



section 3 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 transmission system 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 and potential solutions developed. ATC's five planning zones are shown in Figure III-1.

The population history and projection demographic data for each of the zones below was obtained from the Wisconsin Department of Administration and the Michigan Information Center's State Budget Office. The employment demographic data for each of the zones below was obtained from Woods and Poole.

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. 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.

Demographics

The population of the counties comprising Zone 1 grew at an annual rate of 1% from 1990 to 1995 and at an annual rate of 0.9% from 1995-2000. The highest growth rates occurred in Marquette County, though the highest increase in population occurred in Marathon County.

During those same two periods, employment growth rates in Zone 1 were 2.4% and 1.7%, respectively. The highest growth rates occurred in Adams County, though the highest increase in employment occurred in Marathon County.

Future Growth Projections

Population in Zone 1 is projected to grow at 0.3% annually through 2005 and at 0.3% from 2005 through 2010. Marathon County is projected to realize the highest growth in population while Portage County is projected to have the highest population growth rates.

Employment in zone 1 is projected to grow at 1.1% annually through 2005 and at 1.2% from 2005 through 2010. Marathon County is projected to realize the highest growth in employment, while Adams County is projected to have the highest employment growth rates.

Environmental Considerations

This planning zone covers the central and north-central portions of the state and spans a wide range of ecological landscapes varying from the Northern Highland and North Central Forest regions in the northern part of the Zone through the Forest Transition, Central

Sand Plains and Central Sand Hills regions to the Western Coulee and Ridges region in the southern portions of the zone. Descriptions of the characteristics of each of these ecological landscapes may be found on the Wisconsin Department of Natural Resources Web site at http://www.dnr.state.wi.us/org/land/er/publications/cw/Ecological_landscapes.asp. The northern portion of the zone contains numerous lakes and woodlands while the southern portions are more agricultural in nature. Lands in this zone are primarily located in the Upper and Central Wisconsin River drainage basins with smaller portions of the zone located in the Fox and Wolf River drainage basins. The Necedah and Fox River National Wildlife Refuges and a small portion of the Nicolet National Forest are located in this planning zone. Several Indian Reservations are located in this zone.

Electricity Demand and Generation

The coincident peak load forecasts for Zone 1 for 2004, 2008 and 2012 are shown in Table III-1. Existing generation along with proposed generation based on projected in service year are also shown. The resultant difference between load and generation with or without the proposed generation is shown as well.

Table III-1 Forecast of Peak Load and Generation in Zone 1

	2004	2008	2012
Peak Load Forecast (megawatts)	1643.7	1760.2	1865.9
Average Peak Load Growth	N/A	1.73%	1.47%
Existing Generation Capacity (megawatts)	745.2	745.2	745.2
Existing Capacity Less Load (megawatts)	-898.5	-1015.0	-1120.7
Existing Generating Capacity plus Modeled Generating Capacity Additions (megawatts)	745.2	1623.0	1623.0
Modeled Capacity Less Load (megawatts)	-898.5	-137.2	-242.9

Modeled generating capacity additions in the table above reflect those proposed capacity additions that were included in the 2003 Assessment analyses models, as listed in Section II under New Generation Assumptions.

The table above shows that load is projected to grow at roughly 1.6% annually from 2004 through 2012. Comparing load with generation (at maximum output) within the zone indicates that Zone 1 is a net importer of power during peak load periods.

Transmission System Issues

Key system performance issues in Zone 1 include:

- The load serving capability of the 115 kV loop in northern Zone 1 (Rhineland 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 can limit 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 and can aggravate the Eau Claire-Arpin flow limit issues.
- There are three large potential generation projects that have requested interconnection studies in Zone 1 and one that has requested transmission service. 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 these projects are identified in Section VIII. However, additional analyses will be required to address the cumulative impact of these proposed projects should they come to fruition, including the upgrades needed to allow delivery of the combined output of these projects to customers.

