



ATC Order 890 Stakeholder Update 2024 Futures Matrix Review

ATC Economic Planning
12-18-08



ATC 2024 Futures Matrix

Drivers	Load Growth within ATC	Energy Growth within ATC	Load Growth outside ATC	Energy Growth outside ATC	Total Small Capacity Coal Retirements (or conversions to natural gas) Within ATC	Generator Additions Within ATC
Lower	0.5%	0.5%	0.5%	0.5%	907 MW	Planned Wind, No NED 3
Mid	1.75%	1.75%	1.75%	1.75%	453 MW	Planned Wind, No NED 3
Upper	3.0%	3.0%	3.0%	3.0%	Announced (289 MW)	Planned Wind, No NED 3, 600 Coal

2024 Futures Descriptions

Robust Economy	3.0%	3.0%	3.0%	3.0%	Upper
High Retirements	1.5%	1.5%	1.5%	1.5%	Lower
High Environmental	1.0%	0.8%	1.1%	1.1%	Lower
Slow Growth	0.5%	0.5%	0.5%	0.5%	Mid
DOE 20% Wind	2.0%	2.0%	2.0%	2.0%	Lower
Fuel & Inv. Limitations	1.3%	1.3%	1.3%	1.3%	Mid

Drivers	% Energy in ATC from Renewables	% Renewables Inside ATC	% Renewables Outside ATC	Natural Gas Price Forecast	Coal Price Forecast for New Units	Environmental Regulations	MISO MTEP09 Generation Portfolios Outside ATC
Lower	10%	50%	50%	-40%	-10%	\$0/ton for CO ₂ , 0% higher mercury costs	N/A
Mid ³	15%	35%	65%	NYMEX For 10 years Followed by EIA Escalation rate	MISO Central & West \$2.24 & \$1.88 per MMBTU, respectively, for 2024	\$25/ton for CO ₂ , 25% higher mercury costs	N/A
Upper	25%	25%	75%	50%	20%	\$44/ton for CO ₂ , 25% higher mercury costs	N/A

2024 Futures Descriptions

Robust Economy	Mid	Mid	Mid-Upper +25%	Upper	Low	Reference
High Retirements	Mid	Mid	Mid-Low -20%	Mid	Mid	Environmental
High Environmental	20.0%	Upper	Upper	Lower	Upper	Environmental
Slow Growth	Lower	Lower	Lower	Mid	Low	Reference
DOE 20% Wind	Upper	Upper	Mid	Lower	Mid	20% Wind
Fuel & Inv. Limitations	Mid	Mid	Mid-Upper +25%	Mid	Mid	Investment Limitation

2024 Load Growth

2024 Future	Inside ATC Growth (%)	Outside ATC Growth* (%)
Reference	~1.72%	~1.27%
Robust Economy	3.0%	3.0%
High Retirements	1.5%	1.5%
High Environmental	1.0%	1.1%
Slow Growth	0.5%	0.5%
20% Wind	2.0%	2.0%
Fuel & Investment Limitation	1.3%	1.3%
2024 Future	ATC 2024 Peak (MW)	MISO 2024 Peak** (MW)
Reference	17,354	141,209
Robust Economy	21,357	184,960
High Retirements	16,644	146,020
High Environmental	15,486	136,941
Slow Growth	14,066	124,487
20% Wind	18,095	157,053
Fuel & Investment Limitation	16,095	141,452

*Outside ATC Growth includes all non-ATC MISO companies

**MISO 2024 Peak Demand includes ATC companies



2024 Energy Growth

2024 Future	Inside ATC Growth (%)	Outside ATC Growth* (%)
Reference	~1.72%	~1.15%
Robust Economy	3.0%	3.0%
High Retirements	1.5%	1.5%
High Environmental	1.0%	1.1%
Slow Growth	0.5%	0.5%
20% Wind	2.0%	2.0%
Fuel & Investment Limitation	1.3%	1.3%
2024 Future	ATC 2024 Energy (GWh)	MISO 2024 Energy** (GWh)
Reference	93,016	710,456
Robust Economy	114,473	948,606
High Retirements	89,206	748,830
High Environmental	81,212	700,451
Slow Growth	75,387	638,372
20% Wind	96,979	810,558
Fuel & Investment Limitation	86,264	725,397

