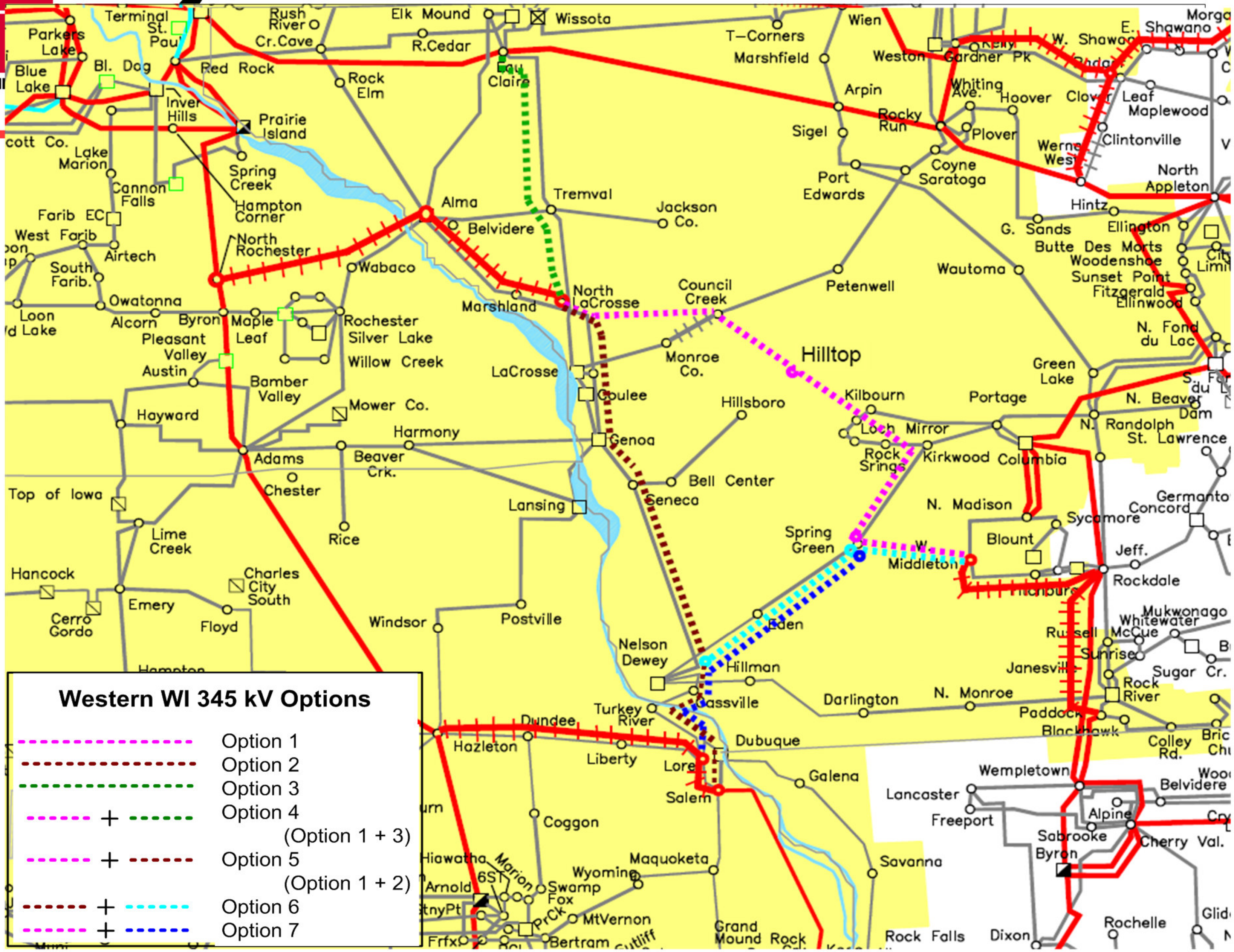
Western Wisconsin Study Update
ATC Stakeholders Meeting

ATC Planning

3-6-2009

Western Wisconsin Transmission Study

- Scope
  - Investigate the reliability needs in the western Wisconsin; investigate the transmission options that will address the identified needs. See figure on next page for the study area and the transmission options.
- Participants
  - ATC, Xcel, GRE, DPC, ITCM, SMMPA and MISO
- Progress status
  - The group has discussed study scope, modeling assumptions and transmission options; currently focusing on modeling issues.


