



**Ellendale Data Center
Request for Permanent PC&N and
Electric Service Agreement #2**

**Informal Hearing – Case Nos. PU-23-320,
PU-23-321 and PU-23-322, February 21, 2024**

 **MONTANA-DAKOTA**
UTILITIES CO.
A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

Filings

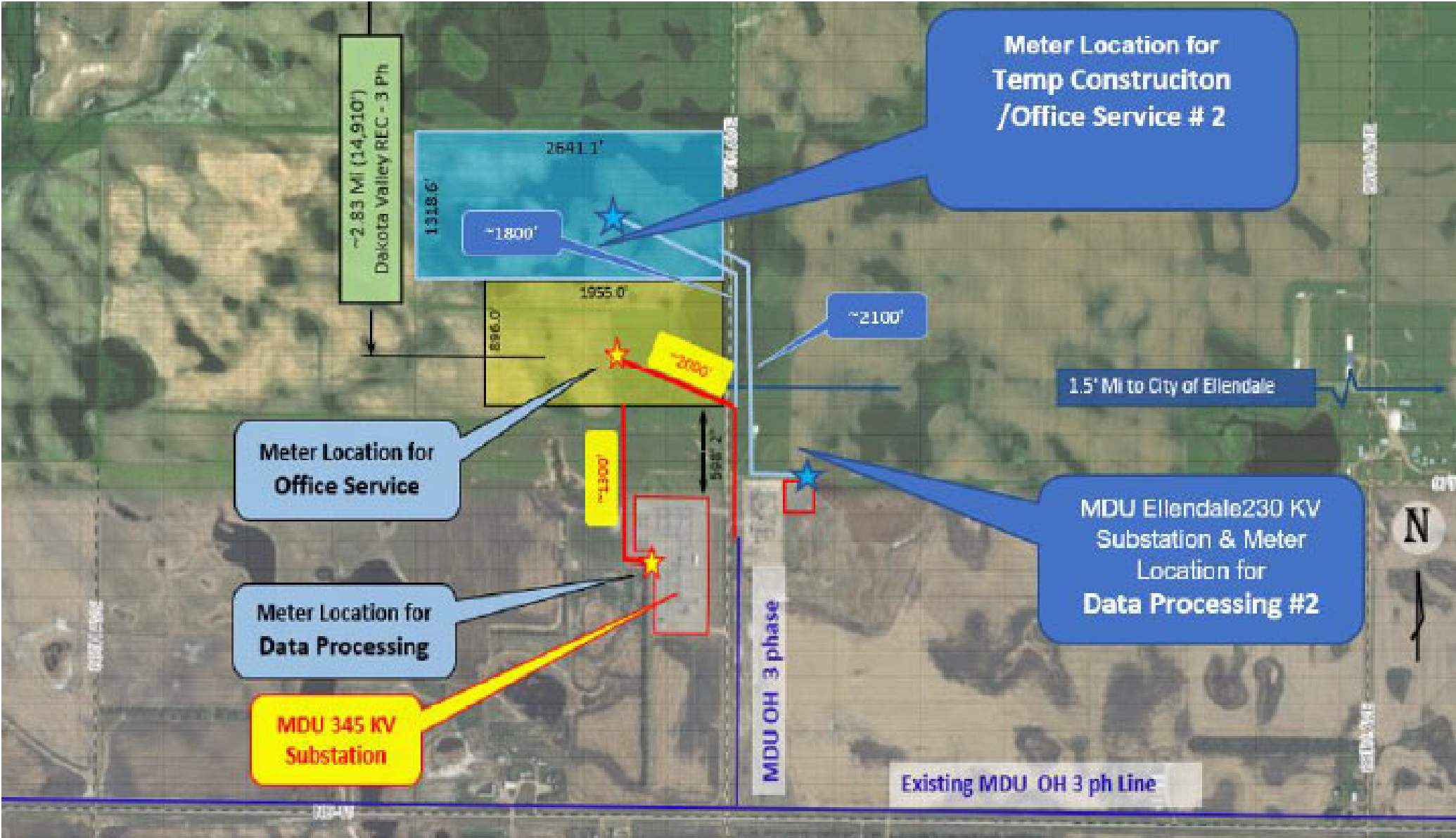
- **On October 2, 2023, Montana-Dakota submitted three applications with the Commission**
 - **Two requests for temporary authority permits to extend temporary service at Applied Digital's Ellendale site for a:**
 - **2nd office location**
 - **2nd data center location**
 - **Application for approval of a second electric service agreement (ESA) with Applied Digital Corporation.**
- **Temporary authorities granted November 8, 2023**
- **Request for permanent authority to serve submitted on November 17, 2023**

Applied's 2nd Ellendale Facility

- **225 MW high density data center expected to house high performance computing (HPC) resources for the artificial intelligence industry**
- **Service provided under Rate 45**
- **Service to office building under Rate 30**
- **Second location within the Company's service territory as provided for in the Service Area Agreement with Dakota Valley Electric Cooperative**

Rate 45 Requirements

- **Data centers/high density computer processing**
- **Minimum load requirements**
- **Interruption requirements**
- **Approved Electric Service Agreements**
 - **Term, pricing, billing frequency, deposits, interruptions, demand response requirements**
- **Extension of service - CIAC**



1898 & Co. Data Center Load Increase Study

- **Conducted in compliance with Order Point 4 of the Settlement Agreement approved in Montana-Dakota's electric service agreement, Case No. PU-22-371**
- **Filed on November 9, 2023**

MDU Native Customer Fuel and Purchase Power Impact Analysis

10/31/2023

Montana-Dakota Utilities

Assumptions

- **Calculated average LMPs from the 1898 Report Base Case and three Change Cases based upon a weighting of 40% Heskett7, 20% WDicksn7, 20% LTLMUDY7, and 20% Baker 8.**
- **Utilized Montana-Dakota's Plexos Model for the 2024 financial plan.**
- **Calculated Fuel and Purchase Power Price for the Base Case and three Change Cases utilizing the average LMPs from the 1898 Report substituted for the MISO Energy Forecast Price in the Plexos Model.**

