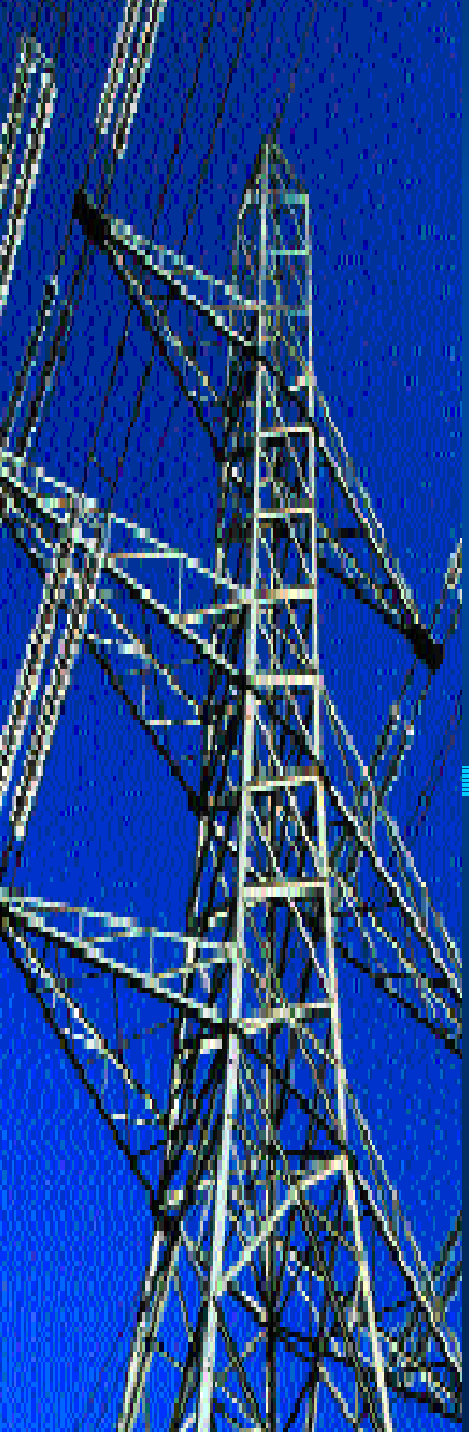


ATC Report
Aug 14, 2003 Event
Part 1

Edina Bajrektarević

Transmission Operations

ATC Overview

1. ATC owns, plans, maintains and operates transmission assets in portions of Wisconsin, Michigan and Illinois
   - Doesn't own generation or distribution assets
   - Operates independently from all users
2. Over $700 million in assets
   - Over 8,900 circuit miles of transmission lines
   - Over 450 substations
3. 25 entities have contributed transmission assets, cash or both to ATC including:
   - 7 investor-owned utilities
   - 12 municipal utilities
   - 4 electric cooperatives
   - 2 public power entities

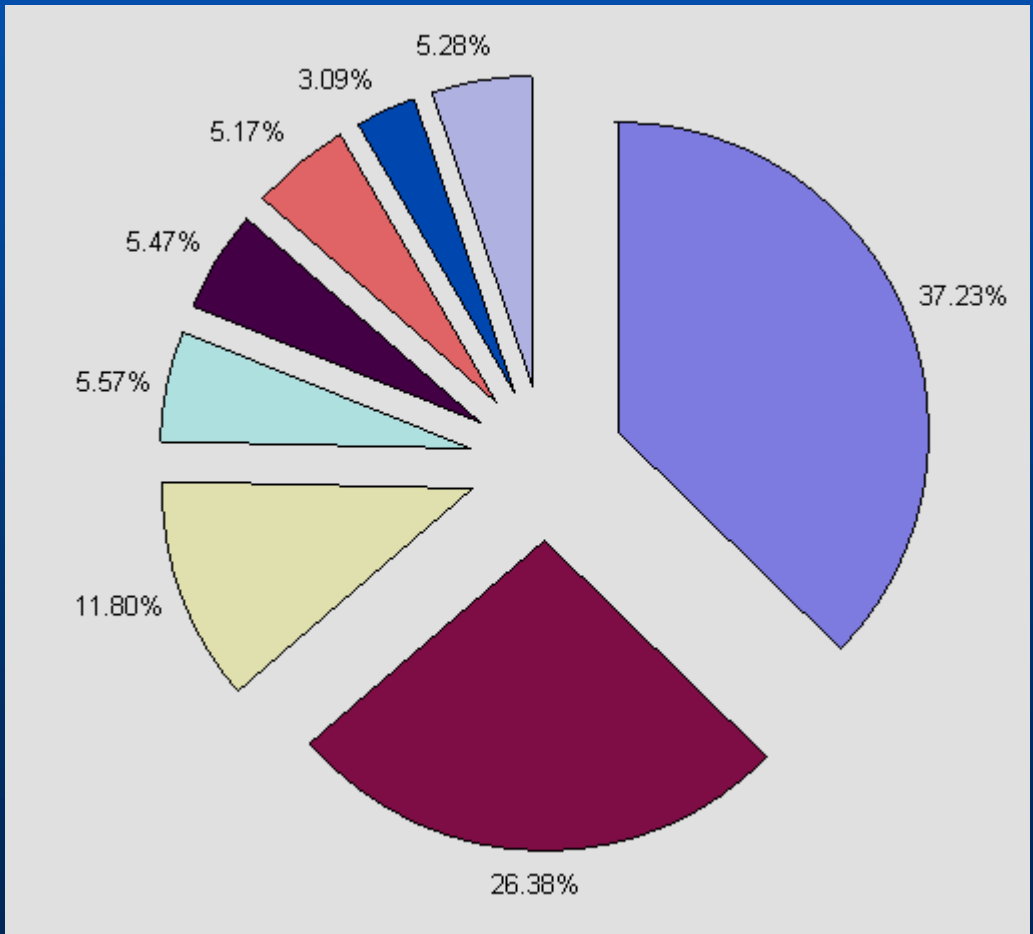
ATC Overview

1. Transmission Service is the ATC's business

ATC's aims:

- Ensure reliable operation of the transmission network
- Provide an adequate infrastructure to meet the needs of all customers
- Operate independently, providing service without discrimination between customers

ATC Ownership

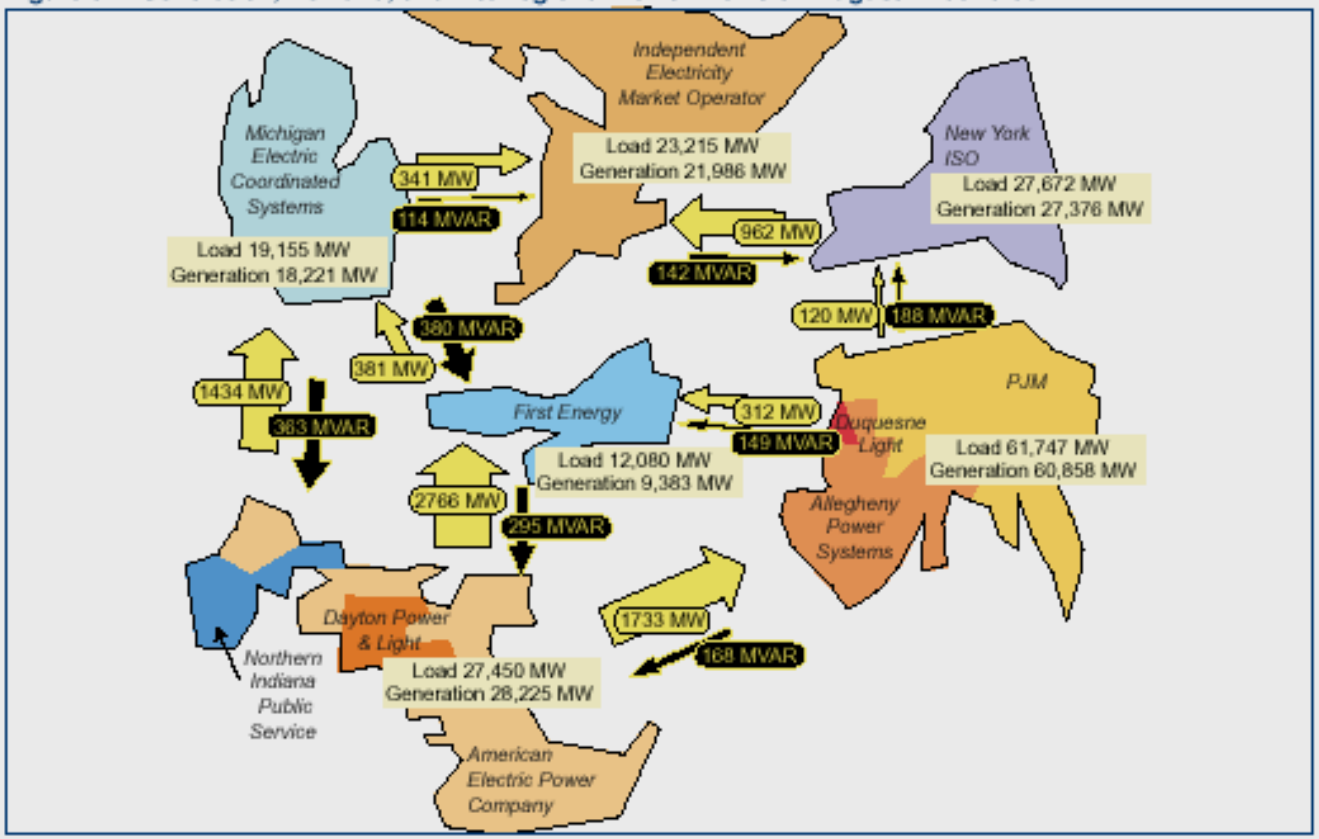


ATC Power Grid, Aug 2003

1. ATC Area Total Load: 12046 MW
2. Available Capacity: 11632 MW
3. Transmission Purchases: 1664 MW
4. Available Operating Reserve: 1721 MW
5. Required Reserve: 386.3 MW

Northeast Blackout Power Grid Aug 14 2003

Figure 3.2. Generation, Demand, and Interregional Power Flows on August 14 at 15:05 EDT



16 ✧ U.S.-Canada Power System Outage Task Force ✧ Causes of the August 14th Blackout ✧

