

Arrowhead-Weston Transmission Line

BENEFITS REPORT

FEBRUARY 2009



KEEPING OUR COMMITMENTS, EARNING PUBLIC TRUST



“You got this project done in an environmentally sensitive area, in a heavily regulated state and in a state that puts a premium on protecting the environment.”

Roger Luce, president, Marathon County Chamber of Commerce

“I’ve held this project up at the National Conference of State Legislatures as a model of how to do it right.”

State Representative Phil Montgomery, current member and former chairman, Assembly Energy and Utilities Committee

“This project benefited the region in more ways than we initially thought it would. At first the main benefit was increasing supplies into Wisconsin, but then the reliability dimension really started to come in to play.”

Brad Oachs, vice president, Power Delivery and Transmission, Minnesota Power

“The Arrowhead-Weston line improves system reliability across a broader area than simply its local area. Because of the interconnected electrical system, its benefits extend throughout the Midwest region.”

Clair Moeller, vice president, Transmission Asset Management, Midwest ISO

Keeping our commitments, earning the public's trust

BY JOSÉ DELGADO

When American Transmission Co. began operations on Jan. 1, 2001, the considerable constraints on the electric system made clear we would have the opportunity to enhance the transmission grid to realize greater reliability and access to power.

In 2001, with state borders marked by power flow limits, utilities frustrated by lack of access to a regional energy market, system voltages that threatened network stability and could not support business expansion or economic development, and near brushes with rolling blackouts for residential customers – all indications of a transmission grid operating at the limits of its capabilities – we knew we had our work cut out for us.

When we assumed responsibility for the 220-mile, 345-kilovolt Arrowhead-Weston transmission line project (first introduced in 1999) it faced considerable public opposition. Eight counties and 24 municipalities opposed the project; and our ultimately accurate reassessment of its budget at \$420 million came as a shock to regulators who had initially authorized it at \$165 million.

“In the case of Arrowhead-Weston, we could only complete the project by earning the public's trust.”

– José M. Delgado, president and CEO, American Transmission Co.



For a project of this magnitude it's imperative to work with someone you trust who will keep commitments, finish the work within budget, minimize inconvenience and maintain communication while the work is underway. Ultimately the work must be of a quality that will provide benefits for a long time to come.

In the case of Arrowhead-Weston, we could only complete the project by earning the public's trust. To do so, we made—and kept—hundreds of public promises.

In February 2009, we closed our books on this project, one of the largest new transmission lines to be constructed in the country at that time. You'll find in this report stories and statistics about the many commitments that we and our utility partners made and honored over seven years' time.

New transmission lines tend to best be appreciated when they are finished. We offer here a tour, if you will, of a transmission line project that provides the electric system with new capabilities, improved energy efficiency, a restored corridor, enhancements for local communities and post-project commentary from local and state officials.

At the end of the day, the public expects the lights to stay on and businesses to run. And when they do, the challenges of constructing society's electric infrastructure fade from public memory. We intend to do our part to continue to tackle those challenges and meet the public's expectations.



Arrowhead-Weston Benefits Report

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Executive Summary

PROJECT BASICS

- 220 miles
- 345 kilovolts
- 8 counties
- 44 municipalities
- 800 landowners
- 72 months of permitting
- 27 months of construction
- \$436 million total cost
- 250,000 homes powered

BENEFITS

- 600 megawatts carrying capacity
- \$94 million in savings over 40 years
- 35 megawatts saved in reduced energy losses
- 5.3 million tons of CO₂ emissions eliminated
- Reduced maintenance costs
- Strong source of power
- Increased access to renewable energy

PROJECT DETAILS

- 100 miles share corridor with existing transmission line right-of-way
- 50 miles share corridor with pipeline, railroad or other established right-of-way
- 45 poles removed from wetlands as part of final project design
- 36,000 wooden mats used in wetland construction
- 80 miles of wetland crossed
- ½ acre of total wetland footprint
- 130 separate acres of shrub wetland will be converted to forested wetlands as part of Army Corps of Engineers permit



LOCAL COMMUNITY SUPPORT

- \$62 million to communities over 40-year life of project
- \$19 million to landowners for easements

COMPLIANCE

- 10 federal and state permitting agencies
- 70 permitting conditions
- 4 minor environmental violations
- 0 environmental fines

SAFETY

- 3.2 recordable incident rate for the Occupational Safety and Health Administration

CHAPTER 1:

New Capabilities

“Before this project was built, no businesses could come to this area because they needed strong, consistent power that we didn’t have. Now several businesses are taking a good look at the area, some are staying and they’re employing people.”

Rob Lester, supervisor, Washburn County Board

“We have some large industrial customers in the Rhineland Loop that are very susceptible to voltage swings. In the old days they were bumped a lot. Since the line came in we have steady-state voltage and we don’t get a lot of the complaints we had in the past.”

**Neil Hermus, superintendent, Distribution Operations,
Wisconsin Public Service Corp., Green Bay, Wis.**



What does the Arrowhead-Weston project do for me?

CHAPTER 1: New Capabilities

WHAT DOES THE ARROWHEAD-WESTON PROJECT DO FOR ME?

Reliable electricity. Support for economic expansion. Lower-cost power. Better access to green power. All are benefits of the Arrowhead-Weston transmission line. The Arrowhead-Weston power line and Stone Lake Substation have brought numerous tangible benefits to the local area, the state of Wisconsin and the Midwest region. This chapter outlines in detail the many benefits to electric system reliability realized by the Arrowhead-Weston project.



Greater ability to deliver power across northern Wisconsin

Often referred to as “transfer capability,” the Arrowhead-Weston transmission line brings in about 600 megawatts of electricity, enough to power a minimum of 250,000 homes. On average, Wisconsin generates about 85 percent of the electricity it uses and imports the rest. As a net importer of electricity, transfer capability is critically important in meeting the state’s electricity needs.

“The opposition said this line was for southern Wisconsin; the reality is that the Rhinelander Loop and the Wausau area saw big benefits from the project. The system around us was so vulnerable. On hot days we had a really tough time keeping voltages up in central Wisconsin, and we have seen a huge improvement from a reliability standpoint.” – Neil Hermus, superintendent, Distribution Operations, Wisconsin Public Service Corp., Green Bay, Wis.

