Ginna Retirement

Reliability Study

27 October, 2015

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I. Introduction

This report is being completed in compliance with the Settlement Agreement and Offer of Settlement in FERC Docket ER15-1047-000, et al.

II. Study Conditions

- System representation as provided by NYISO
- Planned and budgeted new projects modeled in service:
  - Downtown Stations 23 (2015), 251 (2014) and 262 (2015)
  - 115kV transmission lines 901, 943, 944, 902 and 942 (2014/15)
  - 34.5kV transmission lines 802 and 803 (2015)
- Ginna nuclear station retired with plant load of 5 MW served from Station 13A
- Cayuga generation plant out-of-service and Auburn Transmission Project in Service
- Dunkirk units 2, 3 and 4 in-service at 417 MW
- Huntley units 67 and 68 in-service at 354 MW
- Dysinger East interface transfer at 1,645 MW
- PAR settings are optimized in each scenario to mitigate overloads to the extent possible
- 2017 RG&E peak forecast as indicated in Chapter III

III. RG&E Peak Load Forecast

2014 peak weather normalized to 90th percentile load and 1% growth is used for summer peak as is shown in the table below:

Table 1: RG&E Summer Forecast

Growth	1%
Year	**Forecast**
2014	1,775
2015	1,793
2016	1,811
2017	1,829
2018	1,847

Projected winter peak load is shown in the table below:

Table 2: RG&E Winter Forecast

Growth	1%
Year	**Forecast**
2014	1,254
2015	1,267
2016	1,279
2017	1,292
2018	1,305

IV. Current Situation with Ginna in Service

NPCC and NYSRC reliability requirements employ N-1-1 SB (stuck breaker) testing to determine whether the Bulk Power System (BPS) is capable of readjustment following an initial contingency. R&GE does not currently fully satisfy certain NPCC N-1-1 SB contingency tests on the BPS due to violations at Stations 80 and 122. (DPS Case No 11-T-0534)

Problem	Criteria
N-1-1 SB Station 122	NYSRC Reliability Rules and NPCC Directory 1
N-1-1 SB Station 80	NYSRC Reliability Rules and NPCC Directory 1

V. Future Situation without Ginna in Service

V.1. Current Base Case Analysis

The transformers of Station 122 would be overloaded whenever the RG&E peak load reaches 1,430MW during System Normal and post-contingency conditions without Ginna in service, as shown in Table 3. At an RG&E area load of 1,430 MW, two of the transformers at Station 122 are loaded to 100% of Normal rating.

Table 3: Base Case Overload at Station 122 at RG&E Load Level of 1,430 MW (Threshold) without Ginna in Service

MONITORED FACILITY	% NORMAL RATING
STATION 122 345/115 1TR	100
STATION 122 345/115 2TR	100

MONITORED FACILITY	% NORMAL RATING
STATION 122 345/115 3TR	95

V.2. 2017 Summer Case Analysis

Table 4 shows thermal overloads at Station 122 at RG&E summer load level of 1,829 MW, as forecasted for 2017. The loading on the two transformers increases with the increased area load from 100% of normal rating to 116.7%. Further optimization of the PARs to these new circumstances can reduce loading to 105.1%. The 399 MW increase in area load is accommodated through multiple injection points on the RG&E system; the Station 122 transformers carry only a portion of this load.

Table 4: Base Case Overloads at RG&E load level of 1,829 MW

FACILITY	% NORMAL RATING	
	Ginna In-Service	Ginna Out-of-Service
STATION 122 345/115 1TR		105.1
STATION 122 345/115 2TR		105.1

Table 5 shows N-1 violations in the RG&E network associated with the retirement of Ginna at RG&E summer load level of 1,829 MW and Table 6 shows N-1-1 violations associated with the retirement of Ginna at RG&E load level of 1,829 MW, using summer equipment ratings.

Table 5: N-1 Overloads at RG&E load level of 1,829 MW without Ginna in Service

[REDACTED]

Table 6: N-1-1 Overloads at RG&E load level of 1,829 MW without Ginna in Service

[REDACTED]

V.3. 2017 Winter Case Analysis

2017 winter base case has been analyzed with the PARs optimized and Ginna out of service. N-1-1 contingencies are shown in **Error! Reference source not found.**. No N-1 violation has been found for 1,297 MW winter peak load.