•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

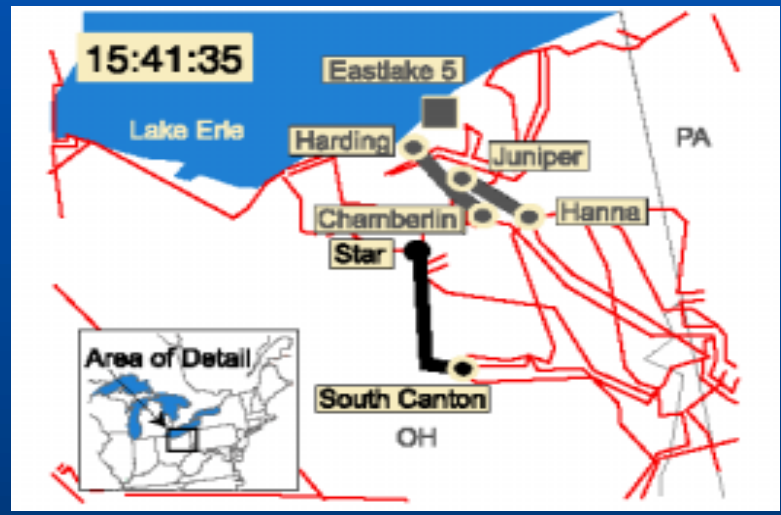
US Northeast Blackout

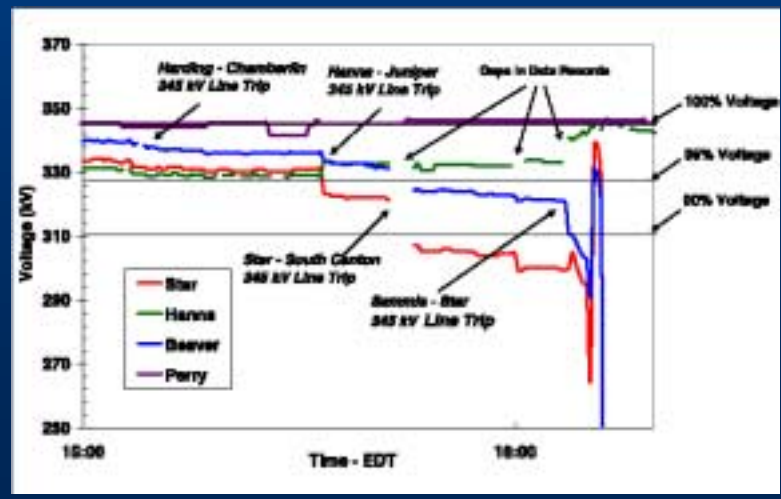
Phase 1: A normal afternoon degrades (12:15 EDT to 14:14 EDT)

Phase 2: FE's computer failures (14:14 EDT to 15:59 EDT)

Phase 3: Three FE 345 kV transmission line failures and many phone calls (15:05 EDT to 15:57 EDT)

Phase 4: The collapse of the FE 138 kV system in Northern Ohio, and the loss of the Sammis – Star line (15:39 to 16:08 EDT)

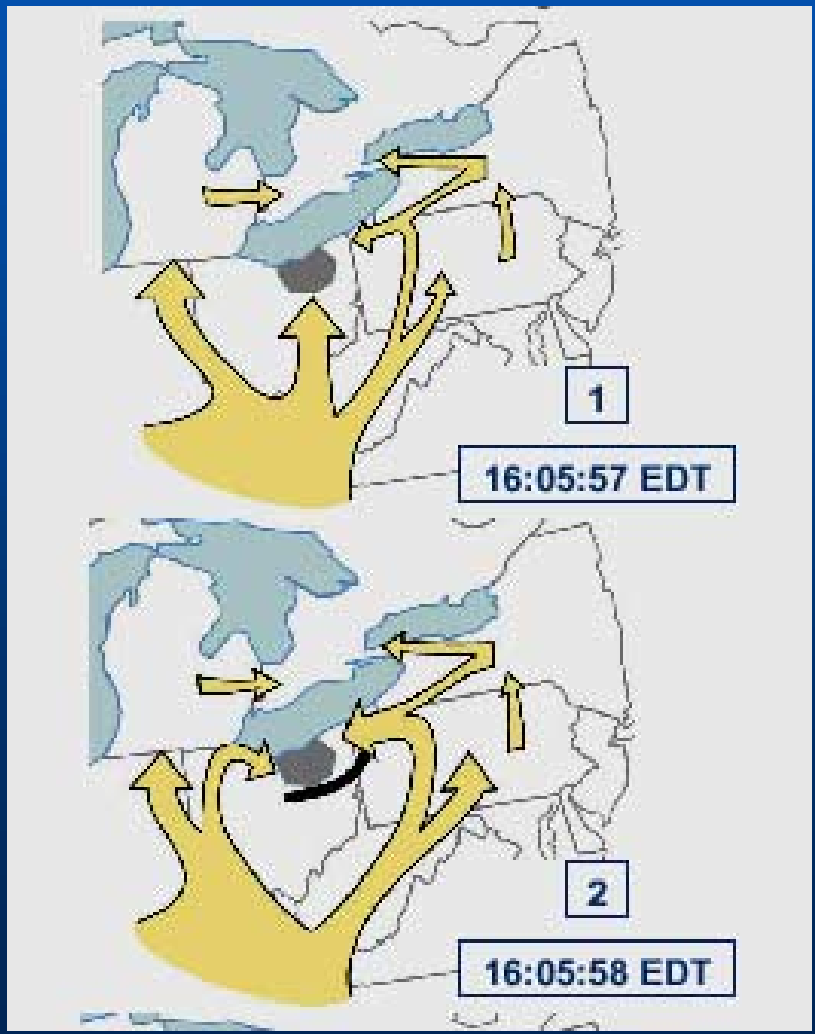




•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

US Northeast Blackout cont.

At 16:05:57 EDT, the trip and lock-out of FE's Sammis-Star 345 kV line set off a cascade of interruptions on the high voltage system, causing electrical fluctuations and facility trips as within seven minutes the blackout rippled from the Akron area across much of the northeast United States and Canada…



•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

US Northeast Blackout cont.

Phase 5: 345 kV Transmission System Cascade in Northern Ohio and South – Central Michigan

Transmission lines into Northwestern Ohio Tripped, and Generation Tripped in South Central Michigan and Northern Ohio: 16:08:59 EDT to 16:10:27 EDT

Figure 5.4. Ohio 345-kV Lines Trip, 16:08:59 to 16:09:07 EDT

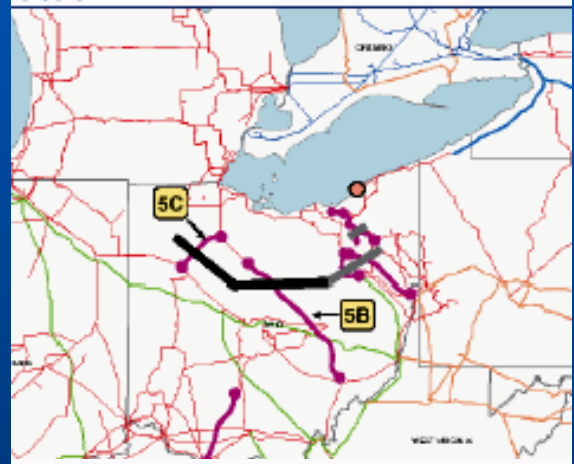


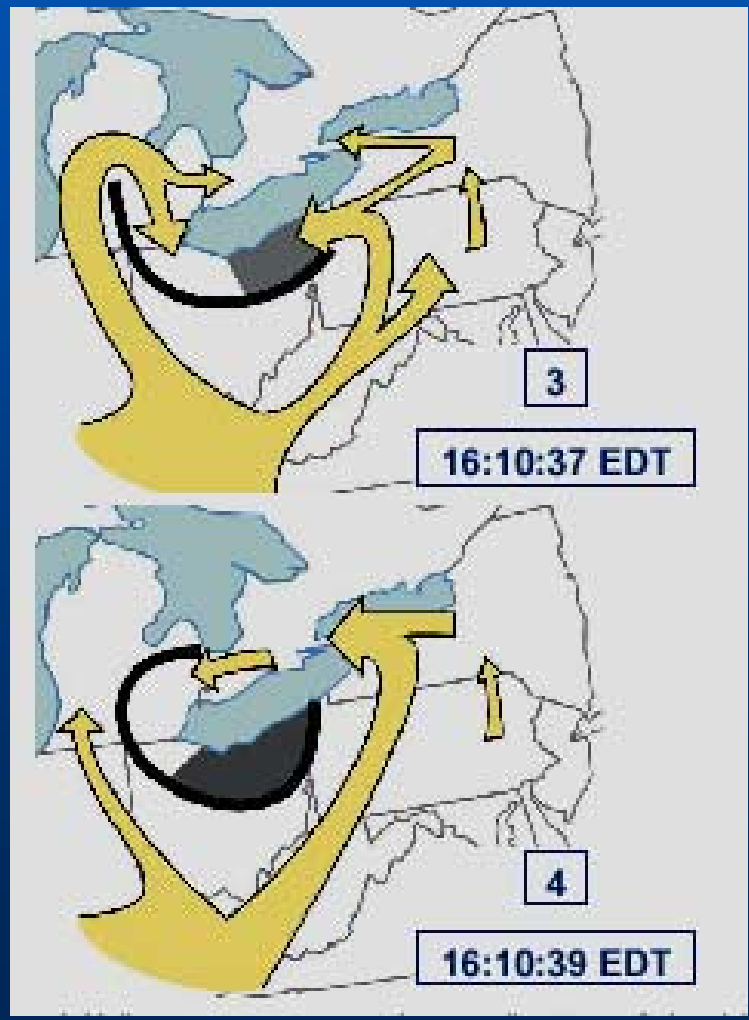
Figure 5.6. Michigan and Ohio Power Plants Trip

•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

US Northeast Blackout cont.

Cleveland separated from Pennsylvania, flows reversed and a huge power surge flowed counter-clockwise around Lake Erie: 16:10:38 EDT…

Large power surge to serve loads in eastern Michigan and northern Ohio swept across Pennsylvania, New Yersey, and New York through Ontario into Michigan: 16:10:38 EDT…



•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

US Northeast Blackout cont.