Figure III-1 ATC Transmission Planning Zones

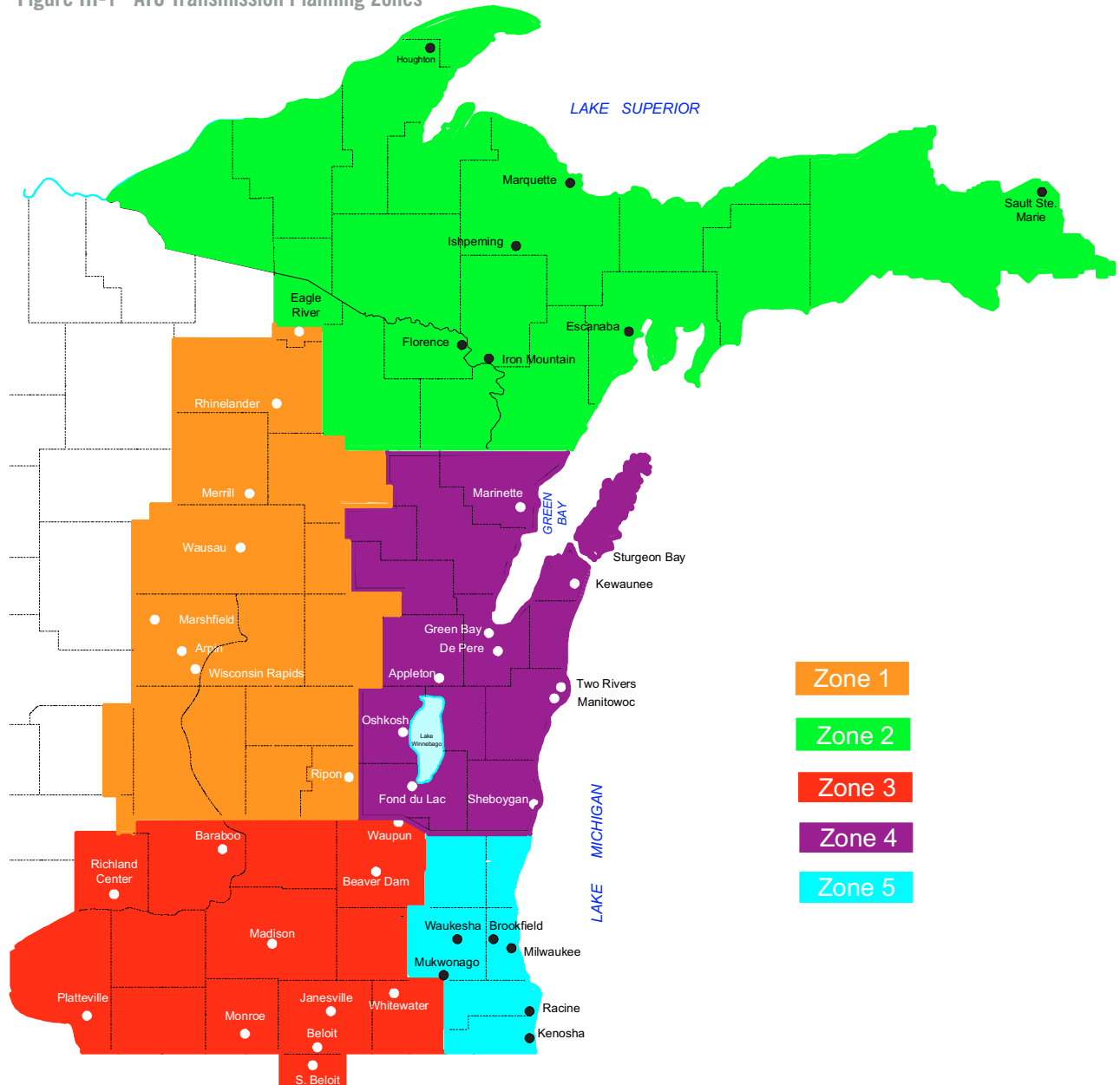
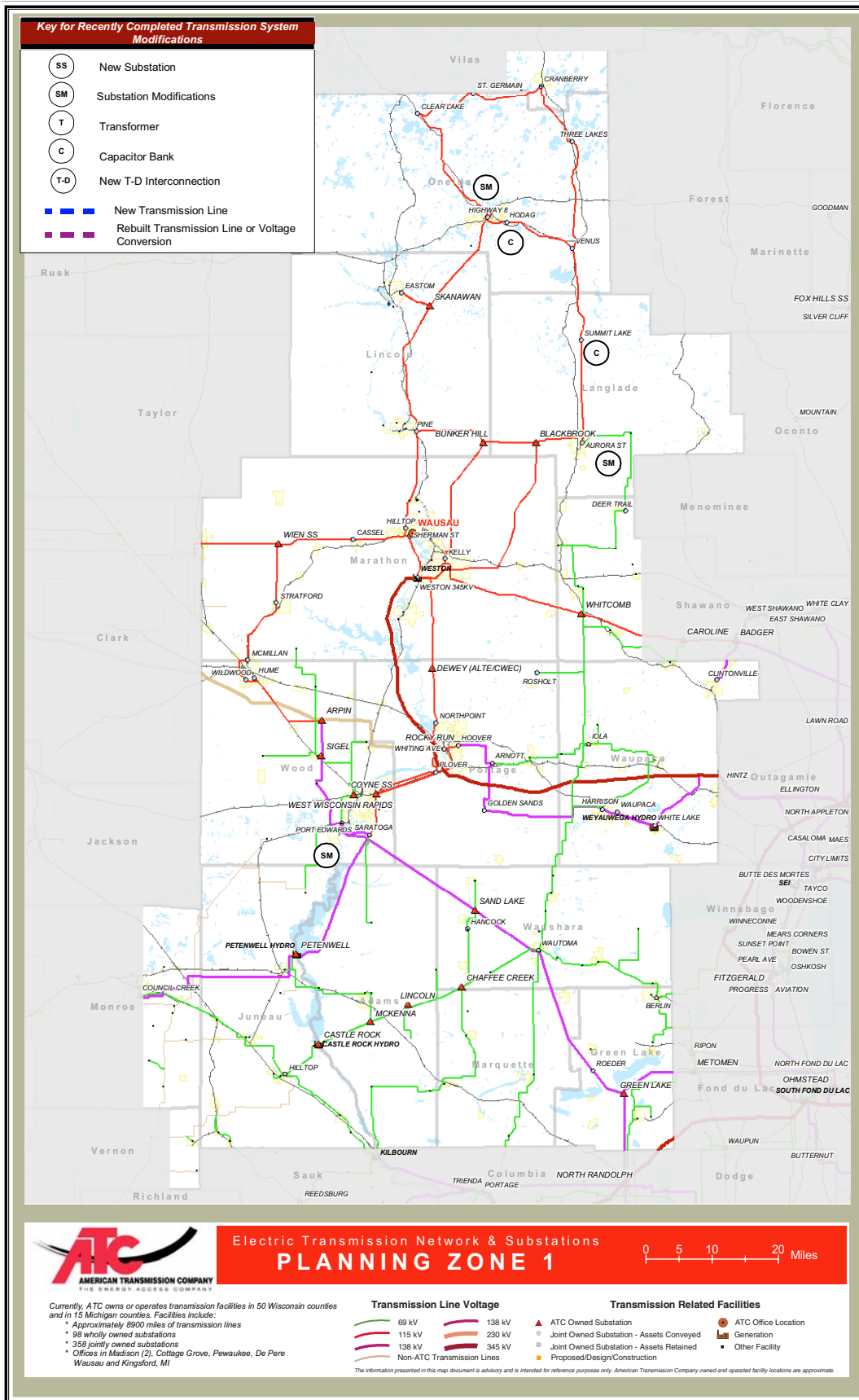


