

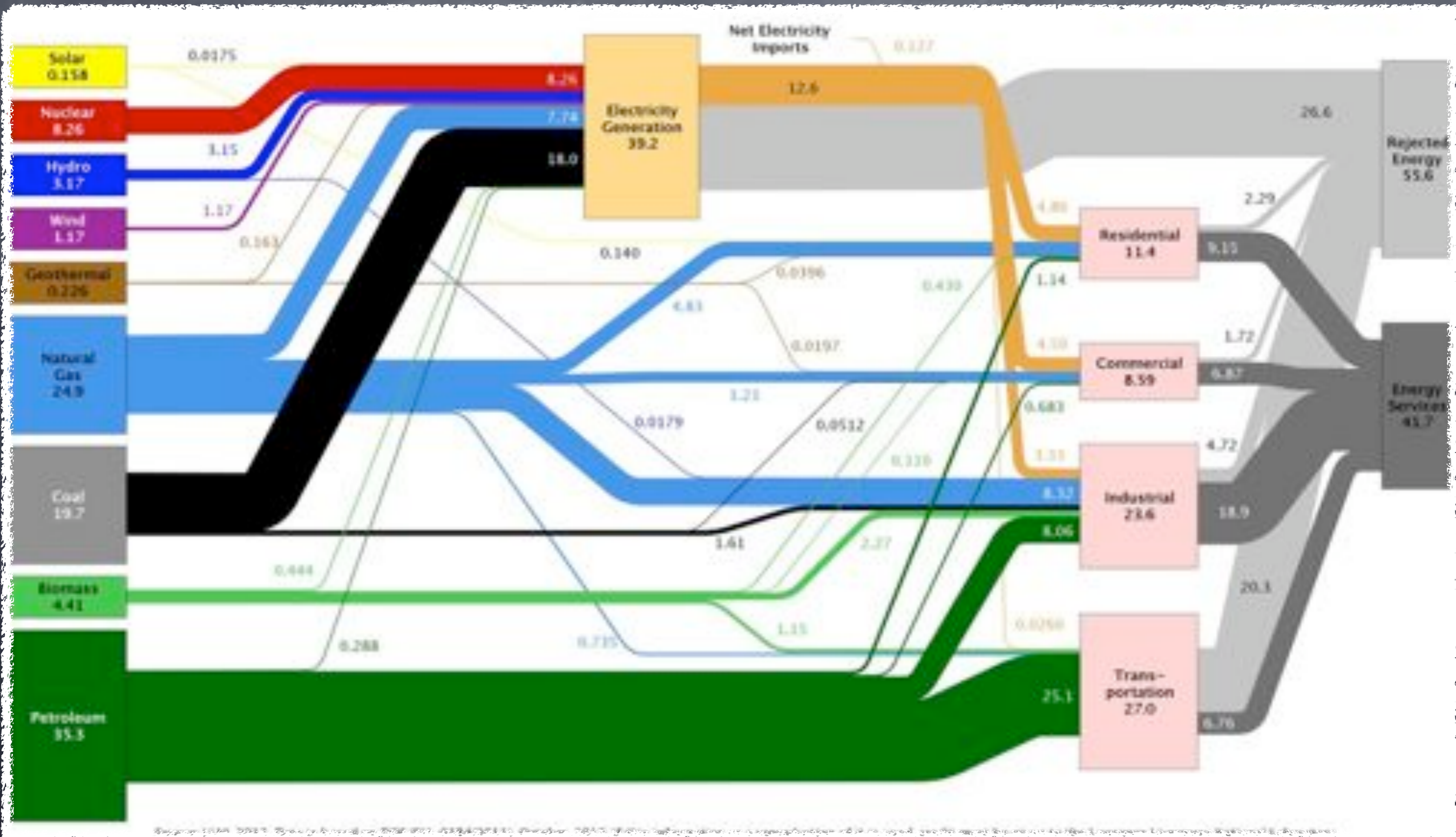
A photograph of a server room. In the foreground, there are several server racks. One rack on the left has a monitor displaying a colorful bar chart. Another rack in the center has a monitor showing a green and yellow heatmap. To the right, there are more server racks, some with monitors displaying data. The room is dimly lit, with the primary light source being the screens and the ambient light from the server units.

**“A DAY IN THE LIFE OF THE GRID”**

**BY: JON WELLINGHOFF**



# Estimated U.S. Energy Use 2011- ~97.3 Quads







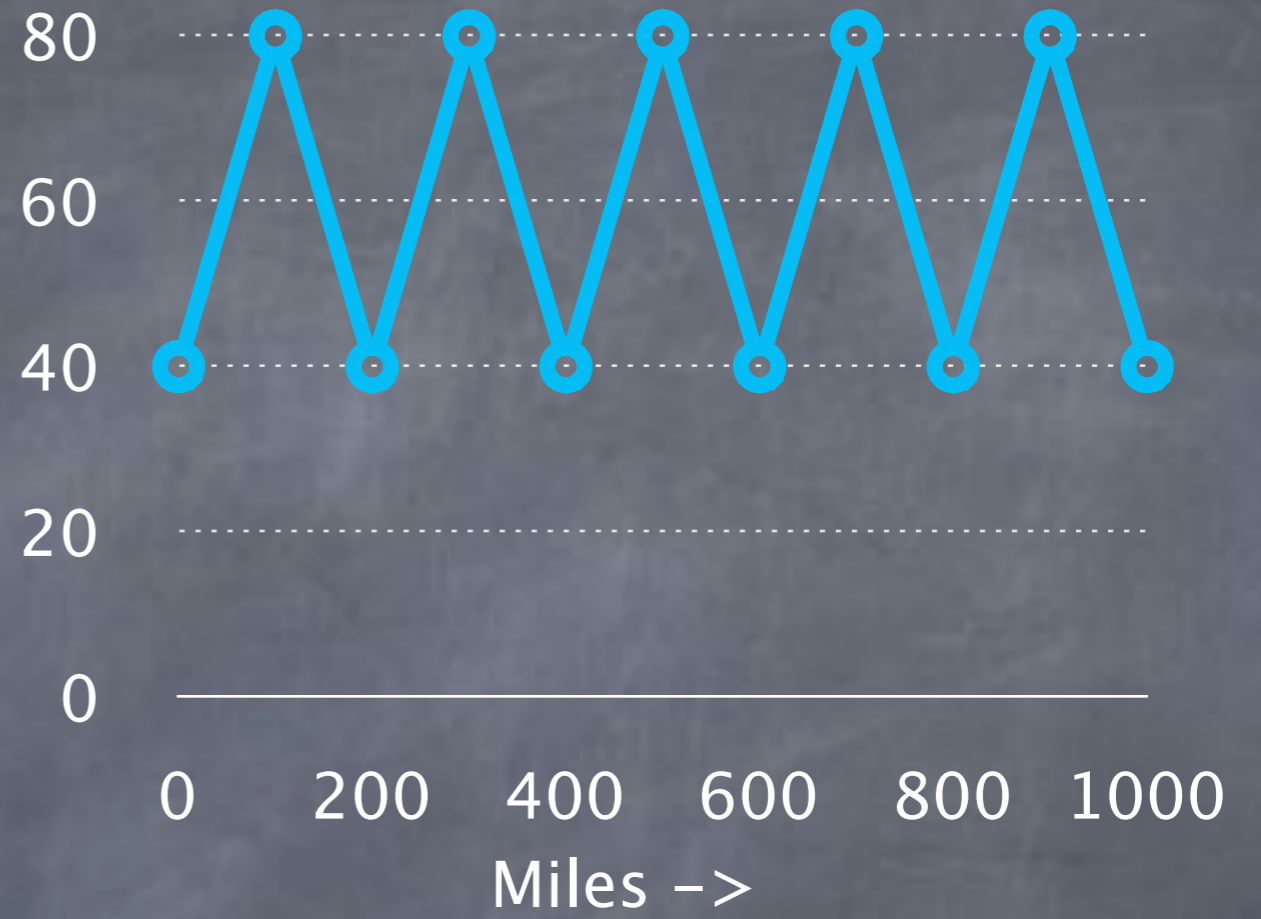
Car #1

1000 mi in 18.75 hrs



Car #1  
1000 mi in 18.75 hrs

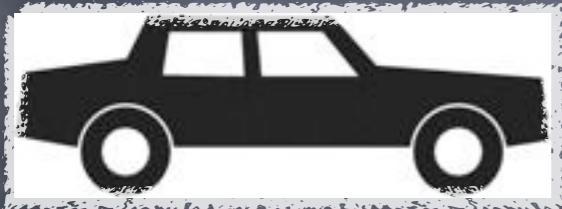
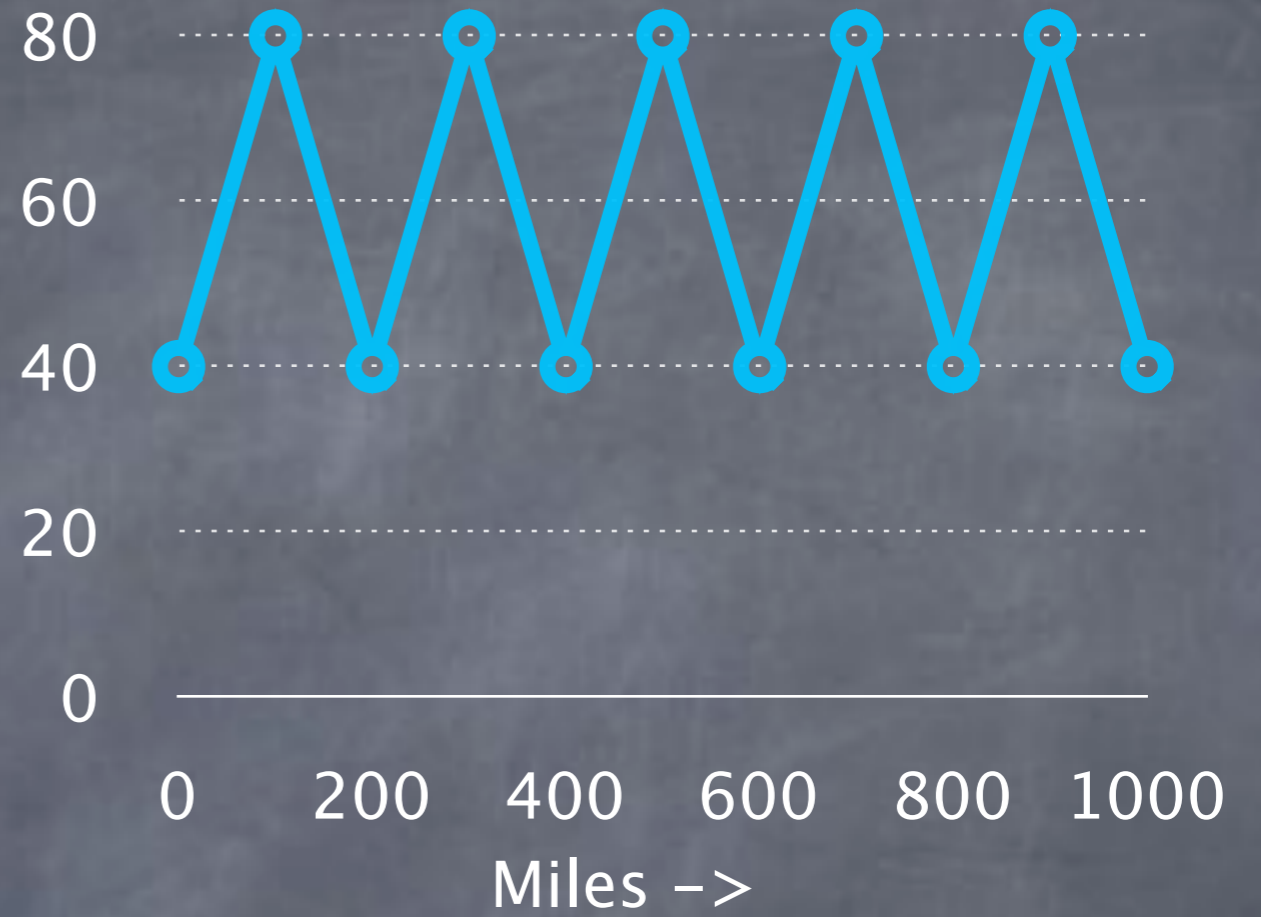
Speed