Greater opportunities to perform maintenance and reduce operating costs

Before Arrowhead-Weston was energized, northern Wisconsin and the state as a whole were limited to a single high-capacity transmission connection to western states called the Eau Claire-Arpin transmission line. In 1999, it was classified by the federal government as the second-most constrained transmission system interface in the country, which made maintenance work problematic. Ordinarily transmission lines are taken out of service for maintenance work. When the transmission system is operating at the limits of its capabilities, high demand for power and lack of capacity on the underlying system severely hamper maintenance programs.

As a result, costly measures were often needed, such as staging maintenance so that the line could be re-energized at any moment with a few hours notice, starting and finishing work on weekend nights when demand was lower, and using helicopters to make repairs while the line remained energized. These efforts required long planning lead-times with neighboring utilities and increased personnel risks and costs.

Immediately after the Arrowhead-Weston transmission line was energized, the Eau Claire-Arpin power line was taken out of service for over three weeks to perform much needed maintenance work including a major pole and insulator replacement project. It was the first time in more than a decade that an outage of that length could be scheduled.

With Arrowhead-Weston energized, ATC and its utility partners are now able to schedule maintenance when it's needed with less planning, lower risk of outages and lower costs. Upcoming maintenance costs in the area will be reduced by \$1.2 million on a single project because Arrowhead-Weston can support demand while another line is de-energized.

“The regional pressure to keep our single tie to the west, the Eau Claire-Arpin line, in service was intense. We planned for months and sometimes years in advance to take that line out of service to perform a few hours or days of maintenance work.” – Jeff Haas, control center leader, Xcel Energy, Eau Claire, Wis.

“Planned outages on the Eau Claire-Arpin 345-kV line used to have significant impacts on our system not only in western Wisconsin, but also in southeastern Minnesota. With the addition of Arrowhead-Weston, system reliability is now maintained.” – Bob Roddy, team leader, Transmission Security, Dairyland Power Cooperative, La Crosse, Wis.



Reliable service is maintained during system outages and events

Before Arrowhead-Weston was energized, transmission system outages, whether planned for maintenance or unplanned, had the potential to threaten reliable electric service. Before Arrowhead-Weston and the Weston 4 generating unit came on line in 2008, demand for electricity so fully utilized the available capacity that during a maintenance outage, a single equipment failure could at times have resulted in a blackout. With a second high-capacity transmission line in place in western Wisconsin, reliable service is unlikely to be threatened in the event of planned outages, weather events or equipment failure.

“One of the big benefits is that we’re not doing fire drills every time Eau Claire-Arpin goes out. Before the Arrowhead-Weston line came on, we had to go through all the iterations of load shed (blackout) planning and coordination, looking at interruptible curtailments, etc. It seemed we were always in that mode. Once the line came in, a lot of that went away.” – Neil Hermus, superintendent, Distribution Operations, Wisconsin Public Service Corp., Green Bay, Wis.



Northern and central Wisconsin receive strong source of power

Over the past 30 years, demand for electricity has roughly doubled while electric system capacity received only minor increases. As Wisconsin Public Service Corp. proposed, permitted and constructed its Weston 4 generating unit, Arrowhead-Weston was needed to deliver power from the plant. Similarly, the Stone Lake Substation serves as an “off-ramp,” providing a strong source of power to Sawyer, Washburn and surrounding counties.

“The biggest concern for us was the reliability of the electric system. We have large industrial users here that are very sensitive to receiving the correct voltages and they were very concerned.”

– Dave Ross, mayor, Superior, Wis.

“Since the Arrowhead-Weston line and Stone Lake Substation have been energized, the voltage in the area is rock-solid. It’s provided a very strong and stable source of electricity to the local area.”

– Dave Dahlberg, vice president, North Central Power Co., Grantsburg, Wis.

“We serve five cooperatives in the area supported by the Stone Lake Substation. Reliability has improved by adding a strong source of power in northwestern Wisconsin.”

– Bob Roddy, team leader, Transmission Security, Dairyland Power Cooperative, La Crosse, Wis.

Lower power losses: system delivers power more easily, carbon emissions reduced

Just as a fuel-efficient car can travel the same number of miles using less energy than a standard vehicle, high-voltage transmission lines like Arrowhead-Weston can deliver electricity more efficiently than lower voltage or heavily loaded transmission lines.

In simple terms, on higher voltage power lines the wires do not get as hot, which results in substantially lower electricity losses in the process of moving power into communities. We estimated the savings from the Arrowhead-Weston project alone at roughly 35 megawatts, of on-peak usage on neighboring systems in 2008. These reduced losses over the 40-year life of Arrowhead-Weston equate to:

- **5.7 million megawatt hours of electricity** are **saved** (enough to power 13,000 homes each year).
- **5.3 million tons of CO₂ emissions** associated with producing lost energy are **eliminated**.
- **The equivalent of a 40-megawatt generating plant not having to be built** to serve peak demand.



The savings from *all* of our transmission line projects placed in service by summer 2007, compared with the transmission system as it was in the summer 2001, are roughly three times the figures above, over the 40-year project-life. Arrowhead-Weston, which was energized in 2008, generated additional savings mentioned above.

“Our investment may be one of the largest energy savings programs in the Upper Midwest.”

– José Delgado, president and CEO, American Transmission Co.

A complete list of ATC’s major transmission line projects completed since 2001 is in Appendix B on page 33. For more information on energy savings and carbon reductions, visit www.atcllc.com.

Why are energy losses reduced?

In simple terms, on higher voltage power lines the wires do not get as hot, which results in substantially lower electricity losses in the process of moving power into communities. Lower losses between the generation source and the delivery point mean a reduction in the electricity output needed to transport power and meet demand. If the generation source is a fossil-fueled power plant, the result is lower carbon emissions. Losses on ATC’s high-voltage network are relatively low at around 2.2 percent of energy carried.

Lower-cost power more accessible for utilities; savings accrue to ratepayers

The Arrowhead-Weston project has also allowed lower-cost power from the Midwest market to reach utilities and their customers throughout Wisconsin in larger volumes for the first time since the Midwest electricity market began operation in 2005. During its first year in service, ATC estimates that utilities in our service area purchased power for consumers for \$5.1 million less than would have been possible without Arrowhead-Weston in service. Cost savings such as these are passed on to consumers under PSCW regulations. The present value of the estimated savings over the 40-year life of the project is \$94 million.



“On the generation side we’re less surprised by events on the system. In years gone by if we lost the Eau Claire-Arpin line, replacement power prices went crazy. Now that we have Arrowhead-Weston as well as Weston 4, we aren’t seeing big market swings. The price volatility has calmed down.”