Phase 6: Transmission lines disconnected across Michigan and Northern Ohio, Generation shut down in Central Michigan and Northern Ohio, and Northern Ohio Separated from Pennsylvania: 16:10:36 to 16:10:39 EDT

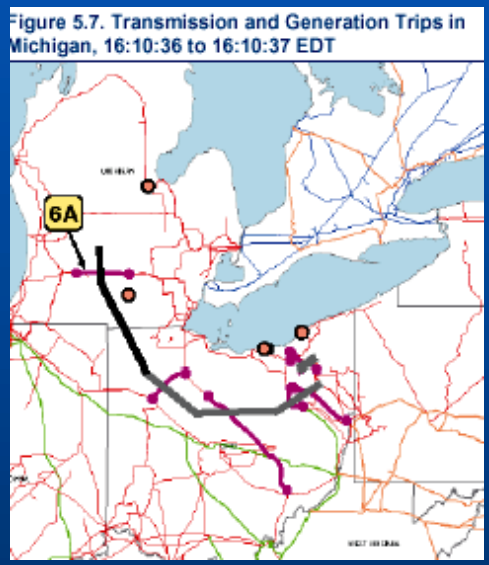


Figure 5.7. Transmission and Generation Trips in Michigan, 16:10:36 to 16:10:37 EDT

Figure 5.8. Michigan Lines Trip and Ohio Separates from Pennsylvania, 16:10:36 to 16:10:38.6 EDT

Figure 5.10. Western Pennsylvania Separates from New York, 16:10:39 EDT to 16:10:44 EDT

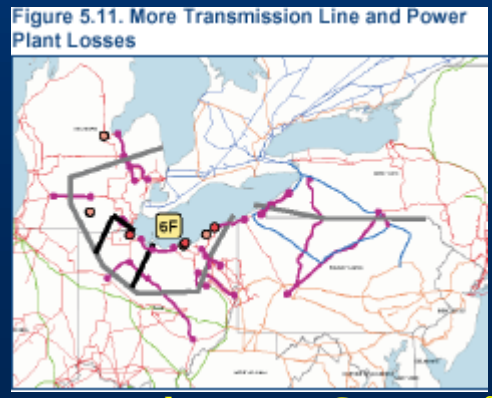


Figure 5.11. More Transmission Line and Power Plant Losses

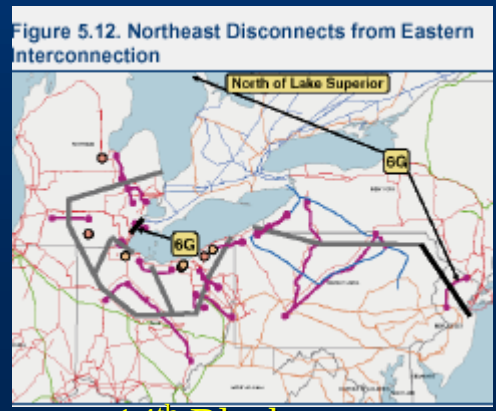
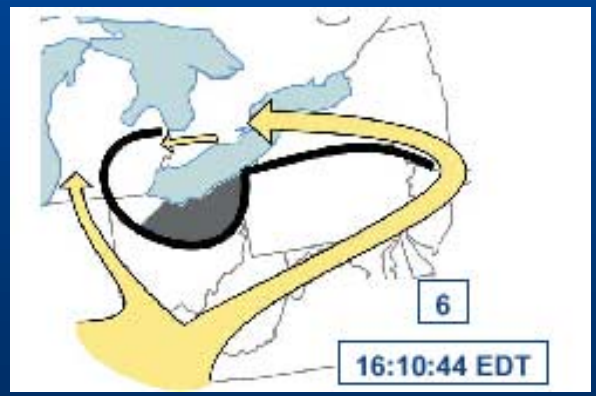
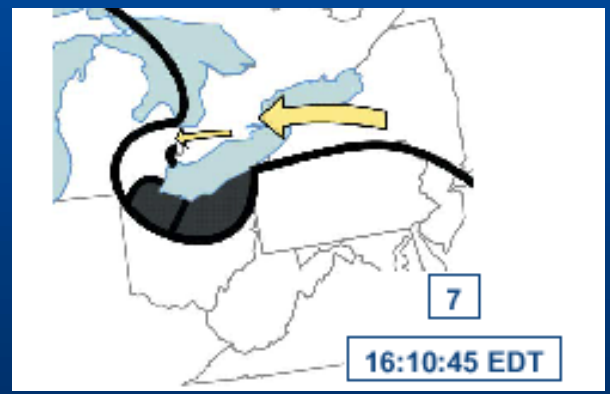


Figure 5.12. Northeast Disconnects from Eastern Interconnection

US Northeast Blackout cont.

Conditions in Northern Ohio and Eastern Michigan degrades further, with more transmission lines and power plants failing: 16:10:39 to 16:10:46 EDT…





Transmission Paths disconnected in New Yersey and northern Ontario, isolating the northeast portion of the Eastern Interconnection: 16:10:42 EDT to 16:10:45 EDT…

•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

US Northeast Blackout cont.

Phase 7: Several Electrical Islands formed in Northeast U.S. and Canada: 16:10:46 EDT to 16:12 EDT.

Cascading Sequence Essentially Complete: 16:13 EDT

Figure 5.13. New York and New England Separate, Multiple Islands Form

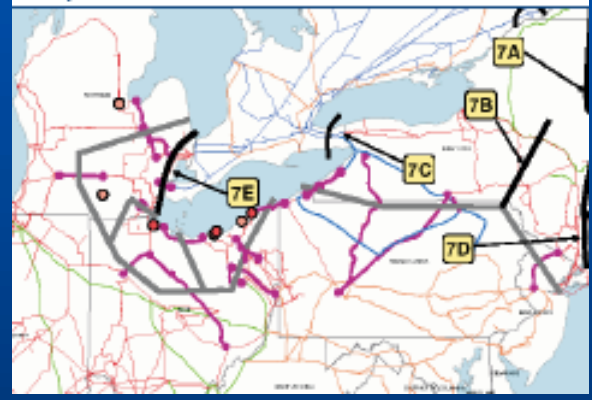
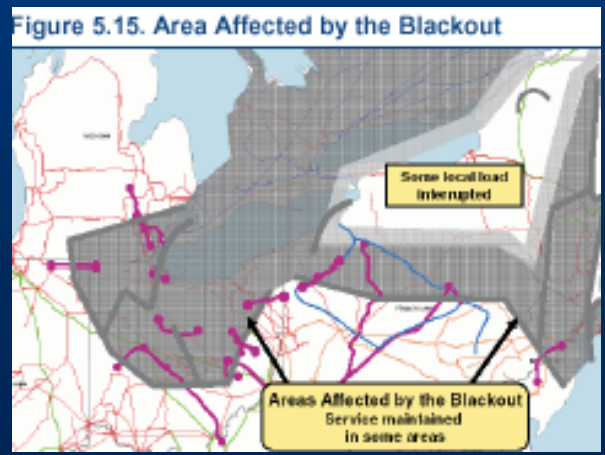


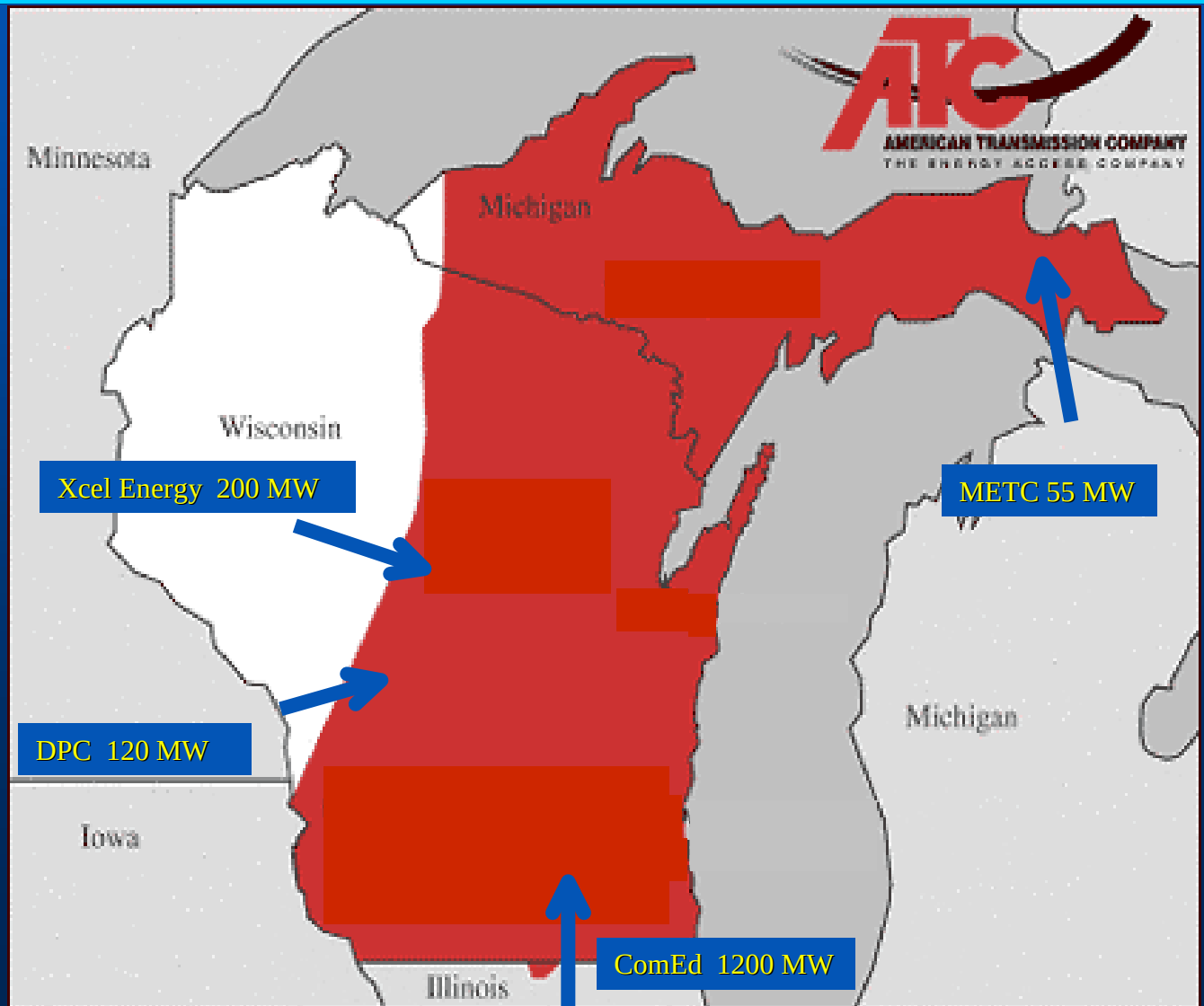
Figure 5.15. Area Affected by the Blackout



•U.S. – Canada Power System Outage Task Force , Causes of the August 14th Blackout