Western WI 345 kV Options
Option 1
Option 2
Option 3
Option 4
(Option 1 + 3)
Option 5
(Option 1 + 2)
Option 6
Option 7
Hilltop
Terminal
St. Paul
Rush River
Cr.Cave
Elk Mound
R.Cedar
Wissota
T-Corners
Marshfield
Wien
Weston
Gardner Pk
W. Shawano
E. Shawano
Parkers Lake
Blue Lake
Bl. Dog
Red Rock
Rock Elm
Eau Claire
Inver Hills
Prairie Island
Arpin
Sigel
Rocky Run
Whiting Ave.
Hoover
Plover
Clintonville
Maplewood
Lake Marion
Spring Creek
Cannon Falls
Hampton Corner
Alma
Tremval
Jackson Co.
Port Edwards
Coyne Saratoga
North Appleton
Hintz
Farib EC
West Farib
Airtech
North Rochester
Belvidere
G. Sands
Ellington
Butte Des Morts
Woodenshoe
Sunset Point
Fitzgerald
Ellinwood
South Farib.
Wabaco
Wautoma
Owatonna
North LaCrosse
Council Creek
Petenwell
Loon Lake
Alcorn
Byron
Maple Leaf
Rochester
Silver Lake
Marshland
Pleasant Valley
Willow Creek
Monroe Co.
N. Fond du Lac
Austin
LaCrosse
Green Lake
Bamber Valley
Coulee
Kilbourn
Portage
N. Beaver Dam
Hayward
Mower Co.
Hillsboro
Randolph
St. Lawrence
Harmony
Genoa
Lock Mirror
Adams
Beaver Crk.
Rock Springs
Kirkwood
Columbia
Chester
Bell Center
Top of Iowa
Seneca
Lansing
N. Madison
Germantown
Concord
Sycamore
Lime Creek
Rice
Spring Green
Blount
W. Middleton
Jeff.
Rockdale
Hancock
Charles City South
Emery
Cerro Gordo
Floyd
Windsor
Postville
Eden
Mukwonago
Whitewater
Russell
McCue
Nelson Dewey
Sunrise
Hillman
Janesville
Sugar Cr.
Rock River
Cassville
Darlington
N. Monroe
Turkey River
Dundee
Hazleton
Paddock
Blackhawk
Colley Rd.
Dubuque
Liberty
Lore
Galena
Wempletown
Lancaster
Belvidere
Salem
Freeport
Alpine
Coggon
Sabrooke
Cherry Val.
Byron
Hiawatha
Marion
Maquoketa
Savanna
Arnold
Wyoming
Swamp Fox
MtVernon
Bertram
Grand Mound
Rock Falls
Dixon
Rochelle

UMTDI-RGOS Update
ATC Stakeholders Meeting

ATC Planning

3-6-2009

UMTDI Background

- UMTDI Executive Committee
  - One commissioner from each of five states
  - One representative from each of the governors' offices
  - IA, MN, ND, SD, WI
- Transmission Planning Working Group
  - Chaired by Chairman David Boyd (MN PUC)
  - Open to participation by all interested parties – two meetings thus far
  - Instructions to participants at Jan 30 meeting: "Work through your states to provide input on the plans – this may be your only chance to provide input"
- Cost Allocation Working Group
  - Chaired by Chairman Erik Callisto (PSCW)
  - Process still emerging – four working groups have been reduced to two or three

UMTDI Background

- Charge to Working Groups
  - Establish a plan that will guide and encourage the construction of interstate transmission to serve the states' commitment to cost-effective renewable generation while maintaining reliability.
  - Develop an equitable cost-sharing methodology
- Transmission Planning WG Inputs
  - MISO RGOS study
  - Input from transmission owners and stakeholders
  - Input from in-state meetings to the Executive Committee

UMTDI – Transmission Planning Working Group

- January 2009 – Initial (and only) meeting of the Transmission Planning Working Group – stakeholders told to provide input through individual states
- February 2009 – Individual state meetings; **MISO** provides indicative cost information for each plan to Executive Team; Executive Team reviews
- March 2009 – UMTDI Exec Team selects preferred strategy; **MISO** detailed design study plan by March 15th; progress meeting
- April-May 2009 – **MISO** conducts design studies
- June-July 2009 – Progress meetings to vet design projects and identify issues for further study
- August 2009 – Progress meeting
- September 2009 – **MISO's detailed transmission design studies** completed on feasible transmission projects; meeting to designate final design projects to UMTDI Executive Committee
- October 2009 – **MISO** includes agreed-upon transmission projects in MTEP 09; UMTDI Executive Committee reports to Governors.

RGOS – Next Steps of Process

- March 2009
  - Develop scope for Design ("Detail") stage of study
- March 2009
  - Next meeting for TO workgroup and Technical Review Group (TRG stakeholder)
- April-May 2009
  - **MISO** conducts Design studies
  - Power flow and PROMOD analysis
- June/July 2009
  - Result of RGOS Design stage complete
- September 2009
  - RGOS report