– Neil Hermus, superintendent, Distribution Operations, Wisconsin Public Service Corp., Green Bay, Wis.

Congestion increases costs

Electric utilities today meet their customers’ demands by participating in an energy market spanning much of the Midwest. The market operates at the wholesale level, where utilities buy power for their customers at the lowest price while also selling power generated by their power plants. The pricing aspect of the market means that physical system limitations, such as heavily congested transmission lines that cannot move sufficient volumes of power to areas of need, result in increased costs. Weak areas of the electric system, where local, more costly generation must run for voltage stability or load-serving purposes, incur additional costs as well.

\$94 million in energy savings | Greater stability in energy prices

Greater access to renewable power

As more states enact renewable energy requirements, the transmission grid must transport green power to consumers, often from remote locations. Renewable energy must be generated where wind, solar, biomass or hydro resources are abundant, and tapping these resources requires regional transmission grid building and investment.

The Arrowhead-Weston transmission line is well situated to help bring in hydro resources from Canada and wind power from the Dakotas. In 2006, approximately 3.8 percent of electricity consumed in Wisconsin was generated using renewable sources of power, including wind, hydro, biomass, photovoltaic and other sources. Wisconsin utilities are required to increase the portion of electricity generated by renewable resources to 10 percent of electricity consumed by 2015. State policymakers are considering raising this requirement to 25 percent by 2025.

“Significant wind energy has come online in the Midwest since this project was energized. Without this line in place, much of this renewable electricity would have been trapped behind the congestion point at the Minnesota-Wisconsin border. With Arrowhead-Weston in place, we can move more wind and hydro power across the Midwest.”

– Dede Subakti, manager, Regional Operations Engineers, Midwest ISO

“We should be saying, ‘solar, wind, transmission,’ in the same breath. Transmission needs to be on equal footing and of the same stature as renewable forms of energy because we won’t reach our goals without it.”

– State Representative Phil Montgomery, current member and former chairman, Assembly Energy and Utilities Committee



Renewable power use must grow from 3.8 percent to 10 percent

Adding capability to the regional grid

One of the benefits of the Arrowhead-Weston project is that in addition to solving the very real reliability problems faced in northern Wisconsin, it also adds capability and capacity to the Midwest system and makes the electric system more reliable and responsive to changing needs on the whole.

WHAT CAPABILITIES DOES IT GIVE US AND WHY ARE REGIONAL BENEFITS IMPORTANT?

The first reason regional benefits are important is that stronger regional connections allow the larger transmission grid to respond more nimbly to weather events like heat waves and cold fronts because power can move in greater volumes to areas of need. Further, the use of the most economic power can be maintained, which helps reduce consumers' electricity costs.

The second reason is that it's more efficient. A grid that is strong across several states allows an import-dependent state like Wisconsin to rely on regional power reserves. When a group of states can collectively pool and utilize their generation resources, then the amount of power reserves required can be reduced over time. In Wisconsin the PSCW is studying the feasibility of reducing the required power reserve margin from 18 to 15 percent. Over the long term, this means existing power plant capacity can last longer before new generation facilities are needed.



“Generation benefits one area nearby whereas transmission benefits everyone at both ends because it can be used to supply energy in either direction.”

– Dede Subakti, manager, Regional Operations Engineers, Midwest ISO

Project benefits extend beyond Wisconsin

In the past 10 years, once in June 1998 and again in September 2007, cascading failures disrupted the power supply across portions of the Midwest and Canada. Both of these events began with outages on major transmission lines in Minnesota and Wisconsin. Both resulted in a cascading effect that caused a large area in the upper Midwest and Canada to separate, or become electrically cut off from the eastern half of the U.S. Both resulted in significant blackouts, the first in western Ontario and the most recent in Saskatchewan affecting hundreds of thousands customers. *A detailed study by the disturbance analysis team coordinated through the North American Electric Reliability Corp. concluded that if the Arrowhead-Weston 345-kV line had been in service, the recent system separation (and related outage) would not have occurred.*

CHAPTER 2:

Benefits to local communities

“Marathon County [would like to use] a portion of the environmental impact fee to purchase land for county forest use. This land would be managed as part of our general county forest lands on a sustained yield basis following Wisconsin County Forest Statutes and Best Management Practices.”

**William Duncanson, director, Wausau and Marathon County Parks,
Recreation and Forestry Department**

“Our current town hall was an old school house originally, with no insulation, original windows and asbestos shingles. It is not very energy efficient or environmentally friendly to say the least. It is also very uncomfortable to work in for our board members and election workers during winter months. The Town Board feels it would best serve the public and environment to make these upgrades.”

Debra J. Van Den Heuvel, clerk, Town of Pershing

“The construction spending during a few winters we had with no snow were very much a boon to small businesses that were hurting when winter tourism was down.”

Dave Minor, president, Douglas County Chamber of Commerce

“We met our sales tax projections for 2007 in August, thanks to the construction spending in our area.”

Tom Stewart, supervisor, Douglas County



**What benefits accrue to communities
that host a transmission line?**



CHAPTER 2: Benefits to local communities

WHAT BENEFITS ACCRUE TO LOCAL COMMUNITIES THAT HOST A TRANSMISSION LINE?

Direct compensation, construction spending and more reliable electricity support communities' economic development.

COMPENSATION TO LOCAL COMMUNITIES

Under Wisconsin law, counties and municipalities through which new 345-kV transmission lines like Arrowhead-Weston pass receive initial and annual impact payments. These payments were originally targeted to environmental improvement projects, but at the request of the towns and municipalities, the law was changed to encompass any project deemed to be in the public interest. Compensation to communities from the Arrowhead-Weston project totals \$62 million over 40 years. In addition, the counties and towns in which substations are expanded receive annual payments from state-utility-shared revenue.

Excerpts from correspondence with the PSCW show a variety of community projects supported by power line payments, including improvements for local parks, town halls, recreational facilities like bike trails and boat landings, land purchase for county forests and nature centers, as well as road and public safety improvements.

In addition, the Chippewa County Board used \$100,000 of its funds to purchase Kempers Woods, and Sawyer County recently allocated \$80,000 for developing a number of projects along the Tussock Trail. The funds are designated for restroom facilities, blacktop for parking lots and an ATV trailhead. Marathon County used a portion of its impact fees for its county forest. More information on these payments is contained in Appendix A on page 32.