Table 7: N-1-1 loading in winter case at RG&E load level of 1,292 MW without Ginna in Service

[REDACTED]

VI. Recommended Projects

The following projects are required in service to solve reliability problems caused by the retirement of Ginna. This work is combined as the Ginna Retirement Transmission Alternative (GRTA):

1. Station 122 345kV reconfiguration and transformer replacements:
   - 3 new transformers with Normal/LTE/STE rating 494/603/630 MVA
   - 345 kV bus reconfiguration to breaker-and-a-half scheme
   - 115kV bus reconfiguration to GIS breaker-and-a-half scheme
2. Upgrade 34.5kV circuits 718, 735, 770 and 11.5kV circuit 623

Resolving the thermal overloads at Station 122 becomes the most pressing issue for RG&E because all other pending projects do not resolve the overloads during peak conditions. The upgrade of Station 122 transformers will be done in combination with a reconfiguration of the station from the ring bus to breaker-and-a-half arrangement. The Station 122 reconfiguration ensures that only one bulk transformer can be lost in a single contingency. Replace the existing 115kV bus arrangement with a GIS breaker-and-a-half scheme due to a fault-overduty failure due to the replacement of the transformers.

The upgrade of the 34.5kV and 11.5kV circuits enables the RG&E network to transfer power from Station 80 to Station 122, and vice versa, which allows the reduction or elimination of thermal overloads under normal and contingency conditions.

Additionally, resolving stuck breaker problems at Station 80 ensures that only one bulk transformer is lost in a single contingency.

VII. Results with GRTA in Service

Table 8, Table 9 and Table 10 show the results without Ginna but with all the components of GRTA in service, including upgrades at Station 80 to mitigate the stuck breaker contingency. Violations associated with the retirement of Ginna have been solved.

Table 8: Base Case Overloads at RG&E Load Level of 1,829 MW with GRTA in Service

MONITORED FACILITY	% NORMAL RATING	
	Ginna In-Service	Ginna Out-of-Service
All Monitored Facilities	None	None

Table 9: N-1 Overloads at RG&E Load Level of 1,829 MW with GRTA in service and without Ginna in Service

MONITORED FACILITY	CONTINGENCY	Ginna Out-of-Service (% LTE)
All Monitored Facilities	All Contingencies	None

Table 10: N-1-1 Overloads at RG&E Load Level of 1,829 MW with GRTA in service and without Ginna in Service

1st CONTINGENCY	2nd CONTINGENCY	MONITORED FACILITY	Ginna Out-of-Service (% LTE)
All Contingencies	All Contingencies	All Monitored Facilities	None

VIII. Reliability Following the Implementation of Each GRTA Component

This chapter evaluates the degree of MW need in the location of Ginna that would still exist following the sequential implementation of each GRTA component according to the specific proposed construction sequence by electric capital delivery, which is:

1. Upgrade 11 kV circuit 623
2. Upgrade 34.5 kV circuit 735
3. Upgrade 34.5 kV circuit 770
4. Upgrade 34.5 kV circuit 718
5. Station 80 - upgrades to mitigate the stuck breaker contingency
6. Station 122 - upgrades including three transformer replacements

Elements 1 through 4 (circuit upgrades) have been combined together because all four components are needed to solve the associated contingencies. If any of the four circuits were not upgraded with the others, it would remain overloaded under contingency.

The MW risk is calculated by simulating a generator in the location of Ginna in a quantity that resolves the violation.

The load curve used for the calculation of hours of exposure is included in attachment 1 and is based in 2013 RG&E hourly load information.

VIII.1. Upgrade 11.5 kV Circuit 623 and 34.5 kV Circuits 718, 735 and 770

The following tables show the violations caused when Ginna is out of service after upgrading circuits 623, 718, 735 and 770:

Table 11: Base Case Overloads at RG&E Load Level of 1,829 MW with Circuit 623, 718, 735 and 770 Upgrades Completed

FACILITY	% NORMAL RATING		
	Ginna In-Service	Ginna Out-of-Service, Circuit Upgrades Not Complete	Ginna Out-of-Service, Circuit 623, 718, 735 and 770 Upgrades Complete
STATION 122 345/115 1TR		105.1	98.6
STATION 122 345/115 2TR		105.1	98.6

There are no System Normal overloads at Station 122.

