AMERICAN TRANSMISSION COMPANY

TEN YEAR TRANSMISSION SYSTEM ASSESSMENT

July 2002

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AMERICAN TRANSMISSION COMPANY
2002 TEN YEAR TRANSMISSION SYSTEM ASSESSMENT

EXECUTIVE SUMMARY

This report contains the Ten Year Assessment for 2002 (the "Assessment") of the transmission facilities owned and service territory encompassed by American Transmission Company ^{LLC} (ATC). ATC's Initial Assessment report was issued in June, 2001 and an Updated Assessment report was issued in February, 2002. This Assessment outlines the transmission system needs identified through the year 2011 based on information provided by the local distribution companies, the latest transmission service requirements, interconnection requests, recent analyses conducted by ATC and input from various stakeholders at ATC-sponsored meetings. This Assessment describes transmission system constraints identified in those analyses along with alternative and specific proposed transmission projects to mitigate those constraints.

This Assessment is intended to provide further foundation for continued discussions in the public arena on the transmission planning process, identified transmission needs and limitations, possible resolutions to those needs, and coordination with other public infrastructure planning processes. Specific opportunities for public participation in the planning process has and will, at a minimum, include periodic Planning Zone Meetings throughout ATC's service territory. In the future, ATC plans to issue an assessment annually each summer with updates, as needed, the following winter. Planning Zone Meetings will be held at least annually following issuance of the Assessment, with additional meetings and communications to be developed as the planning process evolves.

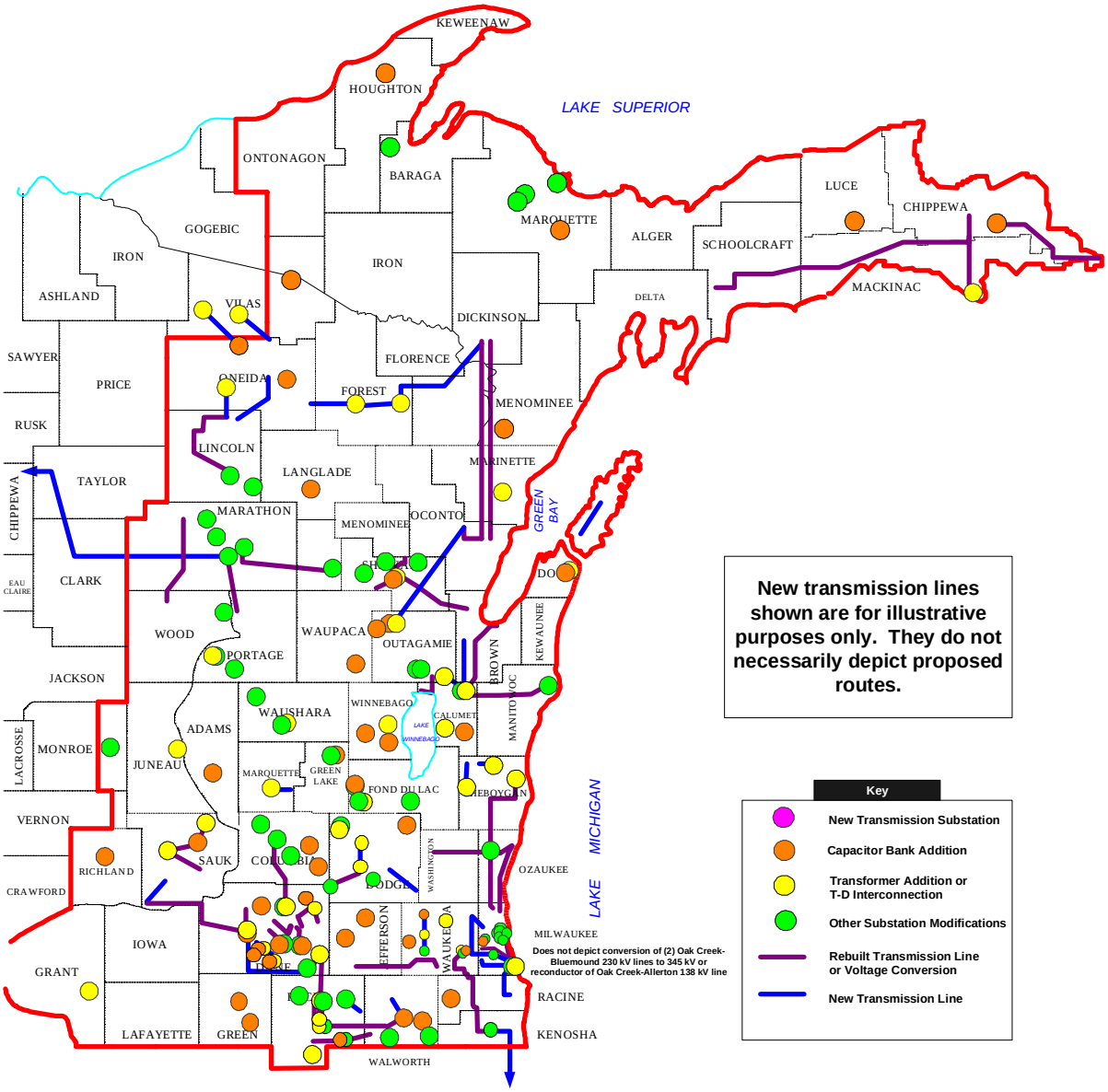
As detailed in this Assessment, there are various needs and limitations identified on the ATC transmission system which must be addressed in the near future. Many of the needs and limitations identified can be addressed with projects that involve equipment additions or replacements at existing substations. Several of the needs and limitations identified involve older transmission lines that can overload under contingency conditions. These lines are candidates to be rebuilt to increase their capacity and to address the aging facility issue. Several of the needs and limitations identified are of sufficient scope and complexity that they will likely require a more comprehensive solution, perhaps involving new transmission facilities.

In total, this updated Ten Year Assessment anticipates the following:

Summary of American Transmission Company's Transmission System Assessments		
	Updated 2001 Assessment (February 2002)	**2002 Assessment** (July 2002)
New Transmission Lines Requiring New Right-of-Way		
345 kV	5 lines / 340 miles	7 lines / 225 miles
161 kV	---	---
138 kV	10 lines / 95 miles	11 lines / 119 miles
115 kV	4 lines / 90 miles	4 lines / 51 miles
69 kV	2 lines / 12 miles	5 lines / 45 miles
Existing Transmission Lines to be Rebuilt, Reconductored or Uprated		
345 kV	4 lines / 90 miles	7 lines / 144 miles
138 kV	21 lines / 380 miles	35 lines / 610 miles
115 kV	4 lines / 95 miles	4 lines / 98 miles
69 kV	10 lines / 80 miles	11 lines / 44 miles
New Transformers to be Installed		
(# of transformers / total capacity)	32 transformers / 8,950 MVA	46 transformers / 12,030 MVA
New Capacitor Banks to be Installed		
(# of installations / capacity)	46 installations / 625 MVAR	54 installations / 995 MVAR

In addition, there are a number of needs and limitations identified in this Assessment for which specific solutions are not identified. In these instances, potential alternative solutions have been identified to provide a basis for further discussion with customers and stakeholders.

Figure ES-1
PROPOSED TRANSMISSION SYSTEM ADDITIONS
2002 THROUGH 2011



Section I

INTRODUCTION

This report contains the Ten Year Assessment for 2002 of the transmission facilities owned and service territory encompassed by American Transmission Company LLC. This Assessment outlines the transmission system needs identified through the year 2011 based on updated information provided by the local distribution companies, updated transmission service commitments, updated analyses conducted by ATC and input from various stakeholders at ATC-sponsored meetings. This Assessment describes transmission system constraints identified in those analyses along with transmission projects specifically identified to mitigate those constraints.

ATC conducted Planning Zone meetings during 2001 to describe its planning process and solicit input on the process and on potential projects and associated right-of-way needs identified in its Initial Ten Year Assessment issued in June. The Planning Zone meetings conducted during 2001 were as follows:

Zone 1; north-central Wisconsin	November 13	Stevens Point, Wis.
Zone 2; upper peninsula of Michigan and northern Wisconsin	August 7	Escanaba, Mich.
Zone 3; south-central/southwest Wisconsin and South Beloit Illinois	November 12	Madison, Wis.
Zone 4; northeast Wisconsin	August 8	Appleton, Wis.
Zone 5; southeast Wisconsin	July 18	Pewaukee, Wis.

At these meetings, stakeholders provided numerous comments and expressed a wide range of opinions regarding the summary of the initial Ten Year Assessment presented by ATC. This input was taken into consideration in the preparation of this Assessment and will continue to be considered in future work and planning process development.

While specific new transmission facilities are identified in this report to address certain needs and/or limitations, ATC will continue to solicit input on such proposed facilities from all interested parties before determining the ultimate solution for which ATC would pursue regulatory or other approval. While several projects planned for the next few years are considered preferred alternatives by ATC, projects planned beyond 2006, in general, should be considered as proxy solutions for resolving identified needs, and as a basis for additional discussion and refinement.

The needs and limitations identified in this Assessment are based on a current set of operational conditions, growth forecasts, proposed new generation and load interconnections, technical analyses, and customer and stakeholder inputs. Over time, new needs will appear and other needs may change. Transmission system conditions are fluid, and it is recognized that the transmission planning process must be able to respond to and incorporate changing needs and conditions. This process is iterative by nature, and

with this assessment the ongoing cycle of needs identification, analysis, public input and solution development continues.

Generation Interconnection and Transmission Service Developments

Since ATC issued its initial Ten Year Assessment in June 2001, approximately 20 studies have been completed by ATC in response to generation interconnection and associated transmission service requests. These studies have identified a number of transmission projects that will be required to grant the generation interconnections and transmission service requested. The transmission projects identified in these studies have been coordinated with load serving and other needs to insure that projects meeting all of these needs are being selected. In the tables in Sections IV and V summarizing the specific projects proposed, those projects driven by generation and/or transmission service requests are identified.

Midwest Independent System Operator

Another development since the Initial Assessment was issued in June 2001 is the startup of operations of the Midwest Independent System Operator (MISO). MISO is one of the Regional Transmission Organizations (RTO) conceived as a result of the Federal Energy Regulatory Commission orders governing operation of the nation's interconnected transmission systems. ATC is a member of MISO.

Reliability Organizations

ATC is also a member of the Mid-America Interconnected Network (MAIN). ATC's responsibilities as a member of MAIN are to participate in seasonal and longer term transmission system assessments, comply with applicable MAIN Guides for reliable operation of the transmission system, develop transmission system models of future years and seasons, and provide information related to these activities.

MAIN is one of nine reliability councils that comprise the North American Electric Reliability Council (NERC). NERC sets standards for reliable planning and operation of the transmission system and applies punitive measures for non-compliance (the "compliance program"). ATC participates in the NERC compliance program, striving to meet the planning and operating standards set by NERC.

ATC is an active participant in MAIN and NERC assessments of regional and eastern interconnection transmission systems. An example of this is the recently completed MAIN 2007 Summer Future System Study.

Coordination with Neighboring Utilities

Given the interconnected and interdependent nature of the transmission system, ATC cannot operate in a vacuum. Coordinated planning with neighboring utilities is a necessity to prudently plan changes and additions to the transmission system. ATC has initiated discussions with Commonwealth Edison, Dairyland Power Cooperative and Minnesota Power, and plans to initiate discussions with Northern States Power and Consumers Power. It is ATC's intent that these discussions will lead to joint evaluations of common system needs, constraints and alternative solutions, where appropriate. Participation in MISO's regional planning processes will facilitate additional coordination between utilities.

Transmission Planning Approach

The fundamental underpinnings of ATC's approach to transmission planning are customer need and public input. ATC intends to propose transmission options to resolve customer needs as expressed through load growth forecasts, new load interconnection requests, long term transmission service requests, generation interconnection requests, need for improved operational reliability, need for resolution of local and regional congestion, need for replacement of old facilities, need for increased operational efficiency, and so on. To facilitate acceptance and implementation of any proposed plans, ATC believes the public, including all stakeholders, must be invited to participate in an open, iterative, and interactive public planning process.

In order to design the most efficient and effective ways of meeting customer needs, ATC has developed a process encompassing four levels of planning: Base – Individual Issue, Second – ATC Planning Zone, Third – ATC System, Fourth – Regional/National. Needs and potential solutions are developed at each level and then vetted against those at the next level, until the most effective overall plans addressing the combined needs are developed. ATC performs the first three levels of planning for its area, and then works with MISO to incorporate resolution of fourth level issues identified through the broader regional planning process led by MISO. ATC is also an active participant in MAIN and NERC reliability assessments of regional and eastern interconnection transmission systems.

The results of ATC's ongoing planning activities are presented in its Ten Year Transmission System Assessment reports, issued approximately every six months in order to be responsive to the most current mix of needs and issues. The purpose of these reports is to illustrate identified needs and potential solutions. This provides the foundation for public discussion and participation in shaping the ultimate plans to be proposed. ATC then holds various public meetings and other communication activities to inform and interact with any interested stakeholders. Stakeholders include customers, public officials, regulators, environmental groups, and other members of the public. The idea is to go out to affected areas, present identified needs and justification for projects in each area, facilitate identification of the most acceptable routes for any new transmission, allow for development and consideration of any additional alternatives which interested entities may want to propose to address identified needs, and receive public input to incorporate into future revisions of proposed plans. Information received becomes an input into ATC's four level planning analyses. Communications activities are ongoing as the overall planning process continues through subsequent iterations.

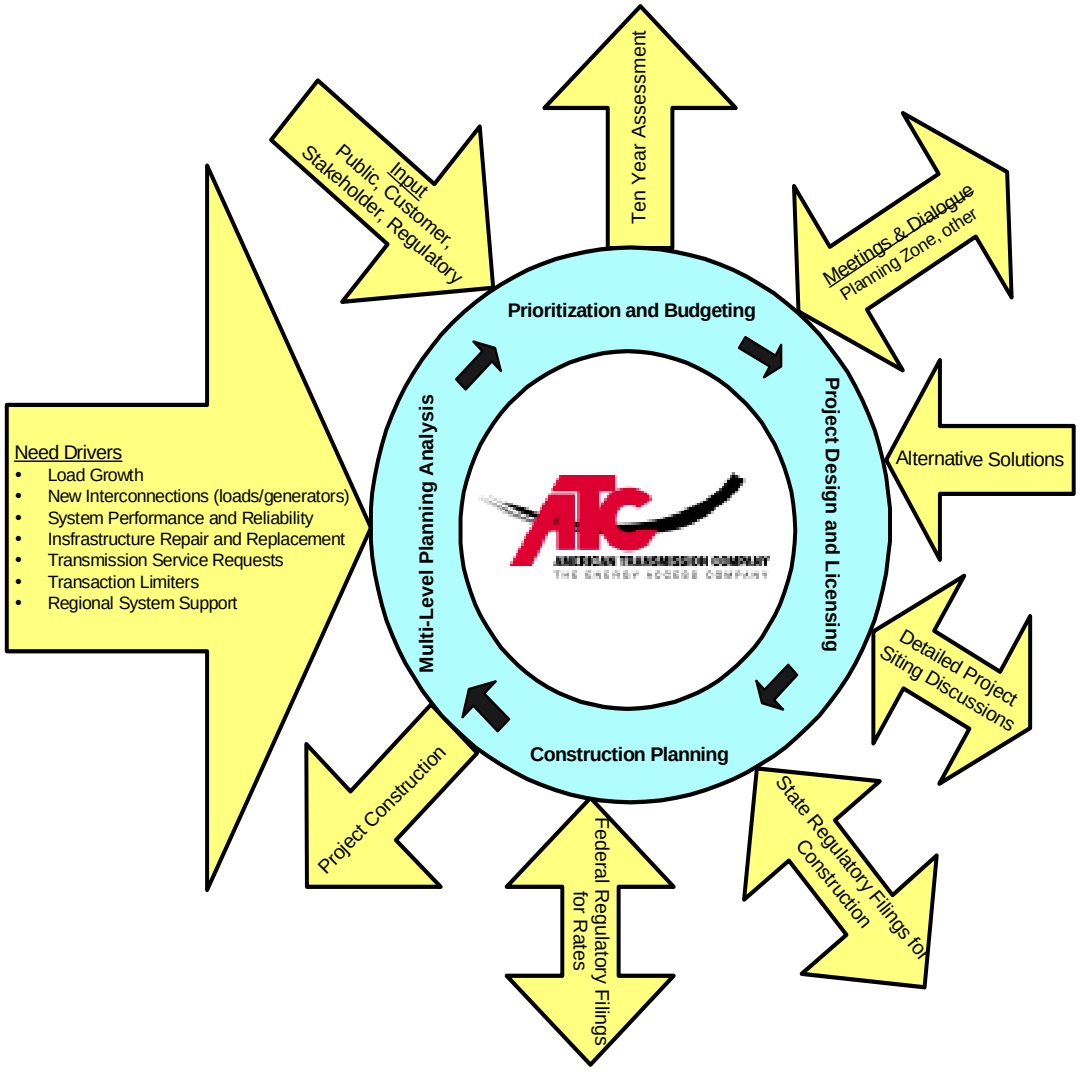
The planning, permitting, and construction cycle for transmission takes longer than for most alternative solutions. If identified needs are addressed effectively through alternative solutions, ATC will defer or cancel proposed transmission projects in response. If the needs remain, ATC will proceed with its projects, which have been effectively tailored through this iterative public input process. Public communication and discussion related to specific projects becomes more focused and targeted as necessary regulatory filing dates approach.

ATC intends to achieve its objectives of providing reliable service and an adequate transmission infrastructure to meet its customers' needs. This planning approach will make this achievement possible by facilitating development of the most effective mix of

projects to meet those needs in a timely fashion. Public participation in this process is vital to its success, as the best plans do no good unless they can actually be implemented, and implemented in time. Communicating openly, early, and repeatedly is the best way to achieve public awareness and acceptance of needs and solutions, and to illustrate responsiveness to public concerns which may otherwise prevent or delay necessary projects.

The figure below depicts ATC's planning process. The blue circle represents ongoing, continuous core ATC activities. Against that backdrop, there are constantly changing inputs and outputs which affect and shape the core activities, and ensure that ultimate project construction is responsive to the current mix of needs and influences.

Figure I-1
ATC's Public Planning Process



Environmental Philosophy and Commitment

ATC is continuing to increase the coordination between transmission planning and environmental planning. Environmental planning involves consideration of impacts, development of mitigation measures and involvement of all stakeholders.

ATC's environmental commitment is built upon its core values – service to our customers, honesty, social responsibility, stakeholder inclusion, financial and environmental sustainability, and respect for its employees and customers.

ATC is committed to environmental leadership in all aspects of our business. We seek to demonstrate this commitment through the following six actions:

- Comply with all applicable laws, regulations and orders.
- Reduce environmental impacts of construction, operation and maintenance through the use of innovative practices, cost-effective technologies, and, where appropriate, environmental mitigation and enhancement.
- Involve employees in environmental stewardship through job responsibilities and encouraging volunteerism.
- Provide employees the tools to participate in environmental stewardship through education and training.
- Address transmission-related environmental issues proactively with regulators and other stakeholders through partnerships and collaborative working relationships.
- Develop and implement an environmental appraisal process to ensure ATC continues to meet its environmental goals.

ATC supports sustainable environmental policies and actions through balancing environmental stewardship with financial, engineering and maintenance requirements, and societal impacts. Pairing our environmental commitment with partnerships among regulators, stakeholders and employees provides a powerful venue for creative, innovative and entrepreneurial resolution of issues. Environmental stewardship translates into good business with the implementation of these philosophies.

Changes to the 2002 Assessment

ATC has made numerous changes to this Assessment in comparison to its prior Assessments. These changes include:

- Incorporating environmental screening of new transmission line alternatives
- Providing statistics on generator redispatch requirements
- Providing statistics on transmission loading relief (TLR) incidents
- Figures depicting proposed generation interconnections and transmission/distribution substations

Section II

METHODOLOGY AND ASSUMPTIONS

This section of the Assessment describes the methods and techniques employed by the ATC in developing this report. The ATC conducted powerflow analyses to identify problems/constraints and to evaluate the merits of system alternatives.

Power Flow Cases

The ATC developed this updated assessment based on power flow cases representing summer peak periods in 2003 and 2009. The 2003 case was developed to evaluate near term needs and to verify findings in the 2001 Updated Assessment. ATC has taken the approach of evaluating the following summer peak season in its Assessments to determine the immediacy of needs identified, hence providing a means of prioritization. The 2009 case was developed as a long term case to evaluate long term needs and to confirm that needs identified in 2003 will increase over time. The year 2009 was selected for a number of reasons:

- It reflects a year sufficiently out in the future to assess long term needs.
- It reflects a year sufficiently out in the future to confirm impending near term needs identified in the 2003 analysis.
- It corresponds to the year that models are being developed for MAIN and NERC.
- It represents a future year in which large scale projects (new 345 kV lines, for example) could be expected to be in-service to address identified long term needs.

Powerflow Model Revisions

Various revisions were made to the powerflow models used in the Updated Assessment for 2001 due to new information available to ATC. The changes made to the powerflow models used for the Updated 2001 Assessment are described below:

2003 Summer Peak

- Utilized interconnection point load forecasts provided by various distribution companies in late 2001. Utilized EIA-411 reports for system-wide coincident peak loads. Projected peak load within ATC: 12,958 MW.
- Revised line and equipment ratings based on field investigations and line surveys.
- Revised system topology as appropriate.
- Removed Badger Power generation (IC001) and associated interconnection (see New Generation Assumptions)
- The model for the system external to ATC was taken from the NERC 2001 Series, 2003 Summer model.

In addition, the following projects were added based on ATC's expectation that they will be completed and/or placed in-service by June 2003:

Table II-1 Projects Expected to be In-Service by 2003 Summer	
Project	Zone
Added a 500 MVA, 345/138 kV transformer at Rockdale	3
Added a 47 MVA, 138/69 kV transformer at Kilbourn	3
Added 28.8 MVAR capacitor banks at Badger, White Lake and Werner 138 kV.	4
Added a 56 MVAR capacitor bank at Sussex 138 kV	5
Added a 500 MVA, 345/138 kV transformer at Cedarsauk	5
Added a 138 kV underground circuit between Haymarket and Center	5
Installed an 8 MVAR capacitor bank at Hodag	1
Installed capacitor banks at Gwinn, Land O' Lakes, Roberts and Talentino (zone 2)	2
Rebuilt the DeTour-Talentino Tap 69 kV line	2
Rebuilt the Cedar-Greenstone 69 kV line	2
Reconductored the Whitewater-Mukwonago 138 kV line	3 & 5
Constructed the Sunrise-McCue 138 kV line	3
Expanded the 345 kV switchyard at Columbia	3
Replaced the existing 138/69 kV transformer at North Beaver Dam	3
Replaced the existing 138/69 kV transformer at Russell	3
Uprated terminal equipment on Russell-McCue 138 kV line	3
Reconnected the NW Beloit 69 kV load to the Paddock-Blackhawk 138 kV line	3
Constructed a second Roosevelt-Wells 69 kV line	4
Constructed a 345 kV switchyard at Forest Junction and connected the existing Point Beach-Arcadian 345 kV line into the new switchyard	4
Installed two 345/138 kV transformers at Forest Junction	4
Rebuilt the Forest Junction-Highway V 138 kV line	4
Strung a new Forest Junction-Lost Dauphin 138 kV line	4
Uprated the Point Beach-North Appleton 345 kV line	4
Converted the Maplewood-Badger and Clintonville-Badger-Shawano W 115 kV lines to 138 kV	4
Uprated terminal equipment on the Forest Junction-Lake Park-City Limits 138 kV line	4
Rebuilt the Saukville-Granville double circuit 138 kV line	5
Uprated the Pleasant Prairie-Arcadian 345 kV line	5
Replaced 138 kV bus equipment at Bain	5

2009 Summer Peak

- Utilized interconnection point load forecasts provided by various distribution companies in late 2001. Utilized EIA-411 reports for system-wide coincident peak loads. Projected peak load within ATC: 15,167 MW (2,209 MW increase from 2003, representing an average annual compounded growth rate of 2.66%)
- The model for the system external to ATC was taken from the MAIN FSSG 2007 Summer model.
- In addition to the projects listed above for the 2003 case, the following projects were assumed to be completed and placed in-service prior to 2009:

Table II-2
Projects Expected to be In-Service by 2009 Summer

Project	Zone
Rebuilt/converted the Pine-Eastom 46 kV line to 115 kV	1
Constructed Skanawan-Highway 8 115 kV line	1
Constructed the Arrowhead-Weston 345 kV line	1
Installed a phase shifting transformer at Council Creek 69 kV	1
Installed 5.4 MVAR capacitor banks at Berlin and Ripon	1
Increase contingency rating of Whitcomb and Caroline 138/69 kV transformers	1
Rebuilt one of the Hiawatha-Indian Lake 69 kV lines to double circuit 138 kV	2
Uprated the Presque Isle-Freeman 138 kV line	2
Uprated the Freeman-Cedar 138 kV line	2
Uprated the Cedar-National 138 kV line	2
Uprated the Cedar-M38 138 kV line (zone 2)	2
Converted the Kilbourn-Reedsburg-Kirkwood 69 kV line to 138 kV	3
Construct the Fitchburg-Tokay-West Towne 69 kV line	3
Installed 345/138 kV transformer and 345 kV bus at North Randolph	3
Installed second 138/69 kV transformer at North Randolph	3
Installed capacitor banks at South Monroe, New Glarus and Burke 69 kV	3
Installed capacitor banks at Dickinson and Elkhorn 138 kV	3
Uprated Columbia-Portage 138 kV line	3
Installed second 138/69 kV transformer at Hillman	3
Converted the normally open Shawano East-Shawano West 34.5 kV bus tie to 138 kV and operate normally closed	4
Replaced the existing 138/69 kV transformer at Crivitz	4
Replaced the existing 138/69 kV transformers at Canal	4
Constructed a second Mullet River-North Mullet River 69 kV line	4
Install a second 138/69 kV transformer at Mullet River	4

- Assumed 600 MW of new generation and associated transmission reinforcements in Zone 1

- Assumed 453 MW of new generation and associated transmission reinforcements in Zone 3
- Assumed 75 MW of new generation in Zone 4
- Assumed 1,980 MW (net) of new generation and associated transmission reinforcements in Zone 5

The transmission reinforcements identified in generation interconnection and transmission service facility studies associated with the new generation above are described in Section IV and listed in Section V of this Assessment.

New Generation Assumptions

In the Initial Assessment for 2001, generation additions that were modeled reflected those proposed generation projects of which ATC had the most knowledge, had obtained regulatory approval or for which ATC had conducted generation interconnection studies. In the Updated Assessment for 2001, due to the volume and evolution of the various generation interconnection requests ATC received, more formal guidelines were established to determine which proposed generation should be modeled for that Assessment. The guidelines established for the Updated Assessment for 2001 considered construction status, status of generation interconnection studies, status of transmission service impact and facility studies and regulatory filings and/or approval. These guidelines, while an improvement over the method used for in the initial Assessment, resulted in significantly more new generation being added (over 6,000 MW) compared with load growth and which now appears to be an unrealistic scenario. Thus, ATC utilized the following criteria to establish which proposed new generation would be modeled in both the 2003 and 2009 cases:

- Those generation projects for which, at the time the models were developed, (i) the ATC has completed a generation interconnection study, a transmission service impact study and a transmission service facility study, and (ii) the generation developer or a customer of the developer has accepted the transmission service approved by ATC.

The criteria above result in the following proposed generation projects being included in the applicable powerflow models:

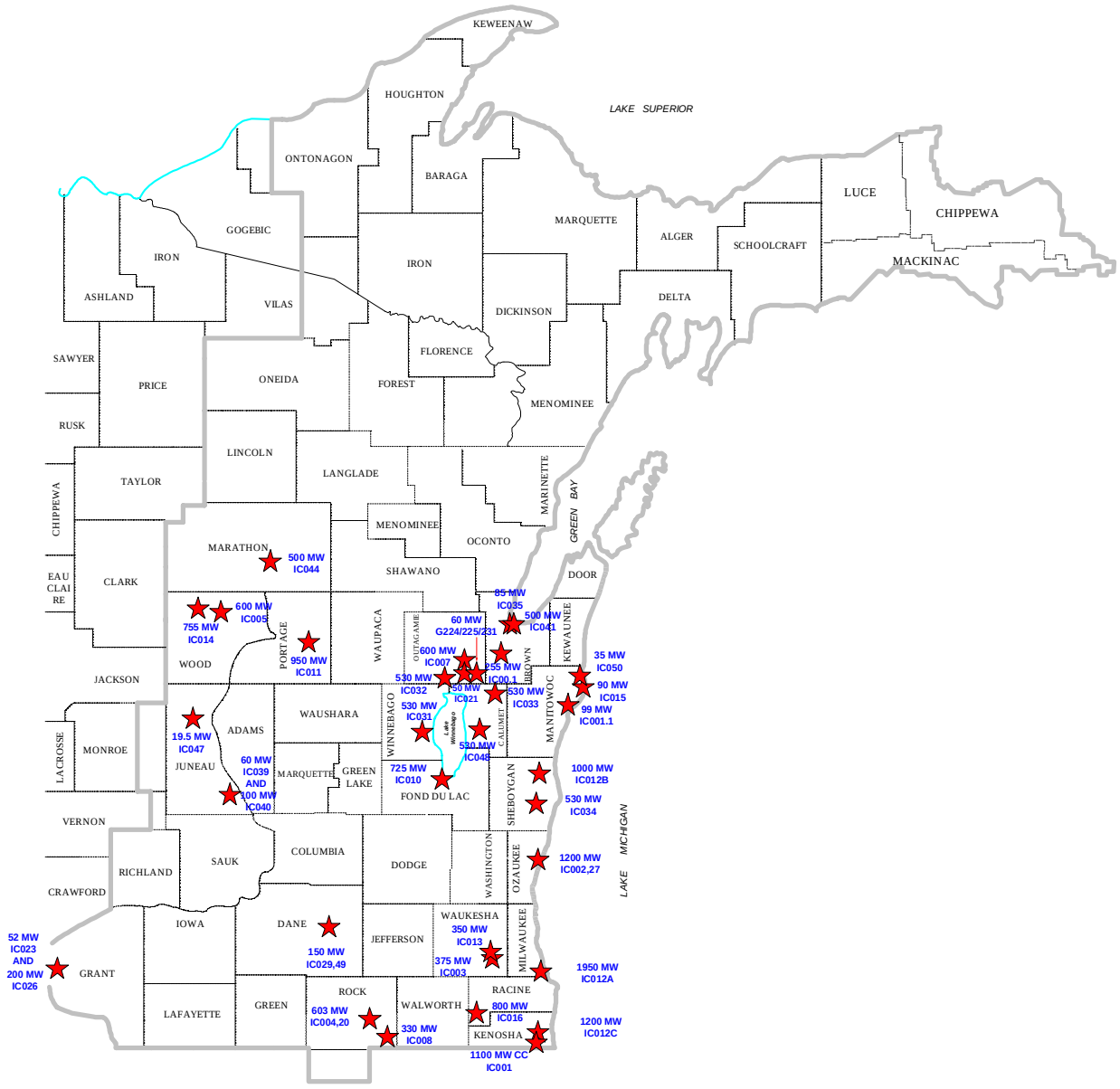
Plant Name/IC No.	Zone	Capacity	Assumed In-service
SkyGen DePere	4	75 MW (255 MW total)	2004
IC004	3	453 MW	2005
IC014	1	600 MW	2005
IC002	5	500 MW	2005
IC002 site retirements	*5*	*-320 MW*	*2005*
IC002	5	500 MW	2008
IC012	5	650 MW	2007
IC012	5	650 MW	2009
	Net Increase:	3,108 MW	

It should be noted that this list does not necessarily reflect what proposed new generation will actually be constructed, nor does it mean that projects not listed here are not viable. Future Assessments will continue to reflect the latest transmission service commitments for proposed generation.

The 75 MW addition at DePere does not meet the specified criteria for inclusion in this case, but was inadvertently left in the 2009 case.

A map showing all of the generation interconnection requests that ATC has received is provided in Figure II-1. A corresponding list of these interconnection requests is provided on ATC's web site.

Figure II-1
Generation Interconnection Requests



Assessment Development

This 2002 Assessment was developed in a chronological fashion. Committed and approved transmission additions expected to be in-service by June, 2003 were included in the 2003 model, as listed above. Projects for which ATC has completed its analysis and is either implementing, has filed an application to construct, or is in the process of preparing an application were included in the 2009 models (see discussion of *2009 Summer Peak* in Power Flow Model Revisions section above).

The needs identified in this Assessment were determined by identifying facilities whose normal or emergency ratings or tolerances are exceeded. The criteria ATC uses to determine what these ratings and tolerances should be based on was developed over the course of 2001. This planning criteria is provided in Appendix B. Among these criteria, the system performance criteria used by the ATC in identifying needs, limitations and problems included the following:

- Any transmission facility that experienced loading in excess of its normal rating under normal system conditions,
- Any transmission facility that experienced loading in excess of its emergency ratings under single contingency conditions,
- Any bus that experiences a voltage more than 5% greater or less than the nominal bus voltage under normal system conditions,
- Any bus that experiences a voltage more than 10% greater or less than the nominal bus voltage under single contingency conditions, and
- Any facility that routinely shows up as a limiter to granting firm transmission service.

The system performance criteria in Appendix B also include criteria for transient stability of generators and system voltage stability. ATC conducts transient analyses to evaluate generator transient stability as part of its study of new generation interconnections and voltage stability analysis on portions of the system where severe low voltages are identified. In instances where these stability criteria were not met, projects were devised and included in this Assessment. ATC also conducts short circuit analyses as part of its study of new generation interconnections to evaluate the adequacy of circuit breakers on the transmission system. In instances where circuit breakers are found to be overdutied, replacements are included in this Assessment.

Environmental Considerations

In addition to the technical and operational factors listed above, environmental considerations associated with alternative solutions identified in the analysis have been taken into account in this Assessment. Screening level assessments of new transmission line alternatives have been incorporated and are provided in Section VI of this Assessment.

Environmental issues are centered around land use; rivers, streams and wetlands; and threatened, endangered and special concern species. Issues may involve state and federal agencies as well as stakeholder organizations. As planning progresses for specific projects and routes, these considerations will be investigated further to identify potential impacts and mitigation measures. ATC will work with state and federal resource agencies to help identify issues for each specific project.

CBM Planning

Capacity Benefit Margin (CBM) is a concept used in the electric utility industry to describe the amount of transmission transfer capability that may be reserved to ensure that load can adequately be served. NERC planning standards specify that if transmission service providers reserve CBM as part of evaluating transmission service requests, those providers must plan for that CBM accordingly. Determining an appropriate amount of CBM to be reserved may be done using probabilistic techniques (loss of load expectation) or deterministic techniques (loss of largest unit), though the probabilistic approach is the standard method advocated by NERC and MAIN.

The FERC is currently developing policy on market models that includes how CBM requirements are determined and applied. ATC intends to comply with the FERC model as it is developed.

On the ATC system, CBM is reserved on various parts of the system ("flowgates") and accounted for in transmission service evaluation studies. Currently, as limitations are discovered in the transmission service evaluation studies, these limitations are taken into account in the development of alternatives to address other load serving issues.

Generator Redispatch

"Redispatch" refers to the need for certain generators to operate during certain periods in order to avoid interrupting power purchases for which the buyer has reserved firm transmission service and to insure that system security is maintained. Within the ATC system, redispatch is done only for network resources – power plants and power purchases that are dedicated to load served within the ATC system. Since the redispatched generators are operated out of economic dispatch order, ATC customers incur a cost during each redispatch incident. ATC monitors redispatch incidents to determine whether transmission system reinforcements to eliminate the need for such incidents are justified based on the economics of the redispatched generators operated out of economic dispatch order or system security.

As shown in the summary of dispatch cost below, the costs incurred for redispatch incidents to date were not considered significant enough to justify the cost of the transmission reinforcements that would be necessary to eliminate the need for the redispatch incidents. In this Assessment, no specific analyses of potential future redispatch requirements were conducted. Such analyses are conducted annually.

Summary of ATC Redispatch Charges

Calendar Year 2001, by month

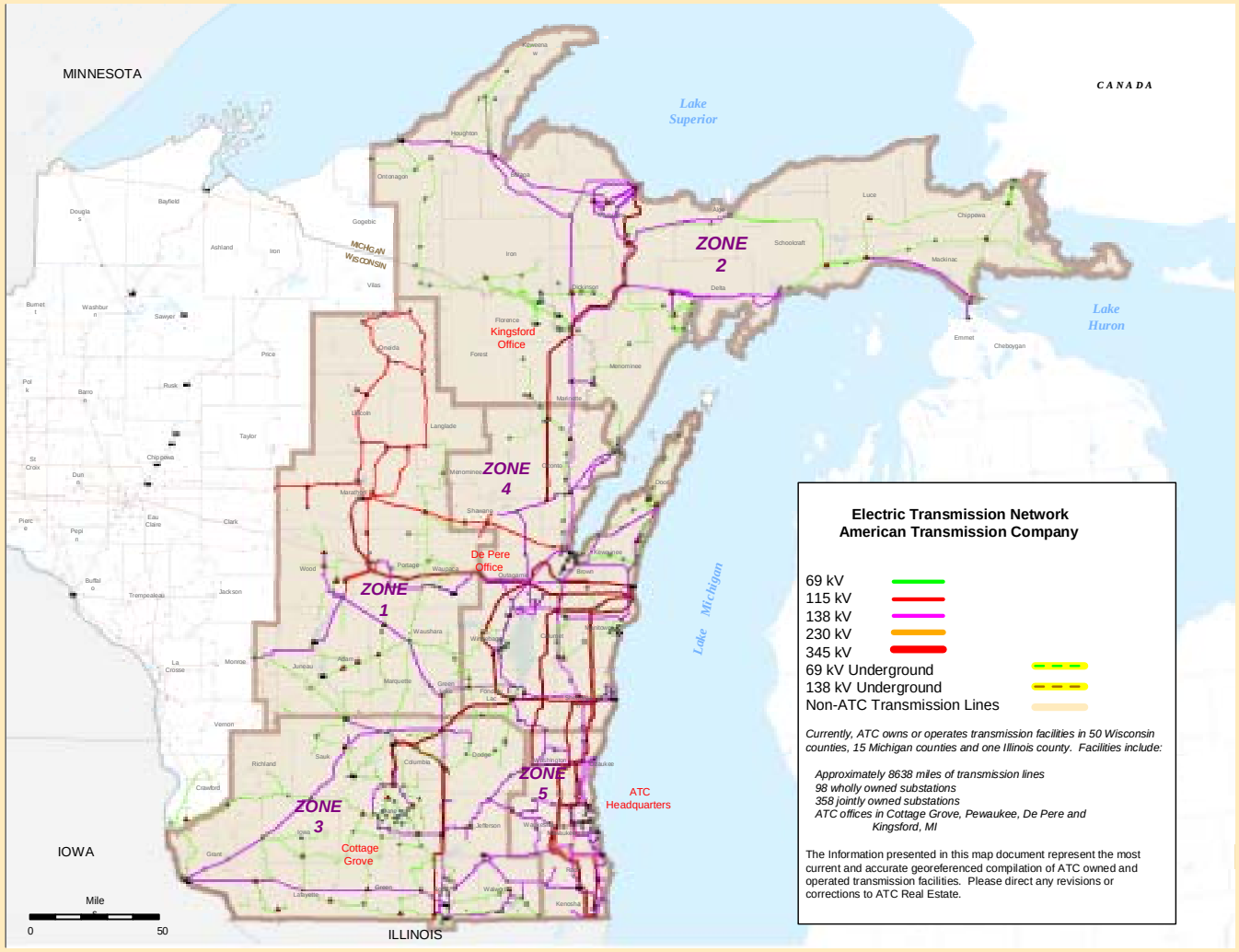
Month		Amount
January	$	192,867
February	$	190,922
March	$	603,596
April	$	106,818
May	$	31,269
June	$	7,128
July	$	22,570
August	$	42,257
September	$	457,199
October	$	933,298
November	$	267,050
December	$	55,968
Total Costs:	**$**	**2,910,942**

Section III

DESCRIPTION OF PLANNING ZONES

ATC utilizes the concept of planning zones in its Assessment of the transmission system within its service territory. Five planning zones have been defined representing distinct areas within which needs are compiled and assessed. As described in Section I, zone level planning is one of four levels at which transmission system needs are assessed. ATC's five planning zones are shown in Figure III-1. Following is a description of each zone, including location, population centers, primary electricity users, key bulk power facilities and key transmission system considerations.

Figure III-1
Planning Zone Boundaries



Zone 1

The physical boundaries of Zone 1 and transmission facilities located in Zone 1 are shown in Figure III-2. Land use in Zone 1 is largely rural, including agricultural and forested areas. Wausau, Marshfield, Wisconsin Rapids and Stevens Point represent the primary population centers in Zone 1. Most of Zone 1 typically experiences peak demands during the summer months with some winter peaks appearing in the northern portion. Primary electricity users in Zone 1 include a number of large paper mills and food processing plants.

Key transmission facilities in Zone 1 include the Arpin-Rocky Run-North Appleton 345 kV line, the Weston-Rocky Run 345 kV line, the 115 kV network in the northern portion of Zone 1 and the 138 kV and 69 kV facilities in the southern portion of Zone 1.

Key system performance issues in Zone 1 include:

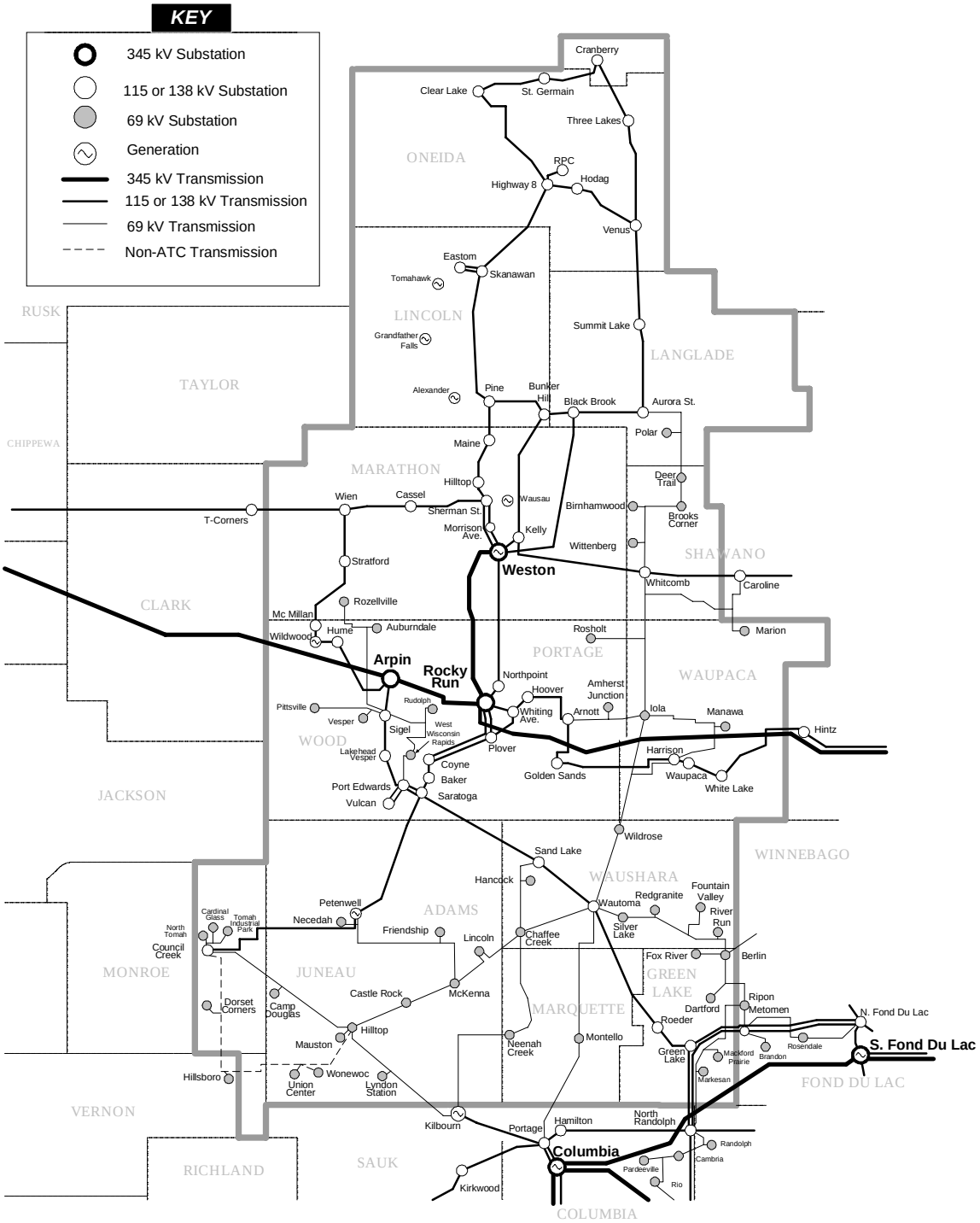
- The load serving capability of the 115 kV loop in northern Zone 1 (a.k.a., Rhinelander Loop), including voltage stability
- The load serving capability of the 138 kV and 69 kV network in southern Zone 1
- Reclosure angle on the Eau Claire-Arpin 345 kV line. This issue currently limits the allowable flow on this line. Stability issues can come into play if the reclosure angle is too large after a trip of this line.
- Operating guides for lower voltage facilities for loss of either the Eau Claire-Arpin or Arpin-Rocky Run 345 kV lines. In particular, the Monroe County-Council Creek 69 kV line and the T Corners-Wien 115 kV line are susceptible to tripping for loss of the Eau Claire-Arpin 345 kV line. For the loss of the Arpin-Rocky Run 345 kV line, the 138 kV system south of Arpin and the 115 kV system north of Arpin are susceptible to overloads. These conditions strain the load serving capability of the network in Zone 1.
- The outage of the Weston Unit 3 generator can result in potential voltage collapse and system instability in the area.
- At least three large potential generation projects have requested interconnection studies in Zone 1. The magnitude of the generation is such that there could be significant impacts on the system in the area, that is, the need for additional transmission outlets to accommodate this potential generation. Potential transmission facilities to accommodate these projects are identified later in this report. However, additional analyses will be required to address the impact of these proposed projects should they come to fruition.

Zone 2

The physical boundaries of Zone 2 and transmission facilities located in Zone 2 are shown in Figure III-3. Land use in Zone 2 is largely rural and heavily forested. Zone 2 typically experiences peak demands during the winter months. Ore mining and paper mills are the largest electricity users in the zone.

Key transmission facilities in Zone 2 include the Morgan-Plains-Dead River 345 kV line, the Plains-Stiles 138 kV line and the 138 kV facilities tying the upper peninsula of Michigan to the lower peninsula.

Figure III-2
Zone 1 Existing Transmission Facilities



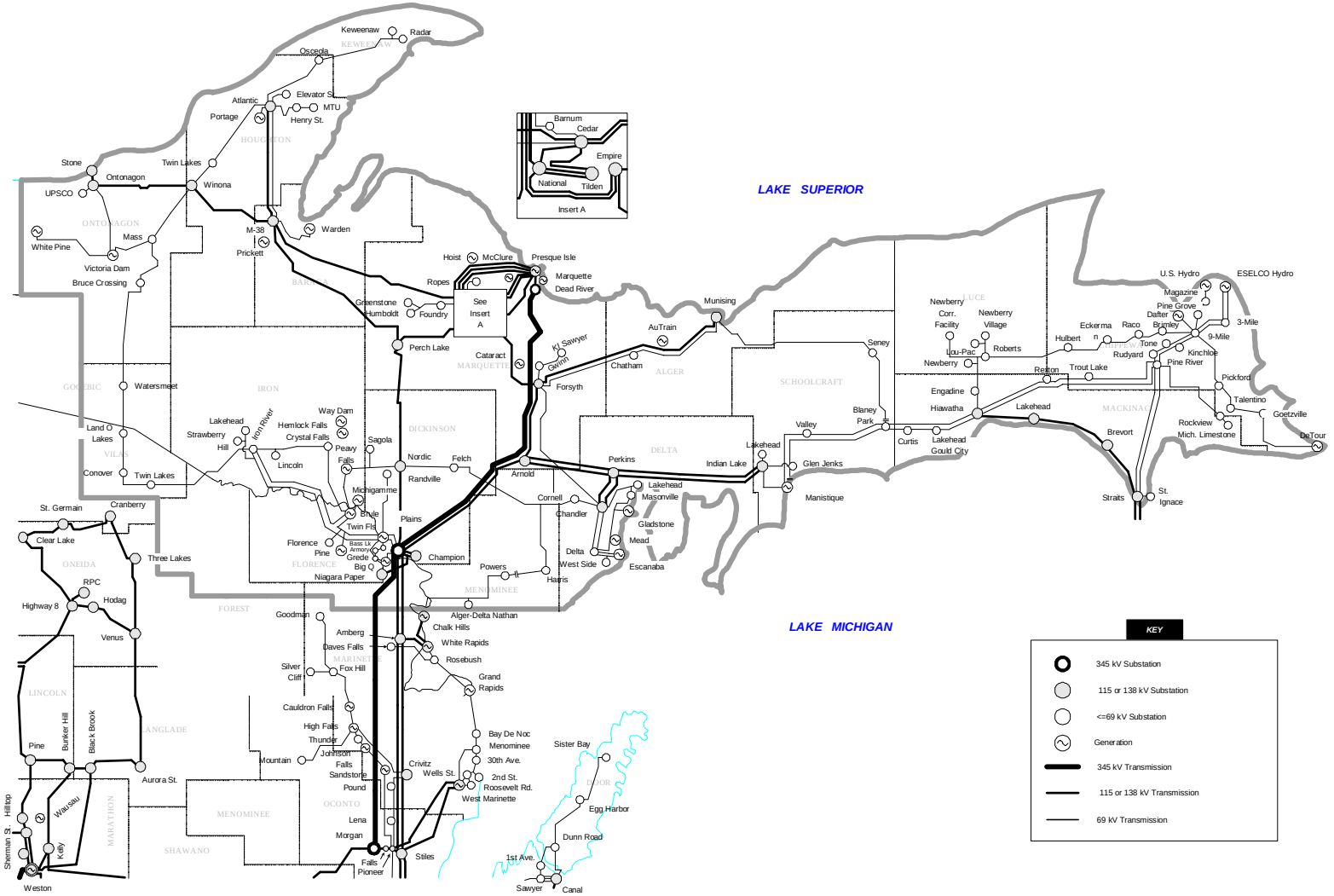


Figure III-3
Zone 2 Existing Transmission Facilities

Key system performance issues in Zone 2 include:

- Limited import and export capability
- An aging 69 kV and 138 kV infrastructure throughout the upper peninsula
- Generator stability
- Parallel path flow around Lake Michigan that imposes heavy loading on the 138 kV and 69 kV systems causing TLRs and requiring reconfiguration of the system
- Low voltages, most pronounced in the western U.P.

In addition, the basis for a number of transmission facility ratings also needs verification. The effort to verify these ratings is underway.

