

Capital/Revenue Investment Proposal – Summary
Strategy for Northern Area Projects at
National Grid's ALCOA and Lake Colby Substations in NY
Transmission, Niagara Mohawk, Project No. C30545 and C32260

A strategy paper by James Harper and Carol Sedewitz – 01-25-2010

Description

The scope of this strategy is to address safety and reliability concerns in Northern NY implementing two projects. This strategy paper proposes the expenditure of \$1.760M to purchase a spare 115-15kV transformer and Thyristor Controlled reactor (TCR) for the 115kV SVC at Lake Colby substation. This strategy paper also proposes the expenditure of \$913K to replace three (3) existing 115kV oil circuit breakers at ALCOA substation. Upon the approval of this strategy paper, \$170,000 will be sought through a separate DOA request for preliminary engineering. The overall strategy calls for a \$2.673M capital expenditure.

Category: **Policy-driven**

Risk score: **34, 35, Safety and Reliability**

Finance

Strategy Cost & Range **\$2.673 M, \$2.406 M to \$2.940 M**

Cost volatility: P20 cost: **NA** P80 cost: **NA**

Probability that project cost will exceed 10% tolerance: **NA**

Project included in approved Business Plan? **Yes**

Project cost relative to approved Business Plan **\$0, 0%**

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

Other financial issues: **NA**

\$m	Current planning horizon			Total	Lower Range P20	Upper Range P80
	Yr 1 10/11	Yr 2 11/12	Yr 3 12/13			
Proposed investment	0.1700	1.3390	1.1640	2.6730		

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

- Coordination with other construction activities at both ALCOA and Lake Colby Substations.
- A PWS will be submitted upon endorsement of the strategy paper in order to allocate the expenditure of \$170K for preliminary engineering.

Key milestones

- Sanction – 03/31/2011
- Commissioning – 10/31/2012
- Completion – 11/30/2012
- Project Closure – 12/31/2012

Climate change

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

Recommendations

The Assessment Management Investment Committee is invited to:

- ENDORSE the investment of \$ **2.673M** in the range **\$2.406M to \$2.940M** by **December 31, 2012**
- NOTE that a Preliminary Works Sanction for the approval of \$170K for preliminary engineering will be submitted upon endorsement of this strategy. Funding Project **C30545** and **C32260** has been created and submitted for approval as a budget placeholder.
- NOTE that **Carol Sedewitz** is the Project Sponsor
- NOTE that **Peter Kohnstam** is the Project Manager and has the approved financial delegation to deliver the project

Signature Carol Sedewitz Date 2/4/2010
 Carol Sedewitz, Director Transmission Planning

Decision of the Sanctioning Authority

I hereby approve the recommendations made in this paper.

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

Capital/Revenue Investment Proposal – Summary
Strategy for Northern Area Projects at
National Grid's ALCOA and Lake Colby Substations in NY
Transmission, Niagara Mohawk, Project No. C30545 and C32260

A project strategy paper by James Harper and Carol Sedewitz – 01-25-2010

1.0 Background

- 1.1 As part of a 115kV transmission area assessment a study was complete in May 2009 for Northern New York. The study was performed for the year 2008-2018 which reviewed thermal, voltage and short circuit criteria violations.
- 1.2 For an N-1-1 contingency for the loss of the long lead time item, the Lake Colby 115kV SVC, followed by a line outage of the Willis-Malone #1 115kV circuit, the voltages in the area decline such that they are below 0.95 p.u. The Lake Colby 115kV SVC is considered as long lead time equipment because the loss of the 115-15kV transformer step up transformer or the thyristor controlled reactor (TCR) component of the SVC are anticipated to take 48 – 60 weeks to repair/replace.
- 1.3 The 115-15kV transformer at Lake Colby for use with the SVC was purchased under a special operating specification issued by Nokian for use with the designed SVC. The National Grid transformer technical specification was used in conjunction with the Nokian specification to assure standardized ancillary devices and construction standards were used in the design and build of this specialty transformer.
- 1.4 There are some special characteristics needed in a SVC transformer which involve operating in a high harmonics environment and the injection of DC current into the core which must be considered carefully when designing the transformer. Failure to do so will result in core saturation and localized hotspots that will lead to transformer failure. The existing transformer had all these elements taken into consideration and a full design review was conducted to assure the transformer would be designed and built to perform to the specification
- 1.5 The Lake Colby 115kV SVC is a critical piece of equipment which regulates the voltage for the Malone-Lake Colby #5 (43.79 miles) and Lake Colby-Lake Placid #3 (10.47 miles) radial lines.
- 1.6 One of the recommendations from the Northern Area 115kV Transmission Study is to purchase a spare 115-15kV transformer and TCR for the Lake Colby 115kV SVC.
- 1.7 This recommendation will improve the restoration time the 115kV SVC will be out of service if the loss of the 115-15kV transformer or the TCR fails. The transformer mentioned above will be on site rather than having to wait 60 weeks to get this equipment from a manufacture and the TCR will be stored at the Potsdam Service Center.
- 1.8 The Study found that at ALCOA, the existing three 115kV OCBs: R120, R120 and R8105 were above 100% percent of their maximum interrupting capability of 25 kAIC.
- 1.9 It is recommended to replace three (3) existing 115kV OCBs at ALCOA substation due to short circuit duty concerns.

