STUDY SESSION
WINNETKA VILLAGE COUNCIL
510 Green Bay Road
Winnetka, Illinois 60093
Tuesday, July 10, 2012
7:30 p.m.

AGENDA

Emails regarding any agenda item are welcomed. Please email contactcouncil@winnetka.org and your email will be relayed to the Council members. Emails for the Tuesday Council meeting must be received by Monday at 4:00 PM. Any email may be subject to disclosure under the Freedom of Information Act.

1) Call to Order.
2) Discussion: Northfield Substation Transformer 2
3) Adjournment

NOTICE

All agenda materials are available at www.villageofwinnetka.org *(click Council and then Current Agenda)*, the Reference Desk at the Winnetka Library, or in the Manager's Office at Village Hall (2nd floor).

Videos of the Village Council meetings are televised on Channel 10 every night at 7 PM and on Channel 18 M-F-Su at 7AM or 7 PM. Videos of the meeting may also be viewed on the Internet via a link on the Village's web site: villageofwinnetka.org

The Village of Winnetka, in compliance with the Americans with Disabilities Act, requests that all persons with disabilities, who require certain accommodations to allow them to observe and/or participate in this meeting or have questions about the accessibility of the meeting or facilities, contact the Village ADA Coordinator – Kathie Scanlan, at 510 Green Bay Road, Winnetka, Illinois 60093, (Telephone (847) 716-3541; T.D.D. (847) 501-6041).

AGENDA REPORT

SUBJECT: **Northfield Substation Transformer**

PREPARED BY: Brian Keys, Director Water & Electric

REF: February 21, 2012 Budget Presentation

DATE: July 5, 2012

The Village's electrical distribution system is supported by three sources of power which include underground tie lines with ComEd, a Village owned substation, and generation equipment at the Electric Plant. During summer months when the electric system serves elevated loading, two of the three sources are required to meet the Village's electrical needs. Prior capital budgets for the Water & Electric Department have contemplated the installation of a second transformer at the Northfield Substation for capacity purposes. As outlined in the budget presentation, a second transformer would provide additional system contingency. In the FYE 2013 Electric Fund Capital Plan, the purchase of substation switchgear required to support a second substation transformer at Northfield has been proposed.

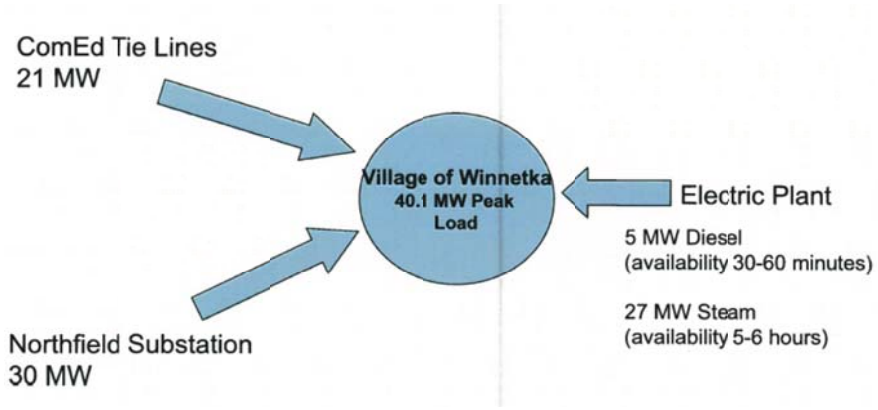
In 1996, the Village of Winnetka constructed the Northfield Substation to provide additional capacity for the Village's electrical distribution system. The substation is located in Northfield, near the New Trier West campus on Happ Road. The 30 megawatt (MW) transformer is connected to ComEd's transmission system. The transformer reduces the electricity from 138,000 volts to 12,470 volts for distribution on the Village's electrical system. The substation is located on property owned by the Forest Preserve with a lease that extends through 2056. This is the largest transformer owned by the Electric Department and no spare unit exists for the substation.

In addition to the substation, Winnetka has three 12,470 volt tie lines from ComEd. The lines were originally installed in the 1970's and originate from ComEd's Northbrook Substation. The interconnection point is a piece of switchgear located near the CarMax dealership on Skokie Boulevard. At this location, ownership and maintenance of the facilities transfers from ComEd to Winnetka. Winnetka has recently replaced their portion of the three underground lines with new cable. The cable lines exist in a common duct bank along Tower Road. Two lines terminate at the Village's South Load Center on Spruce Street and one line terminates at the Electric Plant.