Zone 3

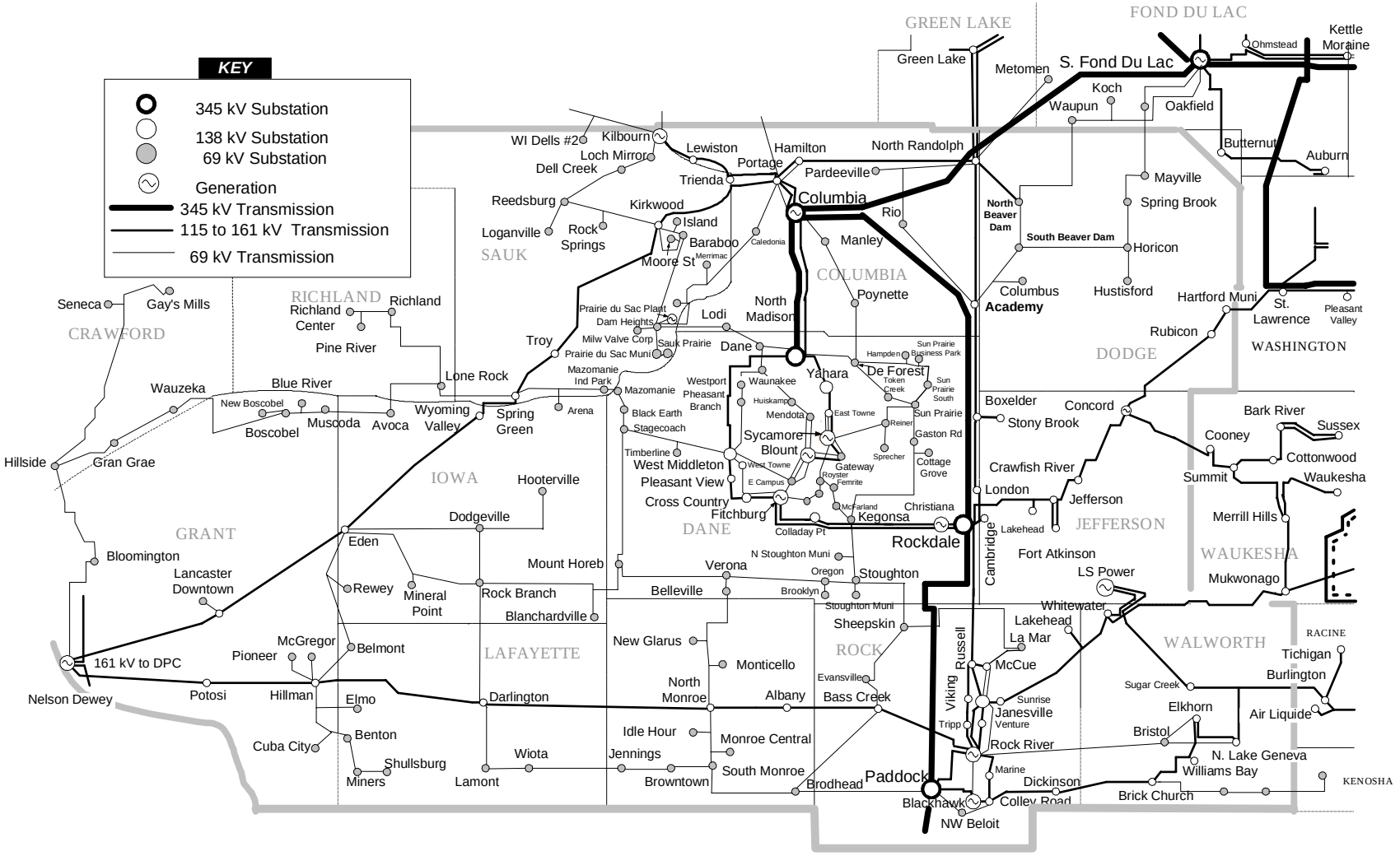
The physical boundaries of Zone 3 and transmission facilities located in Zone 3 are shown in Figure III-4. Land use in Zone 3 is largely rural and agricultural. The major population centers are the Madison metropolitan area and the Janesville/Beloit area. Zone 3 typically experiences peak demands during the summer months. Manufacturing, food processing, state government and institutional loads are among the largest electricity users in the zone.

Key transmission facilities in Zone 3 include the Columbia-North Madison 345 kV line, the Columbia-Rockdale-Paddock-Wempletown 345 kV line and the 138 kV facilities from the Nelson Dewey plant, around the Madison area and in the southeast portion of Zone 3.

Key system performance issues in Zone 3 include:

- Import capability into the Madison area, whether from sources internal or external to the zone
- Insufficient 345/138 kV transformer capability in Dane and Rock Counties
- Heavily loaded 138 kV facilities in the eastern portion of Zone 3
- Heavily loaded 138 kV and 69 kV facilities in the western portion of Zone 3
- MAPP-Eastern Wisconsin power transfers. The 138 kV and 69 kV facilities in the western portion of Zone 3 can be heavily loaded due to load growth combined with heavy imports from MAPP.
- Parallel path flows from northern Illinois. The 138 kV facilities in the eastern portion of Zone 3 can be heavily loaded due to significant generation development in northern Illinois.
- Stability of generation in Columbia and Rock County.
- Low voltages on facilities in Dodge, Green, Jefferson, and Sauk counties, in particular.
- Impact of proposed new generation.

Figure III-4
Zone 3 Existing Transmission Facilities



Zone 4

The physical boundaries of Zone 4 and transmission facilities located in Zone 4 are shown in Figure III-5. Zone 4 land use is a mix of agricultural, forest and urban. Major population centers in Zone 4 include Appleton, Green Bay, Fond du Lac, Sheboygan, Marinette/Menominee and Manitowoc.

Zone 4 typically experiences peak demands during the summer months, though the northern portion of Zone 4 typically experiences nearly equal winter peaks. Paper mills and foundries in the Green Bay and Appleton metropolitan areas are the largest electricity users in the zone.

Key transmission facilities in Zone 4 include the four 345 kV lines extending from the Kewaunee and Point Beach nuclear units, the 138 kV network in the Green Bay area, the two 345 kV lines extending from the Edgewater power plant, the eastern portion of the Rocky Run-North Appleton 345 kV line and the 345 kV lines from South Fond du Lac to Columbia, Edgewater and North Appleton.

Key system performance issues in Zone 4 include:

- Insufficient 345/138 kV transformer capability between the Fox River Valley and the Kewaunee power plant
- Heavily loaded and aging 138 kV facilities in the Green Bay area, north of Green Bay, and the Fox River Valley
- Heavily loaded 138 kV and 69 kV facilities in the Sheboygan area
- Heavily loaded 115 kV and 138 kV lines west of Green Bay and Appleton and associated low voltages
- The stability response of the Point Beach nuclear units
- The limited capability of the system to export power to the upper peninsula of Michigan, resulting in uneconomic dispatch of generating units

Zone 5

The physical boundaries of Zone 5 and transmission facilities located in Zone 5 are shown in Figure III-6. Zone 5 encompasses southeast Wisconsin. Land use in Zone 5 is largely urban, though some agricultural uses exist. The major population center in Zone 5 is the Milwaukee metropolitan area. Zone 5 typically experiences peak demands during the summer months. Large industrial load in the Milwaukee metropolitan area (e.g. Charter Steel, Miller Brewing) are among the largest electricity users in the zone.

Key transmission facilities in Zone 5 include the southern portion of 345 kV lines from Point Beach and Edgewater, the Saukville, Arcadian, Granville and Racine 345/138 kV substations and the transmission lines emanating from the Pleasant Prairie and Oak Creek power plants. There is a significant 138 kV network in the Milwaukee area, a portion of which is underground.

Figure III-5
Zone 4 Existing Transmission Facilities

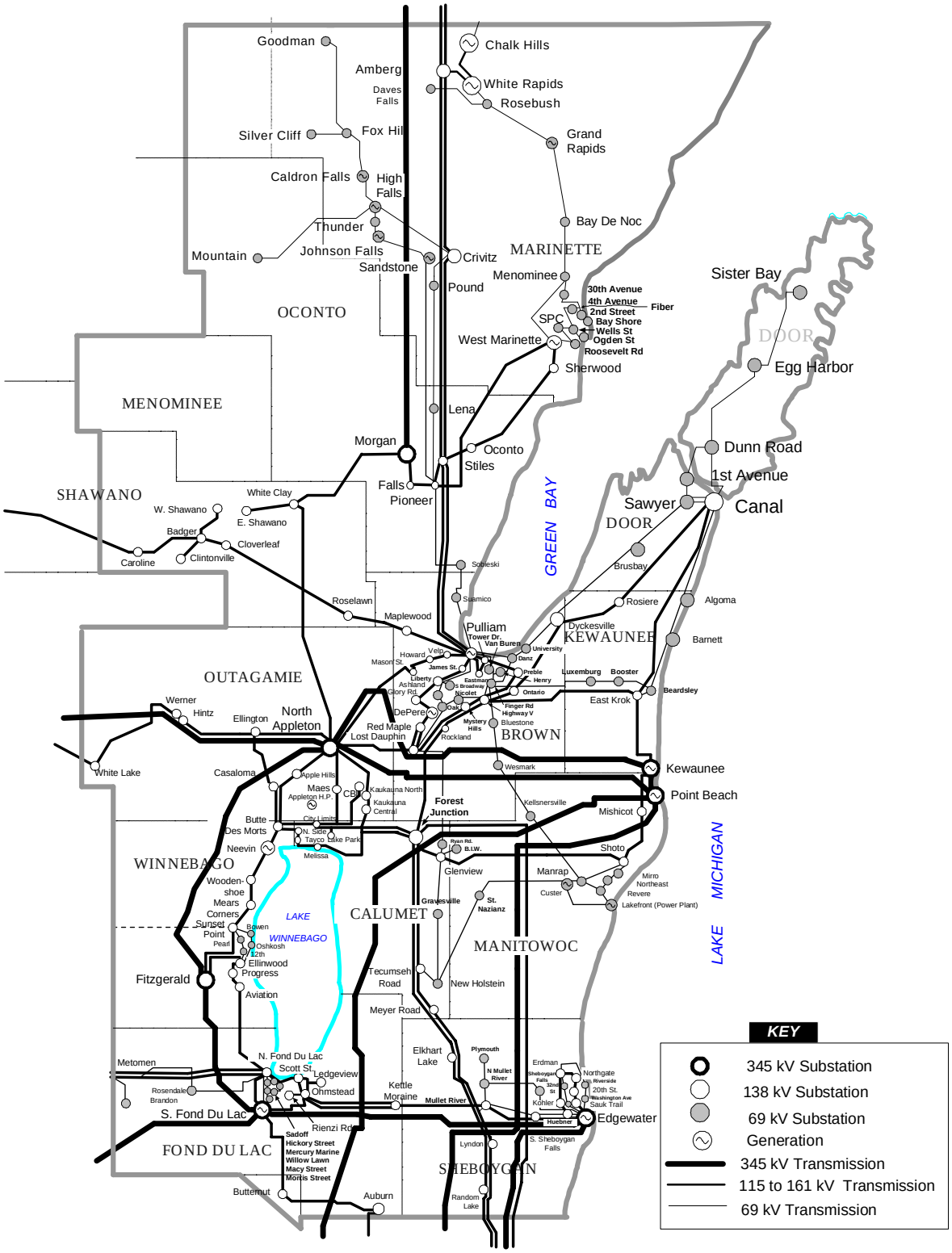
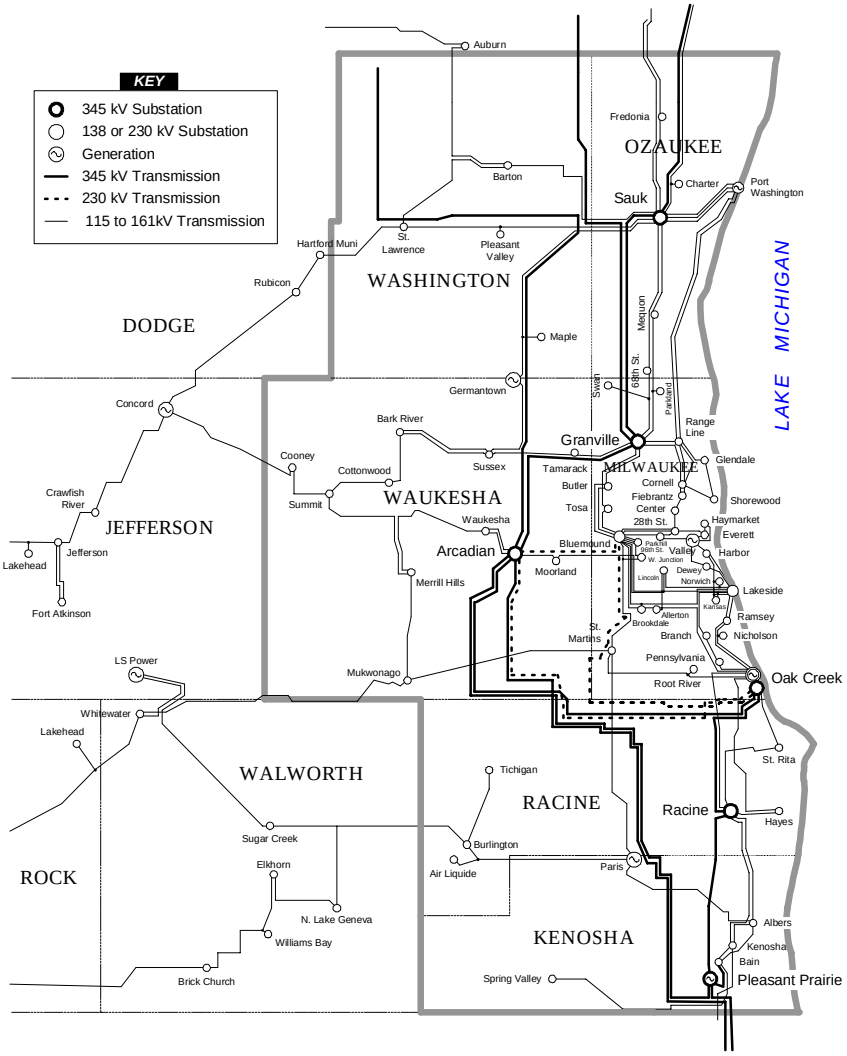


Figure III-6
Zone 5 Existing Transmission Facilities



Key system performance issues in Zone 5 include:

- Heavy flows on aging facilities.
- New generation. Several new generation projects are being planned that will likely influence load serving needs in the zone.
- Heavy flows from the west (Zone 3) resulting in heavily loaded 138 kV facilities in the western portion of Zone 5.
- Stability of existing and proposed generation in the southeast portion of Zone 5

In addition, the Wisconsin Department of Transportation is planning to reconstruct the Marquette Interchange in downtown Milwaukee and portions of the Interstate system nearby the Marquette Interchange. These plans may require that certain ATC transmission facilities be modified or relocated. Until the Marquette Interchange plans have been finalized, ATC will not know which specific transmission facilities will be affected. ATC will include whatever changes to the transmission system in this area in future Assessments once the affected transmission facilities have been identified.

Section IV

RESULTS OF ANALYSES

The results of the power flow analyses conducted to develop system expansion plans are provided in this section. For each zone, system performance criteria limits that are exceeded (overloads, low voltages, stability, etc.) are identified from the results of each base case and associated contingency cases, along with their causes. In addition, system constraints (known transmission service/import limiters) are also identified. The needs and exceeded limits identified are categorized by ATC planning zone. The combined needs identified in the 2003 and 2009 analyses are listed in Tables IV-1 and IV-3, respectively, and shown graphically in Figures IV-1 through IV-5 for Zones 1-5, respectively.

In addition, system constraints that limit ATC's ability to approve transmission service requests or not interrupt transmission service already approved are taken into consideration in developing solutions to limits and needs identified above. These system constraints may be lines, transformers or other equipment whose rating could be exceeded. ATC monitors incidents where transmission service is interrupted or curtailed. These incidents are referred to as Transmission Loading Relief (TLR) incidents. A summary of TLR incidents on the ATC system during 2001 is provided in Table IV-2. The concerns with TLRs from a planning perspective are those that occur repeatedly and/or those that cause firm transmission service to be interrupted or curtailed. As shown in Table IV-2, there are a number of chronic or severe limiters that warrant system reinforcements.

Alternative solutions or the primary (currently preferred) solution to the system performance criteria limits exceeded are described in this Section. For limits exceeded in the 2003 model where the limit must be resolved near term and the preferred solution or a potential solution can reasonably be expected to be constructed by 2009, such solutions are included in the 2009 base case. For criteria limits exceeded in the 2003 analysis where the preferred/potential solutions require further verification and/or more analysis, such solutions are not included in the 2009 model, but the need is further investigated in the 2009 analysis. In instances where the need is further verified by the 2009 analysis, primary and alternative solutions are listed as part of the plan, with an in-service date based on its reasonably likely completion date.

The solutions selected to address the needs and limitations identified will reflect the input of transmission planning process stakeholders, including customers, state and local officials, the public, and coordination with other planning processes, to the extent possible.

2003 Analysis

The system performance criteria limits exceeded and other system needs based on the 2003 base and contingency cases are listed in Table IV-1, along with the magnitude of the limit exceeded, as applicable, and the cause of the limits being exceeded.

In developing a transmission plan based on the results of the 2003 analyses, consideration was given to potential projects that were originally conceived, but not implemented, by the former transmission system owners. In addition, it was recognized that certain projects were sufficiently complex that they would warrant additional scoping, licensing and/or siting analyses, or would require additional time to procure equipment and construct. As such, certain of these projects were assumed to be completed in years beyond 2003. Following is a brief discussion of the criteria limits that were exceeded and the rationale behind the project alternatives selected to be included in this Assessment.

TABLE IV-1
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS - 2003

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
1	Pine-Eastom 115 kV line overload	119%		various outages	Summer peak
1	Eastom-Highway 8 115 kV line overload	111%		various outages	Summer peak
1	Summit Lake-Aurora St 115 kV line (impending) overload	98%		various outages	Summer peak
1	Bunker Hill-Black Brook 115 kV line overload	110%		Weston-Blackbrook 115 kV line outage	Summer peak
1	Arpin 345/138 kV transfomer overload	111%		Arpin-Rocky Run 345 kV line outage	Summer peak
1	Arpin-Sigel 138 kV line overload	101%		Arpin-Rocky Run 345 kV line outage	Summer peak
1	Sigel 138/69 kV transfomer overload	114%		various outages	Summer peak
1	Port Edwards-Lakehead Vesper 138 kV line overload	163%		Arpin-Rocky Run 345 kV line outage	Summer peak
1	Wautoma-Silver Lake 69 kV line overload	103%		various outages	Summer peak
1	Metomen 138/69 kV transfomer overload	107%		various outages	Summer peak
1	Metomen-Rosendale-N Fond du Lac 69 kV line overload	117%		various outages	Summer peak
1	N Randolph-Markesan Tap 69 kV line overload	113%		various outages	Summer peak
1	Whitcomb 115/69 kV transformer overload	114%		various outages	Summer peak
1	Caroline 115/69 kV (impending) transformer overload	98%		Whitcomb 115/69 kV transfomer outage	Summer peak
1	Petenwell 138/69 kV transformer overload	113%		McKenna-Lakehead Adams 69 kV line outage	Summer peak
1	Council Creek 138/69 kV transformer overload	126%		Eau Claire-Arpin 345 kV line outage	Summer peak
1	Rhinelander loop 115 kV bus voltages		< 90%	various outages	Summer peak
1	Sand Lake, Wautoma 138 kV bus voltages		90 - 92%	Port Edwards-Sand Lake 138 kV line outage	Summer peak
1	Roeder 138 kV bus voltage		92%	Green Lake - Roeder 138 kV line outage	Summer peak
1	Berlin area 69 kV bus voltages		< 90%	various outages	Summer peak
1	Council Creek 138 kV bus voltage		84%	Council Creek-Petenwell 138 kV line outage	Summer peak
1	Petenwell to McKenna 69 kV bus voltages		90 - 92%	various outages	Summer peak
2	Radar, Keweenaw, Keweenaw Tap 69 kV bus voltages		91%	Atlantic 138/69 kV transformer outage	Summer peak
2	Straits 138/69 kV transformer overload	128-134%		various outages	Summer peak
2	Brevort, Hiawatha, Lakehead 138 kV & Detour 69 kV bus voltages		87-92%	Lakehead-Brevort-Straits 138 kV line outage	Summer peak
2	Engadine,Newberry,Roberts,Lou-Pac 69 kV bus voltages		90-91%	Engadine-Hiawatha 69 kV line outage	Summer peak
2	Detour, Goetzville, Pickford, Pine River, Straits, St Ignace,Rockview,Talentino, Mich Limestone 69 kV bus voltages		86-91%	Straits 138/69 kV transformer outage	Summer peak
2	Hiawatha 138 kV bus voltage		89%	Hiawatha-Lakehead 138 kV line outage	Summer peak

TABLE IV-1
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2003 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
2	Engadine-Hiawatha 69 kV line (Impending) overload	97%		Manistique-Indian Lake 69 kV line outage	Summer peak
2	Valley, Blaney Park, Manistique 69 kV bus voltages		79-90%	Manistique-Indian Lake 69 kV line outage	Summer peak
2	Radar, Keweenaw, Keweenaw Tap 69 kV (impending) bus voltages		91%	Atlantic-M38 138 kV line outage	Summer peak
2	Presque Isle-Freeman 138 kV line overload	105%		Presque Isle-Cedar 138 kV line outage	Summer peak
2	Cedar-M38 138 kV line overload	121%		Perch Lake-M38 138 kV line outage	Summer peak
2	Winona, Warden 69 kV & M38 138 kV bus voltages		91-92%	Perch Lake-M38 138 kV line outage	Summer peak
3	Rock River 138/69 transformer overload	107%		Blackhawk- Colt Industries Tap line outage / Blackhawk 138/69 transformer outage	Summer peak
3	Paddock 138/69 transformer overload	99%		Colley Road 138/69 transformer outage	Summer peak
3	North Madison 345/138 transformer overload	98%		Outage of adjacent 345/138 transformer	Summer peak
3	Blount-Ruskin 69 kV line overload	121%		Blount-Ruskin Tap 69 kV line outage	Summer peak
3	Blount-Ruskin Tap 69 kV line overload	121%		Blount-Ruskin 69 kV line outage	Summer peak
3	Portage - Columbia 138 kV line overload	106%		Portage-Columbia 138 kV line outage	Summer peak
3	Columbia 200 MVA transformer 1 and 3 overloads	98%		Columbia 345/138 kV, 400 MVA transformer outage	Summer peak
3	North Randolph 138/69kV transformer overload	119%		Fall River Tap-Academy 69 kV outage	Summer peak
3	Oakfield 69 kV bus voltage		91%	South Fond du Lac-Oakfield 69 kV line outage	Summer peak
3	Fox Lake and North Beaver Dam 138 kV bus voltages		82%	North Randolph-Fox Lake 138 kV line outage	Summer peak
3	Lancaster and Eden 138 kV bus voltages		87%	Lancaster-Nelson Dewey 138 kV line outage	Summer peak
3	Dickinson 138 kV bus voltage		91%	Colley Road-Dickinson 138 kV line outage	Summer peak
3	Idle Hour 69 kV bus voltage		88%	Rockdale-Cambridge Tap 138 kV line outage	Summer peak
3	Cambridge, London, etc. 138 kV bus voltages		88%	Rockdale-Cambridge Tap 138 kV line outage	Summer peak
3	Kegonsa 138 kV bus voltage		90%	Kegonsa-Christiana 138 kV line outage	Summer peak
3	Lewiston and Kilbourn 138 kV bus voltages		81%	Lewiston-Kilbourn 138 kV line outage	Summer peak
3	Hillman 138/69 kV transformer overload	111%		Longhollow-Terr Tap 69 kV line outage	Summer peak

TABLE IV-1
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2003 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
3	East Campus to Walnut 69 kV line overload	115%		West Middleton-Blackhawk 138 kV line outage	Summer peak
3	Royster to Pflaum Tap 69 kV line overload	101%		Nine Springs-Fitchburg 69 kV line outage	Summer peak
3	West Middleton to Blackhawk 69 kV line overload	99%		East Campus- Walnut 69 kV line outage	Summer peak
3	East Campus to Blount 69 kV line overload	98%		East Campus-Blount 69 kV line outage	Summer peak
3	Fitchburg 138/69 kV transformer overload	101%		Fitchburg 138/69 kV transformer outage	Summer peak
3	Pflaum 69 kV bus voltage		91%	Royster-Pflaum Tap 69 kV line outage	Summer peak
3	Royster to Femrite 69 kV line overload	103%		North Madison-Yahara River 138 kV line outage, etc.	Summer peak
3	Kegonsa to McFarland 69 kV line overload	111%		North Madison-Yahara River 138 kV line outage, etc.	Summer peak
3	Reiner, Burke, Sprecher 69 kV bus voltages		86%	various outages	Summer peak
3	Academy to Columbus 69 kV line overload	101%		North Randolph-Fox Lake 138 kV line outage	Summer peak
3	Kegonsa to Christiana 138 kV line overload	106%		Christiana-Fitchburg 138 kV line outage	Summer peak
3	McCue 138/69 kV transformer overload	111%		Janesville 138/69 kV transformer outage	Summer peak
4	S Sheboygan Falls 138/69 kV transformer overload	112-96%		various outages	Summer peak
4	Mullet River 138/69 kV transformer overload	116-97%		various outages	Summer peak
4	Edgewater 138/69 kV transformer #2 overload	103-97%		various outages	Summer peak
4	Edgewater 138/69 kV transformer #1 overload	102-96%		various outages	Summer peak
4	Canal 138/69 kV transformer #1 overload	101%		Canal 138/69 kV transformer #2 outage	Summer peak
4	Canal 138/69 kV transformer #2 overload	102%		Canal 138/69 kV transformer #1 outage	Summer peak
4	Sister Bay 69 kV bus voltage		90-92%	various outages	Summer peak
4	Canal 138 kV bus voltage		89%	Canal-East Krok 138 kV line outage	Summer peak
4	Crivitz 138/69 kV transformer overload	107%		Pioneer 138/69 kV transformer outage	Summer peak
5	Pleasant Prairie-Bain 345kV line overload	176%		Pleasant Prairie 345 kV bus tie outage	Summer peak

TABLE IV-2

Summary of Transmission Loading Relief Incidents

		# of Days* at TLR level 3, 4, or 5			
Limiting Element	Contingent Element	3	4	5	Total Days
Albers - Paris 138 kV	Wempletown - Paddock 345 kV	20	1		21
Albers - Paris 138 kV		1			1
Blackhawk - Colley Road 138 kV	Paddock - Rock River 138 kV	8	1	3	12
Butler - Granville 345 kV	Arcadian - Granville 345 kV	1			1
Christiana - Kegonsa 138 kV	Christiana - Fitchburg 138 kV	1			1
Eau Claire - Arpin 345 kV		5	5		10
Ellington - Hintz 138 kV	North Appleton - Rocky Run 345 kV	1			1
Green Lake - Roeder 138 kV	North Appleton - Rocky Run 345 kV	1		8	9
Kewaunee 345/138 kV Transformer	Point Beach - North Appleton 345 kV			5	5
Kewaunee 345/138 kV Transformer		2			2
Manistique - Hiawatha 69kV		2	203		205
Mukwonago - Whitewater 138 kV	South Fond du Lac - Columbia 345 kV	1	1		2
North Appleton - Apple Hills 138 kV	North Appleton - Ellington 138 kV	1			1
North Appleton - Lost Dauphin 138 kV	Kewaunee 345/138 kV Transformer	35	5	6	46
North Appleton - Lost Dauphin 138 kV	North Appleton - White Clay 138 kV		2		2
North Appleton - White Clay 138 kV	Stiles - Pulliam 138 kV	1			1
North Appleton 345/138 kV Transformer #1	North Appleton 345/138 kV Transformer #3		2		2
Paddock - Blackhawk 138 kV	Paddock - Rock River 138 kV	4			4
Paddock 345/138kV Transformer	Paddock - Rockdale 345 kV	22			22
Pleasant Prairie - Racine 345kV	Wempletown - Paddock 345 kV	1			1
Rockdale 345/138 kV Transformer #1	Rockdale 345/138 kV Transformer #2	1			1
Rockdale 345/138 kV Transformer #2	Paddock 345/138 kV Transformer	1			1
Rockdale 345/138 kV Transformer #2	Rockdale 345/138 kV Transformer #1	1			1
Rocky Run - North Appleton 345 kV		6			6
Russell - Rockdale 138 kV	Paddock - Rockdale 345 kV	8			8
Stiles - Amberg 138 kV	Morgan - Plains 345 kV	14	67	4	85
Stiles - Pioneer 138 kV	North Appleton - White Clay 138 kV	7	2	1	10
Wempletown - Paddock 345kV		7			7

Note: * - Sum of number of days is based on determining the highest TLR level for a given day so that each day is only counted once
Level 3: non-firm transmission service curttailments

Level 4: transmission system reconfiguration/redispatch

Level 5: firm transmission service curttailments/redispatch

Zone 1

Summary of Key Findings

- The Rhinelander Loop will require additional interconnections to other portions of the system in order to reliably serve load in the future. Interim measures are needed to avert overloads, low voltages and voltage collapse.
- The Arrowhead-Weston 345 kV line will preclude the need for operating guides currently in use, improve system stability and, in concert with other lower voltage projects, will address import capability needs.
- There are a number of projects needed to both achieve the level of import capability contemplated in the WRAO report associated with the Arrowhead-Weston 345 kV line and to accommodate planned generation to be interconnected at Arpin (IC014).

The key system performance criteria limits exceeded in Zone 1 were low voltages and single contingency overloads. In addition, the need exists to address potentially heavy flows due in part to parallel path flows on certain ATC facilities during non-peak periods and to keep the system intact during outages of the Eau Claire-Arpin and Arpin-Rocky Run 345 kV lines.

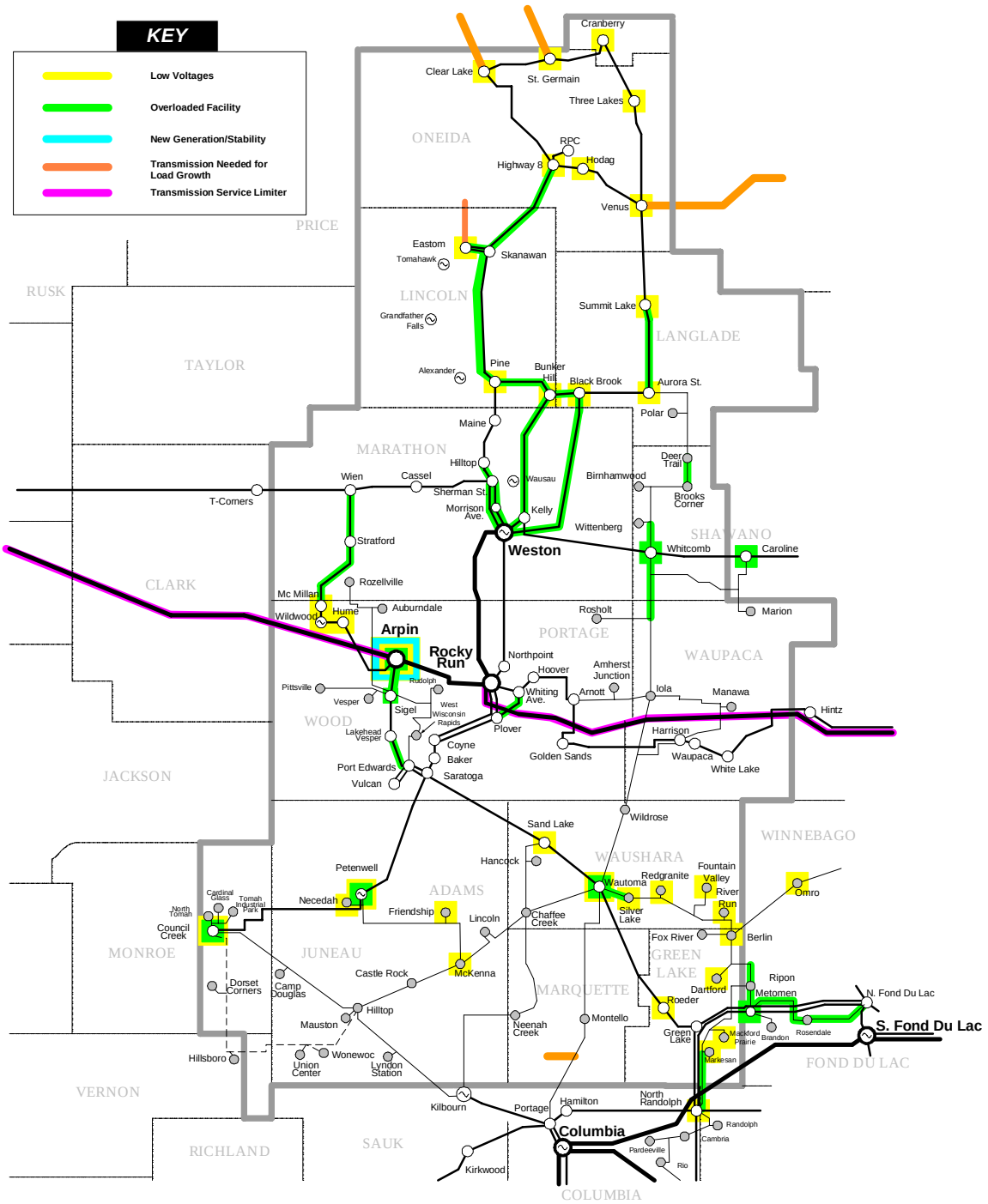
It is anticipated that the parallel path flows will be addressed in large part by the approved Arrowhead-Weston 345 kV project. However, the projected in-service date for this project is late 2005 at the earliest, so interim mitigation measures will be necessary to ensure continued reliable transmission service. It is anticipated that modifications to existing operating guides governing imports from systems west of Wisconsin will be utilized prior to the completion of the Arrowhead-Weston project.

There are a number of projects associated with the Arrowhead-Weston 345 kV line needed to achieve the level of import capability contemplated in the Wisconsin Reliability Assessment Organization (WRAO) report and to accommodate planned generation to be interconnected at Arpin (IC014). These projects include constructing a 345 kV switchyard at Weston, replacing the existing 345/115 kV transformers at Weston and the 138/69 kV transformers at Sigel and Petenwell, rebuilding the Kelly-Whitcomb and the Weston-Northpoint 115 kV lines and uprating the Weston-Kelly 115 kV line and the Port Edwards-Sand Lake 138 kV line.

It should be noted that due to the criteria used in this Assessment for inclusion of proposed new generation, only one of the four proposed generation additions in vicinity of Arpin/Rocky Run/Weston was included in the study model (IC014). The system additions shown in Section V of this Assessment resulting from interconnecting and delivering 600 MW of generation from IC014 would be significantly more extensive if other proposed generation projects in this area were included in the study model.

For the heavy flows on and the contingency separation of certain 69 kV and 138 kV facilities on the western edge of ATC's service territory, the primary solution would be the Arrowhead-Weston project. However, as noted above, this project is not expected to be in-service until at least late 2005. An interim and supporting mitigation measure, which was previously shown by Alliant and Dairyland to effectively address this near term situation (in conjunction with the Arpin Operating Guide) was the installation of a

Figure IV-1
Zone 1 Performance Criteria Limits Exceeded and Other Constraints



phase-shifting transformer at the Council Creek 69 kV bus. That project is scheduled to be in-service by early 2004.

Two events occurred during the summer of 2001 in which load was involuntarily shed on the 115 kV network north of Wausau, referred to here as the Rhinelander loop. The results of the analysis show that, consistent with what was seen in real time operations, severe overloads and low voltages can be experienced during certain contingencies. The primary reason for this condition is that loads experienced on Rhinelander loop during the 2001 summer far exceeded what had been previously forecasted for the area (exceeded the previous forecast for 2006), accelerating the potential for such overloads and low voltages.

As noted in previous Assessments, it was previously assumed that the problems on the Rhinelander loop would be addressed by a new 115 kV line proposed as part of the Arrowhead-Weston project. The new 115 kV line, which would have terminated at Tripoli, a substation proposed along the Arrowhead-Weston line route, and the Highway 8 substation on the Rhinelander loop, would have mitigated what had been impending overloads and low voltages. The Tripoli-Highway 8 proposal was not approved and consequently, other system reinforcements are being considered to address these problems. In addition, new transmission-distribution interconnections have been requested of ATC which are adjacent to the Rhinelander loop and which will require ATC to construct new transmission lines to serve new distribution substations. These factors, along with needs to be addressed on the adjacent 69 kV network to the north of the Rhinelander loop (in Zone 2), are being considered to ensure that the proposed transmission solutions address all issues in the area. Also, see the discussion of ***Conceptual Umbrella Plan for Northern Zones*** under the 2009 Analysis.

Due to the severity of the problems, it will be necessary to address the needs of the Rhinelander loop in stages. Short term solutions, that is, projects that can be implemented prior to 2005 to address the immediate needs of the loop, include accelerating the conversion of WPS's 46 kV system between Pine-Grandfather-Tomahawk-Easton to 115 kV and constructing a new 115 kV between Skanawan and Highway 8 substations.

Alternatives under evaluation as long-term solutions for the Rhinelander loop limitations include rebuilding additional portions of the Rhinelander loop, constructing a new 115 kV or 138 kV line from Cranberry north to Conover combined with the conversion of the Conover-Plains or Conover-Winona 69 kV lines to 138 kV, constructing a new 115 kV or 138 kV line from Venus east to tie to the Plains-Morgan 345 kV line near Dunbar or at Plains, constructing a new 115 kV or 345 kV line from Weston north to Venus, or a combination of the above. In addition, ATC will encourage generation proposals that would reduce the need for additional transmission system reinforcements in this area.

Preliminary results from the evaluation of those alternatives indicate that two new ties to the Rhinelander loop, from either from Weston, Conover or Dunbar, will be required to reliably meet the longer term load serving needs, absent any new generation in the area.

In the interim period prior to the completion of either the short term or long term solutions, the Rhinelander loop is vulnerable to overloads, low voltages and potentially voltage collapse. As such, ATC, in conjunction with WPS, has developed a plan involving interim measures (transmission capacitors at Hodag, distribution capacitors at various locations served by the loop, temporary diesel generation at Venus, to minimize the risk of the problems identified and meet the planning criteria. The contributions to reliability from existing undervoltage load shedding capability and distributed-superconducting magnetic energy storage (D-SMES) units also need to be reviewed.

In addition to the projects above, capacitor bank at the Berlin, McKenna and Ripon 69 kV substations and at the Aurora St. 115 kV substation are needed to address low voltages, the 115/69 kV transformers at Whitcomb and Caroline need to be uprated (replace CTs), the Wien-McMillan 115 kV line needs to be reconductored and and the Port Edwards-Sigel 138 kV line, the North Randolph-Ripon 69 kV line, the Metomen-North Fond du Lac 69 kV line and the Wautoma-Berlin 69 kV line need to be uprated. The Arpin 345/138 kV transformer and Arpin-Sigel 138 kV line overloads are being addressed by the Arpin Operating Guide. The low voltages at the Council Creek 138 kV substation is being addressed through manual control of load tap changers on the Council Creek 138/69 kV transformer.

Additional projects for the Wausau and Rhinelander areas include uprating the Kelly-Bunker Hill-Pine 115 kV circuits. A number of impending low voltages will require adding capacitor banks prior to 2009.

In response to customer requests for a new transmission interconnection, a new 69 kV line from a new substation near Endeavor to an intersection with the existing Portage-Wautoma 69 kV line is planned. Also, new 115 kV transmission lines are planned from Clear Lake to a new Highway D substation, from St. Germain to a new Boulder Junction substation, and from Eastom to a new Lake Nokomis area substation, in response to customer requests for new transmission interconnections.

Zone 2

Summary of Key Findings

- The Hiawatha-Indian Lake line rebuild project will address overloads, improve the voltage profile in the area and preclude the need for opening the existing lines during off-peak periods.
- Overloads of the Presque Isle-Freeman, Freeman-Cedar, Cedar-National and Cedar-M38 138 kV circuits were identified under contingency and these lines will need to be uprated.
- Low voltages in Zone 2 may be adequately addressed with capacitor bank installations, but additional analysis of the low voltage phenomenon is needed.

Significant power flow model verification and modification was conducted for Zone 2 since the Updated 2001 Assessment was issued earlier this year. As a result of these

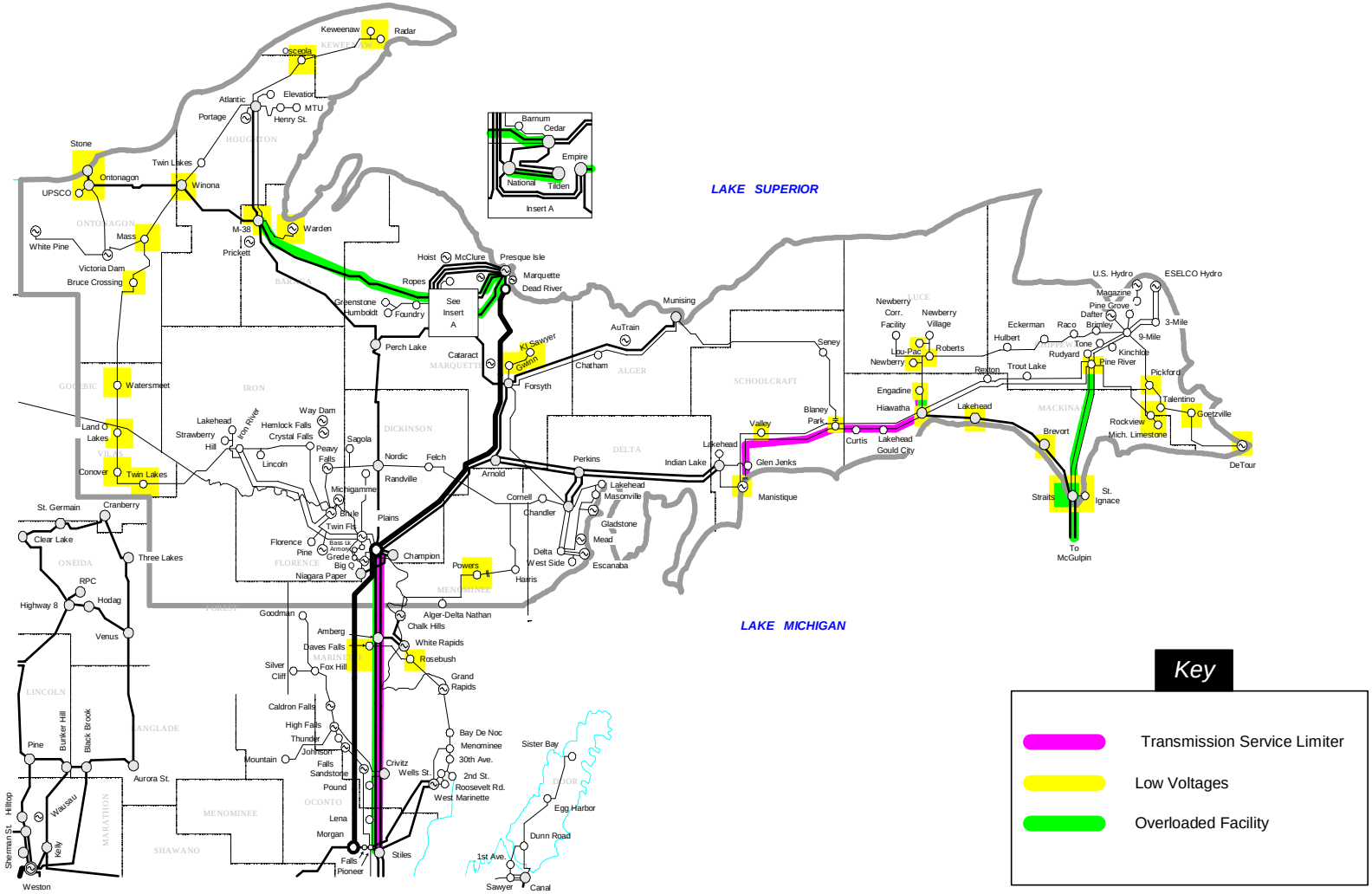


Figure IV-2
Zone 2 Performance Criteria Limits Exceeded and Other Constraints

efforts, some of the overloads and low voltages identified in the Updated Assessment were found not to be valid. However, numerous low voltages were found under contingency conditions that need to be addressed.

The key system performance criteria limits exceeded in Zone 2 were low voltages and single contingency overloads. For the low voltages and certain of the single contingency overloads, capacitor bank installations were selected as the most feasible near term solution. In some instances, overloads are aggravated by low transmission system voltages. Thus, adding capacitors in these instances will not only improve transmission system voltages, but can reduce line loading to acceptable levels. For purposes of this Assessment, approximately 35 MVAR of capacitor banks distributed at Atlantic, Gwinn, Land O' Lakes, Roberts and Talentino were included in the plan, assumed to be placed in service by 2003 or 2004.

However, since there is uncertainty regarding voltage stability in the area given the nature of the transmission system, other technologies such as D-SMES, D-VAR, static var compensators (SVC) or additional transmission lines will be evaluated as longer term solutions.

Overloads of the Presque Isle-Freeman, Freeman-Cedar, Cedar-National and Cedar-M38 138 kV circuits were identified under contingency. These lines will need to be uprated to higher capacities. Laser surveys are being performed for three of these lines to determine in the near future if ratings of the existing facilities can be increased. Replacing a current transformer at the Cedar substation will adequately uprate the Cedar-National circuit.

The analysis identified an overload of the Straits 138/69 kV transformer under various contingency conditions. Replacing the existing transformer or installing a parallel transformer would be the most feasible alternatives available. The plan assumes the addition of a parallel 138/69 kV transformer at Straits in 2005.

The analysis identified overloads on one of the two Hiawatha-Indian Lake 69 kV lines (Hiawatha-Engadine) for various contingencies. In addition, low voltages were identified at Valley, Manistique, Blaney Park and Hiawatha. Further, there have been numerous transmission loading relief (TLR) incidents recently during off-peak periods involving the Hiawatha-Indian Lake 69 kV circuits (see Table IV-3). Heavy flows during off-peak periods over this system are caused in part by cycling of the Ludington pumped storage facility in the lower peninsula of Michigan. Another contributing factor is the increase in use of this system for transactions between ATC customers and entities to the east of Wisconsin. Currently, the potential overloads are being addressed by ATC Operations by opening these 69 kV lines when a first contingency analysis predicts overloads will occur.

However, this preventive action is not considered a viable long term solution. One potential solution would be to install phase shifting transformers at Straits to limit the amount of power that can flow through the system in the upper peninsula and hence lessen the need to take preventive actions. A more robust solution would be to replace the key limiting element, one of the 69 kV lines between Indian Lake and Hiawatha with a double circuit 138 kV line. This project would address existing and projected limitations west of Hiawatha. One of the 69 kV lines between Indian Lake and Hiawatha

has been identified by ATC Maintenance as being in need of rebuilding due to its condition. Thus, replacing this line with a double circuit 138 kV line would (i) help resolve the lack of west-east transfer capability across the upper peninsula, (ii) address the facility condition issue with one of the existing 69 kV lines, and (iii) improve the system from a strategic standpoint by improving the 138 kV network from Plains to Straits. Given the variety of benefits this project would provide, it is included in the plan to be in-service in 2004. However, until a second 138 kV circuit from Hiawatha to Straits is completed and the Plains-Amberg-Stiles constraint is resolved (see below), it will be necessary to operate the rebuilt Hiawatha-Indian Lake line at 69 kV.

The proposed solution for addressing TLRs in Zone 2 for the long term would be to have two 138 kV circuits between Straits and Plains. This would require that the limiting 69 kV circuit between Indian Lake and Hiawatha be replaced with a double circuit 138 kV line, as described above, and eventually add a second 138 kV circuit between Hiawatha and Straits. The second most frequent TLR limiter for flows into and across Zone 2, the Stiles-Amberg-Plains 138 kV double circuit line, will also require reinforcement in some form for the robust solution to be completely effective (see 2009 Analysis, Zone 2).

There are overloads which need to be mitigated by transmission line reinforcements. The Indian Lake-Hiawatha 138 kV double circuit plan mentioned above is one of these areas where ATC is obtaining public input and the permits and approvals necessary to rebuild the line by 2004. In other areas, ATC is evaluating alternatives that may involve regions outside of Zone 2, as well as Zone 2, to develop the optimum reinforcements to serve the needs of Zone 2 customers and customers in other zones. For example, in the western part of Zone 2, alternatives are under consideration that will increase transfer capability and reliability for Zone 1 and 2 customers primarily, but will also provide benefits to other customers using the ATC system. Some of these alternatives involve rebuilding older transmission lines in Zone 2 for higher capacity or even to higher voltages to improve reliability in Zones 1 and 2 and also to improve the ability to move power between Wisconsin and Michigan (see **Conceptual Umbrella Plan for Northern Zones**, 2009 Analysis).

Zone 3

Summary of Key Findings

- The reliability problems in Sauk County can be addressed by converting the Kilbourn-Reedsburg and Kirkwood-Reedsburg 69 kV lines to 138 kV. Interim measures to avert overloads, low voltages and voltage collapse are needed until the conversion is completed.
- Accommodating the proposed Riverside generation will require that numerous transmission system reinforcements be implemented.
- Maintaining reliability in the Madison area will require that a new source (138 kV or 345 kV interconnection) be implemented in the near term and that a number of lines be uprated in some fashion. Longer term, it appears that a 345 kV source on the west side of Madison will be required.
- The Whitewater-Mukwonago 138 kV line reconductor project will address physical condition issues associated with that line and improve transfer capability within Wisconsin.

