

Capital/Revenue Investment Proposal – Summary  
**Strategy to Build Frankhauser 115:13.2kV Substation**  
**Transmission, Niagara Mohawk, Project No. C34427, C30744**  
(A strategy paper by Jeffery Maher/Sponsor Carol Sedewitz – 1/25/2010)

**Description**

The scope of this project is to construct a 115:13.2kV station on Frankhauser Rd in the town of Amherst to address thermal loading concerns, contingency outage exposure, and improve reliability on five distribution feeders and seven distribution substations. Upon the approval of this strategy paper \$300,000 will be sought through a separate DOA request for preliminary engineering of the transmission components of this project.

Category: **Policy-driven**

Risk score: **41, Reliability**

**Finance**

Strategy Cost (TxT and DxT)

**\$4.38m**

Probability that project cost will exceed 10% tolerance:

**NA**

Project included in approved Business Plan?

**Partial**

Project cost relative to approved Business Plan?

**+\$3.76m**

If cost > approved B Plan how will this be funded?

**Substitution of lower priority work**

Other financial issues: In addition to the TxT and DxT costs, a DxD and a TxD cost of \$4.15m is associated with the project for the substation (C28931), feeder changes (C28929) and 34.5kV line work (C30005).

\$ k	Current planning horizon					Yr 6+	Total	Lower Range P20	Upper Range P80
	Yr 1 08/9	Yr 2 09/10	Yr 3 10/11	Yr 4 11/12	Yr 5 12/13				
<b>Proposed investment (TxT)</b>	0	50	300	380	0	0	730		
<b>Proposed investment (DxT)</b>	0	50	1760	1840	0	0	3650		
<b>Proposed investment (DxD)</b>	0	138	3108	805	0	0	4051		
<b>Proposed investment (TxD)</b>	0	100	0	0	0	0	100		
<b>T Approval Total</b>	0	100	2060	2200	0	0	4380		
<b>D Approval Total</b>	0	138	3208	805	0	0	4151		

**Resources**Availability of internal resources to deliver project: **Green**Availability of external resources to deliver project: **Green**Operational impact on network system: **Green****Key issues**

- The proposed in service date is June 2012.
- This project for the distribution portion of this work is summarized in Distribution Strategy Paper DCIG1209P106.

**Key milestones**

- Complete Preliminary Engineering – 09/2010
- Request Full Sanction – 09/2010
- Final Engineering – 03/2011
- Construction – 02/2012
- Commissioning – 03/2012
- Completion – 06/2012

**Climate change**Contribution to National Grid's 2050 80% emissions reduction target: **Unknown**Impact on adaptability of network for future climate change: **Neutral**Are financial incentives (e.g. carbon credits) available? **Unknown****Recommendations**

The Transmission Asset Management Investment Committee is invited to:

- NOTE the investment of **\$4.38M** in the range **\$3.28M** to **\$5.48M** to be completed by **6/30/2012**
- Note that a PWS will be submitted for the approval of **\$300,000** for preliminary engineering of the transmission components of this project upon endorsement of this strategy. Funding Projects C34427 and C30744 have been created and submitted for approval as budget placeholders.
- NOTE that **Carol Sedewitz** is the Project Sponsor
- NOTE that **Thomas Brim** is the Project Manager and has the approved financial delegation to deliver the project

Signature Carol Sedewitz Date 2/3/2010  
 Carol Sedewitz, Director Transmission Planning

**Decision of the Transmission Asset Management Investment Committee**

I hereby approve the recommendations made in this paper.

Signature Paul R. Renaud Date 2/5/10  
 Paul Renaud, Vice President Transmission Asset Management

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**1. Background**

- 1.1. As part of the ongoing Distribution Planning process, a review of the Amherst area of western NY concluded that various Distribution feeders, sub-transmission circuits and several transformers were overloaded for both normal and contingency conditions. This is based on 2008 load levels and overloads are expected to increase as area loads grow over the coming years, see bullet 18.5 for further information.
- 1.2. Facility loading and outage exposure concerns that led to the development of this strategy were identified in National Grid's Distribution 2008 Annual Capacity Plan. In its 2009 update, the Annual Capacity Plan reaffirmed these concerns and the need to pursue this strategy. The concerns include five distribution feeders projected to be loaded above their summer normal rating. Furthermore, seven distribution substations in the local area are projected to exceed their summer emergency ratings in the event of a single contingency. The 2009 Distribution Annual Capacity Plan incorporates 2008 summer actual loads and the latest forecasts, including the consequences of economic downturn. In addition to (and not assumed in) general growth projections, the area also anticipates the addition of several new distribution customers, which further supports the need for additional capacity.