Car #1  
1000 mi in 18.75 hrs

Speed

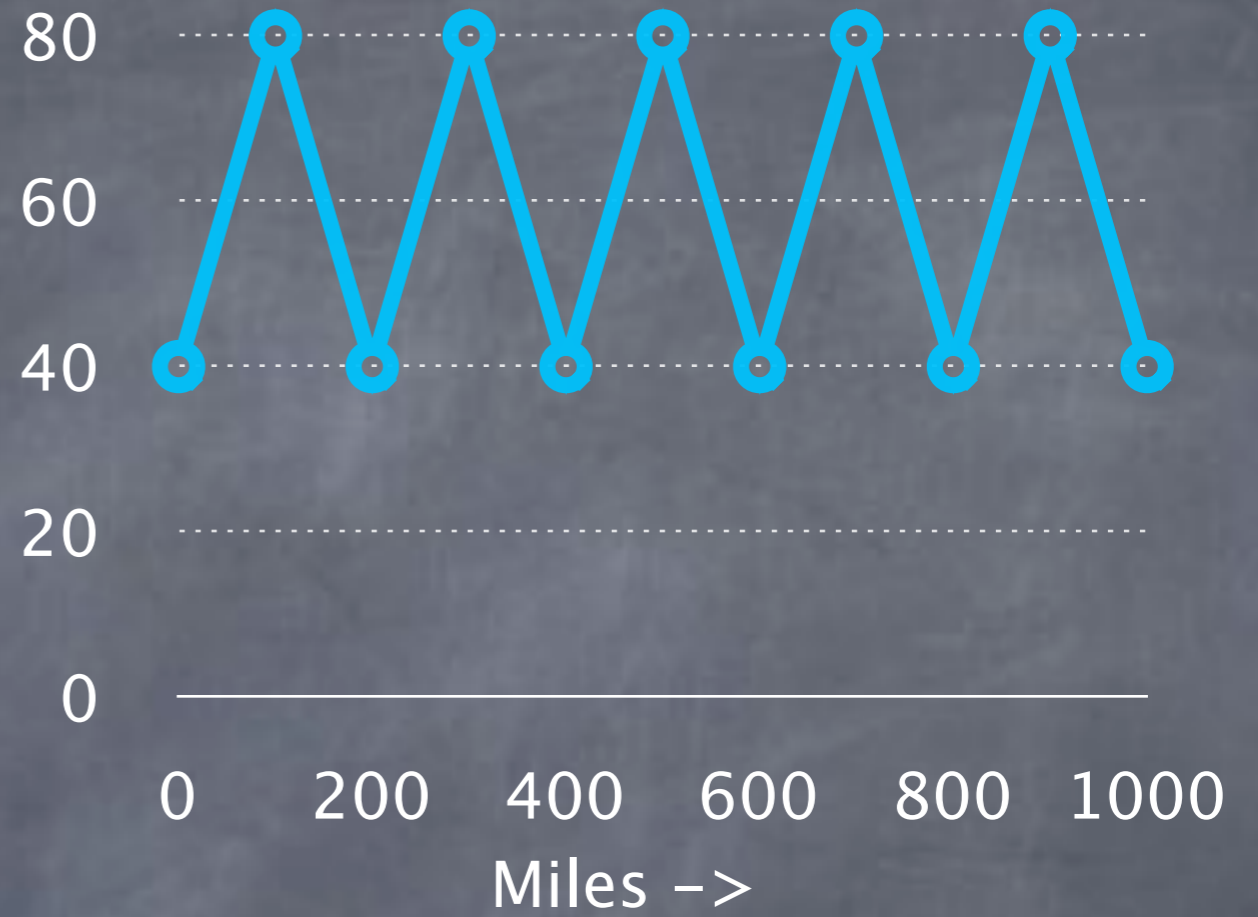


Car #2  
1000 mi in 18.75 hrs



Car #1  
1000 mi in 18.75 hrs

Speed



Car #2  
1000 mi in 18.75 hrs

Speed









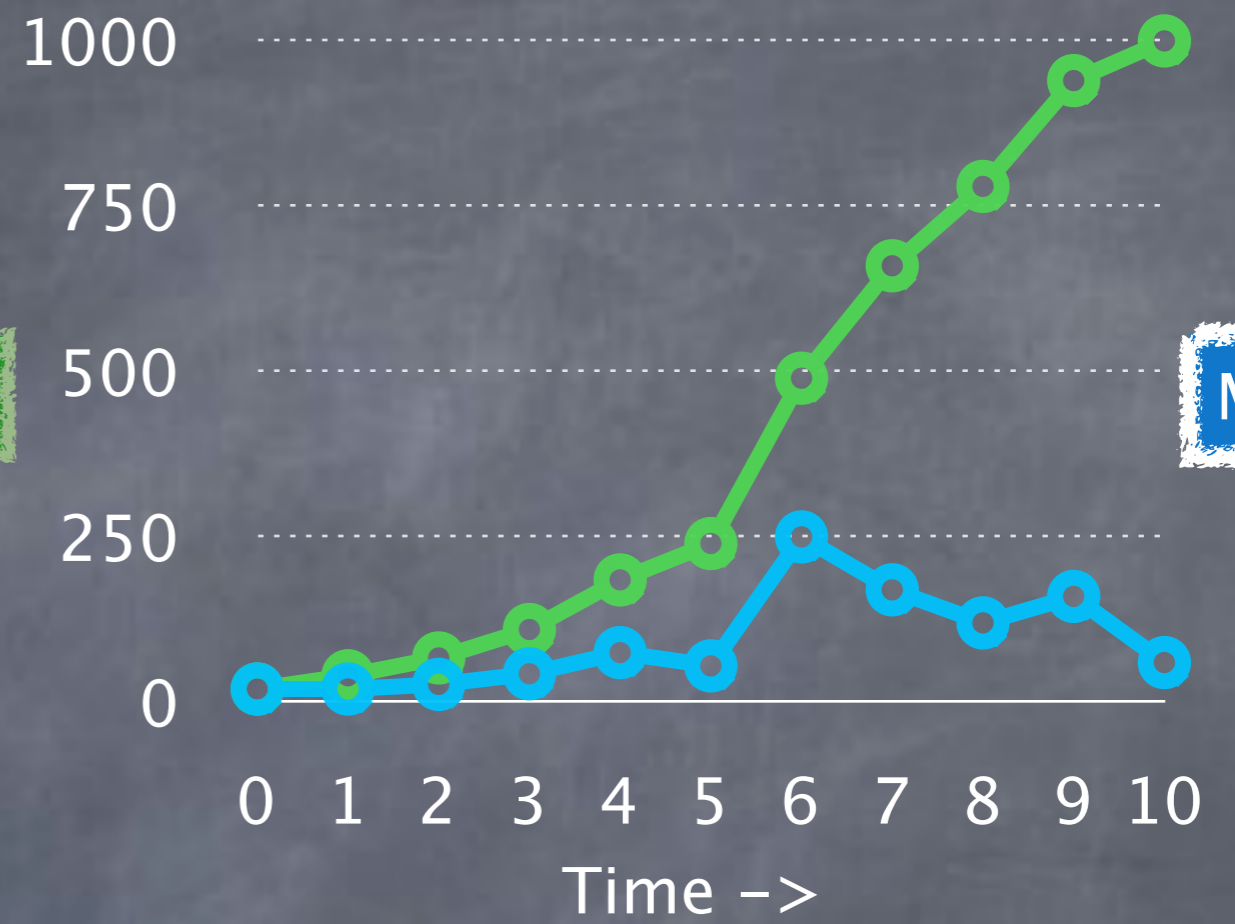
Power Plant  
w/o IE



Power Plant  
w/o IE

MWhs

MWs





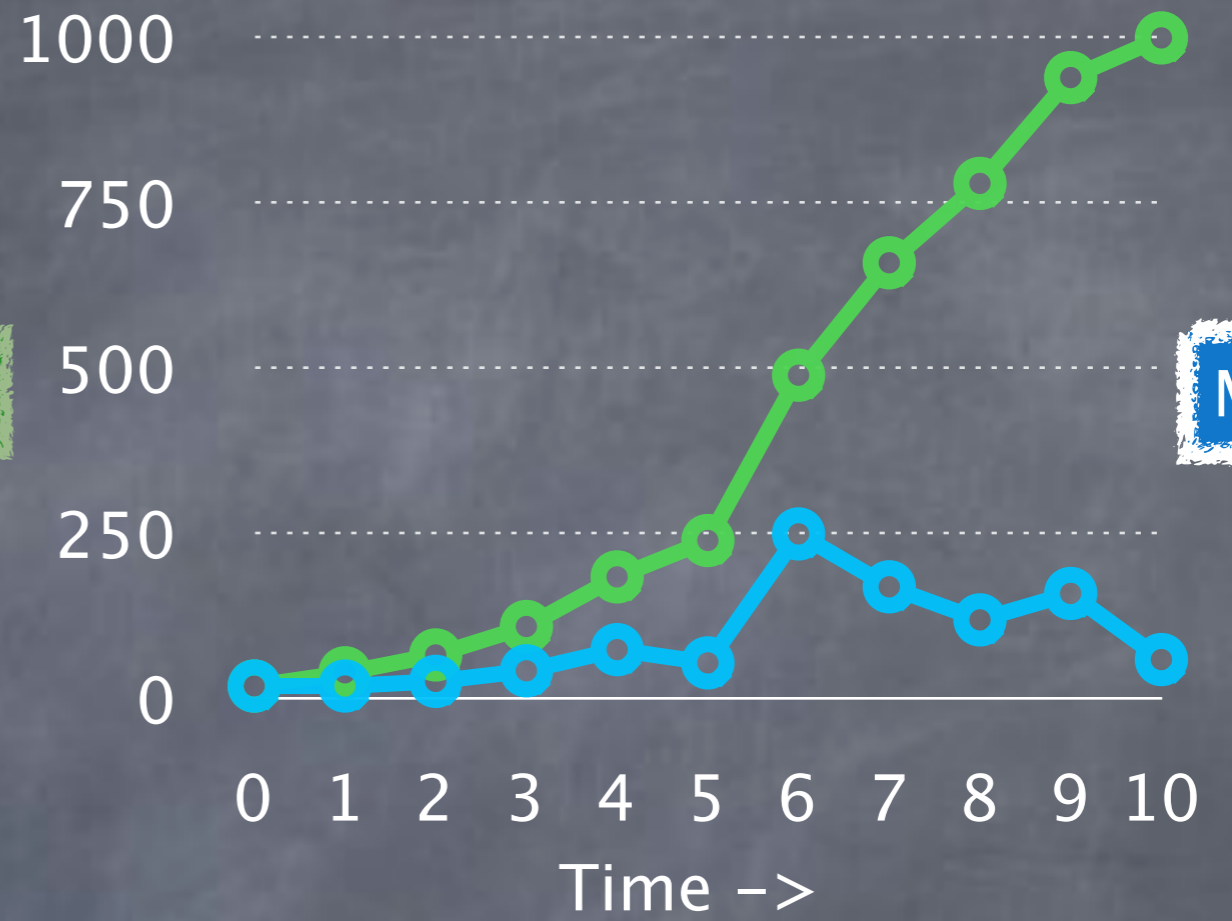
Power Plant  
w/o IE



Power Plant  
w/ IE

MWhs

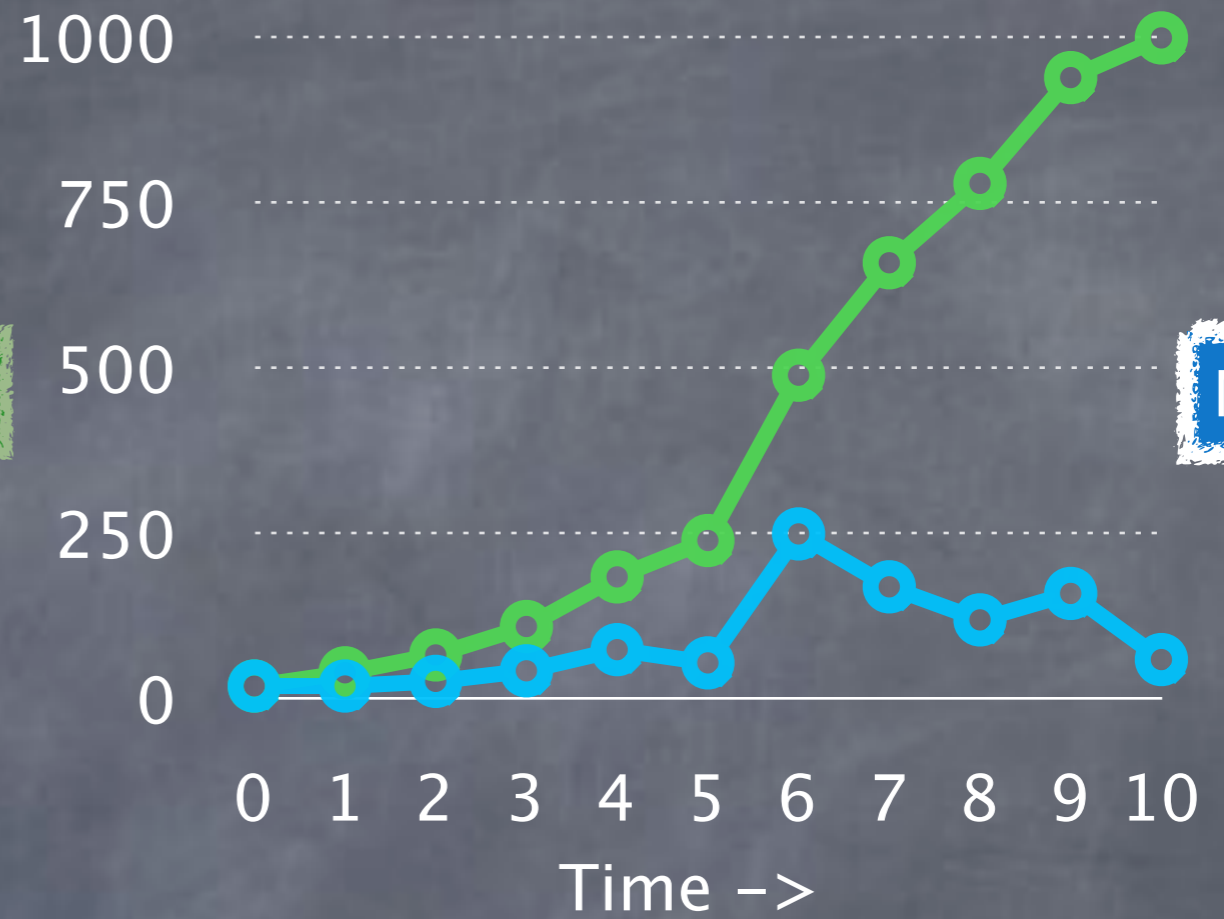
MWs





Power Plant  
w/o IE

MWhs

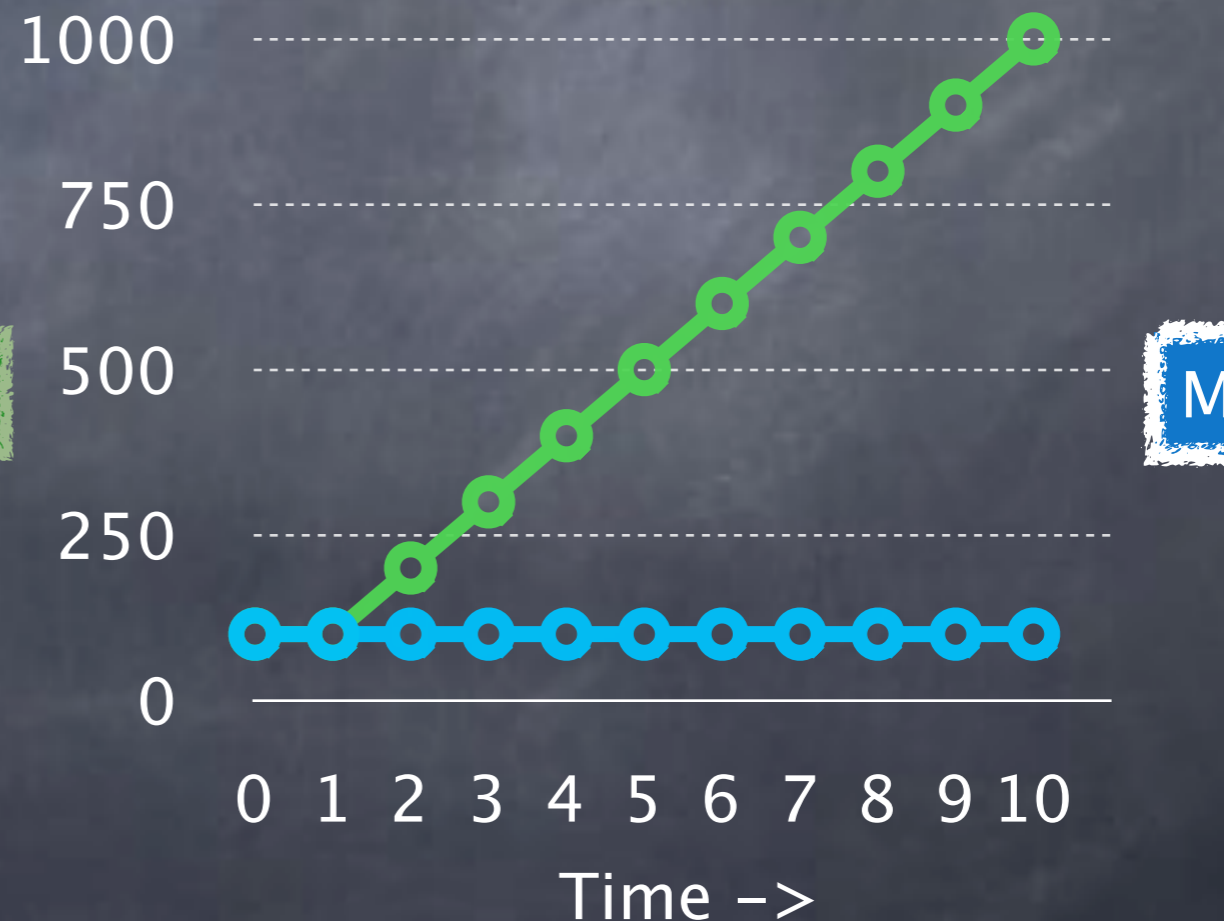


MWs



Power Plant  
w/ IE

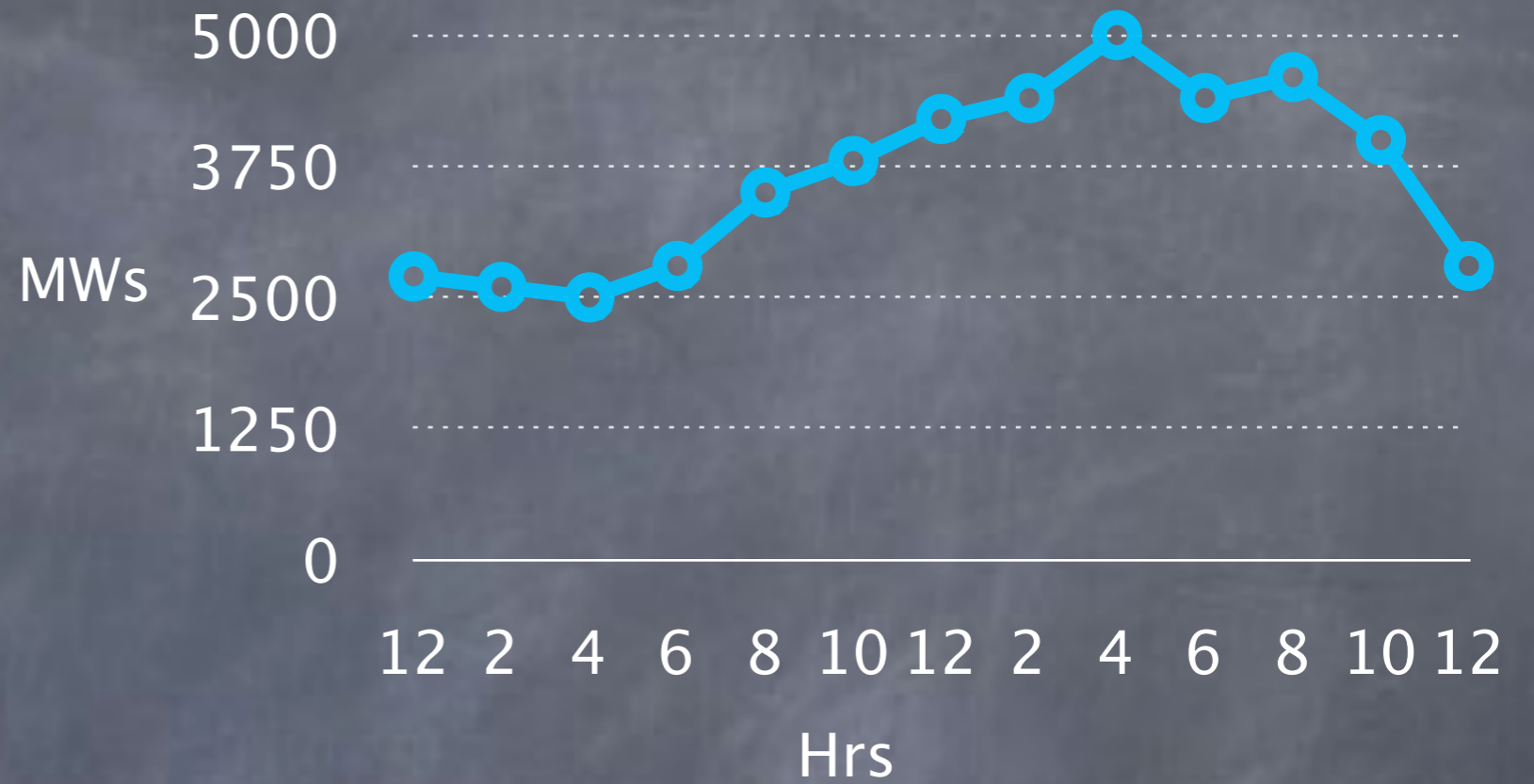
MWhs



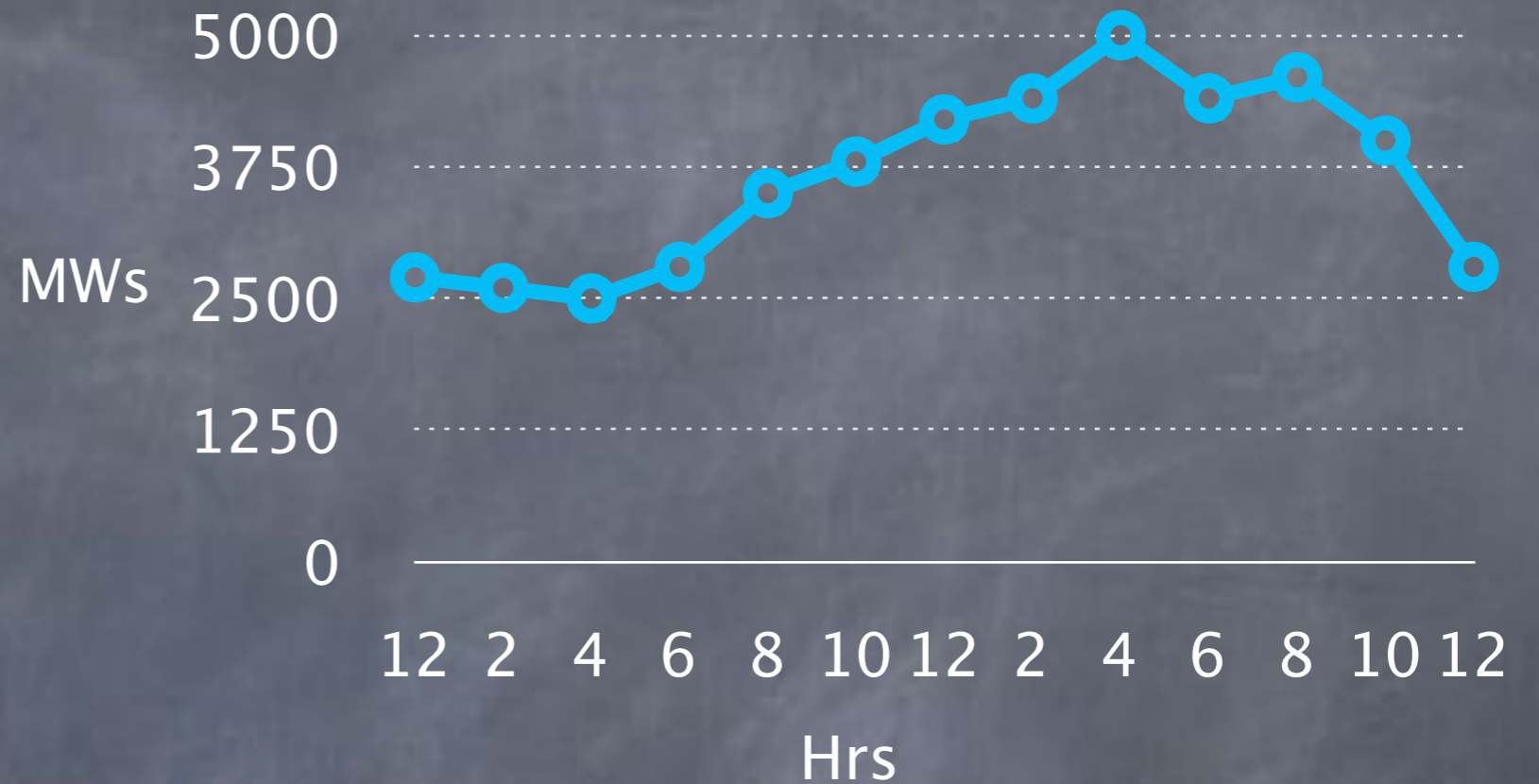
MWs



# Typical Load Curve



# Typical Load Curve



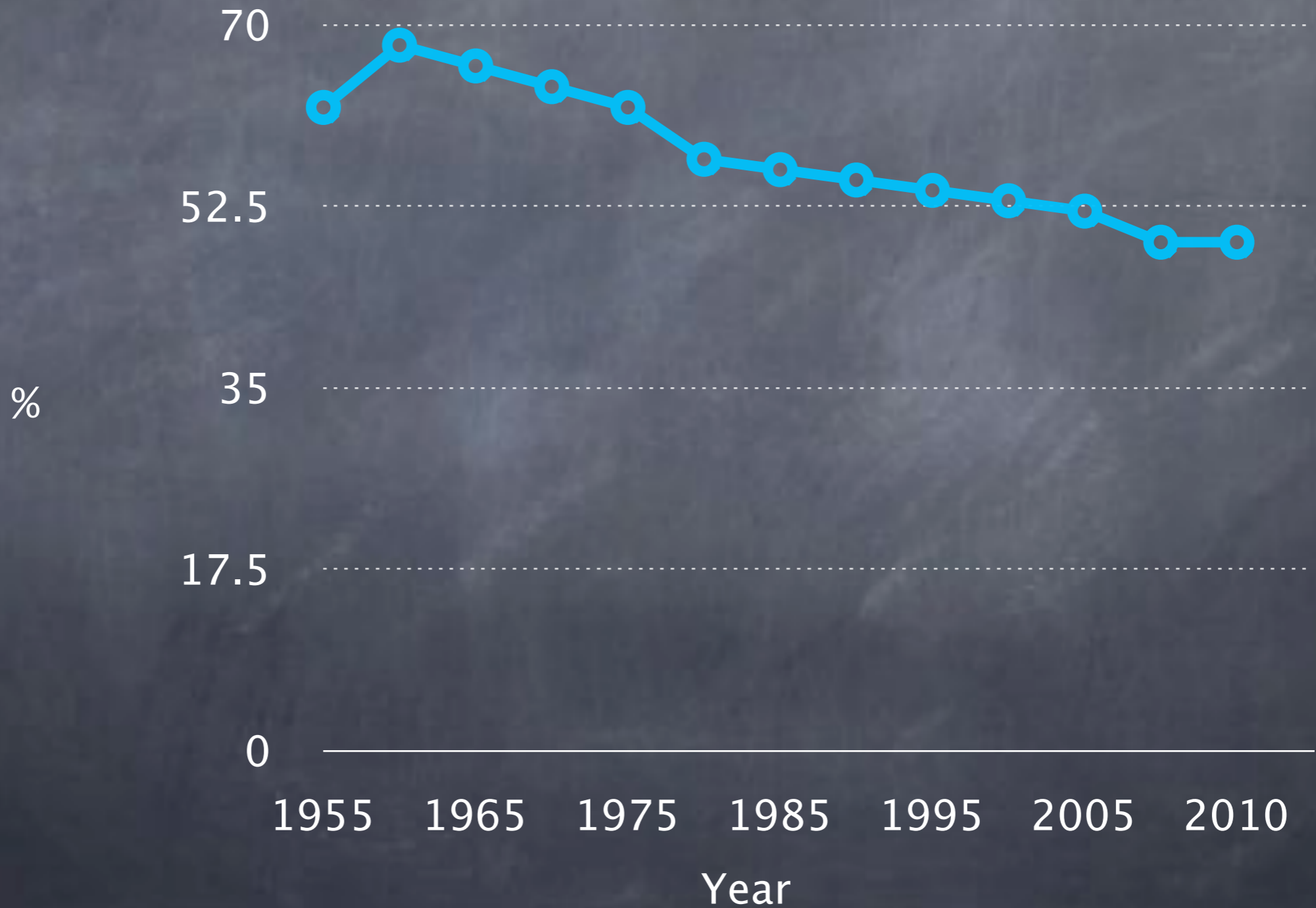
# Ideal Load Curve







# Declining Load Factor



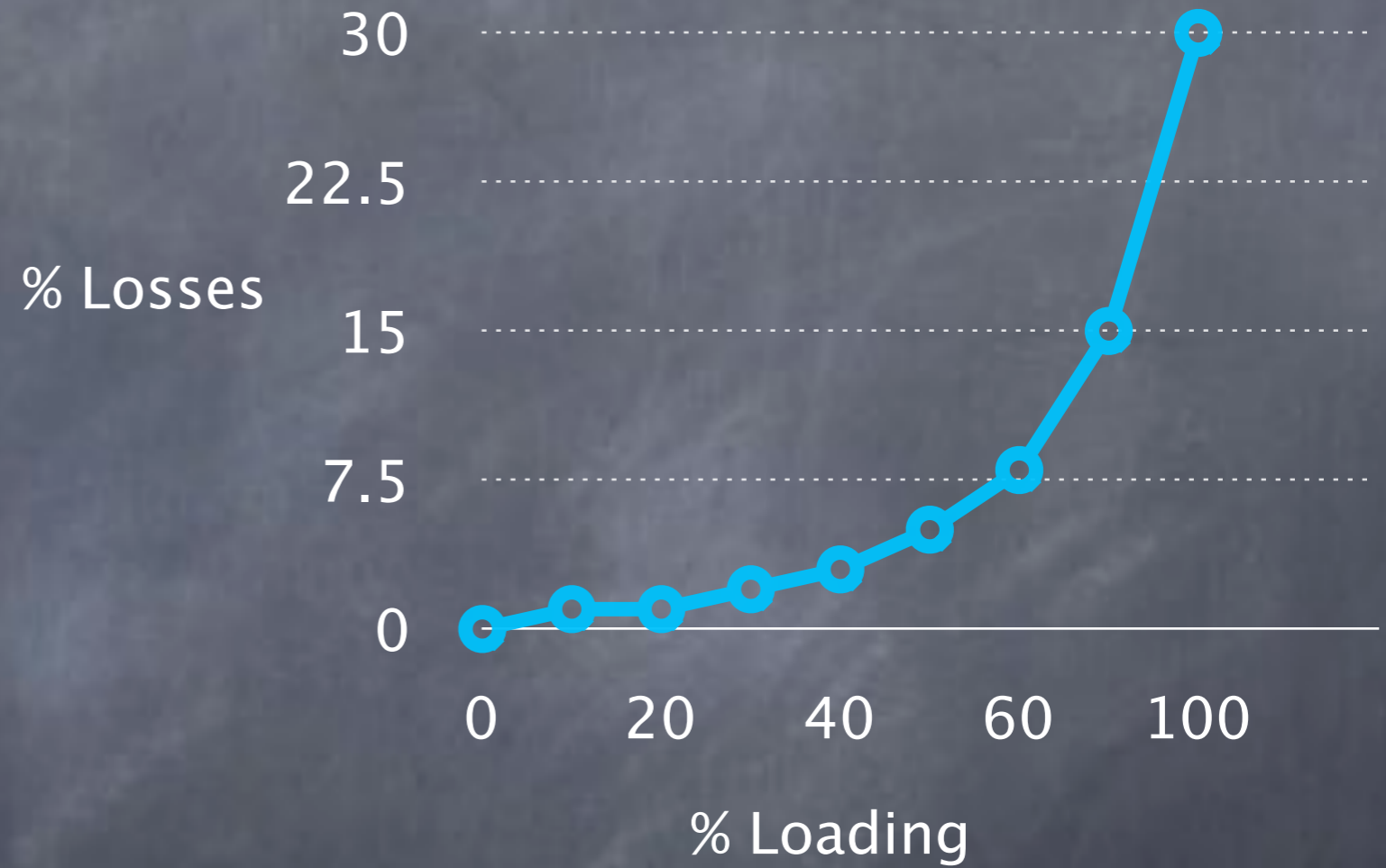