Figure III-2 Zone 1 - Existing Transmission Facilities



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.

Demographics

The population of the counties in Zone 2 experienced no growth from 1990 to 1995 and at an annual rate of 0.4% from 1995 through 2000. The highest population growth rates occurred in Keweenaw County though the highest increase in population occurred in Chippewa County.

During those same two periods, annual employment growth rates in Zone 2 were 1.4% and 1.3%, respectively. Similar to population growth, the highest employment growth rates occurred in Keweenaw County and the highest increase in employment occurred in Chippewa County.

Future Growth Projections

Population in Zone 2 is projected to grow at 0.1% annually through 2005 and at 0.2% annually from 2005 through 2010. Chippewa County is projected to realize the highest growth in population and the highest population growth rates.

Employment in Zone 2 is projected to grow at 1.4% annually through 2005 and at 1.3% annually from 2005 through 2010. Marquette County is projected to realize the highest growth in employment while Forest County is projected to have the highest employment growth rates.

Environmental Considerations

This planning zone includes a small part of the far northeast portion of Wisconsin and the eastern two-thirds of the Upper Peninsula of Michigan. The Wisconsin portions of the zone fall into the Northeast Sands and North Central Forest ecological landscape regions. The portions of the zone located in Michigan are part of the Eastern Upper Peninsula eco-region. A description of the characteristics of the Eastern Upper Peninsula eco-region may be found on the Michigan Department of Environmental Quality Web page at http://www.michigan.gov/dnr/0,1607,7-153-10366_11865-31471--,00.html. Large expanses of this zone are forested and there are large numbers of streams, lakes and wetlands throughout the zone. The Niagara Escarpment expresses itself in the Eastern Upper Peninsula. Lakes Superior, Huron and Michigan form the northern and eastern boundaries of the zone. Two Michigan State Natural Rivers (Fox and Two-Hearted) and eight National Wild and Scenic Rivers (Tahquamenon, Indian, Sturgeon, Whitefish, Yellow Dog, Ontonagon, Paint, Carp, north Sturgeon) are found in this zone. Portions of the Nicolet, Ottawa, and Hiawatha National Forests and numerous state forests and parks are found in this zone. Several Indian Reservations are found in this zone. The Seney National Wildlife Area, Pictured Rocks National Lakeshore, and numerous Federal wilderness areas also are found in this area.

Electricity Demand and Generation

The coincident peak load forecasts for Zone 2 for 2004, 2008 and 2012 are shown in Table III-2. Existing generation along with proposed generation based on projected in service year are also shown. The resultant capacity margins with or without the proposed generation are shown as well.

Table III-2 Forecast of Peak Load and Generation in Zone 2

	2004	2008	2012
Peak Load Forecast (megawatts)	800.5	821.7	839.5
Average Peak Load Growth	N/A	0.66%	0.54%
Existing Generation Capacity (megawatts)	1067.1	1064.1	1064.1
Existing Capacity Less Load (megawatts)	-266.6	242.4	224.6
Existing Generating Capacity plus Modeled Generating Capacity Additions (megawatts)	1067.1	1064.1	1064.1
Modeled Capacity Less Load (megawatts)	266.6	242.4	224.6

Modeled generating capacity additions in the table above reflect those proposed capacity additions that were included in the 2003 Assessment analyses models, as listed in Section II under New Generation Assumptions

The table above shows that load is projected to grow at roughly 0.6% annually from 2004 through 2012. Comparing load with generation (at maximum output) within the zone indicates that Zone 2 has more generation than peak load, though actual operating experience indicates that during most periods, Zone 2 is a net importer of power.