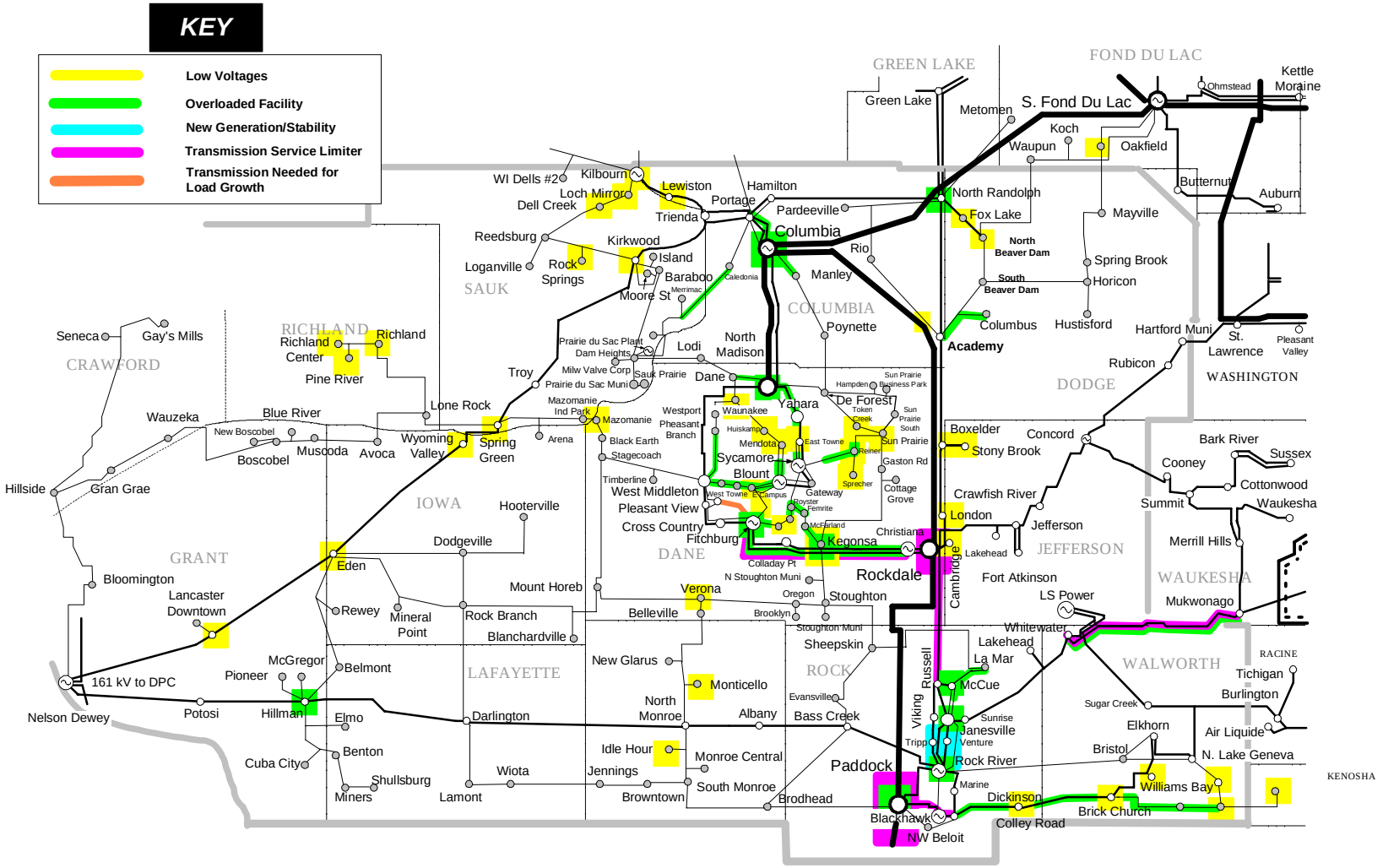


Figure IV-3
Zone 3 Performance Criteria Limits Exceeded and Other Constraints

The key system performance criteria limits exceeded in Zone 3 were low voltages and single contingency overloads. In addition, due to other system enhancements being implemented outside of the ATC system (namely, significant amounts of new generation in northern Illinois), the need exists to address potentially heavy flows on certain ATC facilities due to flows from the south of Wisconsin during non-peak periods. Further, the need to accommodate proposed new generation in the zone is necessitating a more comprehensive evaluation of the Zone 3 system. ATC is commencing focused discussions with neighboring transmission owners to analyze and address issues affecting the transmission system in the area.

In response to certain low voltages, capacitor bank installations were deemed to be the most feasible solution, with installations at Birchwood (new Loch Mirror), Burke, Dickinson, Elkhorn, New Glarus, Richland Center, South Monroe and Rio in 2004. Several of the identified 138 kV low voltages are currently mitigated by ATC Operations personnel through remote control of a 138/69 kV transformer in a particular area. In certain instances, transformer load tap changers are adjusted to bring the 138 kV contingency voltages above the criteria limits while retaining the 69 kV bus voltages above the criteria limits. This is a balancing act that in some cases eventually will not work. Where this mitigation measure is no longer deemed viable, solutions have been proposed to solve these problems. The most notable example of this situation in Zone 3 is the Beaver Dam area which cannot be supported from the existing 69 kV system beyond approximately 2006. Completion of a 138 kV loop from Academy through South Beaver Dam around the eastern edge of Beaver Dam to North Beaver Dam will solve these voltage problems.

In Sauk County, where single contingency overloads were identified as well, converting the Kilbourn-Reedsburg-Kirkwood 69 kV line to 138 kV was determined to be the optimum solution. **Since the voltage conversion alternative will not be completed until at least 2004, interim measures are needed to insure that thermal overloads, low voltages and potentially voltage collapse are averted. ATC, in conjunction with Alliant, WPPI and Reedsburg, has developed an interim plan for averting such problems, involving shifting load from the 69 kV system to the 138 kV system at Lake Delton, installing temporary diesel generation at Reedsburg, contracting for interruptible load, increasing existing 69 kV line ratings and restoring the original rating of the D-SMES unit at Reedsburg.**

In two other cases, unloading the 69 kV system by moving load to the 138 kV system is planned: at Northwest Beloit and, as noted above, Lake Delton.

There were a number of single contingency overloads in Zone 3 based on the 2003 analysis. New 138/69 kV transformer installations are planned for Hillman, Fitchburg and North Randolph (2004), and at Reiner (2006), and a new 345/138 kV transformer is needed at North Randolph (2004). The Columbia-Portage double circuit 138 kV line will need to be uprated and the Janesville-Riverside 138 kV line will need to be rebuilt.

Contingency analysis revealed a number of 69 kV line overloads in the Madison area. In response, the following projects are included in the plan: (i) reconductoring the existing

East Campus-Blount 69 kV circuits (2003), the existing Blount-Ruskin, Blount-Ruskin Tap and West Middleton-Pheasant Branch 69 kV circuits (2006), and the Gateway-Sycamore 69 kV line (2005), (ii) installing a second East Campus-Walnut 69 kV circuit (2003), (iii) rebuilding 69 kV circuits to 138 kV (Kegonsa-McFarland-Femrite (2004) and Sycamore-Reiner-Sprecher (2006)), and (iv) rebuilding the Femrite-Royster 69 kV line.

While these projects will improve reliability in the Madison area, an overriding long term concern for the area is the lack of a strong source to the west side of Madison where growth is the most prolific. Preliminary studies of this situation indicate that even reinforcements at 138 kV will likely not be adequate in the long term. Various alternatives under consideration include a new Rockdale-West Middleton 345 kV circuit or a new North Madison-West Middleton 345 kV circuit. However, it is recognized that either of these projects will take several years to implement and more immediate relief in this area is needed. One alternative for providing such interim relief would be to convert the existing Columbia-North Madison 345/138 double circuit line to double circuit 345 kV. Other options would involve new 138 kV transmission lines on new right-of-way which would likely impose similar schedule constraints as the 345 kV line options above.

For purposes of this plan, the Columbia-North Madison line conversion project, along with a new 345 kV bus at North Madison and replacing the existing 345/138 kV transformers at North Madison was assumed. This alternative will improve voltage profiles and relieve heavy line loading on the east side of Madison and through downtown Madison for the next several years, but a new 345 kV circuit to the west side of Madison will eventually be needed to complete the reinforcements necessary to provide reliable service long term to the area and to provide a source to the 138 kV network in southwest Wisconsin.

A number of projects related to proposed generation additions or improving stability response for new and existing generation are planned. Reconfiguration of the 345 kV switchyard at the Columbia power plant will address overload and stability issues. Proposed new generation in Rock County will require a number of projects in 2003 and 2004 to avert overloads and address stability issues. The projects conceived to accommodate this generation and associated transmission service requests include:

- uprate the McCue-Sheepskin 69 kV line (2003), *
- replacing the 138 kV breakers at Rock River (2004),
- constructing a 138 kV switchyard at a new generation site near the existing Rock River plant (2004),
- constructing a double circuit 138 kV between the new generation site and the Rock River 138 kV switchyard (2004),
- reconfiguring existing 69 kV and 138 kV circuits to form Rock River-Janesville and Rock River-Sunrise 138 kV circuits (2003),
- reconductoring the Whitewater-Mukwonago 138 kV line (2003) (*see discussion below*),
- rebuilding the Kegonsa-McFarland-Femrite 69 kV line to 138 kV, operated initially at 69 kV (2004), *
- rebuilding the Femrite-Royster 69 kV line (2004), *

- installing capacitor banks at Cross Country, Fitchburg, Kegonsa, Tokay and West Middleton (2004), *
- reconductoring the Russell-Rockdale 138 kV line (2004),
- rebuilding the Janesville-Russell 138 kV line (2004),
- replacing the existing 138/69 kV transformers at Fitchburg (2004), *
- replacing the existing 345/138 kV transformers at North Madison (2005) *
- converting the Columbia-North Madison 138 kV circuit to 345 kV (2005), * and
- installing a 138/69 kV transformer at Reiner (2006). *

As noted in the prior discussion, the projects above depicted by an asterisk will provide load serving benefits as well.

Two other situations exist in Zone 3 that will need to be addressed. The Whitewater-Mukwonago 138 kV line is a critical, yet often the limiting, element to importing power into Wisconsin. This facility is nearly 80 years old. While the structures are in good condition, the line has been experiencing hardware and conductor failures, which pose severe safety issues. The optimum near term solution for this situation is to replace the existing conductors and hardware on this line to address the safety issue, which will increase its capacity by approximately 150 MVA (roughly 80%) and address the import limitation issue in the near term. A longer term solution to the limitations in the area could involve a new 345 kV line from the Madison or Janesville/Beloit area to the Milwaukee or Kenosha/Racine area. Environmental sensitivities associated with the Whitewater-Mukwonago line are being considered and addressed in the course of developing the best long term solution for the area's transmission service and load serving needs.

In addition, there are impending low voltages identified on the system in eastern Rock and western Walworth counties and an overload on the Turtle-Bristol 69 kV line under contingency. Converting the existing Turtle-Bristol 69 kV line, which needs to be rebuilt in any case due to its physical condition, to 138 kV, but initially operated at 69 kV (2004) will remedy this situation.

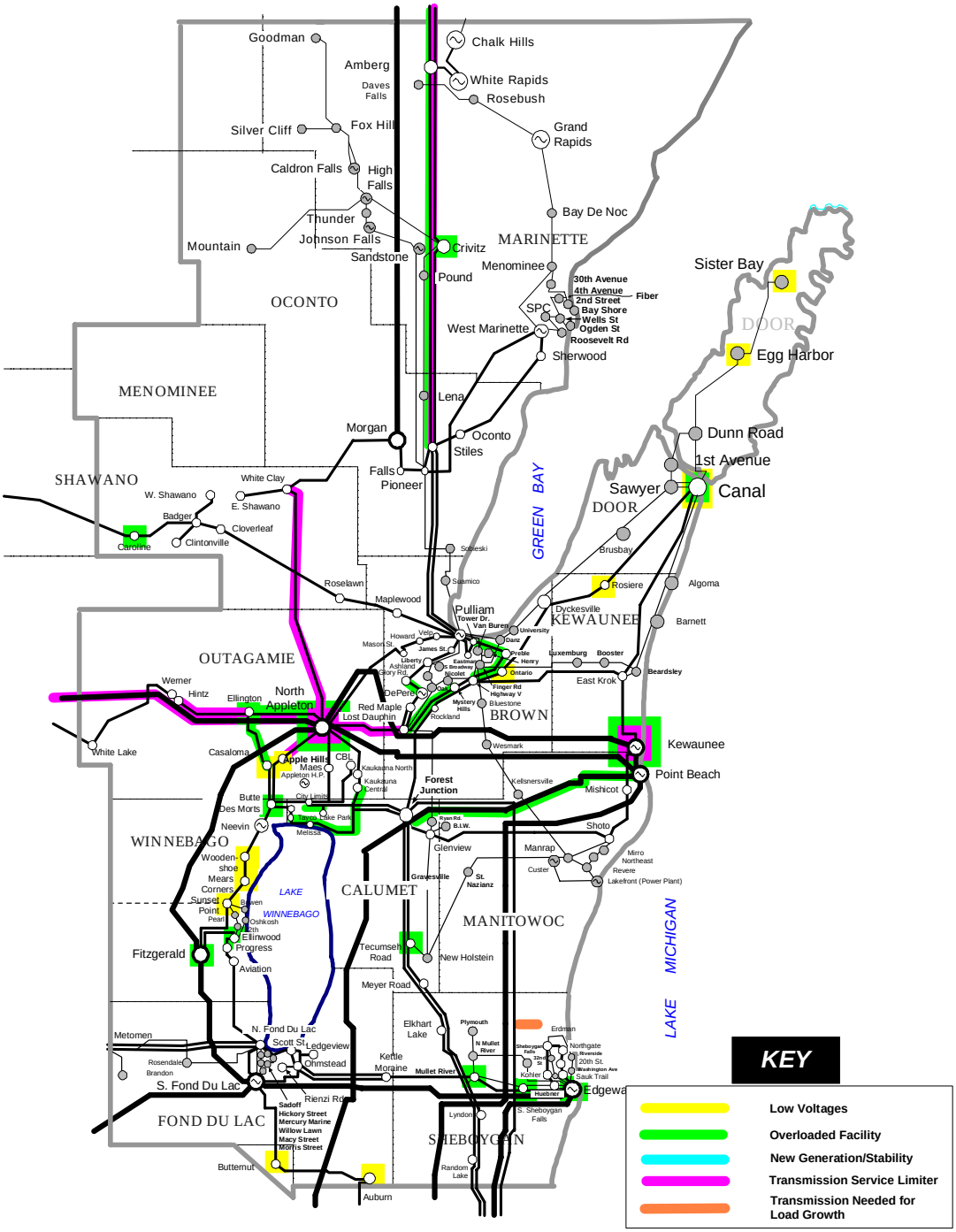
In response to customer requests for new interconnections to the transmission system, a 69 kV circuit from Fitchburg through Tokay to Westown is planned (2004).

Zone 4

Summary of Key Findings

- ❑ The Forest Junction projects addresses numerous system needs, but does not address constraints to moving power from Wisconsin to the upper peninsula.
- ❑ The Morgan-Stiles and Stiles-Amberg-Plains 138 kV lines will need to be rebuilt to address physical conditions issues, avert overloads and to improve transfer capability to and from the upper peninsula of Michigan.
- ❑ Transformer capacity in the Sheboygan area needs to be addressed.
- ❑ Heavy line loads and low voltages in the system west of Appleton and Green Bay will require additional transmission facilities as well as interim measures (capacitor banks).

Figure IV-4
Zone 4 Performance Criteria Limits Exceeded and Other Constraints



The key system performance criteria limits exceeded in Zone 4 were single contingency overloads. In addition, there is a need to address heavy flows on certain ATC facilities from Wisconsin to the upper peninsula of Michigan during non-peak periods and impending low voltages.

In response to the low voltage violations encountered, capacitor bank installations are planned for Badger, Werner and White Lake. However, the 138 kV and 115 kV facilities in this area west of Green Bay are susceptible to heavy loading during both peak and non-peak conditions and some sort of transmission line addition in the area will be required to address this situation for the long term. Converting the 115 kV system from Maplewood through Badger to Clintonville and from Badger to Shawano West to 138 kV and converting the W. Shawano-E. Shawano 34.5 kV line to 138 kV will improve the voltage profile of the network and reliability in the area. These conversions, coupled with other longer term solutions discussed below, will be needed to resolve load serving issues in that area.

The Forest Junction project, which involves rebuilding existing the 138 kV substation, adding two 345/138 kV transformers, looping the Point Beach-Arcadian 345 kV line into the substation, rebuilding the Forest Junction-Highway V 138 kV line and adding a Forest Junction-Lost Dauphin 138 kV circuit (on existing and rebuilt structures), addresses numerous issues in the Fox River Valley, including improving stability response of the Point Beach units, unloading the Kewaunee and North Appleton transformers and improving operating/maintenance flexibility in the area.

The Forest Junction project does not, however, totally resolve the overload issues and TLRs on the 138 kV circuits heading north into Green Bay, nor does it resolve the limitations on power flows to the upper peninsula of Michigan, both during non-peak periods. A more robust solution involving either significant line rebuilds through well-developed areas in Green Bay or a new transmission line will likely be needed to address these needs. Part of this solution will necessarily involve a rebuild of the Morgan-Falls-Pioneer-Stiles 138 kV line, which is a limiting facility to imports and exports, and which will require replacement due to its condition. Another consideration in selecting a solution for these limitations is the heavy line loading on the network west of Green Bay. Potential solutions that could resolve all of these issues include constructing a 345 kV line from Morgan to an intersection with the Rocky Run-North Appleton 345 kV line near the Werner substation, with 345/138 kV transformation at Werner, and constructing a 138 kV line from Werner to Clintonville (see 2009 Analysis, Zone 4).

There were a number of transformer overloads identified in the 2003 analysis (S. Sheboygan Falls, Mullet River, Edgewater, Crivitz and Canal). In response, a second 138/69 kV transformer is planned at both Mullet River and Crivitz (2003-2004), replacement of both existing 138/69 kV transformers is planned at Edgewater and Canal (2003-2004), a new 345/138 kV transformer is needed at Edgewater (2004), an uprate of the Ellinwood 138/69 kV transformer and constructing a second 69 kV circuit between Mullet River and North Mullet River is needed (2003).

To address low voltages in southern Door County, a capacitor bank is planned at the Canal substation. To address an impending line overload in the Fox River Valley, an uprate of the Lake Park-City Limits 138 kV line is needed by 2006. In response to a new

distribution interconnection request, a tap on the Forest Junction-Cedarsauk 138 kV line to Howards Grove is planned in 2006.

Zone 5

Summary of Key Findings

- Most of the line loading and low voltage issues in Zone 5 are impending and hence, do not require immediate action.
- New 345/138 kV transformations in northern Waukesha County and possibly southern Washington County will be needed for voltage support.

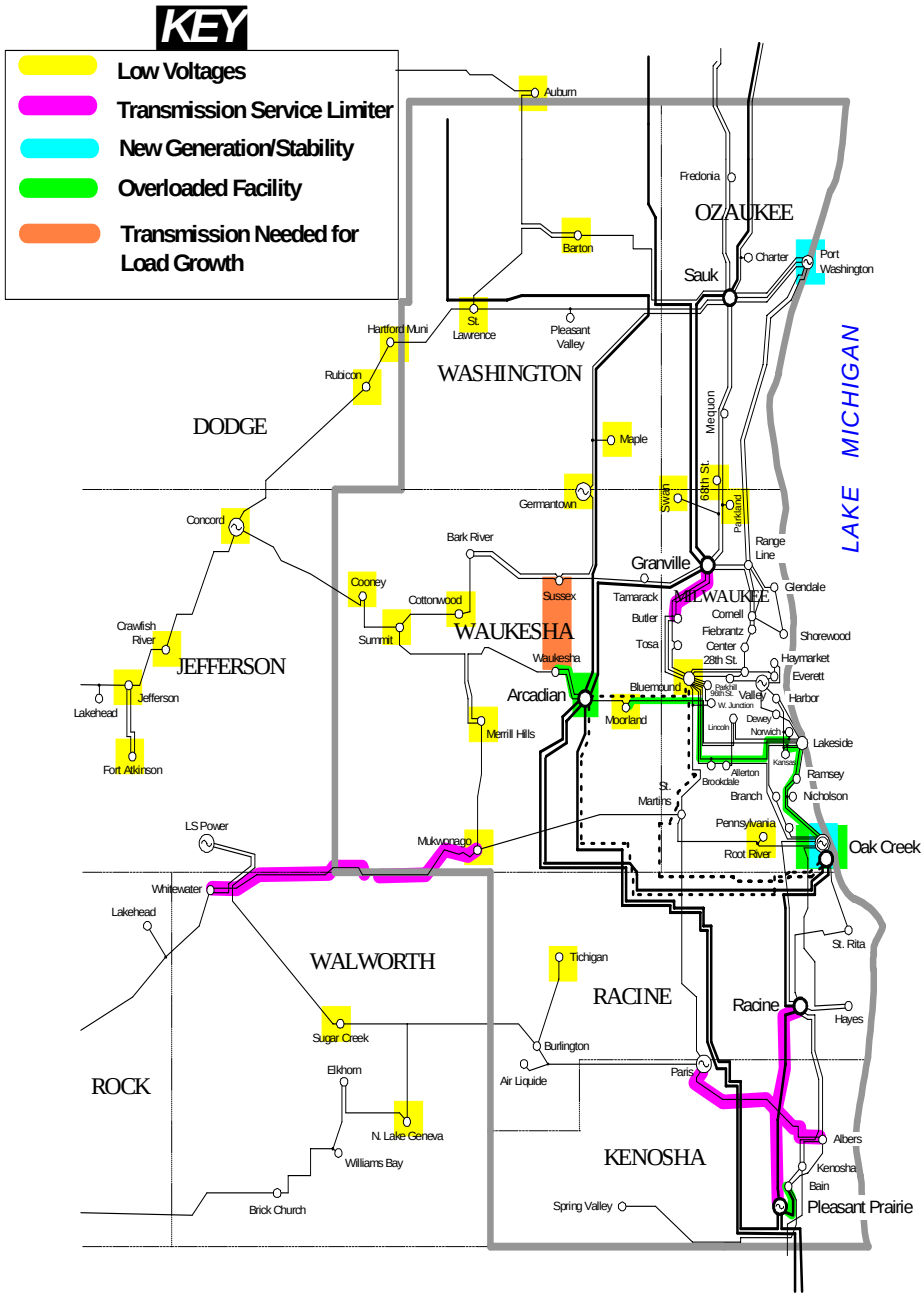
Given the mitigation measures already being taken in this zone, only one additional criterion was exceeded in the 2003 analysis beyond those identified in the Updated 2001 Assessment.

However, a number of overloads and low voltage conditions are impending and show up in conjunction with certain other projects and in the 2009 analysis. In particular, low voltages in northern Waukesha County are expected to be problematic in future years. One solution to many of these problems is a new 345/138 kV substation at a location called Lannon Junction, east of the Tamarack substation. An additional 345/138 kV substation north of Germantown (St. Lawrence is a possibility) may be warranted as well.

The condition of the St. Lawrence-Pleasant Valley-Saukville 138 kV line warrants replacement of the structures. This line will be reconductored as part of the rebuild project (2004).

A new distribution interconnection request will require that a new 138 kV line be constructed from Sussex through a new substation, Duplainville, and on to Waukesha (2005). This project will improve the voltage profile in the Sussex area.

Figure IV-5
Zone 5 Performance Criteria Limits Exceeded and Other Constraints



2009 Analysis

The exceeded system performance criteria limits and other system needs shown in the 2009 base and contingency cases are listed in Table IV-2, along with the magnitude of the exceeded limit, as applicable, and the cause of the limits being exceeded.

Discussion of Alternative Solutions

In developing a transmission plan based on the results of the 2009 analyses, it was assumed that the many of the primary solutions to needs identified in the 2003 analyses would be in-service. However, to determine whether certain needs or impending problems are justified in the future, certain solutions were left out of the 2009 base cases to confirm the need for the solution. Also, depending on the severity of the overloads or low voltages encountered in 2009 that were not encountered in 2003, solutions for those problems were planned for years prior to 2009 so as to minimize risk. Following is a brief discussion of the criteria limits that were exceeded and the rationale behind the project alternatives selected to be included in this Assessment.

Zone 1

Summary of Key Findings

- The Rhinelander Loop will require additional reinforcement prior to and sometime after 2010. One alternative, a 138 kV line from Venus to Plains, would provide adequate support for the Loop through 2010, but it is anticipated that an additional source to the Loop will be needed at some point beyond the current planning horizon.

The key system performance criteria limits exceeded in Zone 1 were single contingency overloads and low voltages. In addition, implementation of the Arrowhead-Weston project will require that certain facilities be upgraded to achieve the import capability targeted for that project.

To address the low voltage and single contingency overloads within the Rhinelander loop, a new 138 kV line from Venus to Plains was assumed (2007). This alternative would mitigate low voltages and overloads on the Rhinelander loop and provide a looped transmission source for two new T-D interconnection requests east of the Rhinelander loop. It is anticipated, however, that another interconnection to the Rhinelander loop will be needed for reliability sometime after 2010. A new Cranberry-Conover 138 kV line coupled with conversion of the Conover-Plains 69 kV line to 138 kV is a primary alternative under consideration for this purpose. In addition, an additional capacitor bank is planned at Hodag (2007) and at Clear Lake (2009). ATC is also considering the merits of other potential solutions as alternatives, including higher voltage lines (also see ***Conceptual Umbrella Plan for Northern Zones***).

To address overloads encountered, uprates of both Weston-Sherman St. circuits will be required (2007), an uprate of the Metomen-Ripon 69 kV line will be required (2007) and a second 138/69 kV transformer at Metomen (2007) and Wautoma (2010) are needed.

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS - 2009

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
1	Skanawan-Pine 115 kV line overload	103%		various outages	Summer peak
1	Bunker Hill-Black Brook 115 kV line overload	112%		Weston-Blackbrook 115 kV line outage	Summer peak
1	Kelly-Bunker Hill 115 kV line overload	100%		various outages	Summer peak
1	Bunker Hill-Pine 115 kV line overload	141%		various outages	Summer peak
1	Weston-Blackbrook 115 kV line overload	110%		various outages	Summer peak
1	Weston-Kelly 115 kV line overload	124%		various outages	Summer peak
1	Weston-Sherman St. 115 kV line overload	133%		various outages	Summer peak
1	Weston-Morrison Ave. 115 kV line overload	124%		Weston-Sherman St. 115 kV line outage	Summer peak
1	Morrison Ave.-Sherman St. 115 kV line overload	121%		Weston-Sherman St. 115 kV line outage	Summer peak
1	Hilltop-Sherman St. 115 kV line overload	107%		various outages	Summer peak
1	Arpin 345/138 kV transfomer overload	126%		Arpin-Rocky Run 345 kV line outage	Summer peak
1	Arpin-Sigel 138 kV line overload	108%		Arpin-Rocky Run 345 kV line outage	Summer peak
1	Sigel 138/69 kV transfomer overload	117%		various outages	Summer peak
1	Plover-Whiting Ave 115 kV line overload	104%		Rocky Run-Whiting Ave. 115 kV line outage	Summer peak
1	Wein-Stratford 115 kV line overload	122%		various outages	Summer peak
1	Stratford-McMillan 115 kV line overload	120%		various outages	Summer peak
1	Wautoma 138/69 kV transformer overload	111%		various outages	Summer peak
1	Metomen 138/69 kV transformer overload	127%		various outages	Summer peak
1	Metomen-Ripon 69 kV line overload	104%		various outages	Summer peak
1	NW Ripon Tap-Ripon 69 kV line overload	103%		various outages	Summer peak
1	Petenwell 138/69 kV transfomer overload	117%		McKenna-Lakehead Adams 69 kV line outage	Summer peak
1	Whitcomb 115/69 kV transformer overload	107%		various outages	Summer peak
1	Whitcomb-Wittenberg 69 kV line overload	126%		various outages	Summer peak
1	Whitcomb-Rosholt Tap 69 kV line (impending) overload	98%		Whiting Ave-Hoover 115 kV line outage	Summer peak
1	Brooks Corner-Deer Trail 69 kV line overload	101%		Blackbrook-Hogan St 115 kV line outage	Summer peak
1	Rhinelander loop 115 kV bus voltages		< 90%	various outages	Summer peak
1	Arpin to McMillan 115 kV bus voltages		< 90%	various outages	Summer peak
1	Sand Lake, Wautoma 138 kV bus voltages		90 - 92%	various outages	Summer peak
1	Roeder 138 kV bus voltage		92%	Green Lake - Roeder 138 kV line outage	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
1	Berlin Area 69 kV bus voltages		< 90%	various outages	Summer peak
1	N Randolph to Ripon 69 kV bus voltages		90 - 92%	N Randolph-Markesan Tap 69 kV line outage	
1	Petenwell 138 kV bus voltage		92%	Saratoga-Petenwell 138 kV line outage	
1	Council Creek 138 kV bus voltage		82%	Council Creek-Petenwell 138 kV line outage	Summer peak
1	Petenwell to McKenna 69 kV bus voltages		< 90%	various outages	Summer peak
2	Powers 69 kV bus voltage		92%	Amberg-White Rapids 138 kV line outage	Summer peak
2	Radar, Keweenaw, Keeweenaw Tap 69 kV bus voltages		92%	Atlantic 138/69 kV transformer outage	Summer peak
2	Sawyer, Gwinn 69 kV bus voltages		90-91%	Forsyth-Gwinn 69 kV line outage	Summer peak
2	Mass, Bruce Crossing, Watersmeet, Land O Lakes, Conover, Twin Lakes 69 kV bus voltages		88-92%	UPP Mass-Mass 69 kV line outage	Summer peak
2	Presque Isle-Empire 138 kV line (impending) overload	100%		Presque Isle-Freeman 138 kV line outage	Summer peak
2	Bruce Crossing, Watersmeet, Land O Lakes, Conover, Twin Lakes 69 kV bus voltages		87-90%	Mass-Bruce Crossing 69 kV line outage	Summer peak
2	UPP Tap 69 kV bus voltage		92%	Iron River-UPP Tap 69 kV line outage	Summer peak
2	Straits-Pine River 69 kV line (impending) overload	97%		Straits-Brevort 138 kV line outage	Summer peak
2	Detour 69 kV bus voltage		92%	Talentino 69 kV bus tie outage	Summer peak
2	Radar, Keweenaw, Keeweenaw Tap 69 kV bus voltages		91%	Atlantic-M38 138 kV line outage	Summer peak
2	Presque Isle-Freeman 138 kV line overload	112%		Presque Isle-Cedar 138 kV line outage	Summer peak
2	Cedar-M38 138 kV line overload	111%		Perch Lake-M38 138 kV line outage	Summer peak
2	Winona, Warden, M38, Osceola, Radar, Keweenaw, Keeweenaw Tap, Stone 69 kV & M38, Ontonagon 138 kV bus voltages		91-92%	Perch Lake-M38 138 kV line outage	Summer peak
2	Presque Isle-Freeman 138 kV line overload	102%		Presque Isle-National 138 kV line outage	Summer peak
2	National-Tilden 138 kV Ckt 2 line (impending) overload	98%		National-Tilden 138 kV Ckt 1 line outage	Summer peak
2	McGulpin-Straits 138 kV line 9901 overload	102%		McGulpin-Straits 138 kV line 9903 outage	Summer peak
2	McGulpin-Straits 138 kV line 9903 overload	102%		McGulpin-Straits 138 kV line 9901 outage	Summer peak
2	Hiawatha, Lakehead 69 kV bus voltages	92%		Morgan-Plains 345 kV line outage	Summer peak
3	Colley Road-Clinton 69 kV line overload	109%		various outages	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
3	Nine Springs, Pflaum 69 kV bus voltages		88-90%	Royster-Pflaum Tap 69 kV line outage	Summer peak
3	Mazomanie 69 kV bus voltage		91%	Arena-Mazomanie 69 kV line outage	Summer peak
3	Waunakee 69 kV bus voltage		90%	Waunakee-Waunakee Tap 69 kV line outage	Summer peak
3	Lake Delton, Kirkwood, Rock Springs, Loch Mirror, Dell Creek, Kilbourn, Lewiston, 138 kV bus voltages		82-90%	Trienda-Lewiston 138 kV line outage	Summer peak
3	Numerous Madison City 69 kV bus voltages--Mendota, Huiskamp, Ruskin, East Campus, Walnut, East Towne, Wingra, etc.		88-90%	Yahara River-Sycamore 138 kV line outage, Columbia-North Madison 345 kV line outage, Kegonsa-Christiana 138 kV line outage, Sycamore-Blount 138 kV line outage	Summer peak
3	Fall River and Doyleston 69 kV bus voltages		88%	Academy-Fall River 69 kV line outage	Summer peak
3	Lake Geneva, Katzenburg, Twin Lakes, South Lake Geneva 69 kV bus voltages		85%	North Lake Geneva-Lake Geneva 69 kV line outage	Summer peak
3	Dickinson, Brick Church, Williams Bay 138 kV bus voltages		87-90%	Dickinson-Brick Church and Colley Road-Dickinson 138 kV line outages	Summer peak
3	Burke, Sun Prairie, Token Creek 69 kV bus voltages		83-91%	Reiner-Burke Tap 69 kV line outage	Summer peak
3	Monticello, Verona 69 kV bus voltages		91%	North Monroe-Monticello 69 kV line outage	Summer peak
3	Lancaster, Mazomanie, Pine River 69 kV bus voltages		89%	Nelson Dewey-Lancaster 138 kV line outage	Summer peak
3	Lancaster, Eden, Wyoming Valley, Spring Green 138 kV bus voltages		83-88%	Nelson Dewey-Lancaster 138 kV line outage	Summer peak
3	Cambridge and London 138 kV bus voltages		91%	Cambridge-Rockdale 138 kV line outage	Summer peak
3	Richland Center, etc. 69 kV bus voltages		85-89%	Richland Center-Richland Center Tap & Dayton-Richland Tap 69 kV line outages	Summer peak
3	Kegonsa-Christiana 138 kV line overload	123%		Christiana-Fitchburg 138 kV line outage	Summer peak
3	North Madison 138/69 kV (impending) transformer overload	98%		Reiner-Sycamore 138 kV line outage	Summer peak
3	North Madison 345/138 kV transformer overload	100%		Outage of adjacent 345-138 kV transformer	Summer peak
3	Christiana-Fitchburg 138 kV line overload	112%		Kegonsa-Christiana 138 kV line outage	Summer peak
3	North Madison-Yahara River 138 kV line overload	106%		Kegonsa-Christiana 138 kV line outage	Summer peak
3	Yahara River-Sycamore 138 kV line overload	102%		Kegonsa-Christiana 138 kV line outage	Summer peak
3	Brick Church-Zenda 69 kV line overload	107%		North Lake Geneva-Lake Geneva 69 kV line outage	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
3	Janesville 138/69 kV transformer overload	102%		McCue 138/69 kV transformer Outage	Summer peak
3	McCue-Milton Lawns 69 kV line overload	119.50%		Outage of Janesville 138-69 kV transformer	Summer peak
3	Kegonsa 138/69 kV transformer overload	105%		Kegonsa-Colliday Point 138 kV line outage	Summer peak
3	McCue 138/69 kV transformer overload	106%		Janesville 138/69 kV transformer outage	Summer peak
3	McCue-Harmony and Harmony-LaMar 69 kV line overloads	103%		Kegonsa 138/69 kV transformer outage and Kegonsa-North Stoughton 69 kV line outage	Summer peak
3	Reiner-Burke Tap 69 kV line overload	102%		North Madison 138/69 kV transformer outage	Summer peak
3	Dane-North Madison 69 kV line overload	103%		Yahara River-Sycamore 138 kV line outage	Summer peak
3	Merimac-Caledonia 69 kV line overload	107%		Island-Kirkwood 69 kV line outage	Summer peak
3	Columbia-Manley Sand 69 kV line overload	111%		North Madison 138/69 kV transformer outage	Summer peak
3	Columbia 138/69 kV transformer (impending) overload	98%		Portage 138/69 kV transformer outage	Summer peak
3	Nine Springs-Fitchburg 69 kV line overload	113%		Royster-Pflaum Tap 69 kV line outage	Summer peak
3	East Campus-Blount 69 kV line overload	121%		East Campus-Blount 69 kV line outage	Summer peak
3	Royster- Pflaum 69 kV line overload	124%		Nine Springs-Fitchburg 69 kV line outage	Summer peak
3	Dickinson-Brick Church (impending) 138 kV line overload	96%		Colley Road-Enzyme 69 kV line outage	Summer peak
3	Blount-Ruskin 69 kV line overload	120%		Waunakee-Waunakee Tap 69 kV line outage	Summer Peak
3	Gateway-Sycamore 69 kV line overload	121%		Sycamore-Blount 138 kV line outage	Summer Peak
4	Egg Harbor 69 kV bus voltage		88-91%	various outages	Summer peak
4	Sister Bay 69 kV voltage		85-91%	various outages	Summer peak
4	Tecumseh 138/69 kV transformer overload	100-97%		various outages	Summer peak
4	Rosebush 69 kV bus voltage		91%	White Rapids-Rosebush 69 kV line outage	Summer peak
4	Dave's Falls 69 kV bus voltage		90%	White Rapids-Rosebush 69 kV line outage	Summer peak
4	Ellinwood 139/69 kV transformer overload	116%		Fitzgerald-Sunset Point 138 kV line outage	Summer peak
4	Butte des Morts 138 kV bus tie 1-2 overload	101-99%		various outages	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
4	Ellington-Casaloma 138 kV line (impending) overload	98%		Casaloma-Butte des Morts 138 kV line outage	Summer peak
4	Ellington 138 kV bus tie 2-3 (impending) overload	97%		Casaloma-Butte des Morts 138 kV line outage	Summer peak
4	N. Appleton 345/138 kV transformer #2 (impending) overload	99%		N. Appleton 345/138 kV transformer #1 outage	Summer peak
4	N. Appleton 345/138 kV transformer #2 (impending) overload	98%		N. Appleton 345/138 kV transformer #3 outage	Summer peak
4	N. Appleton 345/138 kV transformer #3 (impending) overload	96%		N. Appleton 345/138 kV transformer #2 outage	Summer peak
4	Point Beach-Forest Junction 345 kV line (impending) overload	98%		Kewaunee 345/138 kV transformer T-10 outage	Summer peak
4	Edgewater 345/138 kV transformer T-21 overload	112%		Edgewater 345/138 kV transformer T-22 outage	Summer peak
4	Auburn 138 kV bus voltage		89-91%	various outages	Summer peak
4	Butternut 138 kV bus voltage		88-91%	various outages	Summer peak
4	N. Appleton 345/138 kV transformer #1 (impending) overload	99%		N. Appleton 345/138 kV transformer #2 outage	Summer peak
4	Casaloma 138 kV bus voltage		91%	Casaloma-Butte des Morts 138 kV line outage	Summer peak
4	Ellington-N. Appleton 138 kV line overload	119%		Casaloma-Butte des Morts 138 kV line outage	Summer peak
4	Kaukauna Central Tap-Melissa 138 kV overload	136-96%		various outages	Summer peak
4	Melissa-Tayco 138 kV line overload	108%		Butte des Morts 138 kV bus tie 1-2 outage	Summer peak
4	Apple Hills 138 kV bus voltage		92%	N. Appleton-Apple Hills 138 kV line outage	Summer peak
4	Wooden Shoe 138 kV bus voltage		91%	various outages	Summer peak
4	Lost Dauphin-Mystery Hill 138 kV line overload	104-97%		various outages	Summer peak
4	Highway V-Preble 138 kV line overload	108-97%		various outages	Summer peak
4	Tower Drive-Preble 138 kV line overload	105-98%		various outages	Summer peak
4	Ontario 138 kV bus voltage		92%	Highway V-Ontario 138 kV line outage	Summer peak
4	Canal 138 kV bus voltage		85-91%	various outages	Summer peak
4	Kewaunee 345/138 kV transformer T-10 (impending) overload	99%		Point Beach-Forest Junction 345 kV line outage	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
4	Glory Road-DePere 138 kV line (impending) overload	95%		Lost Dauphin-Mystery Hill 138 kV line outage	Summer peak
4	Rosiere 138 kV bus voltage		90-92%	various outages	Summer peak
4	Fitzgerald 345/138 kV transformer overload	101-96%		various outages	Summer peak
4	Sunset Point 138 kV bus voltage		92.0%	Quarry Run-Neevin 138 kV line outage	Summer peak
4	Mears Corners 138 kV bus voltage		91-92%	various outages	Summer peak
4	Lake Park-City Limits 138 kV line overload	106%		N. Appleton-Apple Hills 138 kV line outage	Summer peak
5	Arcadian6-Waukesha6 138 kV line overload	113%		Arcadian4 - Waukesha4 138 kV line outage	Summer peak
5	Arcadian 345/138 kV transformer overload	98%		Arcadian 345/138 kV transformer #1 outage	Summer peak
5	Kansas-Norwich 138 kV line overload	106%		various outages	New generation
5	Kansas-Ramsey 138 kV line overload	112%		various outages	New generation
5	Oak Creek-Ramsey 138 kV line overload	120%		various outages	New generation
5	Moorland-Kansas 138 kV line overload	101%		Arcadian-Moorland 138 kV line outage	New generation
5	Bluemound 230 kV bus voltage		89%	Bluemound-Oak Creek 230 kV line outage	New generation
5	Oak Creek 230/138 kV transformer overload	115%		various outages	New generation
5	Germantown and Maple 138 kV bus voltages		88%	Germantown-Lannon 138 kV line outage	Summer peak
5	Jefferson, Fort Atkinson, Crawfish River 138 kV bus voltages		78%	Jefferson-Lakehead-Rockdale 138 kV line outage	Summer peak
5	Oak Creek 345/138 kV transformer overload	100%		various outages	New generation
5	Bluemound 230 kV, Merrill Hills 138 kV and Mukwonago 138 kV bus voltages		89%	various outages	Summer peak
5	Moorland 138 kV bus voltage		89%	various outages	Summer peak
5	Tichigan, N. Lake Geneva, Sugar Creek 138 kV bus voltages		89%	various outages	Summer peak
5	Mukwonago 138 kV bus voltage		89%	various outages	Summer peak
5	Edgewood 138 kV bus voltage		89%	Edgewood-St. Martins 138 kV line outage	Summer peak
5	Auburn, Barton, Butternut 138 kV bus voltages		89%	various outages	Summer peak
5	Cooney, Cottonwood, Summit 138 kV bus voltages		86%	Bark River-Cottonwood 138 kV line outage	Summer peak

TABLE IV-3
PERFORMANCE CRITERIA LIMITS EXCEEDED AND OTHER CONSTRAINTS – 2009 (continued)

Planning Zone	Performance Criteria Limit Exceeded/Need	% of Facility Rating	% of Nominal Bus Voltage	Cause	Condition
5	Parkland, Swan, 68th St 138 kV bus voltages		87%	Saukville-Granville 138 kV line outages	Summer peak
5	Root River 138 kV bus voltage		89%	Oak Creek-Root River 138 kV line outage	Summer peak
5	Hartford and Rubicon 138 kV bus voltages		89%	Hartford-St. Lawrence 138 kV line outage	Summer peak
5	Concord, Fort Atkinson, Jefferson, Hartford, St. Lawrence 138 kV bus voltages		78%	Rockdale-Lakehead-Jefferson 138 kV line outage	Summer peak

To address other low voltages encountered, capacitor banks are needed at Berlin (2007) and Winneconne (2008).

In response to a new distribution interconnection request, a 115 kV line from St. Germain to a new Boulder Junction substation will be required.

Zone 2

Summary of Key Findings

- Construction of a second Hiawatha-Straits 138 kV circuit will avert overloads, improve 69 kV voltage profiles in the eastern upper peninsula of Michigan (the U.P.) and complete two 138 kV circuits across the U.P.
- Rebuilding the Plains-Stiles double circuit 138 kV line will replace aging facilities, reduce the limitations to granting transmission service to and from the U.P. from/to Wisconsin and improve the U.P./Wisconsin transfer capability.

A number of line overloads and impending low voltages were identified in the 2009 analysis. Uprates of the Presque Isle-Freeman, Cedar-M-38 and National-Tilden 138 kV lines will be required. To address overloads in the eastern U.P., a second 138 kV circuit from Hiawatha to Straits is planned (2007). No specific projects were proposed to address the impending low voltages; these issues will be more thoroughly addressed in future assessments.

The double circuit 138 kV line from Plains to Stiles was identified as a limit to granting transmission service in numerous instances, and a reinforcement will be required. One alternative would be to rebuild the line to accommodate larger conductors. This alternative would be time-consuming due to the fact that the line length is 77 miles and it will be necessary to reconnect the line during the rebuild if emergency conditions occur. This project will also likely require significant and costly redispatch of generation for system security purposes. Other viable alternatives to this rebuild project (which would also eliminate the need for construction-related generation redispatch) could include transmission line projects that lessen flows on the Plains-Stiles circuits. For purposes of this Assessment, a rebuild of the Plains-Stiles line was assumed to be in service in 2006, however, this and other alternatives will require additional study and public input.

Zone 3

Summary of Key Findings

- The 69 kV network in various portions of Zone 3 will require conversion of facilities to 138 kV.
- The numerous low voltages and line overloads in the Madison area signal the need for a new 345 kV source on the west side of Madison.

Many of the system performance criteria limits exceeded in Zone 3 were associated with the 69 kV system within the zone. This finding signals that in many areas within Zone 3, the 69 kV system is becoming inadequate to serve the growing load. Low voltages were shown in the Madison area, in Sauk and Iowa Counties to the west of Madison, in Rock and Walworth Counties along the Illinois border and in Dodge County.

New capacitor banks were planned for Fall River and Lake Geneva. In most cases, however, capacitor banks by themselves will not suffice; new transmission lines or conversion of existing facilities from 69 kV to 138 kV is warranted. A new Elkhorn-Sugar Creek 138 kV line (2007), a new Spring Green-Prairie du Sac 69 kV line (2009) and conversion of the West Middleton-Spring Green 69 kV line to 138 kV (2009) are primary alternatives under consideration. Line and transformer overloads identified are being addressed by 138/69 kV transformer additions at Janesville and Rock River and uprating or reconductoring four different 69 kV lines.

There were also numerous low voltages and line overloads in the Madison area. These problems signal the need for a new 345 kV source into the west side of Madison. For purposes of this plan, a new Rockdale-West Middleton 345 kV circuit was assumed to be the primary alternative. This alternative and others will require additional analyses and input from various stakeholders.

Zone 4

Summary of Key Findings

- Construction of a new Morgan to a new Werner West 345 kV circuit, with a 345/138 kV transformer at Werner West and the Clintonville to Werner West 138 kV line will avert overloads, improve 138 kV voltage profiles in the Fox Valley and Green Bay areas.
- Rebuilding the Plains-Stiles double circuit 138 kV line will replace aging facilities, reduce the limitations to granting transmission service to and from the U.P. from/to Wisconsin and improve the U.P./Wisconsin transfer capability.

A number of line and transformer overloads and impending overloads, as well as low voltages, were identified in the 2009 analysis. Capacitor banks are planned at Butternut and Fitzgerald in 2007, at Rosebush in 2008 and at Canal in 2003, 2006 and 2009. The 138/69 kV transformer at Tecumseh will require an uprate by 2007, as will the Lake Park-City Limits and Kaukauna Central Tap-Melissa 138 kV lines.

Three new transmission line projects are planned in the 2006-2007 timeframe. A new tap on the 138 kV line, from a tap point on the Forest Junction-Cedarsauk 138 kV line, to a new Howards Grove substation will address a transmission-distribution interconnection request.

A new 138 kV line is planned from Clintonville to a new Werner West substation. This project, in conjunction with the Morgan-Werner West 345 kV line project described below will provide significant line loading and voltage profile benefits to that area.

A new 345 kV line is planned from Morgan to a new Werner West substation (adjacent to the Rocky Run-North Appleton line), with a 345/138 kV transformer at Werner West. This project would address a multitude of issues, including Wisconsin-U.P. transfer capability limitations (in conjunction with other reinforcements), voltage profiles west of the Fox Valley and line overloads in the Green Bay and Fox Valley area. It is recognized that this solution will require further study and public input.

Also, as was discussed in the summary for Zone 2, the Plains-Stiles double circuit 138 kV line overloading will need to be addressed. This facility spans Zones 2 and 4. For purposes of this assessment, it was assumed that the line will be rebuilt and in service by 2006 to achieve a higher capacity.

Zone 5

Summary of Key Findings

- ❑ Accomodating planned new generation in the Milwaukee metro area will drive most of the system expansion in Zone 5 later this decade.
- ❑ Addressing a relatively weak 138 kV network in Jefferson and western Waukesha County will require additional analyses (see ***Conceptual Umbrella Plan Development for Southern Zones***).

Line, transformer and bus equipment overloads were identified in Zone 5, as were a multitude of low voltages. In addition, significant amounts of new generation were assumed to be added in this zone in the 2005-2011 timeframe, necessitating additional reinforcements.

The addition of proposed new generation at Port Washington (and retirement of existing generation) will require that the five 138 kV circuits from Port Washington (two circuits to Range Line and three circuits to Saukville) be rebuilt with larger conductors to increase their capacities.

The addition of proposed new generation at Oak Creek coupled with projected load growth will trigger numerous system reinforcements in the Milwaukee metro area in 2007, 2009 and 2011. The reinforcements include:

- Expand Oak Creek 345 kV switchyard to interconnect one new 650 MW generator, unit #7 plus two 345 kV lines and 138 kV switchyard to accommodate new St. Martins line (2007).
- Construct an Oak Creek-Brookdale 345 kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV, and 5 mi. 138 kV. (2007).
- Construct a 345/138 kV switchyard at Brookdale to accommodate two 345 kV lines; 1-500 MVA, 345/138 kV transformer and 4-138 kV lines plus two 138-/26.2 kV transformers (2007).
- Construct a Brookdale-Granville 345 kV line converting/reconductoring 5.6 mi. 138 kV, rebuilding 7mi. 138 kV double circuit tower line and converting/reconductoring 3 mi. 138 kV on existing 345 kV structures (2007).
- Reconductor Bluemound-Butler 138 kV line (KK5051) on new 345 kV structures installed with Brookdale-Granville 345 kV line (2007).
- String Butler-Tamarack (Carmen) 138 kV line on new 345 kV structures installed with Brookdale-Granville line (2007).
- Construct Oak Creek-St Martins 138 kV circuit #2 installing 4 mi. new structures and conductor, plus 12.6 mi. conductor on existing towers (2007).
- Construct 345 kV Bluemound switchyard to accommodate one 345 kV line and one 345/138 kV transformer (2007).
- Convert/reconductor Oak Creek-Bluemound 230 kV line to 345 kV (2007).
- Install circuit breakers at Pleasant Prairie 345 kV switchyard (2007).
- Replace seven 138 kV overdutied breakers at Bluemound (2007).

- Reconductor Oak Creek-Ramsey6 138 kV line (2007).
- Reconductor underground segment of Ramsey5-Harbor 138 kV line (2007).
- Reconductor Oak Creek-Allerton 138 kV line (2007).
- Expand Oak Creek 345 kV switchyard to connect one new 650 MW generator (2009).
- Construct a Pleasant Prairie-Libertyville (CE) 345 kV line (2009).
- Expand Oak Creek 345 kV switchyard to interconnect three new generators, unit #8 and two 345 kV lines, plus installation of eight 345 kV series breakers for stability purposes (2011).
- Expand Oak Creek 138 kV switchyard to reconnect units #6 and #9 (2011).
- Convert and reconductor Oak Creek-Bluemound 230 kV line to 345 kV and loop into Arcadian 345 kV substation (2011).
- Expand 345 kV switchyard at Bluemound to accommodate three additional 345 kV lines and two additional 345/138 kV transformers (2011).
- Reroute Brookdale-Granville 345 kV line into expanded Bluemound 345 kV switchyard (2011).
- Construct Oak Creek-Racine 345 kV line with 4 mi. new structures and conductor, plus convert 9.6 mi. 138 kV line to 345 kV (2011).
- Replace 22-138 kV overdutied breakers at Harbor, Everett and Haymarket Substations (2011).

In addition, capacitor banks are planned at Summit, Tichigan and Moorland in 2009 to address low voltages.

Yet to be resolved is a robust long term solution for the 138 kV system in Jefferson and western Waukesha Counties. This area will require additional analyses.

Conceptual Umbrella Plan for Northern Zones (Zones 1, 2, and 4)

Within the northern zones in ATC's service territory, there are a number of issues for which potential solutions would necessarily affect adjacent northern zones. The purpose of this section is to begin to provide a basis from which to evaluate alternatives within Zones 1, 2, and 4 for their ability to fit into potential regional solutions. This section of the assessment steps back from the preceding discussions of Zones 1, 2, and 4 to get an overview of the issues and solutions that can be combined to develop an umbrella plan for the entire northern region of ATC's service territory. While this discussion focuses on these three zones, it does not intend to exclude other ATC zones or other transmission systems adjacent to ATC's system.