"The purchase of emergency radio and warning equipment would help ensure that emergency services are dispatched promptly, which would benefit from the uniform addressing system signage to direct emergency personnel to the correct location. The window replacement would enhance energy conservation and help preserve the historical portion of the courthouse."

– Bruce Strama, Taylor County clerk

"I view ATC as part of the community. We are very grateful for your help in being part of the historical society project by moving the train depot. And Bass Lake has not had to raise the tax levy since the power line came here."

– Rob Lester, supervisor, Washburn County Board



\$62 million paid to communities over 40 years

ECONOMIC IMPACT OF CONSTRUCTION

The money spent on the Arrowhead-Weston project generates jobs in two ways: the direct employment of vendors paid in connection with the project, and the jobs that result from the economic activity of the people who worked on the project. ATC used local contractors for construction work where possible. A portion of the workers' spending is also subject to state sales taxes and as a result, county and state governments receive increased tax revenues during construction as well.

ATC commissioned a study to estimate the economic ripple effects from its construction spending as a way to quantify the project's overall economic impact. This ripple effect, often referred to as "indirect effects," examines the outward flow of spending from the initial workers and vendors who receive direct payments from ATC.

NorthStar Economics, which prepares economic studies for a variety of government, non-profit and business organizations, estimated several benefits of ATC's construction spending on Arrowhead-Weston, including:

- 2,560 jobs generated or supported
- \$9.5 million in tax revenue generated
- \$464 million total economic impact
- \$1.45 returned for each dollar spent on the project

"There's no question some of those businesses would have gone under without the spending from the construction workers from the pipeline and power line projects."

– Mike Bobin, supervisor, Washburn County Board

We utilized the following contractors in the field during 27 months of construction.

- Olinick, Ladysmith, Wis.
- Superior Redi Mix, Superior, Wis.
- County Materials, Marathon, Wis.
- Northern Clearing, Inc., Ashland, Wis.
- Thomas and Betts, Hager City, Wis.
- Natural Resources Consulting, Cottage Grove, Wis.
- Border States, Green Bay, Wis.
- STS Consulting, Duluth, Minn.
- JZ Environmental, Metamora, Mich.
- MJ Electric, Inc., Iron Mountain, Mich.
- Tri-State Drilling, Inc., Minneapolis, Minn.
- Power Engineers, St. Louis, Mo.
- PAR Electric, Inc., Kansas City, Mo.
- Kenny Construction, Inc., Northbrook, Ill.
- Alcan Corp., Atlanta, Ga.



\$9.5 million in tax revenue | \$1.45 returned for every construction dollar spent

CHAPTER 3:

Environmental protection, restored corridor

“ATC’s overall responsiveness and attentiveness to our concerns was very good.”

**Jeff Schultenover, chief environmental construction inspector,
Public Service Commission of Wisconsin**

“It was a good process with good people involved. The relationship we had was fantastic. Your environmental contractors called our site workers sometimes daily and included them in everything that was going on. You were timely in everything we requested. I don’t think there’s anything you could have done better.”

**Chuck Carlson, district ranger, St. Croix Scenic River Way
and Namekagon River, National Park Service**

“I appreciate the professionalism of ATC staff above all else.”

Tom Peterson, Washburn County forester

“We’re a small utility and we appreciated your working with us to avoid power interruptions during construction.”

Dave Dahlberg, vice president, North Central Power

“Between ATC and WPS I think there was great oversight on safety. Our members worked a lot of hours under tough weather conditions and we didn’t have any significant lost time injury. That’s amazing in terms of the number of hours worked.”

**Forrest Ceel, president, International Brotherhood of Electrical Workers,
Local 2150**



How did ATC avoid and minimize the effects of construction?



CHAPTER 3: Environmental protection, restored corridor

HOW DID ATC AVOID AND MINIMIZE THE EFFECTS OF CONSTRUCTION?

Leaving the land in as good or better condition than we found it was a top priority for us during the 27 months of construction. We also worked extensively with all of the local utilities to keep the lights on during construction, which required major facilities to be de-energized and challenged the electricity supply. We will continue to perform environmental monitoring in sensitive areas for three years after completion of construction. The line was energized in January 2008.

“You hired someone who would tell you each day at the end of the day how you did environmentally and what you needed to fix. To me that’s where it hit the road. You proved yourself.”

– Roger Luce, president, Marathon County Chamber of Commerce

Environmental oversight

We worked with state and federal regulators for 72 months – or 6 years – to address a variety of concerns for the environment. Ten state and federal agencies attached more than 70 permit conditions to this project, and additional agreements, easements, licenses and other approvals had to be negotiated with eight counties, 45 towns and municipalities, 800 landowners and several other utilities.

More than 75 percent of the line shares the same corridor with other infrastructure, such as existing transmission lines, pipelines, roads or railroads. Roughly half of the project, more than 100 miles, was re-built on existing transmission line right-of-way. This design utilized lands that already had been in use and minimized the impact on new land. Nonetheless, much of the corridor had environmental sensitivities that had to be protected.





Wetland protection

To create a stable working area in wetlands, we utilized 36,000 protective mats (equivalent to 29 miles) and performed construction in winter months to make greater use of ice roads and to avoid impacts to plants and animals. We removed 45 structures intended for wetlands from the original design and, where possible, moved other structures to the edge of wetlands. In inaccessible areas we installed ladder hooks to facilitate helicopter maintenance, reducing the potential for future ground disturbance. We also used hundreds of clear span bridges to cross navigable waterways. Although the project crossed 80 miles of wetlands, the aggregate footprint of all structures remaining in wetlands is less than one-half acre. Finally, in cooperation with the Wisconsin Department of Natural Resources, we are in the process of restoring and converting 120 acres of shrub wetlands in Douglas County to a wooded wetland system historically found in the area. Portions of the wetland will be restored by removing fill material created by the railroad grades. These improvements will result in improved recreational and educational opportunities for the local community.

Enhancing habitats for birds

We removed the existing transmission line from the bird sanctuary in Marathon County and routed the double circuit transmission line around the area. We installed bird diverters on poles and wires at many river crossings to prevent collisions and discourage nesting in hazardous areas. When we found osprey nests on structures, we installed platforms in the area for safe future use.