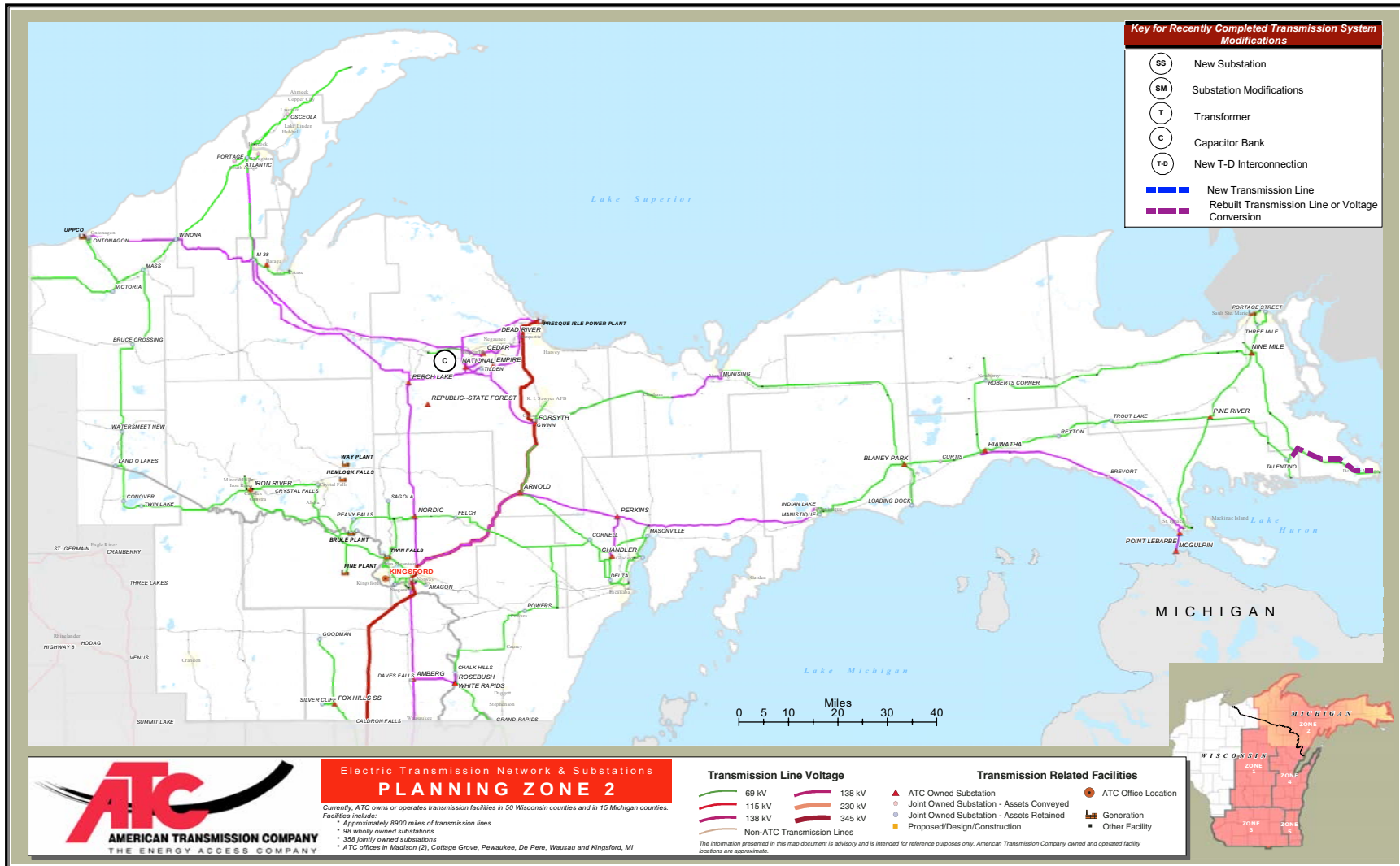
Transmission System Issues

Key transmission facilities in Zone 2 include the Morgan-Plains and Plains-Dead River 345 kV lines, the Plains-Stiles 138 kV double circuit line and the 138 kV facilities tying the Upper Peninsula of Michigan to the Lower Peninsula.

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 at Presque Isle Power Plant
- Parallel path flow around Lake Michigan that aggravates heavy loading on the 138 kV and 69 kV systems also aggravating the need for TLRs and requiring reconfiguration of the system
- Low voltages, most pronounced in the western Upper Peninsula

Figure III-3 Zone 2 - Existing Transmission Facilities



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.

Demographics

The population of the counties in Zone 3 grew at an annual rate of 1.1% from 1990 to 1995 and at an annual rate of 1.5% from 1995-2000. The highest growth rates occurred in Walworth County, though the highest increase in population occurred in Dane County.

During those same two periods, annual employment growth rates in Zone 3 were 2.6% and 2%, respectively. The highest growth rates occurred in Sauk County, though the highest increase in employment occurred in Dane County.

Future Growth Projections

Population in Zone 3 is projected to grow at 0.6% annually through 2005 and at 0.5% annually from 2005 through 2010. Dane County is projected to realize the highest growth in population and the highest population growth rates.

Employment in Zone 3 is projected to grow at 1.4% annually through 2005 and at 1.3% annually from 2005 through 2010. Dane County is projected to realize the highest growth in employment, while Sauk County is projected to have the highest employment growth rates.