The needs, issues, and solutions that would apply to this region as a whole are intended to be conceptual in nature. This means that additional analyses will be needed to determine the details of the conceptual plan proposed. The rest of this section presents the basis for further consideration of the umbrella plan for this region.

The intent of the umbrella plan is that it completely address all of the needs and issues of the region far into the planning horizon. The conceptual umbrella plan proposed is not considered a final proposal, but is meant to be a starting point for crafting a realistic umbrella plan and also for beginning to assess the value of individual reinforcements beyond meeting a local need. Some of the reinforcements described may not be discussed in the rest of this Assessment, but are listed here for expanded consideration in future assessments. Given all the qualified assumptions, review of the plan proposed does begin to show which reinforcements may be

needed regardless of how the umbrella plan develops and which reinforcements may depend on the development of specific parts of the umbrella plan.

Introduction

In order for ATC to properly plan its transmission system in the short and long term, as required by NERC Planning Standards and as needed by our customers, it is important to have regional plans that individual projects can be compared to for the purpose of determining their value. This value goes beyond the local need that justifies them and considers their value to supporting the transmission system in the region. The goal in this section of the assessment is to begin to develop a conceptual umbrella plan for the region that has a basis in resolving needs and issues from zones 1, 2, and 4 without ignoring zones 3 and 5 or adjacent transmission systems.

As a crucial first step in achieving this goal, we have listed all relevant needs and issues throughout the region. Then, we have defined a conceptual umbrella plan that could meet all of the issues and needs. Finally, we provide a discussion of the conceptual plan, noting its particular merits in relation to the needs and issues of the region and noting some of the alternative components of the plan for future consideration.

Many significant technical, environmental, or political issues may not be adequately addressed in this initial umbrella plan. However, ATC expects that future assessments will embellish and develop this conceptual plan into a realistic umbrella plan that includes significant issues even beyond the region defined by Zones 1, 2, and 4.

We emphasize that while analysis of the system has been used to determine some of the issues and some of the individual reinforcements, the conceptual plan has not been analyzed as a whole. It will undergo continued development in future assessments and based on stakeholder input.

Issues

There are several general issues that are likely to require enhancements to the transmission system in the region:

- Load growth requiring new or expanded distribution substations
- Potential generation additions or retirements
- Transmission line and substation equipment condition
- Excessive thermal loading of lines, transformers and other substation equipment
- Lines derated because of inadequate clearances
- Generator and voltage dynamic stability
- Long, weak radial lines
- System limitations resulting in transmission loading relief or operating procedure implementation

From these general issues, a number of more specific issues have been compiled to guide the crafting of the conceptual plan. The more specific issues include:

1. Improve generator stability in the Weston area, and prevent equipment damage when reclosing the Eau Claire-Arpin 345 kV line.
2. Provide up to 3000 MW of simultaneous import capability for the ATC system.
3. Improve reliability by reducing reliance on complicated operating guides and schemes such as the Arpin Guide and the Presque Isle generator tripping scheme.
4. Remove overloads for lines in and around the Rhinelander area to adequately keep up with steadily increasing electrical demands in the area.

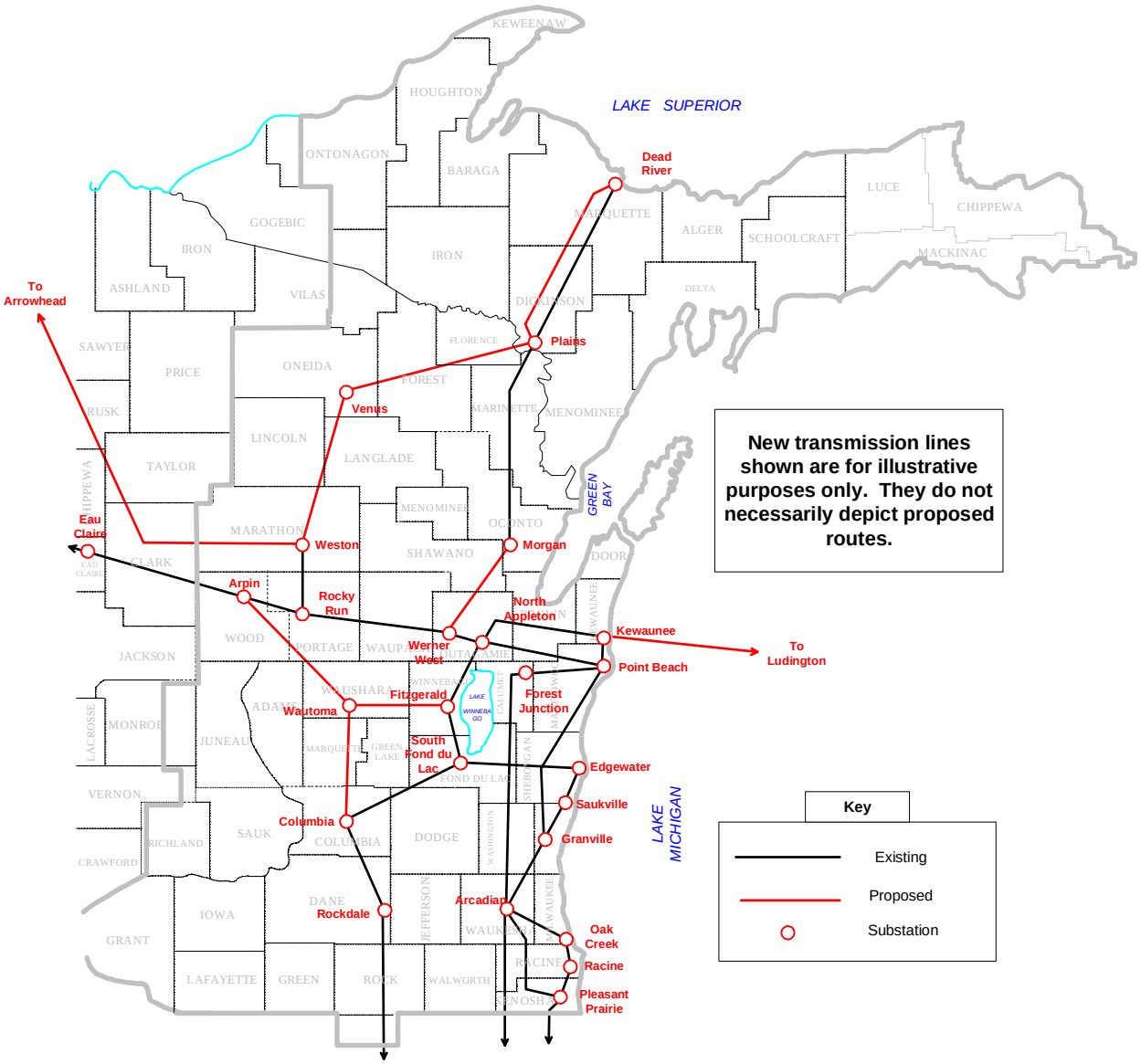
5. Remove overloads for lines and transformers in the Upper Peninsula system.
6. Improve voltage stability in the western Upper Peninsula system.
7. Improve transfer capability across the eastern half of the Upper Peninsula.
8. Improve transfer capability between Michigan and Wisconsin.
9. Mitigate the poor condition (including low clearances) of some facilities by removal or rebuild. Reinforcements for condition needs are identified in the list of reinforcements for each plan.Potential generation sites that require major reinforcements to a significant part of the system.
10. Improve system stability issues and line loading levels for outages affecting ties between the central and eastern parts of Wisconsin.
11. Improve voltage profiles for various single contingencies in central Wisconsin in response to continuing load growth.
12. Improve safety, reliability, and voltage profile for certain radial lines that serve substations such as Goodman and Sister Bay.
13. Improve voltage stability for the Rhinelander area.
14. Provide reliable service to developing load centers by building lines to new T-D substations.
15. Determining the future of the Wausau 46 kV system.

Distribution Substations

Below is a list of new substations or expanded substations that are likely to require new lines or significant system reinforcements because of new or growing load centers. There may be others that are not listed.

- Crandon (Zone 1)
- Boulder Junction (Zone 1)
- Laona (Zone 1)
- Northwest Minocqua (Hwy D, Zone 1)
- North Tomahawk (Lake Nokomis or Hwy Y, Zone 1)
- Dunbar (Zone 4)
- Menominee Fiber Plant (Zone 4)
- Bay de Noc (Zone 4)
- Grand Rapids (Zone 4)

Figure IV-6
Conceptual Umbrella Plan for Northern Zones



Generation Sites

The following list does not reflect generator requests in ATC's interconnection request queue, though a few of the sites are representative of requests in ATC's queue. Rather, it is intended to be a listing of some possible sites that have been previously considered and may not be a complete list of possible sites.

- Weston
- Pulliam
- De Pere
- Appleton
- Harris
- Escanaba
- Presque Isle
- Rocky Run
- Arpin
- Manitowoc

Umbrella Plan Description

The initial conceptual umbrella plan will be described by the major reinforcements that might make up the plan. At this time this plan is a proxy for a number of alternatives that might be considered in the future. It is left to future assessments to refine the plan, add other alternatives, and develop comparative attributes from which to define the preferred umbrella plan. The list of reinforcements should not be considered exclusive. There are very likely other reinforcements required. Additional analyses and stakeholder input will be required to determine the performance and to adjust these conceptual ideas into a technically, environmentally, and politically acceptable plan.

The development of the plan attempted to look at the transmission system from the view of developing a robust plan to handle many scenarios over the planning horizon. Another view that has not been incorporated or developed yet, would consider what is needed to optimally site generation for maximizing use of the transmission system. The generation component has been left for future assessments.

There are two lists below that describe the conceptual plan. The first list contains the facilities common to any plan alternatives. To be classified as a common facility only means that work needs to be done on the same facility regardless of the plan's alternatives. However, the common facility might actually be constructed or operated at a different voltage or rating in some variation of the plan. The second list presents the core of the plan. The heart of the plan is intended to highlight the proxies for line routes and substation sites that might be needed. Associated with the plan is also a sketch showing how the 345 kV system would change. Some alternatives to the proxies listed in the heart of the plan are mentioned in the discussion of the plan at the end of this section.

Facilities That Are Common To All Alternatives

- Construct Arrowhead-Weston 345 kV line project
- Rebuild McMillan-Wien as a 161 kV line, operate at 115 kV (larger conductor)
- Rebuild/convert Pine-Eastom 46 kV line to 115 kV
- Construct Eastom-Hwy Y-Hwy 8 115 kV line
- Construct Clear Lake-Hwy D-Boulder Junction-St Germain 115 kV line

- Rebuild/convert Conover-Plains 69 kV line to 138 kV (condition, operate @ 69 kV in some plans)
- Rebuild Stiles-Crivitz-Amberg-Plains 138 kV double circuit line (condition & larger conductor)
- Rebuild/convert Conover-Winona 69 kV line to 138 kV (condition, operate @ 69 kV in some plans)
- Rebuild/convert Chalk Hills-Chandler 69 kV line to 138 kV (condition, operate @ 69 kV in some plans)
- Rebuild Cedar-M38 138 kV line (condition, larger conductor)
- Rebuild Presque Isle-Cedar 138 kV line (larger conductor)
- Rebuild Indian Lake-Hiawatha-Pine River-Straits 69 kV lines to form a double circuit 138 kV line (condition, operate @ 69 kV in some plans)
- Rebuild/convert Munising-Blaney Park 69 kV line to 138 kV (condition, operate @ 69 kV in some plans)
- Convert Maplewood-Badger 115 kV line to 138 kV
- Convert Shawano East-West 34.5 kV tie to 138 kV
- Construct Werner West-Clintonville 138 kV line & Werner West 345/138 kV substation
- Construct Forest Junction 345/138 kV project
- Rebuild Morgan-Falls-Pioneer-Stiles 138 kV line (larger conductor)
- Construct North Fond du Lac-Butte des Morts 138 kV line

Robust 345 kV Plan
- Convert Weston-Blackbrook 115 kV line to 345 kV operation
- Construct Blackbrook-Venus-Plains 345 kV line
- Construct Plains-Dead River 345 kV line
- Construct Werner West-N Appleton 345 kV line
- Construct Arpin-Wautoma-Columbia 345 kV line
- Construct Wautoma-Fitzgerald 345 kV line
- Construct Kewaunee-Ludington +/- 250 kV DC line
- String a Venus-Crandon-Laona-Goodman-Plains 138 kV circuit (double circuited with Venus-Plains 345 kV line)
- Rebuild Bay de Noc-Grand Rapids 69 kV line (condition)
- Install M-38 bus tie breaker
- Rebuild/convert East Krok-Canal 69 kV line to 138 kV
- Construct second Dunn Road-Sister Bay 69 kV circuit

Discussion of Plan Components

As stated above, the intent of the conceptual plan is that it adequately address the issues identified for the foreseeable future. Future analyses of the technical, environmental, and political merits of the plan will determine how the plan should be modified to accomplish this intent.

Below is a discussion of how the proxy reinforcements and some potential alternatives might address the major issues in the region.

Weston Area Generator Stability and Reclosing the Eau Claire-Arpin 345 kV line.

The Arrowhead-Weston 345 kV project was assumed in place for the umbrella plan and that it adequately addresses the Weston generator stability issues. ATC is not proposing any alternatives for this project because it has already received regulatory review. In any event, it does not conflict with development of the umbrella plan.

3000 MW Simultaneous Import Capability
A number of lower voltage fixes were identified in the Arrowhead-Weston project studies as needed to achieve 3000 MW of simultaneous import capability into eastern Wisconsin in conjunction with the Arrowhead-Weston project. In crafting the umbrella plan, there may be alternatives to consider before ATC commits to implementing these lower voltage projects. For example, the Arpin-Wautoma-Columbia 345 kV line and the Wautoma-Fitzgerald 345 kV line might avoid the need to rebuild the following lines identified in Arrowhead-Weston studies.

- Weston-Kelly-Whitcomb-Badger 115 kV
- Rocky Run-Whiting-Hoover 115 kV
- Port Edwards-Wautoma 138 kV
- Weston-Northpoint 115 kV

Another set of reinforcements that could be investigated as a feasible alternative would be a Weston-Venus-Plains 345 kV line along with a Morgan-North Appleton 345 kV line. A Rocky Run-Fitzgerald 345 kV line should also be considered for use as an alternative.

Reducing Reliance on Operating Guides and Schemes
The Arrowhead-Weston 345 kV project also negates the need for the Arpin Operating Guide as currently used. ATC is not proposing any alternatives for this project because it has already received regulatory review.

The Presque Isle unit tripping scheme could be reduced or eliminated if more outlets are added to the Marquette area transmission system. The conceptual plan proposes a second 345 kV line. The southern terminal of this line will need to be investigated further. Also, the feasibility of additional 138 kV outlets at Presque Isle should be reviewed, but may only reduce the magnitude of the existing unit tripping scheme. Transfer capability into and out of Michigan should be investigated along with eliminating or reducing reliance on this unit tripping scheme.

Rhinelander Loop
The Rhinelander Loop interim and short term plans are needed under any scenario because they provide the most effective and expeditious relief, and also because they fit into any future umbrella plan for the region. The short term plan involving a second 115 kV line between Pine and Highway 8 may need to consider how to serve a proposed Highway Y substation between Eastom and Highway 8.

Rhinelander mid-term and long-term plans have to account for new distribution substations. So to that extent a Venus-Crandon-Laona line is needed for the umbrella plan. However, some consideration will need to be given to whether this line would operate at 115 kV or 138 kV, whether it should ultimately terminate at Amberg or Plains, and whether it should be double circuited with a 345 kV line over any part of its length.

Rhinelander long-term plans will have to be analyzed to determine whether 345 kV makes sense compared to lower voltage alternatives for the local area and for the region. Some long-term plans provide an alternative tie between central and eastern Wisconsin. This benefit will need to be analyzed along with the support for Wisconsin Michigan transfer capability. The proxy plan is a Weston-Venus-Plains 345 kV line. Lower voltage alternatives might consider some combination of the following reinforcements.

- Cranberry-Conover-Plains 138 kV line

- Cranberry-Conover-Winona 138 kV line
- Venus-Crandon-Laona-Plains 138 kV line

The Conover-Winona alternative may have value for solving western Upper Peninsula loading and voltage problems. If a Weston-Venus 345 kV line is not part of the umbrella plan, Then both Venus-Plains 138 kV and Cranberry-Conover 138 kV line reinforcements may be needed soon after 2010 to support the Rhinelander area. Other Rhinelander alternatives that only provide additional support from the Wausau area will need to consider converting Wausau 46 kV lines to 115 kV.

Wausau 46 kV System

In addition to load growth in Wausau, Rhinelander area alternatives or transfer capability across the Wausau area may require considering rebuilding some Wausau 46 kV lines for 115 kV operation. Possibilities for rebuilt lines would include the following or some combination.

- Maine-Brokaw-Strowbridge-Wausau-Townline-Kelly 115 kV
- Sherman-Wausau-Strowbridge-Townline-Kelly 115 kV

The need for converting this system to 115 kV should also consider heavy loading on Weston-Sherman 115 kV lines and the Weston-Kelly 115 kV line. The heavy loading on these lines may be affected significantly by central Wisconsin generation proposals, Rhinelander area solutions, and increasing import capability into Wisconsin.

Western Upper Peninsula

The alternatives for voltage support need to be explored further as they are affected differently by different alternatives in the Rhinelander area (see Rhinelander Loop long term plan discussions). The plan may need to be embellished if additional support in Western Upper Peninsula of Michigan can be justified.

Some lower voltage lines may need to be rebuilt because of condition. If Conover-Winona 138 kV is not rebuilt, then rebuilding M38-Cedar becomes very crucial for both voltage and line loading issues.

Eastern Upper Peninsula & Michigan/Wisconsin Transfer Capability

There are a number of alternatives for improving transfer capability between Michigan and Wisconsin. These alternatives will need to be analyzed within ATC and most likely as a part of some consortium comprised of transmission providers in MAIN and ECAR to adequately address power flow issues around Lake Michigan. High voltage solutions might consist of the following lines.

- Kewaunee or Point Beach or Edgewater-Ludington +/- 250 kV DC or 345 kV AC line
- Weston-Plains-Dead River 345 kV line along with a Plains-Livingston or Arnold-Livingston 345 kV line

A Morgan-North Appleton or Morgan-Werner West 345 kV line might affect the need for the Weston-Plains 345 kV line for the purpose of improving Michigan/Wisconsin transfer capability.

If a high voltage tie across Lake Michigan or around the north end of Lake Michigan is not implemented, then the 138 kV rebuilds and the 69 to 138 kV conversions become very important. The 138 kV alternatives could include any or some of the following.

- Stiles-Plains 138 kV rebuild (needed for condition)
- Hiawatha-Straits 138 kV rebuild of 69 kV

- West Marinette-White Rapids-Chalk Hill-Chandler 138 kV rebuild of 69 kV lines (there may be a number of ways to accomplish this using new or existing rights-of-way)
- Cranberry-Conover-Winona 138 kV
- Chandler-Sister Bay-Canal 138 kV

Facility Condition
The common facilities list includes comments on which lines may require rebuilds due to condition. These facilities will most likely have to be replaced regardless of the final umbrella plan configuration.

Potential Generation Sites/Central and Eastern Wisconsin Ties
The proxy umbrella plan attempts to provide a system capable of connecting significant amounts of generation in the central portion of Wisconsin. Any lower voltage alternatives would also make this attempt but are probably going to result in a less robust system. Additional analysis is needed to determine which alternatives are appropriate and if other alternatives need to be identified. The plan also attempts to provide additional ties between central and eastern Wisconsin, but final plans will depend on how much and where new generation is installed. The proxy in this plan is the Arpin-Wautoma-Columbia 345 kV line and the Wautoma Fitzgerald 345 kV line. Alternatives might include the following facilities.

- Arpin-Weston-Venus-Plains 345 kV
- Arpin-Weston 345 kV and Rocky Run-Fitzgerald 345 kV
- Arpin 345-115 kV transformer, Wildwood-McMillan 115 kV rebuild, Weston-Kelly 115 kV Rebuild, Kelly-Badger 115 kV rebuild

Central Wisconsin/Appleton-Stiles
Under any umbrella plan Werner West and the Badger 115 to 138 kV conversion makes sense because of the support they provide to the Central Wisconsin area. The southern terminal for the 345 kV line proposed from Morgan and its need will need to be reviewed and analyzed. The 345 kV line may also be needed to provide additional voltage support for the growing loads in central Wisconsin or be part of improving Michigan/Wisconsin transfer capability.

Goodman and Sister Bay Radial Lines
The proxy plan would connect Goodman to a new Venus-Plains 138 kV line and connect the Sister Bay substation to Dunn Road with a second 69 kV line.

Routing a second transmission line through Door County will need to consider aesthetic and environmental viewpoints. Other alternatives for looping Sister Bay might include the following.

- Marinette area or Delta-Sister Bay 69 kV line
- Chandler-Sister Bay-Canal 138 kV line
-

Both of these alternatives may offer some alternatives for taking the Stiles-Plains line out of service to rebuild it or for increasing Wisconsin/Michigan transfer capability. If we don't use these ties across the Bay of Green Bay then additional 138 kV support for the Canal area may be needed from the south. One possibility for providing this support might be to add a second East Krok-Canal 138 kV line. To minimize environmental impact, it might be necessary to double circuit the 138 kV line with the existing 69 kV line between these two substations.

New T-D Substations

The plan includes lower voltage lines needed to distribute power to anticipated new substations that are not close to the existing transmission system. Development of the umbrella plan may uncover additional alternatives for connecting these proposed substation to the transmission system. See the facilities lists for lines to the following proposed substations.

- Crandon
- Laona
- Lake Nokomis (Hwy Y)
- Hwy D
- Boulder Junction

There are not any system alternatives for these proposed substations. The major alternatives to consider will probably be route alternatives.

Conceptual Umbrella Plan Development for Southern Zones (Zones 3 & 5)

Similar to the discussion above, within the southern zones in ATC's service territory, there are a number of issues for which potential solutions would necessarily affect adjacent southern zones. These issues are currently being compiled and from that list of issues, ATC expects to begin to provide a basis from which to evaluate alternatives within Zones 3 and 5 for their ability to fit into potential regional solutions. ATC expects that a detailed discussion of the issues will be included in its 2003 Assessment.

Section V

SUMMARY OF PLANNED FACILITY ADDITIONS IN THE 2002 TEN YEAR ASSESSMENT

Summary of Proposed Additions, 2003-2011

The facilities proposed by the ATC based on this 2002 Assessment are listed in Tables V-1 through V-14, and shown graphically in Figures V-1 through V-5. In addition, alternatives for some the primary alternatives shown in Tables V-1 through V-14 are listed in Table V-15. Also, portions of the plan in the 2001 Update Assessment that are not included in this plan are listed in Table V-16.

In each of these tables, there is a column indicating the planned in-service year for each particular facility and a column indicating the year the facility is needed. There are numerous facilities for which the year it is needed precedes the planned in-service year. There are a variety of reasons for this, including:

- The preferred alternative to address a particular need may take several years to implement.
- The need may have existed but had been addressed with operating procedures that are becoming less effective or ineffective.
- The preferred alternative to address a particular need may need to be implemented in phases, thus delaying certain phases.
- New data or information became available that affected the nature of the need or limitation, which necessitated a change in the alternative to be implemented, introducing a delay in implementation.
- The need for a project was based on load or generation development that was uncertain.
- Stakeholder input necessitated a change in the alternative to be implemented, introducing a delay in implementation.

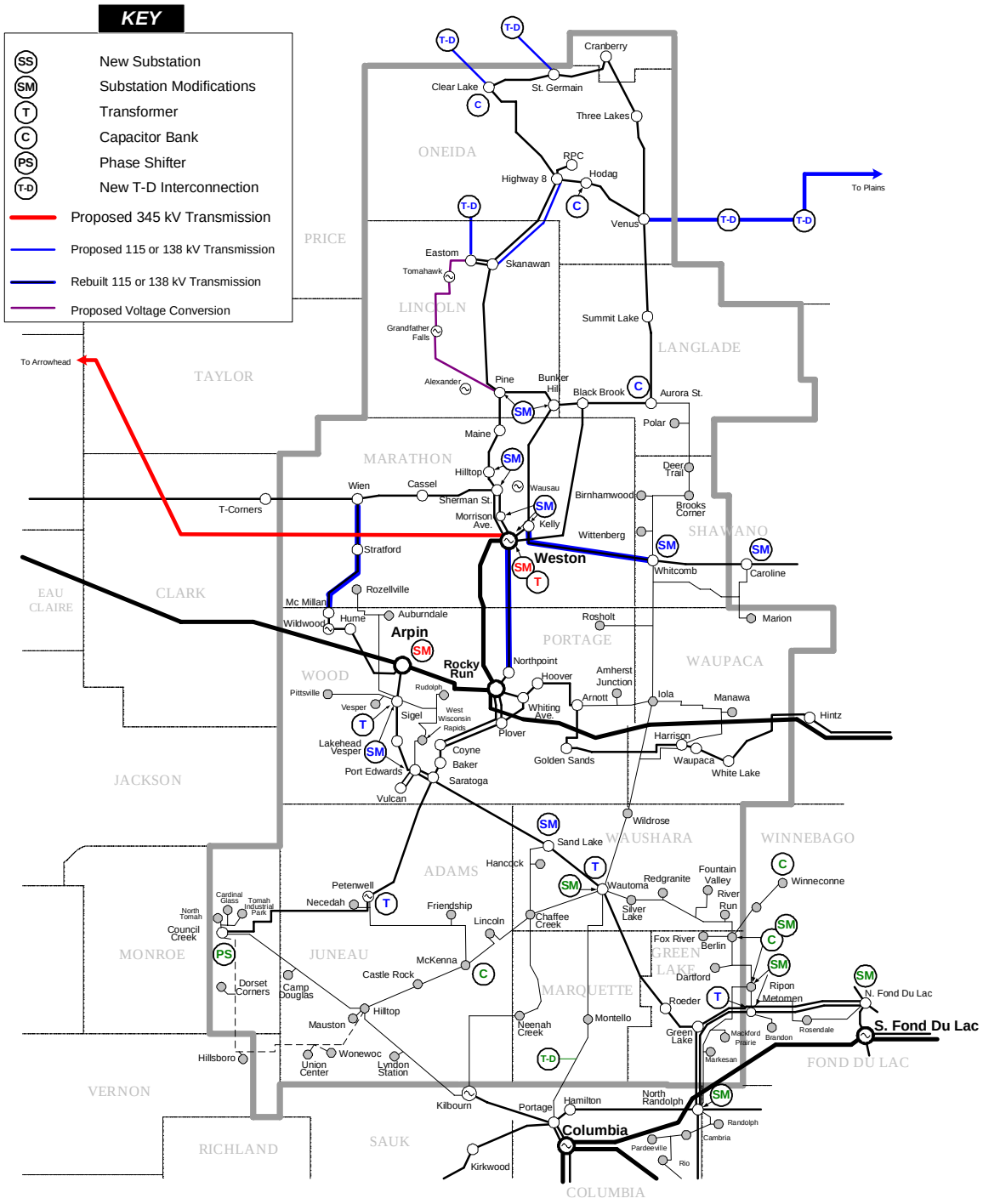
Tables V-1 through V-10 show the facilities planned by year for years 2003-2011, respectively. Table V-11 provides a list of planned transmission lines for years 2003-2011. Since ATC intends to solicit public input on the identification of ultimate solutions through its iterative planning process, these particular projects may be modified in the future. Table V-12 provides a list of proposed transmission line rebuilds, reconductoring and uprates on existing right-of-way for 2003-2011. Table V-13 provides a list of proposed new substations and transformer additions (excluding transmission-to-distribution transformers) for 2003-2011. Table V-14 provides a list of other proposed substation equipment additions or replacements for 2003-2011.

Within the above tables, the need for each project is identified. Need categories include the following:

Reliability: Facility (line, transformer, substation equipment) normal rating is exceeded under normal system conditions or emergency rating is exceeded under single contingency conditions, or bus voltage is not within 5% of nominal voltage under normal system conditions or is not within 10% of nominal voltage under single contingency conditions. (see Appendix B) Impending overload or voltage violations are noted as appropriate.

New generation:	Facility has been identified as necessary to accommodate new generation in generation interconnection studies or related transmission service studies conducted by ATC.
TLR:	Facility has been identified by ATC Operations or ATC Transmission Service as a chronic cause for interrupting, curtailing, limiting or denying transmission service in real time.
T-D interconnection:	Facility is required to interconnect to a new transmission-distribution substation needed by a distribution company served by ATC.
Condition:	Facility has been identified by ATC Maintenance as being in need of repair or replacement.
Stability:	Facility has been identified by ATC Stability and Special Studies as needed to ensure ATC dynamic stability criteria is met (see Appendix B), or will improve stability response of generation.
Import capability:	Facility will enhance import capability of the ATC transmission system.

Figure V-1
Zone 1 - Proposed Transmission System Additions



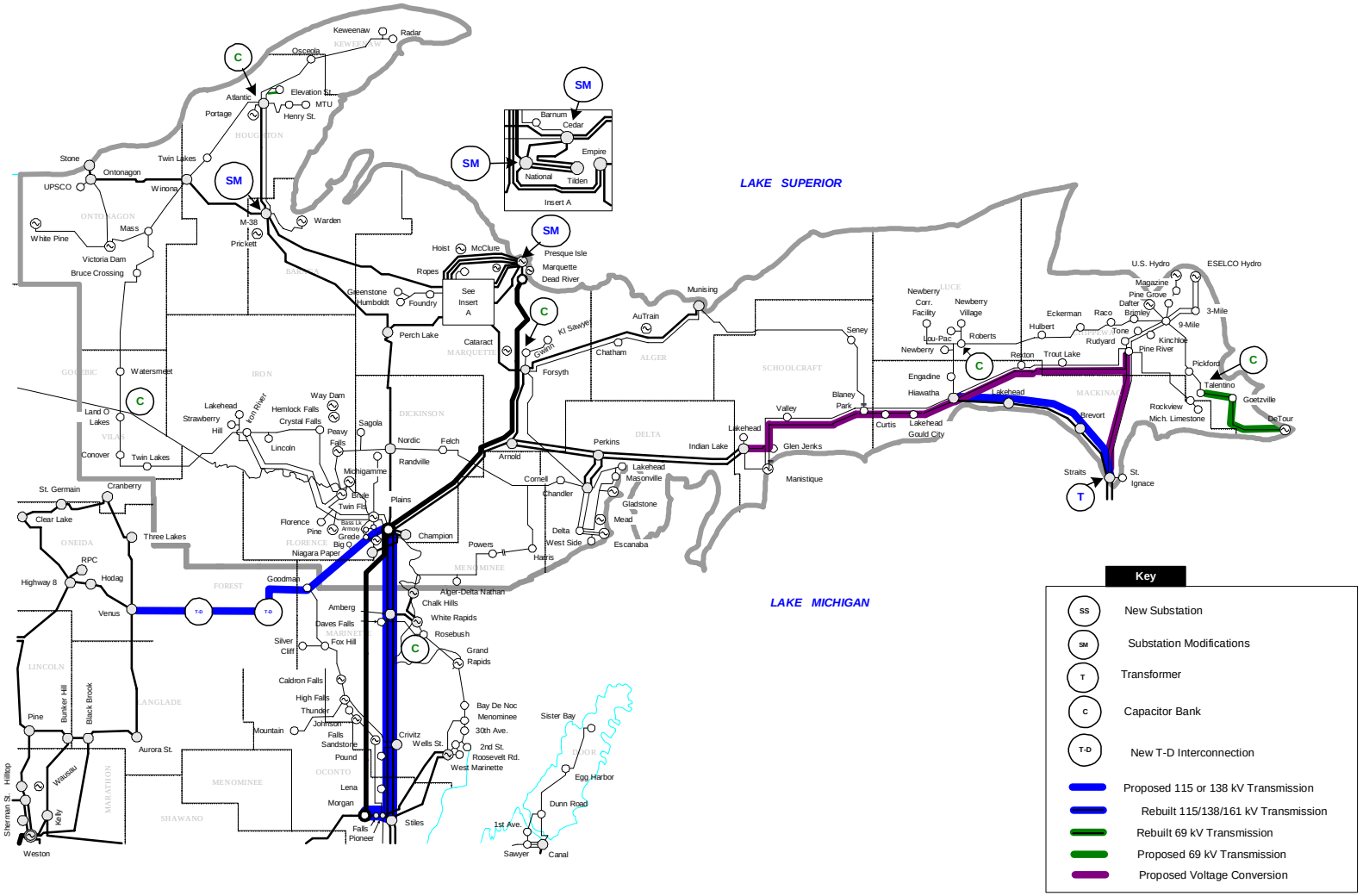


Figure V-2

Zone 2 - Proposed Transmission System Additions

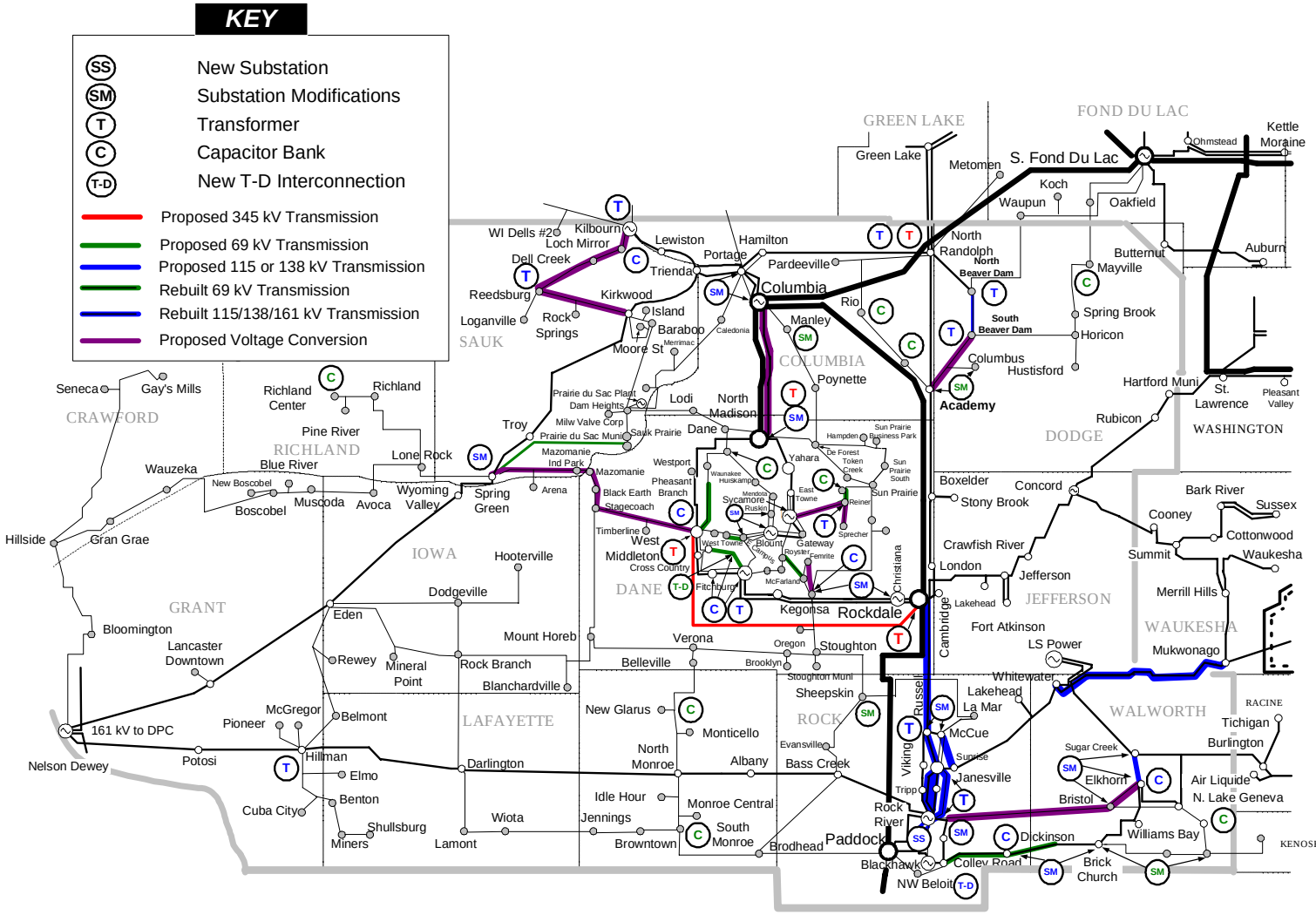


Figure V-3
Zone 3 Proposed Transmission System Additions

Figure V-4
Zone 4 Proposed Transmission System Additions

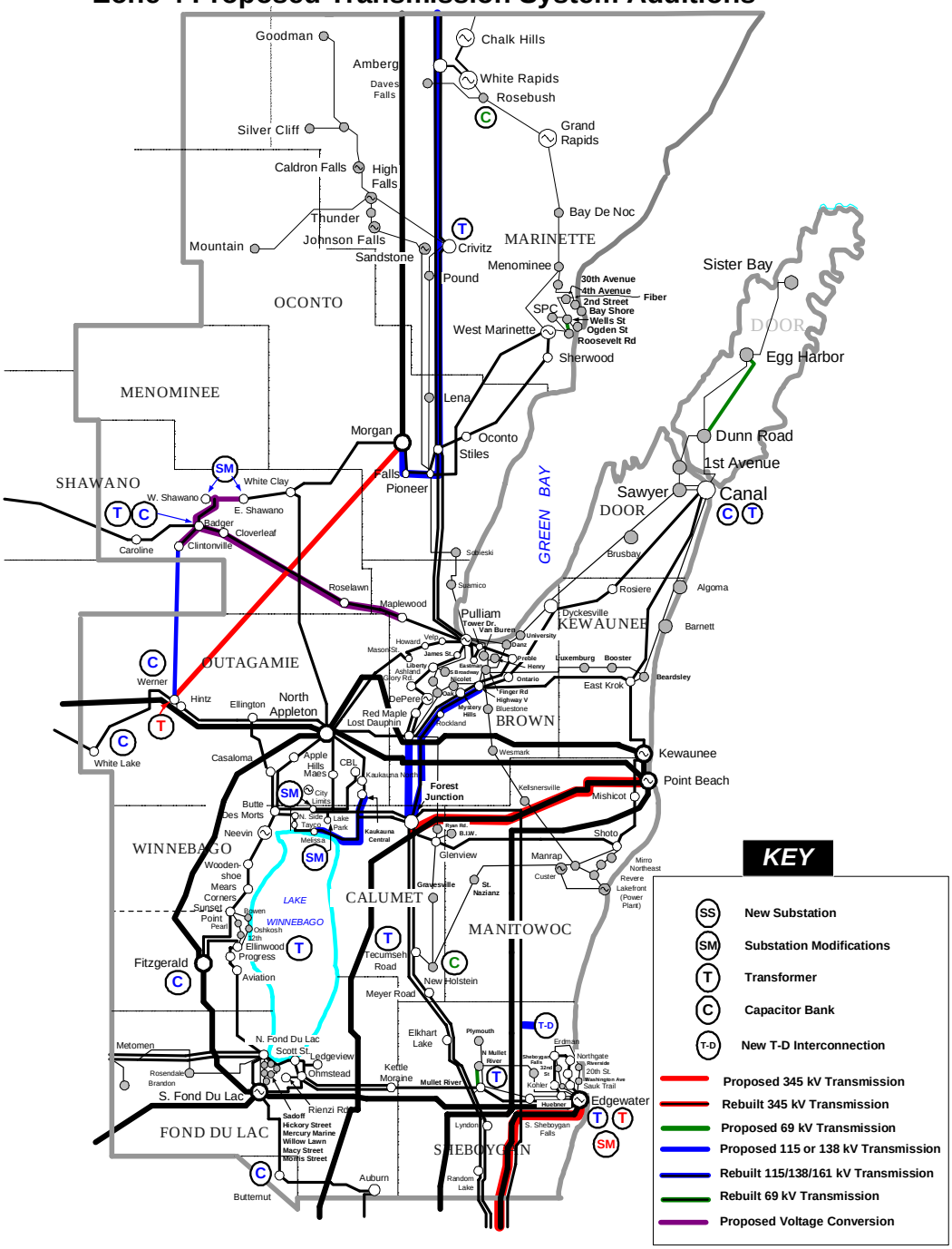


Figure V-5
Proposed Transmission System Additions

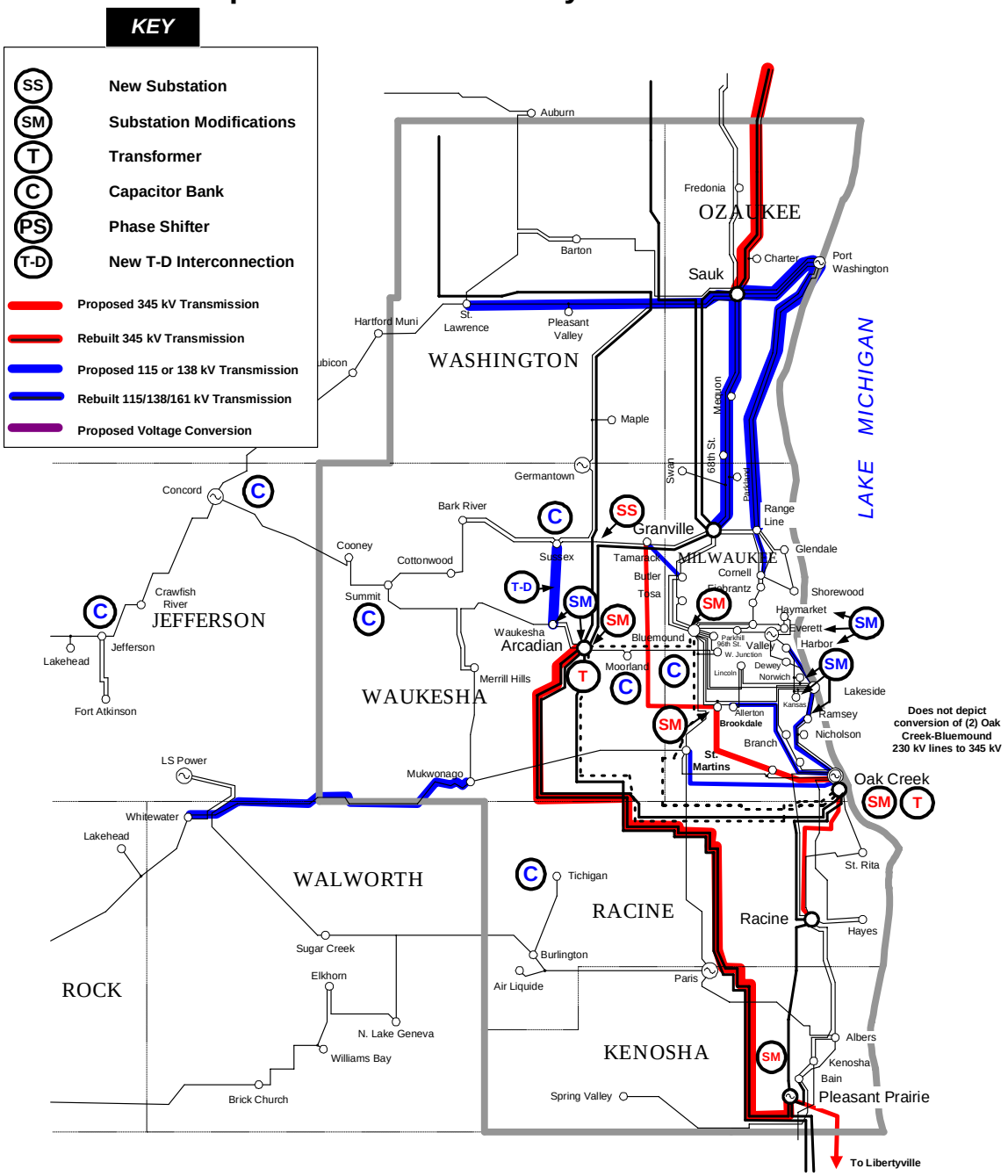


Table V-1

Transmission System Additions for 2002

Planned Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install 8 MVAR capacitor bank at Hodag 115 kV	2002	2002	1	reliability
Replace 138/69 kV transformer at Russell	2002	2002	3	reliability
Install 345/138 kV, 500 MVA transformer at Rockdale	2002	2002	3	reliability, TLR
Install 138/69 kV transformer at Kilbourn	2002	2002	3	reliability
Uprate Kegonsa-Christiana 138 kV line	2002	2002	3	reliability
Uprate Academy-Columbus 69 kV line terminal equipment	2002	2002	3	reliability
Expand the 345 kV switchyard at Columbia	2002	2002	3	reliability, stability
Replace 138/69 kV transformer at North Beaver Dam	2002	2002	3	reliability
Construct a Sunrise-McCue 138 kV line	2003	2002	3	reliability, new generation
Uprate Russell-McCue 138 kV line terminal equipment	2002	2002	3	reliability, new generation
Install 28.8 MVAR capacitor bank at Werner 138 kV	2002	2002	4	reliability
Install 28.8 MVAR capacitor bank at White Lake 138 kV	2002	2002	4	reliability
Install 28.8 MVAR capacitor bank at Badger 138 kV	2002	2002	4	reliability
Construct second Roosevelt-Wells 69 kV line	2002	2002	4	reliability
Install 2-16 MVAR capacitor banks at New Holstein 69 kV	2002	2002	4	reliability
Install 2-28 MVAR capacitor banks at Sussex 138 kV	2002	2002	5	reliability

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-2
Proposed Transmission System Additions for 2003

Planned Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Uprate Port Edwards-Sigel 138 kV line terminal equipment	2002	2003	1	reliability
Construct an Endeavor-Wautoma/Portage Tap 69 kV line	2003	2003	1	T-D Interconnection
Uprate Whitcomb 115/69 kV transformer	2002	2003	1	reliability
Uprate Caroline 115/69 kV transformer	2004	2003	1	reliability
Construct Elevation Tap-Elevation 69 kV line	2003	2003	2	T-D Interconnection
Install 2-7.2 MVAR capacitor banks at Atlantic 69 kV	2003	2003	2	reliability
Install 5 MVAR capacitor bank at Talentino 69 kV	2003	2003	2	reliability
Install 5 MVAR capacitor bank at Gwinn 69 kV	2003	2003	2	reliability
Install 5 MVAR capacitor bank at Land o Lakes 69 kV	2003	2003	2	reliability
Uprate Cedar-M38 138 kV line – scope TBD	2003	2003	2	reliability
Uprate Cedar-Freeman 138 kV line – scope TBD	2003	2003	2	reliability
Uprate Freeman-Presque Isle 138 kV line – scope TBD	2003	2003	2	reliability
Uprate Presque Isle-Cedar 138 kV line – scope TBD	2003	2003	2	reliability
Install 5 MVAR capacitor bank at Roberts 69 kV	2003	2003	2	reliability
Reconductor Whitewater-Mukwonago 138 kV line	2003	2003	3 & 5	condition, reliability, new generation, TLR
Uprate McCue-Sheepskin 69 kV line terminal equipment	2003	2003	3	reliability, new generation
Construct 138 kV switchyard at Rock Co. generation site	2003	2003	3	reliability, new generation
Construct 138 kV double circuit line from Rock Co. generation site to Rock River	2003	2003	3	reliability, new generation
Reconnect NW Beloit 69 kV load to Paddock-Blackhawk 138 kV line	2003	2003	3	reliability
Construct second East Campus-Walnut 69 kV line	2003	2003	3	reliability
Construct a 345 kV ring bus at Forest Junction, loop existing Point Beach-Arcadian 345 kV line into Forest Junction, install two 345/138 kV, 500 MVA transformers	2003	2003	4	reliability

Table V-2

Proposed Transmission System Additions for 2003 (continued)

Planned Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Uprate Dunn Road-Egg Harbor 69 kV line terminal equipment	2003	2003	4	reliability
Install 16 MVAR capacitor bank at Canal 138 kV	2003	2003	4	reliability
Rebuild the Forest Junction-Highway V 138 kV double circuit line	2003	2003	4	reliability
String a 138 kV circuit from Forest Junction to Lost Dauphin on existing structures	2003	2003	4	reliability
Uprate Edgewater-Cedarsauk 345 kV line	2003	2003	4	reliability
Construct a second Mullet River-N Mullet River 69 kV Line	2002	2003	4	reliability
Install second 138/69 kV transformer at Mullet River	2002	2003	4	reliability
Replace two existing Edgewater 138/69 kV transformers	2003	2003	4	reliability
Convert Maplewood-Roselawn-Cloverleaf-Badger and Clintonville-Badger-Shawano West from 115 kV to 138 kV	2003	2003	4	reliability
Relocate Maplewood 138/115 kV transformer to Badger	2003	2003	4	reliability
Convert the normally open Shawano East-Shawano West 34.5 kV bus tie to 138 kV and operate normally closed	2003	2003	4	reliability
Uprate Point Beach-Forest Junction 345 kV line	2003	2003	4	reliability
Rebuild Granville-Saukville double circuit 138 kV line	2003	2003	5	reliability, TLR
Uprate Pleasant Prairie-Arcadian 345 kV line	2003	2003	5	TLR, reliability

Defined in previous 10 Year Assessment

Revised in scope from previous 10 Year Assessment

New to this 10 Year Assessment

Table V-3
Proposed Transmission System Additions for 2004

Planned Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Convert Pine-Grandfather-Tomahawk-Eastom 46 kV lines to 115 kV	2001	2004	1	reliability
Uprate North Randolph-Ripon 69 kV line terminal equipment	2002	2004	1	reliability
Install 5.4 MVAR capacitor bank at Ripon 69 kV	2003	2004	1	reliability
Install additional 5.4 MVAR capacitor bank at Berlin 69 kV	2004	2004	1	reliability
Rebuild DeTour-Talentino Tap 69 kV line	2002	2004	2	reliability
Replace current transformer at Cedar SS for Cedar-National 138 kV	2002	2004	2	reliability
Rebuild and convert one Hiawatha-Indian Lake 69 kV circuit to double circuit 138 kV	2004	2004	2	reliability, TLR
Rebuild Turtle-Bristol 69 kV line to 138 kV and operate at 69 kV	2004	2004	3	condition, reliability, new generation
Convert Kirkwood-Reedsburg 69 kV line to 138 kV	2003	2004	3	reliability
Construct 138/69 kV switchyard at Artesian; install 2-138/69 kV transformers	2003	2004	3	reliability
Construct 69 kV switchyard at Tokay	2004	2004	3	T-D interconnection
Reconfigure 69/138 kV circuits between Rock River and Janesville to create Rock River-Janesville and Rock River-Sunrise 138 kV circuits	2004	2004	3	reliability, new generation
Construct Fitchburg-Tokay-Westowne 69 kV underground line	2004	2004	3	T-D interconnection
Uprate Portage-Columbia double circuit 138 kV line terminal equipment	2003	2004	3	reliability
Rebuild Russell-Janesville 138 kV line	2004	2004	3	new generation
Reconductor Russell-Rockdale 138 kV line	2004	2004	3	new generation
Construct a 345 kV switchyard at North Randolph; install a 345/138 transformer	2004	2004	3	reliability
Install a second 138/69 kV transformer at North Randolph	2004	2004	3	reliability
Install a second 138/69 kV transformer at Hillman	2004	2004	3	reliability
Install 24 MVAR capacitor bank at Dickinson 138 kV	2004	2004	3	reliability
Install 24 MVAR capacitor bank at Elkhorn 138 kV	2004	2004	3	reliability

