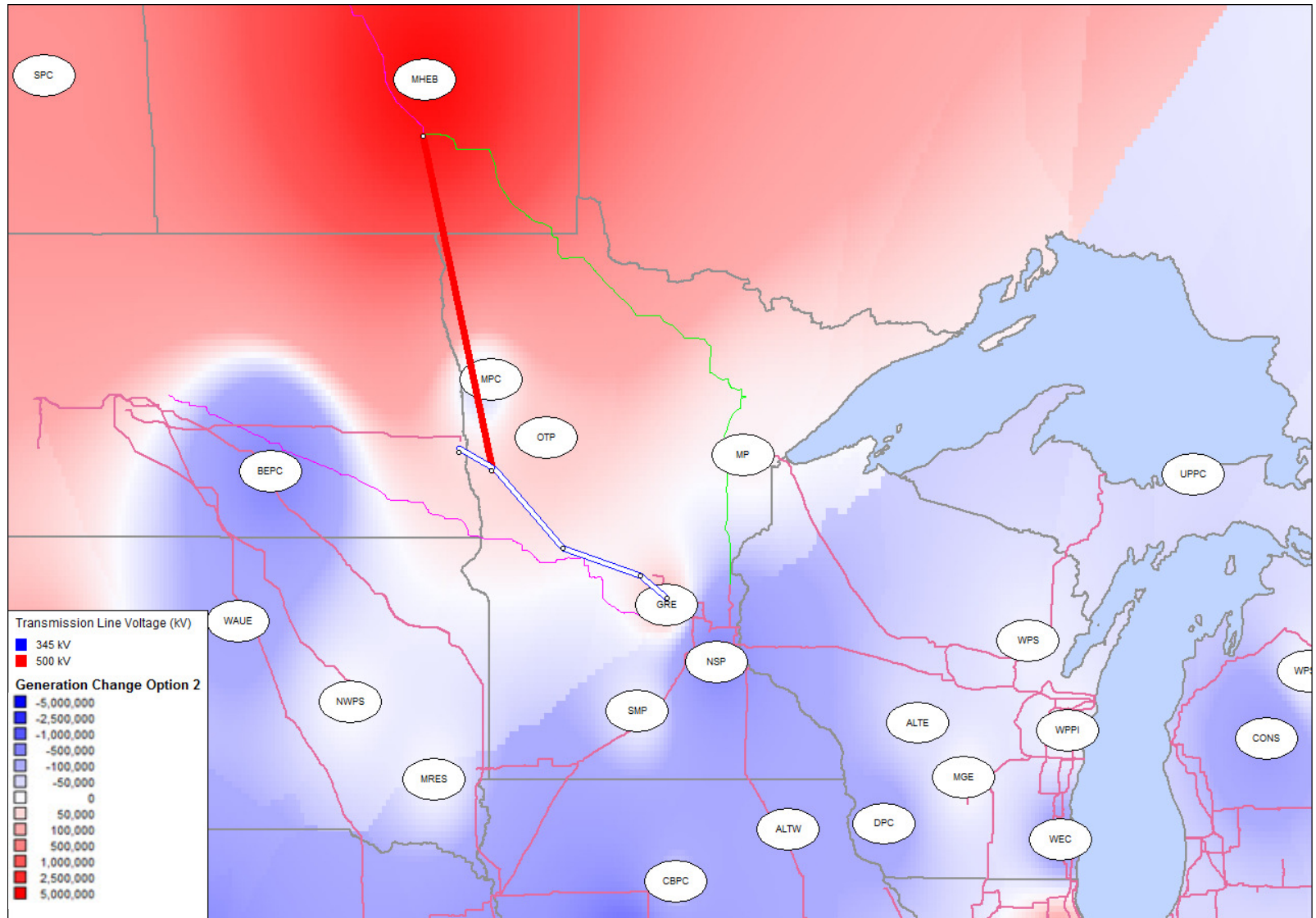
# Generation Change by Unit – Option 3 – T-Tap



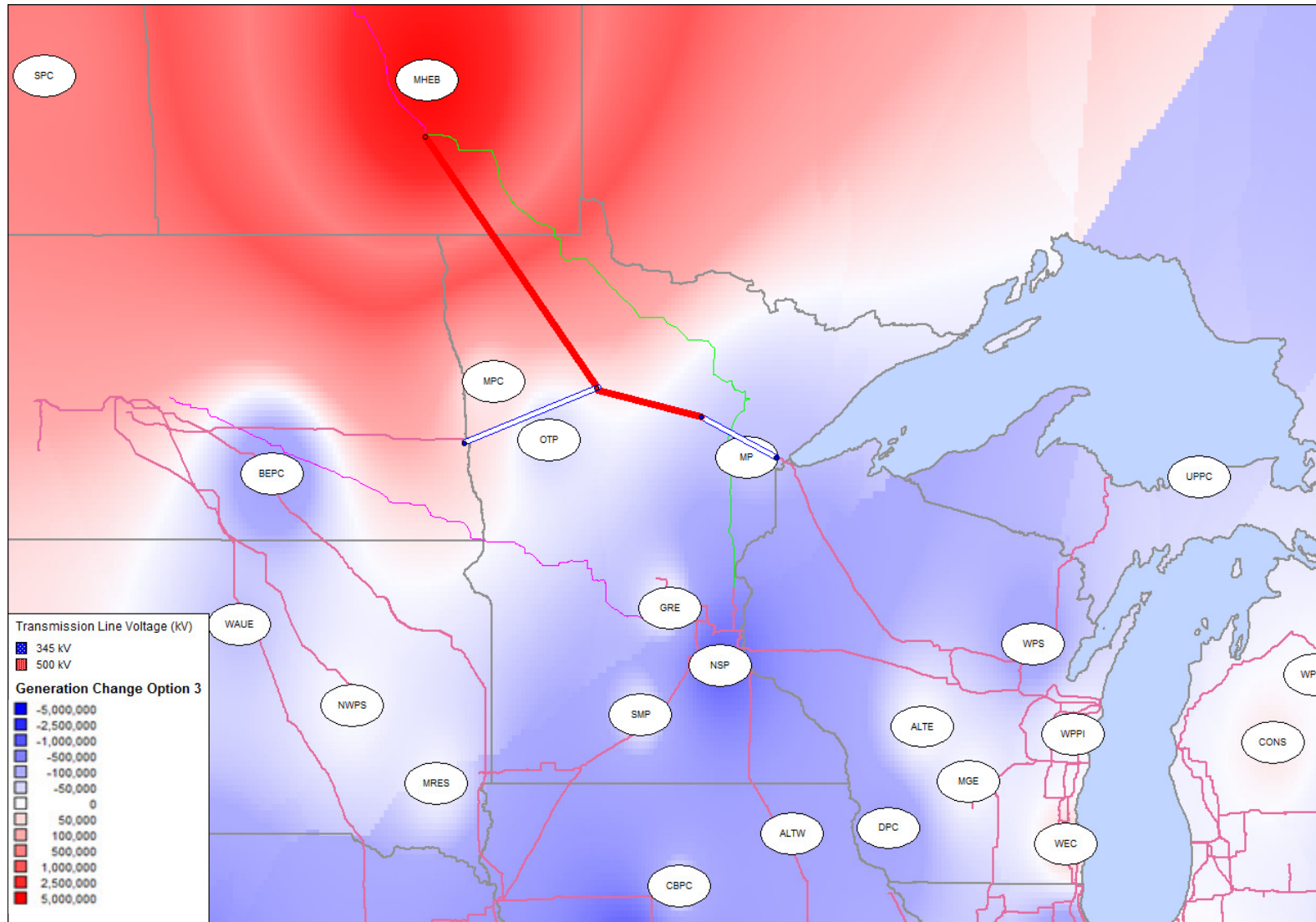
# Generation Change by Company– Option 1