MISO Energy Average LMPs (\$/MWh)

| Month | Base | Existing 180 | Expansion 180 | Additional 100 |
|-------|---------|-----------------|------------------|-------------------|
| 1 | \$25.13 | \$25.30 | \$25.98 | \$26.33 |
| 2 | \$24.35 | \$24.30 | \$25.07 | \$25.54 |
| 3 | \$21.72 | \$21.90 | \$22.14 | \$22.46 |
| 4 | \$18.07 | \$18.34 | \$18.90 | \$19.13 |
| 5 | \$19.31 | \$19.56 | \$19.99 | \$20.35 |
| 6 | \$19.13 | \$19.38 | \$19.72 | \$20.10 |
| 7 | \$24.81 | \$25.26 | \$26.79 | \$29.29 |
| 8 | \$25.12 | \$25.38 | \$27.33 | \$29.41 |
| 9 | \$22.09 | \$22.42 | \$22.81 | \$22.92 |
| 10 | \$22.19 | \$22.25 | \$22.54 | \$22.82 |
| 11 | \$27.21 | \$27.62 | \$28.40 | \$28.91 |
| 12 | \$31.06 | \$31.42 | \$32.55 | \$33.79 |

2024 Plexos Output Results

MDU Fuel and Purchase Power Costs

| Cases | Total Cost (\$) | Percent Increase (%) |
|--------------|-----------------|----------------------|
| Base | 89,953,900 | - |