*Outside ATC Growth includes all non-ATC MISO companies

**MISO 2024 Energy includes ATC companies





2024 Small Coal Capacity Retirements within ATC

2024 Future	Coal Retirements (MW)
Reference	453
Robust Economy	Announced (289)
High Retirements	907
High Environmental	907
Slow Growth	453
20% Wind	907
Fuel & Investment Limitation	453



2024 Generator Additions within ATC (commission date after 2008)

- Nelson Dewey 3 was not included in any of the futures
- All futures include Weston 4 and Elm Road 1 and 2



2024 Generator Additions within ATC (commission date after 2008)

2024 Future	ATC Generator Additions (MW)			
	CT	Coal	Wind	Nuclear
Reference	600	1,200	575	0
Robust Economy	600	1,200	575	0
High Retirements	0	0	575	1,200
High Environmental	0	0	575	1,200
Slow Growth	0	0	575	0
20% Wind	600	0	575	0
Fuel & Investment Limitation	600	600	575	0



2024 % Energy in ATC from Renewables

2024 Future	% Energy from Renewables	Total Energy (GWh)	Target Capacity (MW)*
Reference	15%	93,016	3,838
Robust Economy	15%	114,473	4,723
High Retirements	15%	89,206	3,681
High Environmental	20%	81,212	4,468
Slow Growth	10%	75,387	2,074
20% Wind	25%	96,979	6,669
Fuel & Investment Limitation	15%	86,264	3,559

*Target capacity is calculated assuming a 41.5% capacity factor as obtained from the MISO monthly wind profile for Wisconsin.



2024 % Renewables Inside / Outside ATC

Each future contains a total of **1,014** MW of wind generation within ATC (existing + new)

2024 Future	Calculated Renewable Percentage Splits*			
	Inside ATC (MW)	Inside ATC (%)	Outside ATC (MW)	Outside ATC (%)
Reference	1,014	26%	2,824	74%
Robust Economy	1,014	21%	3,709	79%
High Retirements	1,014	28%	2,667	72%
High Environmental	1,014	23%	3,454	77%
Slow Growth	1,014	49%	1,060	51%
20% Wind	1,014	15%	5,655	85%
Fuel & Investment Limitation	1,014	28%	2,545	72%

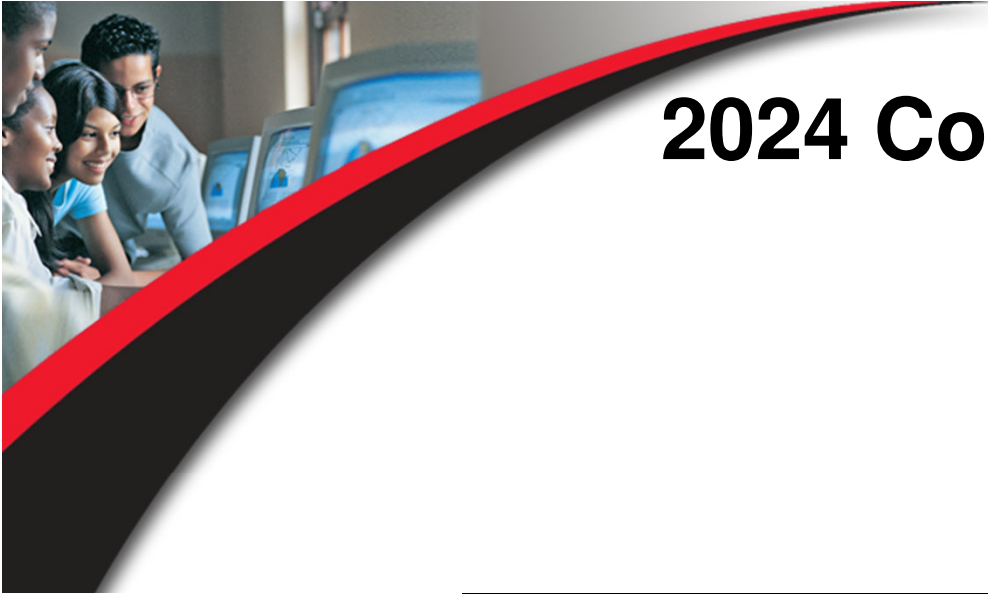
*Calculated based on Target Capacity and Internal Wind Generation (ATC = 1,014 MW)