**2. Driver**

- 2.1. The objective of the project is to relieve the loading issues and improve the reliability of the service to the area load.

**3. Project Description**

- 3.1. The project scope includes construction of a new 115:13.2kV station on National Grid owned property adjacent to the existing Youngmann Rd station, connected to the planned Tonawanda (Paradise) – Erie 115kV circuit #181 and the Tonawanda – Gardenville 115kV circuit #182. The station single line is included in appendix A. A standard single 24/32/40 MVA transformer, a 3.6 MVAR 13.2kV capacitor and four feeder positions will be included.
- 3.2. This new station has been requested by Distribution Network Asset Planning. They have confirmed that a new station with a single transformer is sufficient to address their needs through their planning horizon.
- 3.3. The addition of this station will not result in an adverse impact to the thermal or voltage performance of the transmission system. Most of the load that will be supplied by this station is already being supplied from these circuits.
- 3.4. The short (less than 200 ft) taps will add very little exposure to the reliability of the existing transmission lines.
- 3.5. The expected in-service date for the recommended strategy is June 2012.
- 3.6. It is expected that at some far future point, a second transformer will be added to this station. At that time, the system will be reviewed to determine how the station should be configured. Options will include operating with a closed low side bus tie (similar to most other stations in Western NY) or installing one or more 115kV breakers to segment the 115kV circuit(s). The new substation will be designed to permit these future options. No additional construction will be done at this time to prepare for these possible future arrangements.

- 3.7. This project will require the 230kV lines adjacent to the new station to be raised to allow the new station taps to cross under the 230kV circuits.
- 3.8. This project also includes the relocation of some 34.5kV circuits to make space for construction of the new station.

#### **4. Business Issues**

- 4.1. Failure to implement this project will result in overloads on several feeders, circuits and transformers. This project is consistent with National Grid's goal of complying with all applicable reliability criteria, including our own.
- 4.2. Portions of this project are not included in the current capital plan or the latest version of the proposed capital plan. Following the approval of this proposal, the forecast will be updated with the proposed expenditures.
- 4.3. Other business issues and related information can be found in the Distribution Strategy Paper.

#### **5. Options Analysis**

- 5.1. Alternative 1 – Do Nothing  
The option to do nothing is not recommended due to the projected normal overloads and contingency exposure observed. These concerns represent risk to National Grid assets and to reliability.
- 5.2. Alternative 2 – Build a new substation (recommended)  
This plan will permit National Grid to comply with its criteria and will allow the safe and reliable operation of the system.
- 5.3. Alternative 3 – Strategy Deferral  
The 2009 Annual Capacity Plan, incorporating the consequences of the recent economic downturn, reaffirmed thermal concerns identified in the 2008 Annual Capacity Plan. The option to defer this strategy will continue the risk of system contingencies and could result in facility loads that exceed equipment normal capabilities.
- 5.4. Consideration was given to installing a new substation at the proposed location, using two 15/20/25 MVA transformers with a closed low side bus tie, similar to most distribution stations in Western NY. This option would require almost the same construction as the recommended option, just adding a second transformer. This option was rejected, as the extra capacity is not required to normally serve the load at this point. A second transformer may be added at some future point and the proposed substation layout will facilitate this future expansion. The total cost of this plan is approximately \$11M.
- 5.5. An option to install a new substation at National Grid's Amherst Service Center was reviewed. This option would require extensive construction and conversion work due to the location in reference to the overloaded stations. Even though this alternative relieves Buffalo Station 54 and Buffalo Station 58, it does not pose a viable solution in relieving Alameda Station 124, Youngmann Terminal Station or Maple Rd Station 140. Moreover, it is not a viable option to the recommended plan to relieve the overloaded facilities by 2011. The total cost of this plan is approximately \$10M.
- 5.6. Consideration was also given to upgrading transformer banks at Buffalo Station 58, Alameda Station 124 and Youngman Terminal Station. As part of this alternative, lines 605 and 606 would be reconducted to 500 KCM Cu. and Buffalo Station 54 would be relieved by Buffalo Station 58 and Maple Rd Station 140. Upgrading these transformer banks is more costly than the preferred alternative. The total cost of this plan is approximately \$12M.