| Existing DC | 90,075,870 | 0.25 |
| Expansion DC | 90,765,670 | 1.01 |
| SD DC | 91,269,430 | 1.58 |



QUESTIONS?



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Data Center Load Increase Study

10/19/2023



Background

- MDU serves nearly 431,000 customers across 271 communities¹, that have a cumulative expected load forecast* of ~3,800 GWh for the year 2024
- Data Center Change Case 1 (Existing Datacenter) explores the 2024 effects of siting a 170MW datacenter in MDU's territory
- Data Center Change Case 2 (Expansion Datacenter) explores the 2024 effects of siting a second 170MW datacenter in MDU's territory
- Data Center Change Case 3 (SD DC) explores the 2024 effects of siting an additional 90MW datacenter in MDU's territory in addition to the two 170MW datacenters from Change Case 1 and Change Case 2

Summary of Results

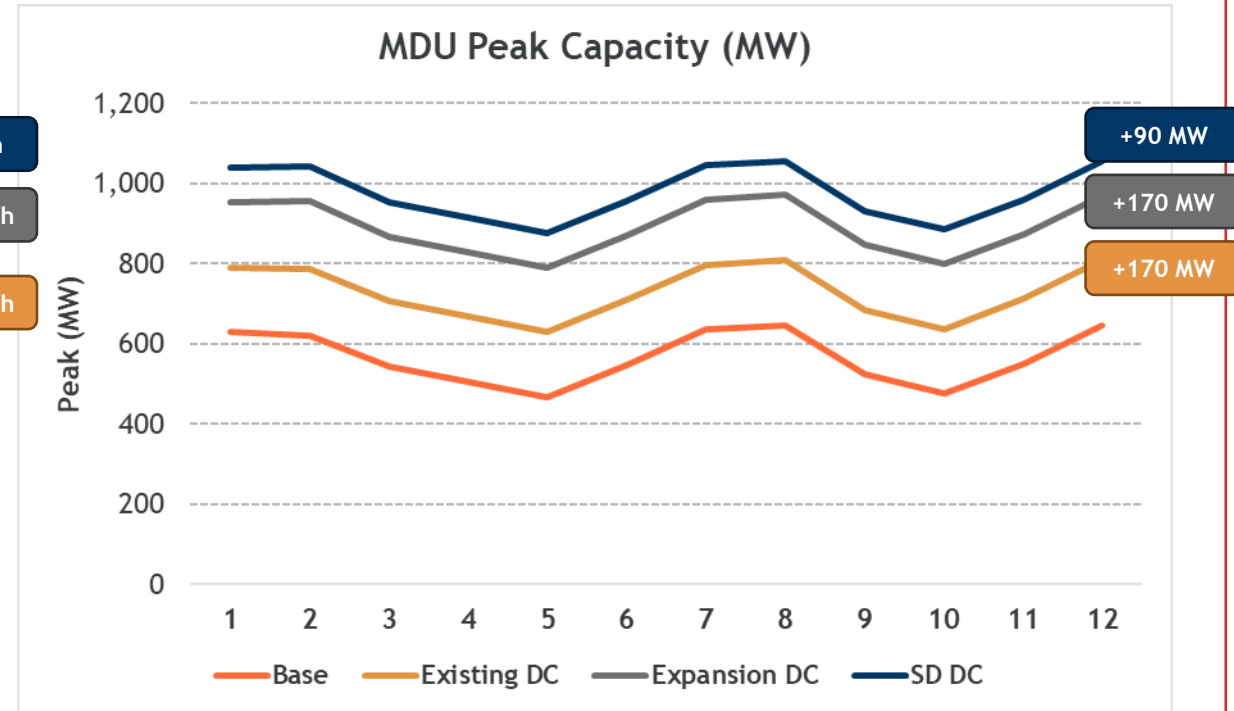
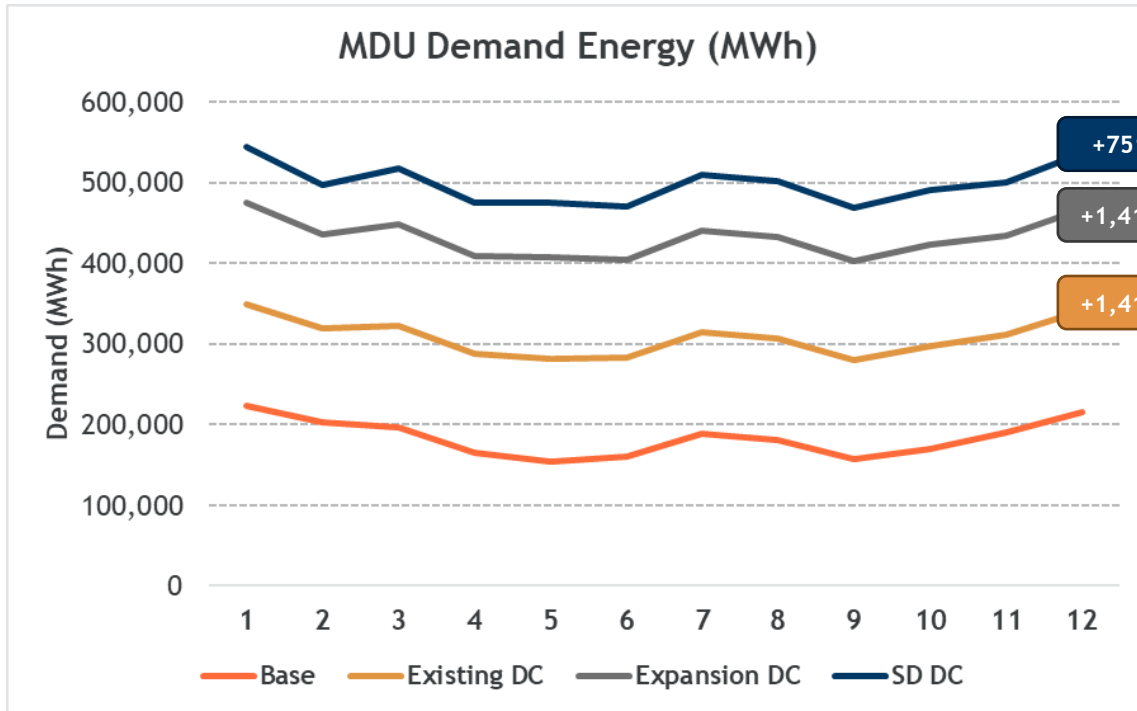