36,000 wetland mats used | One-half acre total wetland footprint

River crossings

At the Namekagon River, pictured right, the route we proposed for the transmission line shared the crossing with a railroad, existing transmission line and pipelines. The National Park Service conducted a detailed evaluation of the river and a crossing's impact on water quality, wetland, fishery, vegetation and wildlife, scenic and visual impacts, and recreational use. Ultimately, the NPS and ATC agreed to use high-tension conductor and a long-span crossing. By doubling the space between poles across the river from 800 to 1,600 feet, the poles could be set back so they would not be visible by canoe from the river. ATC also agreed to consolidate the number of wires crossing the river from 12 to six and set up an endowment to take care of other properties along the river.



At the Black River in Clark County we agreed to avoid the communities of Owen and Withee as well as the Sportsman Lake Wildlife areas. We also designed structures to carry both the existing Xcel power line as well as the Arrowhead-Weston line and avoided a second crossing of the Black River.

“You were transparent and helpful in bringing technological solutions to the table. You could have hard-balled it and worn us down, but you didn’t do that. Between the pole setbacks, the removal of other power lines and the establishment of the endowment fund to improve other properties along the Namekagon River, we were able to see that our concerns were addressed.”

– Tom Bradley, former superintendent, National Park Service



75 percent of the project follows a power line, pipeline, road or railroad.



Compliance and safety

Throughout the 27 months of construction, we had only four minor environmental violations that were immediately remedied. They did not result in enforcement action or fines by the DNR or other regulatory agencies.

The safety and health of everyone working on the Arrowhead-Weston project was of paramount importance. The nature of the construction work, the extreme weather and the variable terrain all contributed to potentially hazardous conditions. A culture of safety was reinforced with crews beginning each work day with on-site discussions about area conditions, work characteristics, and identification of any potential hazards. If an

incident occurred, a “stand down” was declared and work in all areas stopped until a review of the incident and lessons learned could be conducted with all crews. At regular intervals, senior executives from the contractors and utilities met with all field personnel to express their commitment to working safely. The project had a 3.2 recordable incident rate under Occupational Safety and Health Administration regulations, which is very close to OSHA’s “world class” incident rate of 3.0.



“It is a credit to the entire construction team that the incident rate was very low.”

– Mike Rowe, vice president, Construction, American Transmission Co.

Care taken on agricultural lands

In working with farmers on agricultural land, ATC hired agricultural inspectors to inventory all agricultural assets and concerns specific to each parcel. Our process involved working with the property owner and developing site information, field assessments and a construction plan for the property addressing cost, implementation and inspection.

To help address agricultural issues, we developed alternative fencing arrangements in livestock pastureland to exclude livestock from the right-of-way prior to and during construction operations. We also made arrangements to prevent field-applied manure from reaching the right-of-way and ensured that our construction practices would not mix topsoil with subsoil nor cause soil compaction. We also worked with farmers to assess and pay for crop damages caused during construction. Where possible, we improved field roads with gravel, used soils removed for pole foundations to make cattle mounds and moved poles to the edges of property lines. We used a single-pole structure design to facilitate cultivation right up to the base and reduce the footprint to roughly 20 square feet. Agricultural support costs from the project totaled roughly \$2.5 million.



“ATC developed an agricultural inventory assessment process and made a concerted effort to use it in meeting with every farmer so they could find out what their concerns were and address them.” – Dick LaCroix, ATC agricultural inspector, Arrowhead-Weston project

\$2.5 million in agricultural support | Pole footprint 20 square feet

Negotiations with landowners

The project impacted roughly 800 landowners over 220 miles. In addition to paying fair market value based on appraisals for easements, we worked with landowners to address property-specific concerns, leaving cut wood stacked for property owners at their request. We put structures along property lines where possible, replaced fences if we had to take them down, fixed drainage systems if the drain tile was broken during construction and controlled for invasive species. We applied herbicides with permission. Approximately 15 percent of the properties affected began the condemnation process and most were settled prior to a hearing.



“Your company and the workers you hired communicated environmental information to property owners and detail on how the work would be done, which speaks to your ethics. ATC provided me with gated fencing and helped me develop wildlife food plots. I don’t think there’s anything that we asked for that you didn’t deliver on.” – Butch Johnson, impacted landowner and president, Johnson Timber, Hayward, Wis.

Protecting electric service during construction

Every transmission line in the area rated at 115 kV or higher had to be taken out of service multiple times to allow construction of the Arrowhead-Weston transmission line. (When a new transmission line will share a corridor with an existing one, as in this case, the existing line must be de-energized in segments so it can be moved to the new structures.) With key facilities out of service during construction, the already strained transmission system was severely tested in keeping the lights on.



As a result, the Arrowhead-Weston project required an unprecedented level of coordination among the 10 area utilities to ensure that reliable electric service could be maintained during the outages. Over the course of the project, more than 70 outages of transmission system equipment were needed, and these had to be coordinated carefully with the operation of the Weston Power Plant and other generation. In total, roughly 10,000 staff hours were needed to manage the process of de-energizing facilities for construction, coordinating them with other project work, performing reliability and system stability studies, devising reliability plans for maintaining service and preventing outages in case of unexpected events.

800 landowners | \$19 million in easement payments

“As the project stretched out over the years, the need for the project continued and the system constraints kept growing making it more complicated to schedule the outages we needed.”

– Brad Perrett, supervisor, System Operations, Minnesota Power

“When the electric system is stressed, the people who work on it are part of that stress. They are called out day or night, and the work is tougher and riskier when the system is not up to date.”

– Forrest Ceel, president, International Brotherhood of Electrical Workers, Local 2150

Taking extraordinary steps: The superconductor story

If you’ve ever been in a house where the startup of the refrigerator caused the lights to dim, you’ve seen a micro-version of a low-voltage situation. In northern Wisconsin, with a 69-kV line de-energized for construction, the startup of pumps at Enbridge Pipeline caused voltage dips in the surrounding area. Low voltages can cause lights to dim, motors to stall and harm to computers and other sensitive electric equipment.

ATC, Xcel Energy and North Central Power worked for two weeks to come up with a solution. After a new outage schedule and capacitor bank didn’t solve the problem, ATC brought in a huge momentary electricity storage battery referred to as Distributed Superconducting Magnetic Energy Storage. The DSMES boosted voltages during the pump starts so that customers in the surrounding area would not be affected. The DSMES also avoided a costly delay and the impacts of building a temporary transmission line, which would have been impossible given the tight time constraints of bringing both Arrowhead-Weston, and by extension the Weston 4 generator, in service on time.