**Robust Economy included an additional 2,832 MW of Wind Generation inside Wisconsin but assigned to other MISO companies (treated as an import)

***20% Wind included an additional 3,186 MW of Wind Generation inside Wisconsin but assigned to other MISO companies (treated as an import)

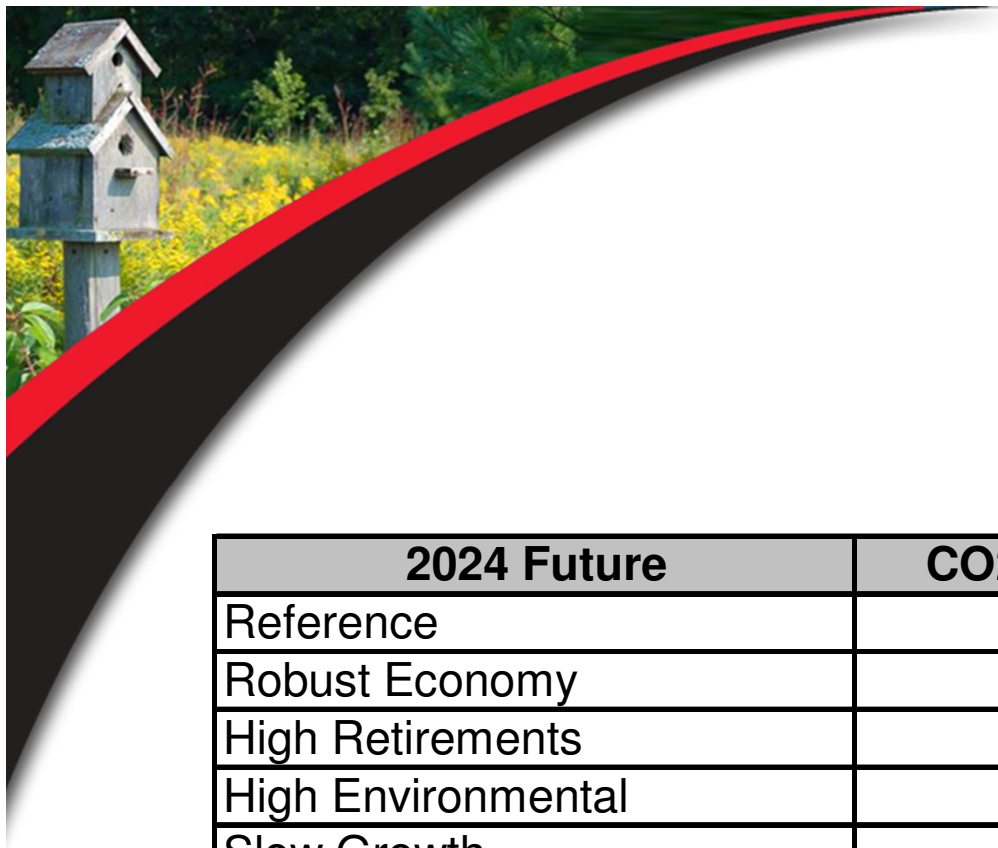
2024 Natural Gas Price Forecast

	Natural Gas Price Forecast (\$/MMBtu)											
2024 Future	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Reference	11.13	11.09	10.83	9.86	9.85	9.94	10.04	10.10	10.12	10.22	10.59	11.03
Robust Economy	13.91	13.87	13.54	12.33	12.31	12.42	12.55	12.62	12.65	12.78	13.23	13.79
High Retirements	8.91	8.88	8.67	7.89	7.88	7.95	8.03	8.08	8.10	8.18	8.47	8.83
High Environmental	16.70	16.64	16.25	14.79	14.77	14.90	15.06	15.14	15.18	15.33	15.88	16.55
Slow Growth	6.68	6.66	6.50	5.92	5.91	5.96	6.02	6.06	6.07	6.13	6.35	6.62
20% Wind	11.13	11.09	10.83	9.86	9.85	9.94	10.04	10.10	10.12	10.22	10.59	11.03
Fuel & Investment Limitation	13.91	13.87	13.54	12.33	12.31	12.42	12.55	12.62	12.65	12.78	13.23	13.79



2024 Coal Price Forecast for New Units

2024 Future	2024 Coal Price Forecast (\$/MMBtu)				
	MISO East	MISO Central	MISO West	MRO	PJM NICA
Reference	2.56	2.24	1.88	1.88	2.24
Robust Economy	3.07	2.69	2.26	2.26	2.69
High Retirements	2.56	2.24	1.88	1.88	2.24
High Environmental	2.30	2.02	1.69	1.69	2.02
Slow Growth	2.56	2.24	1.88	1.88	2.24
20% Wind	2.30	2.02	1.69	1.69	2.02
Fuel & Investment Limitation	2.56	2.24	1.88	1.88	2.24



2024 Environmental Regulations

2024 Future	CO2 Adder (\$/ton)	Mercury Adder (%)
Reference	\$25	25% higher
Robust Economy	\$0	0% higher
High Retirements	\$25	25% higher
High Environmental	\$44	25% higher
Slow Growth	\$0	0% higher