- Without data centers, MDU native load buses experience average LMPs for the year of 2024 between \$21-\$23/MWh
- Increasing data center load in the Ellendale area causes...
 - Native load buses to experience marginal increases in LMP prices. With the highest load datacenter scenario raising average native load bus LMP's by approximately \$2/MWh annually
 - Datacenter load buses however experience a more aggressive rise in LMP's as wind curtailment declines
- The additional load reduces curtailment in region... additional estimated \$230k in annual wind production tax to North Dakota
- MDU resources are being more heavily utilized as data centers are added

Assumptions

MDU Demand Energy and Peak Capacity

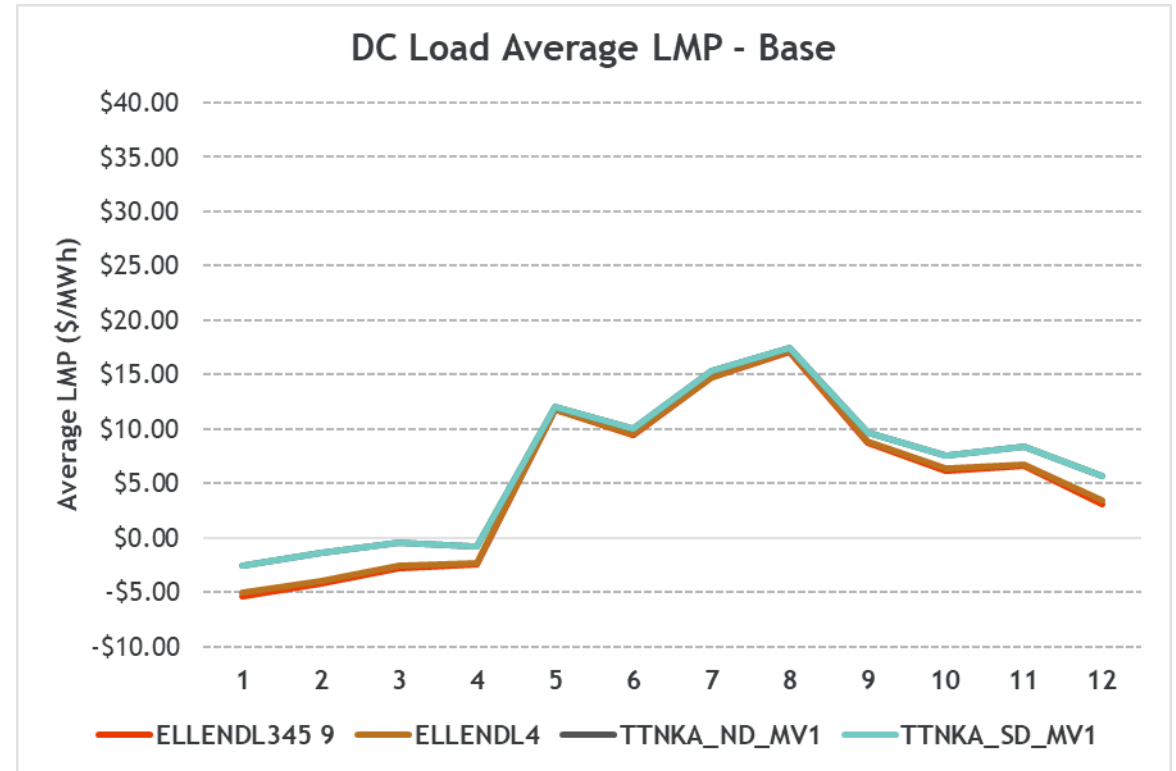
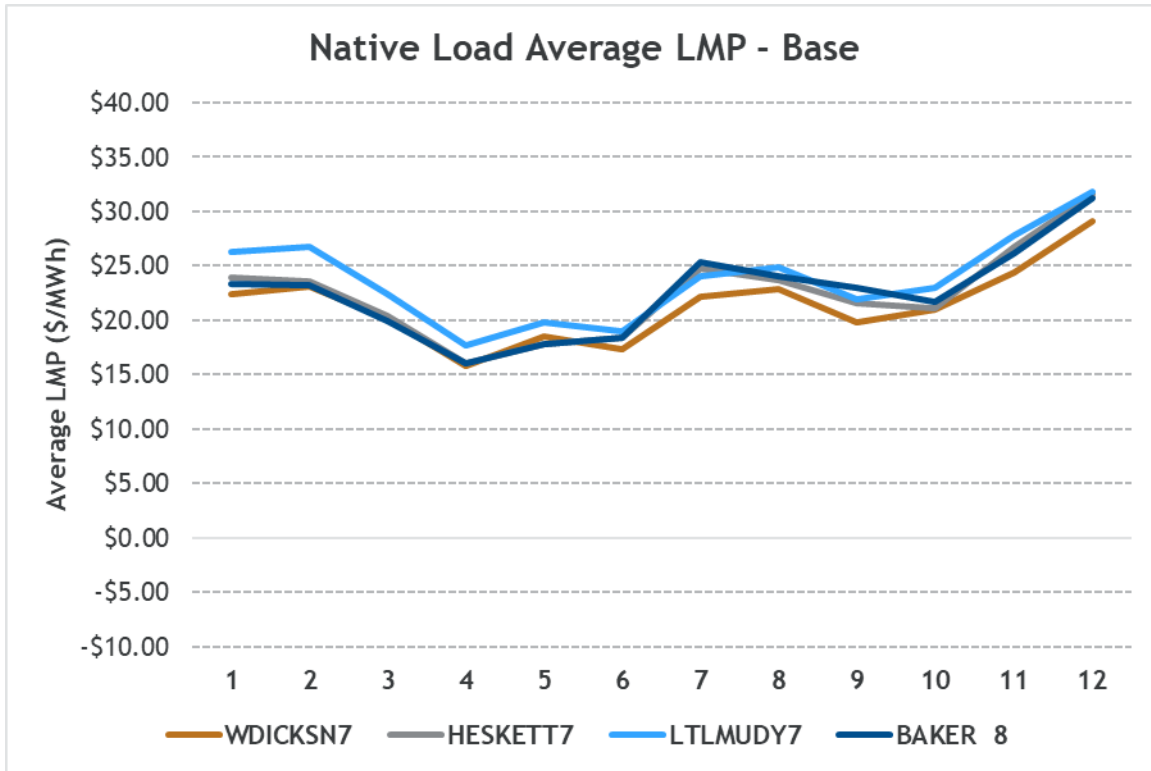
Base Case MDU demand was sourced from the 2024 forecast within the MTEP 21 PROMOD model



Adding all three data centers results in an 64% increase in peak-demand and an 144% increase in annual-energy requirements for MDU.