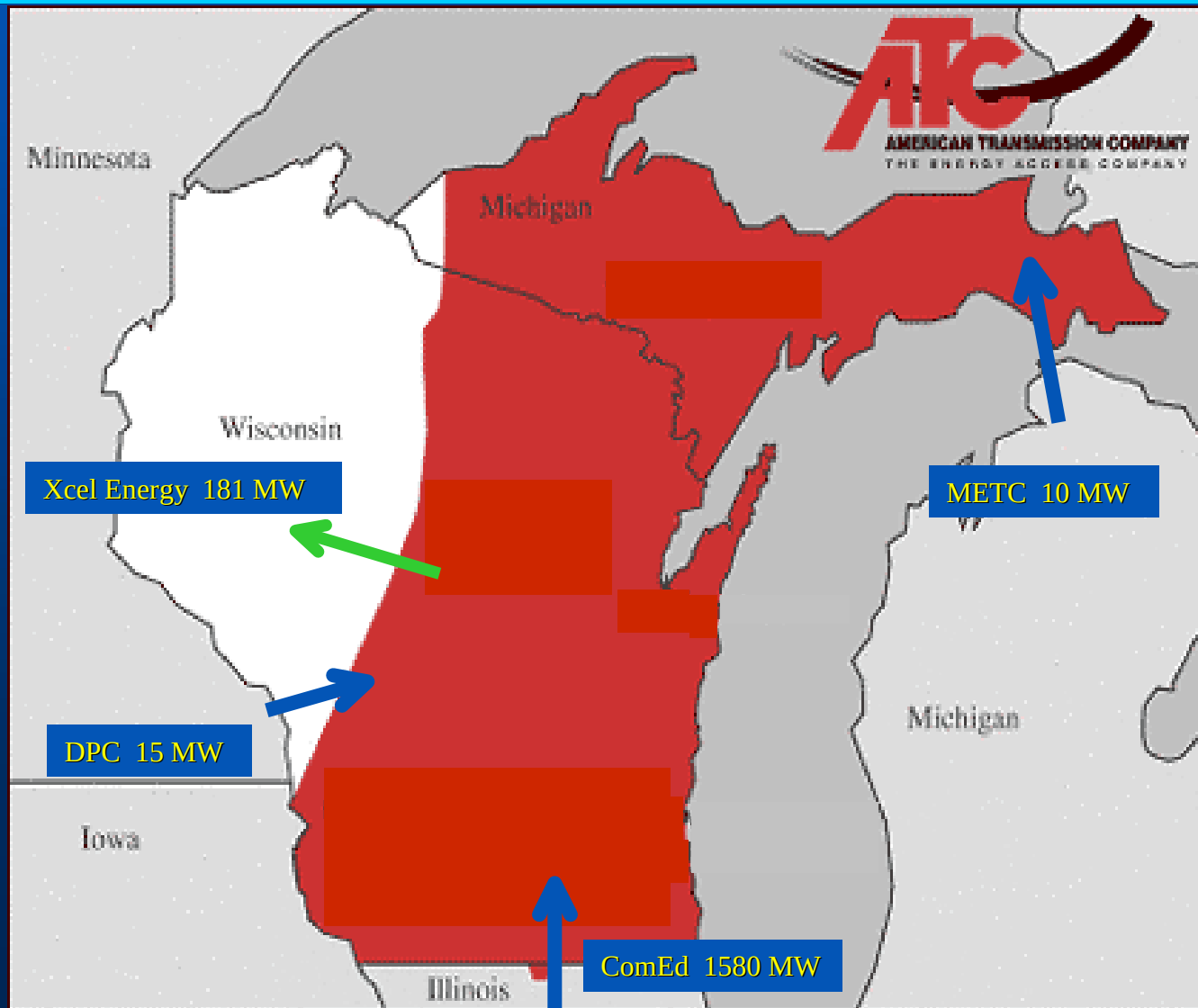
ATC Initial Flows Aug 14, 2003 3:00:00 pm

1. Net flows from all adjacent utilities were into ATC
2. System flows, voltages and frequency were within normal ranges



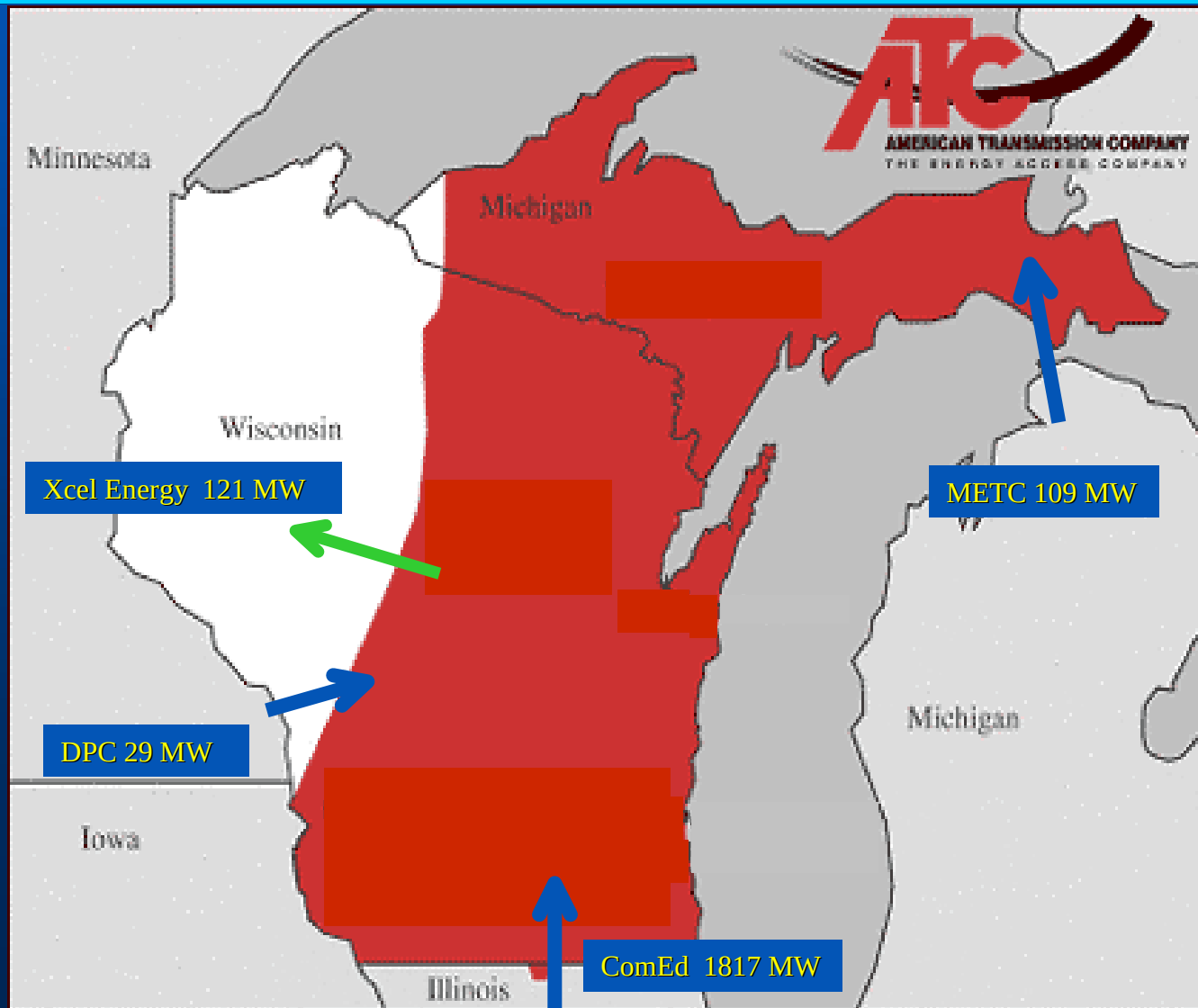
ATC Flows Aug 14, 2003 3:10:52 pm

1. Imports from lower Michigan decreased by 45 MW
2. Imports from ComEd increased by 380 MW total
3. Flows with Xcel reversed directions and changed magnitude by 381 MW
4. Imports from Dairyland Power decreased by 105 MW



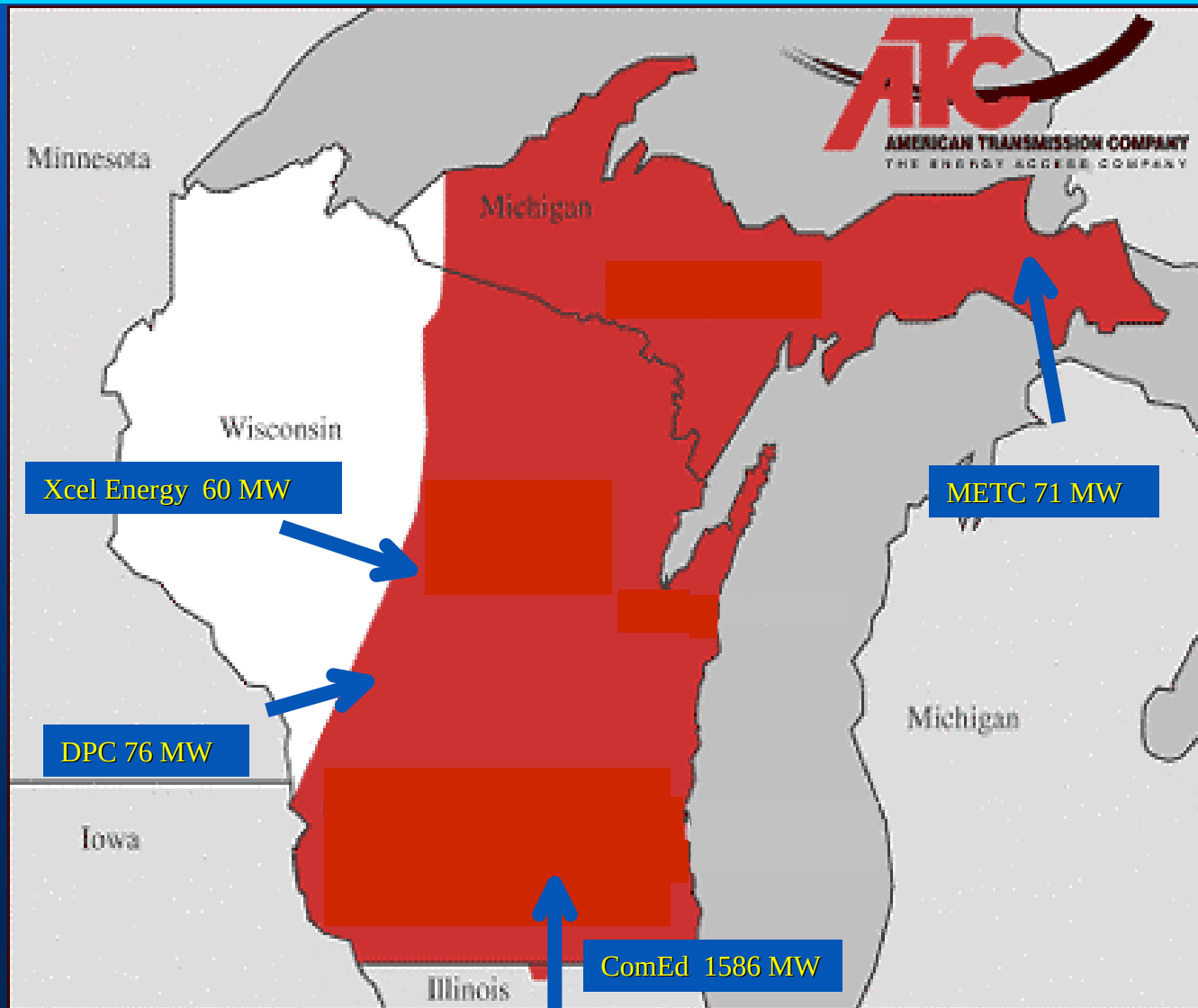
ATC Flows Aug 14, 2003 3:11:08 pm

1. Imports from lower Michigan increased by 99 MW
2. Imports from ComEd increased by 237 MW
3. Exports to Xcel decreased by 60 MW
4. Imports from Dairyland Power increased by 14 MW