# Generation Change by Company– Option 2



# Generation Change by Company– Option 3



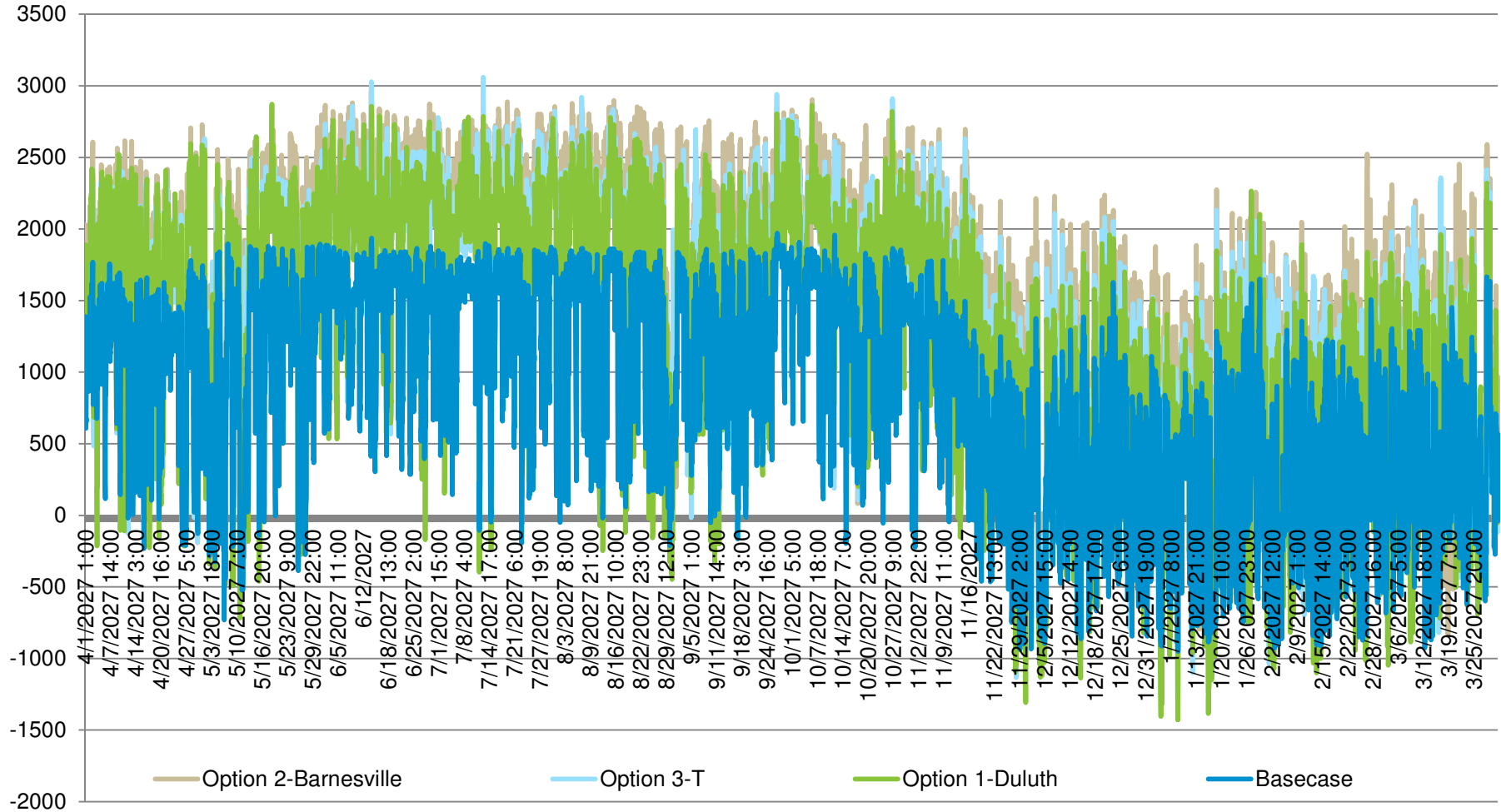
# Summary of Generation Change Maps

- **Manitoba Hydro has about the same generation in all of the change cases (Option 1-3)**
- **Interface flow differences are due to generation changes outside of MH**
- **Option 2 shows increased generation in IESO and decreased flow from MH to non MISO MAPP which causes the increased flow from MH to MISO**
- **All options show the same high level generation pattern changes (generation increases in the north and west and decreases in the east and south)**
- **With increased transmission, higher cost generation is reduced and lower cost generation is increased**