20% Wind	\$25	25% higher
Fuel & Investment Limitation	\$25	25% higher



2024 MISO MTEP09 Generation Portfolios Outside ATC

ATC started with the MISO MTEP09 Futures as a base point for developing the ATC Futures

2024 Future	Base MISO Future
Reference	Reference
Robust Economy	Reference
High Retirements	Environmental
High Environmental	Environmental
Slow Growth	Reference
20% Wind	20% Wind
Fuel & Investment Limitation	Investment Limitation



2024 ATC Generation Portfolio Modifications

- The ATC Futures used a variety of load growth assumptions; both higher and lower than the MISO assumptions
- A Workshop was hosted by ATC on August 22 to discuss the need for generation portfolio modifications in the PROMOD models
- No generation modifications were made to the Reference Future



2024 ATC Generation Portfolio Modifications

Robust Economy Generation Additions

- ATC Futures Load Growth Outside ATC: 3.0%
- MISO Reference Load Growth Assumptions:
 - MISO Central: ~1.26%
 - MISO East: ~0.82%
 - MISO West: ~1.60%
 - MRO: ~1.08%
 - ComEd: ~1.90%

Generation Type	Robust Economy Generation Additions (MW)				
	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	1,200	4,200	2,400	600	0
CT Gas	4,200	4,200	1,800	1,700	1,200
Nuclear	10,800	2,400	1,200	0	1,200
ST Coal	1,200	11,400	6,600	5,400	1,200
Wind	10,750	1,302	20,600	6,000	11,000
Total	28,150	23,502	32,600	13,700	14,600

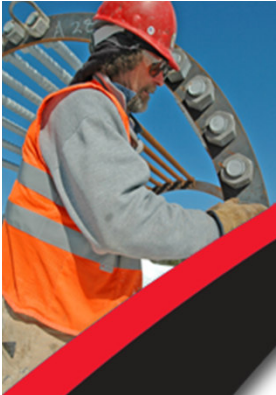


2024 ATC Generation Portfolio Modifications

High Retirements Generation Additions

- ATC Futures Load Growth Outside ATC: 1.5%
- MISO Environmental Load Growth Assumptions:
 - MISO Central: ~0.85%
 - MISO East: ~1.27%
 - MISO West: ~1.00%
 - MRO: ~0.81%
 - ComEd: ~1.43%