Table 12: N-1 Overloads at RG&E Load Level of 1,829 MW without Ginna in Service and with Circuit 623, 718, 735 and 770 Upgrades Completed

[REDACTED]

Table 13: N-1-1 Overloads at RGE Load Level of 1,829 MW without Ginna in Service and with Circuit 718, 735, 770 and 623 Upgrades Completed

[REDACTED]

VIII.2. Upgrade Station 80 to Eliminate Stuck Breaker Contingencies

The following tables show the violations after additionally eliminating the stuck breaker contingencies at Station 80:

Table 14: Base Case Overloads at RG&E Load Level of 1,829 MW without Ginna in Service and with Circuit Upgrades and Station 80 Upgrades Completed

FACILITY	% NORMAL RATING	
	Ginna Out-of-Service, Upgrades Not Complete	Ginna Out-of-Service, Circuit 623, 718, 735 and 770 and Station 80 Upgrades Complete
STATION 122 345/115 1TR	105.1	98.6
STATION 122 345/115 2TR	105.1	98.6

Table 15: N-1 Overloads at RG&E Load Level of 1,829 MW without Ginna in Service and with Circuit Upgrades and Station 80 Upgrades Completed

[REDACTED]

Table 16: N-1-1 Overloads at RG&E Load Level of 1,829 MW without Ginna in Service and with Circuit Upgrades and Station 80 Upgrades Completed

[REDACTED]

VIII.3. Upgrade Station 122 to Eliminate Stuck Breaker Contingencies and Increase Transformer Capacity

Additionally, when the Station 122 upgrades are complete, including the bus reconfiguration and three transformer replacements, the GRTA project is completed and results are the same as shown in chapter VII of this document.

IX. NYISO Results

RG&E has completed this study in coordination with the NYISO. This coordination includes the use of the most recent FERC 715 base case model, consistent project model via ".idv" files, discussion of analysis details, and comparison of results. RG&E provided an update to the NYISO of its corrective action plans under the Local Transmission Planning Process. NYISO has studied the solution and agreed that GRTA will solve the Bulk Power System violations that would be caused by the retirement of Ginna. The NYISO presentation with their analysis results and conclusions is included in this report as Attachment 2.

X. Operational Protocols

As noted earlier in this report, RG&E is completing the project components in a specific sequence beginning with the circuit upgrades, followed by the Station 80 work and then lastly the Station 122 work. The conditions without GRTA entirely are already known. Therefore, assuming that at least the circuit upgrades are complete, and in the event the 2nd and 3rd components are not yet completed by March 31, 2017 and Ginna retires, operational protocols and other measures could reduce the amount of load shedding.

The worst-case MW needs below represent the amount of replacement generation needed (modeled at Ginna's location) to solve the violations associated with the retirement of Ginna. A replacement generation solution would not be equivalent to GRTA because GRTA also resolves pre-existing stuck breaker problems. Therefore, in the information presented below, stuck breaker contingencies are not considered because the stuck breaker contingency is a pre-existing condition.

Under GRTA, the proposed reconfigurations will eliminate the stuck breaker contingencies for Station 122 and Station 80 respectively. This is an appropriate and efficient way to address these contingencies. Furthermore, until the reconfiguration work is complete, operational protocols could mitigate the risk of a stuck breaker contingency.

Situation	N-0 Need	N-1 Need	N-1-1 Need
Line upgrades and Station 80 upgrades completed; Station 122 upgrades not completed	0 MW	80 MW	420 MW
Line upgrades completed; Station 80 upgrades and Station 122 upgrades not completed	0 MW	80 MW	420 MW

Existing operational protocols are as follows:

1. RGE would expect the NYISO to adjust load resources at higher system load levels which may include voltage reduction load relief, EDRP, and SCR to resolve the overload to the extent possible.

2. RGE would take the following steps:

   a. Adjust available 11kV, 34kV and 115kV phase shifter taps to relieve loading on overloaded facilities.
   b. To address the Station 122 N-1-1 contingency, institute an operating plan to locate crews in Station 122 and allow the quick isolation of the stuck breaker condition and restoration of the affected transformer.
   c. To address the Station 80 N-1-1 contingency, institute an operating plan to locate crews in Station 80 and allow the quick isolation of the stuck breaker condition and restoration of the affected transformer.