Table V-3
Proposed Transmission System Additions for 2004 (continued)

Planned Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install 24 MVAR capacitor bank at new Loch Mirror (Birchwood) 138 kV	2004	2004	3	reliability
Install 10.8 MVAR capacitor bank at Rio 69 kV	2004	2004	3	reliability
Install 10.8 MVAR capacitor bank at Burke 69 kV	2004	2004	3	reliability
Install additional 5.4 MVAR capacitor bank at Mayville 69 kV	2004	2004	3	reliability
Install additional 5.4 MVAR capacitor bank at New Glarus 69 kV	2004	2004	3	reliability
Install additional 10.8 MVAR capacitor bank at South Monroe 69 kV	2004	2004	3	reliability
Rebuild Blount-Ruskin 69 kV line	2003	2004	3	reliability, new generation
Rebuild Blount-Ruskin Tap 69 kV line	2003	2004	3	reliability, new generation
Rebuild Kegonsa-McFarland-Femrite 69 kV line to 138 kV	2004	2004	3	reliability, new generation
Rebuild Femrite-Royster 69 kV line	2004	2004	3	reliability, new generation
Install 25 MVAR capacitor banks at Kegonsa, Fitchburg, Cross Country and West Middleton	2004	2004	3	new generation
Install 10.8 MVAR capacitor bank at Tokay	2004	2004	3	new generation
Replace 138/69 kV transformers at Fitchburg with 187 MVA units	2003	2004	3	reliability, new generation
Replace two existing Canal 138/69 kV transformers	2003	2004	4	reliability
Install second 138/69 kV transformer at Crivitz	2003	2004	4	reliability
Rebuild the Morgan-Falls-Pioneer-Stiles 138 kV line	2003	2004	4	TLR, facility condition
Replace 345/138 kV transformer at Edgewater	2004	2004	4	reliability
Reconductor Pleasant Valley-Saukville 138 kV line	2004	2004	5	reliability
Reconductor Pleasant Valley-St Lawrence 138 kV line	2004	2004	5	reliability
Rebuild Port Washington-Range Line double circuit 138 kV line	2004	2004	5	new generation

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-4
Proposed Transmission System Additions for 2005

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Construct Arrowhead-Weston 345 kV line	1997	2005	1	TLR, reliability, import capability & Weston stability
Construct 345 kV switchyard at Weston	2002	2005	1	TLR, reliability, import capability & Weston stability
Replace existing 345/115 kV transformer at Weston with two 500 MVA units	2002	2005	1	TLR, reliability, import capability & Weston stability
Construct Skanawan-Highway 8 115 kV line	2004	2005	1	reliability
Uprate Bunker Hill-Pine 115 kV line terminal equipment	2005	2005	1	reliability
Reconductor Wien-McMillan 115 kV (ATC,MEWD)	2005	2005	1	reliability
Uprate Metomen-N Fond du Lac 69 kV line terminal equipment	2005	2005	1	reliability
Connect double circuit 345/138 kV line from IC014 generation site to Arpin	2005	2005	1	new generation
Uprate Weston-Kelly 115 kV line - scope TBD	2005	2005	1	new generation, reliability
Replace 138/69 kV transformer at Sigel	2005	2005	1	new generation, reliability
Replace 138/69 kV transformer at Petenwell	2005	2005	1	new generation, reliability
Uprate Port Edwards-Sand Lake 138 kV - scope TBD	2005	2005	1	new generation
Construct Clear Lake-Highway D 115 kV line	2005	2005	1	T-D interconnection
Construct 138 or 115 kV line from Venus to new Crandon and Laona	2005	2005	1	T-D interconnections
Construct Eastom-Lake Nokomis 115 kV line	2005	2005	1	T-D interconnection
Install second 138/69, 63 MVA transformer at Straits	2003	2005	2	reliability
Rebuild Janesville-Riverside 138 kV line	2005	2005	3	reliability
Convert Columbia-North Madison 138 kV line to 345 kV	2005	2005	3	reliability, new generation
Reconfigure 345 kV bus at North Madison and replace existing transformers with 500 MVA units	2005	2005	3	reliability, new generation
Convert Kilbourn-N. Reedsburg 69 kV line to 138 kV	2004	2005	3	reliability
Construct S. Reedsburg-N. Reedsburg 138 kV line	2004	2005	3	reliability
Uprate Kaukauna Central Tap-Melissa 138 kV line - scope TBD	2005	2005	4	reliability
Replace Ellinwood 138/69 kV transformer	2005	2005	4	reliability

Table V-4
Proposed Transmission System Additions for 2005 (continued)

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Construct a new Lannon Junction substation at intersection of Granville-Arcadian 345 kV, Forest Junction-Arcadian 345 kV, Sussex-Tamarack 138 kV and Sussex-Germantown 138 kV lines; install a 345/138 kV, 500 MVA transformer	2005	2005	5	reliability & Germantown generation stability
Construct a Waukesha-Duplainville-Sussex 138 kV line	2005	2005	5	T-D interconnection
Rebuild Port Washington-Saukville double circuit 138 kV line	2005	2005	5	new generation
Rebuild Port Washington-Saukville single circuit 138 kV line	2005	2005	5	new generation

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-5
Proposed Transmission System Additions for 2006

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Rebuild Weston-Northpoint 115 kV line	2006	2006	1	increase transfer capability
Rebuild Kelly-Whitcomb 115 kV line	2006	2006	1	increase transfer capability
Uprate Wautoma-Berlin 69 kV line terminal equipment	2006	2006	1	reliability
Install 14.4 MVAR capacitor bank at Aurora Street 138 kV	2006	2006	1	reliability
Install additional 6.3 MVAR capacitor bank at McKenna 69 kV	2006	2006	1	reliability
Rebuild Plains-Amberg-Stiles double circuit 138 kV line	2006	2006	2 & 4	reliability, TLR, condition
Reconductor West Middleton-Pheasant Branch 69 kV line	2006	2006	3	reliability
Install 138 kV bus at Kegonsa	2006	2006	3	reliability, new generation
Convert Academy-South Beaver Dam 69 kV line to 138 kV	2006	2006	3	reliability
Construct South Beaver Dam-North Beaver Dam 138 kV line	2006	2006	3	reliability
Uprate McCue-Milton Lawns 69 kV line terminal equipment	2006	2006	3	reliability
Convert Kegonsa-Femrite 69 kV line to 138 kV	2006	2006	3	reliability, new generation
Construct Sprecher-Femrite 138 kV line	2006	2006	3	reliability, new generation
Install 138/69 kV transformer at Reiner	2006	2006	3	new generation
Convert Sycamore-Reiner-Sprecher from 69 kV to 138 kV	2006	2006	3	reliability
Construct 138 kV line from Forest Junction-Cedarsauk to Howards Grove	2006	2006	4	T-D interconnection
Uprate Lake Park-City Limits 138 kV line terminal equipment	2006	2006	4	reliability
Install 16 MVAR capacitor bank at Canal 138 kV	2006	2006	4	reliability

Defined in previous 10 Year Assessment

Revised in scope from previous 10 Year Assessment

New to this 10 Year Assessment

Table V-6
Proposed Transmission System Additions for 2007

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Construct a Laona-Goodman-Plains 138 kV line	2007	2007	1 & 2	reliability
Uprate Weston-Morrison-Sherman St. 115 kV line - scope TBD	2007	2007	1	reliability
Uprate Weston-Sherman St. 115 kV line - scope TBD	2007	2007	1	reliability
Install second 138/69 kV transformer at Metomen	2007	2007	1	reliability
Uprate Metomen-Ripon 69 kV line - scope TBD	2007	2007	1	reliability
Install additional 8.0 MVAR capacitor bank at Hodag 115 kV	2007	2007	1	reliability
Install additional 5.4 MVAR capacitor bank at Berlin 69 kV	2007	2007	1	reliability
Construct second Hiawatha-Straits 138 kV line	2007	2007	2	reliability
Install a second 138/69, 47 MVA transformer at Rock River	2005	2007	3	reliability
Install a second 138/69 kV transformer at Janesville	2007	2007	3	reliability
Construct Elkhorn-Sugar Creek 138 kV line	2007	2007	3	reliability
Install 10.8 MVAR capacitor bank at Lake Geneva 69 kV	2007	2007	3	reliability
Construct a second Dunn Rd-Egg Harbor 69 kV line	2007	2007	4	reliability
Construct a 345/138 kV switchyard at a new Werner West SS; install a 345/138 kV transformer. Loop existing Rocky Run to North Appleton 345 kV and existing Werner to White Lake 138 kV lines into Werner West	2004	2007	4	reliability
Construct Clintonville-Werner West 138 kV line	2006	2007	4	reliability
Construct Morgan-Werner West 345 kV line	2004	2007	4	reliability, TLR
Replace Tecumseh 138/69 kV transformer	2007	2007	4	reliability
Install 28.8 MVAR capacitor bank at Butternut 138 kV	2007	2007	4	reliability
Install 28.8 MVAR capacitor bank at Fitzgerald 138 kV	2007	2007	4	reliability
Install 10 MVAR capacitor bank at Jefferson 138 kV	2007	2007	5	reliability
Install 2-13 MVAR capacitor banks at Concord 138 kV	2007	2007	5	reliability
Expand Oak Creek 345 kV switchyard to interconnect one new generator, unit #7 plus two 345 kV lines and 138 kV switchyard to accommodate new St. Martins line	2007	2007	5	new generation
Reconductor Oak Creek-Ramsey6 138 kV line	2007	2007	5	new generation
Reconductor underground segment of Ramsey5-Harbor 138 kV line	2007	2007	5	new generation

Table V-6

Proposed Transmission System Additions for 2007 (continued)

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Reconductor Oak Creek-Allerton 138 kV line	2007	2007	5	new generation
Construct a 345/138 kV switchyard at Brookdale to accommodate two 345 kV lines, a 500 MVA 345/138 kV transformer and 4-138 kV lines plus two 138-/26.2 kV transformers	2007	2007	5	new generation
Construct an Oak Creek-Brookdale 345 kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV, and 5 mi. 138 kV	2007	2007	5	new generation
Construct a Brookdale-Granville 345 kV line converting/ reconductoring 5.6 mi. 138 kV, rebuilding 7mi. 138 kV double circuit tower line and converting/ reconducting 3 mi. 138 kV on existing 345 kV structures	2007	2007	5	new generation
Construct Oak Creek-St Martins 138 kV circuit #2 installing 4 mi new structures and conductor, plus 12.6 mi conductor on existing towers	2007	2007	5	new generation
Relocate West Junction tap to 96th St-Brookdale 138 kV line (KK5063)	2007	2007	5	new generation
String Butler-Tamarack (Carmen) 138 kV line on new 345 kV structures installed with Brookdale-Granville line	2007	2007	5	new generation
Reconductor Bluemound-Butler 138 kV line (KK5051) on new 345 kV structures installed with Brookdale-Granville line	2007	2007	5	new generation
Construct 345 kV Bluemound switchyard to accommodate 1-345 kV line and a 500 MVA 345/138 kV transformer	2007	2007	5	new generation
Convert/reconductor Oak Creek-Bluemound 230 kV line K873 to 345 kV	2007	2007	5	new generation
Install two 345 kV series breakers at Pleasant Prairie on lines to Racine (L631) and Zion (L2221)	2007	2007	5	new generation
Replace seven 138 kV overdutied breakers at Bluemound	2007	2007	5	new generation
Reconnect Oak Creek unit #7 to 345 kV switchyard	2007	2007	5	new generation
Replace substation equipment at both Arcadian 138 kV and Waukesha 138 kV associated with KK9942	2007	2007	5	new generation
Replace Oak Creek 230/138kV transformer with a 500 MVA unit	2007	2007	5	new generation

Table V-6
Proposed Transmission System Additions for 2007 (continued)

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install 3-75 MVAR capacitor banks at Bluemound 138 kV	2007	2007	5	new generation
Install 20 MVAR capacitor bank at Summit 138 kV	2007	2007	5	new generation
Install 20 MVAR capacitor bank at Tichigan 138 kV	2007	2007	5	new generation
Install 50 MVAR capacitor bank at Moorland 138 kV	2007	2007	5	new generation

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-7
Proposed Transmission System Additions for 2008

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install 5.4 MVAR capacitor bank at Winneconne 69 kV	2008	2008	1	reliability
Construct St. Germain-Boulder Junction 115 kV line	2008	2008	1	T-D interconnection
Uprate Sherman Street-Hilltop 115 kV line - scope TBD	2008	2008	1	reliability
Convert Turtle-Bristol 69 kV line to 138 kV	2008	2008	3	reliability
Install 4 MVAR distribution capacitor bank at Fall River 69 kV	2008	2008	3	reliability
Install 5.4 MVAR capacitor bank at Rosebush 69 kV	2008	2008	4	reliability
Reconductor Cornell-Range Line 138 kV line	2008	2008	5	reliability
Replace two existing 345/138 transformers at Arcadian with 500 MVA units	2008	2008	5	new generation
Uprate Kansas-Norwich 138 kV line	2008	2008	5	new generation
Uprate Kansas-Ramsey5 138 kV line	2008	2008	5	new generation
Uprate Oak Creek-Ramsey5 138 kV line	2008	2008	5	new generation
Uprate Kansas-Moorland 138 kV line	2008	2008	5	new generation

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-8
Proposed Transmission System Additions for 2009

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install additional 7.2 MVAR capacitor bank at Clear Lake 115 kV	2009	2009	1	reliability
Reconductor Reiner-Burke Tap 69 kV line	2009	2009	3	reliability
Uprate Columbia-Manley Sand 69 kV line terminal equipment	2009	2009	3	reliability
Uprate Brick Church-Zenda 69 kV line terminal equipment	2009	2009	3	reliability
Reconductor Colley Road-Clinton 69 kV line	2009	2009	3	reliability
Construct Rockdale-West Middleton 345 kV line	2009	2009	3	reliability
Install a 345 kV bus and 345/138 kV 500 MVA transformer at West Middleton	2009	2009	3	reliability
Rebuild and convert West Middleton-Spring Green 69 kV line to 138 kV	2009	2009	3	reliability
Construct Spring Green-Prairie du Sac 69 kV line	2009	2009	3	reliability
Install 16 MVAR capacitor bank at Canal 138 kV	2009	2009	4	reliability
Install second 500 MVA 345/138 kV transformer at Oak Creek	2009	2009	5	new generation
Construct a Pleasant Prairie-Libertyville (CE) 345 kV line	2009	2009	5	new generation
Expand 345 kV switchyard at Oak Creek to interconnect one new generator	2009	2009	5	new generation

Defined in previous 10 Year Assessment

Revised in scope from previous 10 Year Assessment

New to this 10 Year Assessment

Table V-9
Proposed Transmission System Additions for 2010

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Install a second 138/69, 47 MVA transformer at Wautoma	2010	2010	1	reliability
Uprate Dickinson-Brick Church 138 kV line terminal equipment	2010	2010	3	reliability
Install 10.8 MVAR capacitor bank at Waunakee 69 kV	2010	2010	3	reliability

Defined in previous 10 Year Assessment
Revised in scope from previous 10 Year Assessment
New to this 10 Year Assessment

Table V-10
Proposed Transmission System Additions for 2011

Proposed Additions	System Need Year	Projected In-Service Year	Planning Zone	Need Category
Expand Oak Creek 138 kV switchyard to reconnect units #6 and #9	2011	2011	5	new generation
Expand 345 kV switchyard at Bluemound to accommodate three additional 345 kV lines and two additional 500 MVA 345/138 kV transformers	2011	2011	5	new generation
Reconnect Oak Creek unit 8 to 345 kV switchyard	2011	2011	5	new generation
Convert and reconductor Oak Creek-Bluemound 230 kV line K862 to 345 kV and loop into Arcadian 345 kV substation	2011	2011	5	new generation
Construct Oak Creek-Racine 345 kV line with 4 mi new structures and conductor, plus convert 9.6 mi. 138 kV line KK812 to 345 kV	2011	2011	5	new generation
Reroute Brookdale-Granville 345 kV line into expanded Bluemound 345 kV switchyard	2011	2011	5	new generation
Replace 22-138 kV overdutied breakers at Harbor, Everett and Haymarket Substations	2011	2011	5	new generation
Expand Oak Creek 345 kV switchyard to interconnect three new generators, unit #8 and two 345 kV lines, plus installation of eight 345 kV series breakers for stability purposes	2011	2011	5	new generation

Defined in previous 10 Year Assessment

Revised in scope from previous 10 Year Assessment

New to this 10 Year Assessment

Table V-11
Identified Needs and Proposed Transmission Lines Requiring New Right-of-Way

Identified Need	Potential Solutions	Approx. Line Mileage		System Need Year	Projected In-Service Year	Planning Zone
		Total	New ROW[1]			
Accommodate new generation	Construct a Sunrise-McCue 138 kV line	6.06	6.06	2003	2002	3
T-D interconnection request	Construct an Endeavor-Wautoma/Portage 69 kV line	4	4	2003	2003	1
Accommodate new generation	Construct 138 kV double circuit line from Rock Co. generation site to Rock River	0.75	0.75	2003	2003	3
Relieve low voltages under contingency	Construct a Hiawatha-Engadine 69 kV line	0.2	0.2	2003	2004	2
T-D interconnection request	Construct Fitchburg-Tokay-Westowne 69 kV underground line	5.5	5.5	2004	2004	3
T-D interconnection request	Construct Clear Lake-Highway D 115 kV line	15	15	2005	2005	1
Relieve overloads, improve voltages	Construct Skanawan-Highway 8 115 kV line	16	16	2004	2005	1
T-D interconnection request	Construct Eastom-Lake Nokomis 115 kV line	5	5	2005	2005	1
T-D interconnection requests	Construct 138 or 115 kV line from Venus to new Crandon and Laona Substations	25	25	2005	2005	1
Improve transfer capability, improve dynamic and voltage stability performance, eliminate need for operating guides, reduce TLRs	Construct Arrowhead-Weston 345 kV line	210	110	1997	2005	1
Relieve overloads under contingency	Construct S. Reedsburg-N. Reedsburg 138 kV line	0.75	0.75	2004	2005	3
T-D interconnection request, improve voltages	Construct a Waukesha-Duplainville-Sussex 138 kV line	8	8	2005	2005	5
Relieve overloads under contingency	Construct South Beaver Dam-North Beaver Dam 138 kV line	6	6	2006	2006	3
Relieve overloads under contingency, accommodate new generation	Construct a Femrite-Sprecher 138 kV line	2	2	2006	2006	3
T-D interconnection request	Construct 138 kV line from Forest Junction-Cedarsauk to Howards Grove	3	3	2006	2006	4
Relieve overloads under contingency, accommodate new generation	Construct an Elkhorn-Sugar Creek 138 kV line	3	3	2007	2007	3
Relieve overloads under contingency	Construct Clintonville-Werner West 138 kV line	16	16	2006	2007	4
Relieve overloads under contingency	Construct Morgan-Werner West 345 kV line	47	47	2004	2007	4
Relieve overloads under contingency, improve voltages	Construct a second Dunn Rd-Egg Harbor 69 kV line	13	13	2007	2007	4

[1] For transmission lines listed in this table, the miles for new right-of-way (ROW) reflect the distance in which the lines would not use existing transmission line ROW. Other corridor sharing opportunities may exist with roads, pipelines, railroads, electric distribution lines, etc., which are not reflected in this table.

Table V-11
Identified Needs and Proposed Transmission Lines Requiring New Right-of-Way (continued)

Identified Need	Potential Solutions	Approx. Line Mileage		System Need Year	Projected In-Service Year	Planning Zone
		Total	New ROW[1]			
Accommodate new generation	Construct an Oak Creek-Brookdale 345 kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV, and 5 mi. 138 kV	25.2	4	2007	2007	5
Accommodate new generation	Construct Oak Creek-St Martins 138 kV circuit #2 installing 4 mi new structures and conductor, plus 12.6 mi conductor on existing towers	16.6	4	2007	2007	5
Improve load serving capability in Rhinelander area	Construct a Laona-Goodman-Plains 138 kV line	46	46	2007	2007	1 & 2
T-D interconnection request	Construct St. Germain-Boulder Junction 115 kV line	15	15	2008	2008	1
Relieve overloads under contingency	Construct Rockdale-West Middleton 345 kV line	35	35	2009	2009	3
Relieve overloads under contingency	Construct Spring Green-Prairie du Sac 69 kV line	22	22	2009	2009	3
Accommodate new generation	Construct a Pleasant Prairie-Libertyville 345 kV line	29.67	22	2009	2009	5
Accommodate new generation	Construct Oak Creek-Racine 345 kV line with 4 mi new structures and conductor, plus convert 9.6 mi. 138 kV line KK812 to 345 kV	13.6	4	2011	2011	5

[1] For transmission lines listed in this table, the miles for new right-of-way (ROW) reflect the distance in which the lines would not use existing transmission line ROW. Other corridor sharing opportunities may exist with roads, pipelines, railroads, electric distribution lines, etc., which are not reflected in this table.

Table V-12
Proposed Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way

Identified Need	Lines to be Rebuilt/Reconductored on Existing ROW	Approx. Mileage of Rebuilt, Reconductored or Uprated Lines	System Need Year	Projected In-Service Year	Planning Zone
Relieve overloads under contingency	Construct second Roosevelt-Wells 69 kV line	3	2002	2002	4
T-D Interconnection request	Construct Elevation-Elevation Tap 69 kV line	0.5	2003	2003	2
Relieve overloads under contingency	Uprate Cedar-M38 138 kV line – scope TBD	56.44	2003	2003	2
Relieve overloads under contingency	Uprate Cedar-Freeman 138 kV line – scope TBD	8.68	2003	2003	2
Relieve overloads under contingency	Uprate Freeman-Presque Isle 138 kV line – scope TBD	8.9	2003	2003	2
Relieve overloads under contingency	Uprate Presque Isle-Cedar 138 kV line – scope TBD	16.65	2003	2003	2
Relieve overloads under contingency	Construct second East Campus-Walnut 69 kV line	1.3	2003	2003	3
Relieve overloads under contingency	Convert Maplewood-Roselawn-Cloverleaf-Badger and Clintonville-Badger-Shawano West 115 kV lines to 138 kV	41	2003	2003	4
Relieve overloads under contingency	Construct second Mullet River-N Mullet River 69 kV line	0.12	2003	2003	4
Relieve overloads under contingency, lower system losses	String a 138 kV circuit from Forest Junction to Lost Dauphin on existing structures	13	2003	2003	4
Relieve overloads under contingency; replace aging facilities	Rebuild the Forest Junction-Highway V 138 kV double circuit line	22.22	2003	2003	4
Relieve overloads under contingency; reduce TLRs, replace aging facilities	Rebuild Granville-Saukville 138 kV line	18	2003	2003	5
Relieve overloads under contingency; reduce TLRs, replace aging facilities	Reconductor Whitewater-Mukwonago 138 kV line	22	2003	2003	3 & 5
Relieve overloads under contingency	Convert Pine-Grandfather-Tomahawk-Eastom 46 kV lines to 115 kV	30	2001	2004	1
Relieve overloads under contingency	Rebuild DeTour-Talentino Tap 69 kV line	19	2002	2004	2
Relieve overloads under contingency; reduce TLRs, replace aging facilities	Rebuild and convert one Hiawatha-Indian Lake 69 kV circuit to double circuit 138 kV	40	2004	2004	2
Relieve overloads under contingency, accommodate new generation, replace aging facilities	Rebuild Turtle-Bristol 69 kV line to 138 kV and operate at 69 kV	29	2003	2004	3
Relieve overloads under contingency	Convert Kirkwood-Reedsburg 69 kV to 138 kV	15.15	2003	2004	3
Relieve overloads under contingency, accommodate new generation	Rebuild Blount-Ruskin 69 kV line	2.19	2003	2004	3
Relieve overloads under contingency, accommodate new generation	Rebuild Blount-Ruskin Tap 69 kV line	2.19	2003	2004	3
Accommodate new generation	Reconfigure 69/138 kV circuits between Rock River and Janesville to create Rock River-Janesville and Rock River-Sunrise 138 kV circuits	20	2004	2004	3

Table V-12
Proposed Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified Need	Lines to be Rebuilt/Reconductored on Existing ROW	Approx. Mileage of Rebuilt, Reconductored or Uprated Lines	System Need Year	Projected In-Service Year	Planning Zone
Accommodate new generation	Rebuild Russell-Janesville 138 kV line	6.3	2004	2004	3
Accommodate new generation	Reconductor Russell-Rockdale 138 kV line	16.52	2004	2004	3
Relieve overloads under contingency, accommodate new generation	Rebuild Kegonsa-McFarland-Femrite 69 kV line to 138 kV	5.9	2004	2004	3
Relieve overloads under contingency, accommodate new generation	Rebuild Femrite-Royster 69 kV line	3.52	2004	2004	3
Relieve overloads under contingency; reduce TLRs, replace aging facilities	Rebuild the Morgan-Falls-Pioneer-Stiles 138 kV line	10.69	2003	2004	4
Aging facilities and relieves a minor overload under contingency	Reconductor Pleasant Valley-Saukville 138 kV line	12	2004	2004	5
Aging facilities and relieves a minor overload under contingency	Reconductor Pleasant Valley-St Lawrence 138 kV line	7	2004	2004	5
Accommodate new generation	Rebuild Port Washington-Range Line double circuit 138 kV line	21	2004	2004	5
Relieve overloads and low voltages under contingency	Reconductor Wien-McMillan 115 kV (ATC, MEWD)	20	2005	2005	1
Relieve overloads under contingency	Convert Kilbourn-N. Reedsburg 69 kV line to 138 kV	18.41	2004	2005	3
Relieve overloads under contingency, accommodate new generation	Convert Columbia-North Madison 138 kV line to 345 kV	17.41	2005	2005	3
Accommodate new generation	Rebuild Janesville-Riverside 138 kV line	9.52	2005	2005	3
Relieve overloads under contingency	Uprate Kaukauna Central Tap-Melissa 138 kV line - scope TBD	8.6	2005	2005	4
Accommodate new generation	Rebuild Port Washington-Saukville double circuit 138 kV line	5	2005	2005	5
Accommodate new generation	Rebuild Port Washington-Saukville single circuit 138 kV line	5	2005	2005	5
Improve import capability	Rebuild Kelly-Whitcomb 115 kV line	24	2006	2006	1
Improve import capability	Rebuild Weston-Northpoint 115 kV line	24	2005	2006	1
Relieve overloads under contingency	Reconductor W. Middleton-Pheasant Branch 69 kV line	4.65	2006	2006	3
Relieve overloads under contingency	Convert Sycamore-Reiner-Sprecher 69 kV line to 138 kV	6.5	2006	2006	3
Relieve overloads under contingency	Convert Academy-South Beaver Dam 69 kV line to 138 kV	12.8	2006	2006	3

Table V-12
Proposed Transmission Line Rebuilds/Reconductors, New Circuits and Voltage Conversions on Existing Right-of-Way (continued)

Identified Need	Lines to be Rebuilt/Reconductored on Existing ROW	Approx. Mileage of Rebuilt, Reconductored or Uprated Lines	System Need Year	Projected In-Service Year	Planning Zone
Relieve overloads under contingency, accommodate new generation	Convert Kegonsa-Femrite 69 kV to 138 kV	5.9	2006	2006	3
Relieve overloads under contingency; reduce TLRs, replace aging facilities	Rebuild Plains-Amberg-Stiles double circuit 138 kV line	131	2006	2006	2 & 4
Relieve overloads under contingency	Construct second Hiawatha-Straits 138 kV line	25	2007	2007	2
Accommodate new generation	Relocate West Junction Tap to 96th St-Brookdale 138 kV line (KK5063)	Not Applicable	2007	2007	5
Accommodate new generation	Reconductor Oak Creek-Ramsey6 138 kV line	0.8	2007	2007	5
Accommodate new generation	Reconductor underground segment of Ramsey5-Harbor 138 kV line	5.72	2007	2007	5
Accommodate new generation	Reconductor Oak Creek-Allerton 138 kV line	5.41	2007	2007	5
Accommodate new generation	Convert and reconductor Oak Creek-Bluemound 230 kV line K873 to 345 kV	29	2007	2007	5
Accommodate new generation	Construct a Brookdale-Granville 345 kV line converting/ reconductoring 5.6 mi. 138 kV, rebuilding 7mi. 138 kV double circuit tower line and converting/ reconducting 3 mi. 138 kV on existing 345 kV structures	15.6	2007	2007	5
Accommodate new generation	Reconductor Bluemound-Butler 138 kV line (KK5051) on new 345 kV structures installed with Brookdale-Granville line	5.41	2007	2007	5
Accommodate new generation	String Butler-Tamarack (Carmen) 138 kV line on new 345 kV structures installed with Brookdale-Granville line	4.12	2007	2007	5
Relieve overloads under contingency	Convert Turtle-Bristol 69 kV to 138 kV	29	2008	2008	3
Accommodate new generation	Reconductor Cornell-Range Line 138 kV line	2.43	2008	2008	5
Relieve overloads under contingency	Reconductor Colley Road-Clinton 69 kV line	6.25	2009	2009	3
Relieve overloads under contingency	Rebuild and convert West Middleton-Spring Green 69 kV line to 138 kV	5.71	2009	2009	3
Relieve overloads under contingency	Reconductor Reiner-Burke Tap 69 kV line	0.98	2009	2009	3
Interconnect new generation to the transmission system	Reroute Brookdale-Granville 345 kV line into new Bluemound 345 kV switchyard	Not Applicable	2011	2011	5
Accommodate new generation	Convert and reconductor Oak Creek-Bluemound 230 kV line K862 to 345 kV and loop into Arcadian 345 kV SS	39	2011	2011	5

Table V-13
Proposed New Substations, Transformer Additions and Replacements

Identified Need	Proposed Additions or Replacements	Transformer Capacity (MVA)		System Need Year	Projected In-Service Year	Planning Zone
		Install	Replace			
Relieve overloads under contingency	Replace 138/69 kV transformer at North Beaver Dam	100	47	2002	2002	3
Relieve overloads under contingency	Install 345/138, 500 MVA transformer at Rockdale	500	0	2002	2002	3
Relieve overloads under contingency	Install 138/69 kV transformer at Kilbourn	47	0	2002	2002	3
Relieve overloads under contingency	Replace 138/69 kV transformer at Russell	100	33	2002	2002	3
Relieve 69 kV overloads under contingencies	Reconnect NW Beloit 69 kV load to Paddock-Blackhawk 138 kV line	Not Applicable	Not Applicable	2003	2003	3
Relieve overloads under contingency	Replace two existing Edgewater 138/69 kV transformers	112	66.6	2003	2003	4
Relieve overloads under contingency	Construct a 345 kV ring bus at Forest Junction, loop existing Point Beach-Arcadian 345 kV line into Forest Junction, install two 345/138 kV, 500 MVA transformers	1000	0	2003	2003	4
Relieve overloads under contingency	Install second 138/69 kV transformer at Mullet River	46.7	0	2002	2003	4
Relieve overloads under contingency	Relocate Maplewood 138/115 kV transformer to Badger	112	112	2003	2003	4
Relieve overloads under contingency	Install a second 138/69 kV transformer at North Randolph	47	0	2004	2004	3
Relieve overloads under contingency	Construct 138/69 kV switchyard at Artesian; install 2-100 MVA transformers	200	0	2003	2004	3
Relieve overloads under contingency	Install a second 138/69 kV transformer at Hillman	47	0	2004	2004	3
Relieve overloads under contingency, accommodate new generation	Replace 138/69 kV transformers at Fitchburg with 187 MVA units	374	202	2003	2004	3
Relieve overloads under contingency	Construct a 69 kV switchyard at Tokay	Not Applicable	Not Applicable	2004	2004	3
Relieve overloads under contingency	Construct a 345 kV switchyard at North Randolph; install a 345/138 kV transformer	500	0	2004	2004	3
Relieve overloads under contingency	Replace two existing Canal 138/69 kV transformers	168	112	2003	2004	4
Relieve overloads under contingency	Install second 138/69 kV transformer at Crivitz	33.6	0	2003	2004	4
Relieve overloads under contingency	Replace 345/138 kV transformer at Edgewater	500	223	2004	2004	4
Improve Weston stability response	Construct 345 kV switchyard at Weston	Not Applicable	Not Applicable	2002	2005	1
Relieve overloads under contingency	Replace existing 345/115 kV transformer at Weston with two 500 MVA units	1000	300	2002	2005	1
Accommodate new generation, relieve overloads under contingency	Replace 138/69 kV transformer at Sigel	60	47	2005	2005	1
Accommodate new generation, relieve overloads under contingency	Replace 138/69 kV transformer at Petenwell	47	33	2005	2005	1
Relieve overloads under contingency	Install second 138/69, 63 MVA transformer at Straits	63	0	2003	2005	2

Table V-13
Proposed New Substations, Transformer Additions and Replacements (continued)

Identified Need	Proposed Additions or Replacements	Transformer Capacity (MVA)		System Need Year	Projected In-Service Year	Planning Zone
		Install	Replace			
Relieve overloads under contingency, accommodate new generation	Reconfigure 345 kV bus at North Madison and replace the existing transformers with 500 MVA units	1000	510	2005	2005	3
Relieve overloads under contingency	Replace Ellinwood 138/69 kV transformer	64	44.8	2005	2005	4
Relieve overloads under contingency	Construct a new Lannon Junction substation at intersection of Granville-Arcadian 345 kV, Forest Junction-Arcadian 345 kV, Sussex-Tamarack 138 kV and Sussex-Germantown 138 kV lines; install a 345/138 kV, 500 MVA transformer	500	0	2005	2005	5
Accommodate new generation	Install 138/69 kV transformer at Reiner	100	0	2006	2006	3
Relieve overloads under contingency	Install a second 138/69 kV transformer at Metomen	47	0	2007	2007	1
Relieve overloads under contingency	Install a second 138/69 kV transformer at Rock River	47	0	2005	2007	3
Relieve overloads under contingency	Install a second 138/69 kV transformer at Janesville	100	0	2007	2007	3
Relieve overloads under contingency	Construct a 345/138 kV switchyard at a new Werner West SS; install a 345/138 kV transformer. Loop existing Rocky Run to North Appleton 345 kV and existing Werner to White Lake 138 kV lines into Werner West	500	0	2004	2007	4
Increase rating/relieve overload under contingency	Replace Tecumseh 138/69 kV transformer	70	44.8	2007	2007	4
Accommodate new generation	Construct a 345/138 kV switchyard at Brookdale to accommodate two 345 kV lines, a 500 MVA 345/138 kV transformer and 4-138 kV lines plus two 138-26.2 kV transformers	500	0	2007	2007	5
Accommodate new generation	Replace Oak Creek 230/138kV xfmr with a 500 MVA transformer	500	360	2007	2007	5
Accommodate new generation	Construct 345 kV Bluemound switchyard to accommodate 1-345 kV line and a 500 MVA 345/138 kV transformer	500	365	2007	2007	5
Relieve overloads under contingency, accommodate new generation	Replace two existing Arcadian 345/138 kV transformers with 500 MVA units	1000	600	2008	2008	5
Relieve overloads under contingency	Install a 345 kV bus and 345/138 kV 500 MVA transformer at West Middleton	500	0	2009	2009	3
Accommodate new generation	Install second 345/138 kV transformer at Oak Creek SS	500	0	2009	2009	5
Accommodate new generation	Expand 345 kV switchyard at Bluemound to accommodate three additional 345 kV lines and two additional 500 MVA 345/138 kV transformers	1000	685	2011	2011	5
Relieve overloads under contingency	Install a second 138/69, 47 MVA transformer at Wautoma	47	0	2010	2010	1

Table V-14
Proposed Substation Equipment Additions and Replacements

Identified Need	Proposed Additions or Replacements	Capacitor Bank Capacity (MVAR)	System Need Year	Projected In-Service Year	Planning Zone
Relieve low voltages under contingency	Install 8 MVAR capacitor bank at Hodag 115 kV	8	2002	2002	1
Increase rating/relieve overload under contingency	Uprate Kegonsa-Christiana 138 kV line	Not Applicable	2002	2002	3
Relieve overloads under contingency	Uprate Academy-Columbus 69 kV line terminal equipment	Not Applicable	2002	2002	3
Interconnect new generation to the transmission system	Expand the 345 kV switchyard at Columbia	Not Applicable	2002	2002	3
Increase rating/relieve overload under contingency	Uprate Russell-McCue 138 kV line terminal equipment	Not Applicable	2002	2002	3
Relieve low voltages under contingency	Install 2-16 MVAR capacitor banks at New Holstein 69 kV	32	2002	2002	4
Relieve low voltages under contingency	Install 28.8 MVAR capacitor bank at Badger 138 kV	28.8	2002	2002	4
Relieve low voltages under contingency	Install 28.8 MVAR capacitor bank at Werner 138 kV	28.8	2002	2002	4
Relieve low voltages under contingency	Install 28.8 MVAR capacitor bank at White Lake 138 kV	28.8	2002	2002	4
Relieve low voltages under contingency	Install 2-28 MVAR capacitor banks at Sussex 138 kV	56	2002	2002	5
Relieve overloads under contingency	Uprate Whitcomb 115/69 kV transformer	Not Applicable	2002	2003	1
Relieve overloads under contingency	Uprate Caroline 115/69 kV transformer	Not Applicable	2004	2003	1
Relieve low voltages under contingency	Install 2-7.2 MVAR capacitor banks at Atlantic 69 kV	14.4	2003	2003	2
Relieve low voltages under contingency	Install 5 MVAR capacitor bank at Talentino 69 kV	5.4	2003	2003	2
Relieve low voltages under contingency	Install 5 MVAR capacitor bank at Gwinn 69 kV	5.4	2003	2003	2
Relieve low voltages under contingency	Install 5 MVAR capacitor bank at Land o Lakes 69 kV	5.4	2003	2003	2
Relieve low voltages under contingency	Install 5 MVAR capacitor bank at Roberts 69 kV	5.4	2003	2003	2
Accommodate new generation	Uprate McCue-Sheepskin 69 kV line terminal equipment	Not Applicable	2003	2003	3
Interconnect new generation to the transmission system	Construct 138 kV switchyard at Rock Co. generation site	Not Applicable	2003	2003	3
Relieve low voltages under contingency	Install 16 MVAR capacitor bank at Canal 138 kV	16	2003	2003	4
Increase rating/relieve overload under contingency	Convert the normally open Shawano East-Shawano West 34.5 kV bus tie to 138 kV and operate normally closed	Not Applicable	2003	2003	4
Relieve low voltages under contingency	Uprate Dunn Road-Egg Harbor 69 kV line terminal equipment	Not Applicable	2003	2003	4
Relieve overloads under contingency	Uprate Point Beach-Forest Junction 345 kV line	Not Applicable	2003	2003	4
Increase rating/relieve overload under contingency	Uprate Edgewater-Cedarsauk 345 kV line	Not Applicable	2003	2003	4
Relieve overloads under contingency	Uprate Pleasant Prairie-Arcadian 345 kV line	Not Applicable	2003	2003	5
Increase rating/relieve overload under contingency	Install 69 kV phase shifter at Council Creek SS	Not Applicable	2002	2004	1

Table V-14
Proposed Substation Equipment Additions and Replacements (continued)

Identified Need	Proposed Additions or Replacements	Capacitor Bank Capacity (MVAR)	System Need Year	Projected In-Service Year	Planning Zone
Increase rating/relieve overload under contingency	Uprate North Randolph-Ripon 69 kV line terminal equipment	Not Applicable	2002	2004	1
Relieve low voltages under contingency	Install additional 5.4 MVAR capacitor bank at Berlin 69 kV	5.4	2004	2004	1
Relieve low voltages under contingency	Install 5.4 MVAR capacitor bank at Ripon 69 kV	5.4	2003	2004	1
Interconnect new generation to the transmission system	Uprate Port Edwards-Sigel 138 kV line terminal equipment	Not Applicable	2002	2004	1
Increase rating/relieve overload under contingency	Replace current transformer at Cedar SS for Cedar-National 138 kV	Not Applicable	2002	2004	2
Increase rating/relieve overload under contingency	Uprate Portage-Columbia double circuit 138 kV line terminal equipment	Not Applicable	2003	2004	3
Relieve low voltages under contingency	Install additional 5.4 MVAR capacitor bank at Richland Center 69 kV	5.4	2004	2004	3
Relieve low voltages under contingency	Install 24 MVAR capacitor bank at Dickinson 138 kV	24	2004	2004	3
Relieve low voltages under contingency	Install 24 MVAR capacitor bank at Elkhorn 138 kV	24	2004	2004	3
Relieve low voltages under contingency	Install 24 MVAR capacitor bank at new Loch Mirror (Birchwood) 138 kV	24	2004	2004	3
Relieve low voltages under contingency	Install 10.8 MVAR capacitor bank at Rio 69 kV	10.8	2004	2004	3
Relieve low voltages under contingency	Install 10.8 MVAR capacitor bank at Burke 69 kV	10.8	2004	2004	3
Relieve low voltages under contingency	Install additional 5.4 MVAR capacitor bank at Mayville 69 kV	5.4	2004	2004	3
Relieve low voltages under contingency	Install additional 5.4 MVAR capacitor bank at New Glarus 69 kV	5.4	2004	2004	3
Relieve low voltages under contingency	Install additional 10.8 MVAR capacitor bank at South Monroe 69 kV	10.8	2004	2004	3
Interconnect new generation to the transmission system	Install 25 MVAR capacitor banks at Kegonsa, Fitchburg, Cross Country and West Middleton	100	2004	2004	3
Interconnect new generation to the transmission system	Install 10.8 MVAR capacitor bank at Tokay	10.8	2004	2004	3
Increase rating/relieve overload under contingency	Uprate Metomen-N Fond du Lac 69 kV line terminal equipment	Not Applicable	2005	2005	1
Increase rating/relieve overload under contingency	Uprate Bunker Hill-Pine 115 kV line terminal equipment	Not Applicable	2005	2005	1
Increase rating/relieve overload under contingency	Uprate Port Edwards-Sand Lake 138 kV line - scope TBD	Not Applicable	2005	2005	1
Increase rating/relieve overload under contingency	Uprate Weston-Kelly 115 kV line - scope TBD	Not Applicable	2005	2005	1

Table V-14
Proposed Substation Equipment Additions and Replacements (continued)

Identified Need	Proposed Additions or Replacements	Capacitor Bank Capacity (MVAR)	System Need Year	Projected In-Service Year	Planning Zone
Interconnect new generation to the transmission system	Connect double circuit 345/138 kV line from IC014 generation site to Arpin	Not Applicable	2005	2005	1
Relieve low voltages under contingency	Install 14.4 MVAR capacitor bank at Aurora Street 115 kV	14.4	2006	2006	1
Relieve low voltages under contingency	Install additional 6.3 MVAR capacitor bank at McKenna	6.3	2006	2006	1
Increase rating/relieve overload under contingency	Uprate Wautoma-Berlin 69 kV line terminal equipment	Not Applicable	2006	2006	1
Increase rating/relieve overload under contingency	Uprate McCue-Milton Lawns 69 kV line terminal equipment	Not Applicable	2006	2006	3
Interconnect new generation to the transmission system	Install 138 kV bus at Kegonsa	Not Applicable	2006	2006	3
Increase rating/relieve overload under contingency	Uprate Lake Park-City Limits 138 kV line terminal equipment	Not Applicable	2006	2006	4
Relieve low voltages under contingency	Install 16 MVAR capacitor bank at Canal 138 kV	16	2006	2006	4
Relieve low voltages under contingency	Install additional 8.0 MVAR capacitor bank at Hodag 115 kV	8	2007	2007	1
Increase rating/relieve overload under contingency	Uprate Weston-Morrison-Sherman St. 115 kV line - scope TBD	Not Applicable	2007	2007	1
Relieve low voltages under contingency	Install additional 5.4 MVAR capacitor bank at Berlin 69 kV	5.4	2007	2007	1
Increase rating/relieve overload under contingency	Uprate Weston-Sherman St. 115 kV line - scope TBD	Not Applicable	2007	2007	1
Increase rating/relieve overload under contingency	Uprate Metomen-Ripon 69 kV line - scope TBD	Not Applicable	2007	2007	1
Relieve low voltages under contingency	Install 10.8 MVAR capacitor bank at Lake Geneva 69 kV	10.8	2007	2007	3
Relieve low voltages under contingency	Install 28.8 MVAR capacitor bank at Butternut 138 kV	28.8	2007	2007	4
Relieve low voltages under contingency	Install 28.8 MVAR capacitor bank at Fitzgerald 138 kV	28.8	2007	2007	4
Interconnect new generation to the transmission system	Expand Oak Creek 345 kV switchyard to interconnect one new generator, unit #7 plus two 345 kV lines and 138 kV switchyard to accommodate new St. Martins line	Not Applicable	2007	2007	5
Relieve low voltages under contingency	Install 10 MVAR capacitor bank at Jefferson 138 kV	10	2007	2007	5
Relieve low voltages under contingency	Install 2-13 MVAR capacitor banks at Concord 138 kV	26	2007	2007	5
Relieve overloads under contingency	Replace substation equipment at both Arcadian 138 kV and Waukesha 138 kV associated with KK9942	Not Applicable	2007	2007	5

Table V-14
Proposed Substation Equipment Additions and Replacements (continued)

Identified Need	Proposed Additions or Replacements	Capacitor Bank Capacity (MVAR)	System Need Year	Projected In-Service Year	Planning Zone
Accommodate new generation & load growth	Install 3-75 MVAR capacitor banks at Bluemound 138 kV	225	2007	2007	5
Load growth	Install 20 MVAR capacitor bank at Summit 138 kV	20	2007	2007	5
Load growth	Install 20 MVAR capacitor bank at Tichigan 138 kV	20	2007	2007	5
Load growth	Install 50 MVAR capacitor bank at Moorland 138 kV	50	2007	2007	5
Interconnect new generation to the transmission system	Reconnect Oak Creek unit #7 to 345 kV switchyard	Not Applicable	2007	2007	5
Interconnect new generation to the transmission system	Install two 345 kV series breakers at Pleasant Prairie on lines to Racine (L631) and Zion (L2221)	Not Applicable	2007	2007	5
Interconnect new generation to the transmission system	Replace seven 138 kV overdutied breakers at Bluemound	Not Applicable	2007	2007	5
Relieve low voltages under contingency	Install 5.4 MVAR capacitor bank at Winneconne 69 kV	5.4	2008	2008	1
Relieve overloads under contingency	Uprate Sherman Street-Hilltop 115 kV line - scope TBD	Not Applicable	2008	2008	1
Relieve low voltages under contingency	Install 4 MVAR distribution capacitor bank at Fall River 69 kV	4	2008	2008	3
Relieve low voltages under contingency	Install 5.4 MVAR capacitor bank at Rosebush 69 kV	5.4	2008	2008	4
Accommodate new generation	Uprate Kansas-Norwich 138 kV line	Not Applicable	2008	2008	5
Accommodate new generation	Uprate Kansas-Ramsey5 138 kV line	Not Applicable	2008	2008	5
Accommodate new generation	Uprate Oak Creek-Ramsey5 138 kV line	Not Applicable	2008	2008	5
Accommodate new generation	Uprate Kansas-Moorland 138 kV line	Not Applicable	2008	2008	5
Relieve low voltages under contingency	Install additional 7.2 MVAR capacitor bank at Clear Lake 115 kV	7.2	2009	2009	1
Increase rating/relieve overload under contingency	Uprate Brick Church-Zenda 69 kV line terminal equipment	Not Applicable	2009	2009	3
Relieve overloads under contingency	Uprate Columbia-Manley Sand 69 kV line terminal equipment	Not Applicable	2009	2009	3
Relieve low voltages under contingency	Install 16 MVAR capacitor bank at Canal 138 kV	16	2009	2009	4
Interconnect new generation to the transmission system	Expand Oak Creek 345 kV switchyard to interconnect one new generator	Not Applicable	2009	2009	5
Increase rating/relieve overload under contingency	Uprate Dickinson-Brick Church 138 kV line terminal equipment	Not Applicable	2010	2010	3
Relieve low voltages under contingency	Install 10.8 MVAR capacitor bank at Waunakee 69 kV	10.8	2010	2010	3

Table V-14
Proposed Substation Equipment Additions and Replacements (continued)

Identified Need	Proposed Additions or Replacements	Capacitor Bank Capacity (MVAR)	System Need Year	Projected In-Service Year	Planning Zone
Interconnect new generation to the transmission system	Expand Oak Creek 345 kV switchyard to interconnect three new generators, unit #8 and two 345 kV lines, plus installation eight 345 kV series breakers for stability purposes	Not Applicable	2011	2011	5
Interconnect new generation to the transmission system	Reconnect Oak Creek unit #8 to 345 kV switchyard	Not Applicable	2011	2011	5
Interconnect new generation to the transmission system	Reconnect Oak Creek units #6 and #9 to 138 kV switchyard	Not Applicable	2011	2011	5
Interconnect new generation to the transmission system	Replace 22-138 kV overdutied breakers at Harbor, Everett and Haymarket Substations	Not Applicable	2011	2011	5

Table V-15
Alternative Solutions to Proposed Additions

Primary Solution(s)	Alternate Solution(s)	Projected In-Service Year	Planning Zone
Convert Pine-Grandfather-Tomahawk-Eastom 46 kV system to 115 kV and construct new Skanawan-Highway 8 115 kV line	1.) Weston-Venus 345 kV line. 2.) Venus-Crandon-Laona-Goodman-Dunbar 115 kV line. 3.) Venus-Crandon-Laona-Plains 138 kV line. 4.) Convert Plains-Conover to 138 kV with a new Conover-Cranberry 138 kV line. 5.) Convert Winona-Conover to 138 kV with a new Conover-Cranberry 138 kV line 6.) Generation in upper portion of Rhinelander Loop.	2004	1
Construct new Skanawan-Highway 8 115 kV line	1.) Rebuild as double circuit 115 kV lines on existing center line. 2.) Construct a new 115 kV line parallel to the existing line. 3.) Construct new Eastom-Highway 8 115 kV line incorporating new WPS T-D interconnection request (Lake Nokomis area) into routing of the line.	2005	1
Laona-Goodman-Plains 138 kV line	1.) Weston-Venus 345 kV line. 2.) Weston-Venus-Plains 345 kV line. 3.) Convert Plains-Conover to 138 with a new Conover-Cranberry 138 kV line. 4.) Convert Winona-Conover to 138 kV with a Conover-Cranberry 138 kV line. 5.) Laona-Goodman-Dunbar 115 or 138 kV line. 6.) Generation in upper portion Rhinelander Loop	2007	1
Construct Clear Lake-Highway D 115 kV line and construct St. Germain-Boulder Junction 115 kV line. Both lines to be radial.	1.) Loop new T-D substations with a Clear Lake-Hwy D-Boulder Junction-Conover 115 kV line. 2.) Loop new T-D substations with a Clear Lake-Hwy D-Boulder Junction-St. Germain 69 kV line. 3.) Construct new 69 kV radial lines and 115/69 kV xfmrs at Clea Lake and St. Germain. 4.) Construct a new 115 kV line from Clear Lake west to NSP's system to incorporate new Hwy D and possible DPC T-D interconnect (Butternut).	2005	1
Construct Eastom-Lake Nokomis 115 kV line (radial).	1.) Include new Lake Nokomis T-D interconnection request in the routing of a Eastom-Highway 8 115 kV line which is described as an alternate to the Skanawan-Highway 8 115 kV line.	2005	1
Install capacitor banks at Ripon, Berlin, and Winneconne. Uprate Metomen-Ripon 69 kV line and install 2nd 138/69 kV transformer at Metomen.	1.) Reconfigure N. Randolph-Ripon 69 kV line to N. Randolph-Metomen & Metomen-Ripon 69 kV lines, 138-69 kV double circuit from Metomen to Berlin with new 138/69 kV xfmr at Berlin.	2005	1

