An Intelligent Transportation System Smart Grid

Location – USA

Project Introduction:

Marquette Avenue and Second Avenue South in Minneapolis, MN are being reconstructed between 1st Street South and 12th Street South. Both streets are being rebuilt from building front to building front. When the project is completed, the street will have two bus lanes and two traffic lanes (both operating in the same direction as they do today), wider sidewalks, new transit shelters, public art, more trees and more attractive landscaping and streetscaping. Several of the transit facilities will have real-time electronic departure information signs.

The number of buses operating in downtown is expected to increase significantly in the future, particularly as commuters continue to turn to mass transit to access the downtown business core. The dual transit lanes on 2nd and Marquette will:

- Dramatically improve the speed and reliability of bus service through downtown
- Add significant bus capacity in the downtown core
- Provide a more “legible” system for downtown commuters by consolidating express transit service into one north-south corridor
- Provide improved passenger waiting facilities, passenger security, passenger information systems, and passenger amenities
- Set the stage for the implementation of other downtown transit improvements

The MARQ2 project is the first of several projects that will reshape transportation in downtown Minneapolis, and it is the first major project to be constructed in the Downtown Transportation Action Plan, which was adopted by City Council in June 2007. When the MARQ2 project is completed, north-south commuter express buses will be moved from Nicollet Mall, 3rd Avenue South and other north-south streets to Marquette and 2nd. North-south commuter bus service will be much faster and more

reliable than it is today, and the number of buses on the Mall during the peak periods will be reduced by about 35%. At that time, bicyclists will be able to use Nicollet Mall 24 hours per day, 7 days per week. By the end of 2010, all buses operating on Nicollet Mall will be hybrid electric buses, resulting in a quieter, cleaner mall environment for pedestrians, shoppers and diners. The removal of express buses from other streets will also help traffic flow better on those streets.

System Requirements:

Lighting, signage and traffic signals in Minneapolis, as in many other locales, are the most numerable fixed assets of roadway infrastructures. Maintaining this equipment has long been a costly and arduous business.

Since these assets are exposed to the environmental extremes of Minnesota, traffic accidents, and occasional vandalism, they need to be strong and robust. Additionally, ongoing deterioration of this field-mounted equipment leads to increased maintenance costs, energy usage and system failures that can cause accidents or even deaths.

Traditionally, repairing inoperable roadway lighting components required visual confirmation of the problem. Typically, a passing motorist may report that a light or series of lights are out, or a pedestrian may report electrical leakages.

When a report of an issue occurs, a maintenance crew from the organization is normally dispatched for an inspection, which in turn, accumulates overhead, personnel, and vehicle maintenance costs. Sometimes, a second or third trip to the site may be necessary to complete repairs, incurring even more expenses.

Obvious costs related to these issues are oil changes, tire replacement, and the increasing cost of fuel. Less obvious, but equally notable are the environmental impacts of greenhouse gas emissions from the trucks, and the costs and environmental impacts associated with the disposal of waste oil, tires, and the service vehicle itself. Minneapolis faced many of these issues with their existing infrastructure.

Project Implementation:

- UNO-2171

System Description:

In light of these issues, the City of Minneapolis subsequently chose to take a proactive step forward, accomplished through the installation of an electrical infrastructure Smart Grid, compliant to US DOT Intelligent Transportation System standards, covering twenty-six city blocks throughout the downtown business and entertainment districts.

Among its many features, this Smart Grid system includes individual streetlight control and monitoring, and scheduling of each light. Revenue grade metering at each roadside electrical service cabinet is offered along with circuit based ground fault detection. Reporting functions automatically alert the appropriate personnel of system anomalies, including pole knockdowns, light outages and dangerous electrical leakage conditions.

The infrastructure data is conveyed to and from data logger computers, which reside in each service cabinet. Each data logger communicates back to the Public Works central office over a robust fiber ITS compliant backbone. At the Public Works Traffic Management Center (TMC), Strategic Telemetry's SmartLights™ software interprets and displays the information collected by the very robust Advantech UNO-2171 "data logger" embedded computers. Additionally, SmartLights™ sets the field operational parameters in the Advantech machines, including lighting dim levels, lighting schedules and alarm levels for the ground fault detectors.

Conclusion:

The result is that hundreds of streetlights, and dozens of roadside electrical service cabinets can be remotely controlled and monitored, in turn, saving energy, conserving the city's maintenance assets, and increasing safety to the vehicle operator and pedestrian alike. A significant added benefit is that payback of systems such as these can be in as little as five years.