Generation Type	High Retirements Generation Additions (MW)				
	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	0	600	600	0	0
CT Gas	1,200	600	600	400	0
Nuclear	1,200	0	0	0	0
ST Coal	3,300	600	1,800	1,800	0
Wind	3,705	113	6,928	2,000	596
Total	9,405	1,913	9,928	4,200	596



2024 ATC Generation Portfolio Modifications

High Environmental Generation Additions

- ATC Futures Load Growth Outside ATC: 1.1%
- MISO Environmental Load Growth Assumptions:
 - MISO Central: ~0.85%
 - MISO East: ~1.27%
 - MISO West: ~1.00%
 - MRO: ~0.81%
 - ComEd: ~1.43%

Generation Type	High Environmental Generation Additions (MW)				
	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	0	0	0	0	0
CT Gas	600	-600	0	200	-600
Nuclear	0	0	0	0	0
ST Coal	1,200	-600	600	600	-600
Wind	1,340	0	1,294	1,000	-2,800
Total	3,140	-1,200	1,894	1,800	-4,000

2024 ATC Generation Portfolio Modifications

Slow Growth Generation Additions

- ATC Futures Load Growth Outside ATC: 0.5%
- MISO Reference Load Growth Assumptions:
 - MISO Central: ~1.26%
 - MISO East: ~0.82%
 - MISO West: ~1.60%
 - MRO: ~1.08%
 - ComEd: ~1.90%

Generation Type	Slow Growth Generation Additions (MW)				
	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	0	0	0	0	0
CT Gas	-1,800	-1,200	-1,200	-500	-1,800
Nuclear	0	0	0	0	0
ST Coal	-3,600	-1,200	-4,800	0	-1,200
Wind	-4,000	0	-7,000	-1,000	-12,000
Total	-9,400	-2,400	-13,000	-1,500	-15,000



2024 ATC Generation Portfolio Modifications

20% Wind Generation Additions

- ATC Futures Load Growth Outside ATC: 2.0%
- MISO 20% Wind Load Growth Assumptions:
 - MISO Central: ~1.26%
 - MISO East: ~0.82%
 - MISO West: ~1.60%
 - MRO: 1.08%
 - ComEd: 1.90%

Generation Type	20% Wind Generation Additions (MW)				
	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	0	1,800	600	0	0
CT Gas	1,800	1,800	600	600	0
Nuclear	0	1,200	0	0	0
ST Coal	3,300	3,600	1,200	1,800	0
Wind	10,964	20,614	7,000	6,000	1,000
Total	16,064	29,014	9,400	8,400	1,000



2024 ATC Generation Portfolio Modifications

Fuel & Investment Limitation Generation Additions

- ATC Futures Load Growth Outside ATC: 1.3%
- MISO Investment Limitation Load Growth Assumptions:
 - MISO Central: ~1.26%
 - MISO East: ~0.82%
 - MISO West: ~1.60%
 - MRO: 1.08%
 - ComEd: 1.90%

Fuel & Investment Limitation Generation Additions (MW)					
Generation Type	MISO - Central	MISO - East	MISO - West	MRO	ComEd
Combined Cycle	0	1,200	0	0	0
CT Gas	0	600	-1,200	200	-600
Nuclear	0	0	0	0	0
ST Coal	0	1,800	-1,200	600	-1,200
Wind	254	239	-4,000	600	-5,249
Total	254	3,839	-6,400	1,400	-7,049