Table V-15
Alternative Solutions to Proposed Additions (continued)

Primary Solution(s)	Alternate Solution(s)	Projected In-Service Year	Planning Zone
Uprate Weston-Sherman St., Weston-Morrison-Sherman St., and Sherman St.-Hilltop 115 kV lines	1). Convert WPS's 46 kV system from Maine-Brokaw-Strowbridge-Wausau Hydro-Townline-Kelly to 115 kV. 2.) Convert WPS's 46 kV system from Sherman St.-Wausau Hydro-Strowbridge-Townline-Kelly to 115 kV	2007	1
Install 69 kV phase shifter at Council Creek	1.) Install a new 161/138 kV transformer at Monroe County and convert DPC's Monroe County-Council Creek 69 kV system to 138 kV.	2004	1
Construct a 0.2 mile Hiawatha to Engadine 69 kV line to relieve low voltages under contingency by removing load from the end of a 71 mile, 69 kV line.	Add capacitor bank near Newberry SS.	2003	2
Add a Second 138/69 kV transformer at Straits	Replace the Straits 138/69 kV transformer with a larger size	2004	2
Uprate Cedar-Freeman 138 kV line Uprate Cedar-M38 138 kV line Uprate Freeman-Presque Isle 138 kV line Uprate Presque Isle-Cedar 138 kV line	Alternative solutions to be defined after Scope of the uprates is developed.	2003	2
Construct second Hiawatha-Straits 138 kV line	Limit flows with a Phase Shifter and add 138 kV capacitors at Brevort or Lakehead	2007	2
Rebuild and convert one Hiawatha-Indian Lake 69 kV circuit to double circuit 138 kV	Rebuild at 69 kV and Limit flows with a Phase Shifter	2004	2
Rebuild Plains-Amberg-Stiles double circuit 138 kV line	Upgrade West Marinette-White Rapids-Chandler to a higher voltage	2006	2 & 4
Convert North Madison 69 kV line through Sun Prairie to Reiner to 138 kV	Reconfigure Sun Prairie 69 kV system, install second 138/69 kV transformer at North Madison	2005	3
Construct a new 345 kV line from Rockdale to West Middleton	Uprate Christiana to Fitchburg 138 kV line to 319 MVA	2004	3
Construct a new 345 kV line from Rockdale to West Middleton	Reconductor Kegonsa to Christiana 138 kV line	2005	3
Construct a new 345 kV line from Rockdale to West Middleton	1.) Convert Kegonsa to Femrite to 138 kV, close the 138 kV loop from Femrite to Sprecher, convert the Sycamore to Sprecher line to 138 kV 2.) Install Rockdale to Sprecher/Femrite 138 kV double circuit	2008	3
Construct a new 345 kV line from Rockdale to West Middleton	1.) Construct a new 345 kV line from North Madison to West Middleton 2.) Rockdale to Sprecher/Femrite 138 kV double circuit 3) Numerous 138 kV and 69 kV capacitor banks, reconductor Kegonsa to Christiana, reconductor Fitchburg to Christiana, add a second 138/69 kV transformer at North Madison, add a third 345/138 kV transformer at North Madison, reconductor or uprate North Madison to Sycamore 138 kV line, install a second 138/69 kV transformer at Kegonsa, reconductor all three East Campus to Blount 69 kV lines, reconductor Blount to Gateway 69 kV line.	2009	3
Convert 69 kV line from West Middleton to Spring Green to 138 kV and Construct a new 345 kV line from Rockdale to West Middleton	Install several capacitor banks on 69 kV buses and on 138 kV buses	2008	3

Table V-15
Alternative Solutions to Proposed Additions (continued)

Primary Solution(s)	Alternate Solution(s)	Projected In-Service Year	Planning Zone
Install line between Spring Green and Prairie du Sac to off load this line	Install parallel transformers at Portage and North Madison	2009	3
Construct a second Mullet River-North Mullet River 69 kV line, add a second Mullet River 138/69 kV transformer and replace two Edgewater 138/69 kV transformers	Tap the Forest Junction-Cedarsauk 138 kV line to Sheboygan Falls and add a 138/69 kV transformer	2003	4
Replace Canal 138/69 kV transformers 1 and 2	1.) Add a third 138/69 kV transformer at Canal 2.) Add generation to the 69 kV system in Door County	2003	4
Add a 16 MVAR capacitor bank at Canal 138 kV in 2003, 2006 and 2009 for a total of 48 MVAR	1.) Construct a 138 kV line from Egg Harbor to Menominee under the bay of Green Bay and operate at 69 kV 2.) Construct a 138 kV line from Sister Bay to Escanaba under the bay of Green Bay and operate at 69 kV 3.) Add generation to the 69 kV system in Door County	2003	4
Replace the Crivitz 138/69 kV transformer with a larger size	Add an additional 138/69 kV transformer at Crivitz	2003	4
Replace Ellinwood 138/69 kV transformer	1.) Add a second Ellinwood 138/69 kV transformer 2.) Add 138 kV conductor for Ellinwood-Sunset Point 138 kV on existing structures	2005	4
Construct 138 kV line from Forest Junction-Cedarsauk to Howards Grove	1.) Construct a 138 kV line from Erdman to Howards Grove 2.) Construct a 69 kV line from Erdman to Howards Grove	2006	4
Construct the Morgan-Werner West 345 kV line and construct a 345/138 kV switchyard at a new Werner West SS; install a 345/138 kV transformer. Loop existing Rocky Run to North Appleton 345 kV and existing Werner to White Lake 138 kV lines into Werner West	1.) Construct a 345 kV line from Morgan to N. Appleton, add a fourth 345/138 kV transformer at N. Appleton, uprate the Melissa-Tayco 138 kV line, uprate Butte des Morts 138 kV bus, uprate Casaloma-Ellington-N Appleton 138 kV line, uprate Ellington 138 kV bus and uprate Fitzgerald 345/138 kV transformer. 2.) Add a fourth 345/138 kV transformer at N. Appleton, uprate the Melissa-Tayco 138 kV line uprate Butte des Morts 138 kV bus, uprate Casaloma-Ellington-N Appleton 138 kV line, uprate Ellington 138 kV bus, uprate Point Beach-Forest Jct 345 kV line, uprate Lost Dauphin-Mystery Hills 138 kV, uprate Highway V-Preble-Tower Dr 138 kV line, uprate Glory Rd-De Pere 138 kV line, uprate Kewaunee 345/138 kV transformer, uprate Fitzgerald 345/138 kV transformer and add a 14.4 MVAR capacitor bank at Apple Hills 138 kV	2006	4
Construct Clintonville-Werner West 138 kV line	1.) Construct Clintonville-Manawa 138 kV line and convert Manawa-Harrison 69 kV to 138 kV		
Construct a second Dunn Rd-Egg Harbor 69 kV line	1.) Construct a new 138 kV line from Dunn Rd to Egg Harbor 2.) Add generation to the 69 kV system in northern Door County	2007	4
Install two 345 kV series breakers at Pleasant Prairie on lines to Racine (L631) and Zion (L2221)	Reconfigure 345 kV lines on bus sections 3 and 4. Reconfigure Pleasant Prairie 345 kV straight bus into ring bus. Construct a 345 kV bus at Bain SS.	2007	5
Construct Pleasant Prairie-Libertyville 345 kV line	Construct Big Bend-Paddock 345 kV line	2009	5

Table V-16
Proposed Additions Removed From Plan Since Last Assessment

Formerly Planned Additions	Projected In-Service Year	Planning Zone	Reason for Removal
Uprate Rocky Run-Whiting Avenue 115 kV	2003	1	revised load/model information
Move Port Edwards 18.0 MVAR capacitor bank to Wautoma	2003	1	revised project scope
Construct Arpin-Columbia 345 kV line	2006	1	generation no longer in the case
Construct 345 kV switching station at IC005 generation site	2006	1	generation no longer in the case
Construct double circuit 345 kV line from IC005 generation site to Arpin	2006	1	generation no longer in the case
Rebuild Cedar to Greenstone 69 kV line (Clarksburg line)	2002	2	revised load/model information
Install second 138/69, 25 MVA transformer at Munising	2003	2	revised load/model information
Install 5 MVAR capacitor bank at Lakehead 69 kV	2003	2	revised load/model information
Install 10 MVAR capacitor bank at Louis Paper 69 kV	2003	2	revised load/model information
Install 5 MVAR capacitor bank at UPP Lincoln 69 kV	2003	2	revised load/model information
Install 5 MVAR capacitor bank at Mass 69 kV	2003	2	revised load/model information
Uprate Crystal-Brule 69 kV line	2003	2	revised load/model information
Uprate Chandler-Cornell 69 kV line	2003	2	revised load/model information
Install 15 MVAR capacitor bank at Engadine 69 kV	2003	2	revised load/model information
Install 15 MVAR capacitor bank at Newberry 69 kV	2003	2	revised load/model information
Install 3-7.2 MVAR capacitor banks at M-38 138 kV	2003	2	revised load/model information
Install 5 MVAR capacitor bank at Detour 69 kV	2003	2	revised load/model information
Uprate Twin Lakes-Winona 69 kV line	2004	2	revised load/model information
Uprate Winona-Portage Tap 69 kV line	2004	2	revised load/model information
Uprate Portage Tap-Atlantic 69 kV line	2004	2	revised load/model information
Install 3-4.8 MVAR capacitor banks at Conover 69 kV	2008	2	revised load/model information
Install 2.4 MVAR capacitor bank at Crystal Falls 69 kV	2008	2	revised load/model information
Reconductor existing 69 kV underground line from East Campus to Walnut	2003	3	revised scope of work
Install 10.8 MVAR capacitor bank at Idle Hour 69 kV	2004	3	revised location to South Monroe
Construct a Rockdale-Sprecher double circuit 138 kV line	2007	3	revised scope of work
Uprate Paddock-Shirland Ave. 69 kV line	2010	3	revised load/model information
Add a 138/69 transformer at Bass Creek	2010	3	revised load/model information
Uprate Brodhead-South Monroe line	2010	3	revised load/model information

Table V-16
Proposed Additions Removed From Plan Since Last Assessment (continued)

Formerly Planned Additions	Projected In-Service Year	Planning Zone	Reason for Removal
Reconnect the Plymouth 69 kV load to the Elkhart Lake-Random Lake 138 kV line	2003	4	customer has withdrawn T-D interconnection request
Install a third 345/138 kV, 500 MVA transformer at Forest Junction	2006	4	generation no longer in case
Construct a 345 kV line from IC007 generation site to Forest Junction	2003	4	generation no longer in case
Replace 1200 Amp bus equipment at Bain 138 kV	2003	5	revised load/model information
Cut Arcadian-Zion 345 kV line and interconnect with a double circuit 345 kV line from Badger Power to form Badger Power-Zion and Badger Power-Arcadian 345 kV lines	2003	5	generation no longer in the case
Construct 345 kV switching station at Badger Power	2004	5	generation no longer in the case
Uprate Oak Creek-Nicholson-Ramsey 138 kV line	2007	5	revised load/model information
Install 20 MVAR capacitor bank at Allerton 138 kV	2008	5	revised load/model information
Install 5 MVAR capacitor bank at Fiebrantz 138 kV	2008	5	revised load/model information
Install 2-5 MVAR capacitor banks at Kansas 138 kV	2008	5	revised load/model information
Install 26 MVAR capacitor bank at Cottonwood 138 kV	2008	5	revised load/model information
Install 26 MVAR capacitor bank at Hartford 138 kV	2008	5	revised load/model information
Install 26 MVAR capacitor bank at Merrill Hills 138 kV	2008	5	revised load/model information
Construct a 345 kV switchyard at Bain	2011	5	project alternative

Section VI

ENVIRONMENTAL SCREENING OF NEW TRANSMISSION LINES

This section summarizes the environmental screening requirements for primary projects involving new transmission line construction shown in Table V-11. Table VI-1 below lists the new transmission lines, whether an environmental screening has been provided in this report and the status of projects for which permit applications have already been filed. Exhibits VI-1 through VI-20 contain the high level screening assessments for the projects indicated below.

It should be noted that the projects below do not reflect the entire number of projects listed in Section V that will require some level of environmental assessment. Rather, these projects will require the selection of new rights of way and are likely to result in new environmental impacts. We have identified areas of environmental concern to be incorporated in the final route selection process. Other projects will require environmental assessment and those assessments will be conducted in the course of finalizing the scope for each of those projects.

It should also be noted that the environmental assessments provided in this section are high level and not nearly the level of investigation that will accompany a permit application to construct transmission facilities.

Table VI-1

Identified Needs and Proposed Transmission Lines Requiring New Right-of-Way (Environmental Assessment)

Reference Number	Identified Need	Potential Solutions	System Need Year	Projected In-Service Year	Planning Zone	Environmental Screening Provided?	Comments
1	Accommodate new generation	Construct a 138 kV line from Sunrise to McCue	2003	2002	3	no	Approved by PSCW. Currently under construction.
2	T-D interconnection request	Construct an Endeavor-Wautoma/Portage 69 kV line	2003	2003	1	yes	
3	Accommodate new generation	Construct 138 kV double circuit line from Rock Co. generation site to Rock River	2003	2003	3	no	Submitted to PSCW in Calpine Application
4	Relieve low voltages under contingency	Construct a 0.2 mile 69 kV line from Hiawatha to Engadine	2003	2004	2	yes	
5	T-D interconnection request	Construct Fitchburg-Tokay-Westowne 69 kV underground line	2004	2004	3	no	CA approved
6	Accommodate new generation	Construct a 345/138 kV line from IC014 generation site to Arpin	2005	2005	1	no	Submitted to PSCW in Calpine Application
7	T-D interconnection request	Construct 115 kV line from Clear Lake to Highway D	2005	2005	1	yes	
8	Relieve overloads, improve voltages	Construct 115 kV line from Skanawan to Highway 8	2005	2005	1	yes	
9	T-D interconnection requests	Construct 138 or 115 kV line from Venus to new Crandon and Laona Substations	2005	2005	1	yes	
10	Improve transfer capability, improve dynamic and voltage stability performance, eliminate need for operating guides, reduce TLRs	Construct 345 kV line from Arrowhead to Weston	2005	2005	1	no	CPCN Approved
11	Relieve overloads under contingency	Construct S. Reedsburg-N. Reedsburg 138 kV line	2004	2005	3	no	CA applied for
12	Relieve overloads under contingency, accommodate new generation	Convert Columbia-North Madison from 138 kV to 345 kV	2005	2005	3	yes	
13	Relieve overloads under contingency, improve voltages	Construct a second Dunn Rd-Egg Harbor 69 kV line	2007	2007	4	yes	
14	T-D interconnection request, improve voltages	Construct a Waukesha-Duplainville-Sussex 138 kV line	2005	2005	5	yes	
15	Relieve overloads under contingency	Construct South Beaver Dam-North Beaver Dam 138 kV line	2006	2006	3	yes	

Table VI-1
Identified Needs and Proposed Transmission Lines Requiring New Right-of-Way (Environmental Assessment) (continued)

Reference Number	Identified Need	Potential Solutions	System Need Year	Projected In-Service Year	Planning Zone	Environmental Screening Provided?	Comments
16	T-D interconnection request	Construct a 138 kV line from Erdman to Howards Grove	2006	2006	4	yes	
17	Relieve overloads under contingency, accommodate new generation	Construct an Elkhorn-Sugar Creek 138 kV line	2007	2007	3	yes	
18	Relieve overloads under contingency	Construct 138 kV line from Clintonville to Werner West	2006	2007	4	yes	
19	Relieve overloads under contingency	Construct Morgan-Werner West 345 kV line	2004	2007	4	yes	
20	Accommodate new generation	Construct an Oak Creek-Brookdale 345 kV line installing 4 mi. new structures, converting 16.2 mi. of non-operative 230 kV, and 5 mi. 138 kV	2007	2007	5	yes	
21	Accommodate new generation	Construct Oak Creek-St Martins 138 kV circuit #2 installing 4 mi new structures and conductor, plus 12.6 mi conductor on existing towers	2007	2007	5	yes	
22	Improve load serving capability in Rhinelander area	Construct a Laona-Goodman-Plains 138 kV line	2007	2007	1 & 2		
23	T-D interconnection request	Construct 115 kV line from St. Germain to Boulder Junction	2008	2008	1	yes	
24	Relieve overloads under contingency	Construct Rockdale-West Middleton 345 kV line	2009	2009	3	yes	
25	Relieve overloads under contingency	Construct 69 kV line from Spring Green to Prairie du Sac	2009	2009	3	yes	
26	Accommodate new generation	Construct a Pleasant Prairie-Libertyville 345 kV line	2009	2009	5	yes	
27	Accommodate new generation, project alternative	Construct a 345 kV line from Big Bend to Paddock	2009	2009	5	yes	
28	Accommodate new generation	Construct Oak Creek-Racine 345 kV line with 4 mi new structures and conductor, plus convert 9.6 mi. 138 kV line KK812 to 345 kV	2011	2011	5	yes	

Table VI-2
Screening Information on Transmission Corridors

Corridor information is only provided for new transmission construction that requires new right-of-way acquisition.
Please also provide a map highlighting proposed corridors with the filing.
For a project where a CPCN application has been filed with the Commission this form is not completed.

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Sunrise - McCue 138 kV	1	Application filed with PSCW, project under construction.
	Endeavor-Wautoma/Portage 69 kV	2	
	General Description		New line
	Length (miles)		approx 7
#1	Study Area (Sq. mi.- length X width)		approx 137
#2	Corridor Sharing Opportunities		Existing 69kV line and ROW. New Row should be considered to remove line from state wildlife area. Federal, State, and Columbia/Marquette County roads and an old railroad corridor are located within the study area.
#3	Public Lands		The John Muir Memorial Park, the French Creek State Wildlife Area, and the Marquette Trail are located within the study area.
#4	Sensitive Resources		The French Creek State Wildlife area is presently impacted by the existing 69kV line. Other lakes and streams, forested land, and wetland are found within the study zone.
#5	Cultural Resources		The Marquette Trail is located within the study area.
	Miscellaneous		Current location of 69kV line crosses large expanse of open water at French Creek State Wildlife Area.
	Riverside - Rock River 138 kV	3	Application filed with PSCW as part of Calpine filing.
	Hiawatha-Engadine 69 kV	4	
	General Description		New Line
	Length (miles)		approx 0.5
#1	Study Area (Sq. mi.- length X width)		approx 1.2
#2	Corridor Sharing Opportunities		Proposed Sites are adjacent to each other with no roads between.
#3	Public Lands		None.
#4	Sensitive Resources		None.
#5	Cultural Resources		None Shown.
	Miscellaneous		
	Fitchburg-Tokay-Westowne 69 kV	5	Application filed with PSCW
	Arpin - IC014 Site 345/138 kV	6	Application filed with PSCW as part of Calpine filing.
	Clear Lake to Highway D 115 kV	7	
	General Description		New line
	Length (miles)		approx 14
#1	Study Area (Sq. mi.- length X width)		approx 98
#2	Corridor Sharing Opportunities		Limited. State Highways 47 and 70, several Oneida/Vilas County Roads, and a railroad corridor are located within the study area.
#3	Public Lands		Clear Lake Substation is located within Northern Highland American Legion State Forest. Bearskin-Hiawatha Coop State Trail located within study area. Several areas of scattered state forest lands and fishery areas are also found in the study area.

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Clear Lake to Highway D 115 kV continued	7	
#4	Sensitive Resources		Numerous lakes, streams, wetlands, and forested lands found within the study area.
#5	Cultural Resources		Several locations of cultural interest are found within the study area, including the Lac Du Flambeau Native American reservation, the Minoqua Museum, and the Dr. Kate Pelham Newcomb Museum.
	Miscellaneous		Study area located within the Ceded Territory
	Skanawan to Highway 8 115 kV	8	
			New Line
	Length (miles)		approx 16
#1	Study Area (Sq. mi.- length X width)		approx 250
#2	Corridor Sharing Opportunities		Lincoln/Oneida County Roads. Existing 115kV ROW located within the study zone. State Highway 8 and the Chicago Milwaukee St Paul railroad also within study zone.
#3	Public Lands		State-owned islands on the Wisconsin River.
#4	Sensitive Resources		Scattered lakes, streams, wetlands, and natural areas (Very high quality areas along the Wolf River).
#5	Cultural Resources		High potential for historic and cultural resources within study zone.
	Miscellaneous		study zone located within the Ceded Territory
	Venus-Crandon-Laona 115/138 kV	9	
			New Line
	Length (miles)		approx 24
#1	Study Area (Sq. mi.- length X width)		approx 500
#2	Corridor Sharing Opportunities		WI State HWYs 45/8/32 within study zone. Existing 115 kV transmission ROW in western 1/4 of study zone. Several railroads present. WPS 69kV Distribution line parallels much of WI HWY 8.
#3	Public Lands		Chequamegan-Nicolet National Forest, Veterans Memorial Park, Little Rice Wildlife Area, Wolf River Tower Site, Statewide Natural Areas, Scattered Forest lands, Statewide Spring Ponds, and State-owned Islands on Lake Lucerne.
#4	Sensitive Resources		Numerous lakes, headwaters to the Wolf River, streams, wetlands and forest.
#5	Cultural Resources		Potawatomi Indian Reservation and high potential for other historical and cultural resources within study zone.
	Miscellaneous		
	Arrowhead - Weston 345 kV	10	Application filed with PSCW
	S. Reedsburg - N. Reedsburg 138 kV	11	Application filed with PSCW
	Columbia - North Madison 345 kV	12	
	General Description		Conversion of 138 kV line to 345 kV
	Length (miles)		approx 17
#1	Study Area (Sq. mi.- length X width)		approx 240
#2	Corridor Sharing Opportunities		Existing 138 kV/345 kV double circuit line to be converted to 345 kV/345 kV double circuit line along existing alignment. Additional r.o.w. width may be required. State and County roads and a railroad corridor also are located within the study area.
#3	Public Lands		The Poynette State Game Farm, Arlington Research Station, and several state fishery areas are found within the study area. MacKenzie Environmental Center, Muir Park, and Goose Pond Sanctuary also are located within the study area.

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Columbia - North Madison 345 kV (continued)	12	
#4	Sensitive Resources		Audubon Goose Pond State Natural Area, Lost Lake State Natural Area, and Rocky Run Oak Savanna are located within the study area.
#5	Cultural Resources		Several locations of cultural interest are found within the study area, including the Fort Winnebago Site, Old Indian Agency House, Portage Canal, Society Hill Historic District, Zona Gale House, the Leopold Memorial Reserve, and the Fort Winnebago Surgeon's Quarters.
	Miscellaneous		
	Second Dunn Rd-Egg Harbor 69 kV	13	
	General Description		New Line
	Length (miles)		approx 13
#1	Study Area (Sq. mi.- length X width)		approx 205
#2	Corridor Sharing Opportunities		Existing 69kV ROW
#3	Public Lands		Murphy County Park,Lyle-Harter-Matter County Park, Penninsula State Park and Potawatomi State Parks are all locate within the study zone. None are impacted by the existing Dunn Rd-Egg Harbor 69kV tranmission line.
#4	Sensitive Resources		None shown.
#5	Cultural Resources		None Shown.
	Miscellaneous		
	Waukesha-Duplainville-Sussex 138 kV	14	
	General Description		New Lines feeding a new Duplainville Substation.
	Length (miles)		approx 10
#1	Study Area (Sq. mi.- length X width)		approx 180
#2	Corridor Sharing Opportunities		State and County roads, railroad corridor, and existing electrical distribution line routes located within the study area offer the best potential for corridor sharing.
#3	Public Lands		Frame Park, Waukesha County Fairgrounds, Waukesha Airport, are among the larger publically owned lands in the project area.
#4	Sensitive Resources		Busse Woods, Fox River, and Pewaukee River are all located within the project area.
#5	Cultural Resources		Cultural Map of Wisconsin does not identify any sites within the project area.
	Miscellaneous		
	South Beaver Dam - North Beaver Dam 138 kV	15	
	General Description		138 kV System Tie
	Length (miles)		approx 4
#1	Study Area (Sq. mi.- length X width)		approx 100
#2	Corridor Sharing Opportunities		Extension of 138 kV feed from North Beaver Dam to South Beaver Dam to strengthen source. Additional r.o.w. may be required. State and County roads, railroad corridor, and an existing 69 kV transmission line route also are located within the study area.
#3	Public Lands		Crystal Lake, Waterworks, and Lakeview parks are located within the study area.
#4	Sensitive Resources		Shaw Marsh wildlife area, and Beaver Dam Lake are found within the project area.
#5	Cultural Resources		
	Miscellaneous		

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Howards Grove-Erdman 138 kV	16	
	General Description		New Line
	Length (miles)		approx 4
#1	Study Area (Sq. mi.- length X width)		approx 75
#2	Corridor Sharing Opportunities		I-45, State HWY's 23/32/42 are located within the study zone as well as county highways J/JJ/Y.
#3	Public Lands		None shown.
#4	Sensitive Resources		None known.
#5	Cultural Resources		None shown.
	Miscellaneous		
	Elkhorn - Sugar Creek 138 kV	17	
	General Description		138 kV System Tie
	Length (miles)		approx 3
#1	Study Area (Sq. mi.- length X width)		approx 44
#2	Corridor Sharing Opportunities		New 138 kV tie relieve system overloads and accommodate new generation. Additional r.o.w. will be required. State and County roads located within the study area offer the best possibility of corridor sharing.
#3	Public Lands		Several city parks and the Walworth County Fairgrounds are located within the study area.
#4	Sensitive Resources		Jackson and Sugar Creeks and Silver Lake are found within the project area
#5	Cultural Resources		The Webster House Museum and Watson's Wild West Museum are located within the project area.
	Miscellaneous		
	Clintonville-Werner West 138 kV	18	
	General Description		New Line
	Length (miles)		approx 14 miles
#1	Study Area (Sq. mi.- length X width)		approx 220
#2	Corridor Sharing Opportunities		State HWY's 22/45 run north-south within the corridor as well as several county highways, existing transmission ROW's, pipelines, and railroads within the study zone
#3	Public Lands		Parks include Olen, Walter A. Olen , Bucholtz, Pfeifer, Hatten, Abrahams Parks, as well as the Embarrass River and Wolf River fishery areas, Deer Creek and Mukwa wildlife areas, and a designated Statewide Natural area.
#4	Sensitive Resources		The Embarrass and Wolf Rivers, scattered lakes, streams and much wetland within study zone.
#5	Cultural Resources		High potential for historic and cultural resources within study zone.
	Miscellaneous		
	Morgan-Werner West 345 kV	19	
	General Description		New Line
	Length (miles)		approx 39
#1	Study Area (Sq. mi.- length X width)		approx 1,316
#2	Corridor Sharing Opportunities		Several state highways, county highways, existing transmission ROW's, pipelines, and railroads within the study zone.
#3	Public Lands		Parks include Mielke Co Park, and Cedar's, Walter A. Olen , Rock Ledge, Shiocton Lake, Lindsay, Pfeifer, Hatten, Abrahams Parks, as well as numerous fish, wildlife, habitat and natural areas along the Wolf River throughout study zone.

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Morgan-Werner West 345 kV (continued)	19	
#4	Sensitive Resources		Lost Lake State Natural Area, Parfrey's Glen State Natural Area, Sohlberg Silver Lake State Natural Area, Roche-A-Cri Mounds State Natural Area, Quincy Bluff and Wetlands State Natural Area, Lawrence Creek State Natural Area, (Muir's) Enis Lake-Muir Park State Natural Area, Observatory Hill State Natural Area, Buena Vista Quarry Prairie State Natural Area, and Powers Bluff Maple Woods State Natural Area. The Wisconsin River, scattered lakes, streams and wetlands along with forested lands and agricultural land.
#5	Cultural Resources		High potential for historic and cultural resources within study zone.
	Miscellaneous		
	Oak Creek - Brookdale 345 kV	20	
	General Description		New transmission line segments along with conversion of 16 mile 138 kV segment to 345 kV.
	Length (miles)		approx 26
#1	Study Area (Sq. mi.- length X width)		approx 129
#2	Corridor Sharing Opportunities		Several state and county roads and existing 138, 230, and 345 kV line routes exist in the project area.
#3	Public Lands		Racine & Milwaukee County parkland, Root River Parkway, Whitnall Park.
#4	Sensitive Resources		Root River & Tributaries, Big Muskego Lake, State Natural Areas (Gravel Pit Woods, Caddy Vista Woods, Stone Woods, County Line Lowland Woods, and a few locally significant areas identified in a SEWRPC report.
#5	Cultural Resources		The Ben Hunt Cabin is identified in the project area on the Cultural Map of Wisconsin.
	Miscellaneous		Some additional right-of-way needed, Hales Corners Airport.
	Oak Creek - St. Martins 138 kV	21	
	General Description		Addition of a second 138 kV circuit to an existing line
	Length (miles)		approx 16
#1	Study Area (Sq. mi.- length X width)		approx 76
#2	Corridor Sharing Opportunities		Existing transmission ROW can be follwed for this project. Additional corridor sharing opportunities exist with state & county roads in the project area.
#3	Public Lands		Racine & Milwaukee County parkland, Root River Parkway, Whitnall Park.
#4	Sensitive Resources		Root River & Tributaries, Big Muskego Lake, State Natural Areas (Gravel Pit Woods, Caddy Vista Woods, Stone Woods, County Line Lowland Woods, and a few locally significant areas identified in a SEWRPC report.
#5	Cultural Resources		The Ben Hunt Cabin is identified in the project area on the Cultural Map of Wisconsin.
	Miscellaneous		
	Laona-Goodman-Plains 138 kV	22	
	General Description		New Line
	Length (miles)		approx 38
#1	Study Area (Sq. mi.- length X width)		approx 1,273
#2	Corridor Sharing Opportunities		State HWY 8 is located within the study area. County roads limited. An existing 69kV and 345kV ROW are located within the study area.

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Laona-Goodman-Plains 138 kV (continued)	22	
#3	Public Lands		The Chequamegon-Nicolet National Forest located within the study area. Several County Parks including Veteran Memorial Park, Goodman Co Park, McClintock Co Park, Twelve Falls Co Park, Long Slide Falls Co Park, and the Morgan Co Park. In addition the Goodman Park, Marion Park, American Legion Park, and the Menomonee Road are found within the study area. The Camp One Springs Fishery area is also located within the study zone.
#4	Sensitive Resources		Numerous lakes and streams, forested land, and much wetland found within the study zone. Of note is the Spread Eagle Barrens located near Spread Eagle WI. Several Statewide Natural Areas located within the study zone.
#5	Cultural Resources		High potential for historic and cultural resources within the study zone.
	Miscellaneous		Study zone located within the Ceded Territory
	St. Germain - Boulder Junction 115 kV	23	
	General Description		New Line
	Length (miles)		approx 16
#1	Study Area (Sq. mi.- length X width)		approx 89
#2	Corridor Sharing Opportunities		Very limited. Vilas County Roads and State Highway 155 are located within the study area.
#3	Public Lands		St. Germain Substation located in or near Northern Highland American Legion State Forest. State Forest covers most of the study area.
#4	Sensitive Resources		Numerous lakes, streams, wetlands and forested lands found within the study zone. The Aurora Lake State Natural Area is located in or near the study area.
#5	Cultural Resources		No locations of cultural interest are identified on the Cultural Map of Wisconsin within the study area.
	Miscellaneous		Study area located within the Ceded Territory
	Rockdale - West Middleton 345 kV	24	
	General Description		345 kV System Tie
	Length (miles)		approx 28
#1	Study Area (Sq. mi.- length X width)		approx 690
#2	Corridor Sharing Opportunities		New tie from the 345 kV system to relieve system overloads in the Madison area. Additional r.o.w. will be required. State and County roads, and existing transmission lines located within the study area offer the best possibility of corridor sharing.
#3	Public Lands		Numerous city, county, and state parks including Indian Lake, LaFollette, and Festbe County Parks, Governor Nelson and Lake Kegonsa State Parks, portions of the Glacial Drumlin State Trail, and several state fishery and wildlife areas are located within the study area.
#4	Sensitive Resources		Bean Lake, Red Cedar Lake, and the Hook Lake/Grass Lake state natural areas, and much of the Yahara River drainage basin are found within the project area.
#5	Cultural Resources		The Koshkonong Norwegian Settlement, Bernard-Hoover Boar House, Robert M. LaFollyette House, Gilmore House, Olin House, the State Capital, several effigy mound sites, numerous museums, and the Langdon Street, Sherman Avenue, Third Lake Ridge, and University Heights Historic Districts are located within the project area.
	Miscellaneous		
	Spring Green - Prairie du Sac 69 kV	25	
	General Description		69 kV System support

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Spring Green - Prairie du Sac 69 kV (continued)	25	
	Length (miles)		approx 18
#1	Study Area (Sq. mi.- length X width)		approx 290
#2	Corridor Sharing Opportunities		New 69 kV feed from Spring Green to relieve system overloads and provide system support in the Prairie du Sac area. Additional r.o.w. will be required. State and County roads, and existing transmission lines located within the study area offer the best possibility of corridor sharing.
#3	Public Lands		Numerous city, county, and state parks including Summer Oaks and Fish Lake County Parks, Tower Hill State Park, and lands along the Lower Wisconsin State Riverway are located within the study area.
#4	Sensitive Resources		Spring Green Reserve, Ferry Bluff, Tower Hill Bottoms, and Mazomanie Bottoms state natural areas, and The Lower Wisconsin River state wildlife area are found within the project area.
#5	Cultural Resources		The Tower Hill Shot Tower, August Derleth HomWilliam Steuber Home, the Honey Creek Swiss Rural Historic District, and Taliesin are located within the project area.
	Miscellaneous		
	Libertyville - Pleasant Prairie 345 kV	26	
	General Description		New 345 kV Line
	Length (miles)		approx 17
#1	Study Area (Sq. mi.- length X width)		approx 260
#2	Corridor Sharing Opportunities		New 345 kV line to accommodate new generation. Additional r.o.w. will be required. State and County roads, railroad and existing transmission lines corridors located within the study area offer the best possibility of corridor sharing.
#3	Public Lands		Numerous city, county, and state parks including Illinois Beach State Park, Chain O'Lakes State Park, Anderson Park, Red Arrow Park, Sunnyside Park, Beulah Park, Shiloh Park, and Prairie Springs Park are located within the study area.
#4	Sensitive Resources		The Chiwaukee Prairie, Carol Beach Low Prairie, and Tobin Road Prairie state natural areas are found within the Wisconsin portions of the project area. The Van Patten Woods Forest Preserve, Wadsworth Savanna Forest Preserve, Waukegan Savanna Forest Preserve, Lyons Woods Forest Preserve, and Wedgewood Creek Forest Preserve, 15 natural areas within the Illinois Beach and Illinois Dunes areas, and an additional 72 natural areas in the Chain O'Lakes-Fox River area in the portion of the project area in Illinois. The Des Plaines River watershed runs through much of the project area.
#5	Cultural Resources		The Third Avenue Historic District, Florence Parry Heide Home, Orson Welles Home, and the Library Park Historic District are among those cultural resources located in the Wisconsin portion of the project area.
	Miscellaneous		
	Big Bend - Paddock 345 kV	27	
	General Description		New 345 kV Line
	Length (miles)		approx 52
#1	Study Area (Sq. mi.- length X width)		approx 2,350
#2	Corridor Sharing Opportunities		New 345 kV line to accommodate new generation. Additional r.o.w. will be required. State and County roads, railroad and existing transmission lines corridors located within the study area offer the best possibility of corridor sharing.

Table VI-2 (continued)

Instruction Note	Line Name	Transmission Line Reference Num.	Screening Information
	Big Bend - Paddock 345 kV (continued)	27	
#3	Public Lands		Numerous city, county, and state parks including Kettle Moraine State Forest, Big Foot Beach State Park, Muskego and Mukwonago County Parks, Carver-Roehl Park, Starin Park, LaMar Park, Memorial Park, Springs Park, Bong Recreation area, Ela Park, Phantom Glen Park, Denoon Park, Heg Park, numerous state wildlife areas and trails are located within the study area.
#4	Sensitive Resources		The Kettle Moraine State Forest, numerous state wildlife areas, and state natural areas including Beulah Bog, Lulu Lake, Bluff Creek Springs, Eagle Oak Openings, C.F. Messinger Dry Prairie, Avon Bottoms, Scuppernong Prairie, Kettle Moraine Fens and Low Prairie, Muskego Park Hardwoods, Cherry Lake Sedge Meadow, and Karcher Springs among others are found within the project area.
#5	Cultural Resources		The Frances Wiggins Ford Farm, Old World Wisconsin, the General Atkinson Mound Group, Statesan Historic District, Governor Harvey Home, Clinton Village Hall, the Jefferson Prairie Norwegian Settlement, East Milwaukee Street Historic District, Prospect Hill Historic District, Conrad Cottages Historic District, the Grace and Pearl Historic District and many others as well as numerous museums are located within the project area.
	Miscellaneous		
	Oak Creek - Racine 345 kV	28	
	General Description		New 345 kV Line
	Length (miles)		approx 12
#1	Study Area (Sq. mi.- length X width)		approx 190
#2	Corridor Sharing Opportunities		New 345 kV line to accommodate new generation. Additional r.o.w. will be required. State and County roads, railroad and existing transmission lines corridors located within the study area offer the best possibility of corridor sharing.
#3	Public Lands		Numerous city and county parks including Bender Park, Cliffside Park, Johnson Park, the Root River Parkway, Quarry Lake and Shoop Park are located within the study area.
#4	Sensitive Resources		Renak-Polak Maple Beech Woods and Sander Park Hardwoods state natural areas, Hunts woods, Cliffside Park woods, Tabor woods, Caledonia low woods, Oak Creek low woods, and Root River riverine forest are found within the project area
#5	Cultural Resources		The Wind Point Lighthouse and Herbert F. Johnson House are located within the project area.
	Miscellaneous		

NOTES:

Transmission Line Reference number refers to the entry number made on the New Transmission Construction template

#1	Study Area Width:	For lines 0-5 miles long, study area width equals length of segment: for lines 5-15 miles long, study area width equals 5 miles; for lines > 15 miles long, study area width equals 30% of line length.
#2	Corridor Sharing Opportunities:	Identify dominant corridor types.
#3	Public Lands:	Identify properties by name.
#4	Sensitive Resources:	List major stream crossings, significant topographic features, designated natural areas, etc.
#5	Cultural Resources:	List resources shown on the statewide cultural resources map.

Exhibit VI-1

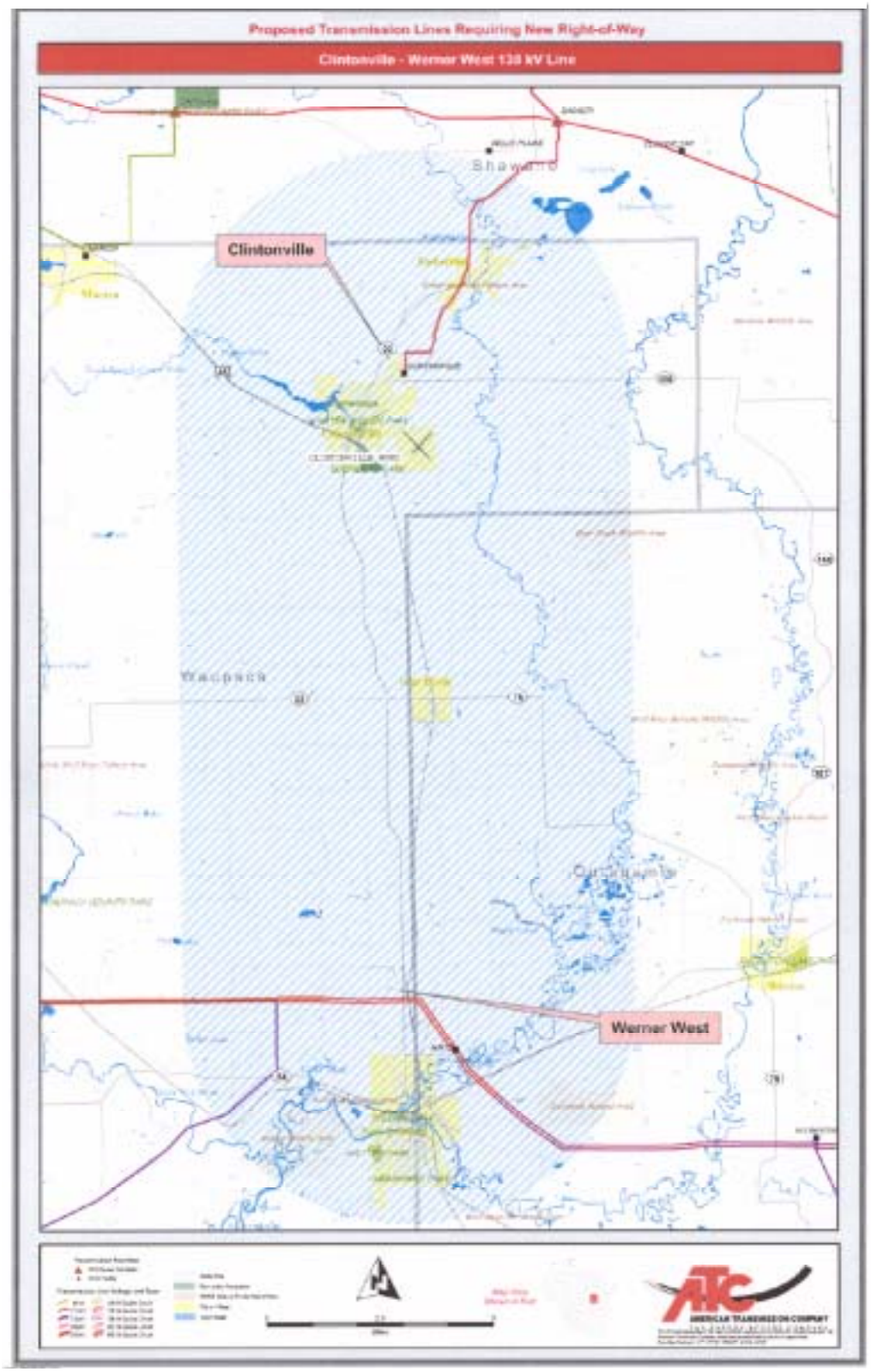

Proposed Transmission Lines Requiring New Right-of-Way
Clintonville - Werner West 138 kV Line
Clintonville
Werner West
AMERICAN TRANSMISSION COMPANY

Exhibit VI-2

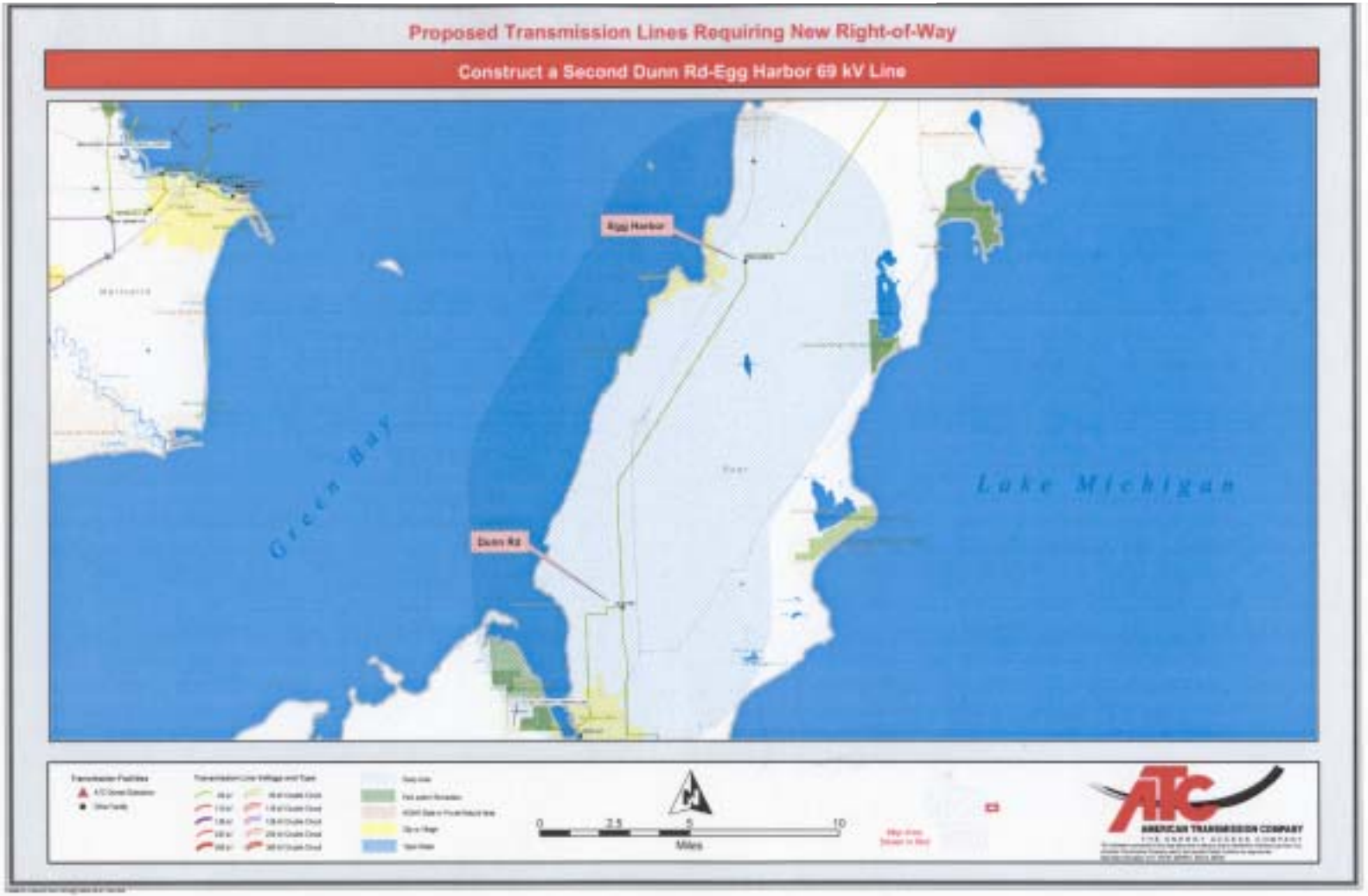

Proposed Transmission Lines Requiring New Right-of-Way
Construct a Second Dunn Rd-Egg Harbor 69 kV Line
Egg Harbor
Dunn Rd
Green Bay
Lake Michigan
0
2.5
5
10
Miles
ATC
AMERICAN TRANSMISSION COMPANY

Exhibit VI-3

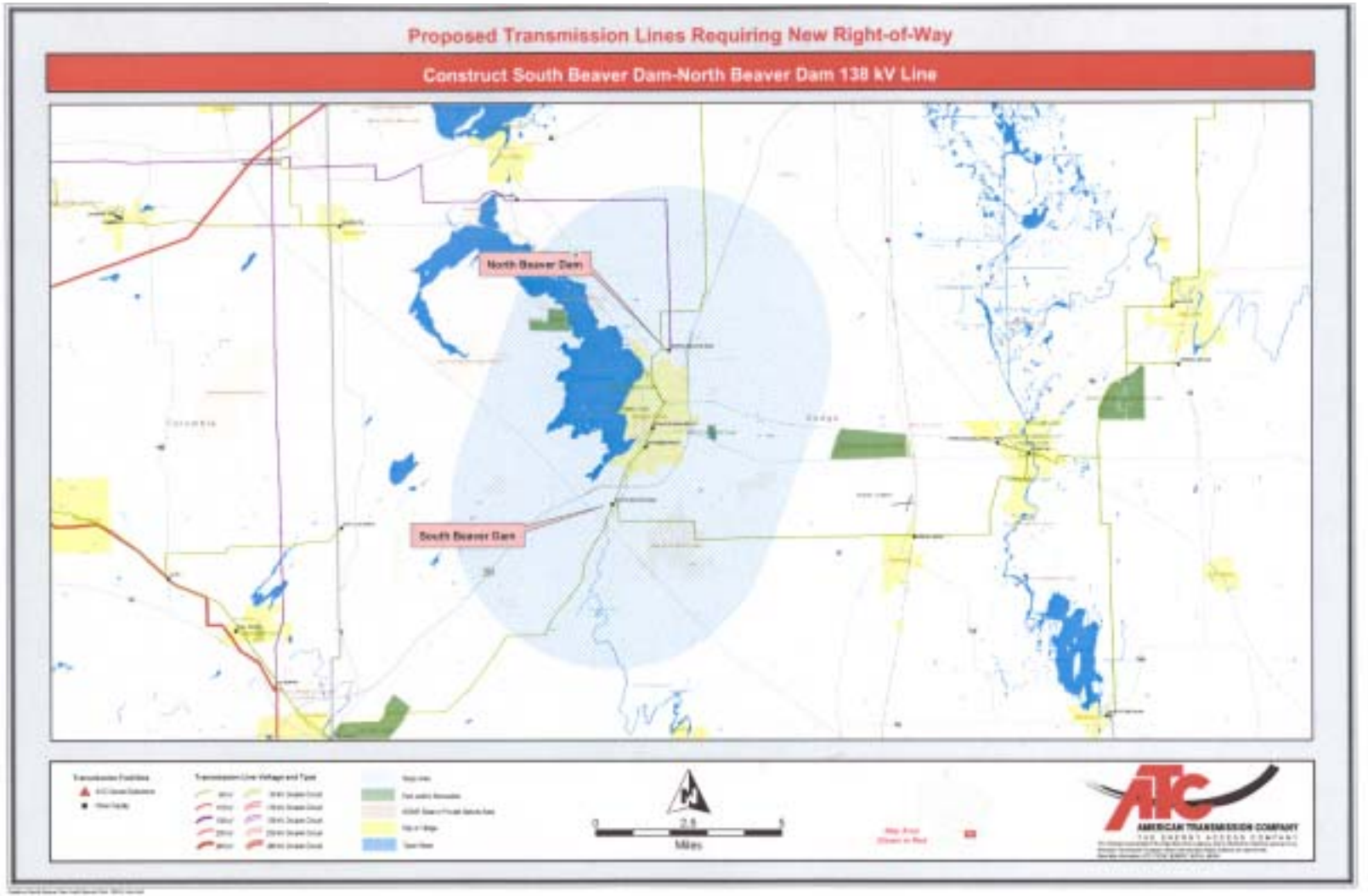

Proposed Transmission Lines Requiring New Right-of-Way
Construct South Beaver Dam-North Beaver Dam 138 kV Line
North Beaver Dam
South Beaver Dam
Miles
AMERICAN TRANSMISSION COMPANY