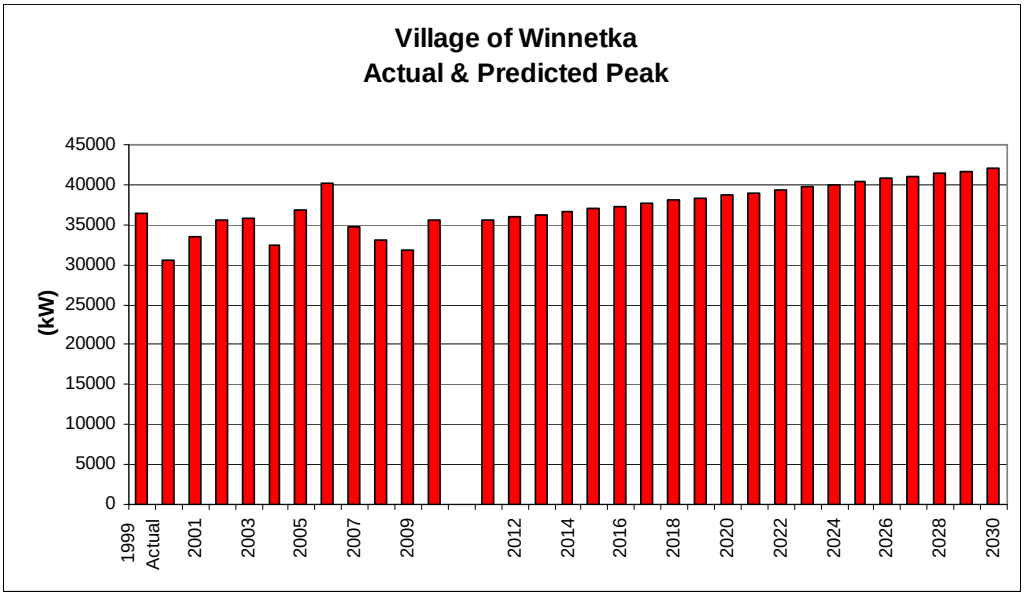
The third source of power is the Village's Electric Plant. Generation at the Electric Plant consists of two diesel generators and three steam turbines. The diesel units were installed in 1978 with a rated capacity of 2,500 kW each. Three steam turbines installed during the period 1948-1960 provide an additional 27,000 kW of capacity. These units are powered by steam

created by four boilers that are fired on natural gas. It takes approximately 5-6 hours to generate sufficient steam to operate the turbines.

A summary of the generation resources has been included in Exhibit A. Capacity sources are summarized as follows:



The electric system must have sufficient capacity to handle peak electrical demands. The historical hourly peak electric demand was establish in 2006 at 40.1 MW. IMEA's 2011 long term predicted peak for Winnetka's electric system is shown below. IMEA's predicted peak load forecast is based on a normal summer and the preceding peaks and growth.



It should be noted that Winnetka has experienced peaks in excess of 39 MW in both 2011 and 2012. During normal operation with load requirement of 39 MW, approximately 15 MW of load is provided by the tie lines and the balance is served through Northfield substation.

As currently designed and operated, the electric system has sufficient operating flexibility to cover the loss of its largest capacity source, the Northfield transformer. Estimated restoration

times for loss of the transformer are dependent on electrical demand on the system at that time. Load would be restored using tie lines and/or generation equipment.

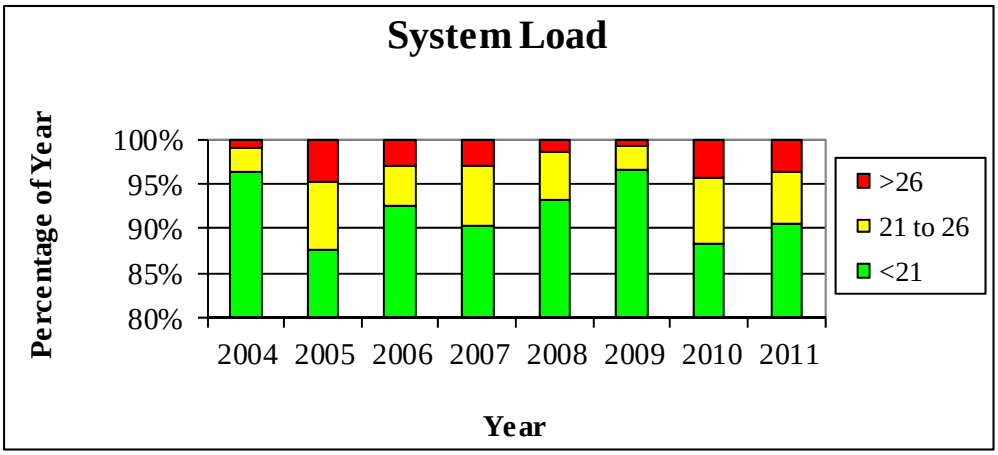
System Load under 21 MW: Plant Operator would utilize tie lines to restore load in less than 10 minutes.