“During construction, the whole system was rocked by the Enbridge Pump Start. Putting in the DSMES mitigated the effects on our system.” – Dave Dahlberg, vice president, North Central Power

Ahead of schedule, within budget: reviewing project management

In December 2003, the Arrowhead-Weston project was approved for the second time by the PSCW with a total budget of \$420.3 million. The PSCW allowed a contingency of up to 5 percent on the total budget. There were significant challenges to overcome in ensuring that the total project cost, when completed, would be within the approved amounts. Those issues included: increased prices of steel, concrete and fuel; increased demand for construction workers; and an unprecedented need for construction mats. All levels of the project team made a significant, pro-active effort to focus



on managing the budget within the approved levels. Some of those actions included strict controls on cost and purchasing decisions implemented by ATC, Wisconsin Public Service Corp. and Minnesota Power.

MAJOR COST CONTROLS INCLUDED:

- Auditing of costs during construction
- Establishing direct supervision of all costs across the project
- Establishing a rigorous schedule and cost review and control process, which included monthly review of budget, schedule, trends and risks

STRATEGIC PURCHASING DECISIONS INCLUDED:

- **Steel poles:** We established a firm construction schedule that allowed the vendor to lock in material costs, which saved significant costs when steel prices rose.
- **Construction mats:** Mats created a stable work area minimizing environmental impacts caused by construction in wetland areas. Early in the construction phase, it became apparent that a large supply of construction mats would be needed to ensure proper mitigation. It was also understood that construction mats would have a useful life, well beyond their use on the Arrowhead-Weston project and could be used on other ATC projects. As a result, ATC purchased 36,000 mats and allocated a portion of the cost to the project based on their useful life.
- **Bidding:** To ensure reasonable construction costs, we asked for bids for each section of the line. This effort resulted in a more detailed understanding of the components and assumptions that comprised the bid and ultimately led to a reduced cost for each segment.

The final cost of the Arrowhead-Weston project was \$436 million or 3.86 percent above the reauthorized amount and within the 5 percent contingency. In addition, the construction was completed nearly seven months early and energizing of the project was completed four months ahead of schedule in January 2008.

“Everyone felt from the start that this project was headed toward being over budget, not on schedule and wrought with problems. Then there were significant management controls put in place by Wisconsin Public Service Corp. and ATC, and we came in ahead of schedule and within budget and finished the project successfully.” – Dave Harpole, vice president, Energy Projects, Wisconsin Public Service Corp.

CHAPTER 4:

Lessons learned and applied

“The Arrowhead-Weston project could not have gotten off to a worse start.”

Dave Minor, president, Superior Chamber of Commerce

“Based on six years of talking to thousands of people, I honestly believe it [civil disobedience] will happen. It’s not something I advocate, but I do believe it will happen.”

**Tom Kreager, president of opposition group
Save Our Unique Lands, DNR hearing, 2005**

“The mayhem we expected did not materialize.”

Tom Dalbec, Douglas County sheriff

“They’re beyond it now. The opposition painted a picture that was so terrible. Now people wonder what all the fuss was about.”

Dave Minor, president, Superior Chamber of Commerce

“I can’t recall seeing one ‘no line’ sign on your transmission line project going east from here. There’s been no uproar at the county level or at the town level.”

Roger Luce, president, Marathon County Chamber of Commerce



How are ATC's major projects going?

CHAPTER 4: Lessons learned and applied

HOW ARE ATC'S MAJOR PROJECTS GOING?

At ATC we view power line siting as an ongoing process that depends heavily on a continuous public discussion about our projects with a broad group of stakeholders: landowners, local officials, environmentalists, advocacy organizations, regulators, the media and others. We believe that up-front communication is critical for successfully completing transmission line projects. To that end, we designate one to three years, depending on the size and nature of the project, to public communications and outreach before we submit a proposal for regulatory review. For new right-of-way projects, we involve the public heavily in our process of route evaluation and selection. During the outreach process our project teams meet numerous times with these stakeholders to discuss the project and its development process. We catalog the input we receive and include all public comments in our regulatory filing.



“The difference is night and day with the context among landowners on ATC’s two projects to the west and the east. We’ve heard not one ‘boo’ from the County Board about your transmission line projects to the east. Over here to the west [with the Arrowhead-Weston project] it was about being victimized by a big corporation and over here to the east [with the Central Wisconsin project] it’s about a community need.” – Brad Karger, Marathon County administrator, Wausau, Wis.

“As anyone involved in power line siting can tell you, those who will benefit from a project will generally, with adequate facts and time to digest them, accede to tolerating the construction and bearing its cost. It essentially becomes a matter of communication. However, if those who must bear the impact — either of the costs or the physical presence, or both — of the line do not perceive that they receive some commensurate benefit, then transmission proponents face a determined opposition in public decision-making processes.”

– José Delgado, president and CEO, American Transmission Co.

Other 345-kV projects underway

ATC has several other 345-kV transmission line projects either completed or underway.

1. North central Wisconsin – *under construction*

We are currently constructing two 50-mile, 345-kV transmission lines to bolster the grid and deliver increased output from Wisconsin Public Service Corp's new 500-megawatt addition to its Weston Power Plant south of Wausau. Our staff held 38 public "open house" style meetings in the project area over a three-year period and met with dozens of local officials. Both projects were approved in June 2006 by the PSCW with minimal opposition. Construction is currently 80 percent complete and these transmission lines are scheduled to be energized in December 2009.

2. Rockdale-West Middleton – *under review*

Our proposal for a 345-kV transmission line in Dane County is currently under review by the PSCW. In addition to roughly a three-year period of public outreach and route evaluation, we took the unprecedented step in 2004 of sponsoring the Energy Initiative, a year-long technical review of our engineering need studies by non-profit environmental and utility advocacy organizations. The need for the project was generally accepted during the 2004 review and acknowledged in the PSCW's draft Environmental Impact Statement. Many citizens and organizations are also participating in the PSCW's routing, siting and review processes.

The proposed project, which will serve multiple reliability functions, involves constructing approximately 32 to 55 miles (depending on route) of new 345-kV transmission line to connect the Rockdale Substation located in eastern Dane County with the West Middleton Substation west of Madison. It is expected to be in service in 2013.