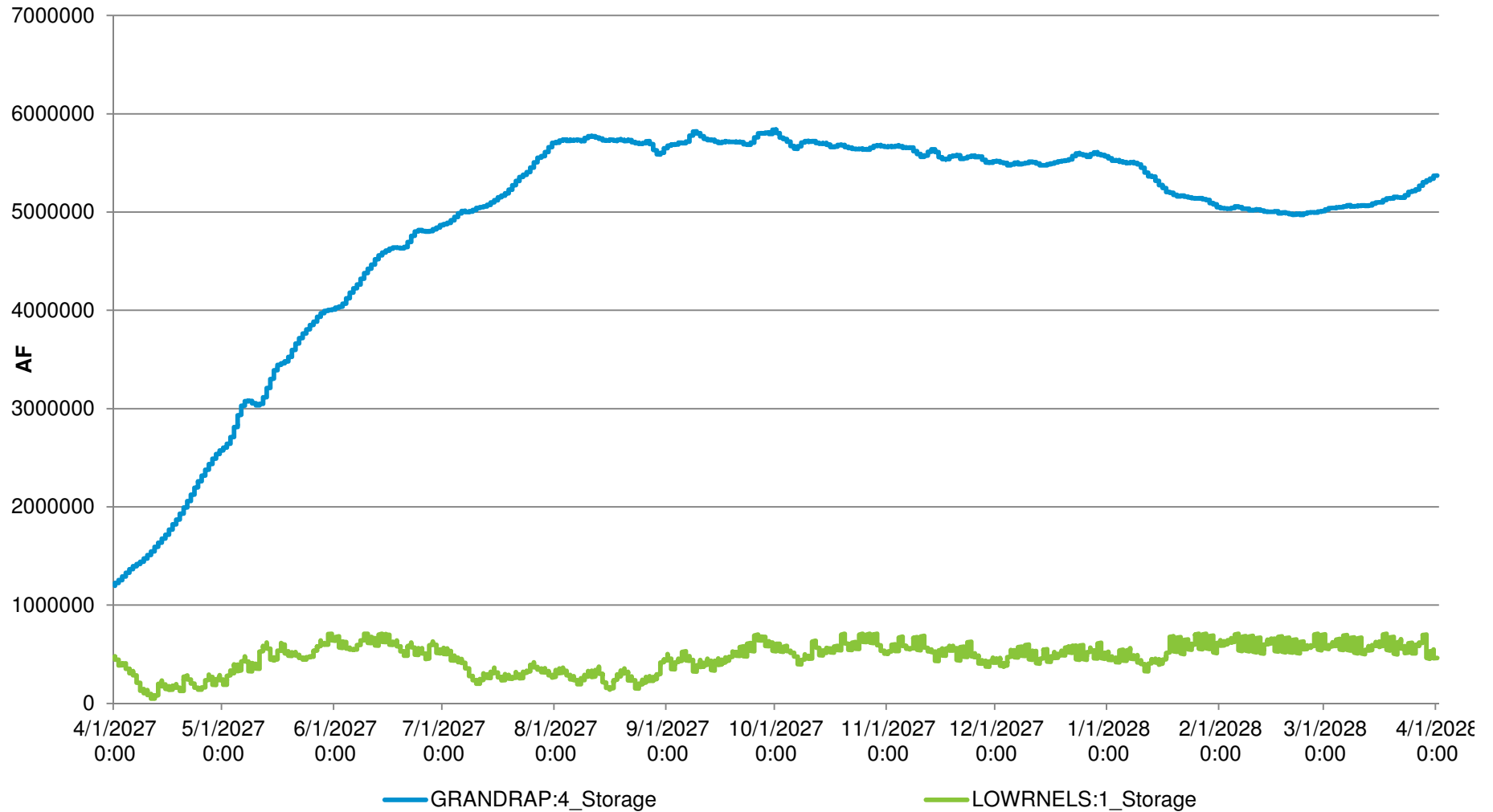




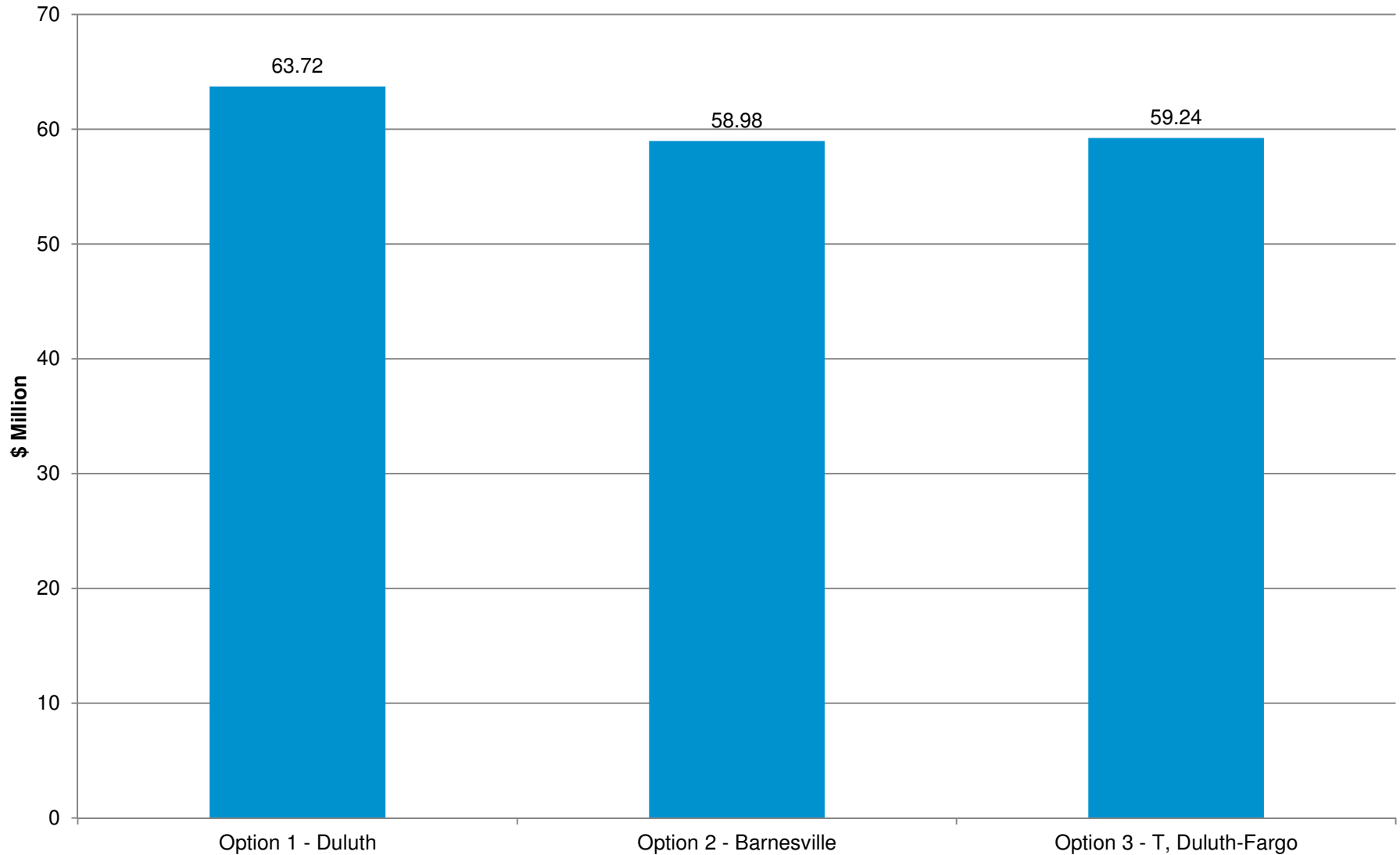
# MH-MISO Interface Flow (MW)