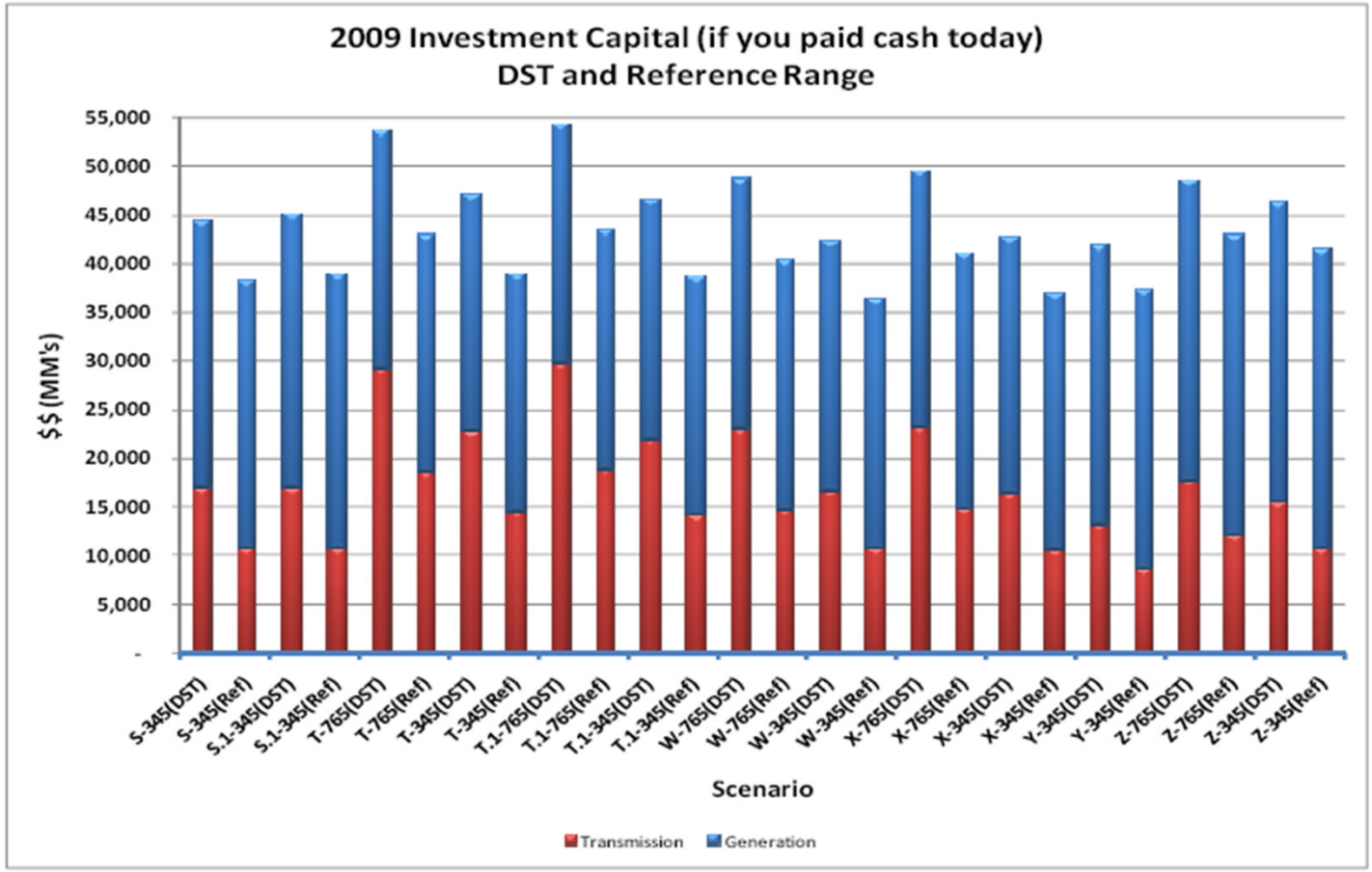
RGOS Indicative Costs

Indicative Scenario Results

- Range of key parameters across strategies
  - Transmission miles (345 kV, 765 kV and DC)
    - DST range: 4263 to 7095 miles
    - Reference range: 3197 to 5321 miles
  - $/MWH
    - DST range: $205 to $288
    - Reference range: $196 to $151
  - Installed costs, transmission and generation (2009 dollars, pay cash today)
    - DST range: $41,848,000,000 to $54,325,000,000
    - Reference range: $36,401,000,000 to $43,492,000,000
  - Cumulative net present value of revenue requirements (2018 dollars)
    - DST range: $118,109,000,000 to $153,325,000,000
    - Reference range: $71,916,000,000 to $84,908,000,000

MidwestISO
Energizing the Heartland

Indicative Costs



DST range: $41,848,000,000 to $54,325,000,000
Reference range: $36,401,000,000 to $43,492,000,000