**6. Milestones**

- 6.1. This strategy paper and subsequent revisions, when approved, will be handed over to Project Management, who will be responsible for its execution. It is expected that sanctioning will be targeted for late 2010.
- 6.2. Construction strategy and outage requirements will be addressed at the sanction level.

**7. Safety, Environmental and Planning Issues**

- 7.1. The Permitting and Licensing team will work with Project Management to identify and address permitting, municipal approval and environmental issues.
- 7.2. The plan utilizes National Grid owned property for the new station however a new easement may be required as part of the relocation of existing 34.5 kV distribution supply cables to provide clearance for the proposed substation.
- 7.3. Nearby transmission lines will be energized during construction if this strategy is implemented. The importance of maintaining appropriate working clearances from these, and the performance of a nonreclosing assessment of nearby energized lines should be emphasized in the construction documents issued to Transmission Line Services or contractors in the sanction phase of this project.

**Investment Recovery****8. Investment Classification**

- 8.1. The investment classification for this strategy is based on Distribution Planning criteria.
- 8.2. Portions of the project are not in the current budget and will be walked in, while a project with a lower risk score is walked out.

**9. Regulatory Implications**

- 9.1. This strategy supports the company's regulatory responsibility to serve load.

**10. Customer Impact**

- 10.1. This strategy maintains customer reliability in the Amherst Study Area.

## Financial Impact

## 11. Cost Summary

11.1. The aggregate cost estimate to implement this recommended plan is for the fiscal years 2009/10 to 2012/13.

		Table 1: Current planning horizon								
		Yr 1 08/9	Yr 2 09/10	Yr 3 10/11	Yr 4 11/12	Yr 5 12/13	Yr 6+	Total	Lower Range P20	Upper Range P80
Capital Investment (TxT)	Proposed sanction	0.00	0.05	0.30	0.38	0.00	0.00	0.73		
	Capital plan	0.00	0.02	0.23	0.37	0.00	0.00	0.62		
	Variance to plan	0.00	+0.03	+0.07	+0.01	0.00	0.00	+0.11		
	Unit cost allowance									
	O&M	0.00	0.00	0.00	0.01	0.00	0.00	0.01		
	Removal	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	Total	0.00	0.05	0.30	0.38	0.00	0.00	0.73		

		Table 2: Current planning horizon								
		Yr 1 08/9	Yr 2 09/10	Yr 3 10/11	Yr 4 11/12	Yr 5 12/13	Yr 6+	Total	Lower Range P20	Upper Range P80
Capital Investment (DxT)	Proposed sanction	0.00	0.05	1.76	1.84	0.00	0.00	3.65		
	Capital plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	Variance to plan	0.00	+0.05	+1.76	+1.84	0.00	0.00	+3.65		
	Unit cost allowance									
	O&M	0.00	0.00	0.00	0.01	0.00	0.00	0.01		
	Removal	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
	Total	0.00	0.05	1.76	1.84	0.00	0.00	3.65		

**12. Cost Assumptions**

- 12.1. These cost estimates are study grade (+/- 25%). Sanction grade cost estimates (+/- 10%) will be developed at the sanction level. An annual inflation of 3.1% was used for future years.
- 12.2. An easement may be required for relocation of the existing 34.5kV distribution supply cables to provide clearance for the proposed substation. This has not been included in the estimate.

**13. Benefits Summary**

- 13.1. The expected in-service date for this project is 2012, which is beyond the term of the current New York rate plan. Capital expenditures are estimated to total \$4.38m. Once new rates go into effect in 2011/2012, it is assumed a return will be earned on 100% of the rate base assets. This will have the following annual impact on:

- Operating Profit = \$0.51m
- Net Income = \$0.19m

**14. NPV**

- 14.1. This strategy is not financially driven so the NPV is not applicable.