Line Losses  
& Reactive Power  
w/o IE

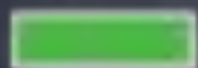
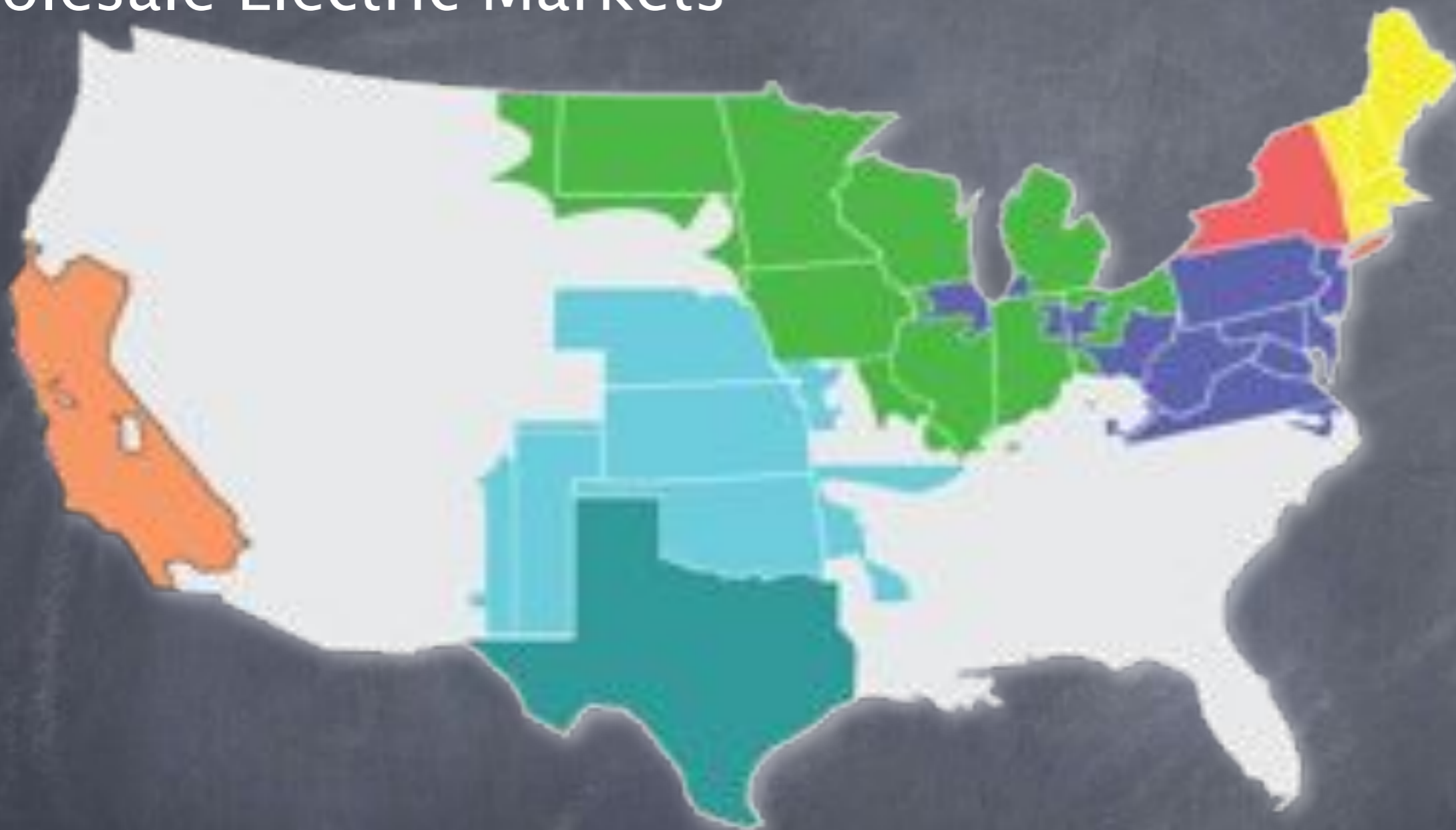


Line Losses  
& Reactive Power  
w/o IE





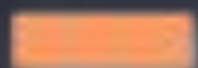
# FERC Independent Organized Wholesale Electric Markets



Midwest ISO



PJM Interconnection



California ISO



New York ISO



ISO New England



Southwest Power Pool



Electric Reliability Council of Texas

7/21/2011 1:00 EST

PMVP Projects

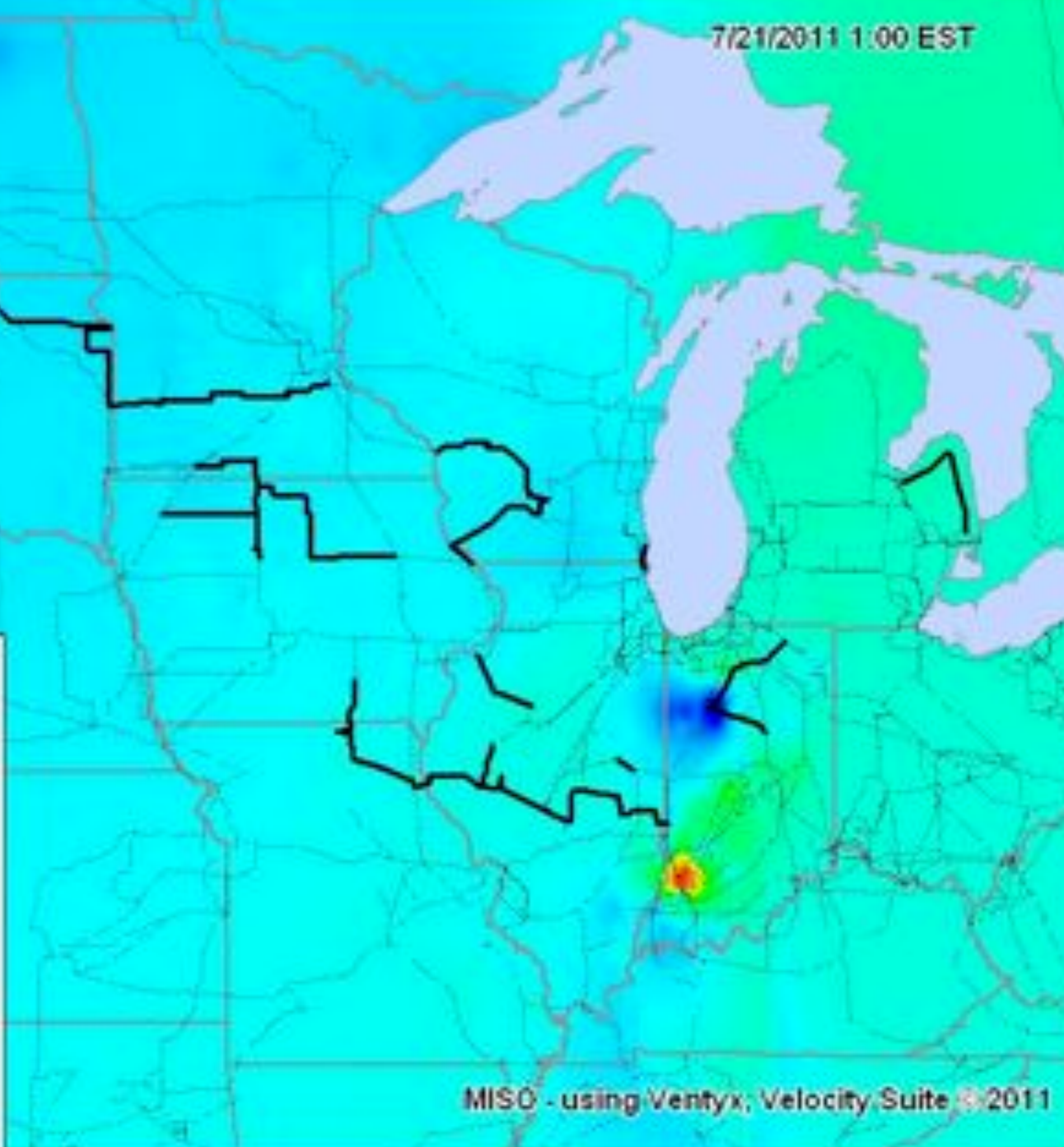
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999





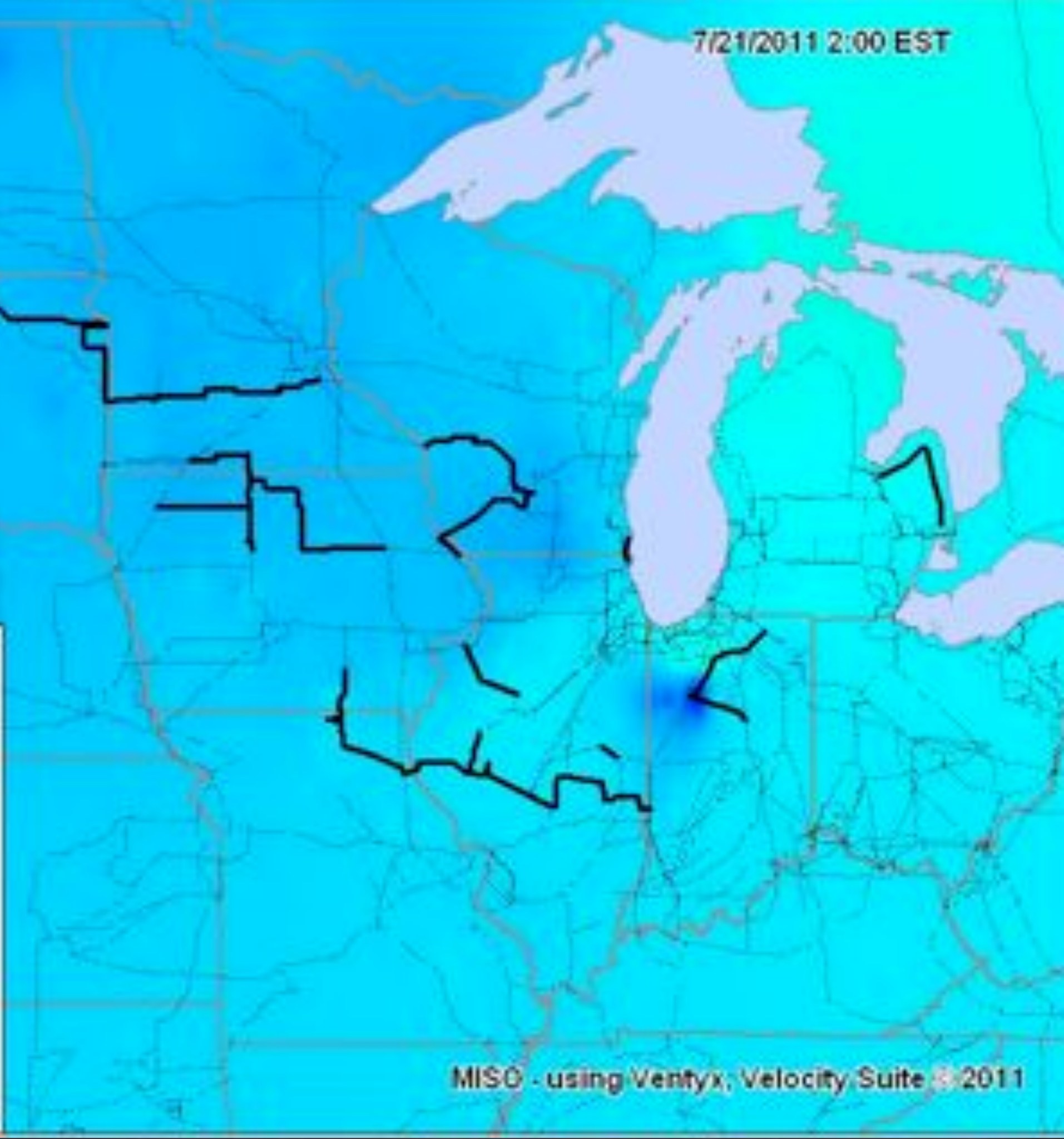
7/21/2011 2:00 EST

PMVP Projects

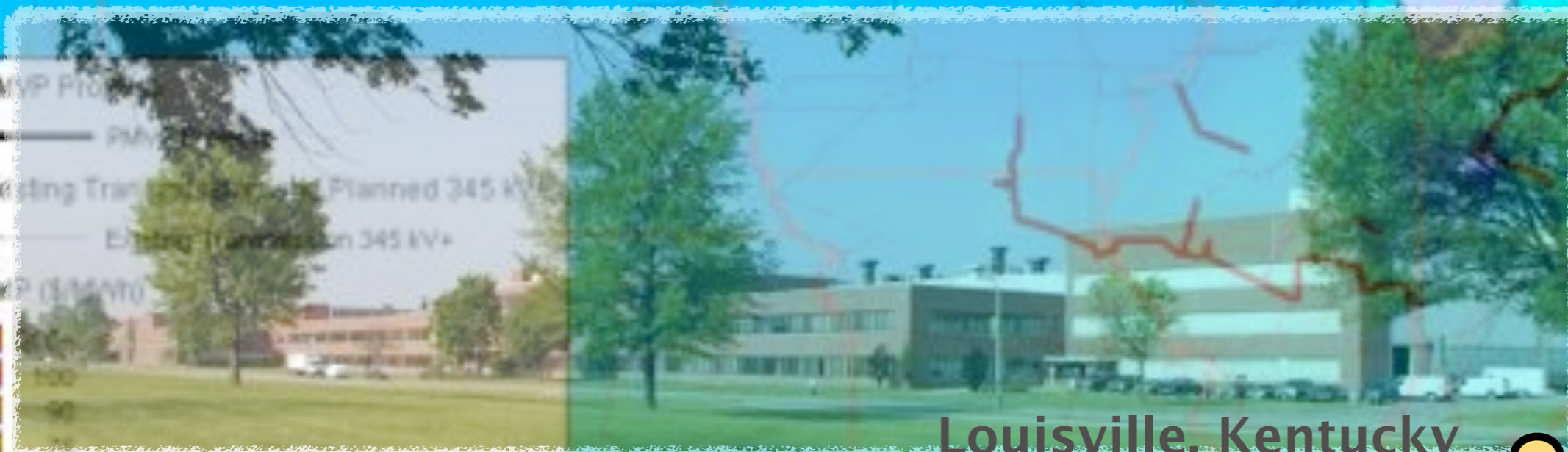
Existing Transmission and Planned 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999