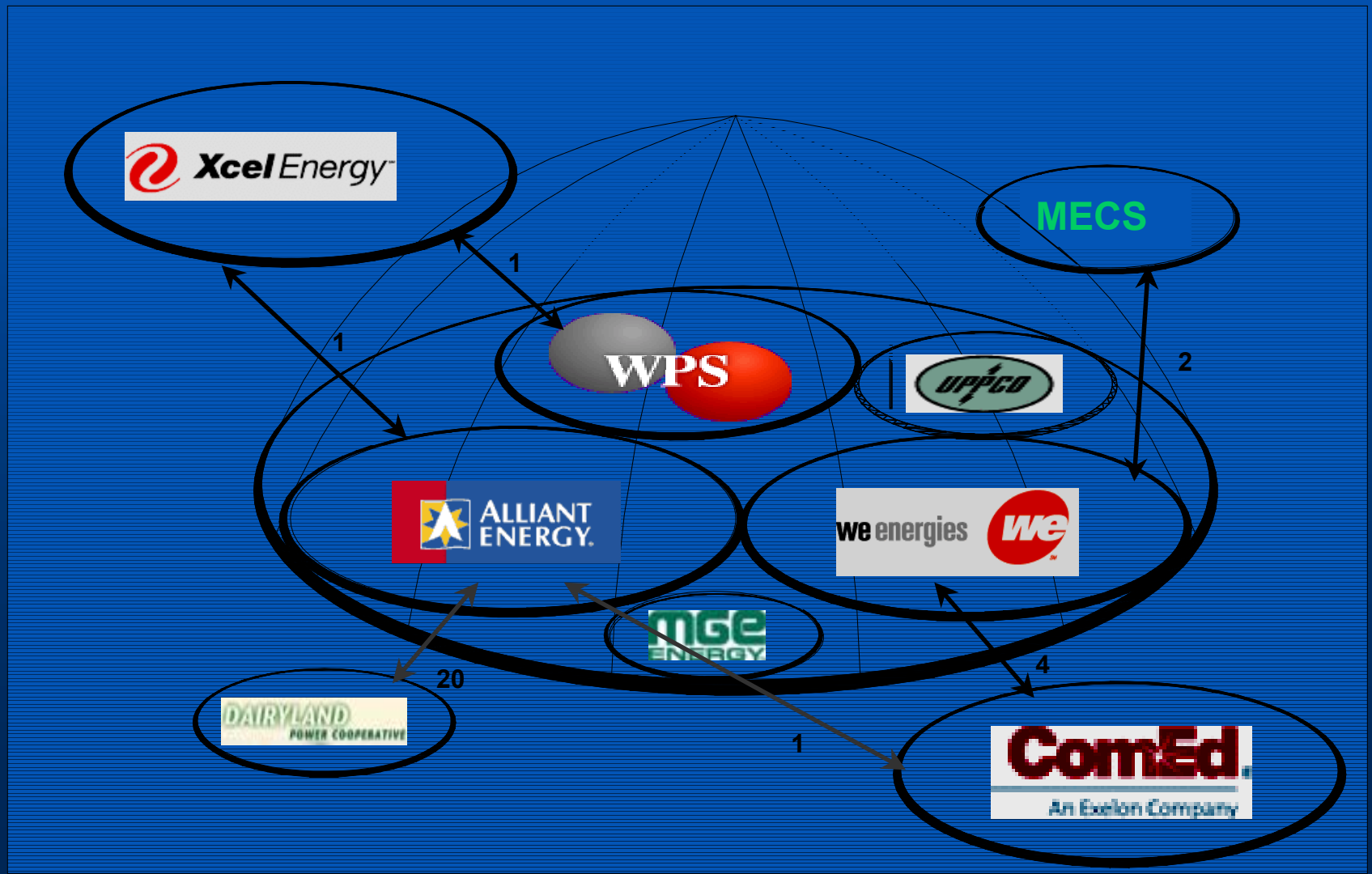


ATC Post Event Flows Aug 14, 2003 3:30:20 pm

1. Imports from lower Michigan decreased by 38 MW
2. Imports from ComEd decreased by 231 MW
3. Xcel Flows reversed directions and changed magnitude by 181 MW
4. Imports from Dairyland Power increased by 47 MW



ATC Control Area Interconnections

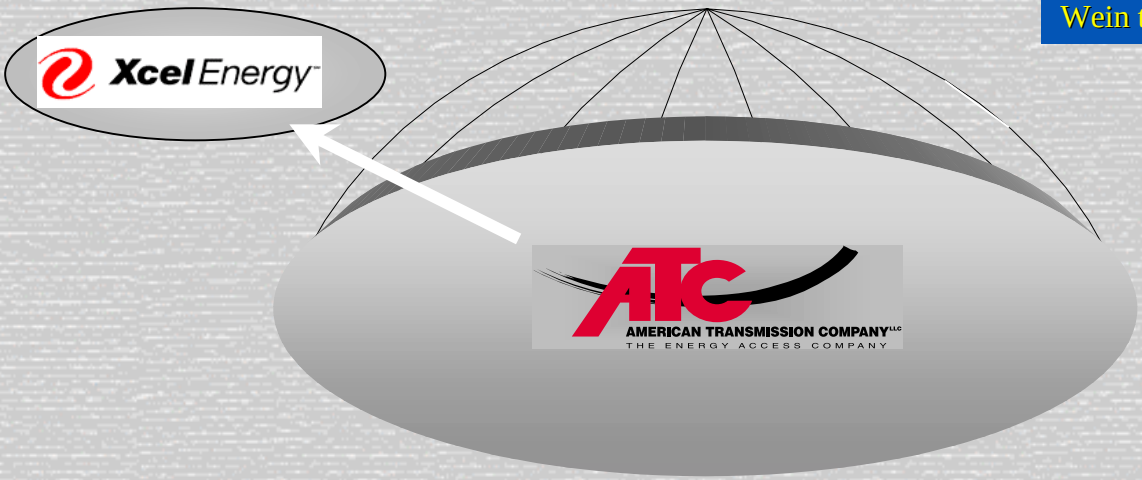


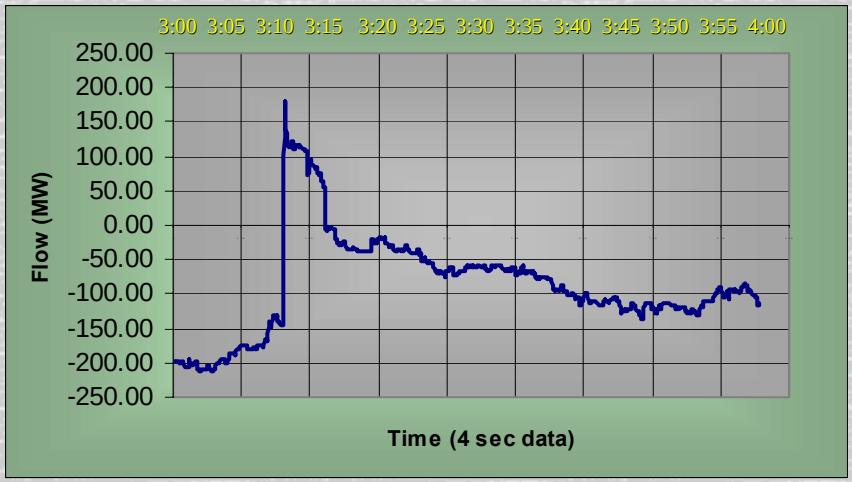
System Operations

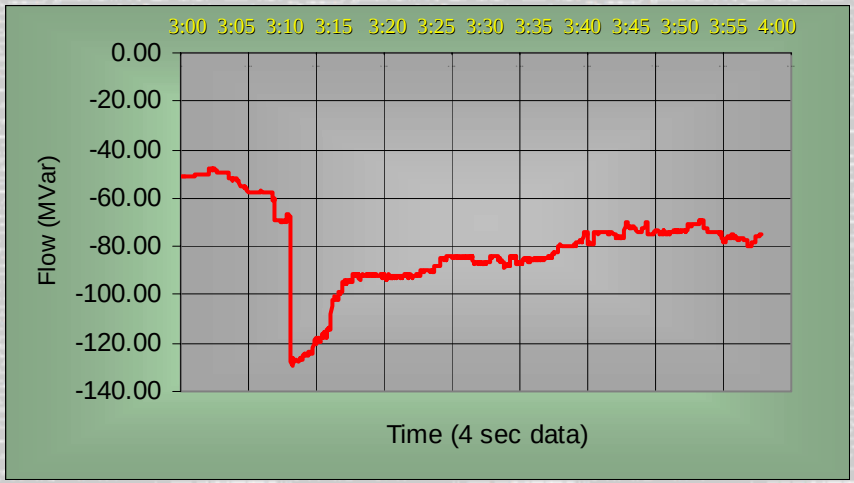
“ Emphasize the importance of the System Control Operators, as the front lines of the power system security…”

ATC - Xcel Energy Interconnections

Arpin Eau Claire 345 kV line (8E5) +
Wein to T Corners 115 kV line (W-23)