**15. Additional Impacts**

- 15.1. In addition to the TxT and DxT costs listed in the tables above, a DxD cost of \$4.15m is associated with this project.
- 15.2. The TxT costs (T line work) are entirely under C30744, the DxT and DxD costs are under C28929 (D line work), C28931 (D station work) and C34427 (T station work). The TxD 34.5 kV line work is under C30005.

**16. Execution Risk Appraisal**

- 16.1. If later reviews determine that significant permitting work is required, it could delay the progress of this project.
- 16.2. Significant outage restrictions are not expected, though if restrictions are discovered later they could delay the progress of this project.
- 16.3. The schedule of outages for the Tonawanda project may impact outage availability for this project. The outages for the Tonawanda project are tentatively scheduled to occur in late 2011 and early 2012. Any opportunities to coordinate the outage requirements for the two projects should be pursued but the Tonawanda work will need to take priority.
- 16.4. The raising of the 230kV lines and the relocation of the 34.5kV circuits will need to be completed before the construction of the new station and the taps. Delay of these portions of the work will delay the remainder of the project.

**17. Statements of Support**

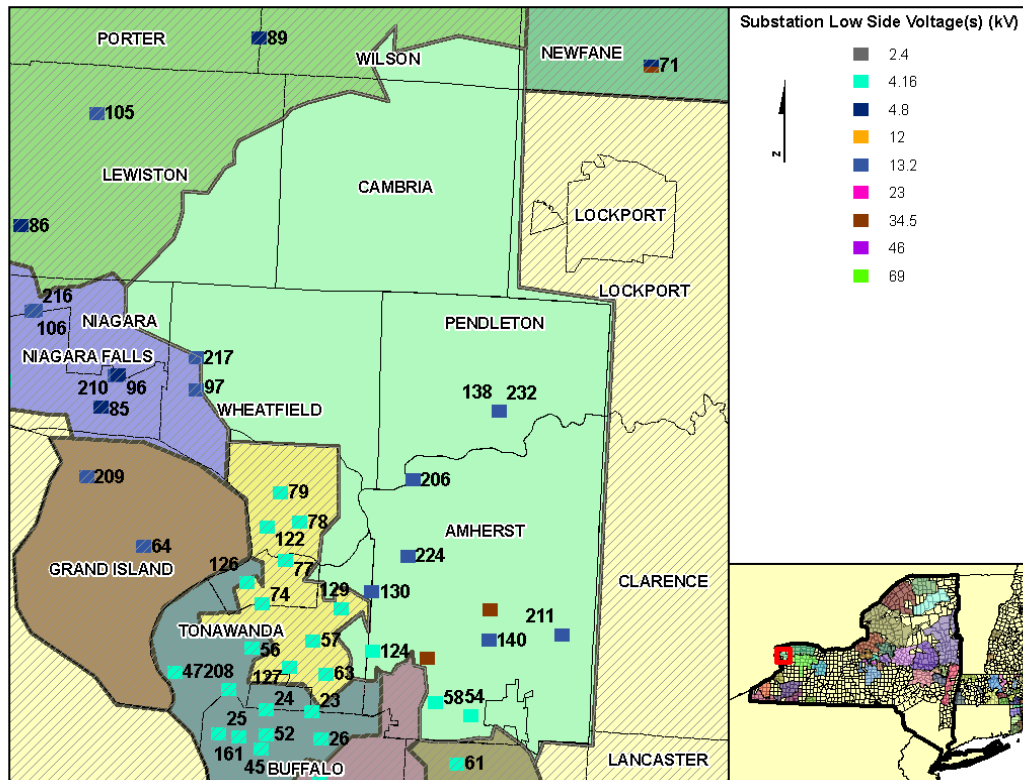
17.1. Authors of this paper assure that the supporters listed state they support this paper.