Environmental Considerations

This zone covers the south central and southwestern portions of the state. The ecological landscapes in this zone vary from Southeast Glacial Plains in the east through Central Sand Hills areas to areas that are part of the Southwest Savanna and Western Coulee and Ridges landscapes in the west. The eastern portions of the zone are generally level to gently rolling terrain while the western areas are characterized by the ridges and valleys of the driftless area. The northern and western portions of this zone are located in the Lower Wisconsin River Drainage Basin and the Mississippi River forms the zone's western boundary. Other portions of this zone are located in the Grant-Platte, Sugar River-Pecatonica, Upper and Lower Rock and Fox Illinois drainage basins. Horicon Marsh National Wildlife Refuge is located in the northeast part of the zone and the Upper Mississippi River Wildlife and Fish Refuge is located along the zone's western edge. The Baraboo Hills are located in the north-central portion of the zone. The Lower Wisconsin River State Riverway is also found in this zone.

Electricity Demand and Generation

The coincident peak load forecasts for Zone 3 for 2004, 2008 and 2012 are shown in Table III-3. Existing generation along with proposed generation based on projected in service year are also shown. The resultant capacity margins with or without the proposed generation are shown as well.

Table III-3 Forecast of Peak Load and Generation in Zone 3

	2004	2008	2012
Peak Load Forecast (megawatts)	2922.7	3132.1	3580.6
Average Peak Load Growth	N/A	1.74%	3.40%
Existing Generation Capacity (megawatts)	3356.4	3356.4	3356.4
Existing Capacity Less Load (megawatts)	433.7	224.3	-224.2
Existing Generating Capacity plus Modeled Generating Capacity Additions (megawatts)	3356.4	3508.8	3508.8
Modeled Capacity Less Load (megawatts)	433.7	376.7	-71.8

Modeled generating capacity additions in the table above reflect those proposed capacity additions that were included in the 2003 Assessment analyses models, as listed in Section II under New Generation Assumptions.

The table above shows that load is projected to grow at roughly 2.61% annually from 2004 through 2012. Comparing load with generation (at maximum output) within the zone indicates that Zone 3 has more generation than peak load during peak load periods. However, actual operating experience indicates that during most load periods, Zone 3 is a net importer of power.

Transmission System Issues

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 Power 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 and associated low voltages.
- 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.

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 some of the largest electricity users in the zone.

Demographics

The population of the counties comprising Zone 4 grew at an annual rate of 1% from 1990 to 1995 and at an annual rate of 1.2% from 1995-2000. The highest growth rates occurred in Calumet County, though the highest increase in population occurred in Brown County.

During those same two periods, employment growth rates in Zone 4 were 2.5% and 1.9%, respectively. The highest growth rates and highest increase in employment occurred in Brown County.

Future Growth Projections

Population in Zone 4 is projected to grow at 0.3% annually through 2005 and from 2005 through 2010. Brown County is projected to realize the highest growth in population, while Menominee County is projected to have the highest population growth rates.

Employment in Zone 4 is projected to grow at 1.3% annually through 2010. Brown County is projected to realize the highest growth in employment and the highest employment growth rates.

Environmental Considerations

This zone includes lands in the Southeast Glacial Plains, Central and Northern Lake Michigan Coastal, and Northeast Sands ecological landscape regions. The area drains towards Lake Michigan via the Milwaukee, Sheboygan, Manitowoc, Twin-Door-Kewaunee, Wolf and Lower Fox Drainage Basins. Lake Winnebago and the Fox Valley are located in the central part of this zone. The eastern boundary of the zone is formed by the shorelines of Lake Michigan and Green Bay. The Niagara Escarpment runs through the center of the zone and out the Door Peninsula. Portions of the Kettle Moraine State Forest and the Horicon National Wildlife Refuge are found in the southern end of the zone. Navarino State Wildlife Area and a segment of the Wolf River classified as a Federal Wild and Scenic River are located in the northwest part of the zone. Several Indian Reservations are located in this zone.

Electricity Demand and Generation

The coincident peak load forecasts for Zone 4 for 2004, 2008 and 2012 are shown in Table III-4. Existing generation along with proposed generation based on projected in service year are also shown. The resultant capacity margins with or without the proposed generation are shown as well.