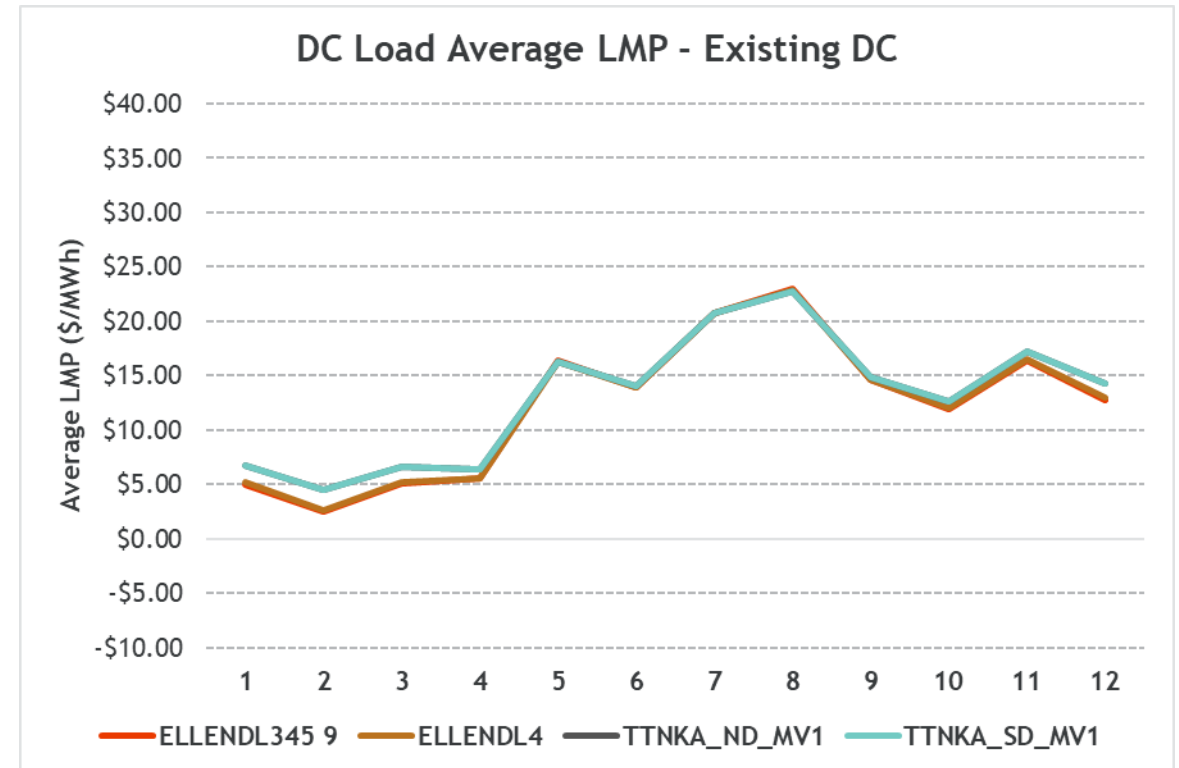
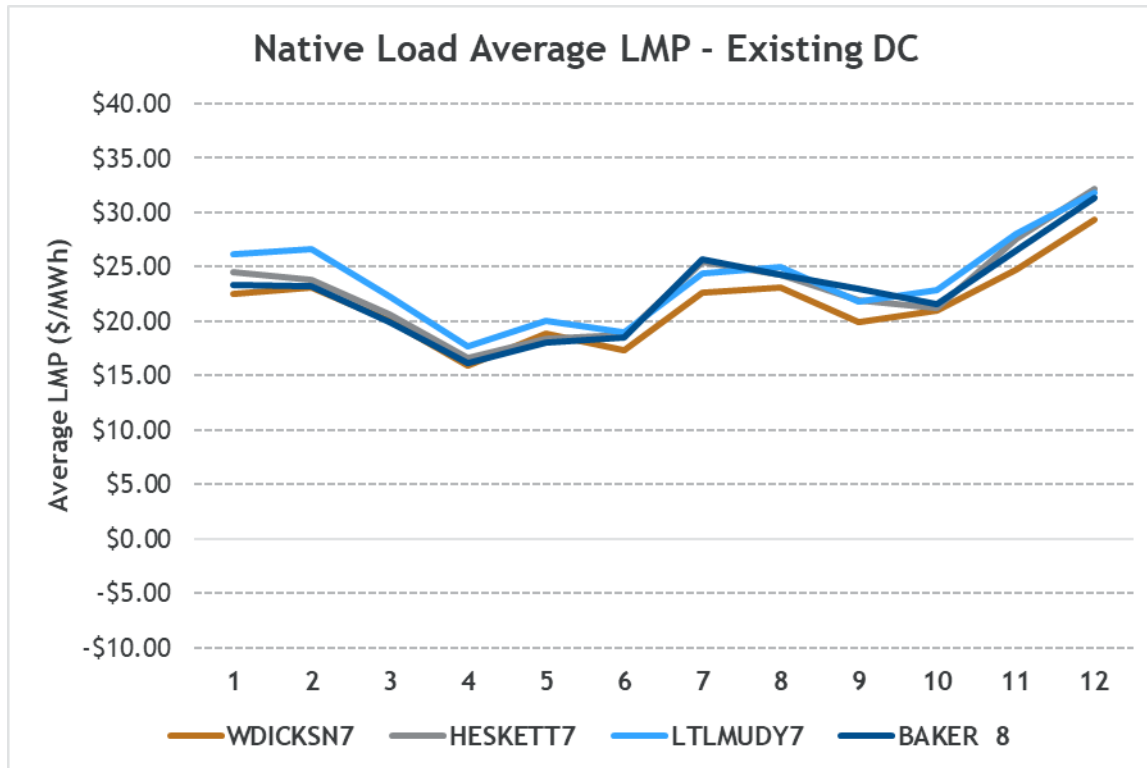
Pricing Impacts