7/21/2011 2:00 EST

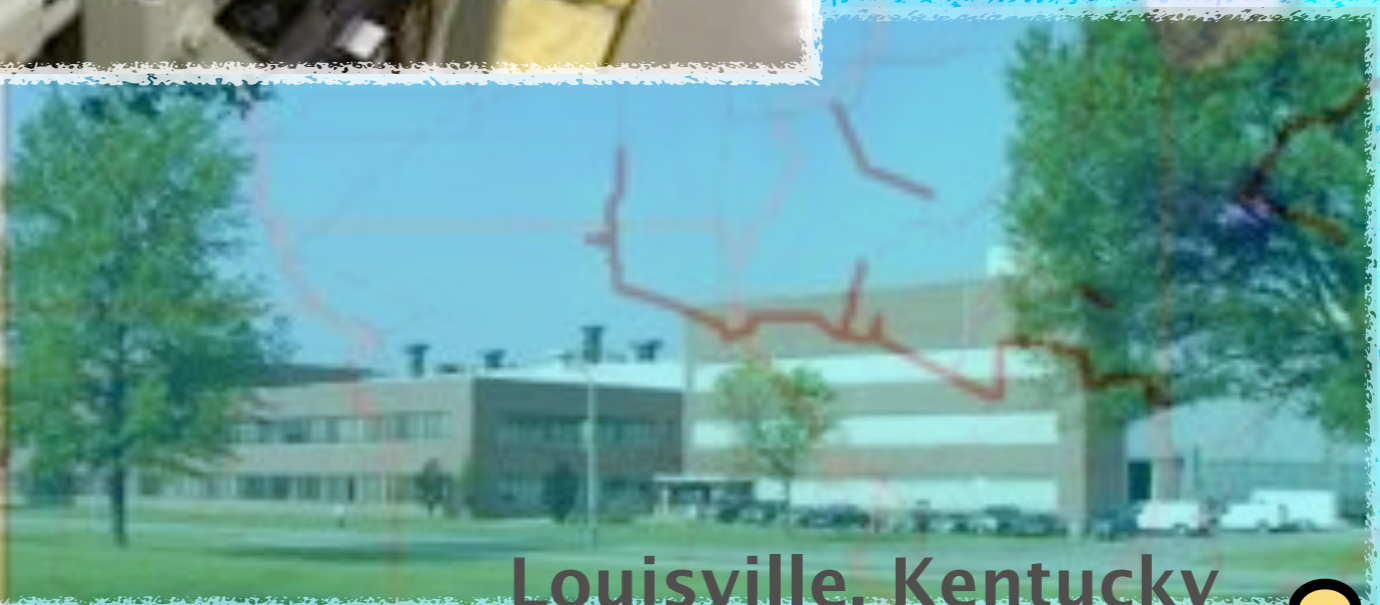
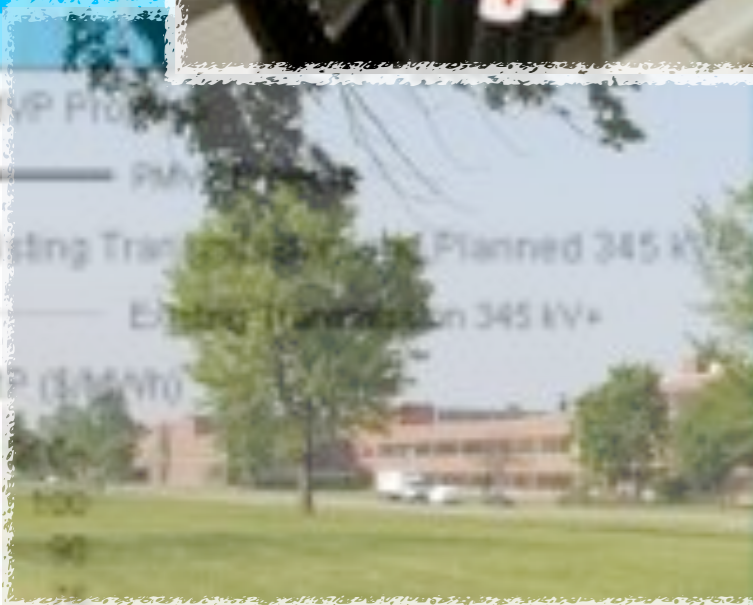


Louisville, Kentucky



- PMVP Projection
- Existing Transmission Planned 345 kV+
- Existing Transmission 345 kV+
- LM (MW)
- 62
- 50
- 30
- 0
- 999

7/21/2011 2:00 EST

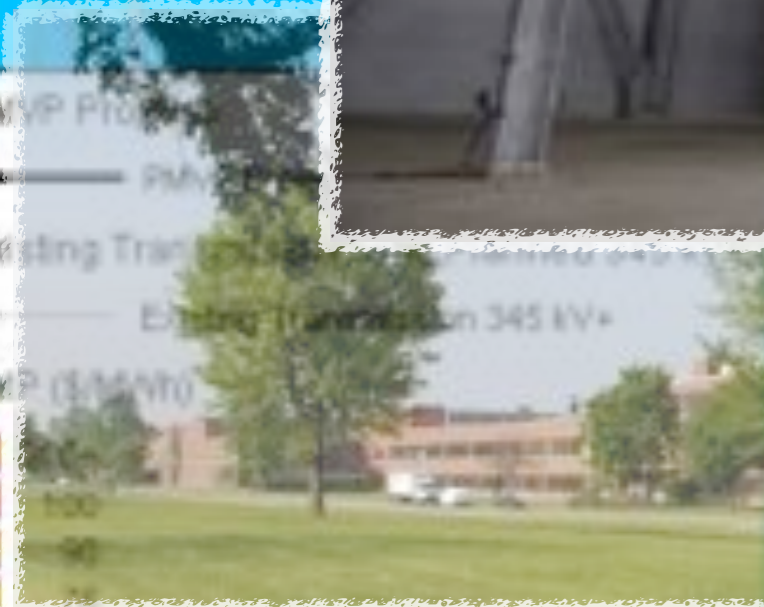


Louisville, Kentucky



- PMVP Projection
- Existing Transmission
- Planned 345 kV+
- Existing Transmission 345 kV+
- LMF (MANTO)
- 100
- 90
- 80
- 70
- 60
- 50
- 30
- 0
- 999

7/21/2011 2:00 EST



Louisville, Kentucky



- PMVP Plot
- Existing Transmission 345 kV+
- LMR (MANTO)
- 82
- 50
- 30
- 0
- 999

7/21/2011 2:00 EST

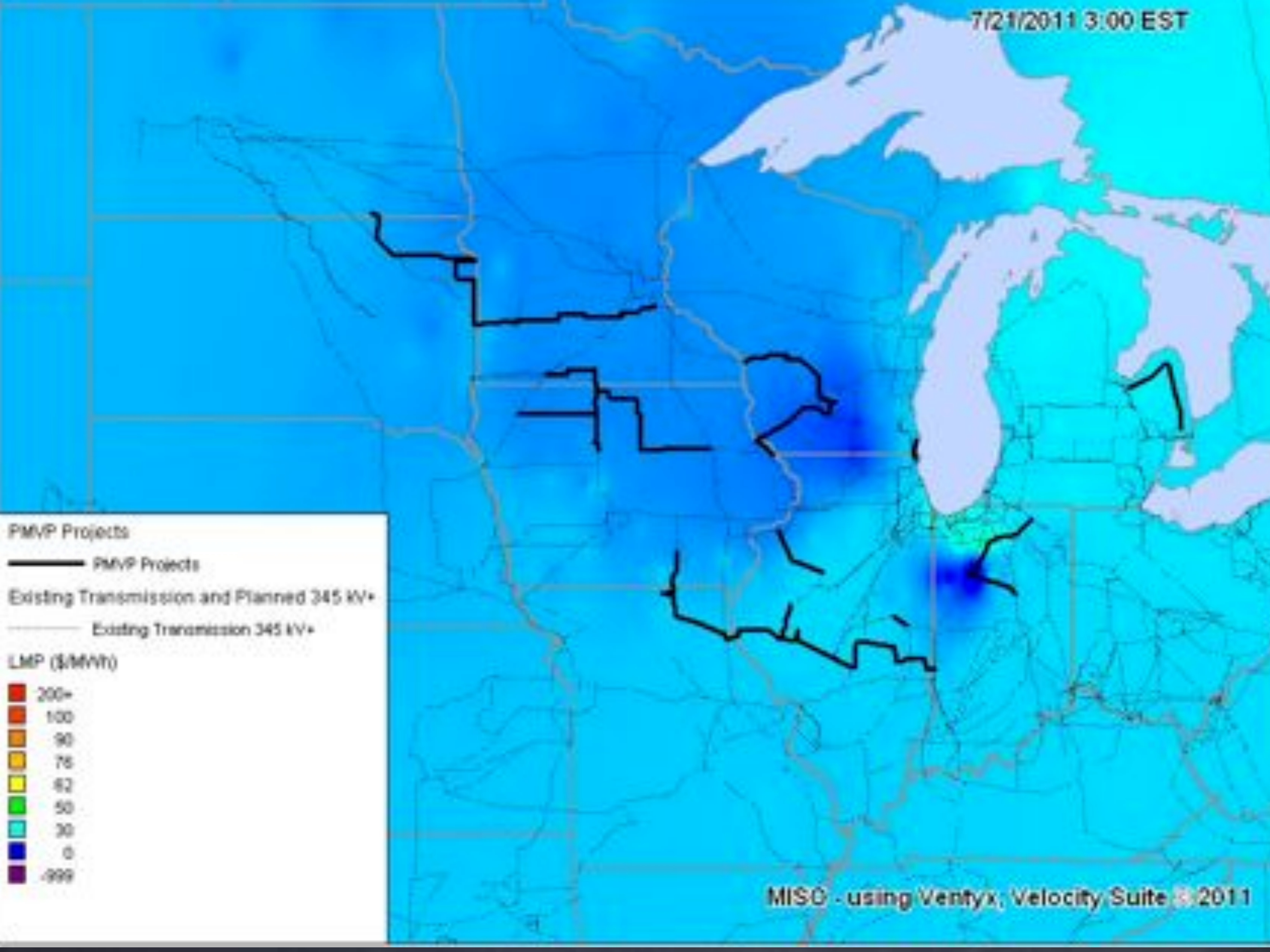


Louisville, Kentucky



- PMVP Plot
- Existing Trac
- LM (MANTO)
- 62
- 50
- 30
- 0
- 999

7/21/2011 3:00 EST



PMVP Projects

— PMVP Projects

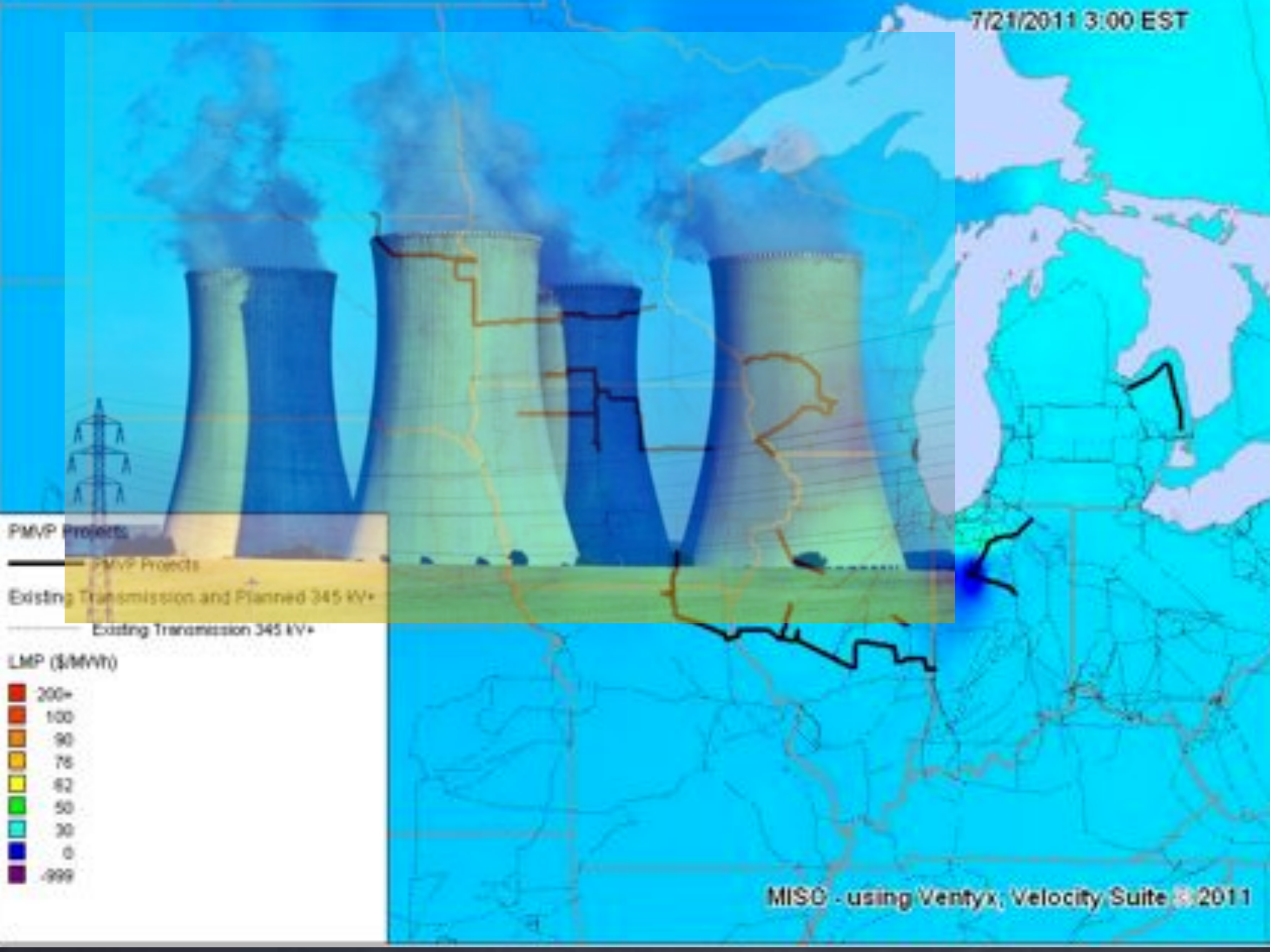
Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999

7/21/2011 3:00 EST



7/21/2011 4:00 EST

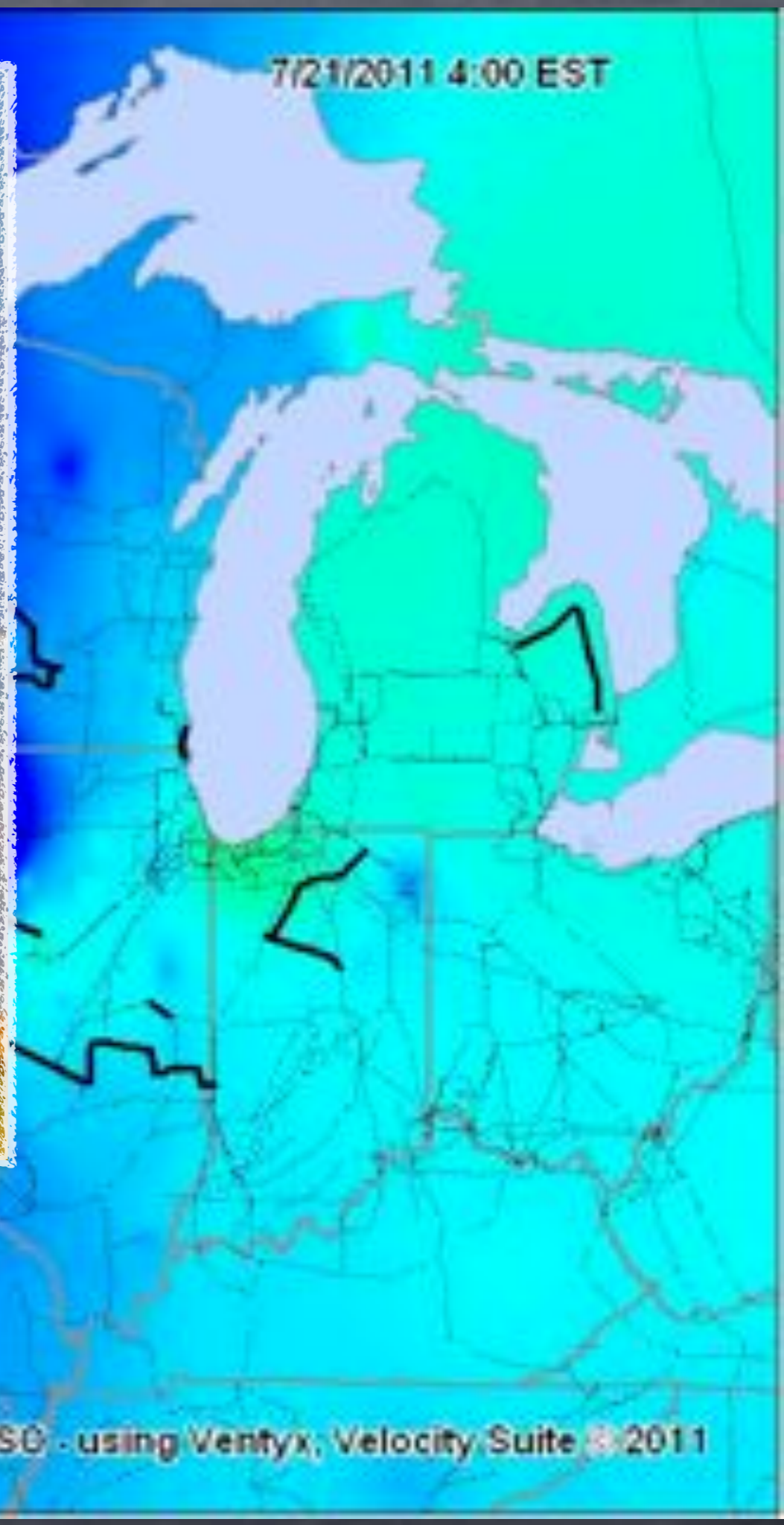
**PMVP Projects**  
— PMVP Projects

**Existing Transmission and Planned 345 kV+**  
— Existing Transmission 345 kV+

**LMP (\$/MWh)**

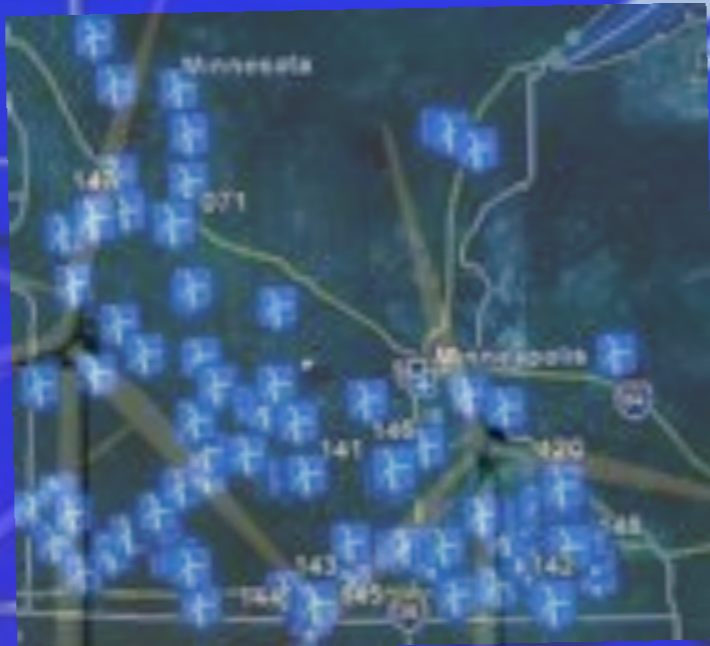
200+
100
90
75
60
50
30
0
-999





- PMVP Pr
- Existing Y
- LMP (\$/M)
- 200+
  - 100
  - 90
  - 75
  - 60
  - 50
  - 30
  - 0
  - 999