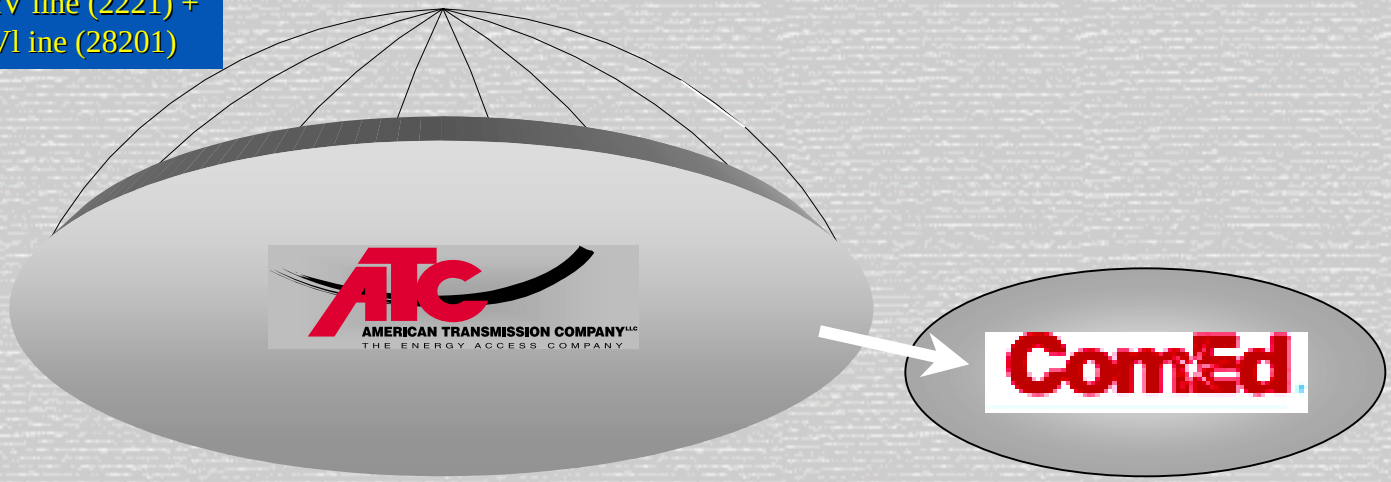


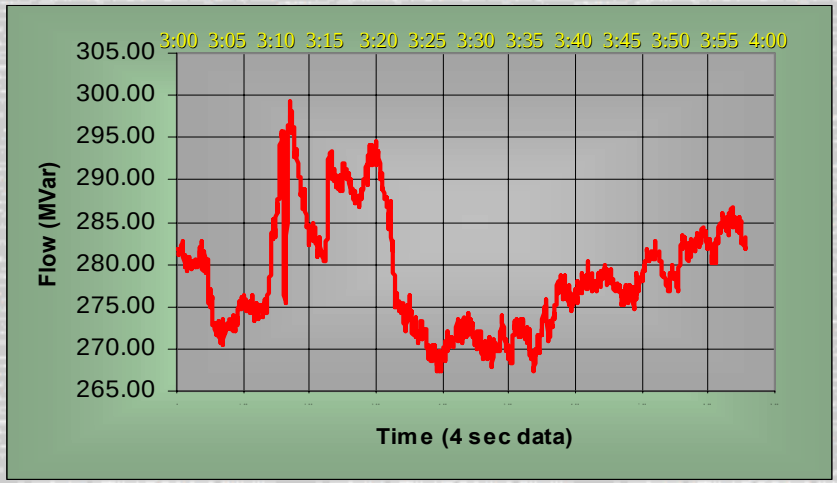




ATC – ComEd Interconnections

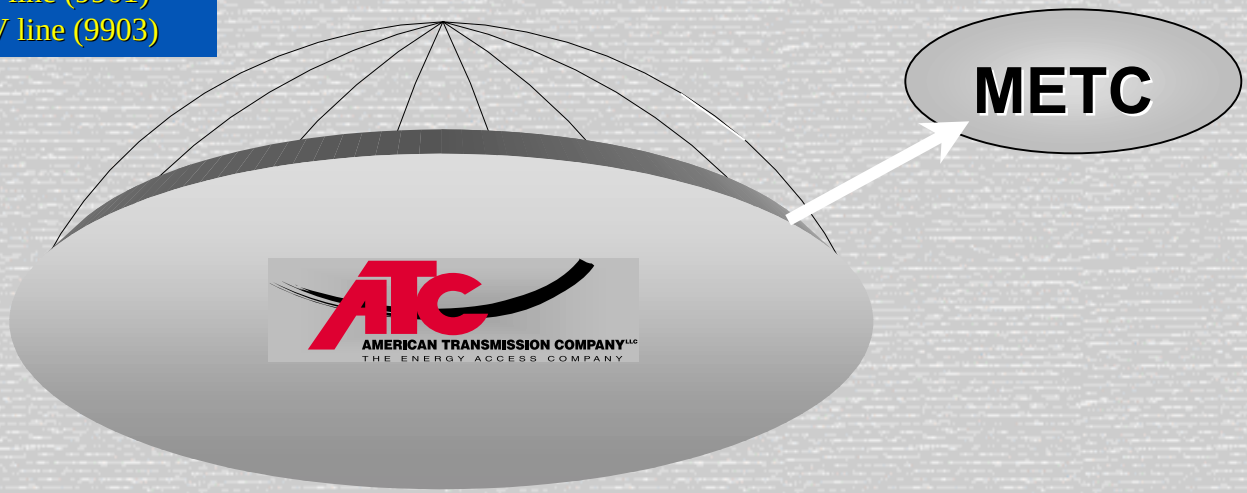
Paddock to Wempletown 345 kV line (W-9+
Arcadian to Zion 345 kV line (2222) +
Pleasant Prairie to Zion 345 kV line (2221) +
Lakeview to Zion Dist 138 kVl ine (28201)

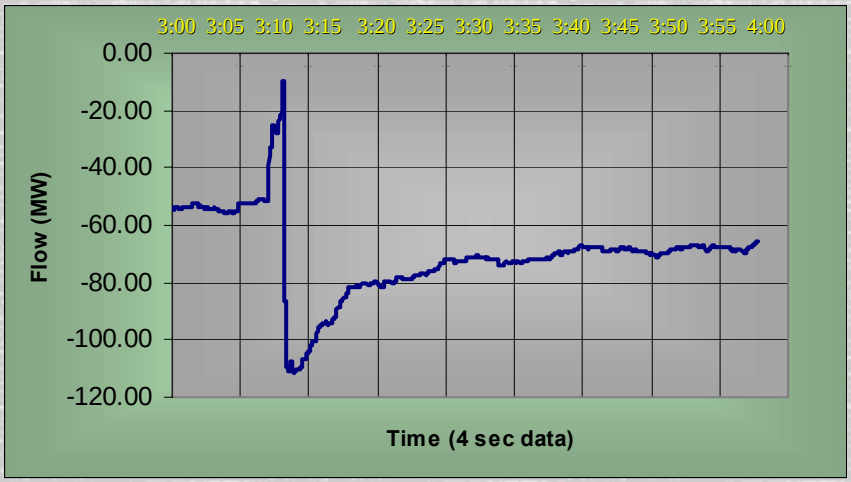


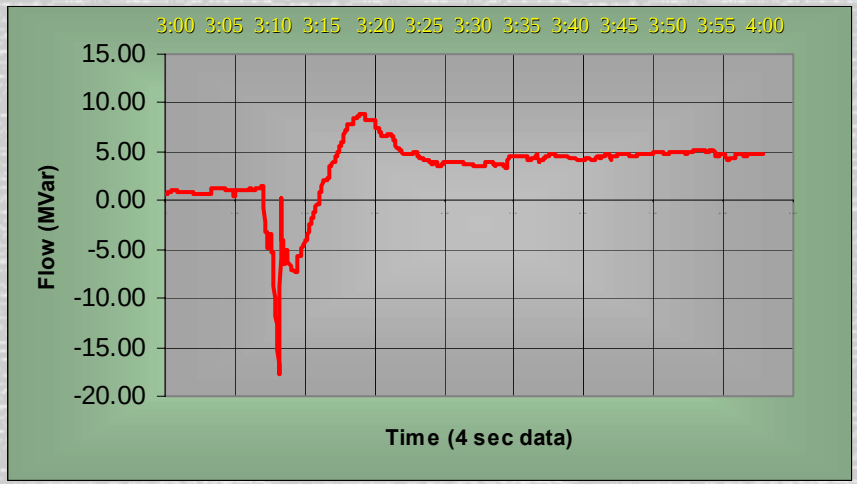


ATC – METC Interconnections

Straits to McCulpin 138 kV line (9901) +
Straots tp McGulpin 138 kV line (9903)