LMP Average Pricing - Base



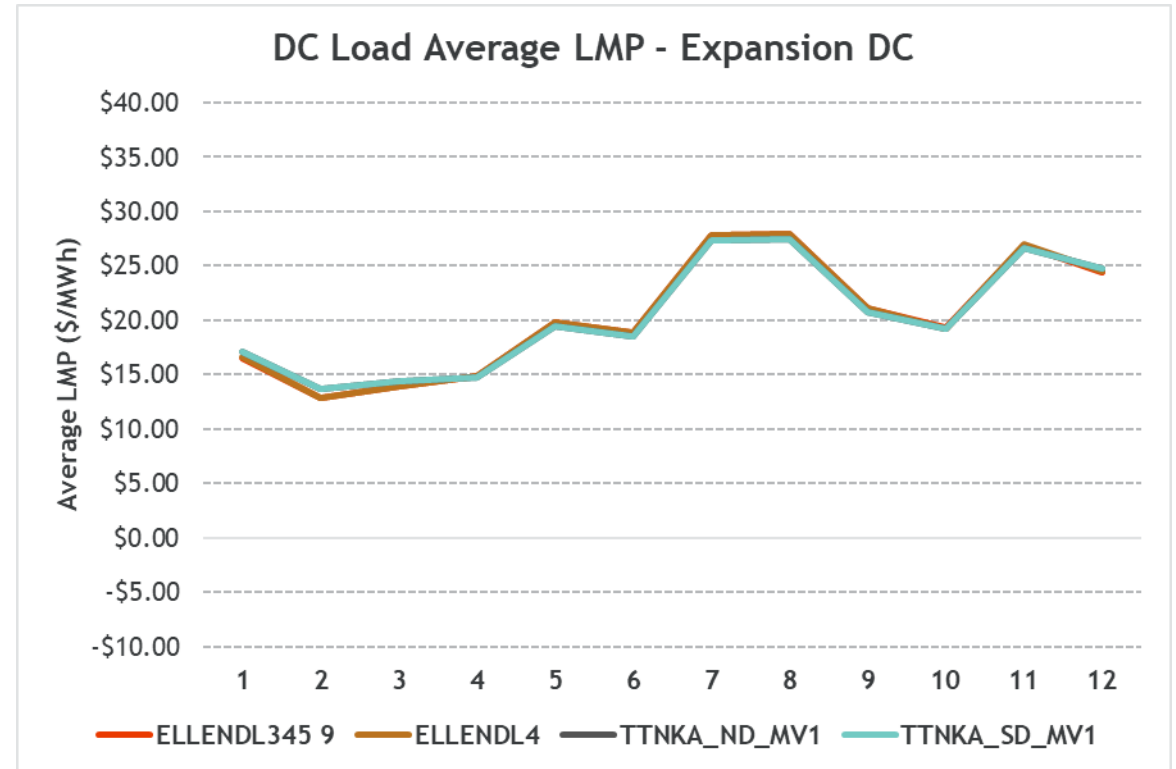
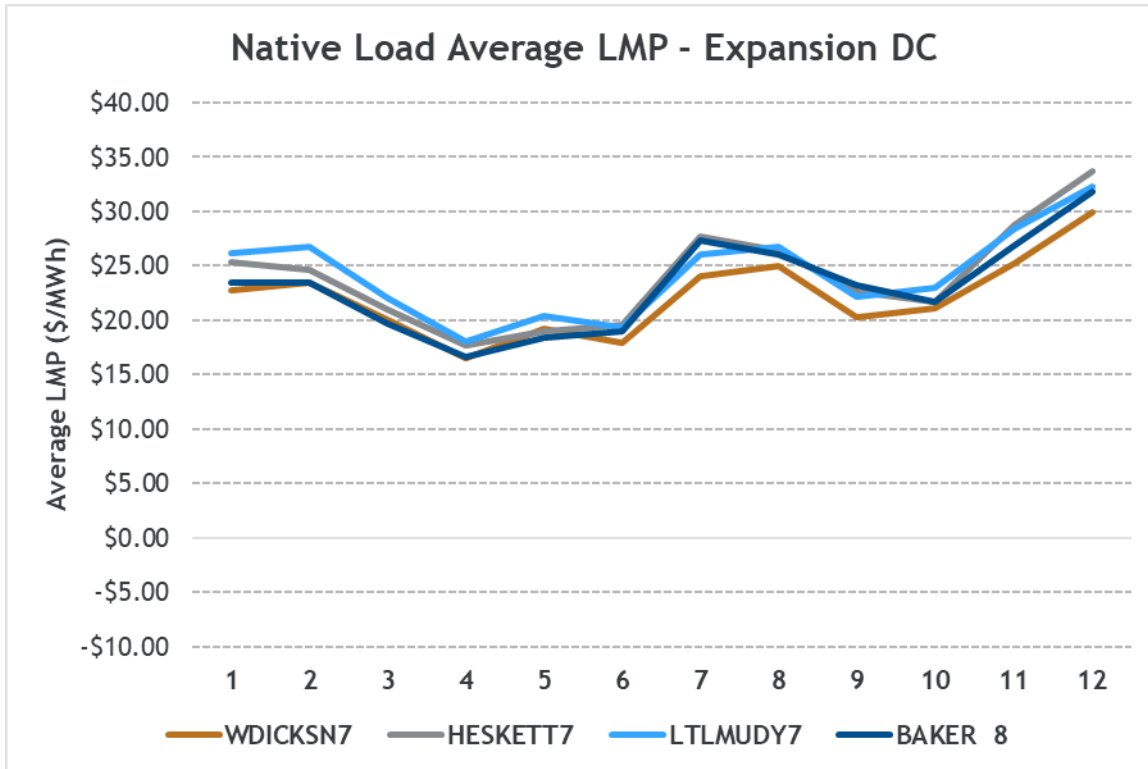
Marginal Energy Cost (MEC) is consistent between load and data center busses. Data Center load busses are experiencing about -\$21/MWh of congestion annually before adding any load.