7/21/2011 4:00 EST



**PMVP Projects**

— PMVP Projects

**Existing Transmission and Planned 345 kV+**

— Existing Transmission 345 kV+

**LMP (\$/MWh)**

200+
100
90
75
60
50
30
0
-999

7/21/2011 5:00 EST

PMVP Projects

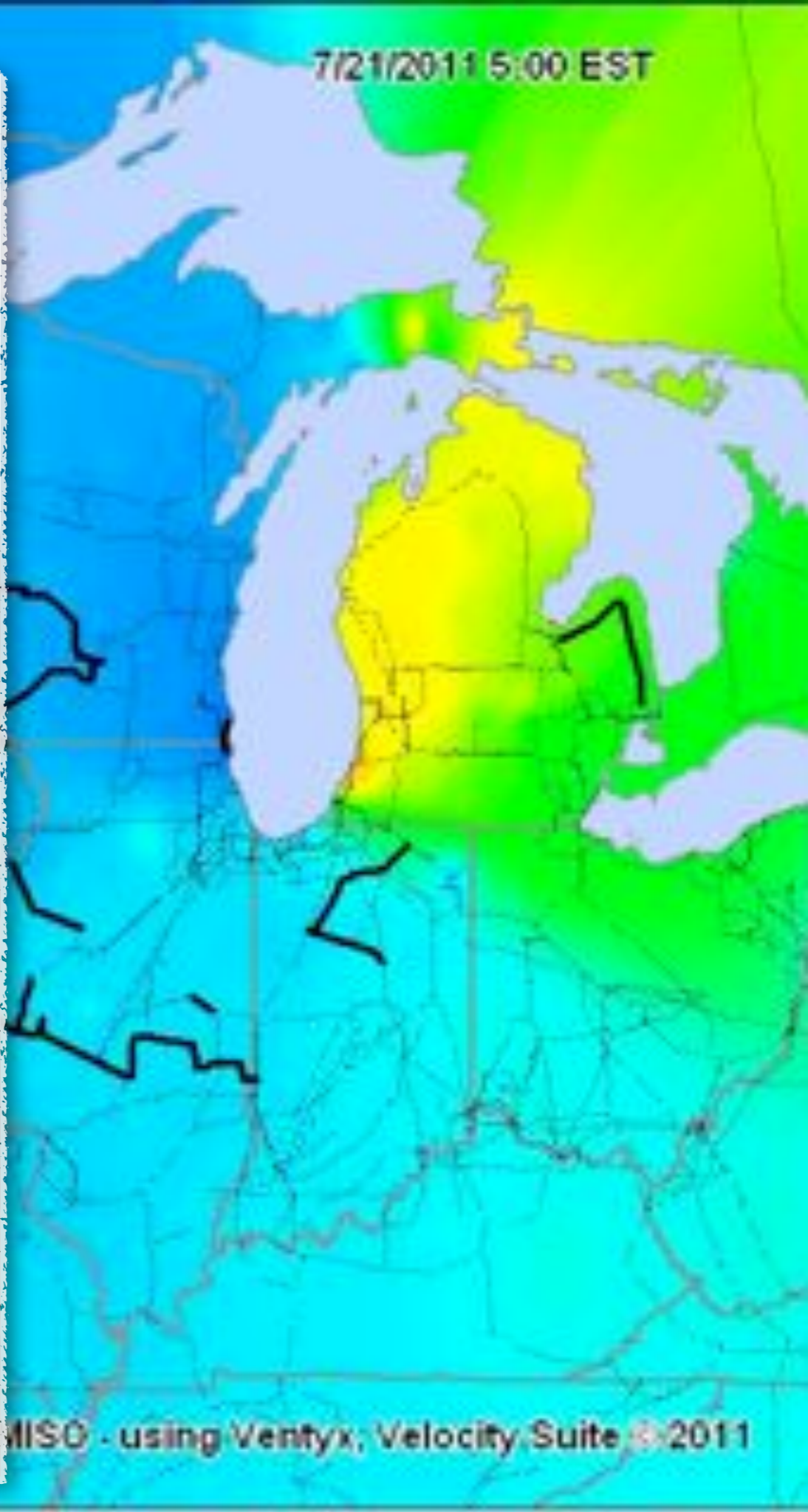
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

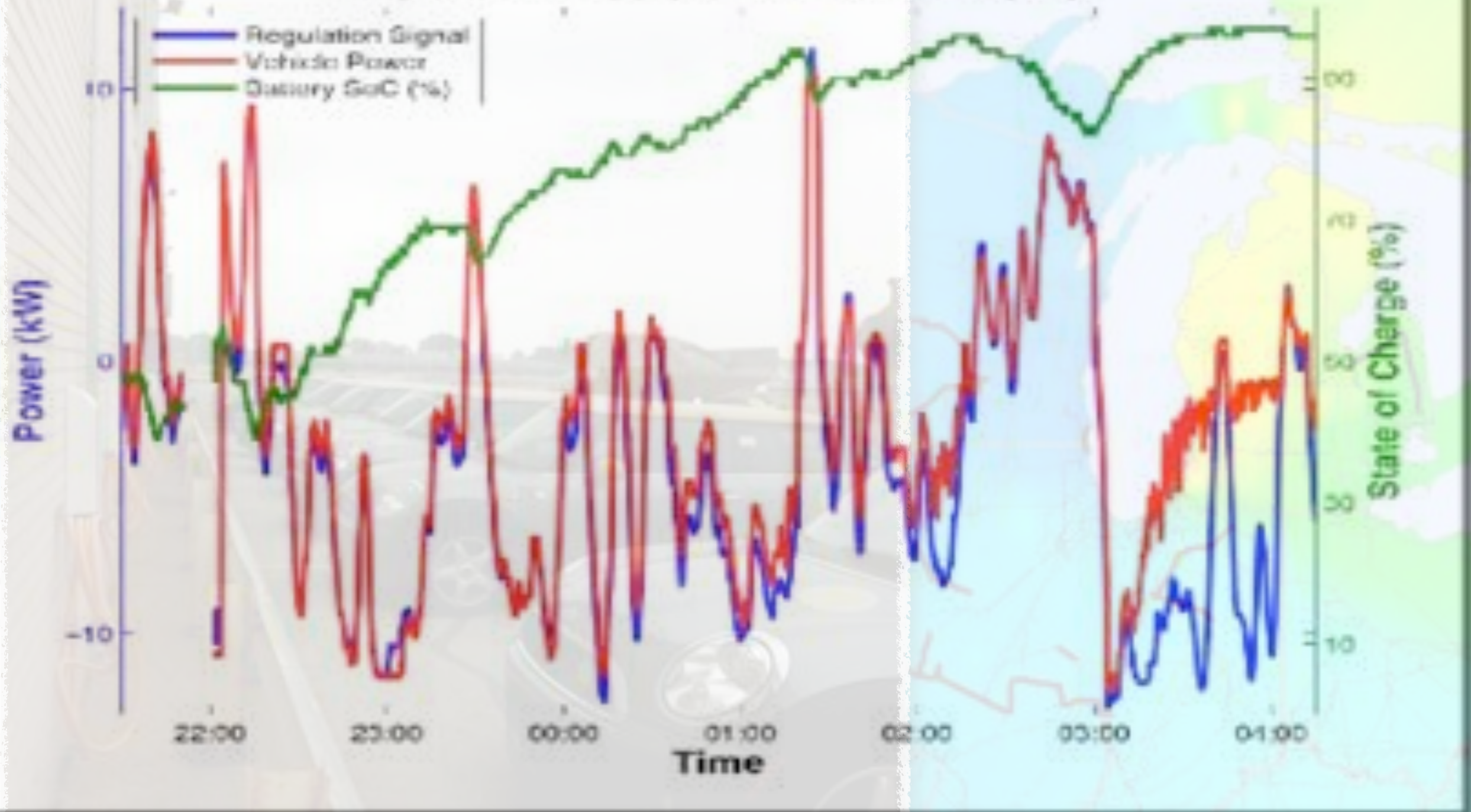
200+
100
90
75
62
50
30
0
-999



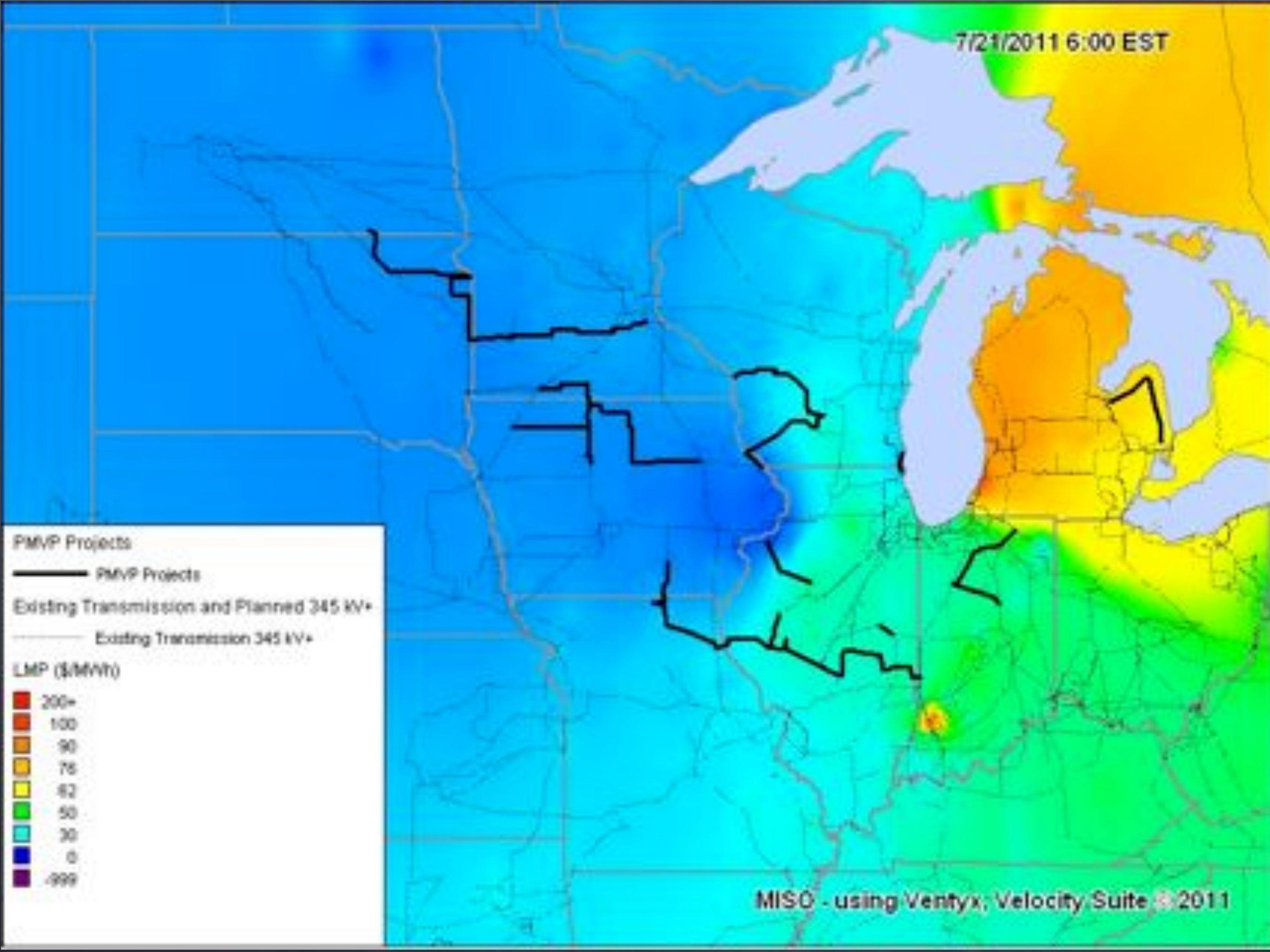
Morgan Ellis

7/21/2011 5:00 EST

### Regulation Supply (incidental charging)



7/21/2011 6:00 EST



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 7:00 EST

PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999

MISO - using Verityx; Velocity Suite 2011





7/21/2011 8:00 EST

PMVP Projects

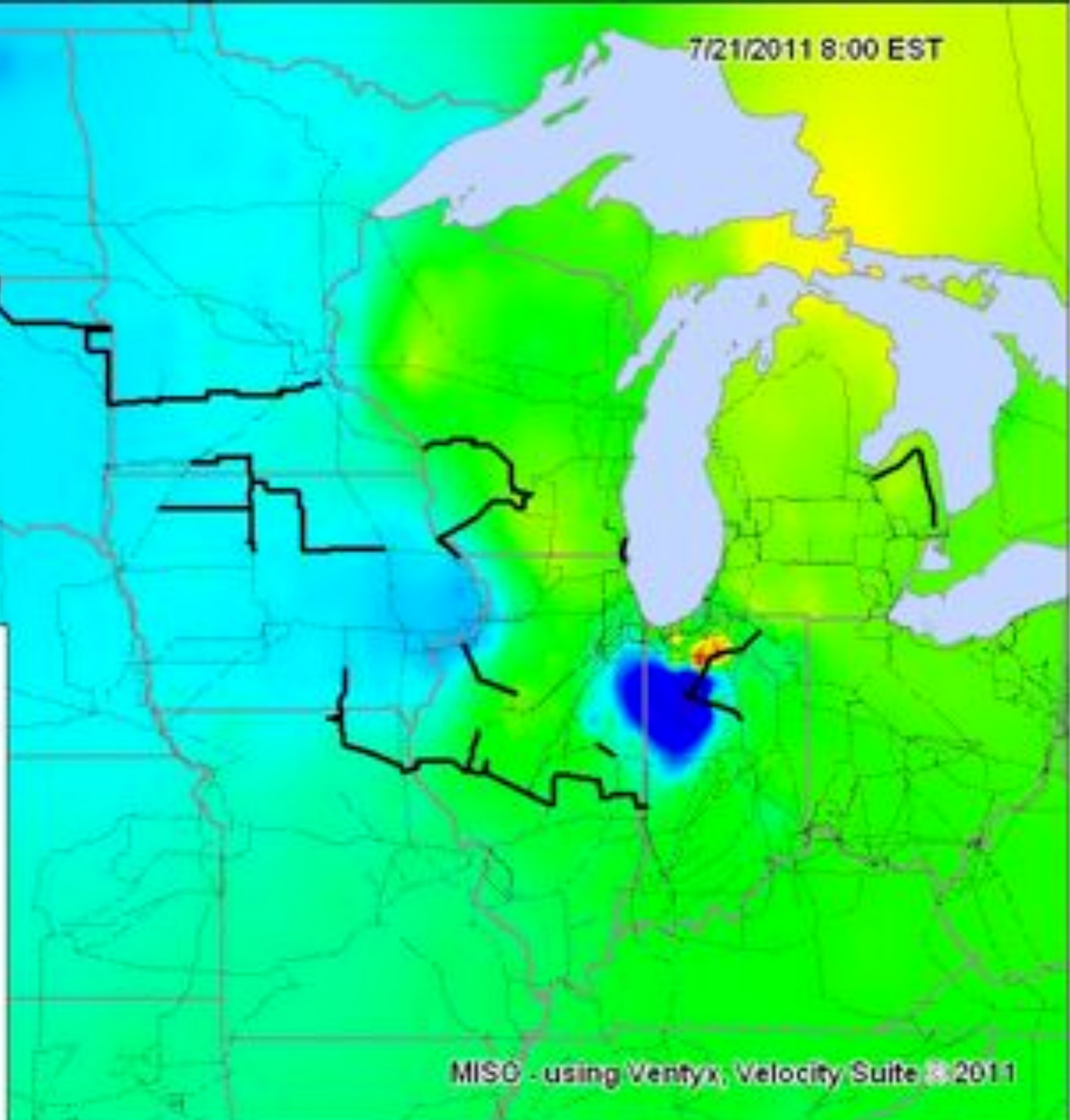
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
76
62
50
30
0
-999



7/21/2011 9:00 EST



MISO - using Ventyx, Velocity Suite © 2011

7/21/2011 10:00 EST

PMVP Projects

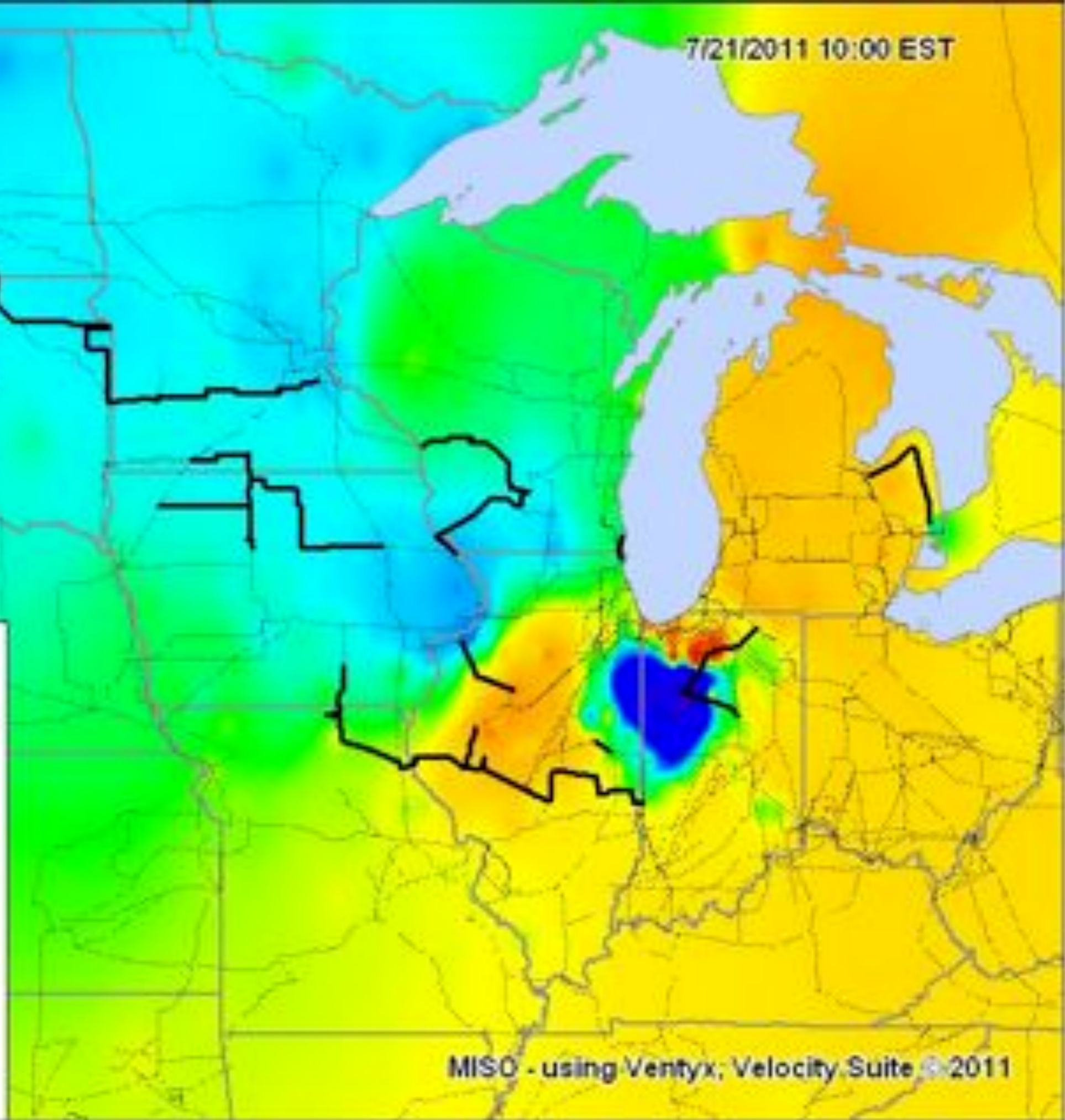
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
76
62
50
30
0
-999