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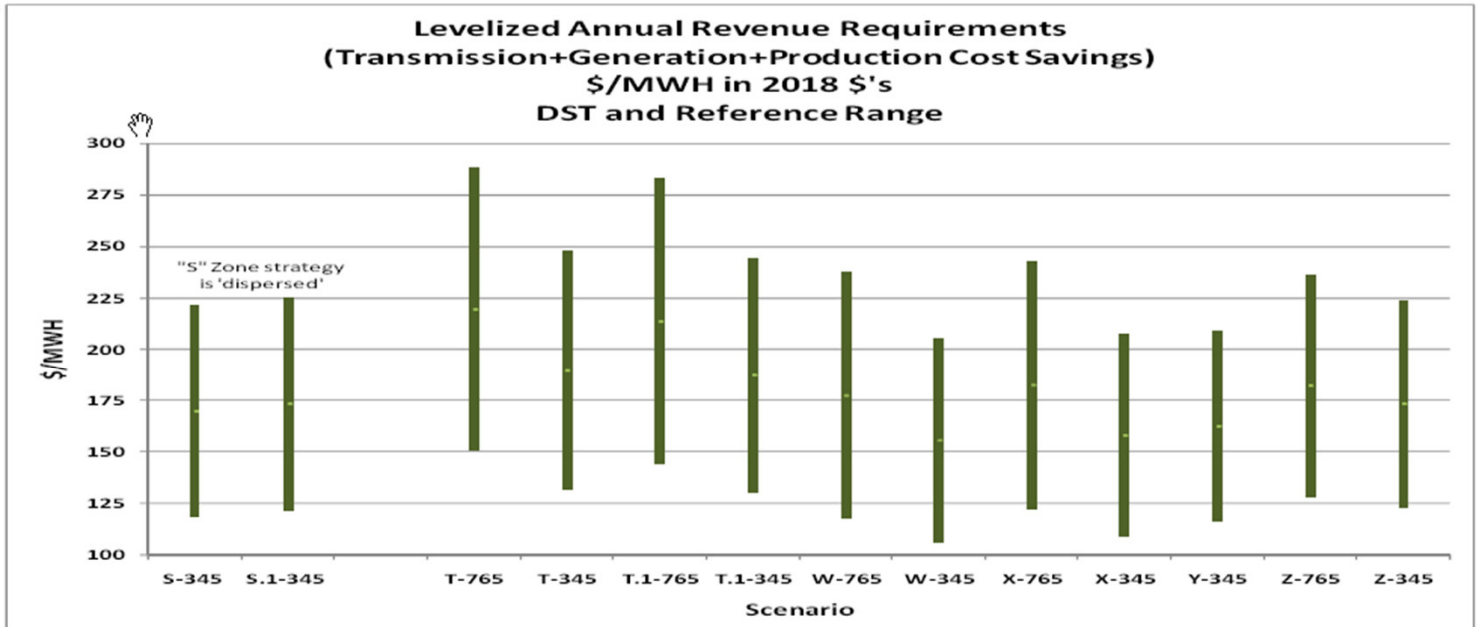
RGOS Indicative Costs



Strategy	Line Miles 345 kV	Line Miles 765 kV	Line Miles DC	+ Gen MW's	# Zones	Cost Range: Production Cost $/MWH	Cost Range: *Total $/MWH DST	Cost Range: *Total $/MWH Ref	Cost Range: ** Capital ($, MM) DST	Cost Range: ** Capital ($, MM) Ref
S-345	5170	0	0	13712	20	(38)	221	119	44,405	38,308
++S.1-345	5170	0	0	13541	19	(38)	225	121	45,063	38,966
T-765	2572	3162	0	12153	17	(25)	288	151	53,610	42,977
T-345	7095	0	0	12153	17	(27)	248	132	47,115	38,923
T.1-765	3092	2965	0	12245	18	(34)	283	144	54,325	43,492
T.1-345	6907	0	0	12245	18	(28)	244	130	46,611	38,677
W-765	2589	2321	0	12796	18	(47)	237	118	48,734	40,357
W-345	5383	0	0	12796	18	(42)	205	106	42,349	36,401
X-765	2601	2394	0	13131	18	(46)	243	122	49,496	41,133
X-345	5331	0	0	13131	18	(42)	207	109	42,682	36,896
Y-345	4263	0	0	14322	20	(36)	209	117	41,848	37,286
Z-765	3798	666	61	15387	22	(47)	236	128	48,539	42,958
Z-345	4305	0	61	15387	22	(47)	223	123	46,249	41,538

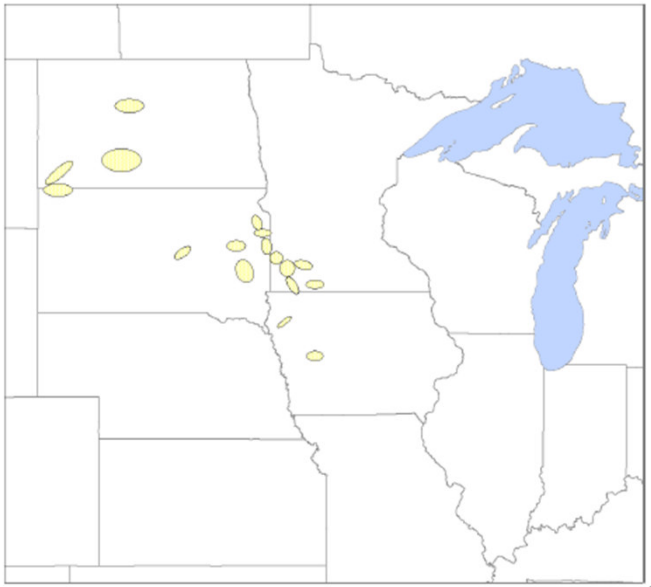
MidwestISO
Energizing the Heartland

* Transmission + Generation + Production cost (all 2018 $'s)
** 2009 Investment Capital (if you paid cash today): Transmission + Generation
+ MW's calculated from exact energy needed and capacity factor
++ Used 500 MW for Lake Michigan