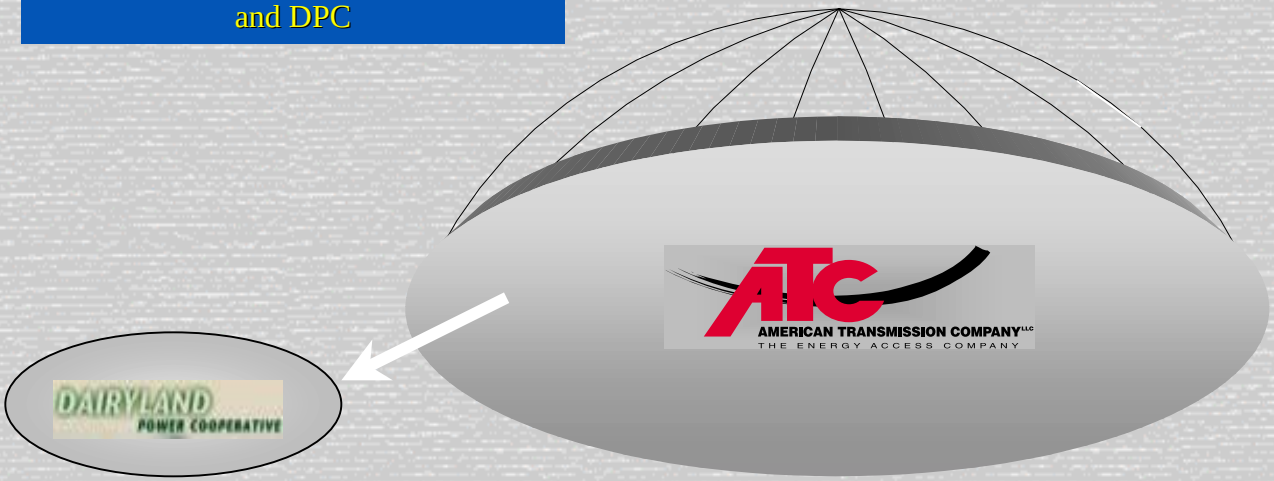


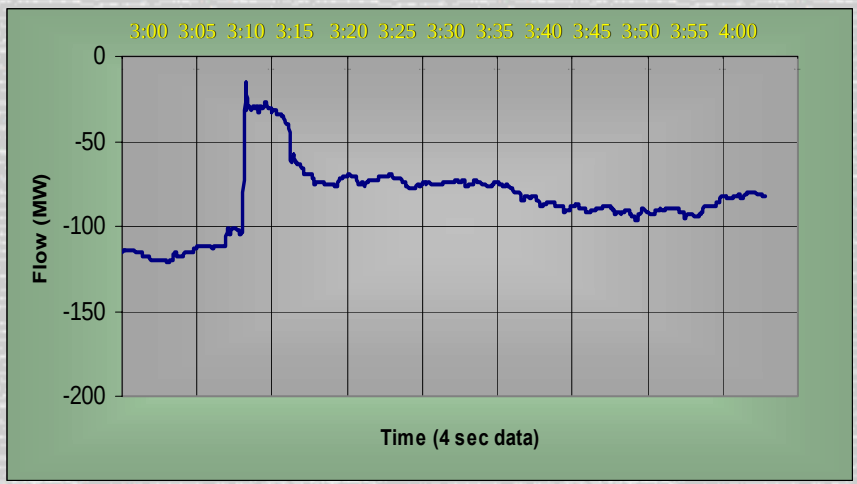




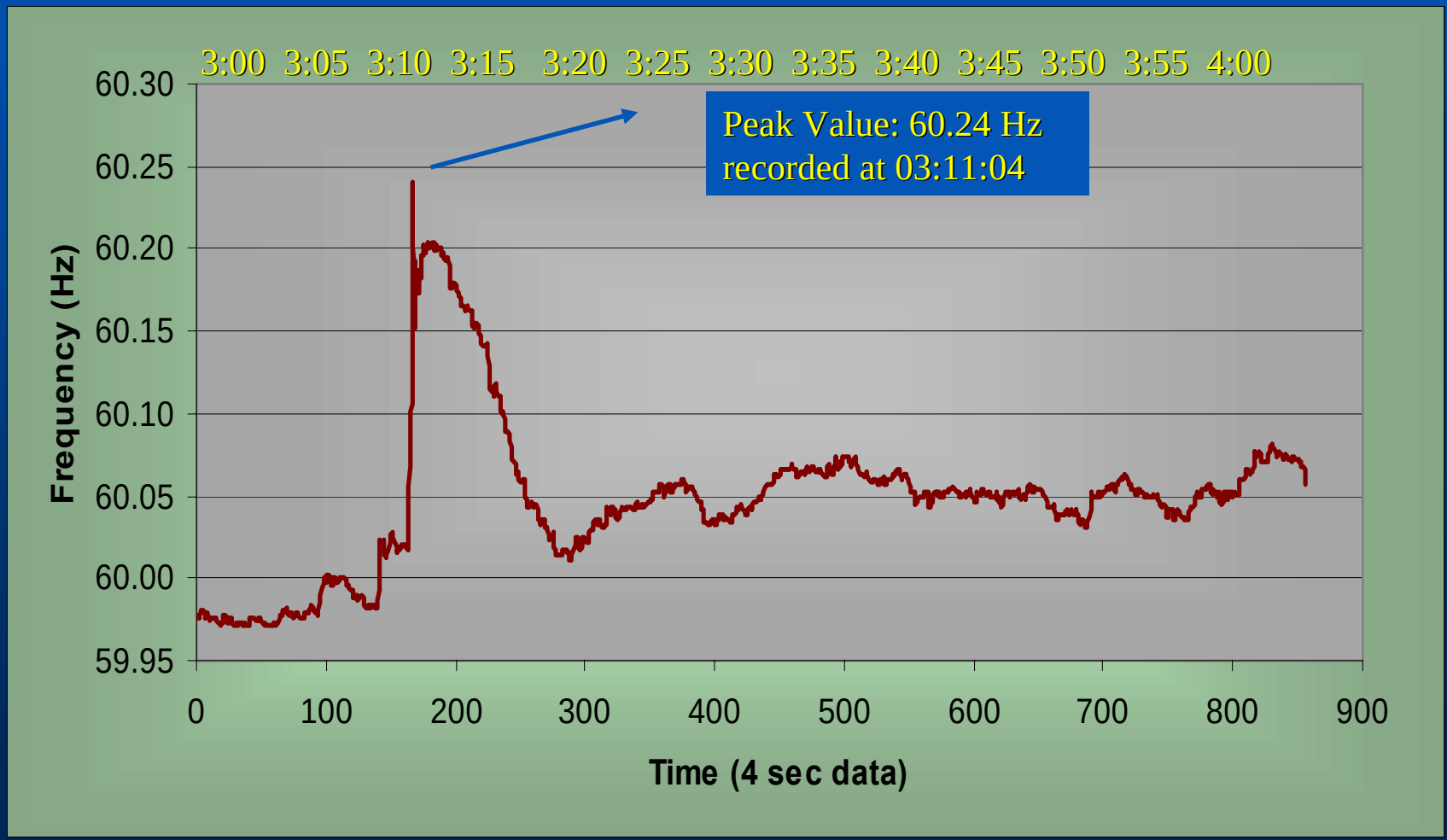
ATC – Dairyland Power Interconnections

Sum of the all tie lines between ATC and DPC



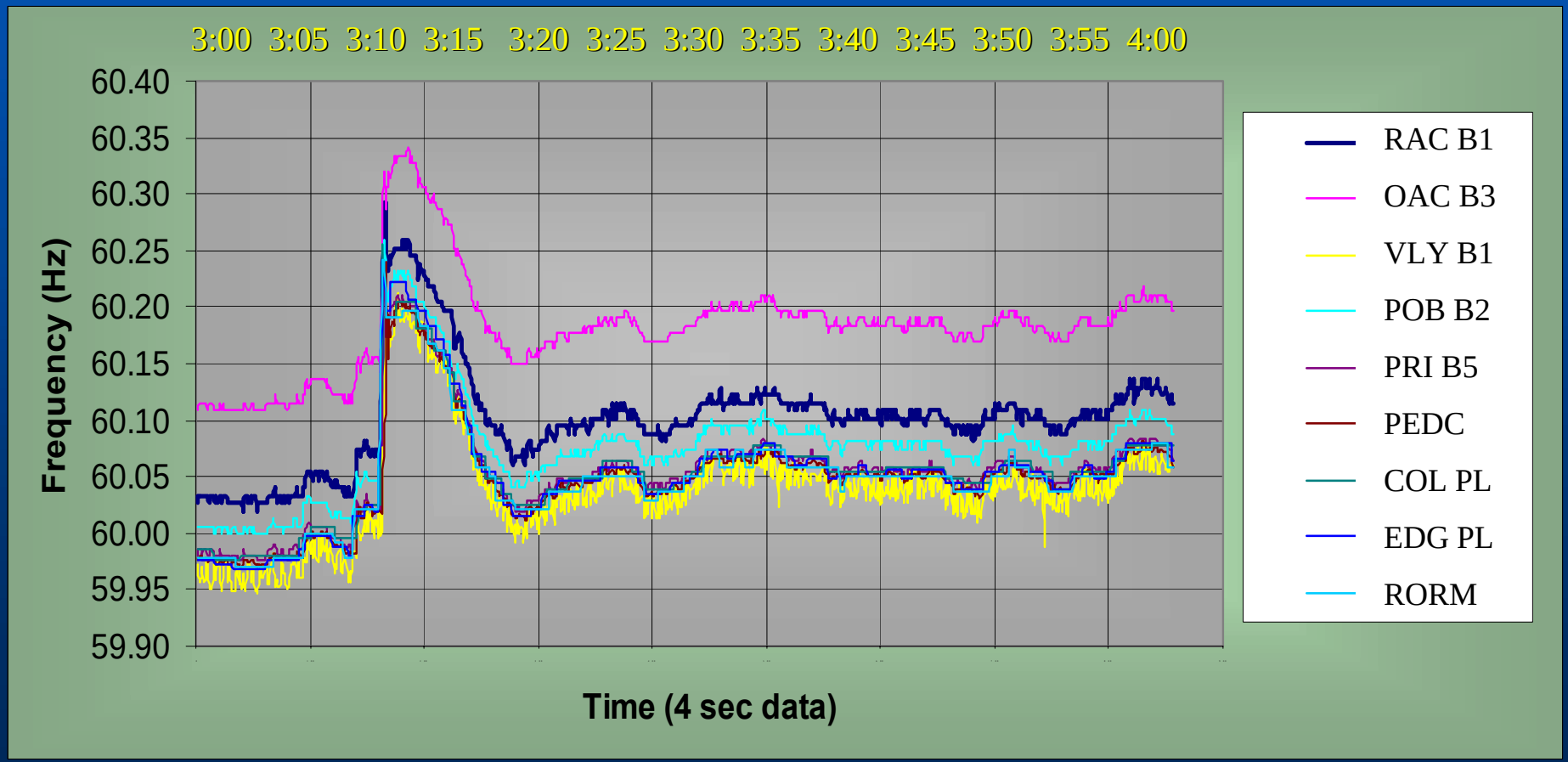


System Frequency

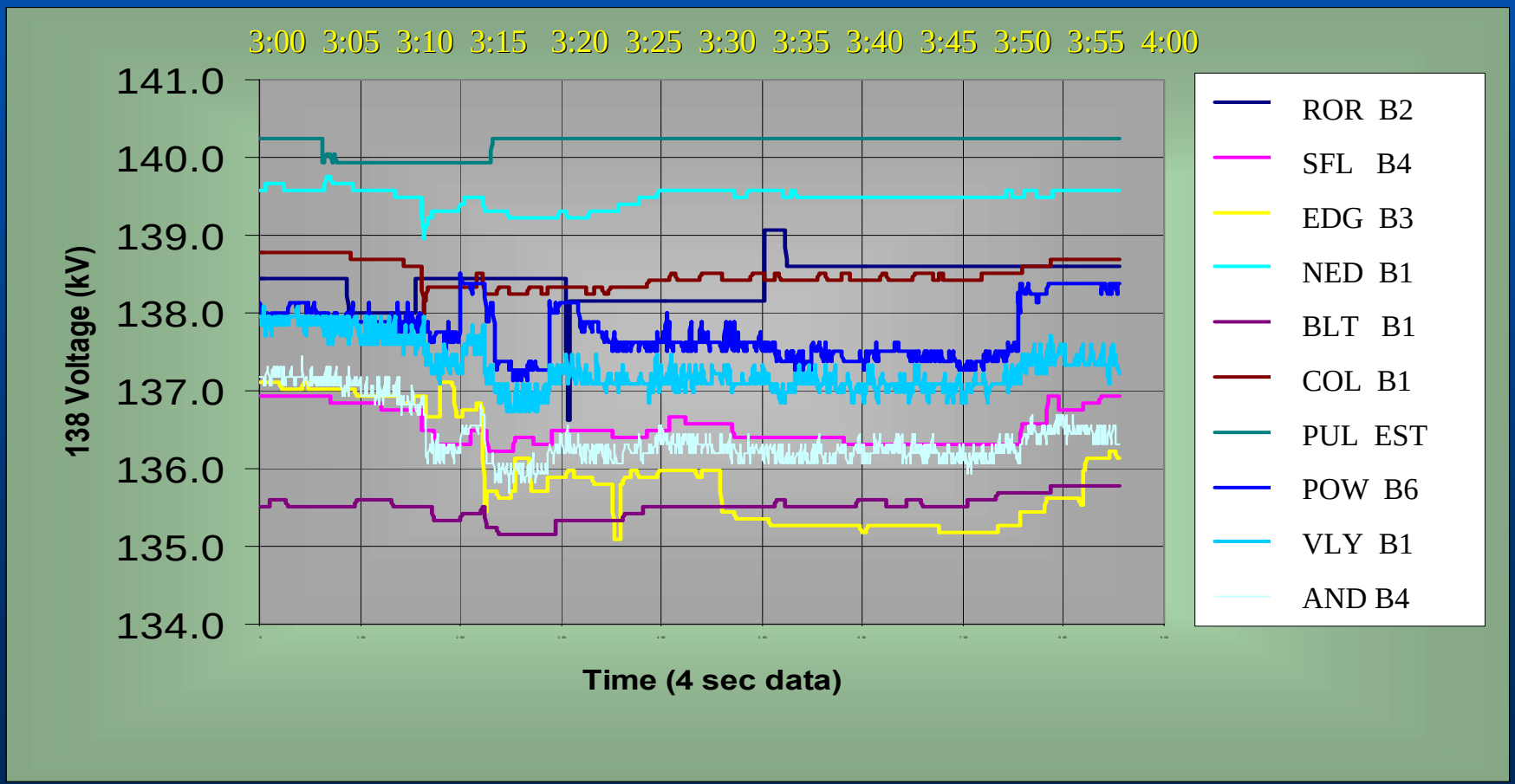


*Note: Measurement taken at WEC Control Center

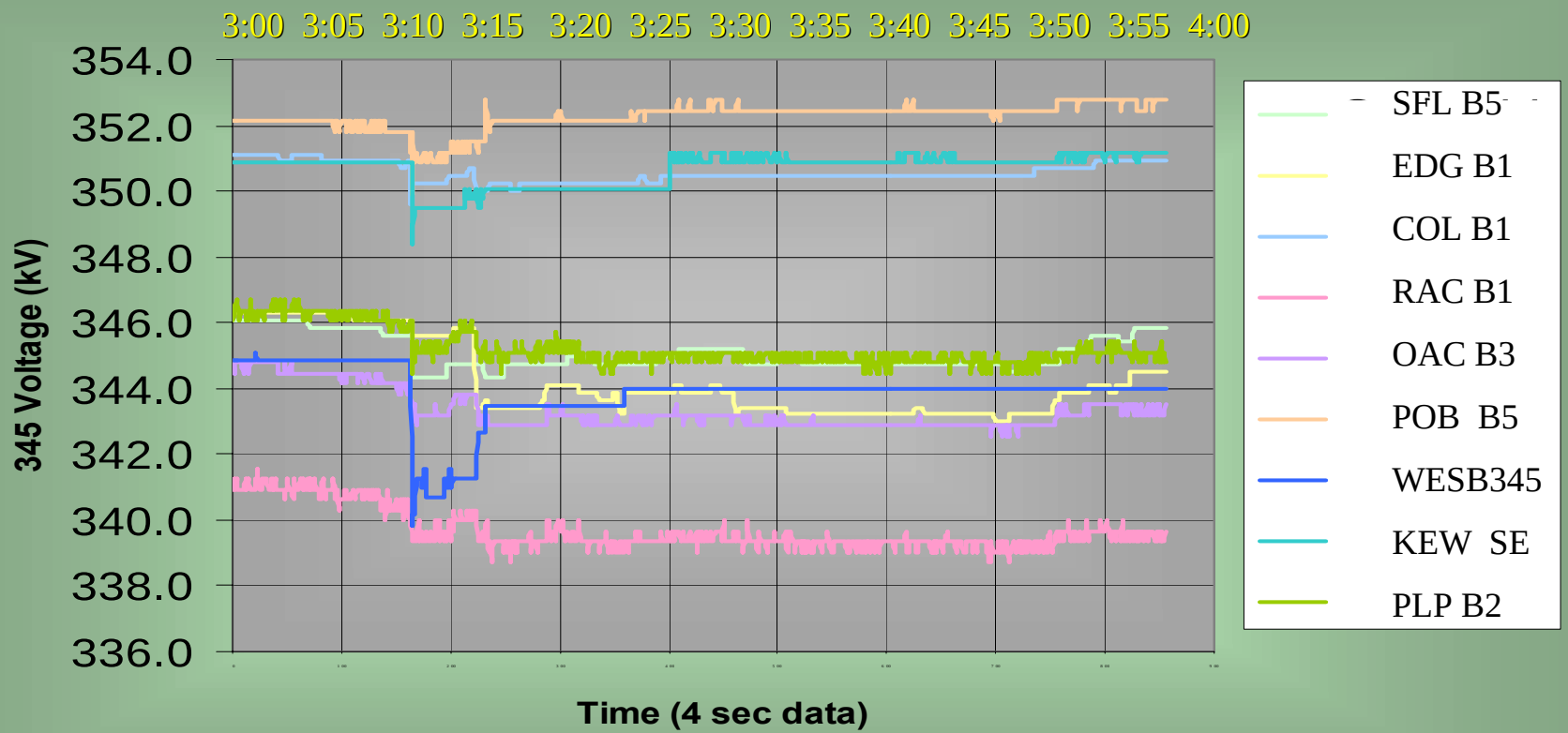
ATC Frequencies



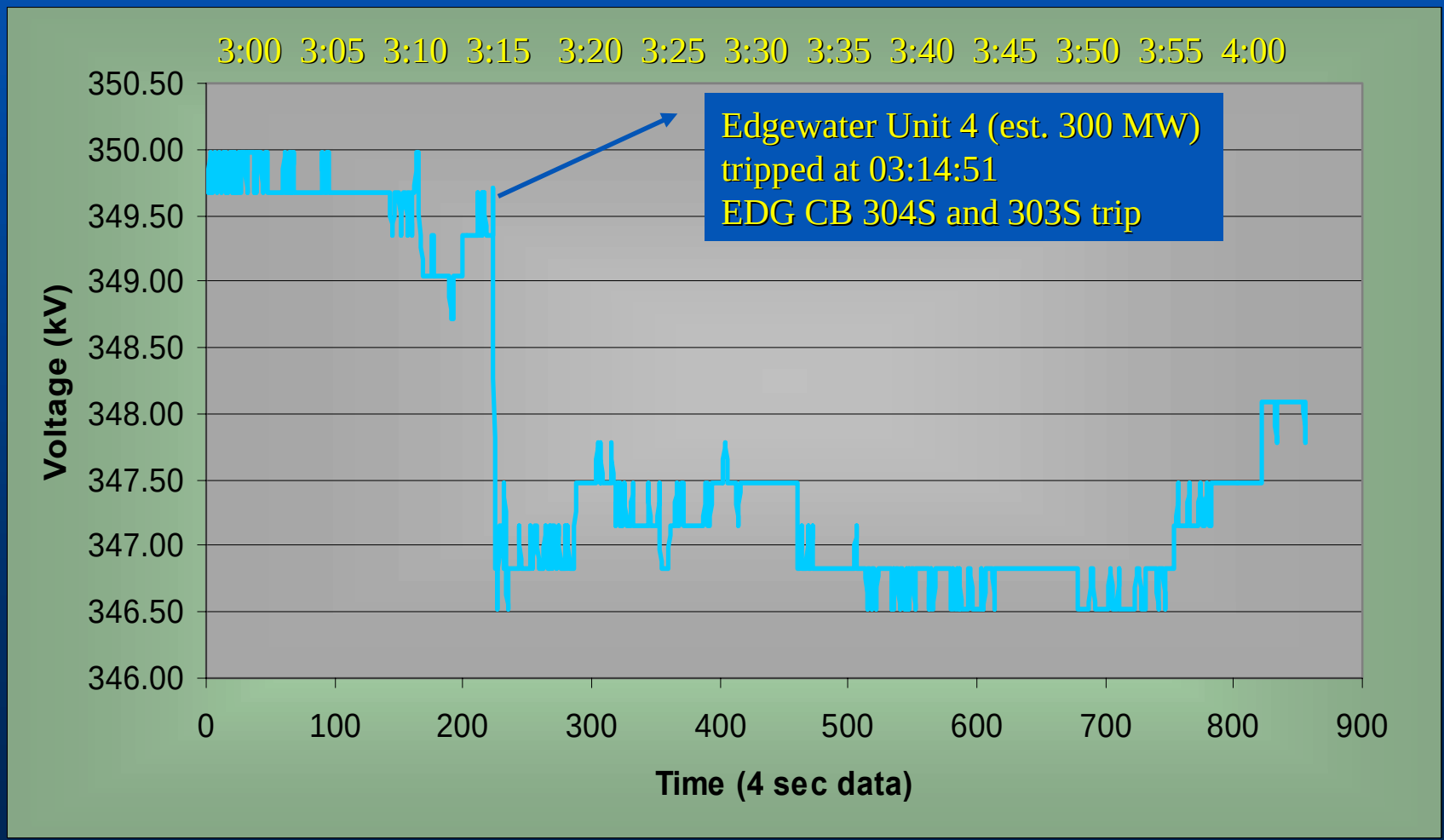
138 kV Bus Voltages



345 kV Bus Voltages



Edgewater 345 kV Bus Voltage



*Note: Measurement taken at Edgewater Substation

Summary

- ATC System remained stable throughout Northeast USA Blackout of Aug 14, 2003
- Highest recorded frequency on the ATC system was 60.29 Hz at Racine Substation
- Edgewater Unit 4 was the only unit that tripped on the ATC system
- There were no transmission line trips on the ATC system as a result of this event
- Largest voltage deviation on the ATC system occurred at Straits Substation (approximately 10 kV)