Table III-4 Forecast of Peak Load and Generation in Zone 4

	2004	2008	2012
Peak Load Forecast (megawatts)	3139.6	3316.2	3625.4
Average Peak Load Growth	N/A	1.38%	2.25%
Existing Generation Capacity (megawatts)	4162.5	4162.5	4162.5
Existing Capacity Less Load (megawatts)	1022.9	846.3	537.1
Existing Generating Capacity plus Modeled Generating Capacity Additions (megawatts)	4162.5	4162.5	4162.5
Modeled Capacity Less Load (megawatts)	1022.9	846.3	537.1

Modeled generating capacity additions in the table above reflect those proposed capacity additions that were included in the 2003 Assessment analyses models, as listed in Section II under New Generation Assumptions.

The table above shows that load is projected to grow at roughly 1.81% annually from 2004 through 2012. Comparing load with generation (at maximum output) within the zone indicates that Zone 4 has more generation than load during peak load periods. Actual operating experience indicates that during lighter load periods, Zone 4 is a net exporter of power.

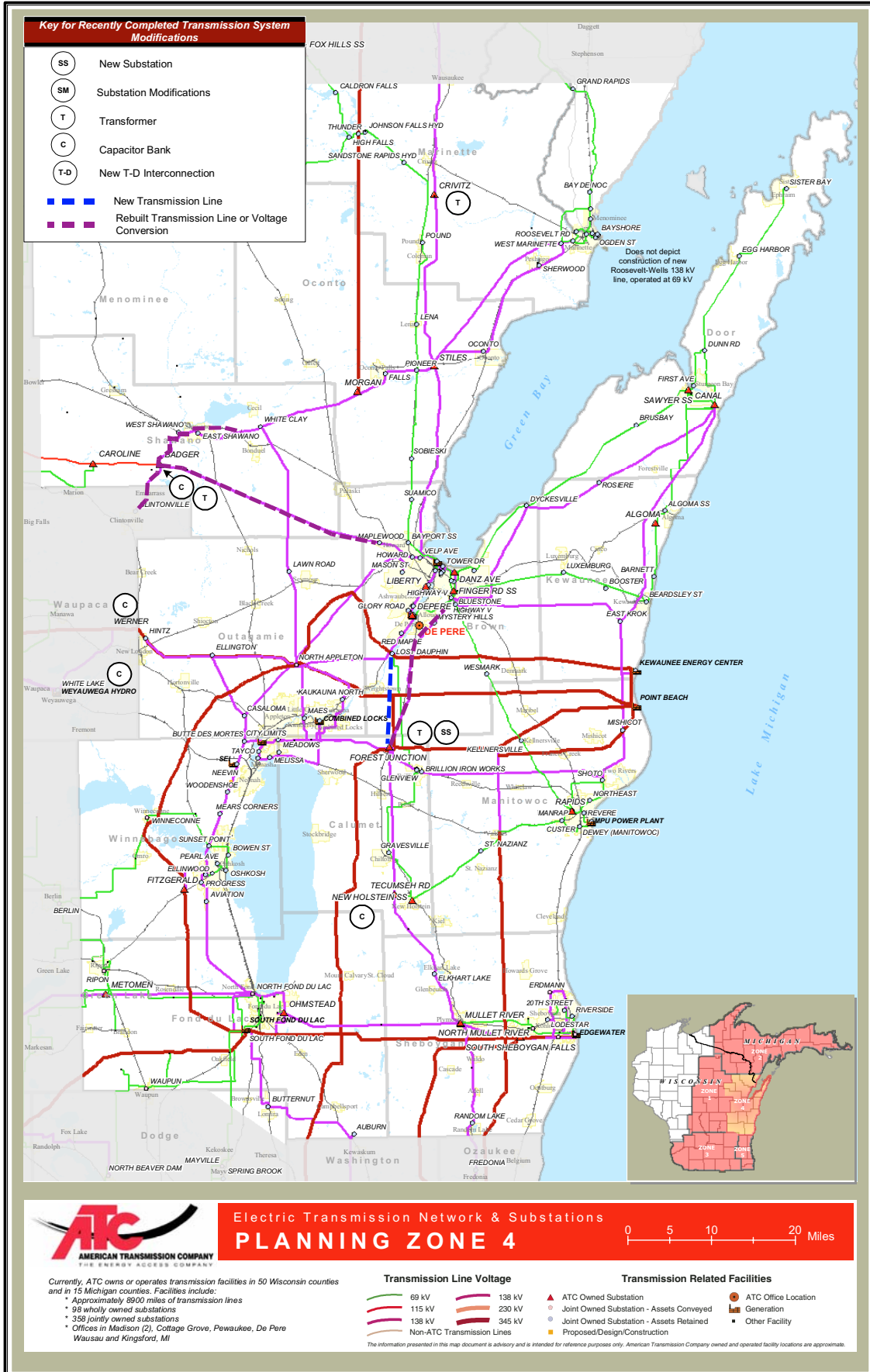
Transmission System Issues

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:

- 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 Michigan's Upper Peninsula, resulting in uneconomic dispatch of generating units

Figure III-5 Zone 4 - Existing Transmission Facilities



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 (such as Charter Steel, Miller Brewing) are among the largest electricity users in the zone.

Demographics

The population of the counties in Zone 5 grew at an annual rate of 0.7% from 1990 to 1995 and at an annual rate of 0.4% from 1995-2000. The highest growth rates occurred in Washington County though the highest increase in population occurred in Waukesha County.

During those same two periods, employment growth rates in Zone 5 were 1.2% and 1.5% respectively. The highest growth rates and the highest increase in employment occurred in Waukesha County.

Future Growth Projections

Population in Zone 5 is projected to grow at 0.5% annually through 2005 and at 0.4% annually from 2005 through 2010. Milwaukee County is projected to realize the highest growth in population, while Washington County is projected to have the highest population growth rates.

Employment in Zone 5 is projected to grow at 0.8% annually through 2005 and at 0.9% annually from 2005 through 2010. Waukesha County is projected to realize the highest growth in employment and the highest employment growth rates.

Environmental Considerations