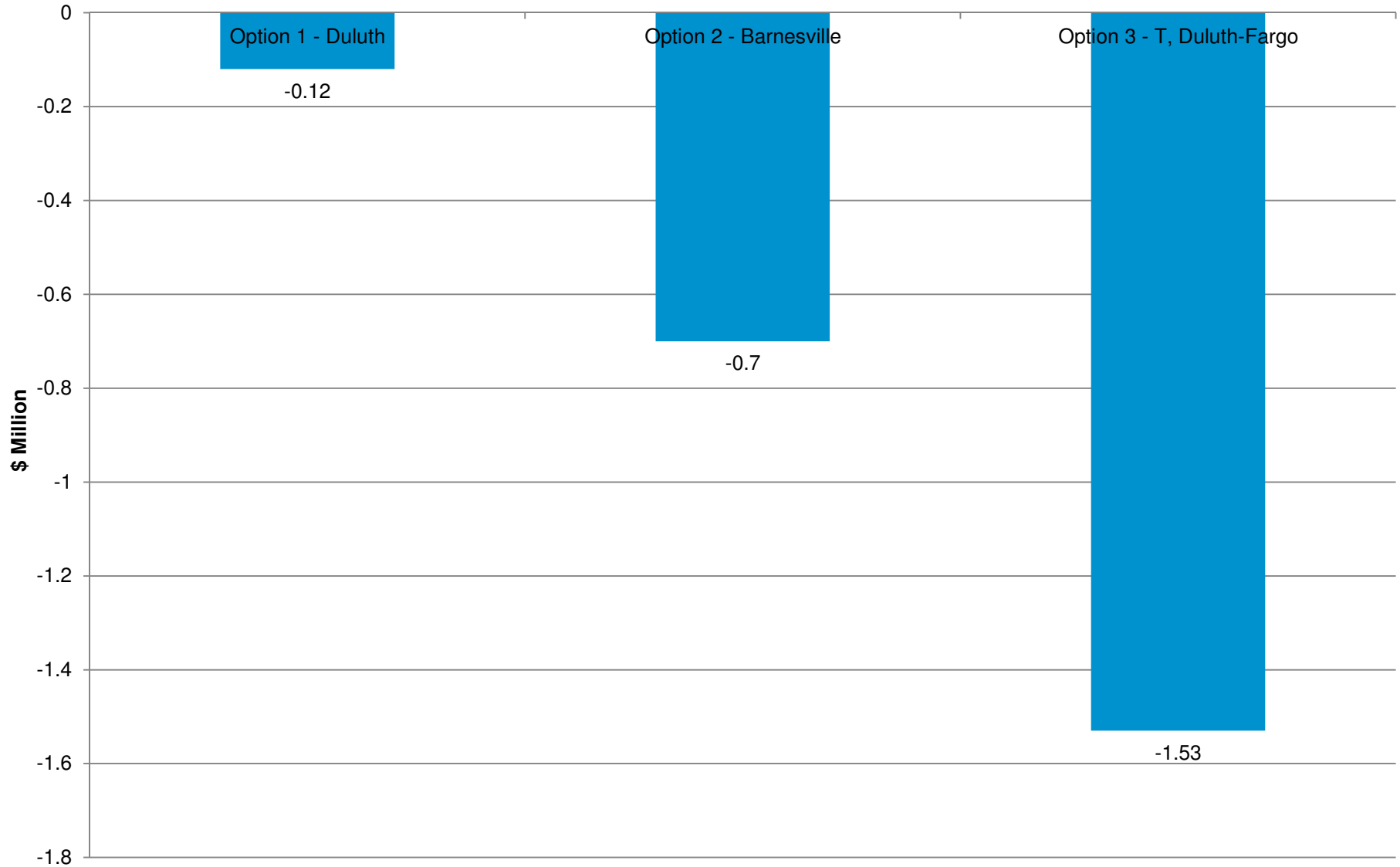
# Storage Usage for MH Hydro Generators



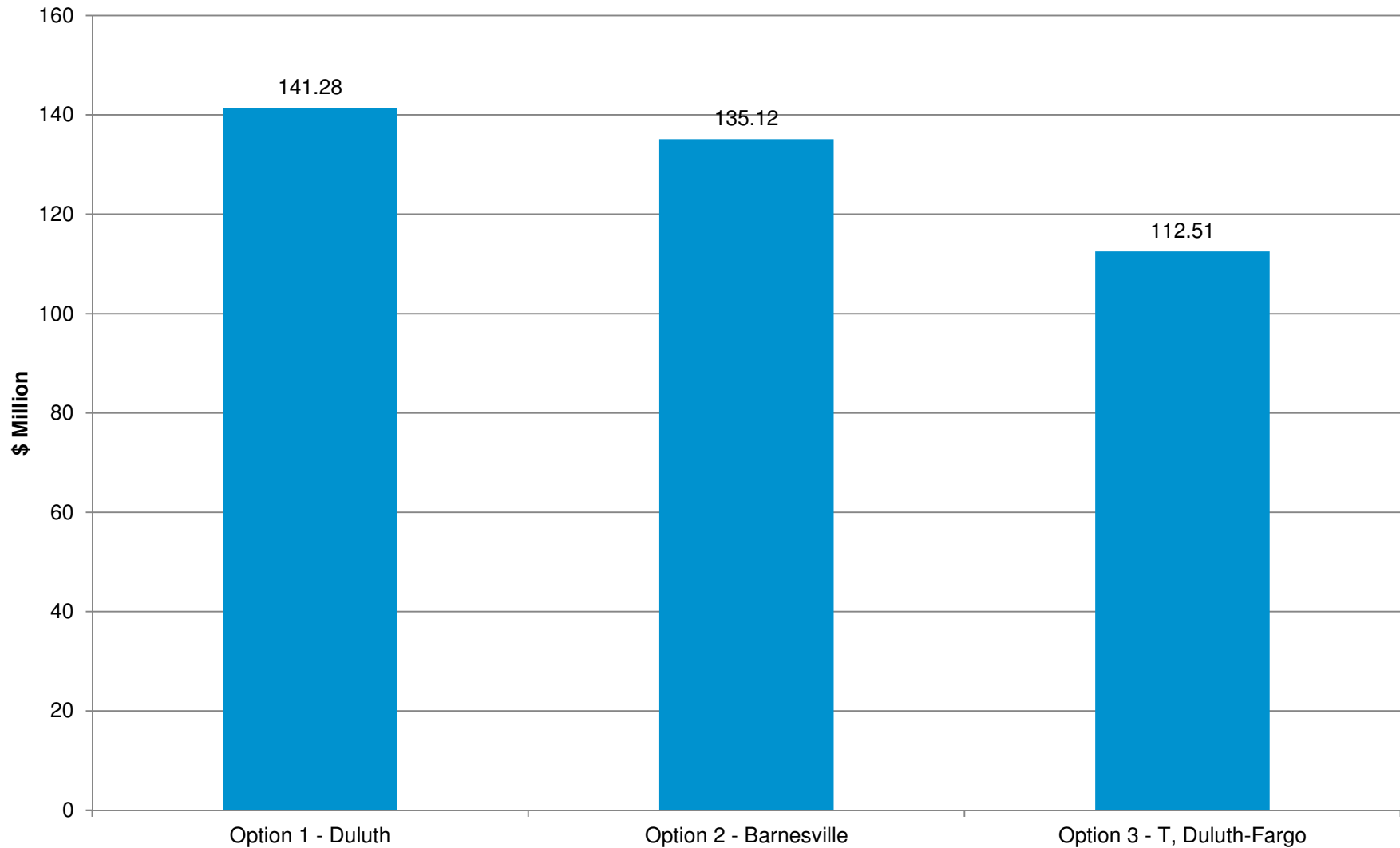
## 2027 Fiscal Year MISO Production Cost Savings \$Million