2. Driver

- 2.1 Reliability and Safety are the primary drivers in determining an overall risk score of 34 and 35 for both the proposed strategy.

Funding Project	Project	In-Service Date	Score
C30545	Replace three 115 kV breakers at ALCOA	Fall 2012	34
C32260	Purchase spare equipment for Lake Colby SVC	Fall 2012	35

3. Project Description

- 3.1 The recommended strategy is to purchase as spares one (1) 115-15kV, 82.7MVA, wye-delta, SVC power transformer and one (1) 15kV, 9.446mH TCR coil unit with support insulators and hardware.
- 3.2 The transformer will be stored (fully dressed out) in the Lake Colby Substation, on a new foundation installed in available space near the SVC yard. The TCR will be stored in the truck barn at the Potsdam Service Center.
- 3.3 The recommended strategy at ALCOA includes replacing existing equipment. Breakers R120, R130 and R8105 manufactured in 1958 will be replaced to achieve a 50 kAIC.
- 3.4 From a station condition assessment performed by asset strategy the breakers at the ALCOA substation were determined to be replaced within 5 years due to their condition.
- 3.5 There will not be any line work associated with the recommended strategies.
- 3.6 The expected in-service date for the recommended strategies is December 31, 2012.

4. Business Issues

- 4.1 The 115kV SVC is critical to the support of the radial 115kV system to Lake Colby which can result in low voltage without it under certain contingencies. Providing spare equipment for the 115kV SVC will increase system reliability and mitigate the risk due to long lead time equipment for this radial 115kV system.
- 4.2 The existing three breakers at ALCOA have reached their capacity to interrupt a short circuit fault at the above substation. If such a fault were to occur, the consequences of such an event could be catastrophic resulting in personnel injury and equipment damage.

5. Options Analysis

SVC Alternatives

- 5.1 Alternative S-1 – Do Nothing at Lake Colby

This alternative has a risk due to the exposure from the N-1-1 condition which still be present and the 115kV radial system will be at risk due to severe low voltage and load shedding for the loss of the 115kV SVC at Lake Colby. The radial Malone – Lake Colby # 5 line serves 70 MVA load during the winter. The existing capacitor bank at the Lake Colby substation causes a voltage rise violation. The total number of customers connected to the radial 115kV line is 5,784. The CMI of the loss of the 115kV SVC transformer bank is 97 million.

5.2 Alternative S-2 – Purchase spare equipment for the Lake Colby 115kV SVC

Recommended strategy is to purchase as spares one (1) 115-15kV, 82.7MVA, wye-delta, SVC power transformer and one (1) 15kV, 9.446mH thyristor-controlled reactor coil unit with support insulators and hardware. The transformer will be stored (fully dressed out) in the Lake Colby Substation, on a new foundation installed in available space near the SVC yard. The TCR will be stored in the truck barn at the Potsdam Service Center. This would allow the radial 115kV system to be restored to normal within a week.

5.3 Alternative S-3 – Demand Side Management

Transmission Planning worked with the Distributed Resources department to develop a Demand Side Management alternative project for the load supported by the Lake Colby substation. A feasible Demand Side Management project could not be implemented for 20 MVA of load relief that would be needed to support the system for the loss of the Lake Colby 115kV SVC and the Malone-Willis #1 115kV line.

ALCOA Breakers Alternative

5.4 Alternative B-1 – Do Nothing at ALCOA

This Alternative is rejected. The fact that the existing three breakers might not be able to interrupt a short circuit fault at ALCOA dictates that they must be replaced or upgraded to the appropriate interrupting capability level at the substation. Safety and reliability concerns will still be an issue.

5.5 Alternative B-2 – Split the ALCOA 115 kV Buses

This alternative is not feasible because the ALCOA bus is a main source to the 115kV system that can not be split and sectionalized into two separate bus sections to reduce the fault current levels.

5.6 Alternative B-3 – Series Reactor or New technology to reduce fault current

This alternative has a cost issue because installing a series reactor at ALCOA substation will be an expensive option to implement. The cost to install a series reactor at ALCOA substation is \$1.013 M. There are currently environmental issues with the soil at Alcoa station that may limit the amount of work to install the series reactor at this station. A distribution line owned by Alcoa station will need to be relocated and the expansion into their yard will be required to implement this option. Alcoa has expressed a concern with this option which is a significant risk. Implementing fault current limiting technology is not feasible because it is still in the developmental stages and is not anticipated to be available for commercial operation for another 5 years.