Exhibit VI-4

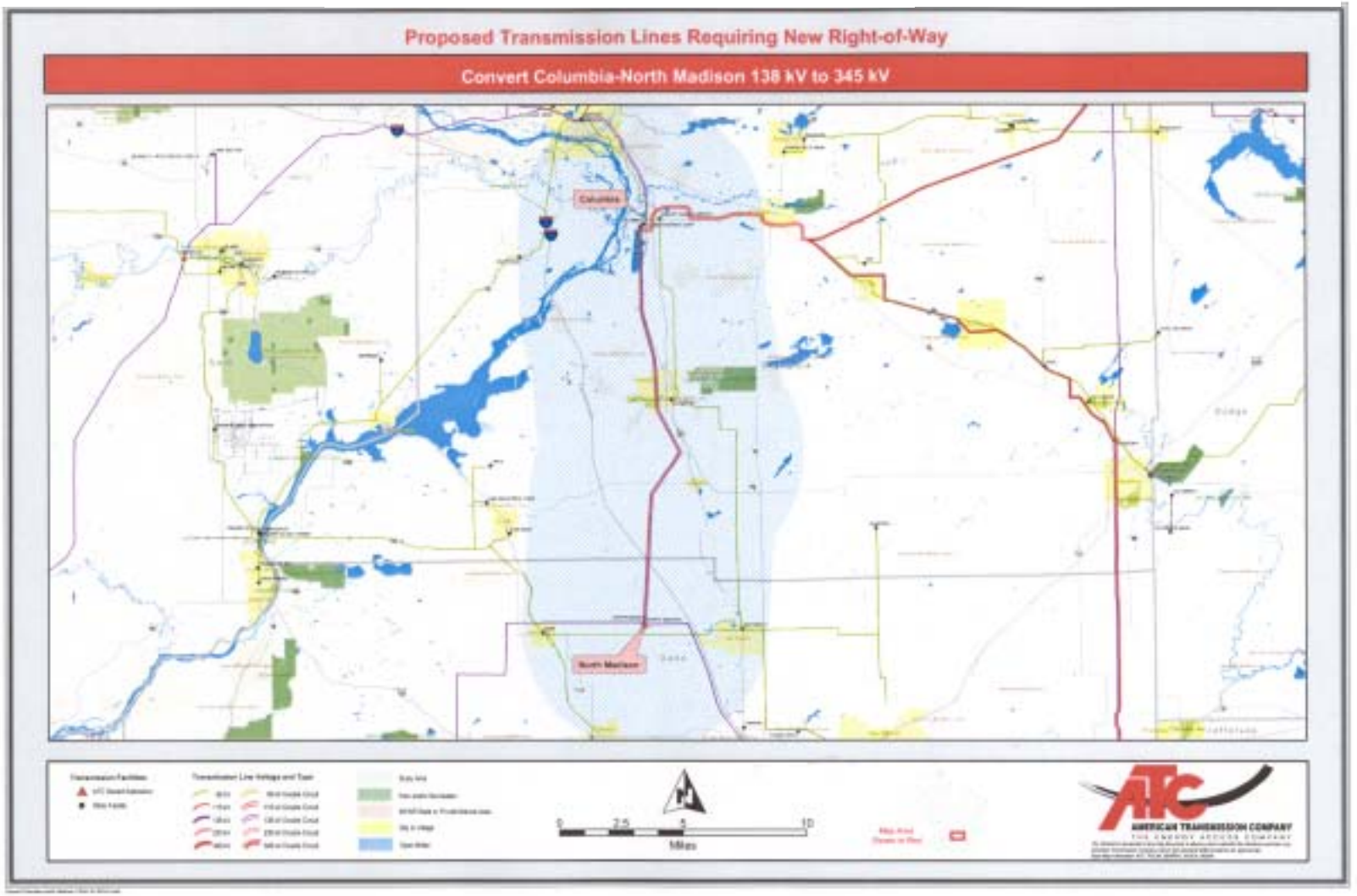

Proposed Transmission Lines Requiring New Right-of-Way
Convert Columbia-North Madison 138 kV to 345 kV
Columbia
North Madison
0
2.5
5
10
Miles
ATC
AMERICAN TRANSMISSION COMPANY

Exhibit VI-5

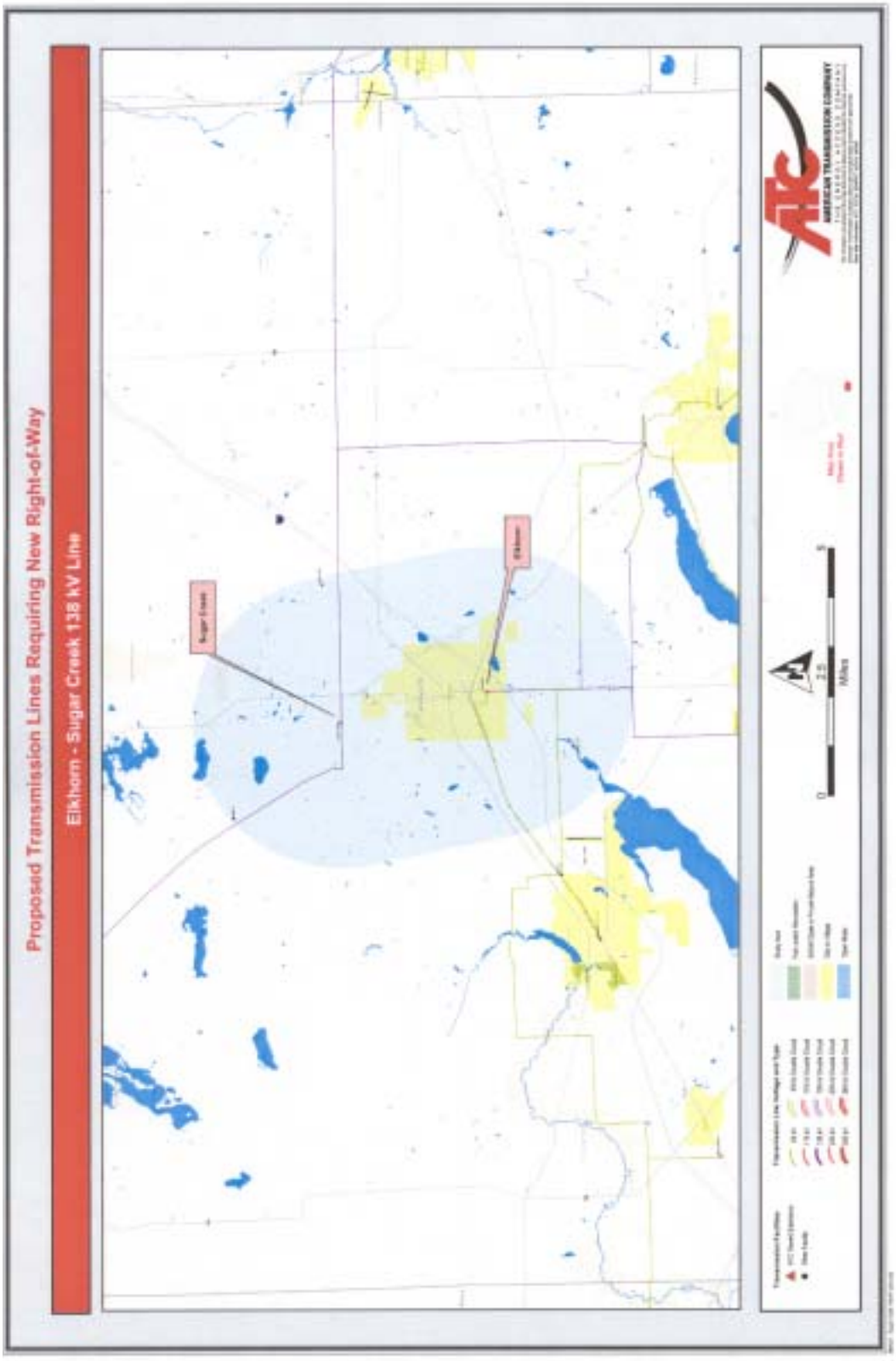

Proposed Transmission Lines Requiring New Right-of-Way
Elkhorn - Sugar Creek 138 kV Line
Sugar Creek
Elkhorn
Miles

Exhibit VI-6

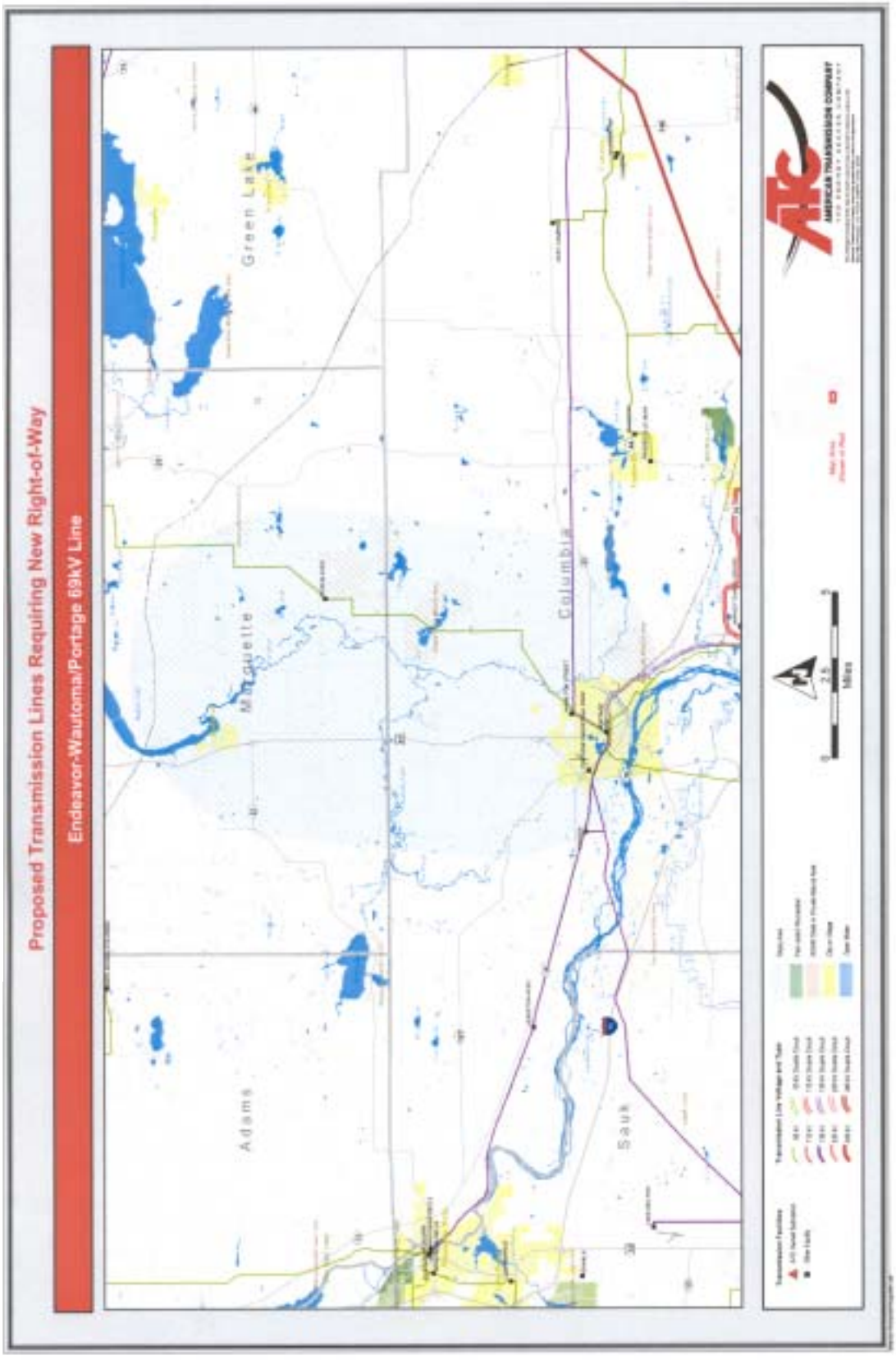

Proposed Transmission Lines Requiring New Right-of-Way
Endeavor-Wautoma/Portage 69kV Line
Green Lake
Marquette
Columbia
Adams
Sauk
AMERICAN TRANSMISSION COMPANY
Miles

Exhibit VI-7

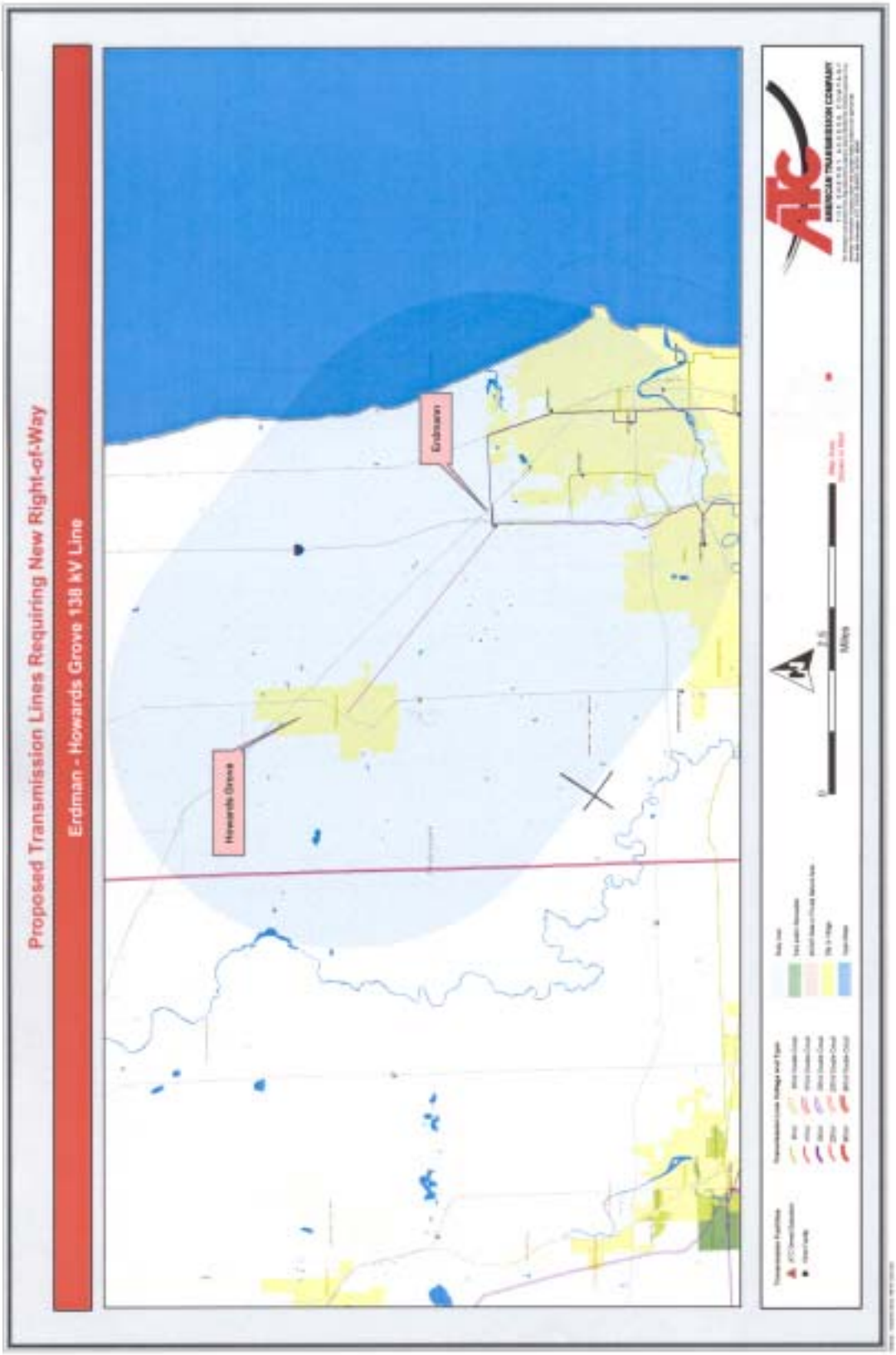

Proposed Transmission Lines Requiring New Right-of-Way
Erdman - Howards Grove 138 kV Line
Howards Grove
Erdmann
Miles

Exhibit VI-8

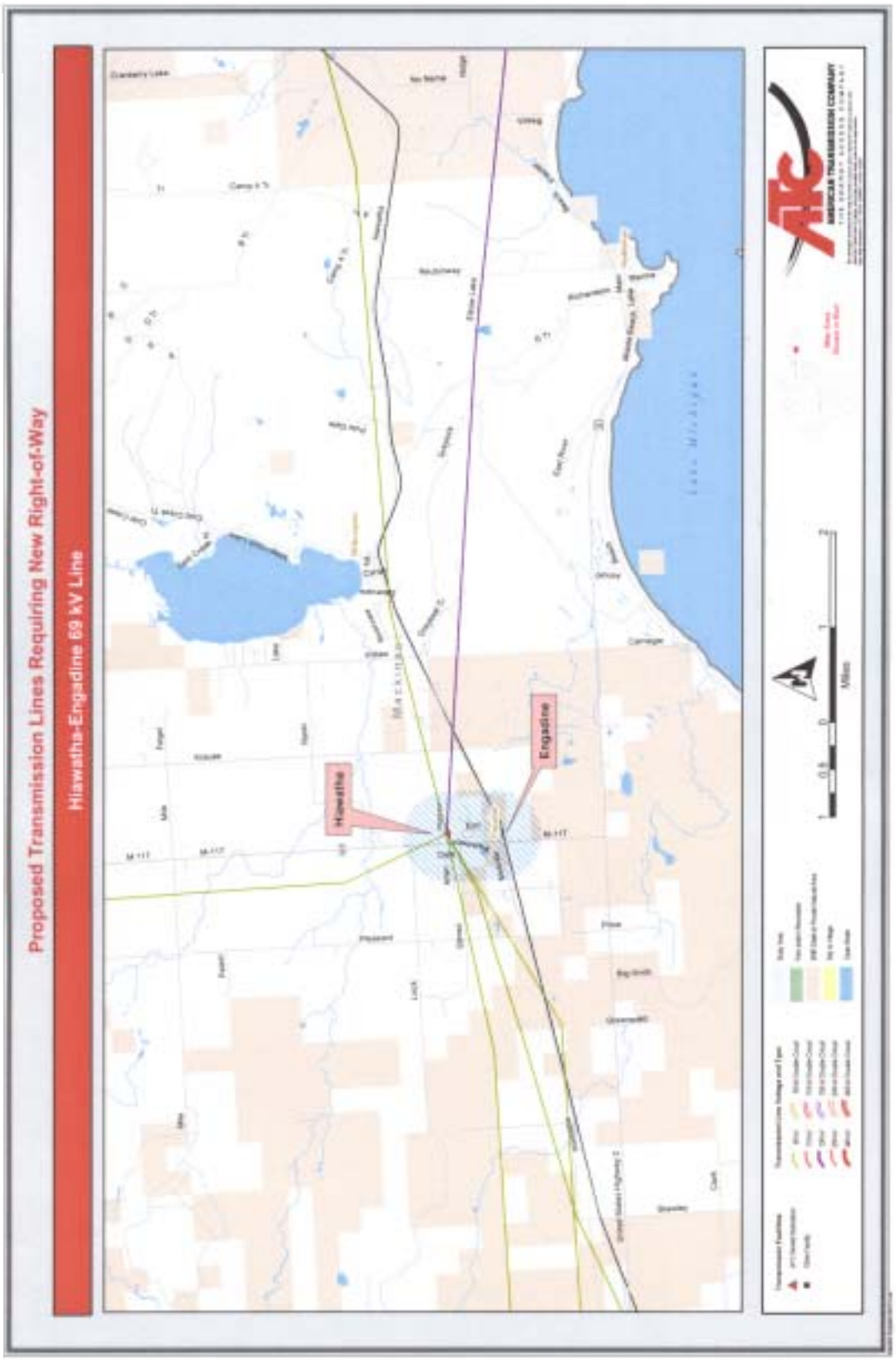

Proposed Transmission Lines Requiring New Right-of-Way
Hiawatha-Engadine 69 kV Line
Hiawatha
Engadine
Lake Michigan
Miles

Exhibit VI-9

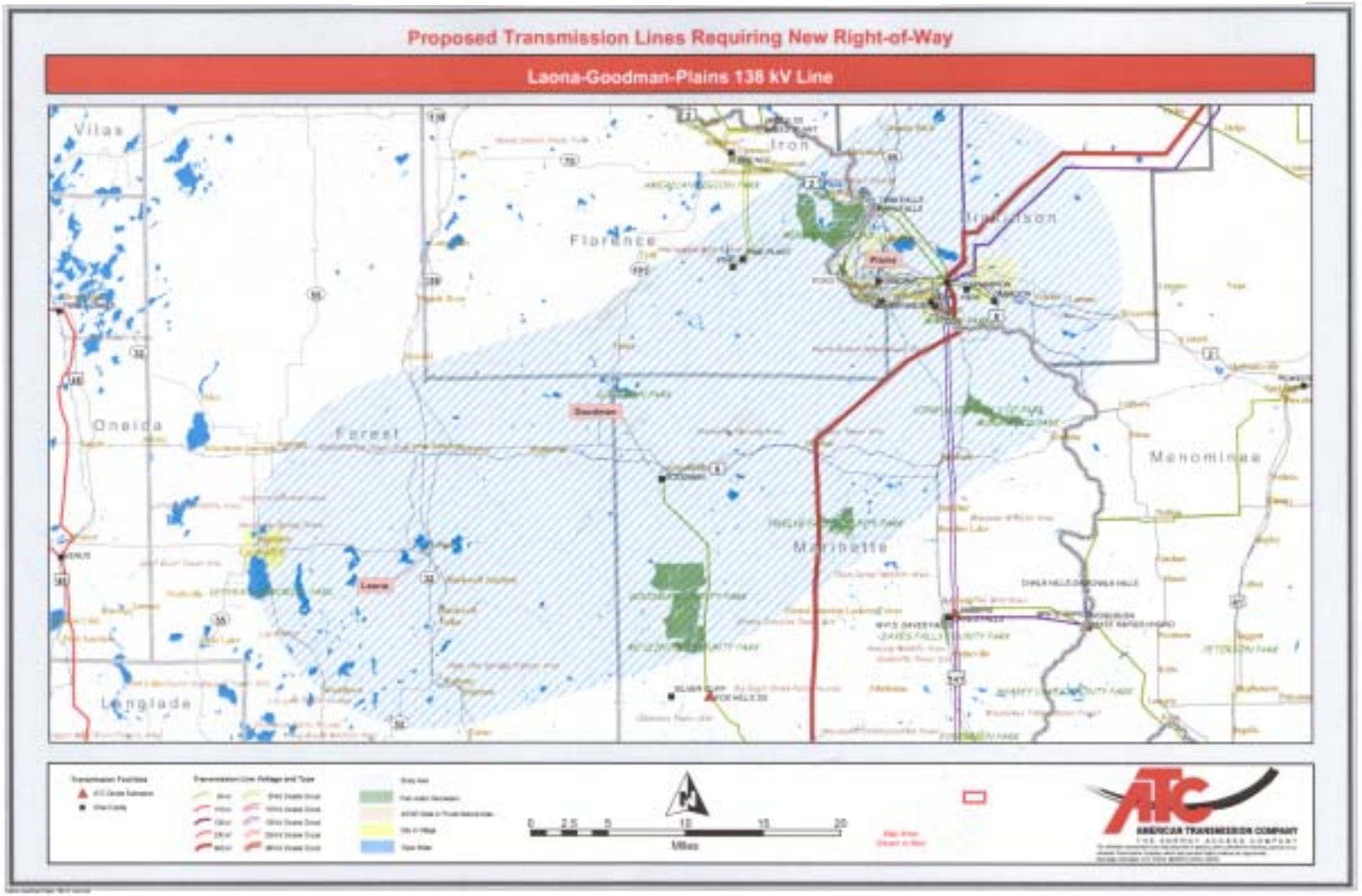
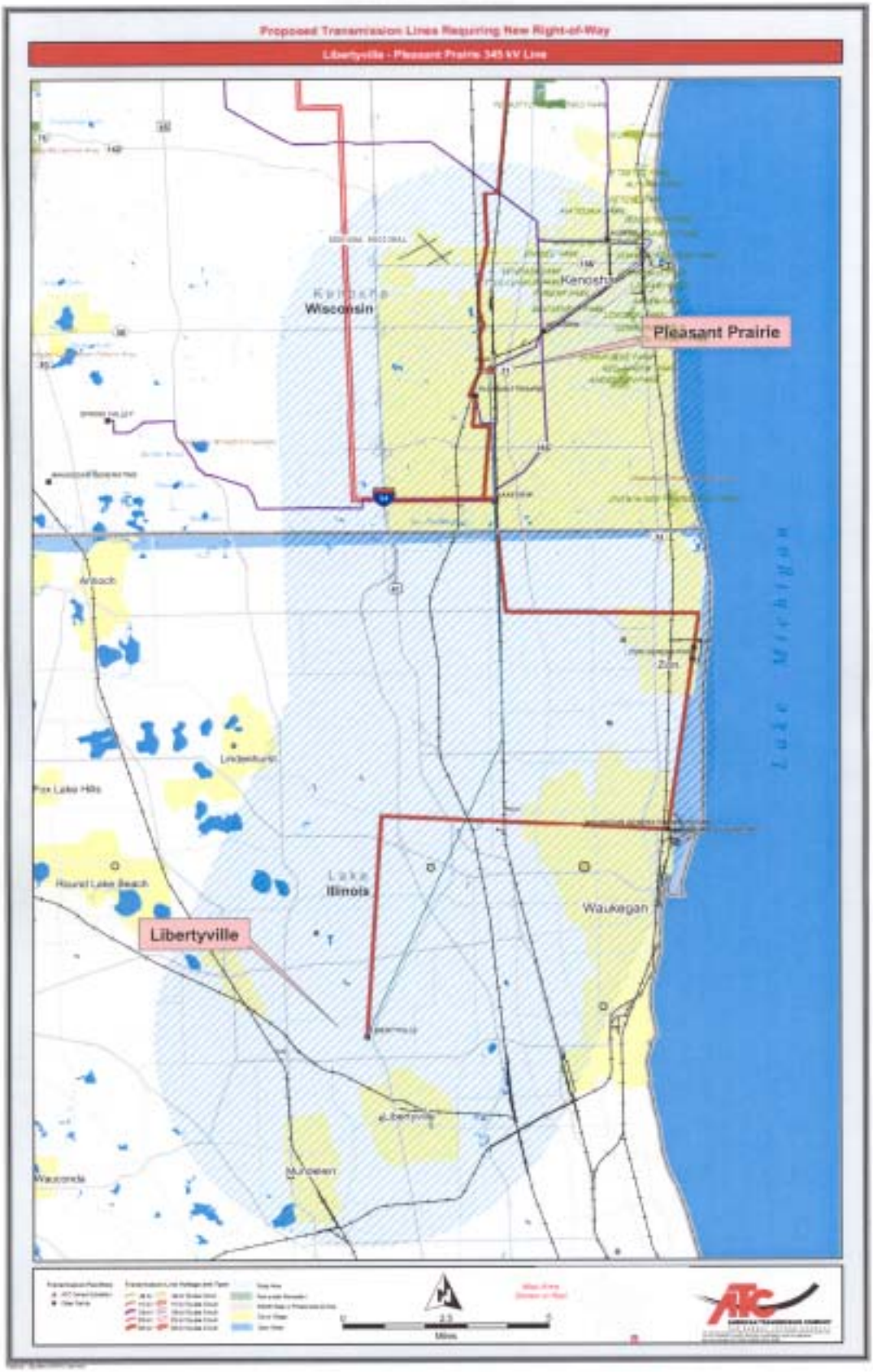

Proposed Transmission Lines Requiring New Right-of-Way
Laona-Goodman-Plains 138 kV Line
Vilas
Iron
Florence
Oneida
Forest
Menominee
Marinette
Langlade
Miles
AMERICAN TRANSMISSION COMPANY

Exhibit VI-10



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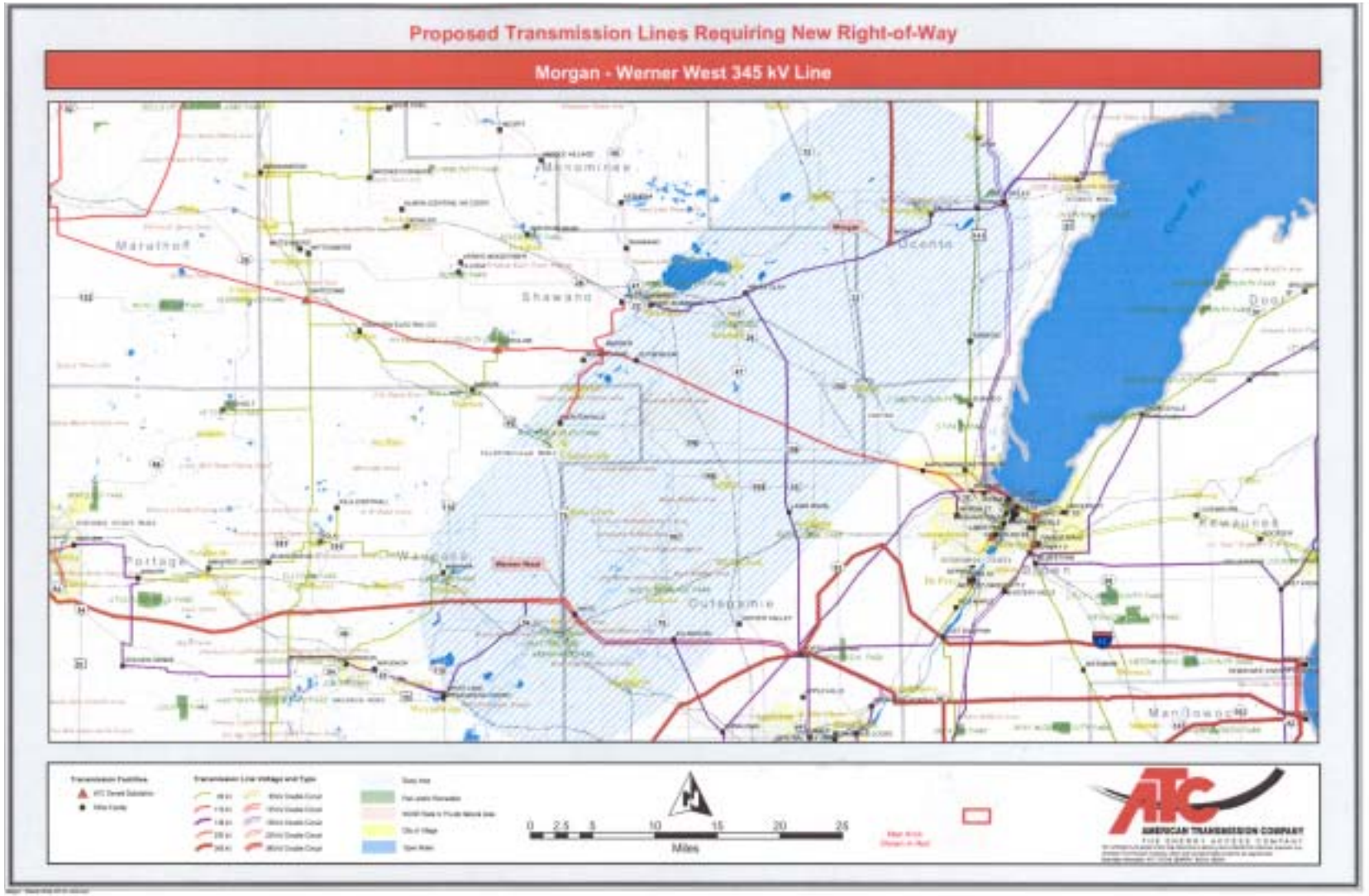

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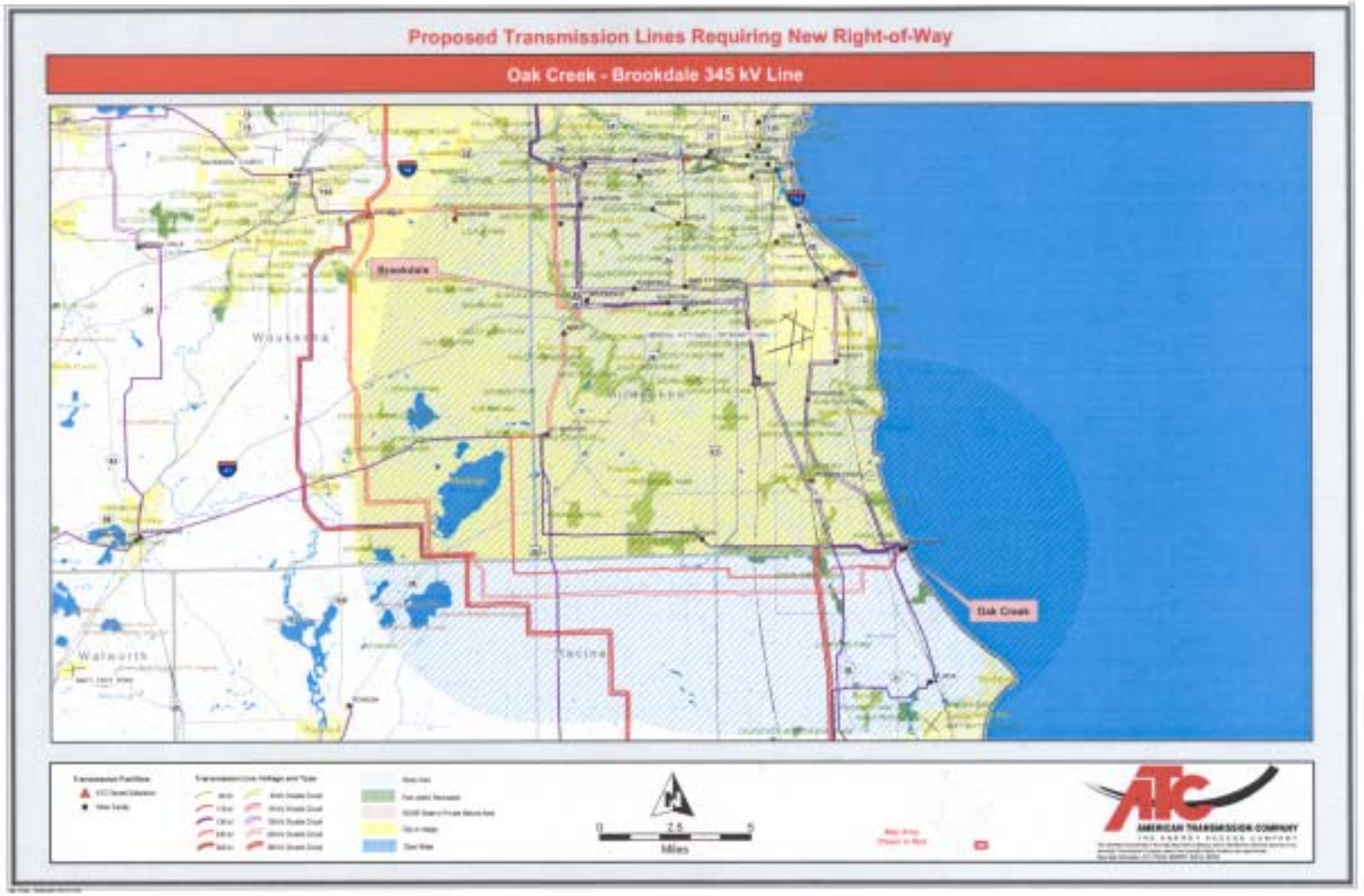

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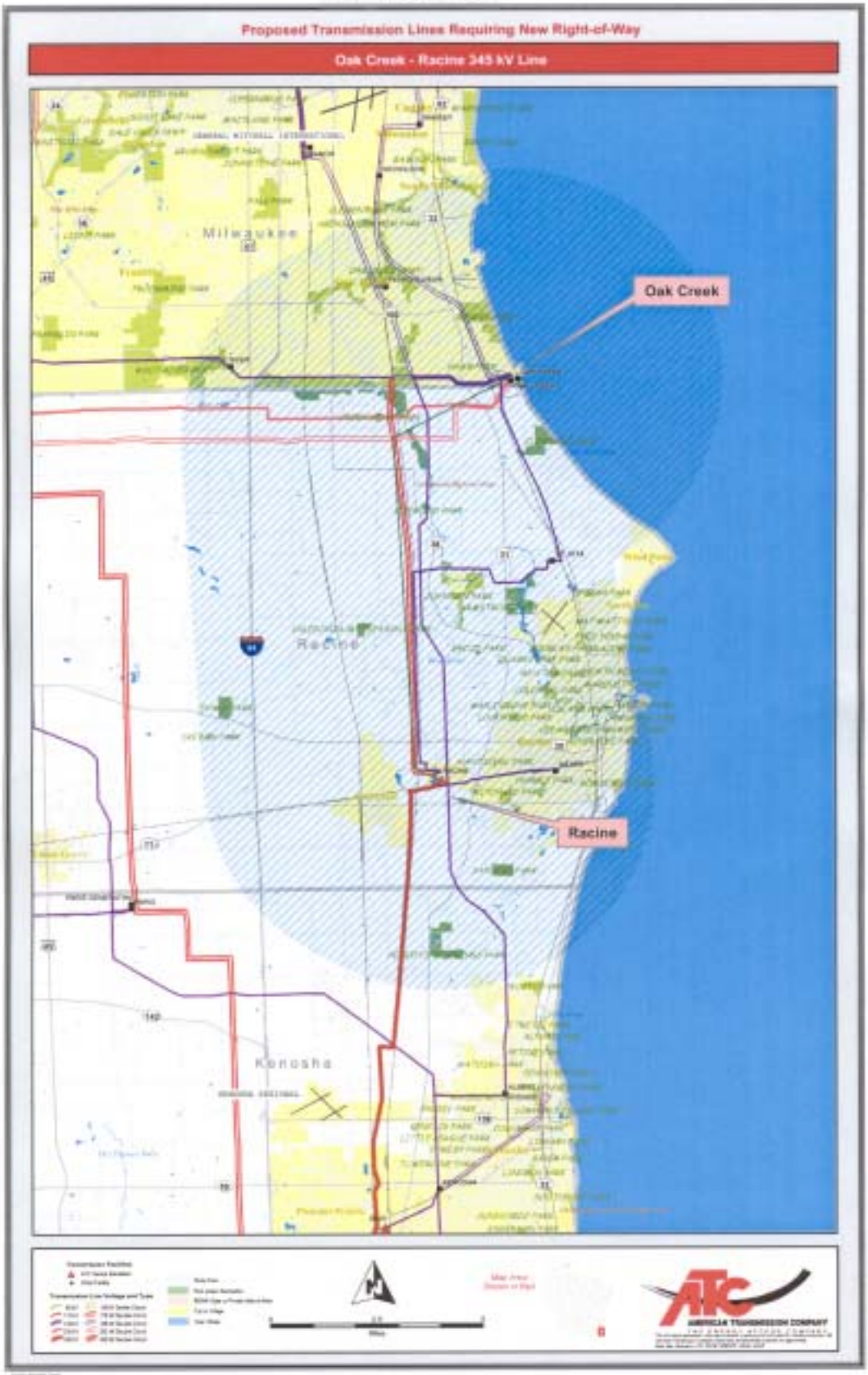

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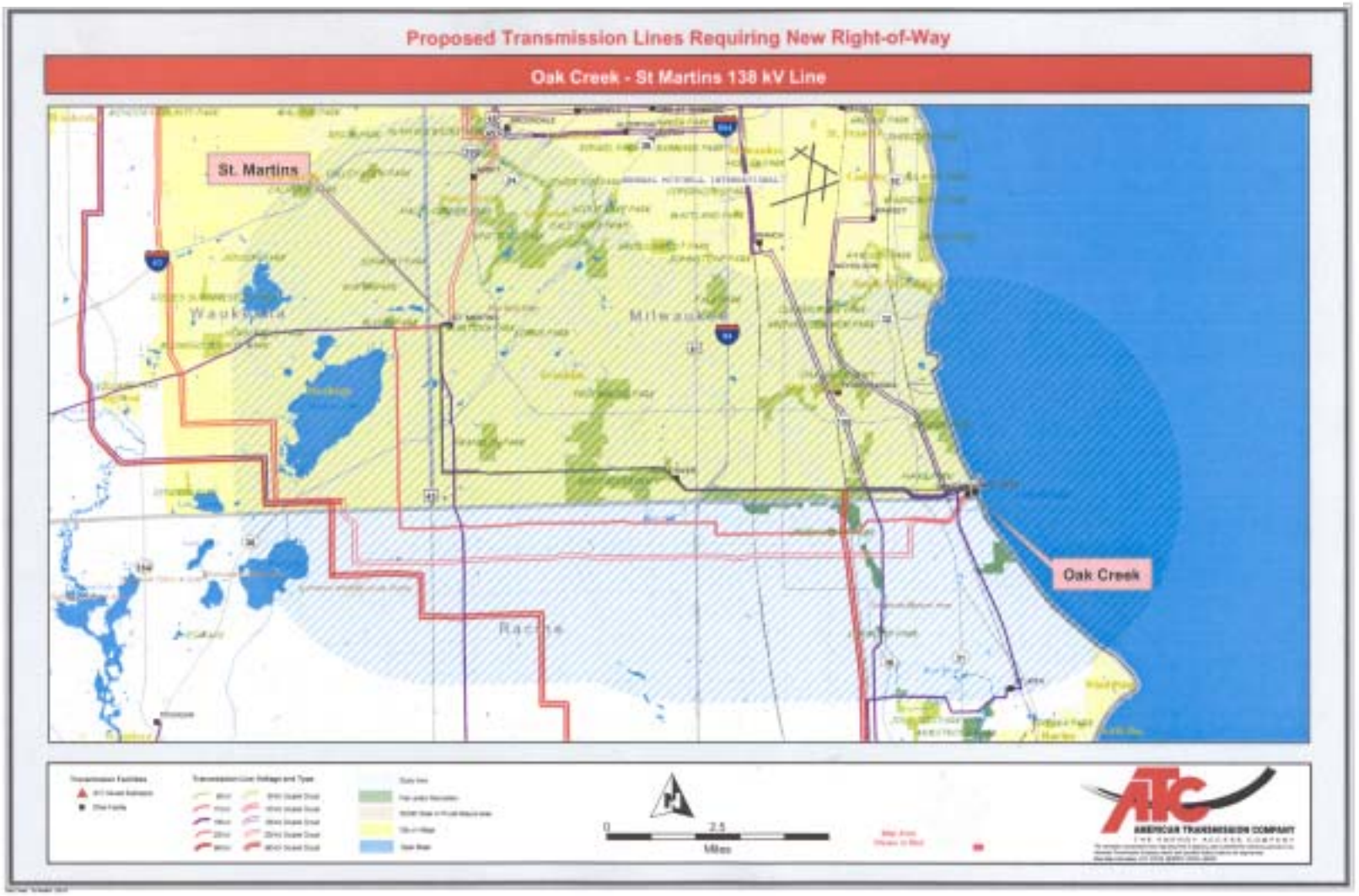

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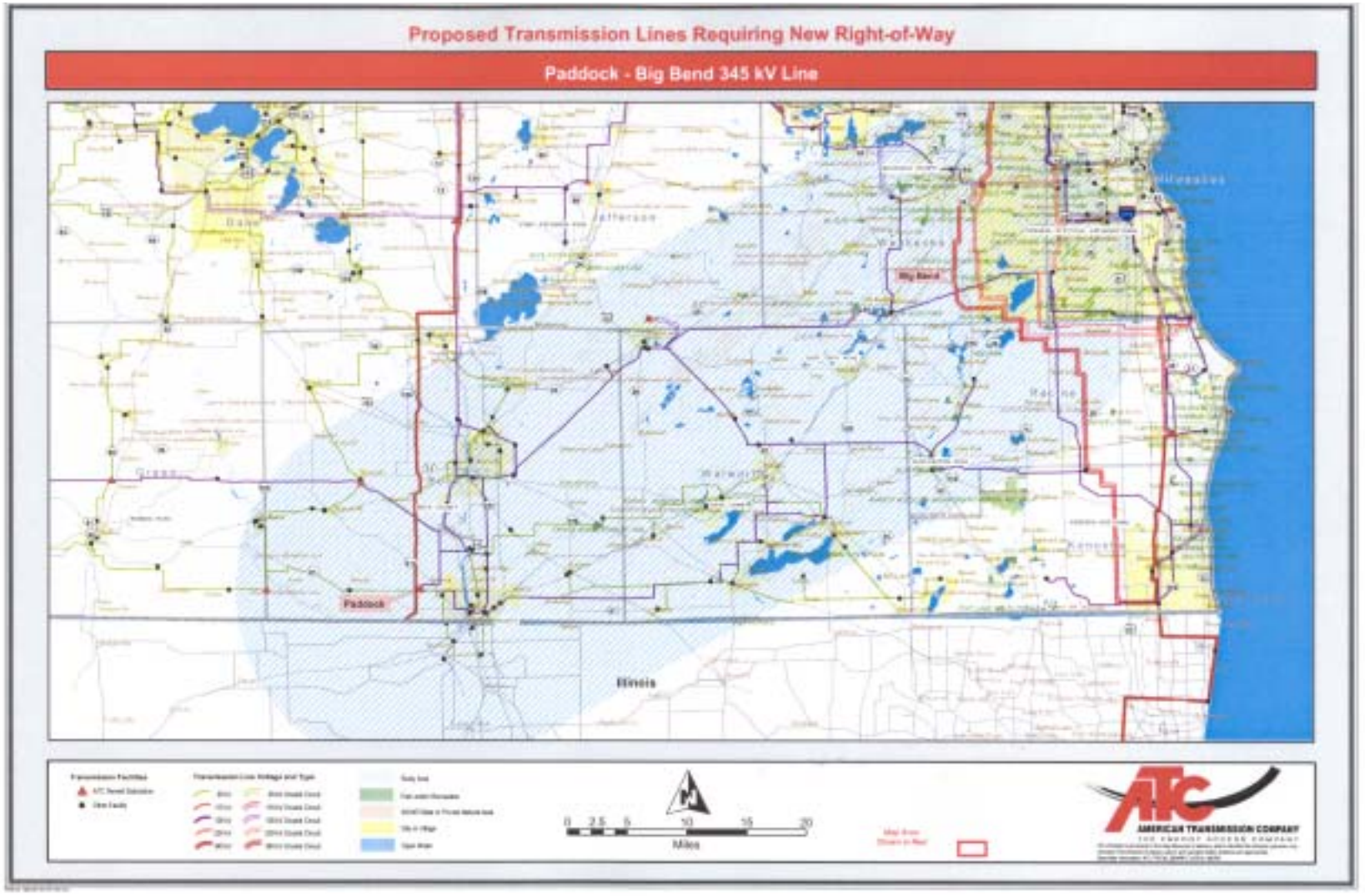

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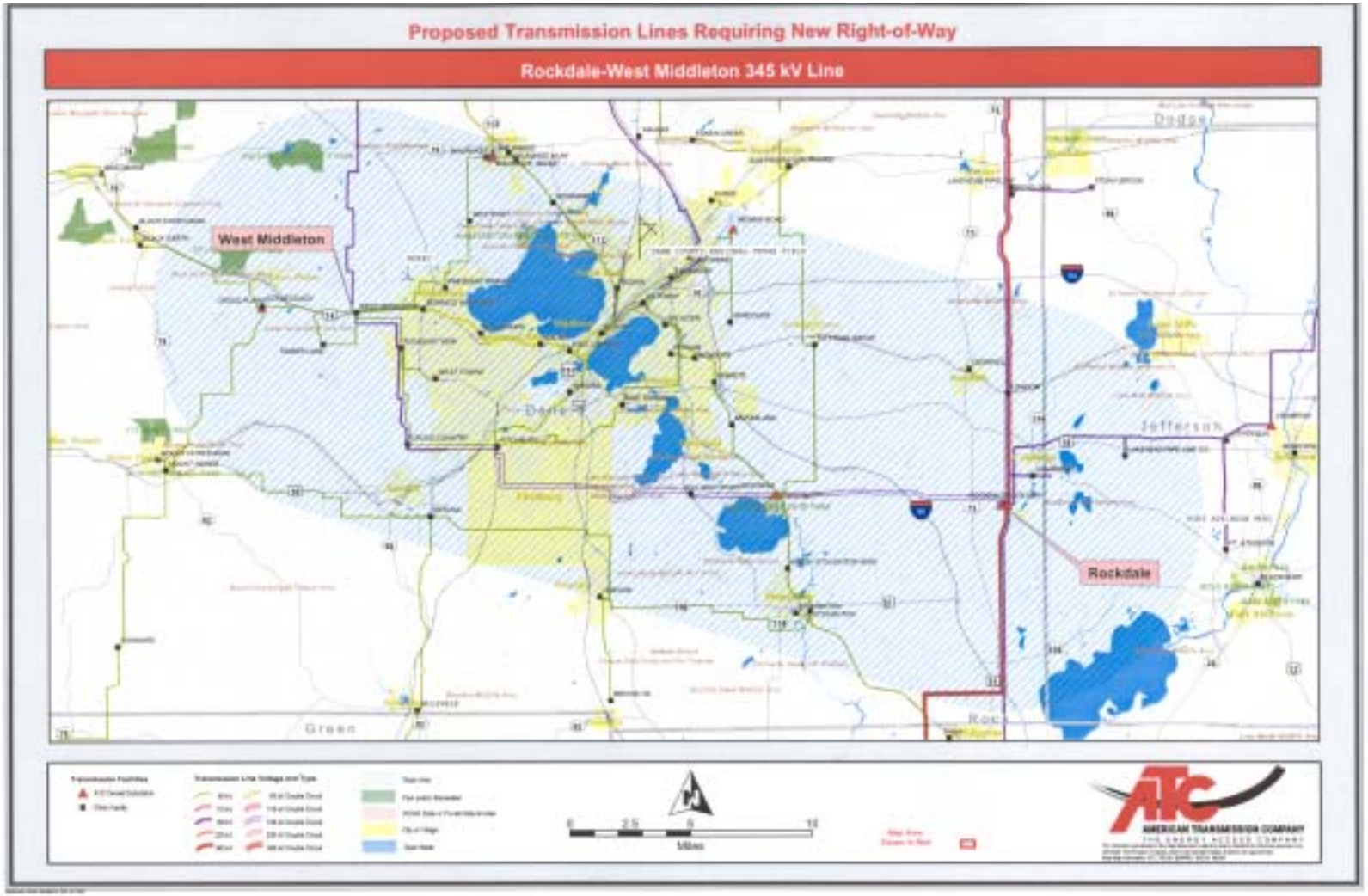