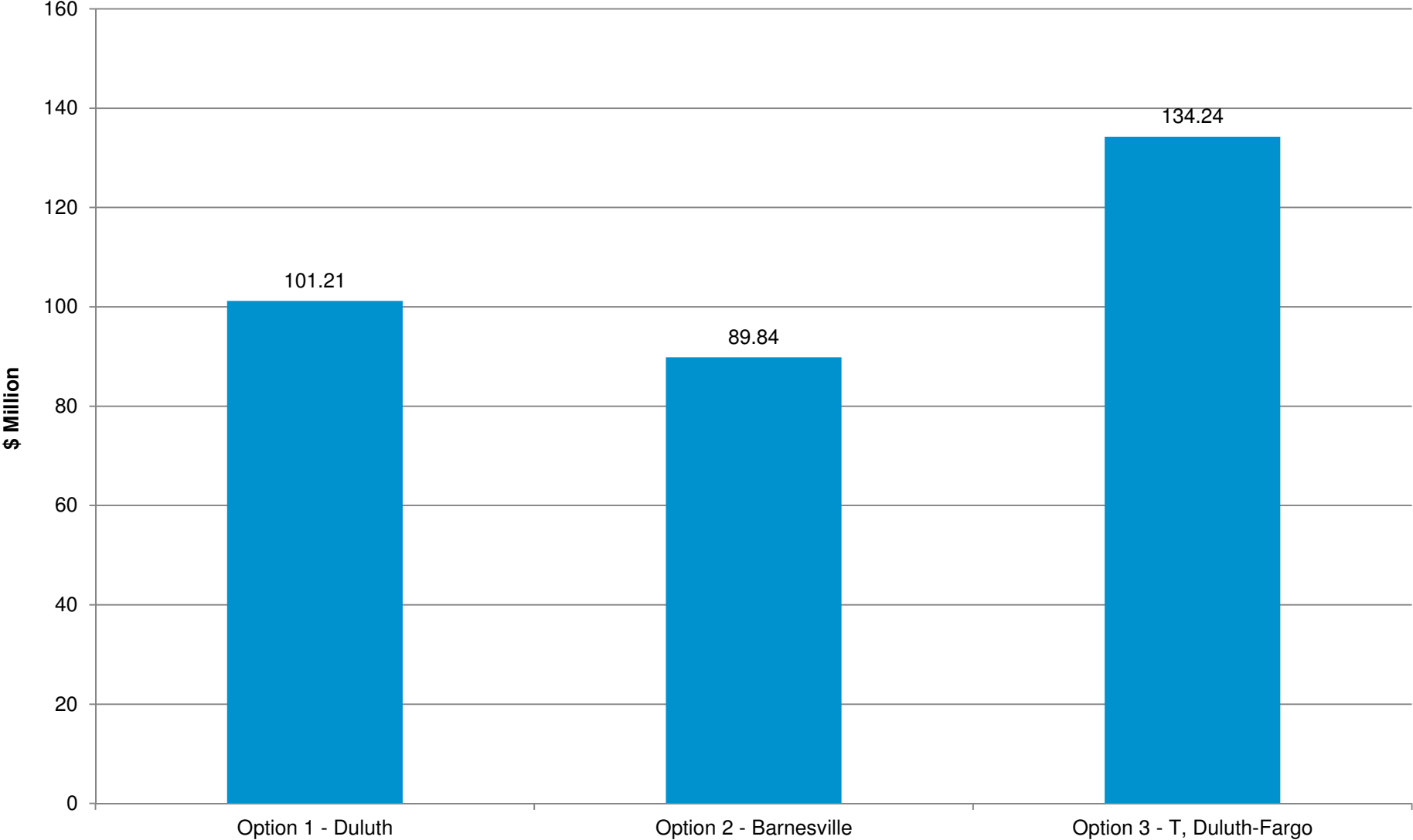
## 2027 Fiscal Year MH Production Cost Savings \$Million