Additional Modifications – Modeling Demand Response

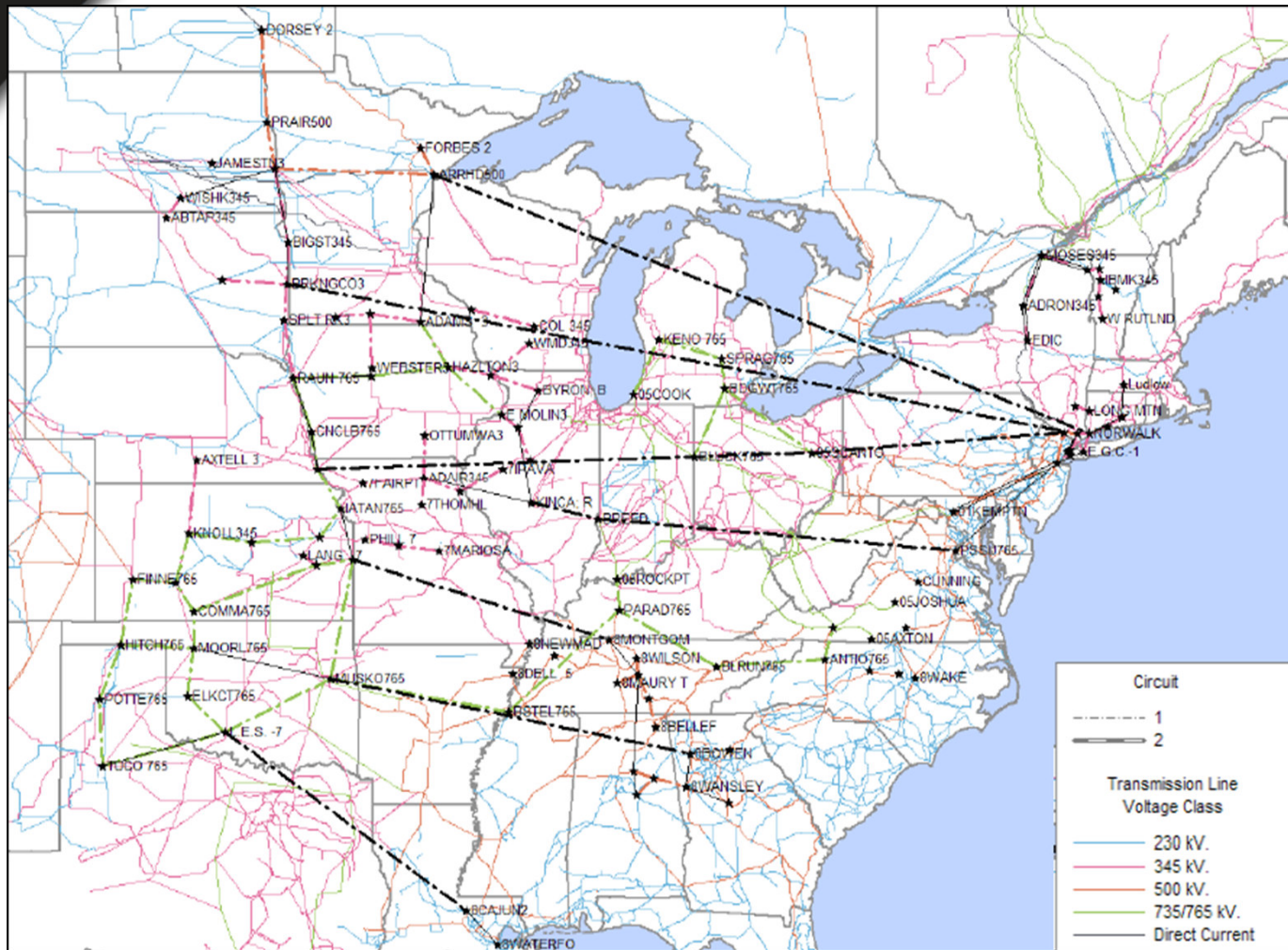
- New technique designed to mimic demand response on the ATC system
- Modeled a quick start unit at every load bus of >5 MW within ATC (716 total units)
- Priced high (\$1,324 in 2024) so units only run when absolutely needed (reliability) and don't run for economic purposes
- Parameters set to not contribute to spinning reserves



Additional Modifications – MISO Overlay

- MISO Overlays were added to all of the 2024 models
- The MISO Wind Overlay was added to the 20% Wind Future
- The MISO Reference Overlay was added to each of the other 6 Futures