Planning Zone 5 encompasses the southeastern portion of the state and is the most densely populated of the zones. The area lies in the Southern Lake Michigan Coastal and Southeast Glacial Plains ecological landscape regions. Most of the zone lies in the drainage basins of the Milwaukee, Root or Fox Rivers. The Kettle Moraine State Forest lies in the western portions of the zone, and Lake Michigan forms its eastern boundary. Pre-settlement vegetation varied from prairie and oak savanna in the south to southern mesic forest in the northern portions of the zone. Agricultural land uses are common throughout this zone.

Electricity Demand and Generation

The coincident peak load forecasts for Zone 5 for 2004, 2008 and 2012 are shown in Table III-5. Existing generation along with proposed generation based on projected in service year are also shown. The resultant capacity margins with or without the proposed generation are shown as well.

Table III-5 Forecast of Peak Load and Generation in Zone 5

	2004	2008	2012
Peak Load Forecast (megawatts)	4629	5044.6	5468.2
Average Peak Load Growth	N/A	2.17%	2.04%
Existing Generation Capacity (megawatts)	3603	3603	3603
Existing Capacity Less Load (megawatts)	-1026	-1441.6	-1865.2
Existing Generating Capacity plus Modeled Generating Capacity Additions (megawatts)	3603	4588.4	6538.4
Modeled Capacity Less Load (megawatts)	-1026	-456.2	1070.2

Modeled generating capacity additions in the table above reflect those proposed capacity additions that were included in the 2003 Assessment analyses models, as listed in Section II under New Generation Assumptions

The table above shows that load is projected to grow at roughly 2.1% annually from 2004 through 2012. Comparing load with generation (at maximum output) within the zone indicates that Zone 5 has less generation than load during peak load periods.

Transmission System Issues

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.

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
- Sagging voltage profile in portions of Washington, Waukesha and Jefferson counties
- 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 near the Marquette Interchange. These plans may require that certain ATC transmission facilities be modified or relocated, as follows:

- A portion of Everett - 28th Street underground 138 kV circuit will need to be relocated in 2004.
- The Valley-Harbor and Valley-Dewey underground 138 kV circuits may need to be relocated in 2005 or 2006.
- The 138 kV switchyard at the Valley Power Plant will require various equipment modifications and a more extensive maintenance program.

Figure III-6 Zone 5 - Existing Transmission Facilities