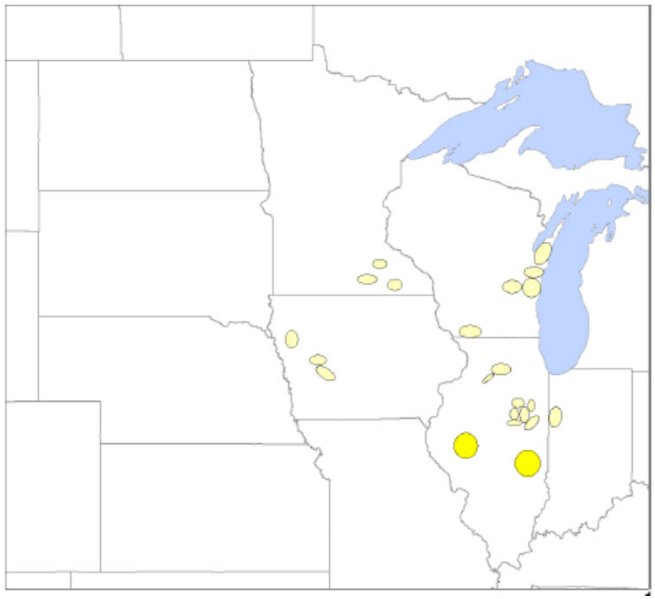
UMTDI/RGOS Plans

- MISO created Renewable Energy Zones
- MISO created seven Renewable Energy Zone scenarios ranging from West to East within 5-state region (labeled T through Z)
- Workshop in January with TOs to develop indicative plans for each configuration