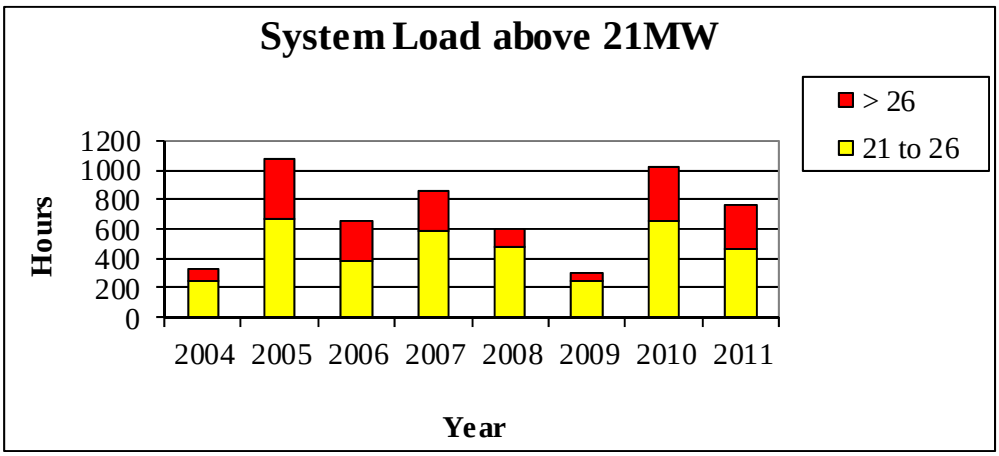
System Load 21.1 – 26 MW: Plant operator would utilize tie lines and diesel units to restore load in approximately 30-90 minutes.

System Load 26.1 - 41 MW: Plant operator would utilize tie lines, diesel units, and steam turbines to restore load. The estimated time for total restoration of all customer load is 5-6 hours.

Depending on the nature of the transformer failure and/or cause of a "trip", field repairs would be attempted at the substation. Lead time for these repairs would be measured in day(s). If the transformer failed catastrophically or could not be field repaired, industry inquiries to locate a used transformer would be utilized. Depending on the location of the unit, this could take multiple weeks to secure and install. Lead times for new substation transformers vary with market demand, but could take 38 weeks.

For a majority of the year, Winnetka's system load is under 21 MW. In 2011, system load was above 26 MW for 292 hours which equates to 3.3% of the year. This typically occurs during the period of June – September.





During those periods when system load is above 26 MW, an emergent transformer outage will result in extended outage restoration times. As noted earlier, it would take approximately 6 hours to start the steam turbines to provide a large amount of the replacement power.

Prior planning discussions have focused on a second transformer at the Northfield Substation for capacity purposes. Based on current system loading, the Village has sufficient capacity until system load growth approaches 50 MW. Other factors to be considered are as follows:

- What level of contingency should the system be designed to address?
    - Plan for the loss of the largest source (Northfield) or interconnection point (ComEd tie lines).
    - Spare transformer

- As peak system load gradually increases over time, there is increased reliance on the Electric Plant for system contingency. However, this increased reliance has substantial considerations.
    - Multiple hour time delay for availability of steam turbines.
    - If there is a generation equipment failure (i.e. 2009 #6 rotor failure, 84 days), it will require an extended repair time.

- Customer perception that the generating plant is immediately (or already) on-line and available.
    - Expectation for service reliability.

Positive benefits resulting from a second transformer at Northfield are as follows:

- Additional system capacity and/or in-service spare transformer.
- Reduction in the need to rely solely on the Electric Plant for system contingency and provides increased flexibility during abnormal events.
- Provides flexibility for future decisions related to the long term operations of boilers and steam turbines. Without additional capacity, any reduction in generation capability results in a reduction in overall system contingency.