5.7 Alternative B-4 - Replacement of the three breakers -

This plan is the recommended strategy that will permit National Grid to comply with the transmission planning criteria and will allow the safe operation of the 115kV breakers at ALCOA. The cost of this project is \$913 K.

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. A decision on how this will be constructed will be included at the sanction level.

6.2 Construction strategy and outage requirements will be addressed at the sanction level. Outages for this recommendation are subject to other system conditions and will likely need to be timed during low loading periods.

7. Safety, Environmental and Planning Issues

- 7.1 In and around both the ALCOA and Lake Colby substations, nearby transmission conductors and equipment will be energized while the work described in this strategy paper is under way. It is important to note that maintaining appropriate working clearances from energized facilities will be emphasized with all personnel involved with the proposal presented in this strategy paper.
- 7.2 During the construction period, adequate line and generation outage coordination will be performed in order to insure that the short circuit level during that time at the construction site does not impose a safety risk for National Grid staff or contractors.
- 7.3 In order to further mitigate safety related issues associated with equipment required to remain in service in an abnormal condition until the upgrade is completed, an Operational Planning & Review assessment was implemented and an operational safety procedure based on the "Management of Risks with Abnormal Equipment," document PR.07.00.001 Version 1.0-04/18/07 is in place for ALCOA substation.
- 7.4 There are no environmental permits required and the SPCC plan does not need to be changed. The spare unit will be inspected for leaks on the same schedule as the operating units.

8. Investment Recovery**8.1 Investment Classification**

- 8.1.1 The investment classification for this strategy is based on reliability.

8.2 Regulatory Implications

- 8.2.1 There are no regulatory implications associated with this recommended project.

8.3 Customer Impact

- 8.3.1 There are no associated customer impacts with this recommended project.

9. Financial Impact

9.1 Cost Summary

		Table 1: Current planning horizon						
\$M		Yr 1 10/11	Yr 2 11/12	Yr 3 12/13	Yr 4 13/14	Total	Lower Range P20	Upper Range P80
Capital Investment	Proposed sanction	0.1700	1.2090	1.1640		2.5430		
	Capital plan	0.0000	0.4000	2.2700		2.6700		
	Variance to plan	0.1700	0.8090	-1.1060		-0.1270		
	Unit cost allowance							
	O&M	0.0000	0.0500	0.0000		0.0500		
	Removal	0.0000	0.0800	0.0000		0.0800		
	Total	0.1700	1.3390	1.1640		2.6730		

9.2 Cost Assumptions

9.2.1 These cost estimates are study grade (+/- 25%). Sanction grade cost estimates (+/- 10%) will be developed at the sanction level.

9.3 Benefits Summary

9.3.1 Niagara Mohawk's bundled delivery rates for T&D in New York are fixed within a 10-yr rate plan until October 31, 2012. Embedded in these bundled rates are fixed levels for the return on (equity) and return of (depreciation) capital investments. To the extent capital investments fall within the capital program forecast included in the rate plan, the company recovers the associated equity and depreciation.

9.3.2 For a major project proposed during the period 2009-2011, and for which capital spending is defined as incremental to the capital budget incorporated in the rate plan, the merger rate plan provides an opportunity to petition the NY Public Service Commission for special ratemaking treatment.

9.3.3 Once new rates go into effect in 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 = \$0.31m
- Net Income = \$0.12m

9.3.4 The expected in-service date for this strategy is December 31, 2012.

9.4 NPV

9.4.1 This strategy is not financially driven so the NPV is not applicable.

9.5 Additional Impacts

9.5.1 This strategy has no additional impacts.

10. Execution Risk Appraisal

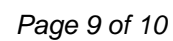
Failure to purchase this spare equipment could place the radial 115kV system at risk during the next contingency while a replacement for a failed unit is being ordered and delivered. This situation could be severe enough to cause the loss of the 115kV radial system.

The risk of not replacing the circuit breakers at the ALCOA substation could cause a hazardous safety condition within the station or degrade reliability with the failure of this equipment.

11. Statements of Support

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

- Director Transmission Planning (Carol Sedewitz)
- Director Transmission Investment Management (Thomas Sullivan)
- Director Transmission Finance – Reporting and Forecasting (Andy Forth)
- Manager Transmission Finance – Rates (Linda Doering)
- Director NY Control Center (Michael Schiavone)
- Director Operational Planning & Review (Julian Cox)
- Manager Substation Engineering-NY (Suzan Martuscello)
- Manager Protection Engineering -NY (Steven Fanning)
- Director Network Planning (Robert Sheridan)
- Director Transmission Commercial Services (Bill Malee)
- Director Transmission Asset Strategy (Alan Roe)



Appendix A – Figure 2