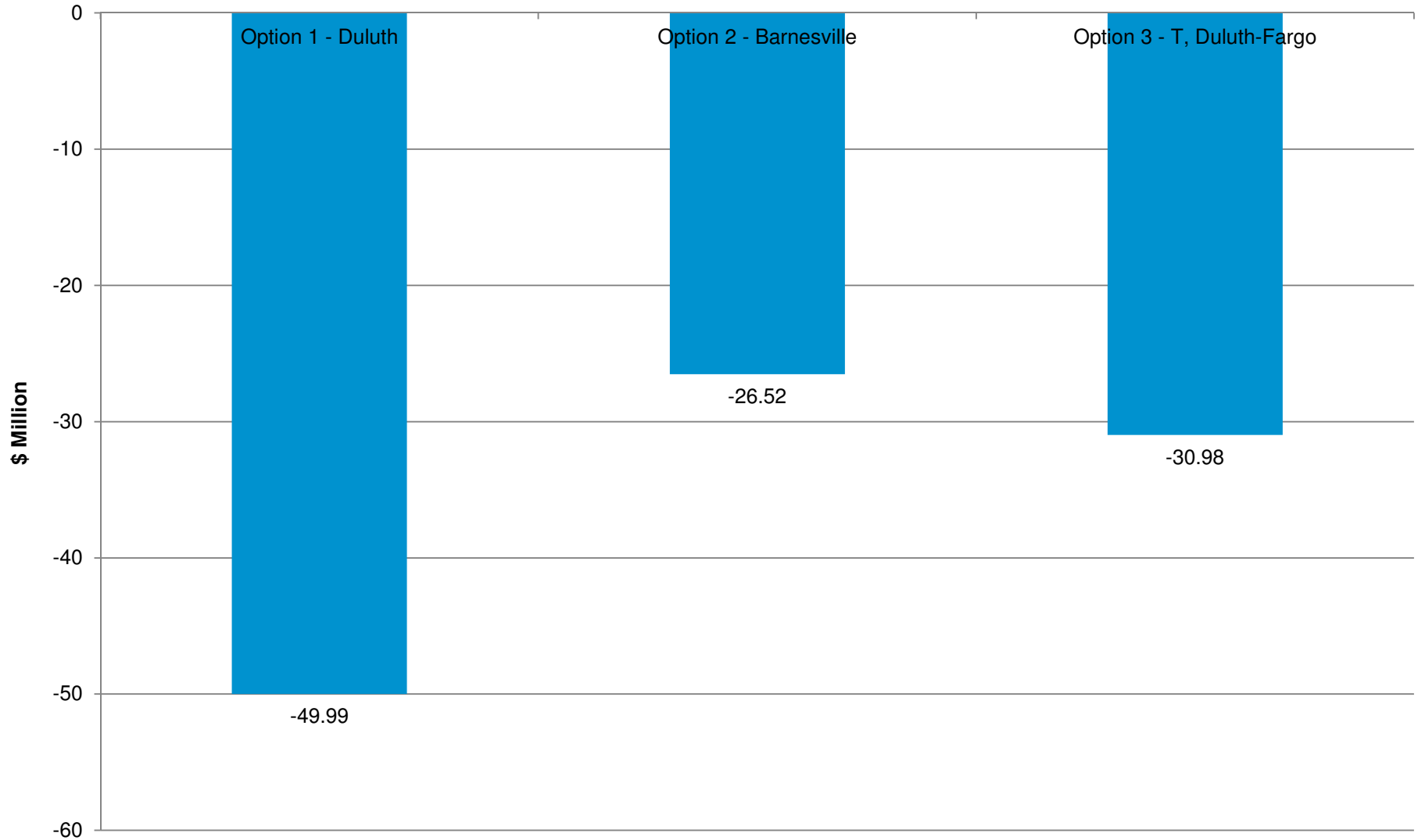
## 2027 Fiscal Year System Production Cost Savings \$Million



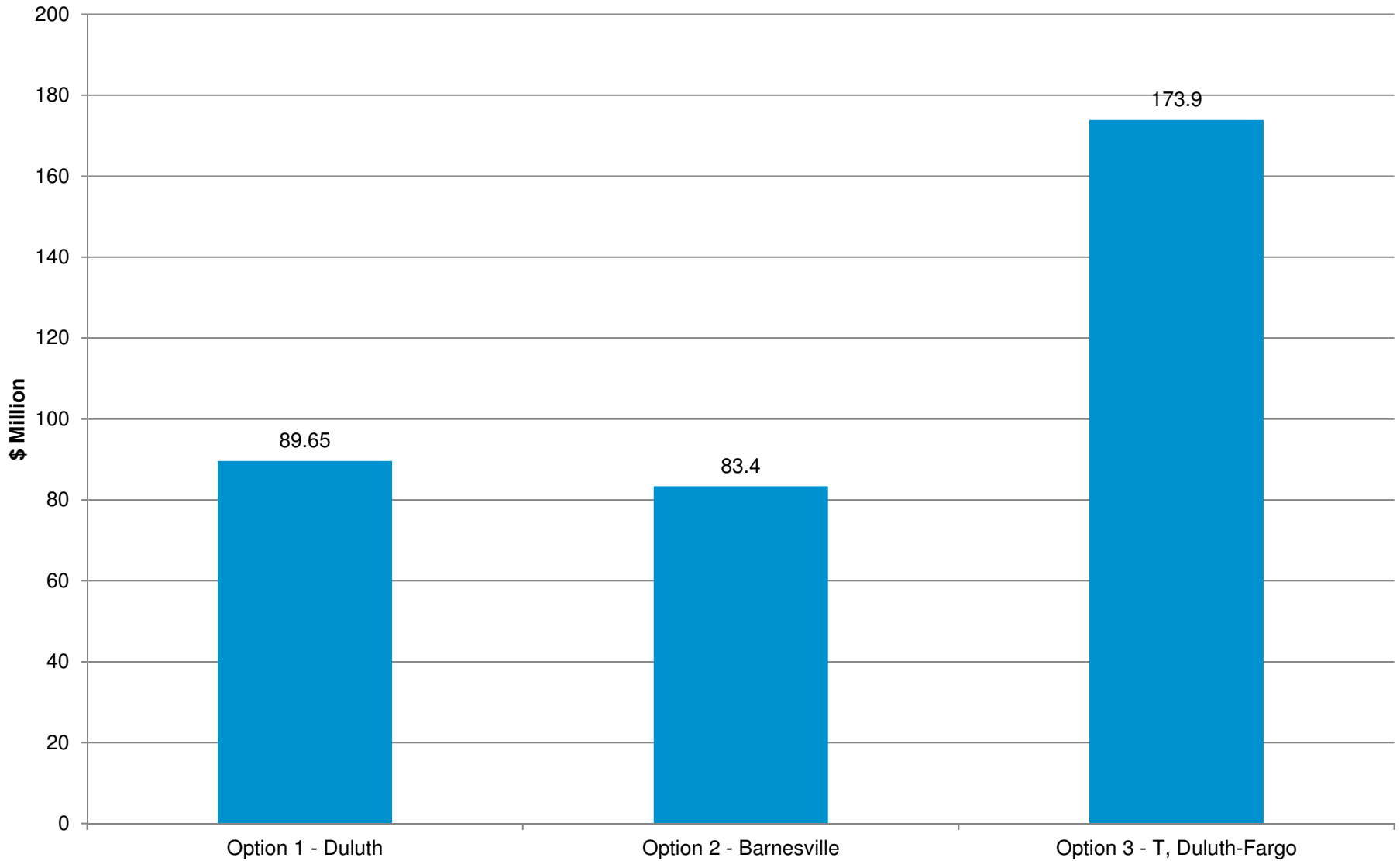
# 2027 Fiscal Year MISO Load Cost Savings \$Million