LMP Average Pricing - Case 1: Existing DC



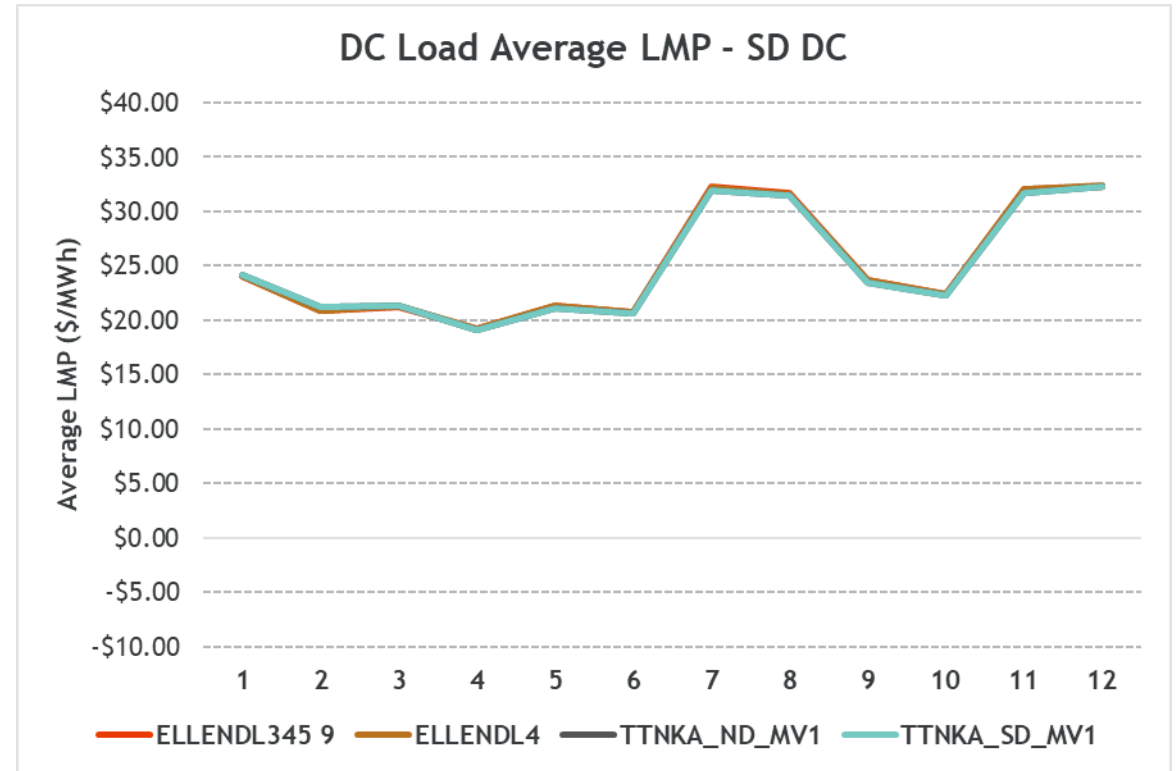
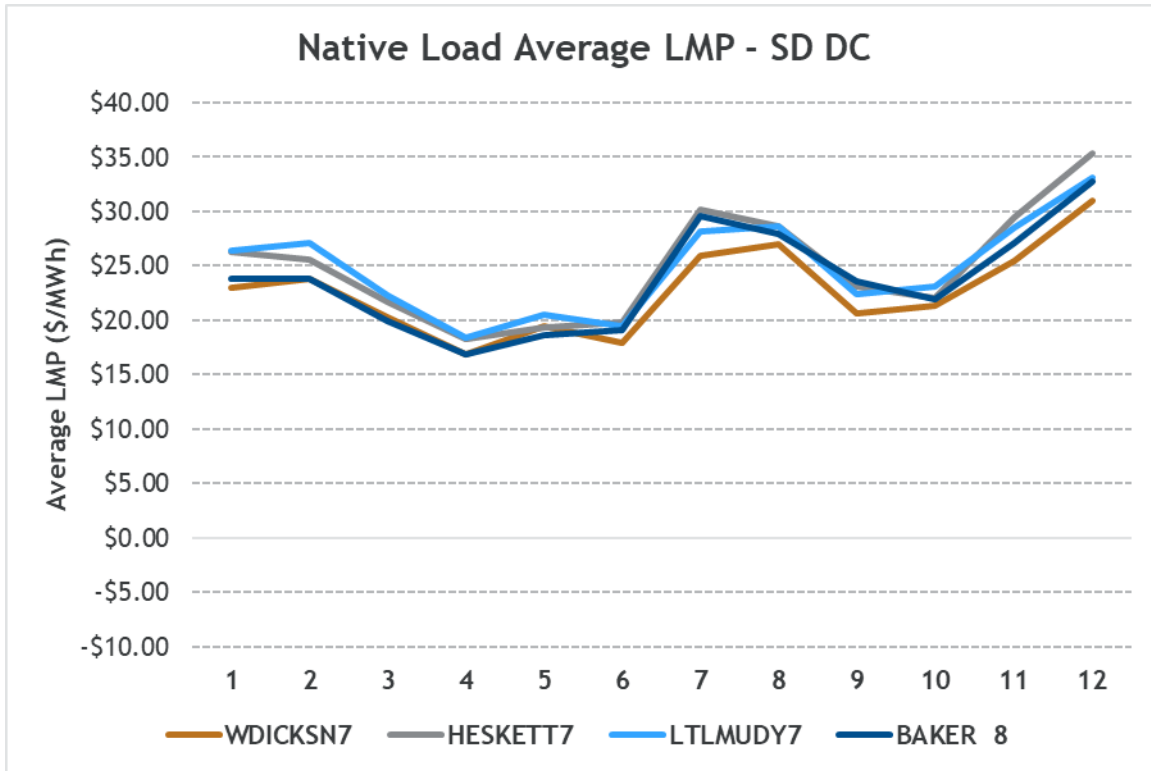
The introduction of data center load (+170 MW) into the system results in LMP price uplift. Data Center load buses are experiencing about -\$13/MWh of congestion annually after the first DC addition.

LMP Average Pricing - Case 2: Expansion DC



With the continued data center expansion (170MW + 170MW), LMP prices at the data center busses are converging towards the patterns observed at the native load buses.