Additional MISC

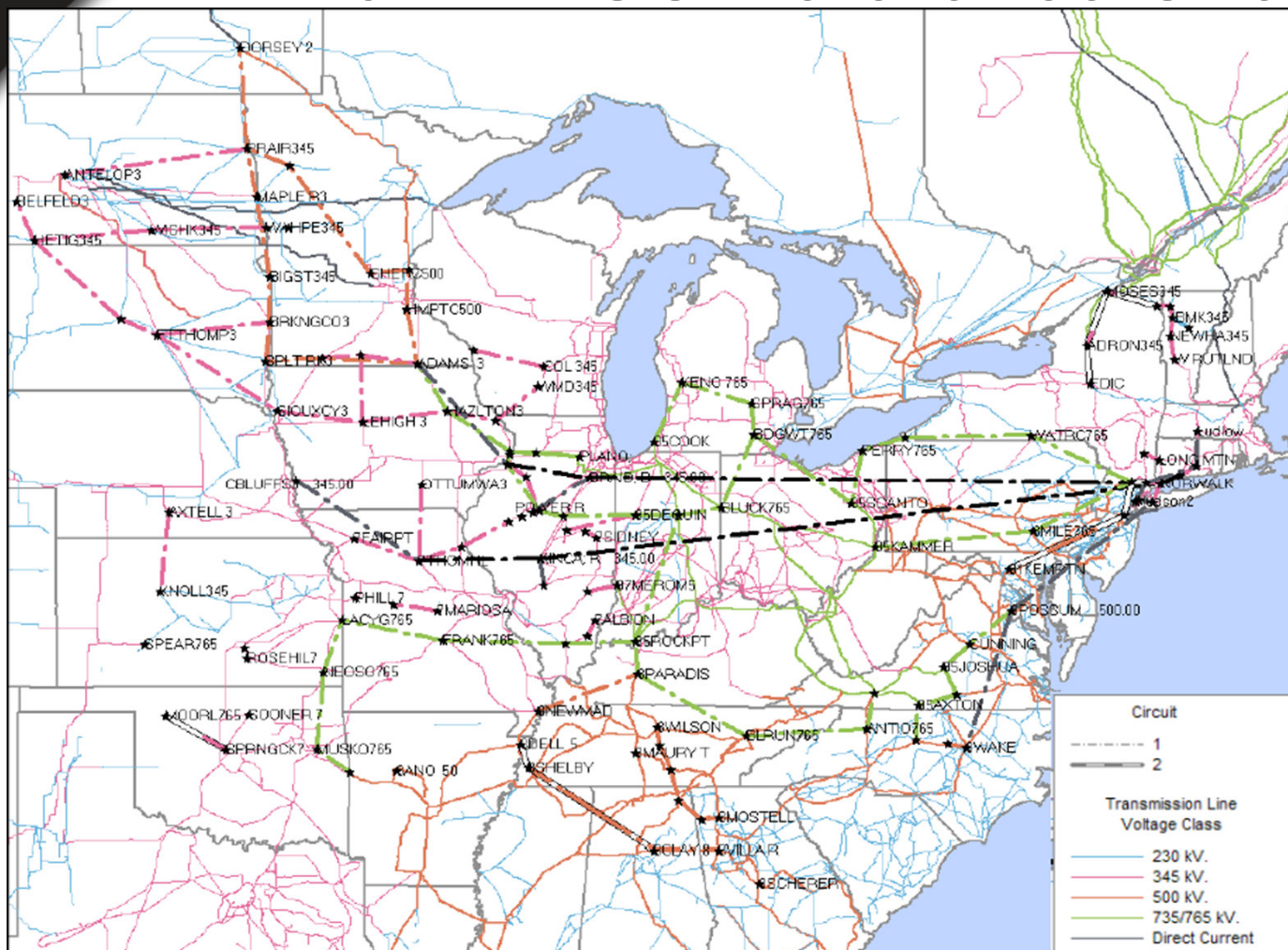


Map taken from the October 2 JCSP Workshop.

The 2 lines into Wisconsin have been removed for the ATC Futures analysis.



Additional Modifications – 2024 MISO Reference Overlay



Map taken from the October 2 JCSP Workshop.

The 2 lines into Wisconsin have been removed for the ATC Futures analysis.





Questions?

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