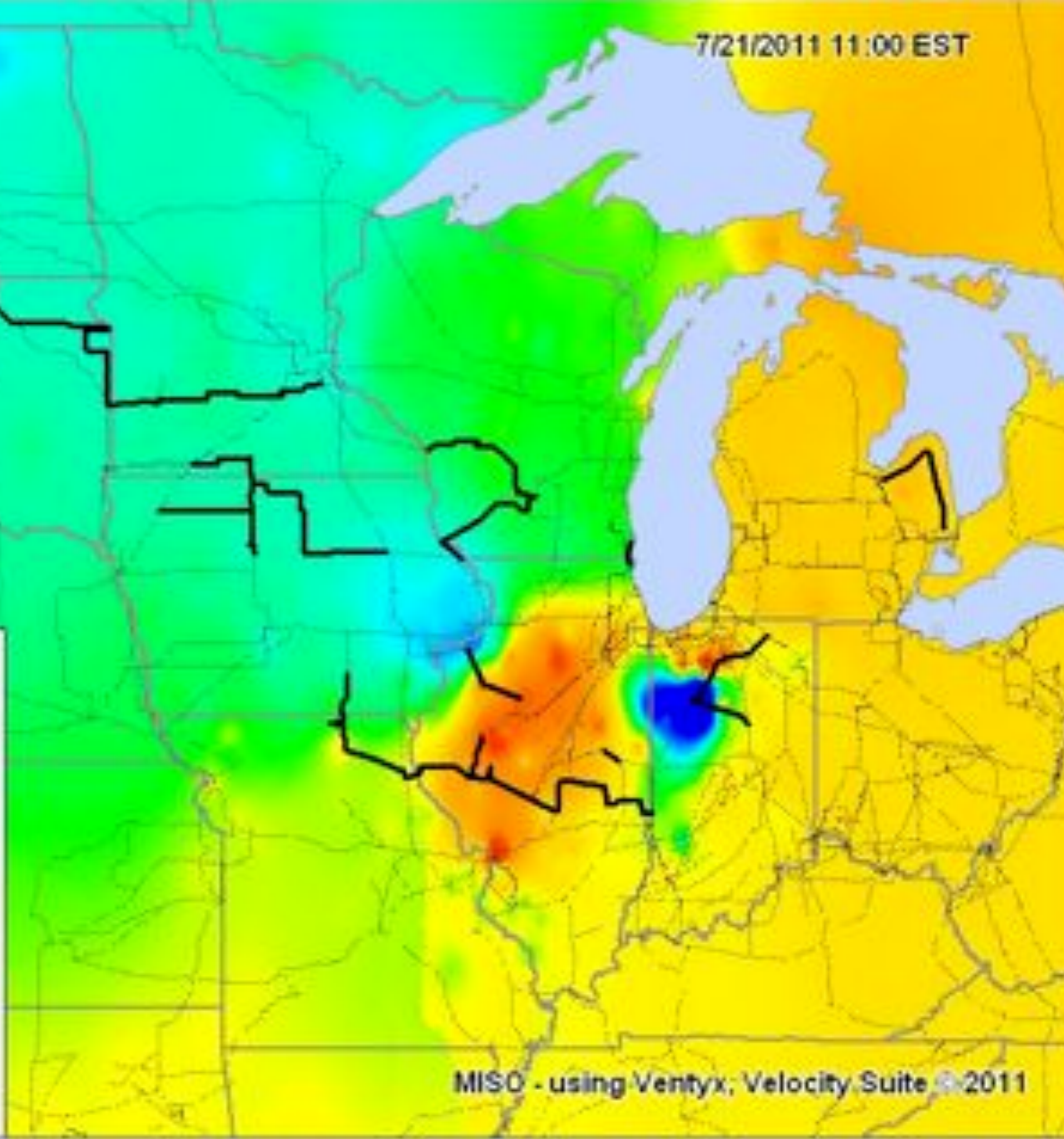
7/21/2011 11:00 EST

**PMVP Projects**  
— PMVP Projects

**Existing Transmission and Planned 345 kV+**  
— Existing Transmission 345 kV+

**LMP (\$/MWh)**

200+
100
90
75
62
50
30
0
-999



7/21/2011 12:00 EST

PMVP Projects

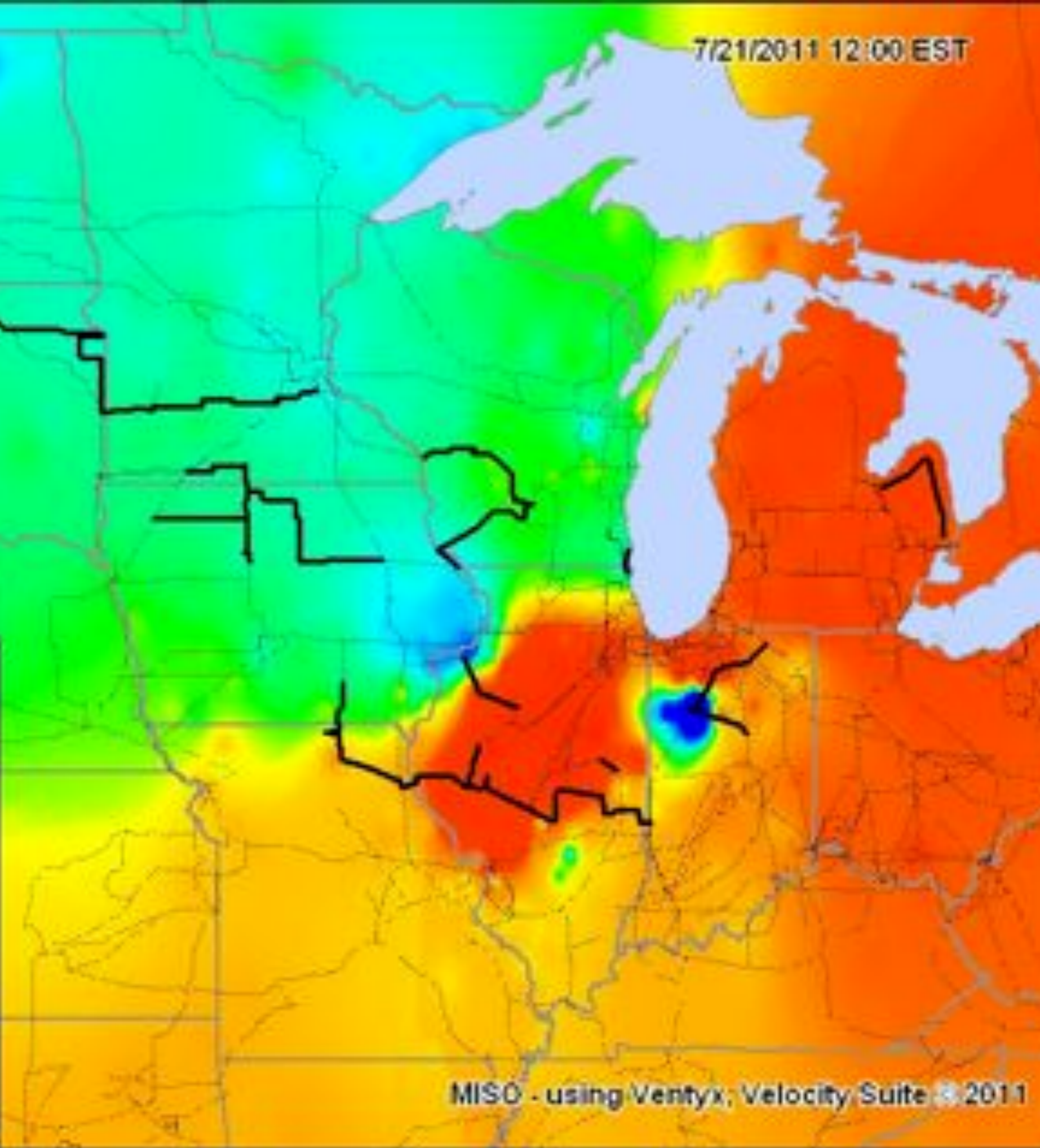
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

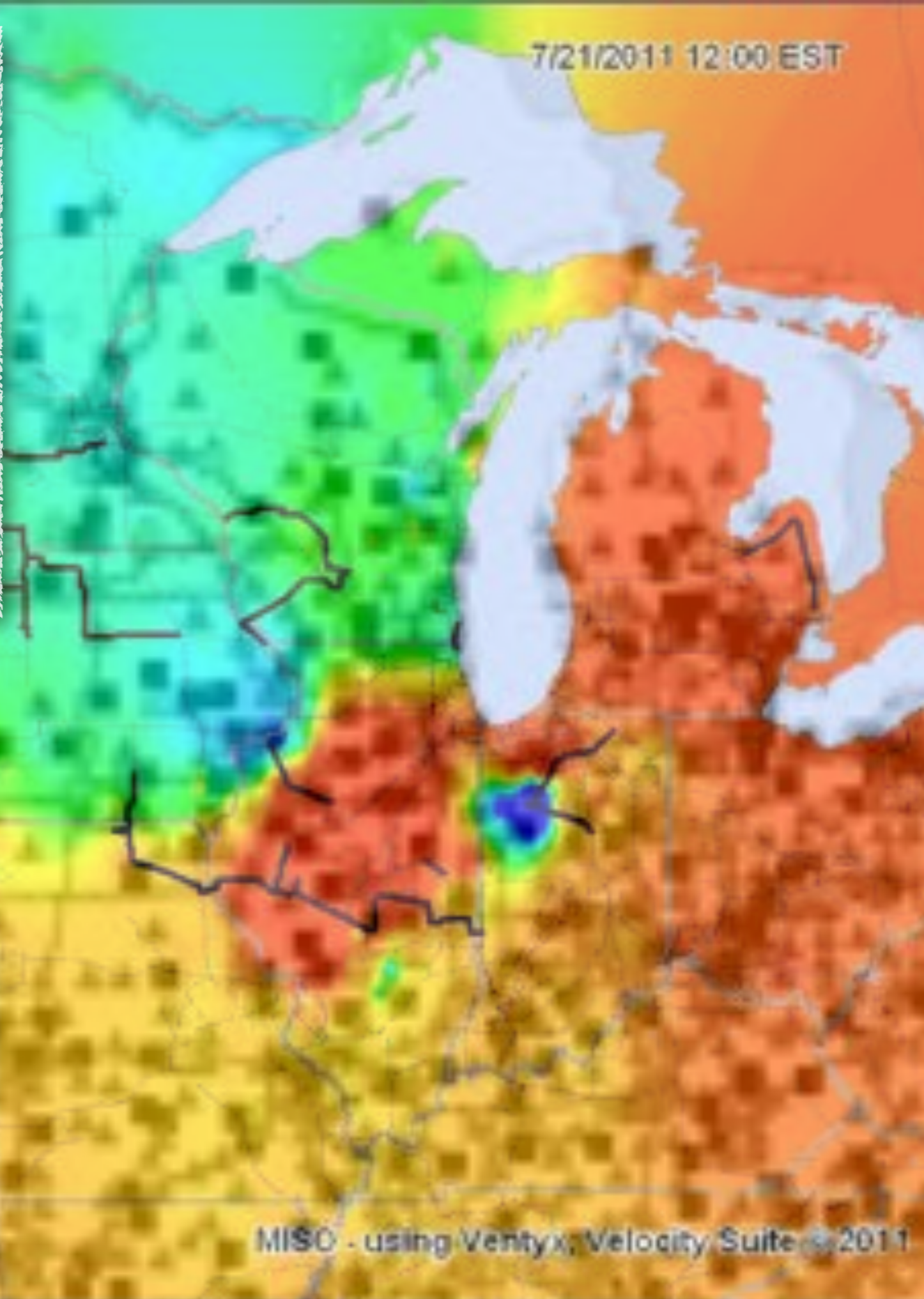
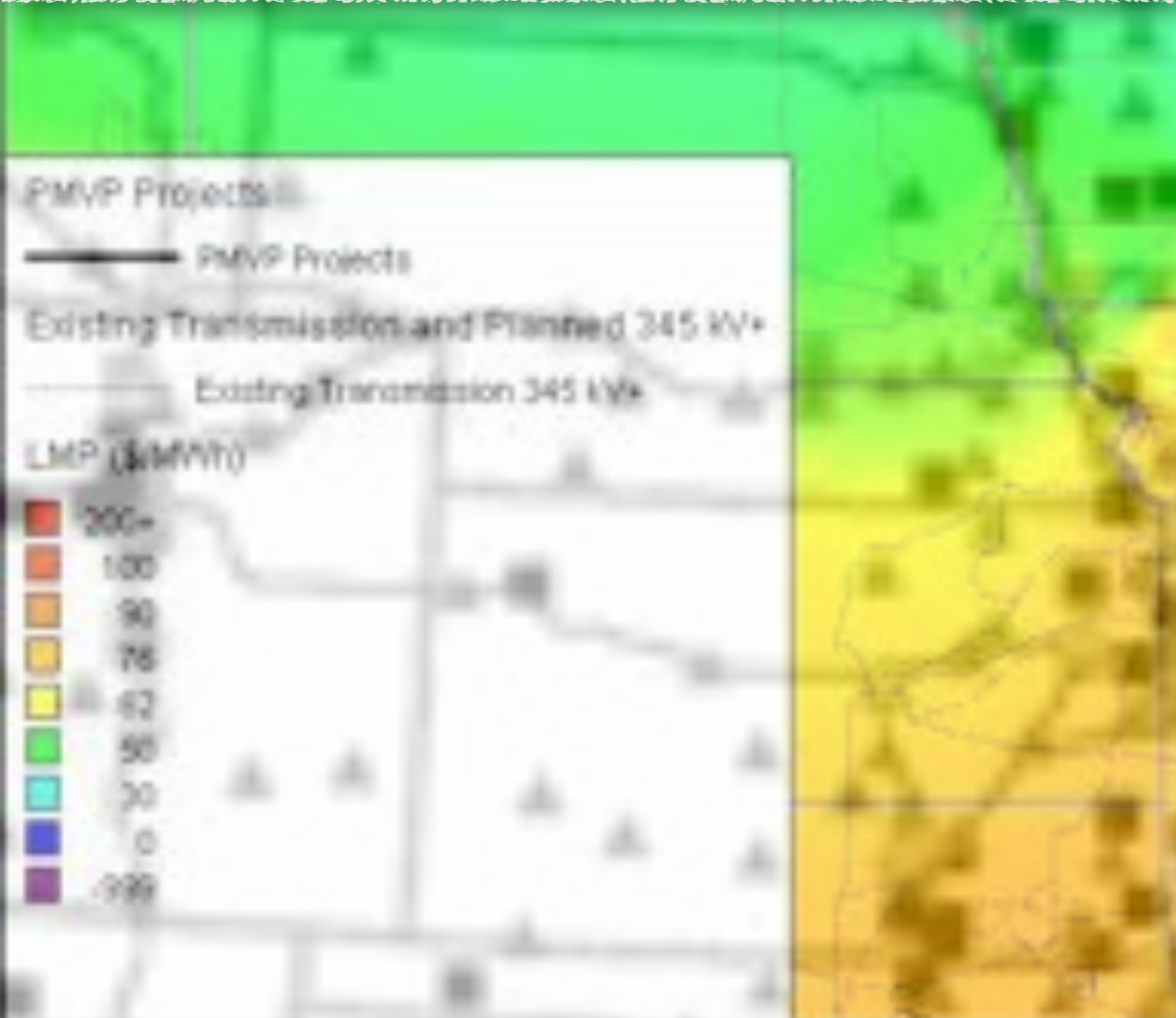
LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999





7/21/2011 12:00 EST



7/21/2011 13:00 EST

PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

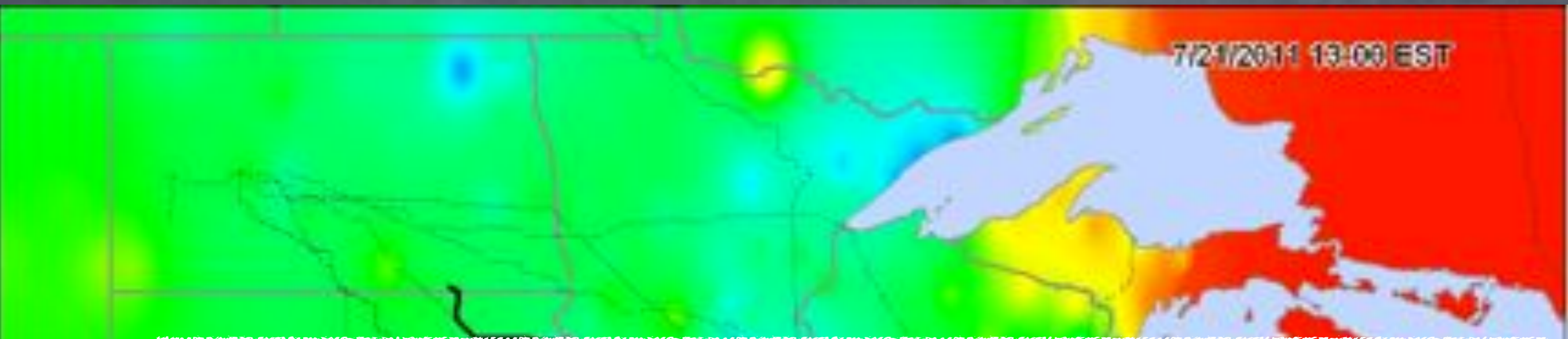
— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999