LMP Average Pricing - Case 3: SD DC

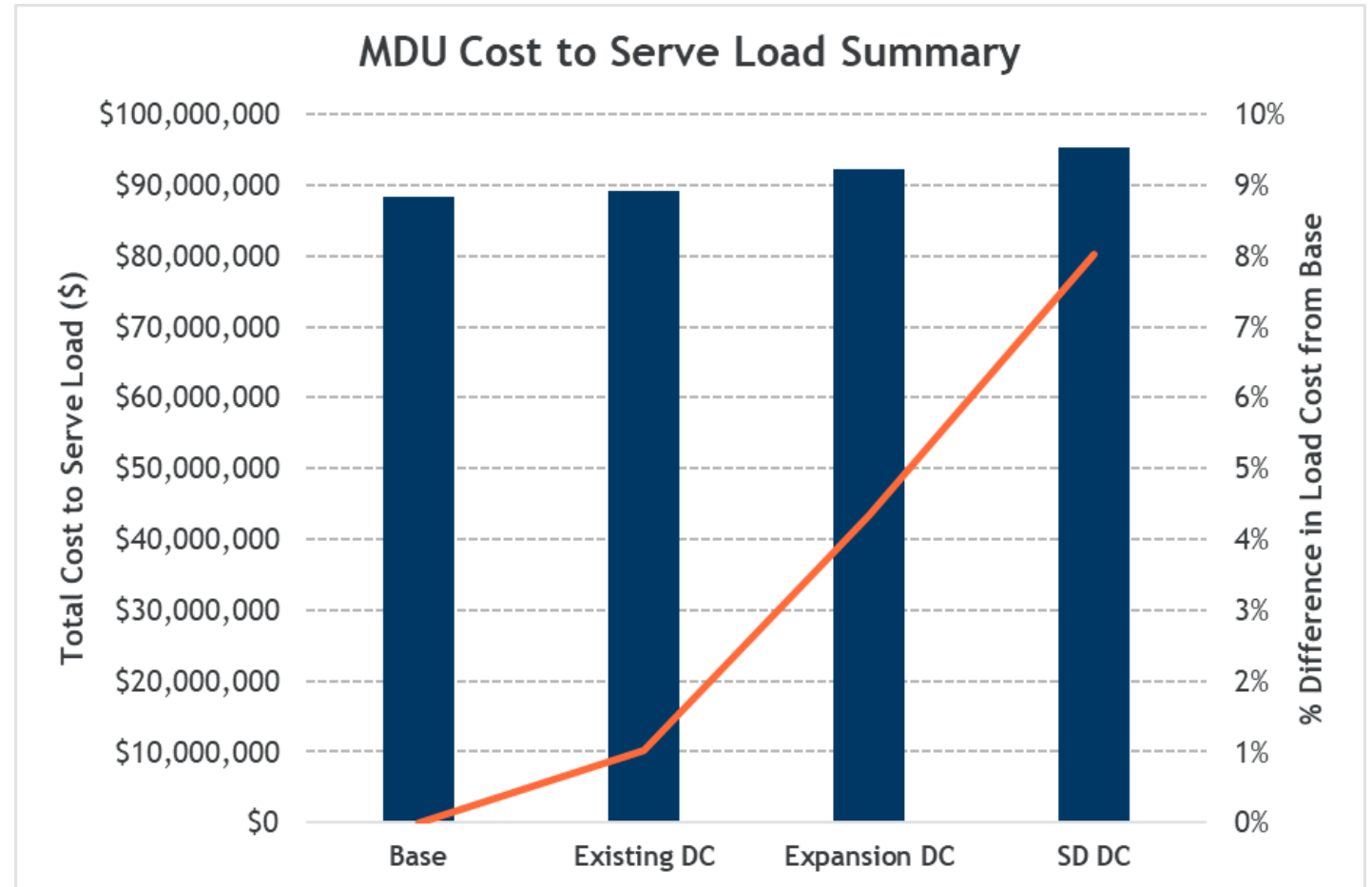


With the third DC added in the model, we see near parity between native load and data center load busses from an LMP perspective. Value proposition of adding additional load in the wind rich pocket around Ellendale is virtual eliminated.

MDU Gross* Native Load Cost



| Cases | Total Cost (\$) | Percent Increase (%) |
|--------------|-----------------|----------------------|
| Base | \$88,322,973 | |
| Existing DC | \$89,223,770 | 1.02% |
| Expansion DC | \$92,160,442 | 4.34% |
| SD DC | \$95,404,300 | 8.02% |



Native Load Bus Congestion

Native Load Bus Congestion* Summary

| Load Buses | WDICKSN7 | HESKETT7 | LTMUDY7 | BAKER8 | Avg. Congestion |
|--------------|----------|----------|---------|---------|-----------------|
| Base | -\$3.02 | -\$1.43 | -\$2.12 | -\$1.65 | -\$2.06 |
| Existing DC | -\$2.31 | +\$0.38 | -\$1.53 | -\$0.55 | -\$1.52 |
| Expansion DC | -\$1.22 | -\$1.09 | -\$0.46 | -\$3.14 | -\$1.86 |
| SD DC | -\$0.01 | +\$0.74 | +\$0.77 | -\$1.92 | -\$0.57 |

- Similar total LMP pricing across all native load nodes (see pricing impacts section)
- Increased datacenter load in Ellendale area on the system generally results in increasing congestion experienced by load center buses (increased cost of load)

Data Center Load Bus Congestion

Data Center Load Bus Congestion* Summary

| DC Buses | ELLENDL345 | ELLENDL4 | TTNKA_ND_MV1 | TTNKA_SD_MV1 | Avg. Congestion |
|--------------|------------|----------|--------------|--------------|-----------------|
| Base | -\$22.62 | -\$22.44 | -\$20.58 | -\$20.58 | -\$21.56 |
| Existing DC | -\$13.48 | -\$13.39 | -\$12.38 | -\$12.38 | -\$12.91 |
| Expansion DC | -\$1.65 | -\$1.59 | -\$1.56 | -\$1.56 | -\$1.59 |
| SD DC | +\$5.70 | +\$5.72 | +\$5.54 | +\$5.54 | +\$5.63 |

- Buses where the datacenters are sited see changes in congestion as more DC load comes online, reducing generation curtailment and contributing to increasing bus LMPs
- The increased load in wind rich areas impacts the duration and severity of binding constraints seen in the region...
 - ...from the perspective of load, this is increasing the cost to serve new Data Center(s) located in the Ellendale area

Summary of Results



- Without data centers, MDU native load buses experience average LMPs for the year of 2024 between \$21-\$23/MWh
- Increasing data center load in the Ellendale area causes...
 - Native load buses to experience very marginal increases in LMP prices. With the highest load datacenter scenario raising average native load bus LMP's by approximately \$2/MWh annually
 - Datacenter load buses however experience a more aggressive rise in LMP's as wind curtailment declines
- The additional load reduces curtailment in region... additional estimated \$230k in annual wind production tax to North Dakota
- MDU resources are being more heavily utilized as data centers are added

Summary of Results... Continued

- Congestion impacts in the Ellendale area result in increasing bus LMPs wiping out the financial advantage seen by the DC customers by the time all three data centers are added.
- Increased datacenter load in Ellendale area on the system generally results in lower congestion experienced by load center buses (increased cost of load).
- Increasing datacenter load has minimal impact on the congestion observed at Big Stone and provides a small price improvement at Coyote.