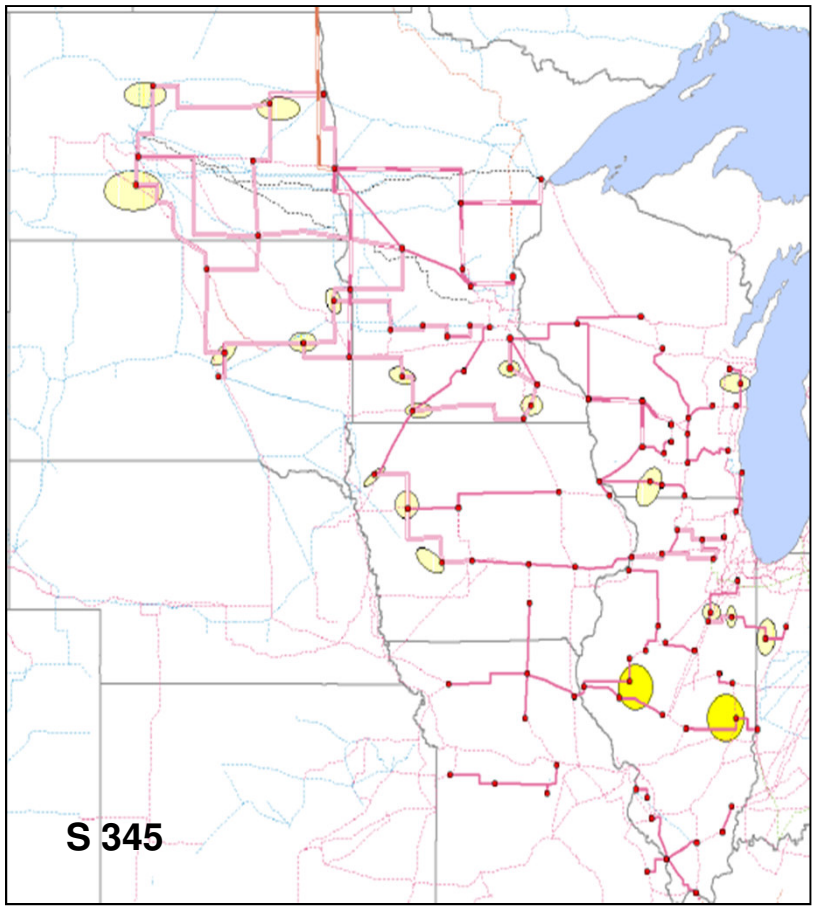
T Zones



Z Zones

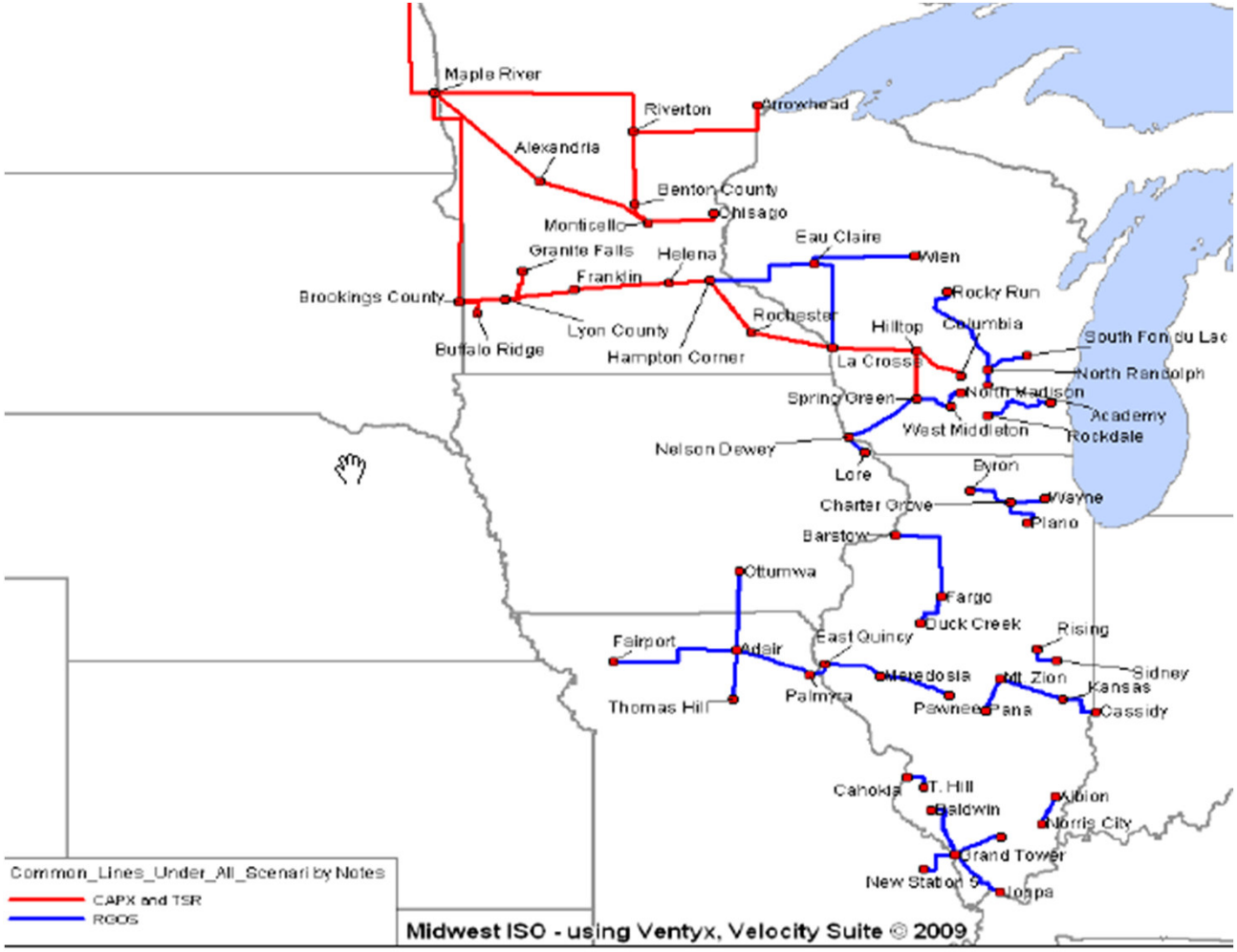


UMTDI/RGOS Plans

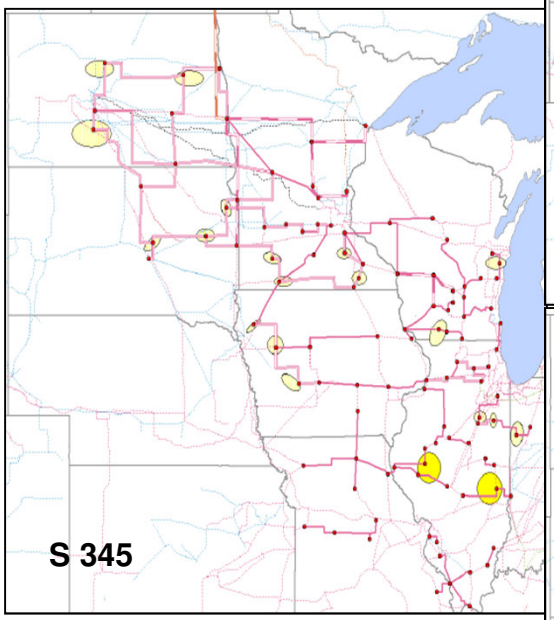


- MISO has added three more options
  - Stakeholder specified REZ configuration (S)
  - T.1 configuration moving some zones slightly east
  - May consider merits of ITC Green Power Express option in the Detail Stage