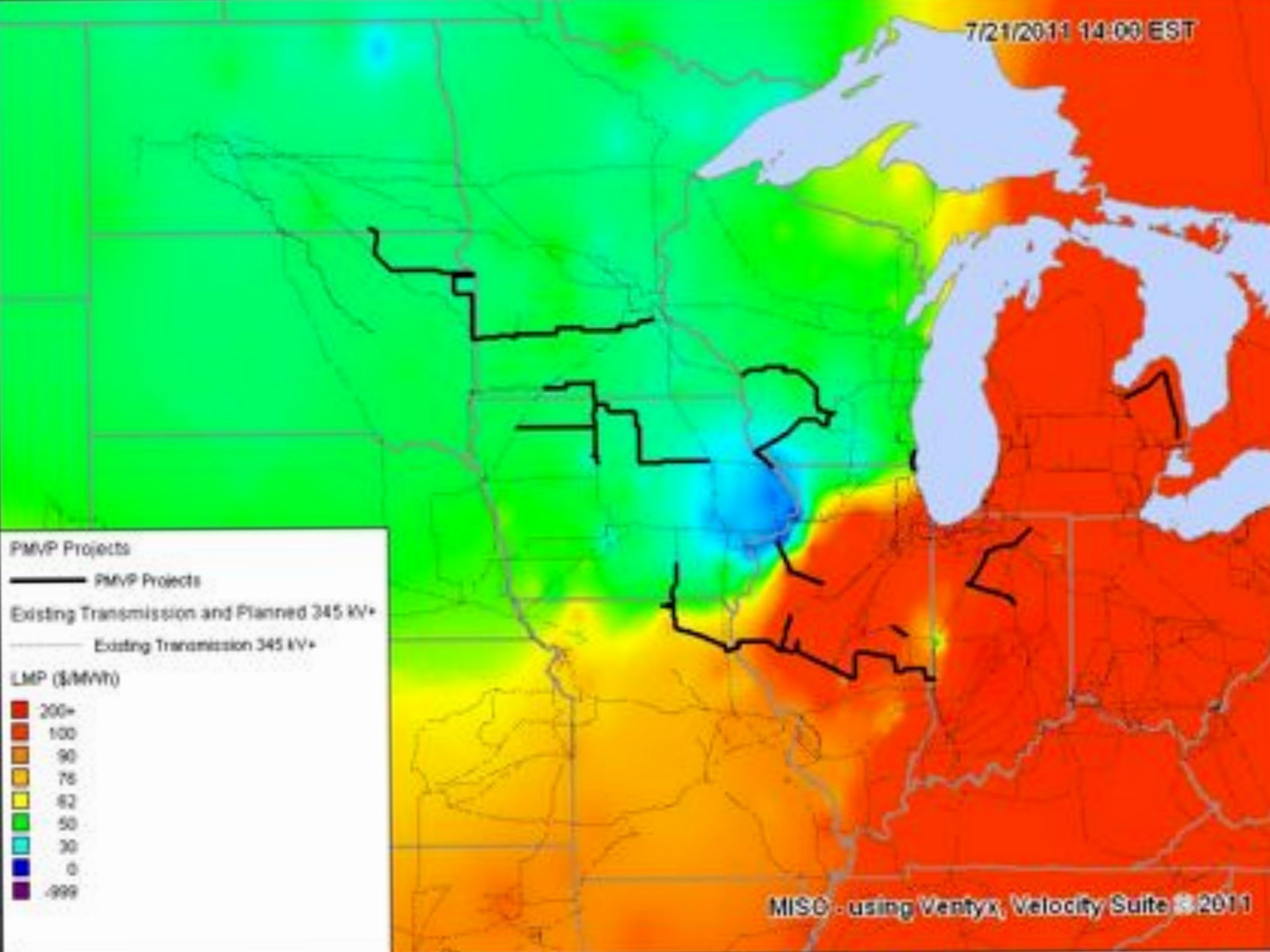
MISO - using Ventyx Velocity Suite © 2011

7/21/2011 13:00 EST



- PMVP Project
- PM
- Existing Trunk
- Exis
- LMP (\$/MWh)
- 200+
- 100
- 90
- 75
- 62
- 50
- 30
- 0
- 999





PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

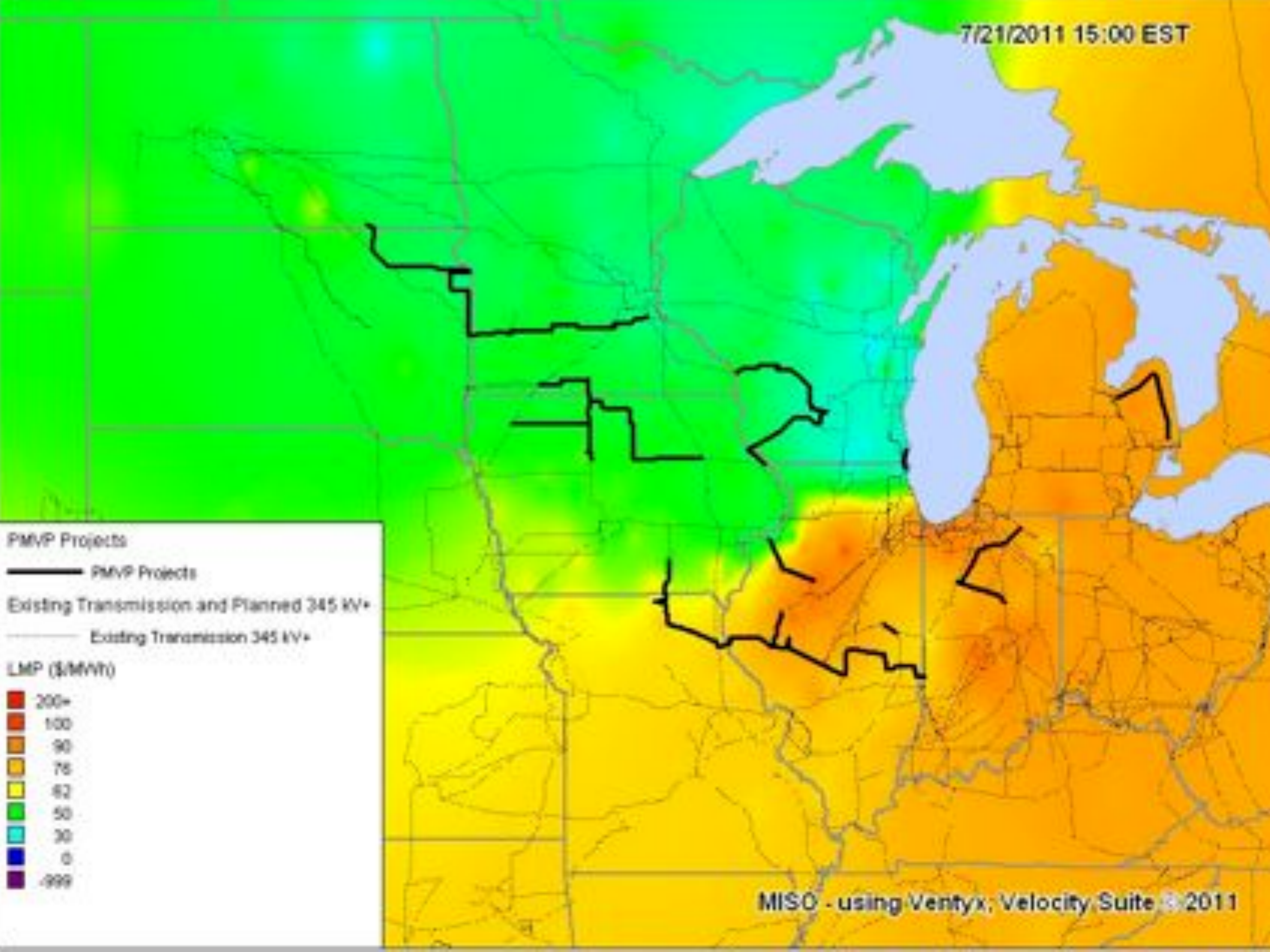
200+
100
90
75
62
50
30
0
-999

7/21/2011 14:00 EST



- PMVP
- Exist
- LMP
- 20
- 1
- 75
- 62
- 50
- 30
- 0
- 999

7/21/2011 15:00 EST



PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
76
62
50
30
0
-999

7/21/2011 15:00 EST

**PMVP Projects**

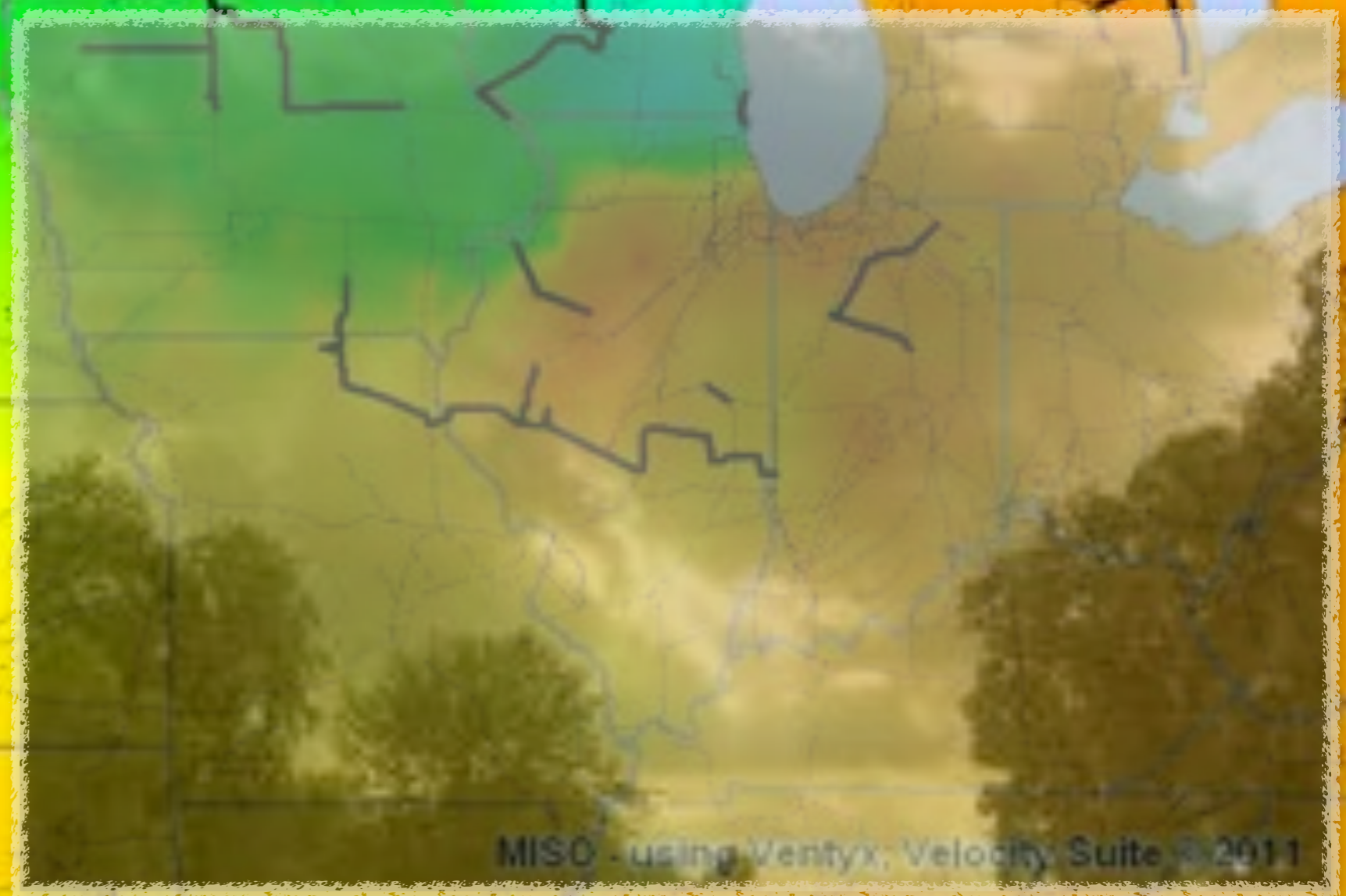
— PMVP Projects

**Existing Transmission and Planned 345 kV+**

— Existing Transmission 345 kV+

**LMP (\$/MWh)**

200+
100
90
75
62
50
30
0
-999



7/21/2011 16:00 EST

PMVP Projects

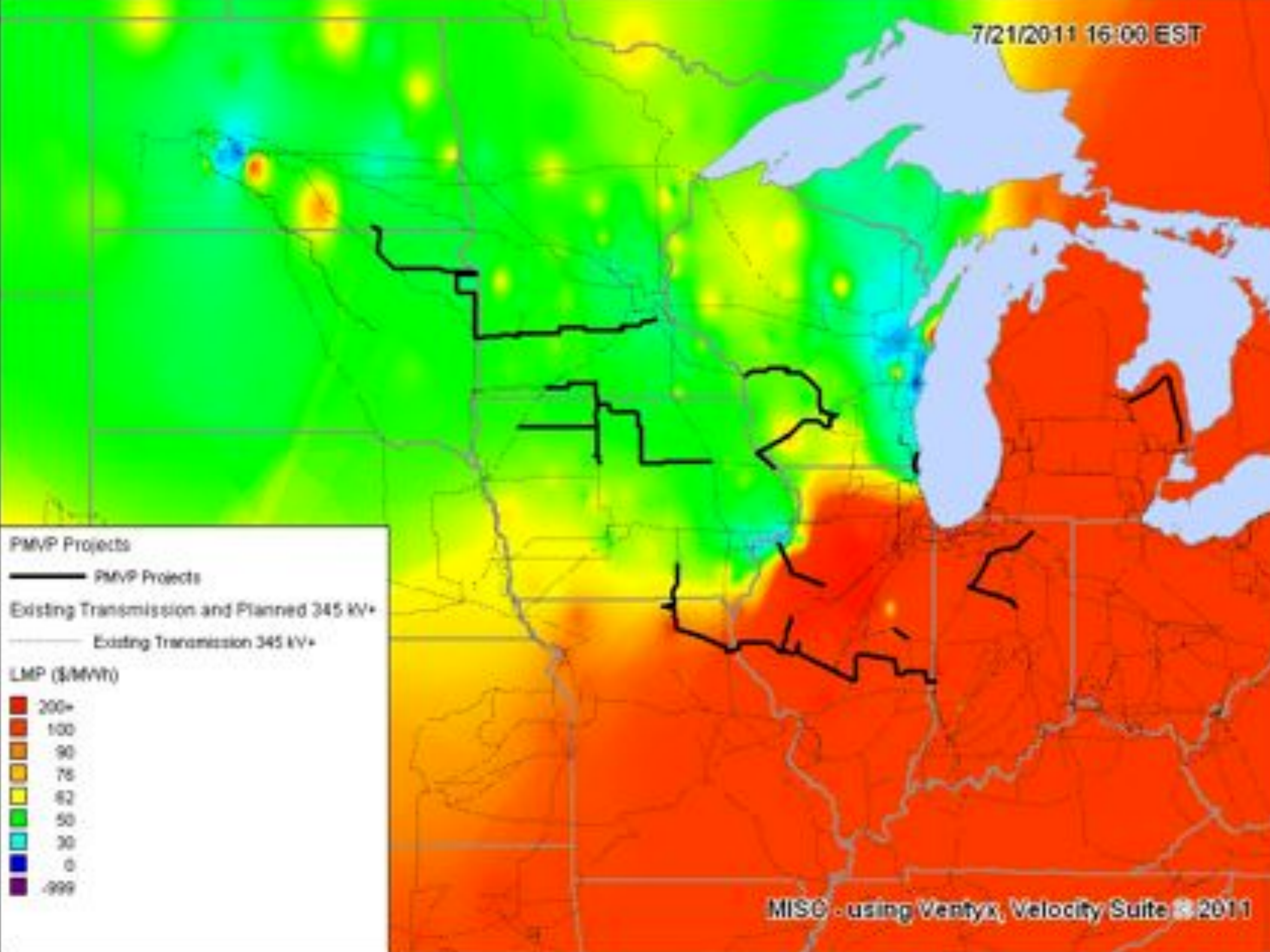
— PMVP Projects

Existing Transmission and Planned 345 kV+

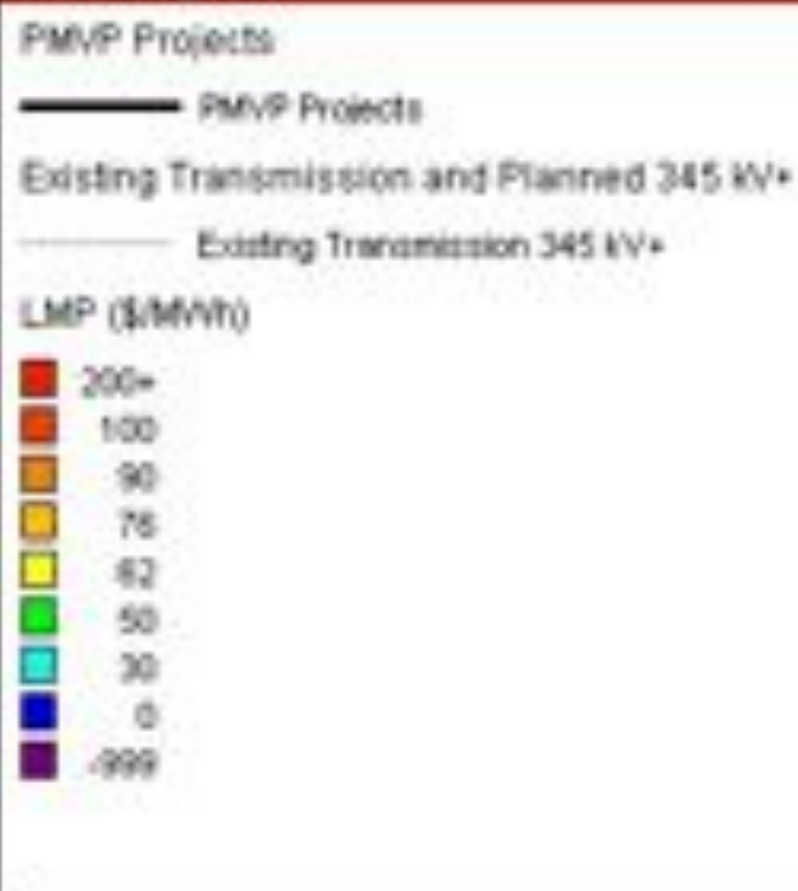
— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999