"Arrowhead-Weston was the first project to be looked at under the 360-day PSCW review, and it created problems for people that wanted to get involved. In contrast, ATC voluntarily, three years in advance of its regulatory filing, sponsored a technical review of its Dane County projects for environmental and ratepayer advocates. People may not have liked what they heard, but it gave them the opportunity to become involved much earlier in the process in a way that the law doesn't allow." – Steve Hiniker, executive director, 1000 Friends of Wisconsin



3. Paddock-Rockdale, the economic project

– *under construction*

Construction began in fall 2008 on a 35-mile, 345-kV transmission line on existing rights of way linking the Rockdale Substation in Dane County with the Paddock Substation in Rock County near the Wisconsin-Illinois border. The Paddock-Rockdale project is the first transmission line in the Midwest ISO’s footprint to be justified on economic savings rather than system reliability concerns. Construction is expected to be completed in spring 2010.



4. Columbia-North Madison – completed

In 2006 we placed in service a new 17-mile, 345-kV transmission line running from the Columbia Power Plant near Portage into northern Dane County. Built on an existing double-circuit transmission line, we upgraded the capacity of one of the existing transmission lines, rated at 138 kV, to 345 kV.

5. Wempleton-Paddock – completed

In 2005 we placed in service a second 345-kV circuit to existing structures on 15 miles of a critical transmission line at the Wisconsin-Illinois border. It was the first interstate 345-kV tie to be added in decades.



114 substations upgraded | 15 new substations built

Appendix A: Compensation to communities for 345-kV transmission line construction

In 1999 the Wisconsin legislature passed legislation which provides for both a one-time and an annual impact payment to counties and municipalities directly impacted by the construction of new 345-kV transmission lines. The funds can be spent for projects deemed in the public interest, ranging from environmental preservation to municipal service upgrades to road improvements.

The amount of payments is based on the total cost of the project as determined by the PSCW. The PSCW determines the allocation to each county and municipality based on the number of miles of new transmission line in their jurisdiction. The Wisconsin Department of Administration collects the funds from ATC and distributes it to the counties and municipalities. The amounts listed below are approximate.

One-time payment to all affected counties and municipalities

The aggregate amount of this payment is set at 5 percent of the total project cost and allocated amongst impacted municipalities as well as counties based on the number of miles of new transmission line in each. The allocation of this fee is split 50/50 between the county and all of the municipalities. The one-time payments totaled \$17.8 million for the Arrowhead-Weston project.

Annual payment assuming 40 years to all affected municipalities

The annual payment is set at 0.3 percent of the total project cost and it is allocated to the municipalities based on the number of miles of the new transmission line located in each municipality. This payment remains at the same level each year. Using the 40-year accounting life of a transmission line project, as an example, the total amount of annual fees paid would exceed \$42 million.

State-utility-shared revenue paid annually to municipalities and counties

In addition, the counties and towns where substations are upgraded receive additional money from utility-shared revenue. The amount is based on the cost of new construction at each of the substations, with future annual payments based on a depreciation rate set by the PSCW. These payments are reduced over time as the asset depreciates.

The payment is also split under state law with the towns receiving three mills and the county receiving six mills. The funds can be used as the county or town chooses just as with other shared revenue payments. The DOA distributes the funds on the same schedule as other shared revenue payments.

Easement payments for public land use to several counties

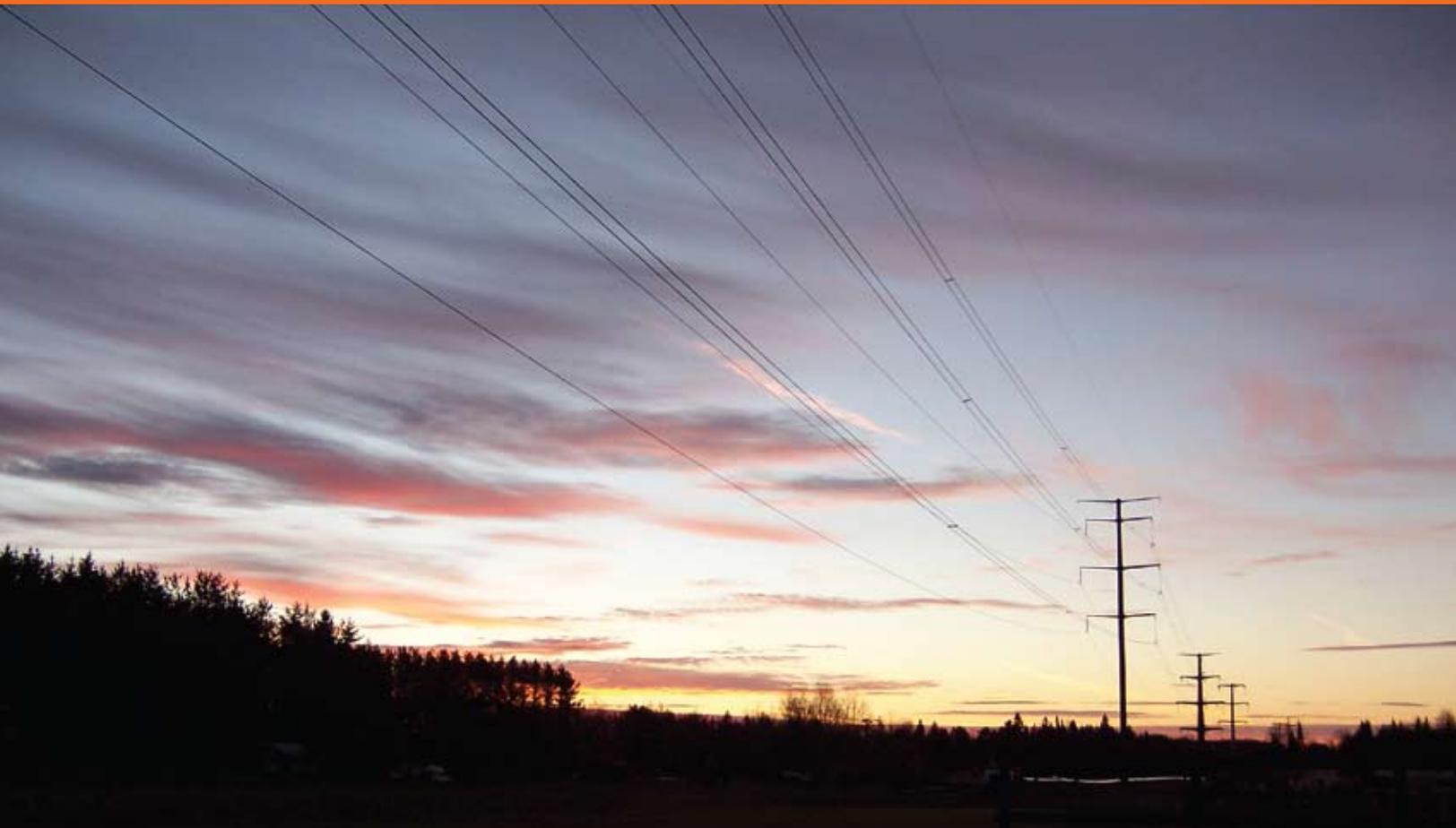
Marathon, Rusk, Washburn and Douglas counties and the Marathon School District received one-time payments for easements and other considerations on publicly owned land. The easements were expansions of previously existing power line right-of-way. These were one-time payments to be used as the public entity chooses. Private landowners were compensated as well.