- Director Transmission Planning (Carol Sedewitz)
- Director Transmission Finance - Budget
- Manager Transmission Finance - Rates
- Director Transmission Commercial Services (Bill Malee)
- Director Transmission Asset Strategy (Alan Roe)
- Director NY Control Center (Michael Schiavone)
- Director Operational Planning & Review
- Manager Substation Engineering-NY
- Manager Protection Engineering -NY (Steven Fanning)
- Director Transmission Line Engineering (Mark Browne)
- Director Transmission Investment Management (Thomas Sullivan)
- Director Transmission Project Management
- Chair, Permitting & Licensing Team (Chris Gorman)
- Director Regional Delivery (Kathleen Darwin)
- Director Works Program Management
- Director System Delivery (Joseph Luchini)
- Director Distribution Network Asset Planning (Rob Sheridan)
- Manager Distribution Capacity Planning
- Director Distribution Project Management

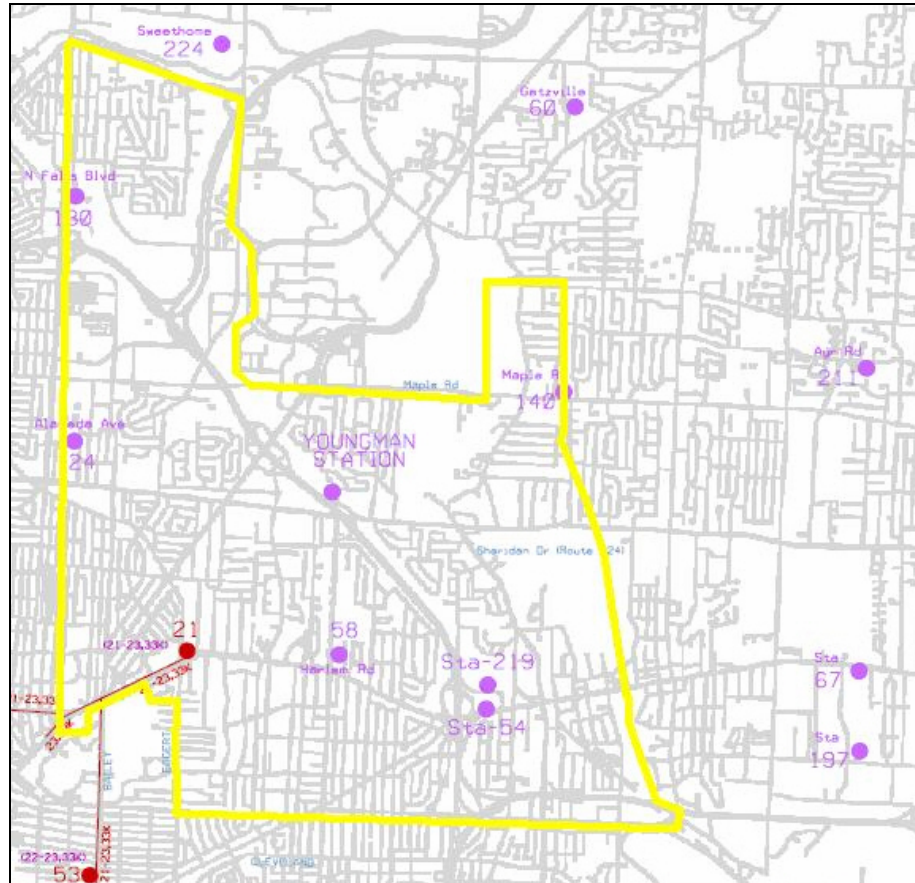




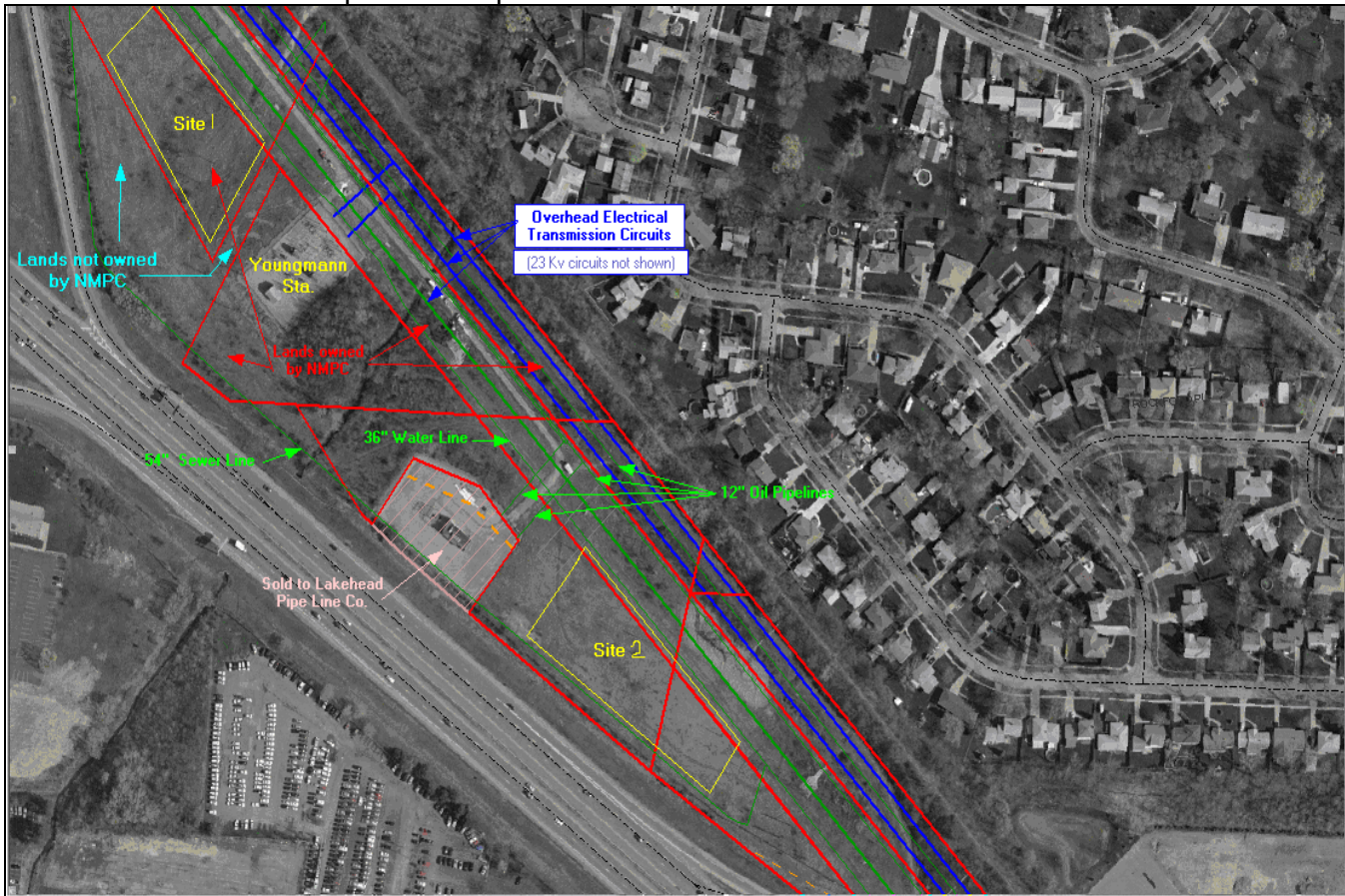
## 18.2. Amherst Study Area



## 18.3. Affected Area



## 18.4. Aerial Map of the Proposed Substation Site



## 18.5. Existing Equipment Loading

Table 3: Feeders projected to exceed normal operation thermal limits

STATION	FEEDER	VOLTAGE (kV)	RATING (AMPS)	ACTUAL LOAD		PROJECTED LOAD					
				2008		2009		2012		2015	
				A	%	A	%	A	%	A	%
BUFFALO STATION 54	5461	4.16	330	313	95	326	99	337	102	345	105
BUFFALO STATION 54	5468	4.16	330	307	93	319	97	330	100	338	102
BUFFALO STATION 54	5469	4.16	266	267	100	277	104	287	108	294	110
BUFFALO STATION 54	5473	4.16	266	290	109	301	113	312	117	320	120
SWEET HOME RD 224	22457	13.2	330	320	97	333	101	344	104	353	107