7/21/2011 17:00 EST



MISO - using Verityx, Velocity Suite © 2011

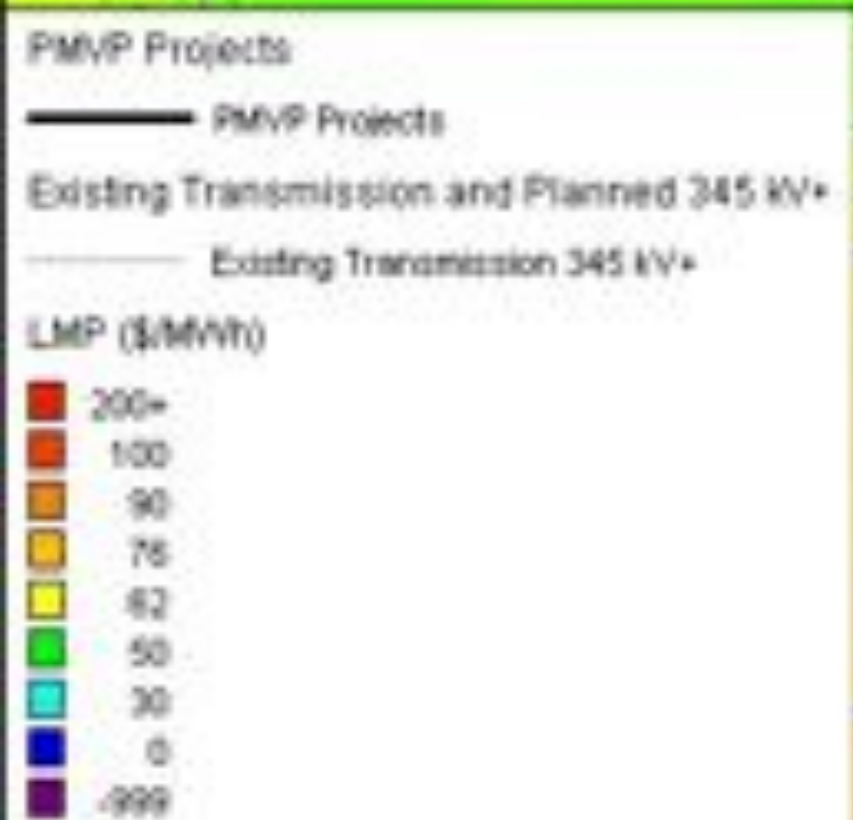
7/21/2011 17:00 EST







7/21/2011 18:00 EST



7/21/2011 19:00 EST

PMVP Projects

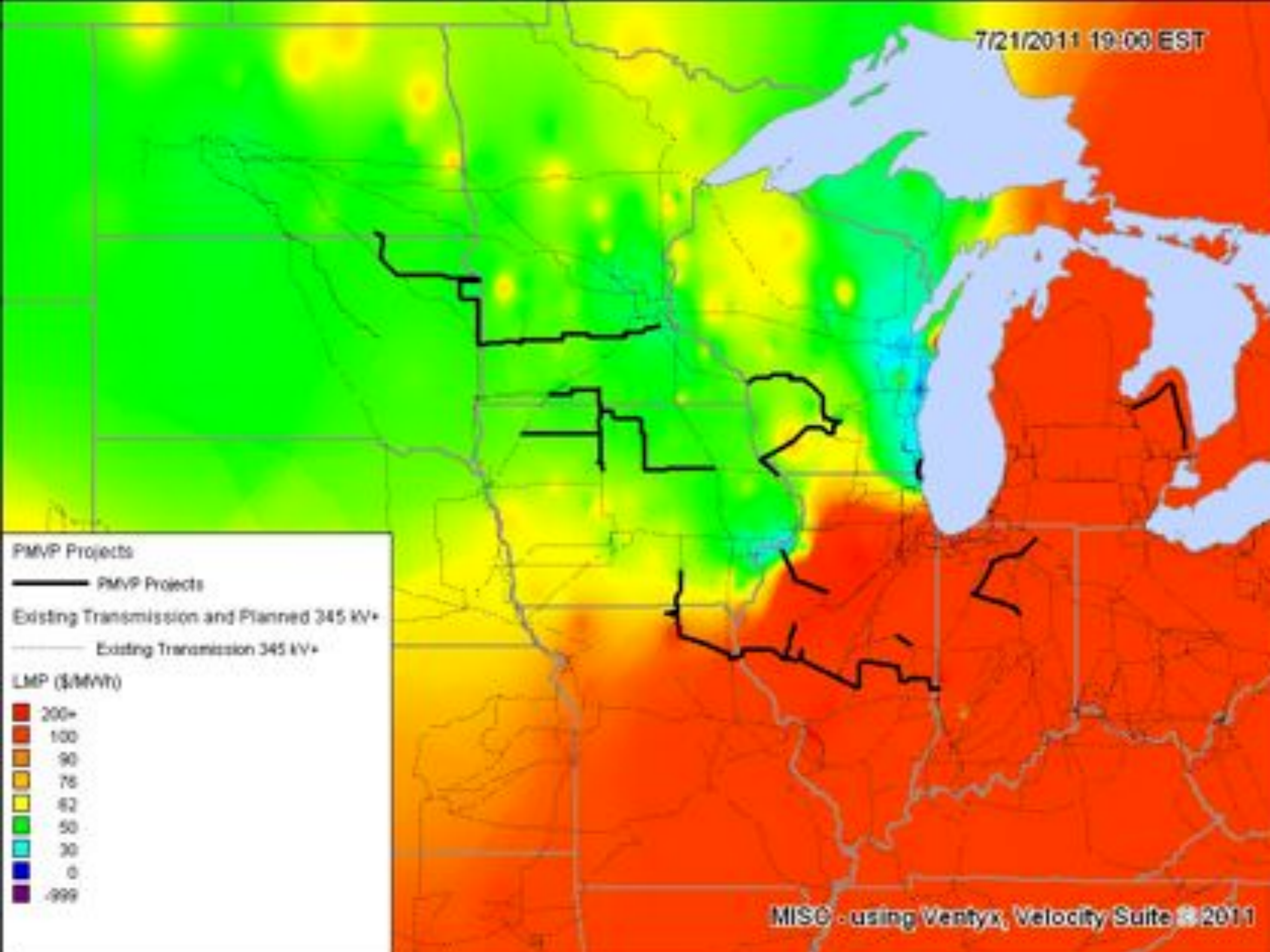
— PMVP Projects

Existing Transmission and Planned 345 kV+

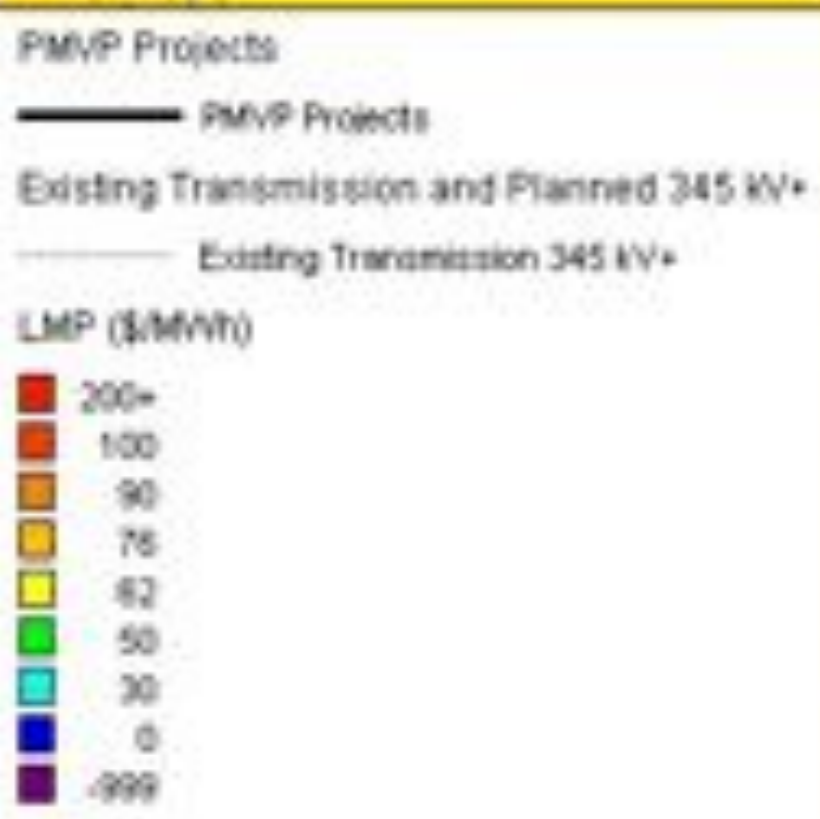
— Existing Transmission 345 kV+

LMP (\$/MWh)

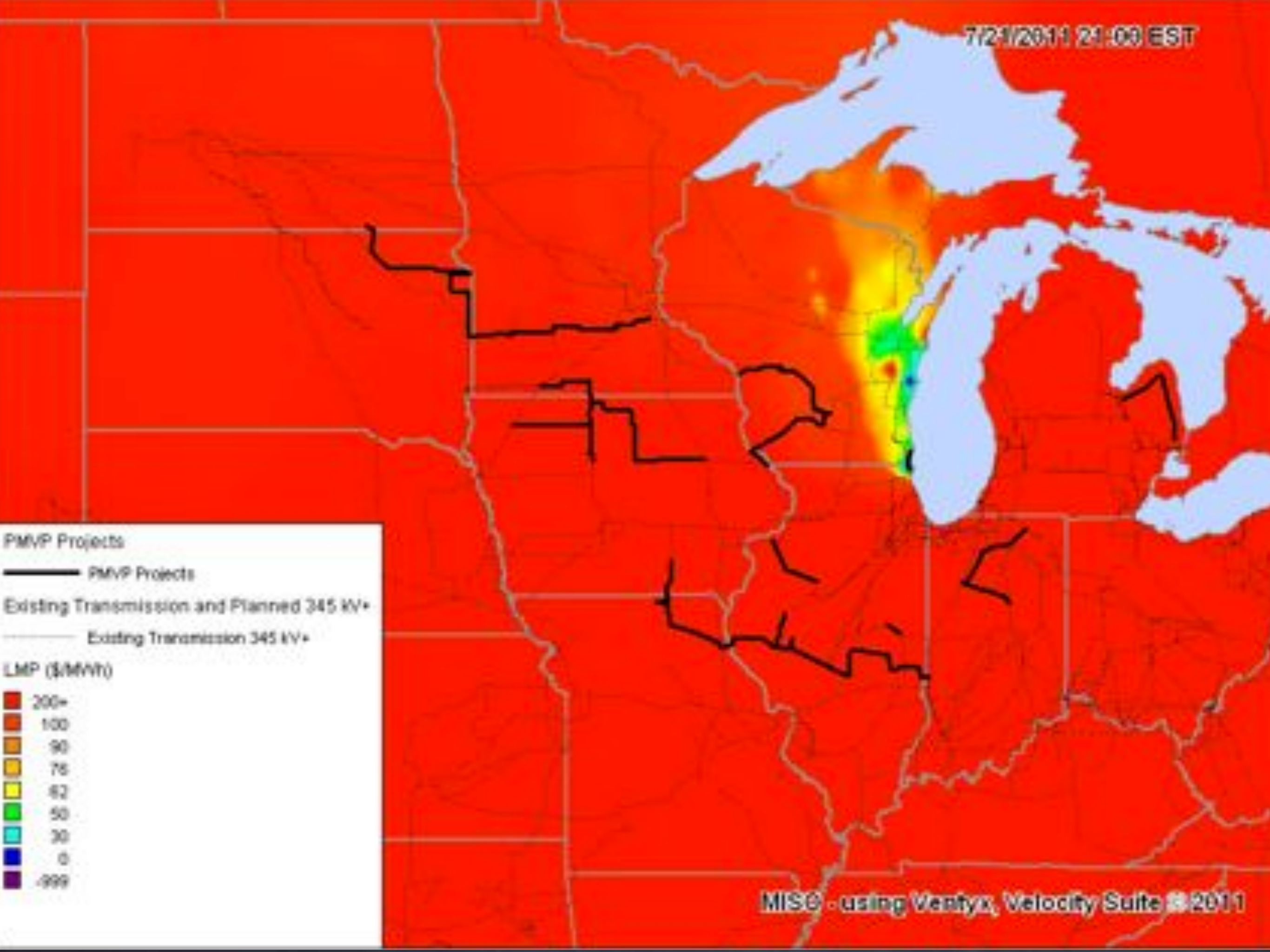
200+
100
90
75
62
50
30
0
-999



7/21/2011 20:00 EST



7/21/2011 21:00 EST



PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
78
62
50
30
0
-999



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PMVP

— PMVP Projects

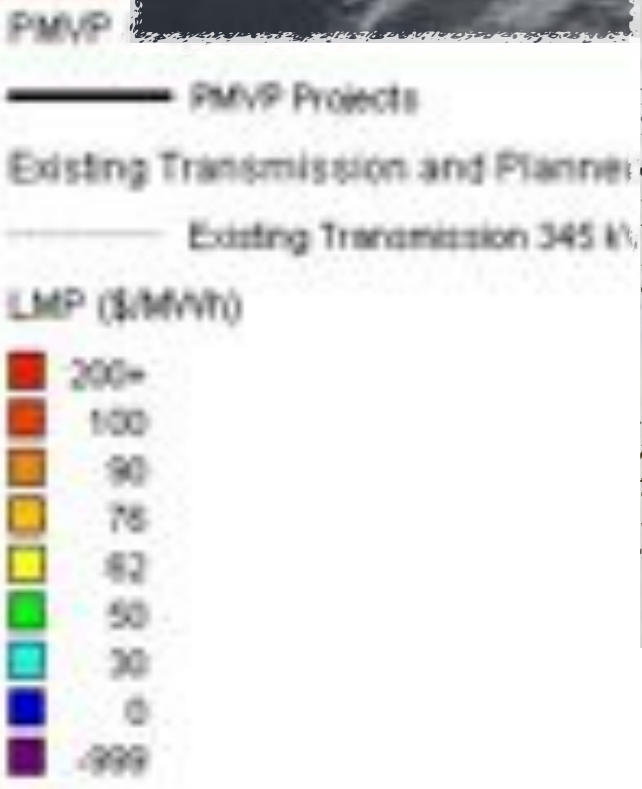
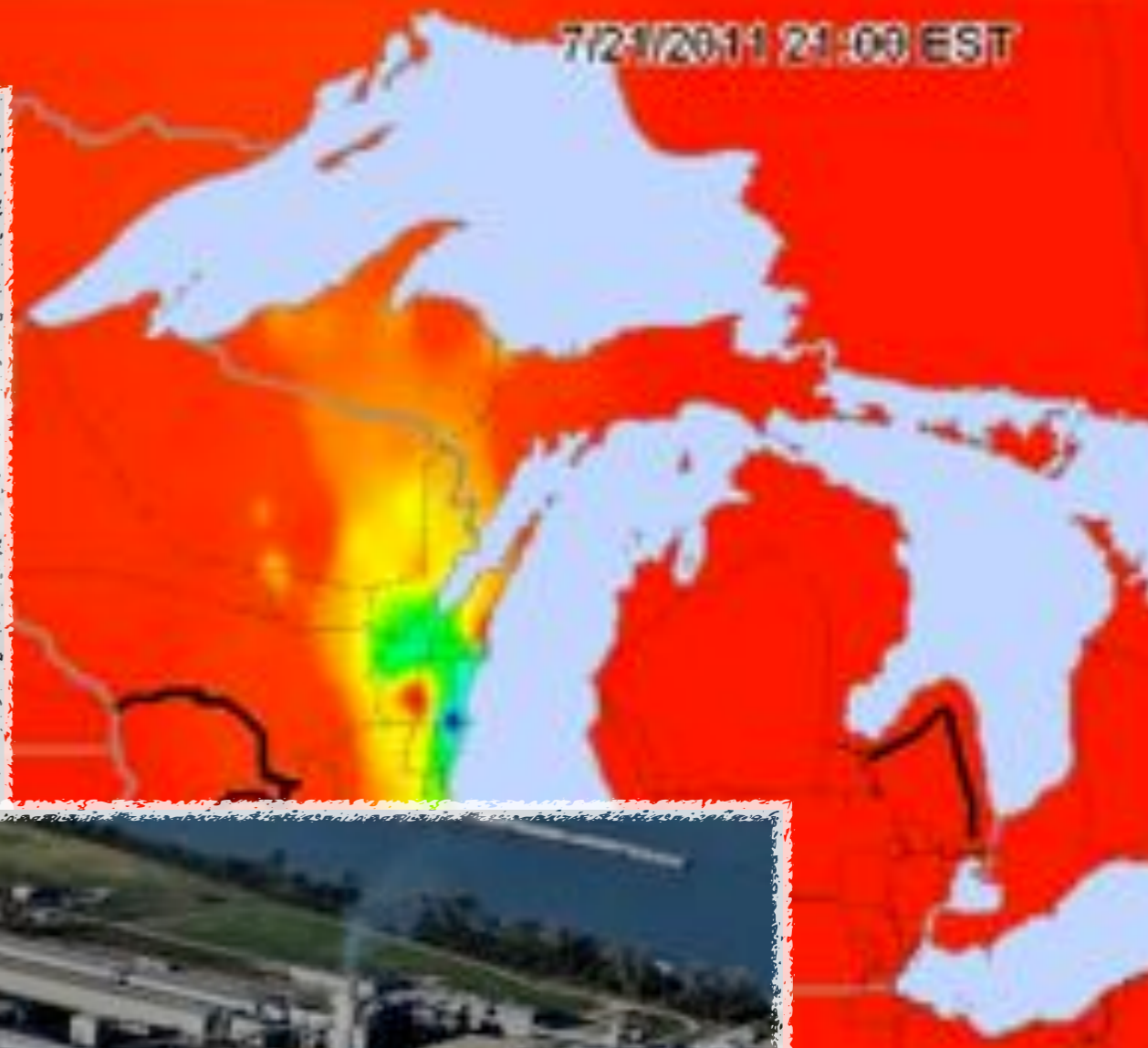
Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999





7/21/2011 22:00 EST

**PMVP Projects**

— PMVP Projects

**Existing Transmission and Planned 345 kV+**

— Existing Transmission 345 kV+

**LMP (\$/MWh)**

200+
100
90
75
62
50
30
0
-999



7/21/2011 23:00 EST

PMVP Projects

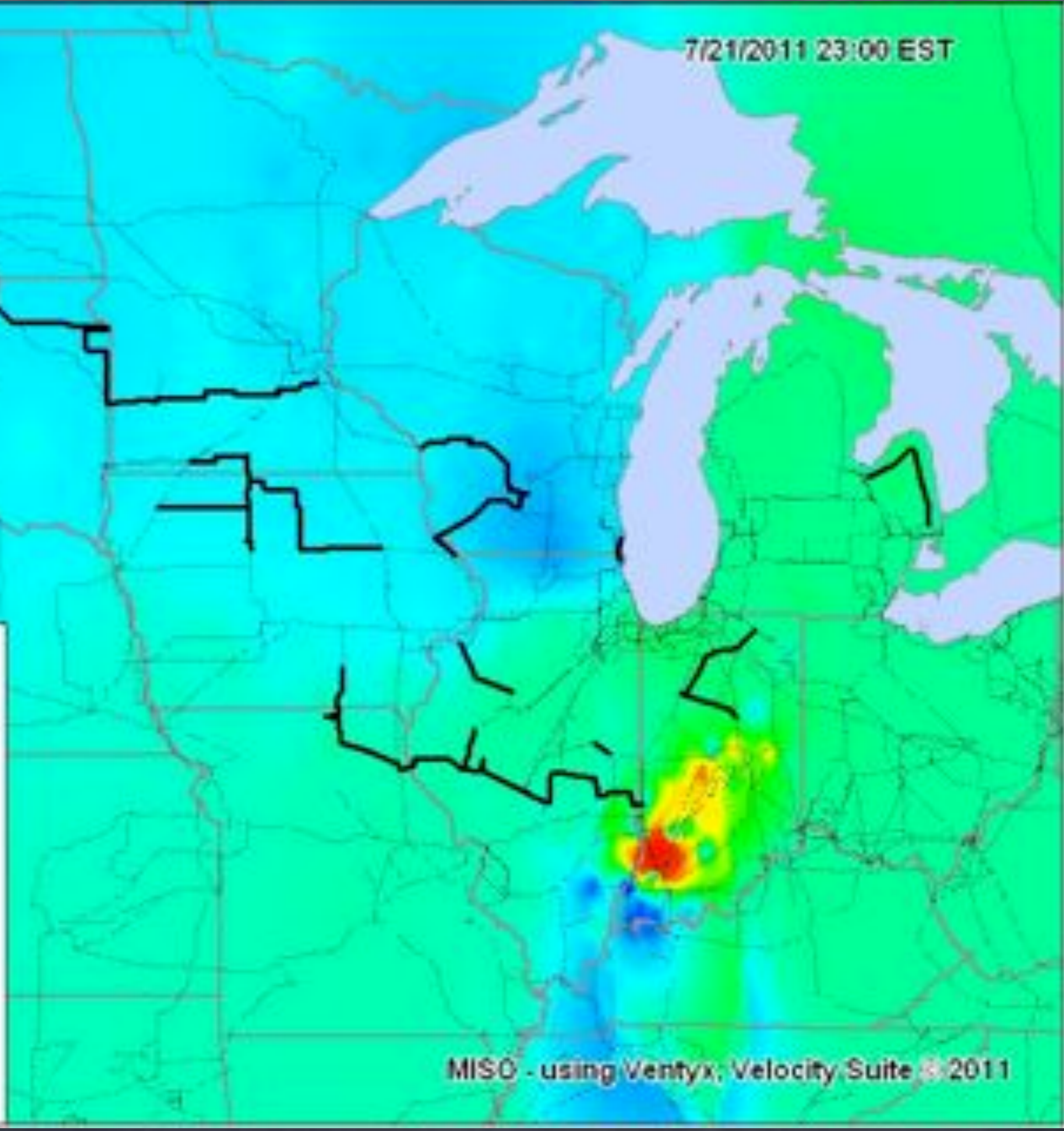
— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999





7/21/2011 24:00 EST

PMVP Projects

— PMVP Projects

Existing Transmission and Planned 345 kV+

— Existing Transmission 345 kV+

LMP (\$/MWh)

200+
100
90
75
62
50
30
0
-999