## 2027 Fiscal Year MH Load Cost Savings \$Million

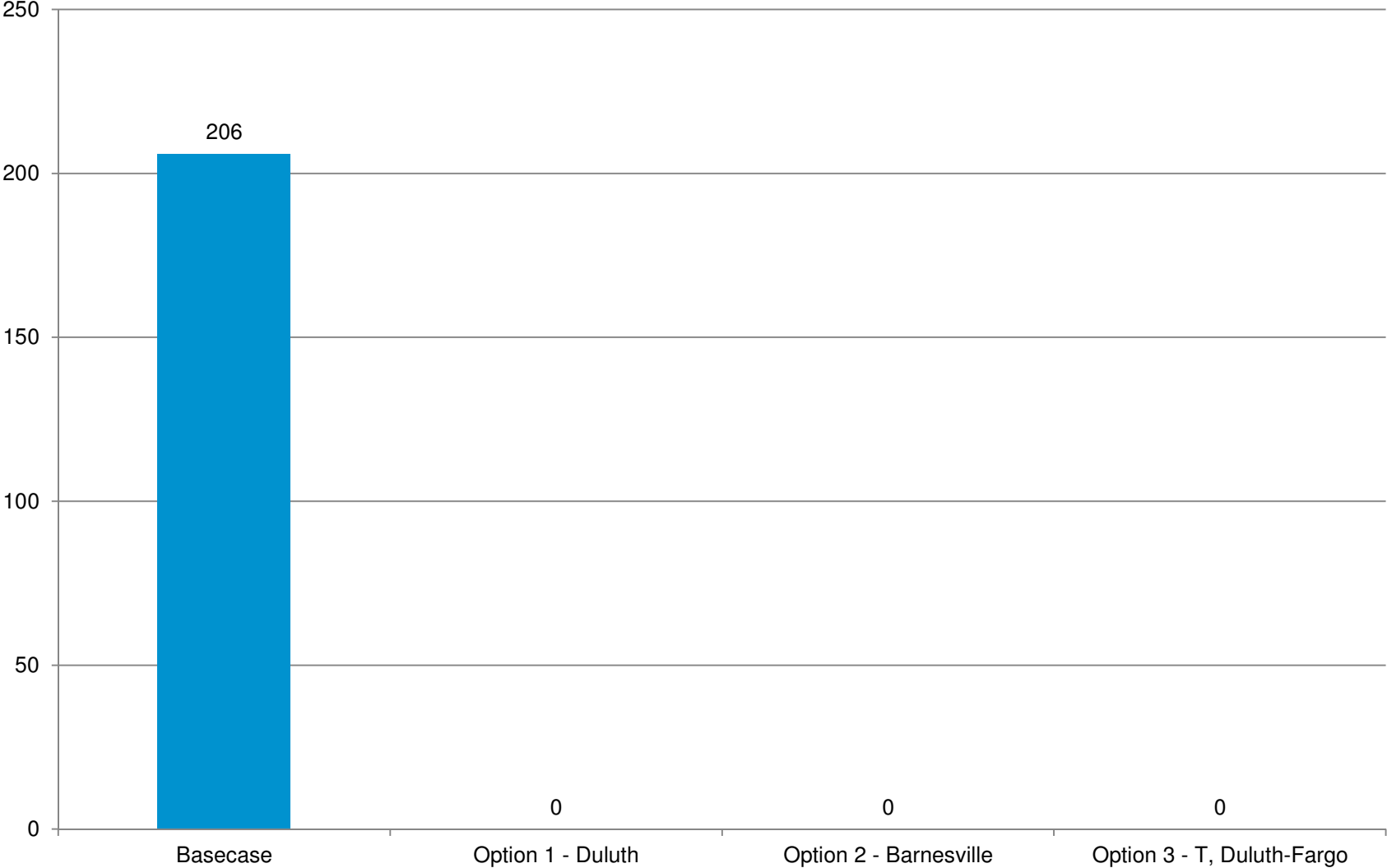


## 2027 Fiscal Year System Load Cost Savings \$Million





# 2027 Fiscal Year Binding Hours MHEX\_S 12



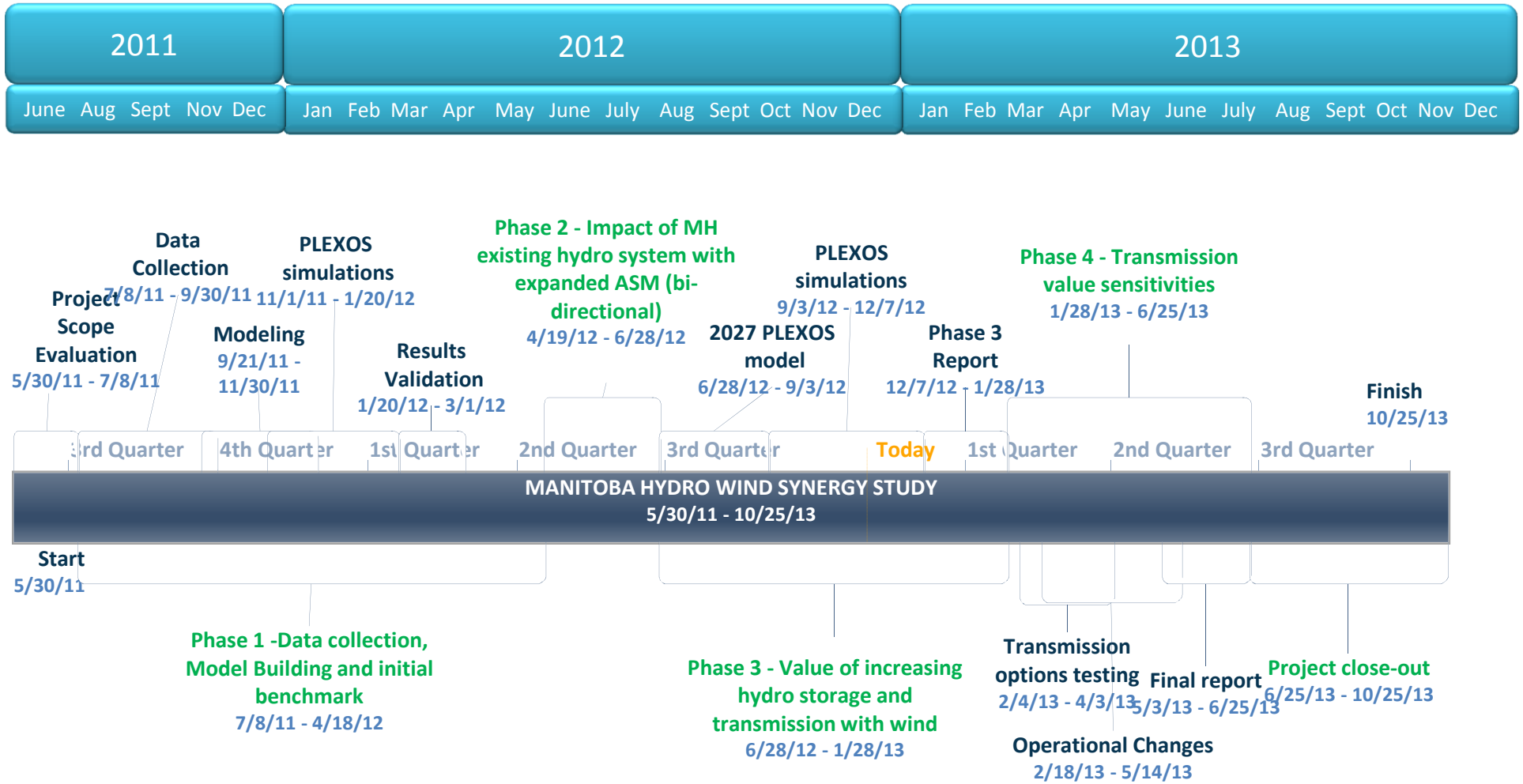
## Other Findings

- **Wind curtailment changes little because only the day ahead simulation was run, preceding this TRG, which includes a perfect wind forecast and no RT dispatch.**
- **Wind-synergy is present between MISO and MH, but doesn't change significantly with additional transmission and generation.**
- **Interleave runs should produce increased benefit because of the flexibility of the hydro generation and will be presented at the next TRG.**

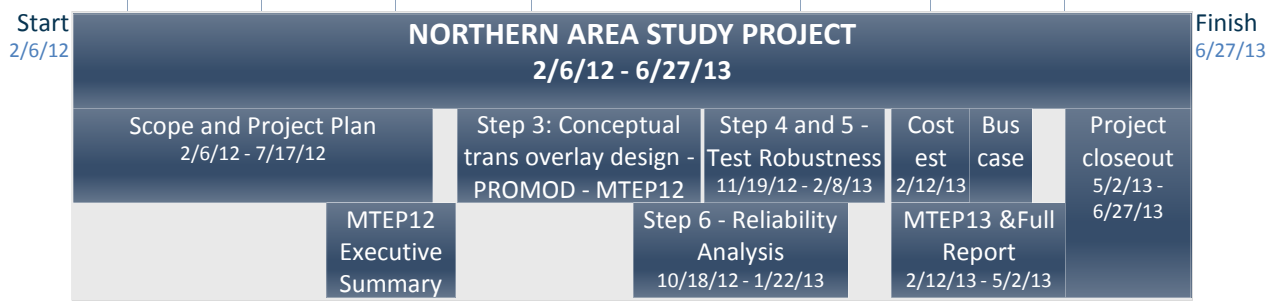
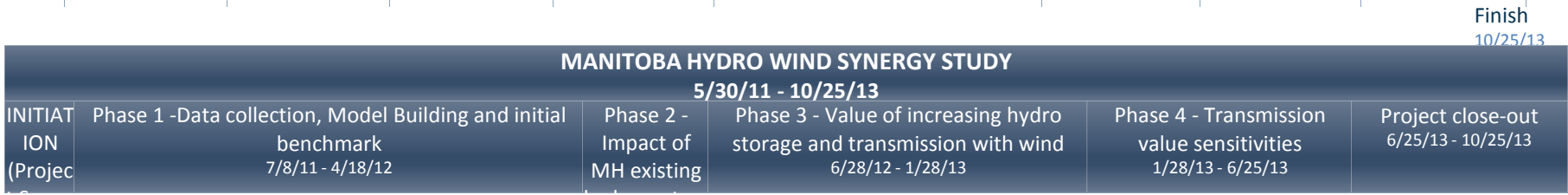
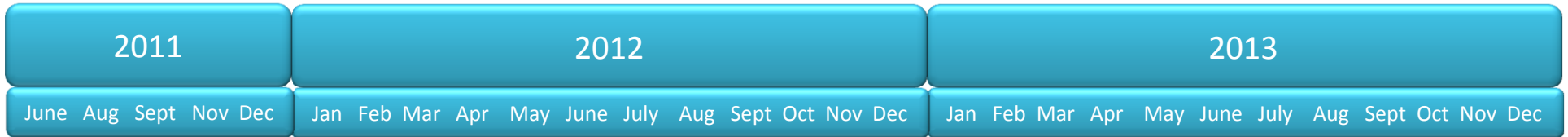
# Conclusion

- **All three options show strong benefits**
- **Phase III is progressing on schedule**
- **The next TRG will be in mid January in St. Paul to present final Phase III results**

# Manitoba Hydro Wind Synergy Study Timeline



# MH Wind Synergy- NAS - MEPS Timelines



Recommend to MTEP for Dec BOD approval  
6/19/13



# Coordination with Northern Area Study

- **MH Wind Synergy Study (MHWSS) compares the 3 transmission options along with additional hydro generation.**
- **The results from MHWSS may lead to the project recommendation in MTEP13 Appendix B**
- **Northern Area Study is designing and testing transmission lines starting where the MHWSS options leave off**
- **Due to the studies timing, the Northern Area Study is using each of the 3 transmission options as input variables (separate sensitivities)**
- **The Northern Area Study is using the MHWSS developed hydro resource dispatch/outputs as an input**



# Next Steps

- **Refine VWS curves with the help of MH in order to more accurately reflect hydro generators**
- **Get cost estimates from Duluth and T options**
- **We will be performing the Day Ahead (DA) and Real Time (RT) interleave runs to explore the production cost savings, wind curtailment, load cost reduction, etc. from the RT market caused by the divergence between forecasted and actual wind and load**
- **Continue to refine the benefit metrics of the three transmission option**

# Contact Info

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