Lines Common to all RGOS Scenarios



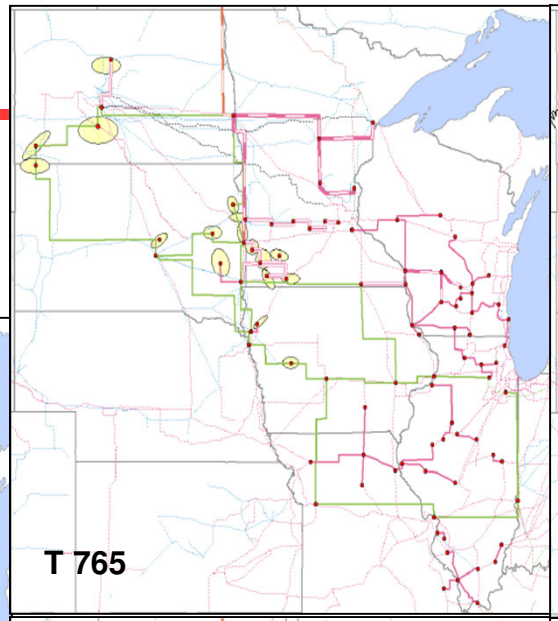
UMTDI diagrams for Scenarios S, T and T.1

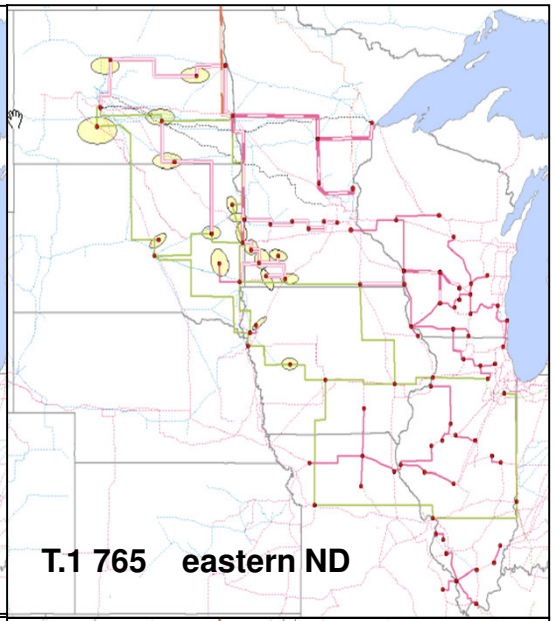


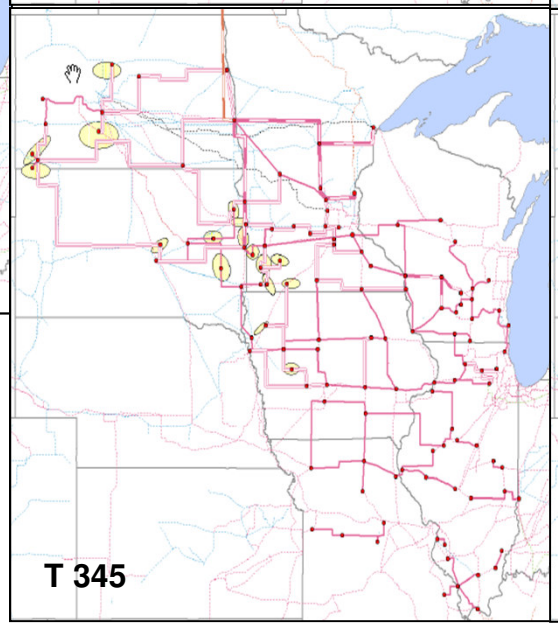
No Diagram

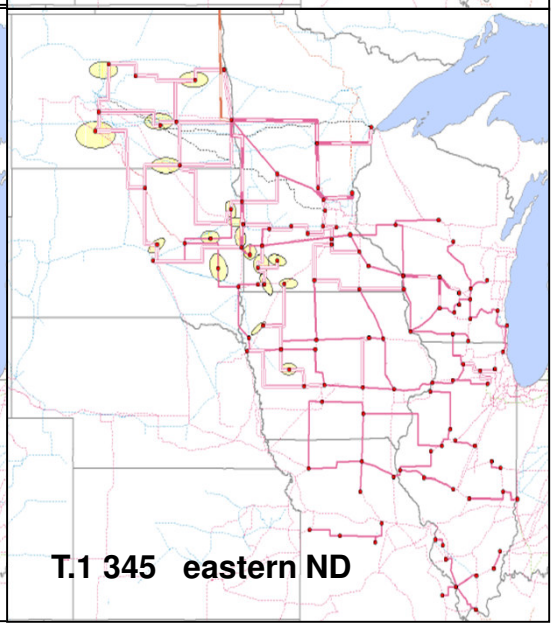
S.1 345

(replace a WI zone with a WI off-shore)