Payment type	Amount	Annual	Recipient	Total paid over 40-year project life
One-time impact fee	\$17.8 million	No	Counties and municipalities	\$17.8 million
Annual impact fee	\$1.07 million	Yes	Municipalities	\$42 million
Utility-shared revenue	\$300,000	Yes	Counties and municipalities that host substations	\$6 million
Easement payments	\$19 million	No	Individuals, counties or other public entities holding land needed for easements	\$19 million
Total				\$84.8 million

Appendix B: Completed transmission line projects since 2001

Since 2001, ATC has completed 351 miles of new line, upgraded 1,364 miles of lines, built 15 new substations and upgraded 114 substations.

Arrowhead-Weston	Built a 220-mile, 345-kV line between Wausau, Wis. and Duluth, Minn. to improve reliability.
Cranberry-Conover	Completed a new 138-kV transmission line between the Cranberry Substation south of Eagle River and Conover Substation east of Conover. Relieves costly constraints to the systems that serve northern Wisconsin and the Upper Peninsula of Michigan; strengthens local-area reliability.
Columbia-N. Madison	Increased voltage on a 17-mile existing transmission line running from the North Madison Substation west of DeForest to Alliant Energy's Columbia Substation located near the Columbia Power Plant.
Columbia-Rio	A new 9-mile, 69-kV transmission line from near the Columbia Power Plant to a substation near Rio.
Cypress Substation	ATC provided transmission interconnection for a wind generation facility constructed by We Energies, located in northeast Fond du Lac County. The entire wind farm consists of 88 turbines.
Dodge County	Completed 13 miles of new 138-kV transmission line connecting the Rubicon Substation near Neosho to the Hustisford Substation.
Duplainville (Waukesha-Sussex)	Built a new 9-mile, 138-kV transmission line between Waukesha and Sussex. The line connects to a new We Energies substation in Pewaukee (called the Duplainville Substation).
East Beaver Dam	Completed 1.5 miles of new 138-kV transmission line which serves a new Alliant Energy substation (Beaver Dam Substation).
Ellinwood-Sunset	Structure replacement along Hwy. 41 between the Ellinwood and Sunset substations in the Town and City of Oshkosh.
Femrite-Sprecher	Built 4 miles of new 138-kV transmission line connecting the Sprecher Substation, located near the Sprecher Rd./CTH BB intersection, with the Femrite Substation, located on Femrite Road near the I-90/USH 12/18 interchange.
Ford Drive Substation	Installed two line switches/poles and a line tap to New Holstein's new Ford Drive Substation.
Gardner Park-Hilltop	Rebuilt an 11-mile, 115-kV line to support addition of new generator at Weston Power Plant.
North Appleton-Lost Dauphin	Replaced structures on 138-kV line between North Appleton and Mason Street substations, and replaced structures on 138-kV line between North Appleton and Lost Dauphin substations.
North Appleton-White Clay	Increased line clearance on 30 miles of structures.
Paris-St. Martins	Upgraded 17-mile transmission line between the Paris Substation in Union Grove and the St. Martins Substation in Franklin.
Plains-Stiles	Rebuilt and upgraded 110 miles of 69-kV and 138-kV lines in Oconto and Marinette counties in Wisconsin, and Menominee and Dickinson counties in Michigan.
Plymouth-Johnsonville	With Plymouth Utilities, built a new substation and a 2.25-mile, 138-kV line to serve Johnsonville Sausage plant expansion.
Portage-Montello	Upgraded 11 miles of 69-kV lines between Portage and Montello.
Port Washington-Saukville	Upgraded two 5-mile lines connecting Port Washington with Saukville Substation. Supports new units at We Energies Port Washington Generating Station.
Rhineland Loop	Addresses low voltage/voltage collapse in the Rhineland area.
Sauk County	Increased capacity of 33 miles of existing transmission lines, upgraded six substations and built three new substations in cooperation with Reedsburg Utility and Wisconsin Power & Light.
Saukville-St. Lawrence	Rebuilt 19 miles of 138-kV transmission line from the Saukville Substation to the St. Lawrence Substation in Washington County.
Shawano East-West	Replaced horizontal post insulators (the ceramic piece that holds the wire to the structure and opposes the flow of electric current) on approximately 38 wood poles that were part of the 138-kV line constructed in the 1980s.
T-20 Phase 2 (Weston-Rocky Run)	Replaced the remaining structures and insulators, added new conductors from Weston-Northpoint and installed optical ground wire from Weston-Rocky Run.
Venus-Metonga	Built new 13-mile, 115-kV transmission line between Monico and Crandon, Wis.
Wempleton-Paddock	Added a second 345-kV line to existing 15-mile line between southern Rock County and northern Illinois.
West Towne-Fitchburg-Tokay	Constructed 6 miles of new 69-kV underground transmission line to connect the West Towne Substation and Fitchburg Substation to the new, MGE-built Tokay Substation.
Whitewater-Mukwonago	Upgraded 22 miles of transmission line between the Whitewater and Mukwonago substations.



“ATC’s narrowly constrained service area is bounded on two sides by Great Lakes. Since our formation in 2001, we have built or upgraded more than 1,700 miles of transmission line in a heavily regulated environment. A continuous public discussion about what we’re doing and why, along with clear ties between local needs and benefits have been important components of our success.”

– José Delgado, president and CEO, American Transmission Co.



Helping to **keep the lights on**, businesses running and communities strong



ATC is a Green Tier company, selected by the Wisconsin DNR for demonstrating superior environmental performance and continual improvement.

FOR MORE INFORMATION ON THE ARROWHEAD-WESTON TRANSMISSION LINE PROJECT OR OTHER AMERICAN TRANSMISSION CO. PROJECTS, PLEASE VISIT WWW.ATCLLC.COM