Table 4: Substations projected to exceed summer emergency rating

STATION	VOLTAGE (kV)	SE RATING (MVA)	ACTUAL LOAD		PROJECTED LOAD					
			2008		2009		2012		2015	
			MVA	%	MVA	%	MVA	%	MVA	%
Youngmann Terminal	115/34.5	44.8	32.4	72	33.6	75	34.8	78	35.7	80
Maple Rd 140	115/13.2	40.5	38.7	96	40.2	99	41.6	103	42.7	105
Alameda Rd 124	34.5/4.16	19.1	20.9	109	21.7	114	22.5	118	23.0	120
Buffalo Station 54	115/4.16	12.7	18.0	142	18.7	147	19.4	152	19.8	156
Getzville Station 60	115/13.2	28.5	24.4	85	25.3	89	26.2	92	26.8	94
Sweethome Rd 224	115/13.2	39.1	32.4	83	33.7	86	43.0	110	44.1	113
Niagara Falls Blvd 130	115/13.2	42.7	31.6	74	32.9	77	36.8	86	37.8	88

A summary of the projected and existing system loading concerns is as follows:

- Existing load at Buffalo Station 54 4.16kV distribution feeders 5469 and 5473 is in excess of summer normal rating
- Projected loading on Buffalo Station 54 4.16kV distribution feeders 5461 and 5468 is projected to exceed summer normal rating during the summer peak periods of 2010 and 2012, respectively
- Projected loading on Sweet Home Rd 224 13.2kV distribution feeder 22457 is projected to exceed summer normal rating in 2010
- Existing load at Buffalo Station 54 115/4.16kV substation is in excess of summer emergency rating for the loss of either T1 or T2 transformers
- Existing load at Buffalo Station 124 34.5/4.16kV substation is in excess of summer emergency rating for the loss of any T1-T4 transformers
- Projected loading at Maple Rd 140 115/13.2kV substation is projected to exceed summer emergency rating by 2010, for loss of either T1 or T2 transformers
- Projected loading at Sweet Home Road 224 115/13.2kV substation is projected to exceed summer emergency rating during the summer peak of 2010 for the loss of either T1 or T2 transformers

As ties with neighbouring substations are limited, a contingency scenario would result in the shedding of distribution load to maintain contingency load under the transformers emergency rating. Existing contingency load at Buffalo Station 54 represents MWh exposure of 127 MWh (projected to 171 MWh in 2015). Existing contingency load at Buffalo Station 124 represents MWh exposure of 43 MWh (projected to 94 MWh in 2015). In addition, contingency load at Sweethome Rd 224 and Maple Rd 140 substations is projected at 119 MWh and 52 MWh of exposure in 2015, respectively.

#### 18.6. Post Project Equipment Loading

This strategy eliminates all normal and contingency exposure concerns. The tables below are excerpts from the 2009 Annual Capacity Plan and illustrate the benefits achieved after the strategy is complete.

Table 5: Feeders projected to be relieved as a result of a new substation

FEEDER	RATING (AMPS)	ACTUAL LOAD		PROJECTED LOAD					
		2008		2009		2012		2015	
		A	%	A	%	A	%	A	%
5461	320	313	95	326	99	252	84	259	86
5468	290	307	93	319	97	212	71	217	72
5469	260	267	100	277	104	252	95	259	97
5473	260	290	109	301	113	240	90	246	93
22457	400	320	97	333	101	169	51	173	52

Table 6: Stations projected to be relieved as a result of a new substation

STATION	RATING (MVA)	ACTUAL LOAD		PROJECTED LOAD					
		2008		2009		2012		2015	
		MVA	%	MVA	%	MVA	%	MVA	%
Youngmann Terminal	44.8	32.4	72	33.6	75	25.7	57	26.3	59
Maple Rd 140	40.5	38.7	96	40.2	99	33.7	83	34.5	85
Alameda Rd 124	19.1	20.9	109	21.7	114	16	84	16.4	86
Buffalo Station 54	12.7	18.0	142	18.7	147	10.8	85	11.1	87
Getzville Station 60	28.5	24.4	85	25.3	89	15.5	54	15.9	56

STATION	RATING (MVA)	ACTUAL LOAD		PROJECTED LOAD					
		2008 MVA	%	2009 MVA	%	2012 MVA	%	2015 MVA	%
Sweethome Rd 224	39.1	32.4	83	33.7	86	37.5	96	38.4	98
Niagara Falls Blvd 130	42.7	31.6	74	32.9	77	34.0	80	34.9	82