Exhibit VI-17

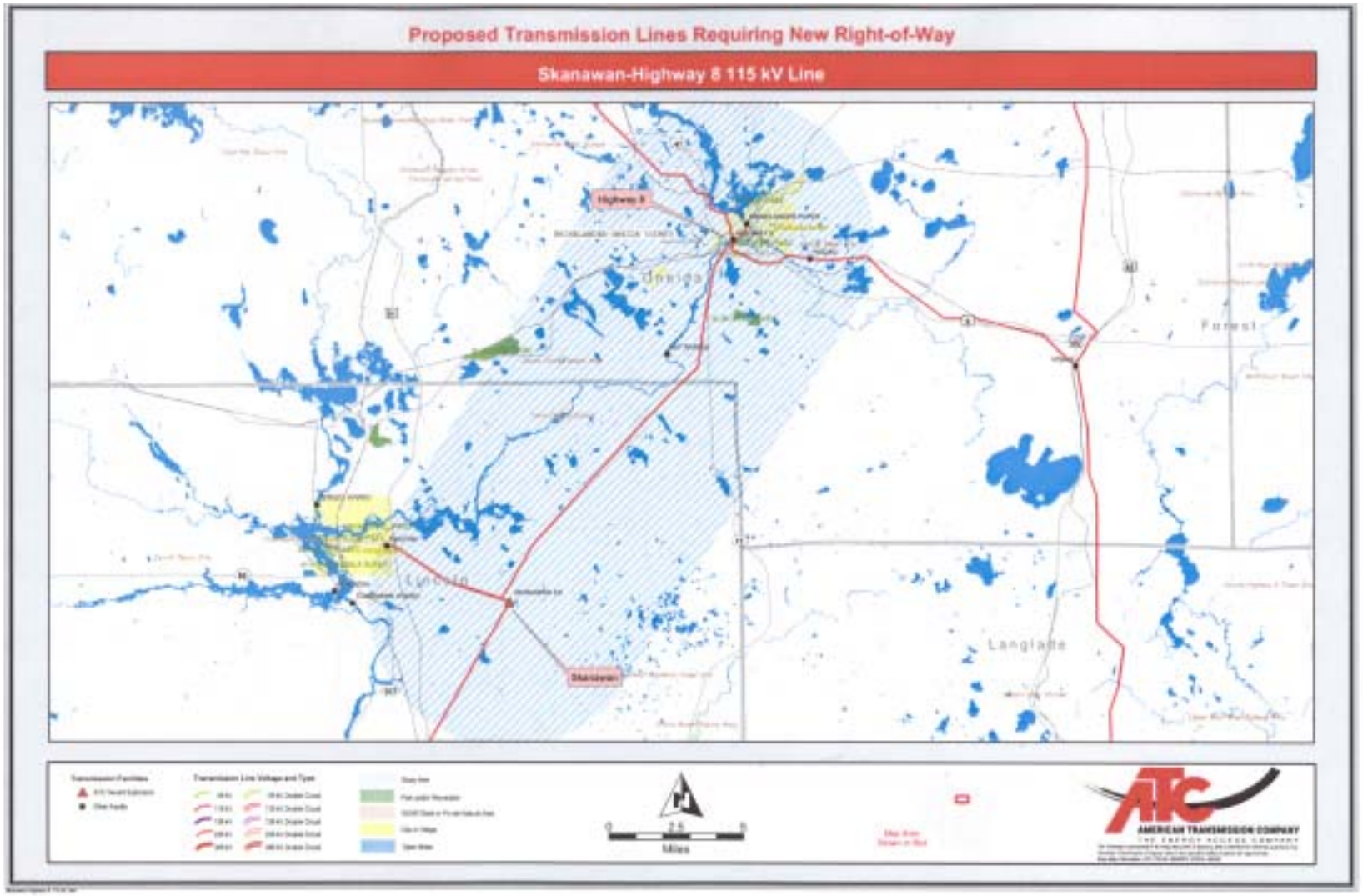
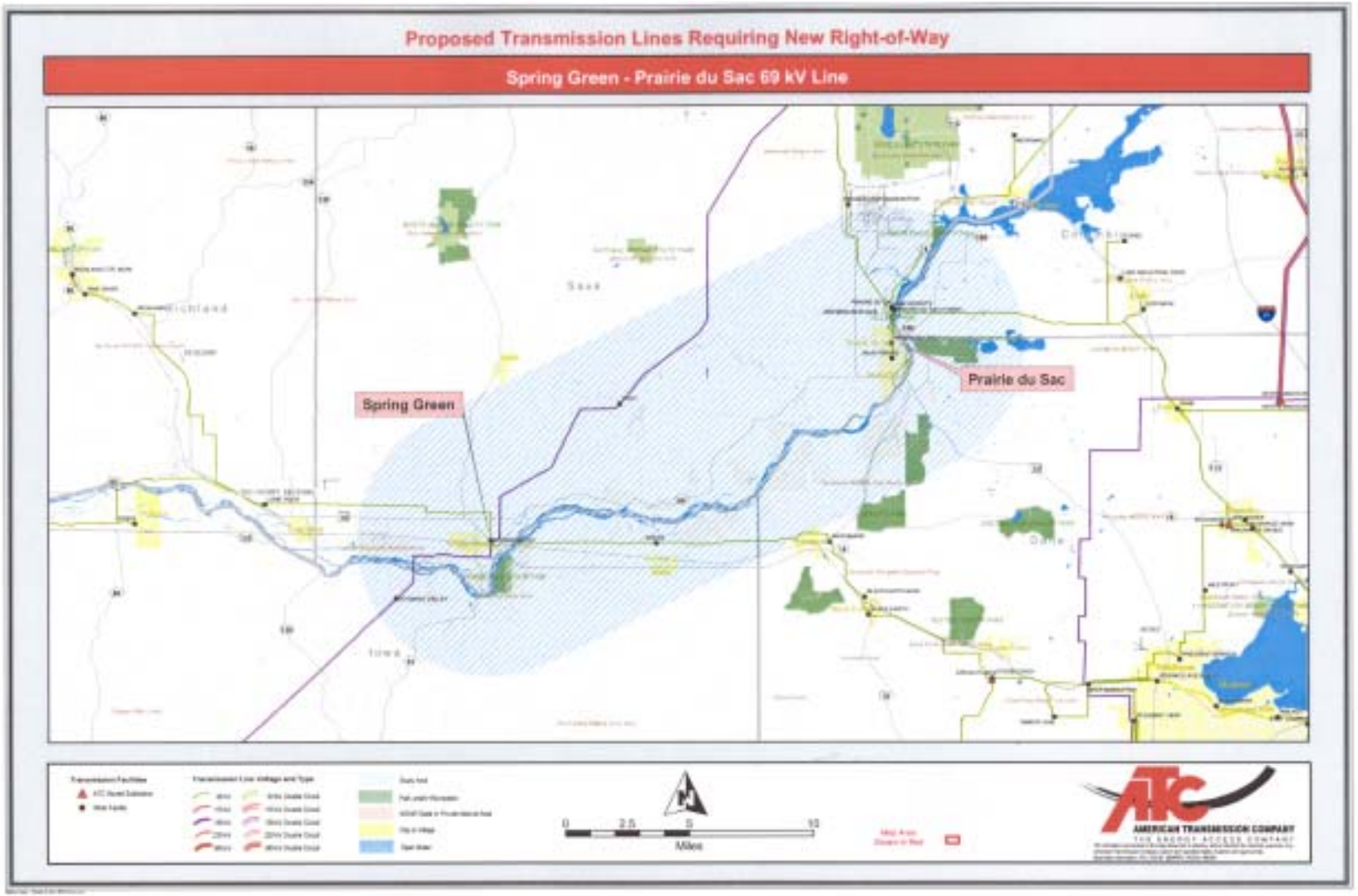


Exhibit VI-18



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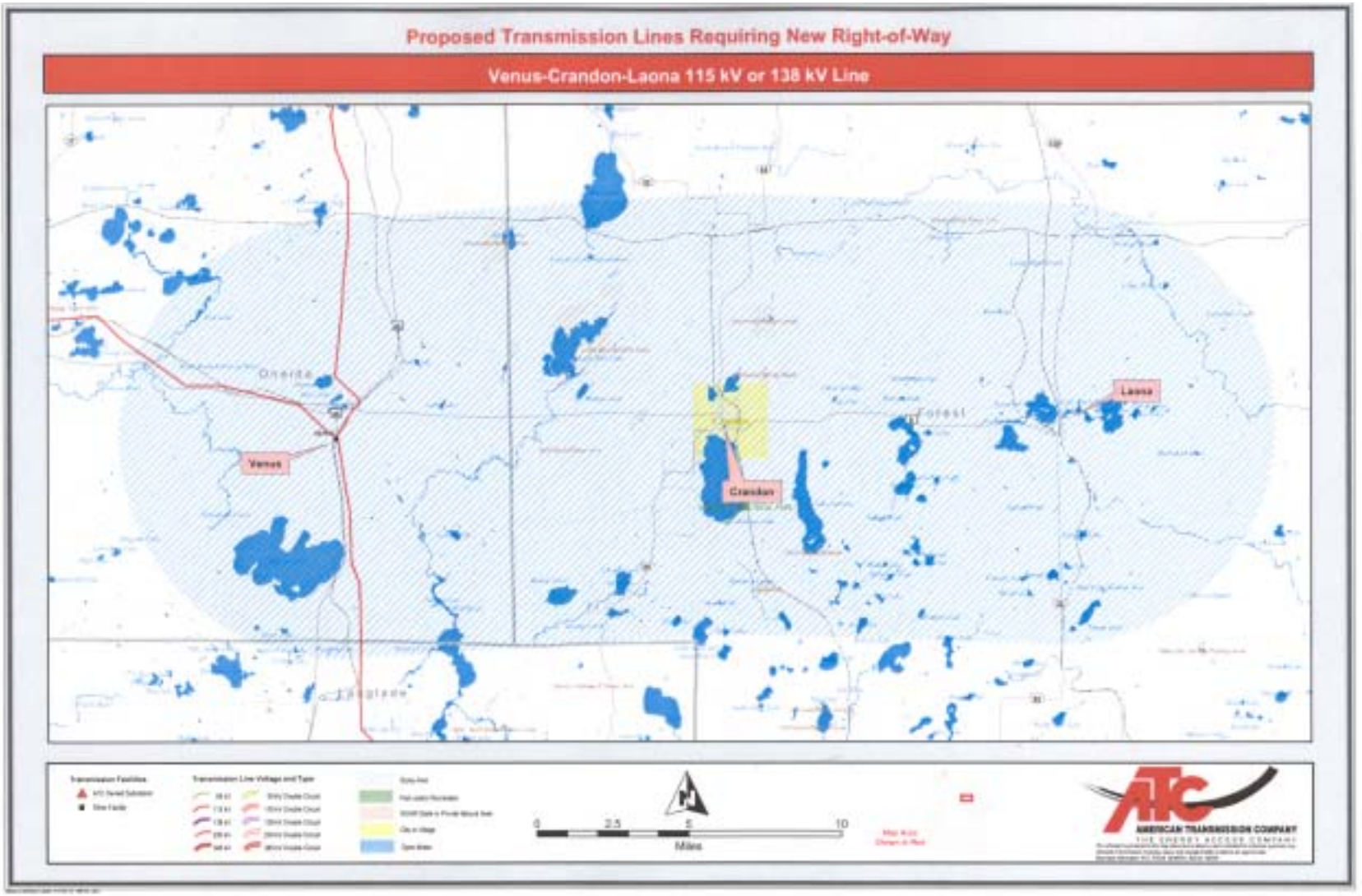

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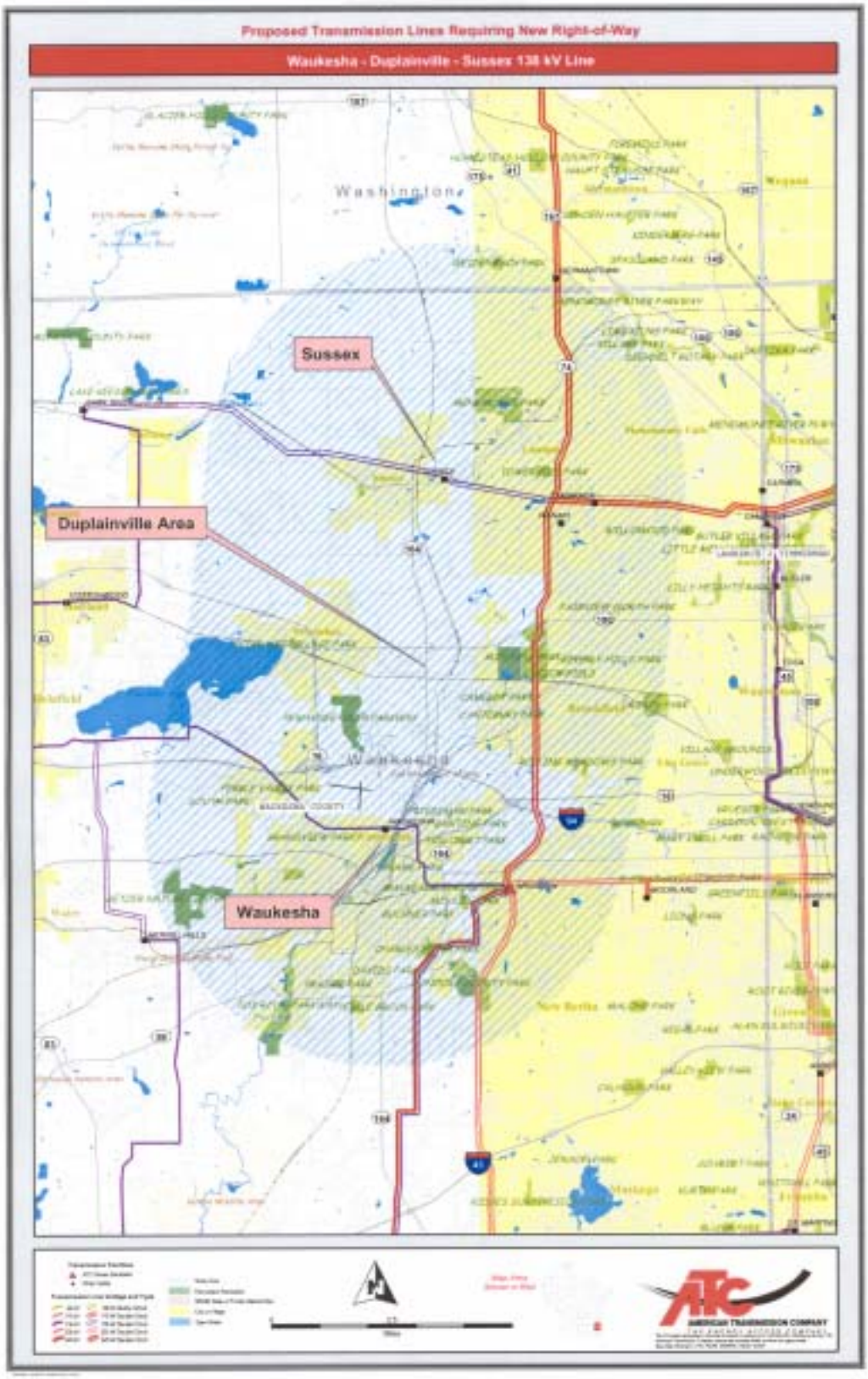


Appendix A

Transmission-Distribution Interconnections

ATC has received numerous requests from distribution companies for new T-D interconnections. These interconnections generally take on three different types of projects:

1. Constructing new T-D substations. Typically, these new interconnections involve constructing a new T-D substations adjacent to an existing transmission line and looping the transmission line into the new substation. In some instances, the new substation may not be able to be sited adjacent to the transmission line and requires that ATC construct a transmission line to the new substation site. Since this type of interconnection is a way for a distribution company to redistribute load between the two existing substations, it typically does not materially affect transmission system performance. In some instances, however, the optimum site for the new substation, from a distribution planning perspective, is such that a new transmission line from two substations that were not previously interconnected is warranted, forming a new network line, which can materially affect transmission system performance.

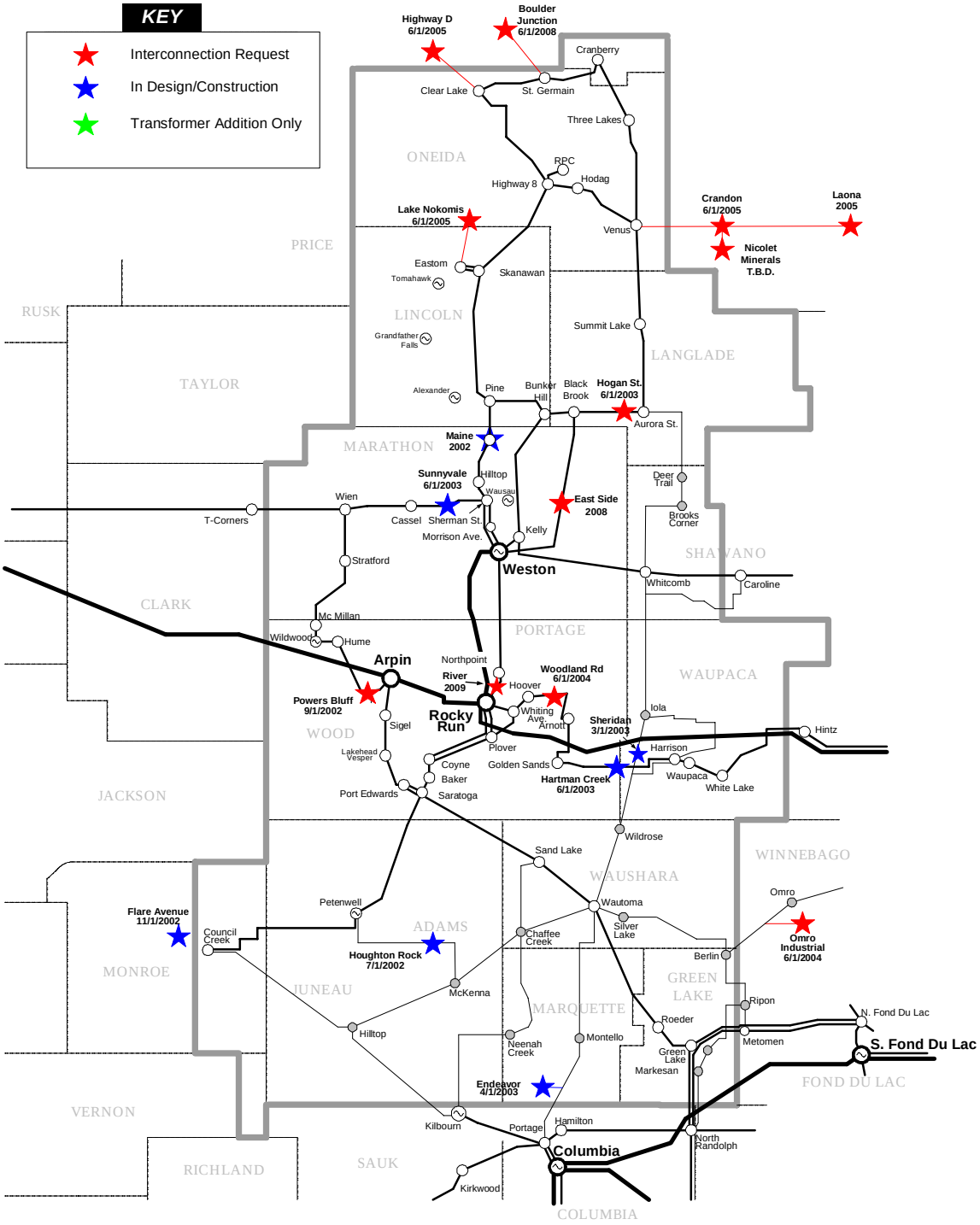
2. Adding T-D transformers at existing substations. These new interconnections involve expanding an existing T-D substation to accommodate a new T-D transformer. Typically, this type of interconnection is a way for a distribution company to improve reliability by providing redundancy, lower the loading on existing T-D transformers and meet increasing customer demand.

3. Replacing existing T-D transformers at existing substations. These are not technically new interconnections since no expansion is required at the existing T-D substation – it's merely a means of increasing transformer capacity. This type of project is a way to reliably serve increasing customer demand.

In some instances, the reason for a new T-D interconnection request is driven by a large new customer load, such as a new industry with a large demand for electricity. In these instances, there may be a need for other transmission system reinforcements to reliably serve the new load.

All of the T-D interconnection requests that are being implemented, designed or evaluated by ATC are shown in Figures A-1 through A-5 for Zones 1-5, respectively. A corresponding list of these interconnection requests is available on ATC's web site.

Figure A-1
Transmission-Distribution Interconnection Requests - Zone 1



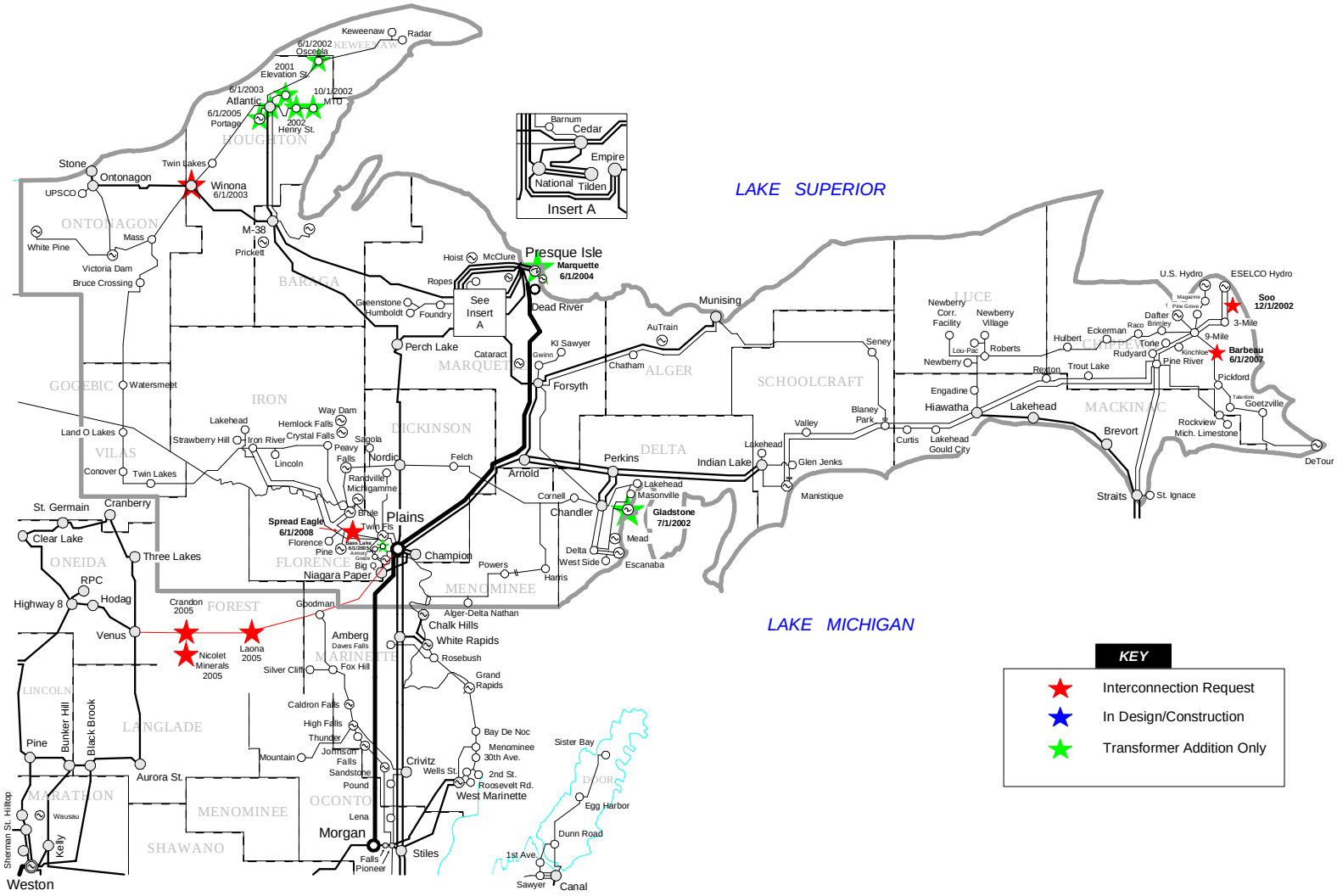


Figure A-2
Transmission-Distribution Interconnection Requests - Zone 2

Figure A-3
Transmission-Distribution Interconnection Requests - Zone 3

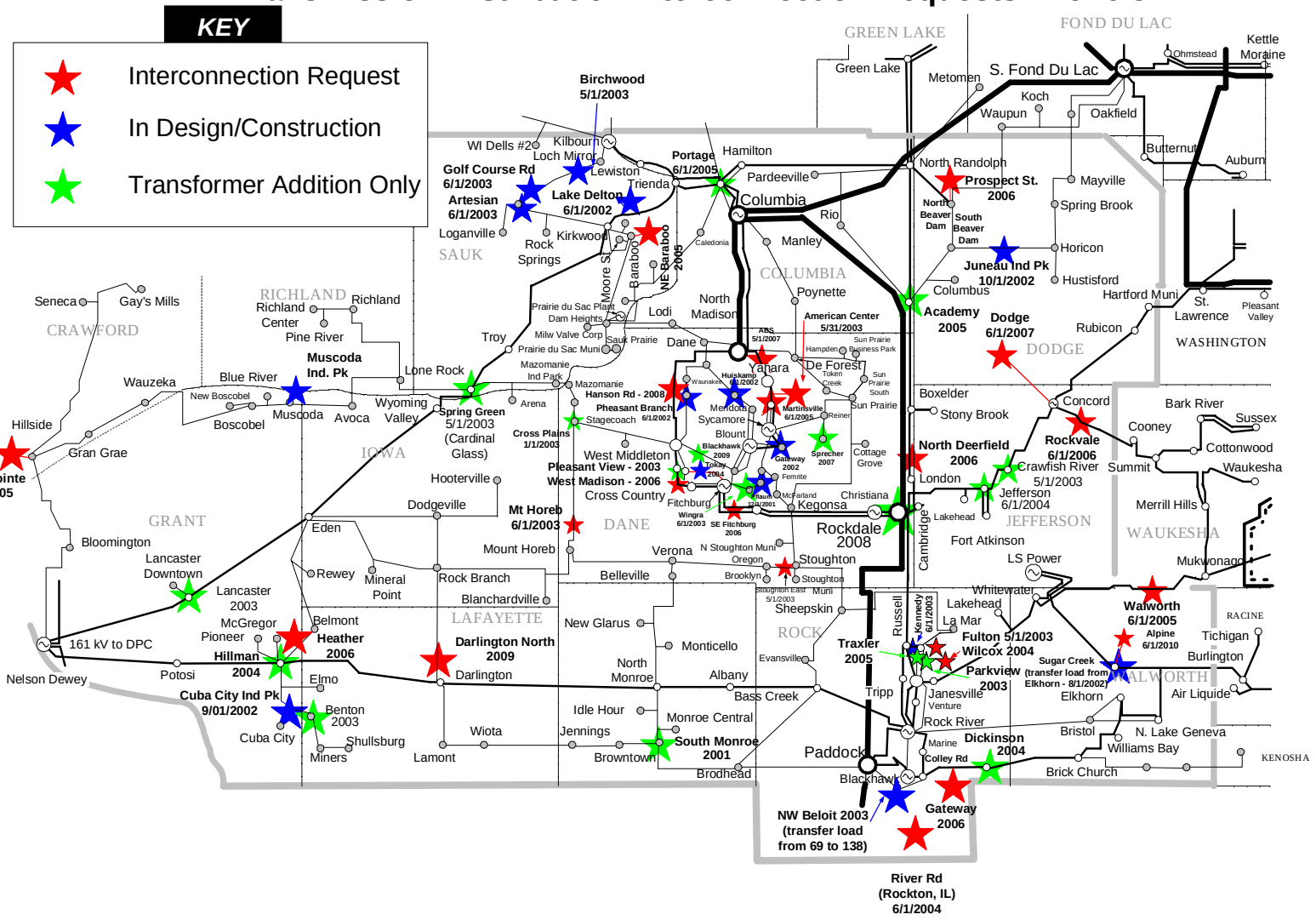


Figure A-4
Transmission-Distribution Interconnection Requests - Zone 4

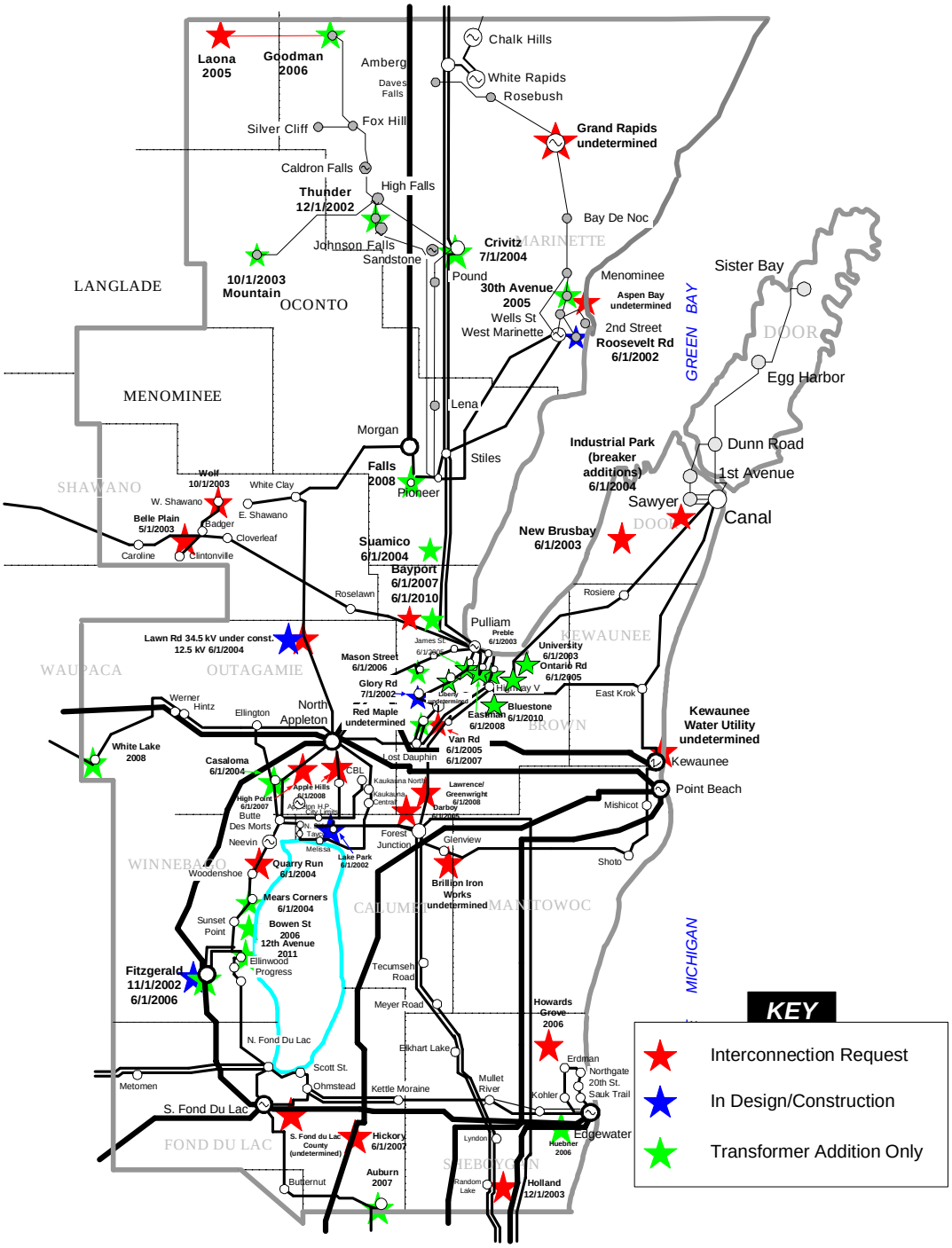
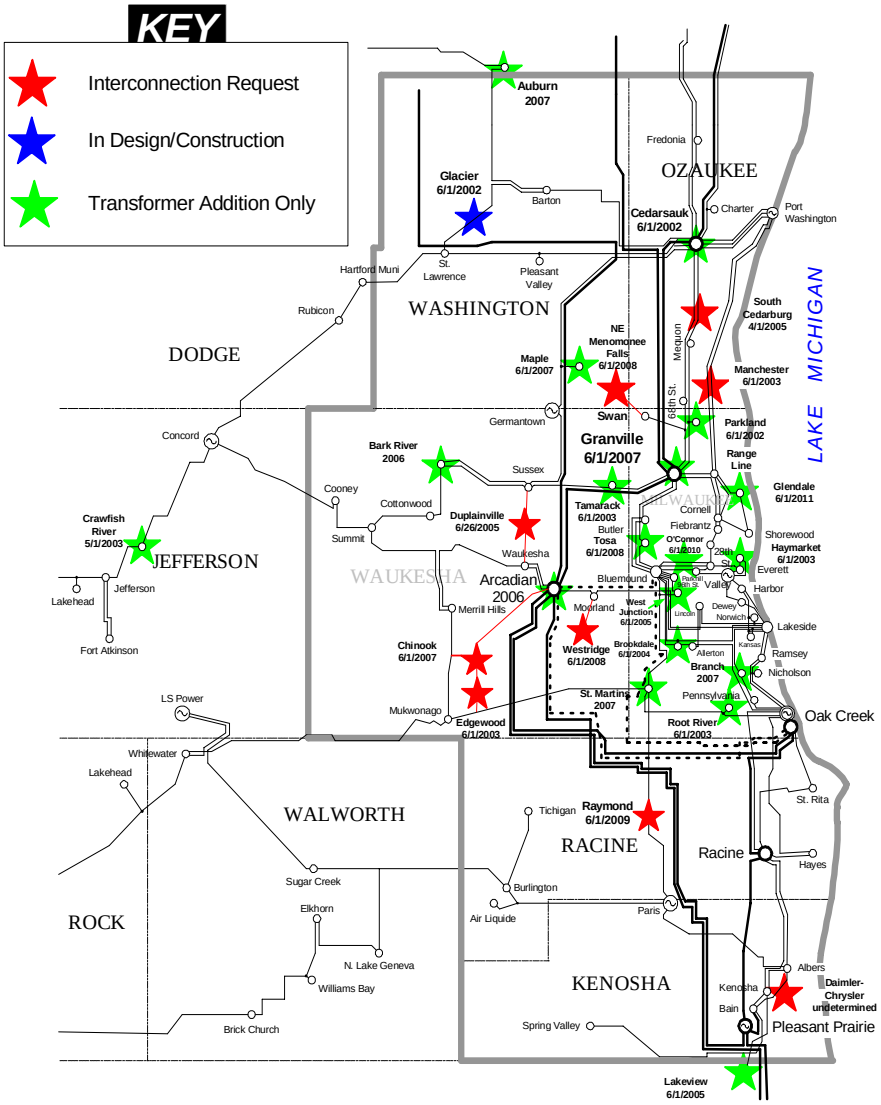


Figure A-5
Transmission-Distribution Interconnection Requests - Zone 5



Appendix B

AMERICAN TRANSMISSION COMPANY
PLANNING CRITERIA

This document describes the system planning criteria that ATC will utilize to ensure that the ATC transmission system is adequate to support effective competition in energy markets, reliably deliver power to systems connected to and customers dependent upon ATC's transmission system, provide support to distribution systems interconnected to ATC's transmission system and deliver energy from existing and new generation facilities connected to the ATC transmission system. This document may be revised from time to time in response to new system conditions, new technologies being employed and new operating procedures, as appropriate. The criteria described below may be subject to change by ATC as warranted. Situations that could precipitate such a change could include, but are not limited to, new system conditions, extraordinary events, safety issues, operation issues, maintenance issues, customer requests, regulatory requirements and reliability council or NERC requirements.

The planning criteria is divided into the following categories:

- System Performance Criteria
- Capacity Benefit Margin Criteria
- Transmission Reserve Margin Criteria
- Facility Rating Criteria
- Model Building Criteria
- Facility Condition Criteria
- Planning Zones
- System Alternatives
- Load Forecast Criteria
- Economic Criteria
- Environmental Criteria
- Other Considerations

System Performance Criteria

System performance will be assessed at least annually. Such assessments will involve steady state simulations and, as appropriate, dynamic simulations. Steady state assessments will include consideration of the following system load conditions:

1) Summer peak
2) Summer shoulder peak
3) Fall/Spring off-peak
4) Winter peak
5) Hot Summer peak

The first three load conditions above will be assessed in all long-range planning studies. The last two load conditions will be considered when more detailed analyses are being conducted of specific alternatives developed to solve a particular problem. The specific criterion associated with each of the load conditions above is provided below under **Load Forecast Criteria**.

Steady State Criteria

The steady state system performance criteria to be utilized by ATC shall include:

1) No system element (line, transformer, terminal equipment, etc.) should experience loading in excess of its normal rating under normal system conditions, that is, with all transmission facilities in service. This criterion should apply for a reasonably broad range of generation dispatch conditions.
(Applicable NERC Planning Standard: I.A.S1.M1)

2) Operating procedures (operating guides) may be employed by ATC and/or entities with generation and/or distribution facilities interconnected with the ATC transmission system to avoid transmission facility loadings in excess of normal ratings provided such procedures are practical for sustained periods, that is, such procedures do not impose on personnel or public safety, do not significantly degrade system reliability, do not result in a significant loss of transmission facility life or significant risk of damage to a transmission facility and/or do not unduly burden any entity financially. Manual switching of circuits or other facilities should not normally be utilized in such an operating procedure.

3) No system element should experience overloads in excess of its emergency rating for a single contingency on the transmission system. This criterion should apply for a reasonably broad range of generation dispatch conditions. This criterion can include manual or automatic switching of circuits or other facilities.
(Applicable NERC Planning Standard: I.A.S2.M2)

4) No voltage levels that could cause damage to ATC or ATC customer facilities should be tolerated on a sustained basis. The acceptable voltage range is 95% to 105% of nominal voltage under normal system conditions. Such measurements shall be made at the high side of transmission-to-distribution transformers.
(Applicable NERC Planning Standards: I.A.S1.M1, I.D.S1.M1, I.D.S1.M2)

5) Under single contingency conditions, the temporary acceptable voltage range is 90% to 110%. Bus voltages must be restored to within 5% of nominal voltage within 30 minutes.
(Applicable NERC Planning Standard: I.A.S2.M2)

6) Load shedding will not be utilized in planning studies to relieve an overload of a transmission facility under normal or single contingency conditions.
(Applicable NERC Planning Standard: I.A.S2.M2)

7) Generation output should not be limited under normal or single contingency conditions. ATC will consider a lower standard of service if requested by a transmission customer.

8) The MAIN Extreme Disturbance Criteria should be used to assess system performance. This Criteria involves examining a prior facility outage plus a new single contingency, loss of all circuits on a right-of-way and loss of an entire

substation, including generation at that substation. This Criteria should be used to determine system vulnerabilities but may not necessarily dictate that potential problems identified need to be remedied with system additions.
(Applicable NERC Planning Standard: I.A.S4.M4)

Dynamic and Steady-State Stability Criteria

The dynamic system performance criteria to be utilized by ATC shall include:

1) For generator transient stability, faults will be modeled near the high side bus at generating plants.

2) Generator transient stability will be maintained for a sustained three phase fault cleared from any line or transformer in primary time with a single pre-existing line or transformer contingency.
(Applicable NERC Planning Standards: I.A.S2.M2, I.A.S3.M3)

3) Generator transient stability will be maintained for a three phase fault cleared in breaker failure backup time with no pre-existing line or transformer contingency.
(Applicable NERC Planning Standards: I.A.S2.M2, I.A.S3.M3)

4) Unacceptable transient stability performance includes the following conditions:
    a) Generating unit is out of step, unless deliberately islanded,
    b) Cascading tripping of transmission line or uncontrolled loss of load,
    c) Voltage excursions outside of 20% of nominal voltage for more than 30 cycles,
    d) Voltage instability at any time after a disturbance,
    e) Voltage recovery of less than 70% of nominal after a disturbance, or
    f) Poorly damped oscillations.

(Applicable NERC Planning Standard: I.A.S2)

The steady-state stability performance criterion to be utilized by ATC will include:

1) With a generating plant at full output, all units will remain steady-state stable with the non-fault opening of any of the transmission circuits interconnected with that plant.
(Applicable NERC Planning Standard: I.A.S2.M2)

2) With a generating plant at full output, all units will remain steady-state stable with the non-fault opening of any two transmission circuits on a common structure that are interconnected with that plant.

Capacity Benefit Margin (CBM) Criteria

CBM is defined as the amount of firm transmission transfer capability preserved by a transmission provider for load serving entities (LSEs) whose loads are located on that transmission provider's system, to enable access by the LSEs to generation from interconnected systems to meet generation reliability requirements. ATC shall perform import capability studies to ensure that the simultaneous import capability of eastern Wisconsin (as a sub-region of MAIN) is sufficient to support a minimum reliability criterion. The present reliability criterion of 0.1 day per year Loss of Load Expectation (LOLE) is dictated by MAIN Guide #6. Determination and application of CBM for the

ATC system is in accordance with MAIN's Regional Standardized Capacity Benefit Margin Methodology.

Transmission Reserve Margin (TRM) Criteria
TRM is defined as the amount of transmission transfer capability necessary to provide reasonable assurance that the interconnected transmission network will be secure. TRM accounts for the inherent uncertainty in system conditions and the need for operating flexibility to ensure reliable operation as system conditions change. At this time, ATC employs no TRM in rating transmission facilities or in determining transfer capability.

Facility Rating Criteria
The facility ratings that ATC will utilize initially in system planning, design and operation will initially be based on the current criteria utilized by the former owners of transmission facilities. ATC will develop appropriate facility rating criteria to ensure consistency across its transmission system. ATC's facility rating criteria and resultant facility ratings is being developed. Facility ratings established by ATC will be consistent between ATC planning and operations. To ensure adequate operating flexibility, ATC will use normal facility ratings during routine maintenance periods.

Facilities to be included are line conductors, underground cable, bus conductors, transformers, autotransformers, circuit breakers, disconnect switches, current transformers, potential transformers, relays (overcurrent/directional overcurrent/impedance), and wave traps. ATC facility rating criteria will be consistent with the following NERC Planning Standards: II.C.S1.M1, II.C.S1.M2, II.C.S1.M3, II.C.M4 and II.C.S1.M5.

Model Building Criteria
ATC will strive to develop and maintain consistency in the powerflow models used for its planning efforts and in assessing whether and under what conditions transmission service is available. The starting point for powerflow models used by ATC will be models contained in the NERC and/or MAIN data bank. ATC will utilize load forecasts provided by its end-use load-serving customers in future model building efforts, both internally and in conjunction with MAIN and NERC. All ATC powerflow models will be developed using PTI PSS/E software. All ATC powerflow models will be publicly available; such models will be posted on ATC's OASIS website.
NERC Planning Standard:

Facility Condition Criteria
The facility condition criteria to be utilized by ATC for system planning purposes will include:

1) Any transmission line on structures that are beyond their design life, any transmission line that has exhibited below average availability or any transmission line that has required above average maintenance will be considered a candidate for replacement. In assessing potential line replacements, consideration will be given to other needs in the area of the candidate line to determine whether rebuilding the line to a higher voltage would fit into the "umbrella" plan for that

planning zone (see **Planning Zones** below). Close coordination with the engineering, operation and maintenance and environmental personnel at ATC will be maintained, and public input solicited, in such assessments.

2) Any substation bus that is beyond its design life, has exhibited below average availability or has required above average maintenance will be considered a candidate for rebuilding and potential redesign. In assessing potential bus rebuilds, consideration will be given to likely and potential expansion at candidate substations, including consideration of the "umbrella" plan for the planning zone. Close coordination with the engineering, operation and maintenance personnel at ATC will be maintained in such assessments.
3) Any substation whose design or configuration prevents maintenance, in a safe manner, on substation equipment or lines terminating at the substation will be considered a candidate for rebuilding and/or potential redesign/reconfiguration. In assessing such rebuilds/redesigns/reconfigurations, consideration will be given to likely and potential expansion at candidate substations, including consideration of the "umbrella" plan for the planning zone. Close coordination with the engineering, operation and maintenance personnel at ATC will be maintained in such assessments.
4) Any underground cable that is beyond its design life, has exhibited below average availability or has required above average maintenance will be considered a candidate for replacement. In assessing potential cable replacements, consideration will be given to other needs in the area of the candidate cable to determine whether replacing the cable with a cable of higher ampacity or with a cable capable of a higher voltage would fit into the "umbrella" plan for that planning zone. Close coordination with the engineering, operation and maintenance personnel at ATC will be maintained in such assessments.
5) ATC will strive to verify the efficacy of all operating guides that require on-site operations.

Planning Zones

It is ATC's intent to conduct system planning on a long-range basis by developing plans for the ATC transmission system as a whole as well as plans for specified zones within the boundaries of ATC's transmission system. These zones are shown in Figures 1-6, attached. The idea behind the zone approach to long-range planning is to develop plans that consider all of the needs/problems/developments within each zone. The goal within each zone would be to develop an "umbrella" plan for the zone, that is, a plan that emphasizes projects that serve multiple purposes or solve multiple problems within the zone. The zone approach is intended to address requirements for support to the local distribution systems in that zone on a least cost basis. It is anticipated, however, that several projects that span more than one zone or possibly even the ATC transmission system boundaries, may evolve. Such projects will likely involve coordination with other transmission owners or regional transmission organizations.

The planning zones shown in Figures 1-6 deviate significantly from existing control area boundaries and from planning zones traditionally used for joint planning in conjunction with the Wisconsin PSC. The zones were selected considering the need for a manageable

number of planning areas and to consolidate areas within the state with similar topology and load characteristics.

System Alternatives
ATC will consider alternatives to transmission-only solutions for problems on the transmission system as appropriate. Such alternatives could include, but not be limited to, distributed generation, load management and conservation measures. ATC will utilize sound judgment and input from others in assessing whether non-transmission solutions are applicable on a case-by-case basis.

Load Forecasting Criteria
ATC will initially utilize load forecasts provided by its end-use load-serving customers. Such customers are required, under ATC's Distribution-Transmission Interconnection Agreements and Network Operating Agreements, to provide ATC with monthly peak demand forecasts for the next ten years. ATC may, in the future, develop load forecasts either concurrent with or independent of its load-serving customers. In addition, ATC, in coordination with its load-serving customers, may develop representative load duration curves based on actual and normalized load conditions. The ATC methodology for developing, aggregating and maintaining load forecast information will be in accordance with NERC Planning Standard II.D.S1.

In utilizing or developing load forecasts, the following criteria will be used:

1) Summer peak demand forecasts will be calculated in such a way that there is an almost equal probability of exceeding or falling short of the forecast when average peak making weather does occur.
2) Summer shoulder peak demand forecasts will be developed reflecting moderate weather days (75-80^{o}). Such forecasts will be based on a load level that, within a reasonable range, captures as many shoulder peak hours within a representative load duration curve of load connected to the ATC transmission system. These demand forecasts will be developed to evaluate high power transfer conditions.
3) Winter peak demand forecasts will be calculated in such a way that there is an almost equal probability of exceeding or falling short of the forecast when average peak making weather does occur.
4) Fall/Spring off-peak forecasts will be based on a load level that, within a reasonable range, captures as many off-peak hours within a representative load duration curve of load connected to the ATC transmission system.
5) A hot summer forecast, reflecting above-average summer weather and peak demand conditions, will be developed. This peak demand forecast will be calculated in such a way that there is a 90% probability of falling short of and a 10% probability of exceeding the forecast due to weather conditions.

Economic Criteria
ATC will conduct appropriate economic analyses when evaluating transmission additions, replacements and modifications. The criteria to be used in such economic analyses for purposes of system planning will include the following:

1) In developing screening level capital cost estimates for transmission lines and substations, terrain, geology and land use will be considered.
2) In conducting transmission system loss analysis, a sufficient number of powerflow cases will be developed to cover a reasonable range of load conditions from which to assess system losses. In addition, the value of losses shall be projected based on the energy futures market or on a credible energy price forecast.
3) In conducting analysis of generation redispatch precipitated by transmission constraints, a sufficient number of powerflow cases will be developed to in order to reasonably estimate the amount of time that such redispatch may be warranted. In addition, the cost of such redispatch will be projected based on marginal production costs and/or historical redispatch cost data of generating units dispatched to relieve the constraint. ATC will determine the economic feasibility of eliminating generation must-run situations based on these analyses.

Environmental Criteria

The overriding environmental criterion to be used by ATC in system planning is that environmental analyses will be conducted at a screening level for alternatives being considered in high-level evaluations. The goal of such environmental analyses is to identify potential environmental impacts, such as aesthetics, avoid such impacts where possible and, where it is not possible, minimize and mitigate such impacts to the extent possible. More detailed environmental analyses will be undertaken to support an application to siting authorities of specific transmission alternatives.

Other Considerations

Project Constructability

ATC will consider the constructability of proposed additions, replacements or modifications to the transmission system as part of its system planning process. In particular, ATC will consider:

1) whether addition, replacement or modification of a transmission line, transformer or other facility would result in violation of the **System Performance Criteria** above, and
2) whether addition, replacement or modification of a transmission line, transformer or other facility precludes the ability of ATC Operations to conduct maintenance activities on other transmission facilities.

Multiple Contingency Planning

ATC will conduct its system planning in accordance with the **System Performance Criteria** above, including planning for single contingency events. There may be circumstances, however, where the risk to ATC and/or ATC customers of a multiple contingency event is sufficiently severe to warrant consideration for planning purposes. Examples of such an event would include (i) the loss of a transmission facility during the period of maintenance or repair of another transmission facility, (ii) a multiple contingency arising from a common cause such as a fire, flood, etc., or (iii) failure of a transmission structure supporting multiple circuits. ATC will evaluate the probability

and consequences of certain selected multiple contingency scenarios to determine whether to apply a multiple contingency standard.

Such multiple contingency scenarios may warrant consideration of operating guides. In these circumstances, ATC will document the potential event(s), the associated risks and potential mitigation measures, and will coordinate with affected customers, as appropriate.
(Applicable NERC Planning Standard: I.A.S4.M4)

Terminal Equipment Limitations
Substation terminal equipment should not limit transmission facility ratings under normal or single contingency conditions. This criterion would apply to new transmission facilities and should be reviewed when proposing modifications to existing facilities.

Maximization of Existing Rights-of-Way
ATC will maximize use of existing rights-of-ways. Existing electric transmission, gas pipeline, railroad and highway corridors will be identified in all comparisons of alternatives and utilized where feasible. As a starting point in each environmental analysis, ATC will utilize the screening-level environmental review employed for all of the new transmission line alternatives considered in prior Advance Plan processes.

Reduction of Transmission System Losses
ATC will strive to plan its transmission system such that transmission system losses are minimized. ATC will undertake this goal by considering system losses along with all other cost factors in all evaluations of alternative transmission projects or plans. See **Economic Criteria**.

Operating Flexibility
ATC will strive to plan its transmission system such that operating flexibility is maximized. ATC will accomplish this by considering as wide a variety of scenarios as practical, including maintenance scenarios, when evaluating alternative transmission projects or plans.

Radial Transmission Service
ATC will evaluate the risk of serving customer load from radial facilities. Such evaluations will consider the amount of load being served, the capability of the underlying distribution system and the amount of time that service is likely to be interrupted for the loss/failure of the radial facility.