Beyond the capital cost of the transformer and associated equipment, there are some drawbacks to installing second transformer at the Northfield site. A significant portion of the Village's substation capacity will be located at a single site. As such, events such as a tornado, transmission line events, and/or substation fire could impact both units. Alternatives that exist for providing additional capacity and contingency include the following:

- New substation site:
  No sites currently identified. In FYE2011, the Village pursued the purchase of another site located along ComEd's transmission lines as a potential future substation site. The site was not procured based on the preliminary environmental assessment and remediation costs. New substation site and associated duct runs estimated at $5M+.

- Additional 12.5kV underground tie line(s) from ComEd
  - 7 MW of capacity
    - Existing duct line from interconnect to Village limits has room for one additional circuit. Any additional circuits would require construction of a new duct line.
    - Annual Facilities Charges: estimated cost $54,700
    - Winnetka Construction Cost: estimated $450,000
    - ComEd Construction Cost: Unknown (Best "guess" ~$1M- $1.5M)

- Installation of additional generation
  - 2.25MW diesel unit: $650,000
  - Installation cost dependent on location
  - Requires environmental permitting

Northfield Substation Proposal:

The Northfield Substation was originally designed for two transformers. The transformer pad for the second unit was installed when the substation was initially constructed in 1996. In addition to the transformer, additional equipment such as switchgear and a capacitor bank are required. Modifications to the existing site are recommended to reduce the risk of a single event impacting both units. These include installation of a fire suppression system in the building and a fire wall in the transformer yard.

The total project cost for the second substation transformer at Northfield Substation is currently estimated at $2.2M over 4 years. A detailed breakdown of the estimated project costs has been included in Exhibit B. The project is currently budgeted in the Electric Fund's Capital Plan.

Northfield Substation – Capital Plan

	FYE 2013	**FYE 2014**	**FYE 2015**	**FYE 2016**
New Switchgear	$325,000			
Transformer (& associated site modifications)		$817,000	$643,000	
Capacitor Bank				$400,000

The proposed Capital Plan for the second transformer at Northfield Substation has been budgeted across four years due to the significant cost. This timeframe could be shortened or expedited based on financial considerations and desired levels of system contingency. Upon engineering design, manufacturing lead times for a similarly sized transformer were 34 -38 weeks in 2011. Staff is requesting authorization to initiate the development of a bid specification and obtain bids for the substation switchgear required for a second transformer at the Northfield Substation. In conjunction, staff would also submit an interconnection request with ComEd to determine any new requirements for the future transmission connection. Upon receipt of the bids, the award recommendation will be presented to the Council for their consideration. Installation of the

switchgear does not require the Council to automatically move forward with procurement of the transformer. However, if consideration for additional system contingency at another site is the preferred alternative, the procurement of switchgear should be tabled.

RECOMMENDATION:
Consider providing policy direction.

1) Approval for staff to proceed with development of a bid specification and to obtain bids for the switchgear.

2) Approval for staff to submit an interconnection request with ComEd for the future installation of a second transformer at the Northfield Substation.

Exhibit A

Electric Plant Generation Resources

- Diesels
  - Two 1978 units
  - Capacity: 2,500 kW each
  - Time required to place units on line with distribution system, approx. 30 - 60 minutes.
  - IMEA Annual Capacity Credit: $195,840

- Steam Turbines
  - Unit 4 1953 9,000 kW
  - Unit 6 1948 6,000 kW
  - Unit 7 1960 12,000 kW
  - Time required to place steam turbines on line with distribution system, approximately 6 hours.
  - IMEA Annual Capacity Credit: $1,291,200

- Boilers
  - Unit 4 1958 110,000 lbs./hour
  - Unit 5 1938 40,000 lbs./hour
  - Unit 7 1948 69,000 lbs./hour
  - Unit 8 1964 125,000 lbs./hour

Note: Capacity credits reduce the Village's wholesale power cost.

Exhibit B

		FYE 2013	FYE 2014	FYE 2015	FYE 2016
Switchgear	$325,000	$325,000			
Capacitor Bank	$400,000				$400,000
Transformer					
Professional Services	$15,000		$15,000		
Transformer	$850,000		$425,000	$425,000	
Special Design: Bushing & Impedance	$85,000		$42,500	$42,500	
Rigging and Filling after Delivery	$50,000			$50,000	
Crane	$5,500			$5,500	
Cable installation	$69,770			$69,770	
Fire Protection / Suppression	$200,000		$200,000		
Wall / Replace Exhaust Vents	$100,000		$100,000		
Relay Testing / Commissioning	$15,000			$15,000	
Contingency (5%)	$69,514		$34,757	$34,757	
	$2,184,784	$325,000	$817,257	$642,527	$400,000