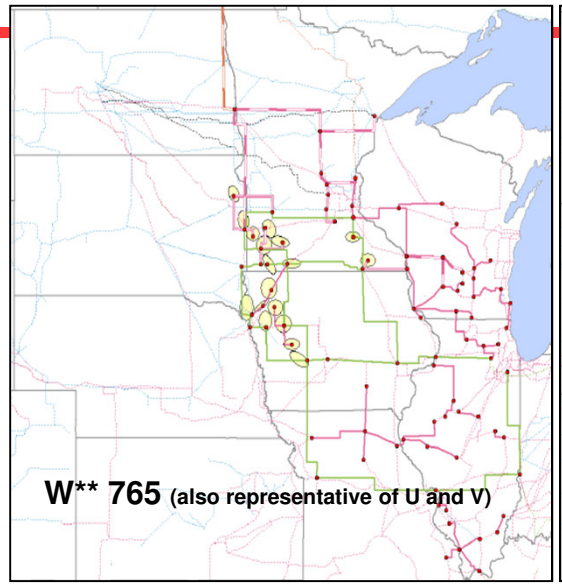


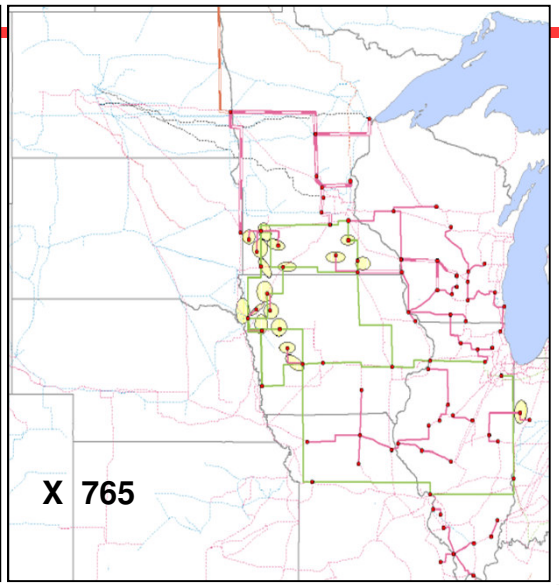


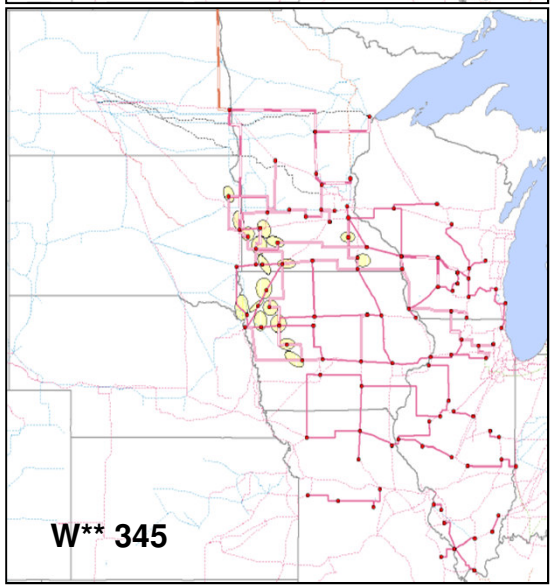


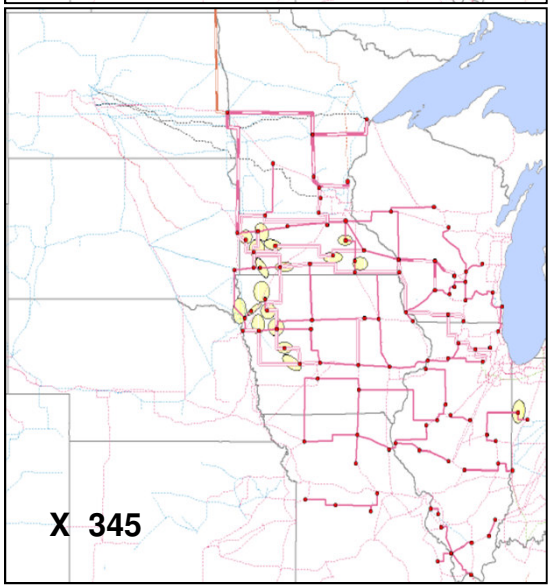


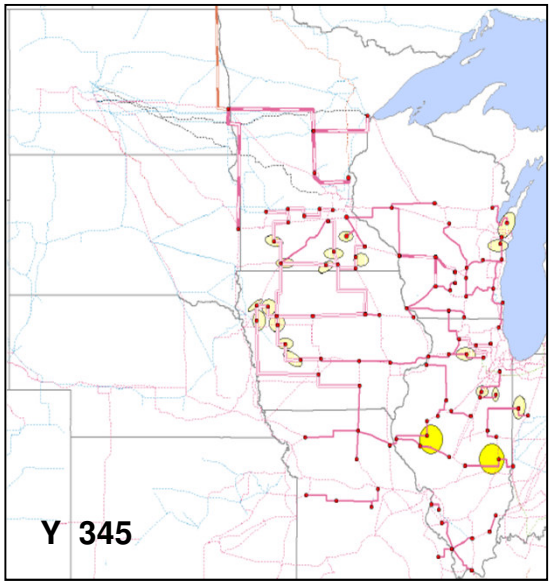
UMTDI diagrams for Scenarios W*, X and Y











UMTDI diagrams for Scenarios Y and Z and S