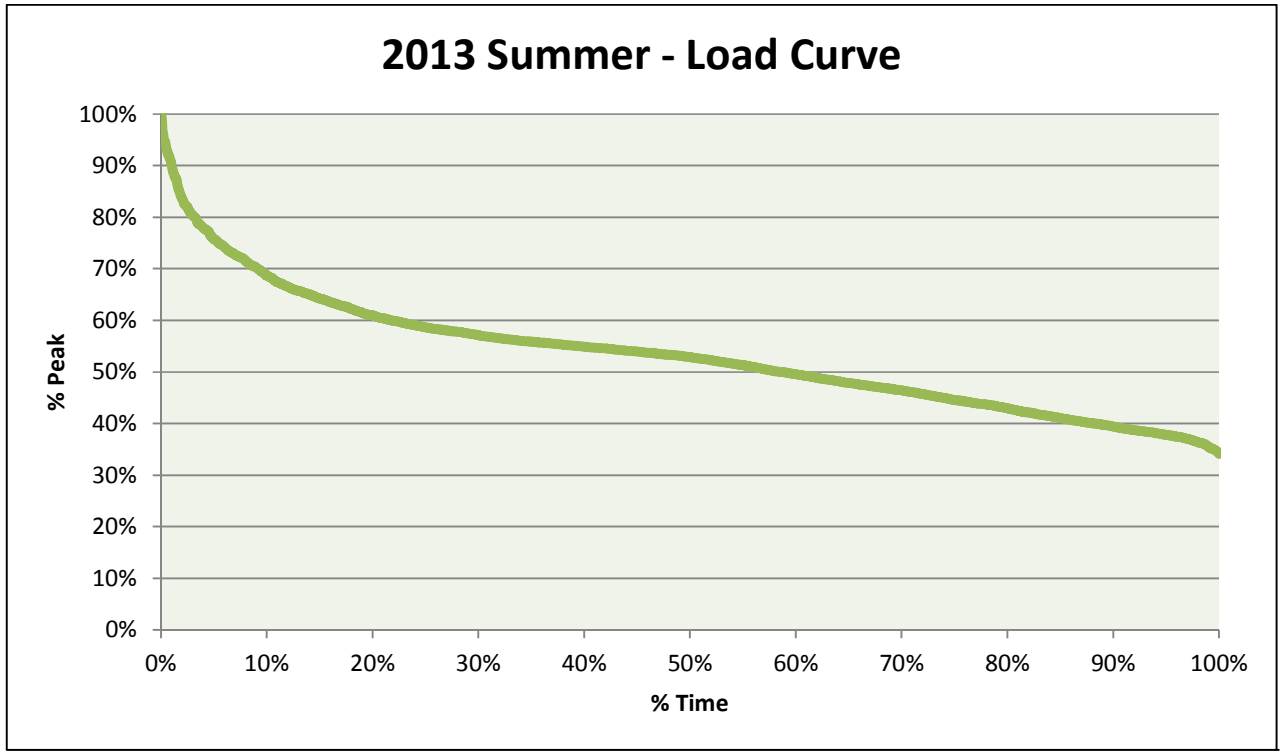
XI. Conclusion

This updated report has demonstrated that GRTA will solve the violations which would be caused by the retirement of Ginna. The components will be placed in service in a specific sequence. Any needs arising from a delay in the completion of the components would be met with operational protocols and other measures.

XII. Attachments

Attachment 1 – Hourly Load Curve
Attachment 2 – NYISO presentation

Attachment 1 – Hourly Load Curve



Attachment 2

Review of RG&E LTP Update – GRTA

Kevin DePugh
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New York Independent System Operator

ESPWG
October 6, 2015 (Revised October 16, 2015)
NYISO

DRAFT – FOR DISCUSSION PURPOSES ONLY

Background

- December, 2014: RG&E first identified the Ginna Retirement Transmission Alternative (GRTA) in PSC proceedings as a possible transmission solution to the retirement of Ginna.
- On 9/24/2015, RG&E updated its Local Transmission Plans (LTPs) to include the GRTA projects, to be in-service mid-2017.
- The Station 255 project is scheduled to be in-service by 2020.

GRTA Project

- Upgrade the 3 - 345/115kV transformers at Pannell substation
- Reconfigure the 345kV and the 115kV at Pannell substation to eliminate stuck breakers that removed more than one of the 345/115kV transformers
- Reconfigure the 345kV at Station 80 to eliminate stuck breakers that removed more than one of the 345/115kV transformers

2014 RNA/CRP – Rochester

- RNA noted overloads on the Rochester BPTF system.
- The RNA also noted that the completion of Station 255 would relieve the loading issue in Rochester.
- The CRP noted that if RG&E updated its LTP to include the GRTA, the NYISO would conduct further analysis of the reliability needs in the Rochester area.

Additional Reliability Study

- The NYISO performed an Additional Reliability Study for Exelon Corporation in May of 2014 that evaluated the impact of the retirement of Ginna.
- Exelon filed the study report with the PSC on July 11, 2014.
- This analysis also showed overloads on the Rochester BPTF system.

NYISO Analysis of GRTA

- Performed for the years 2019 and 2024 using the 2014 CRP cases with Ginna out-of-service.
  - ***The year 2019 had the GRTA project in-service***
  - ***The year 2024 had the GRTA project and Station 255 in-service***
- Study performed on BPTF facilities.
- The analysis showed no BPTF transmission security issues in the Rochester area.

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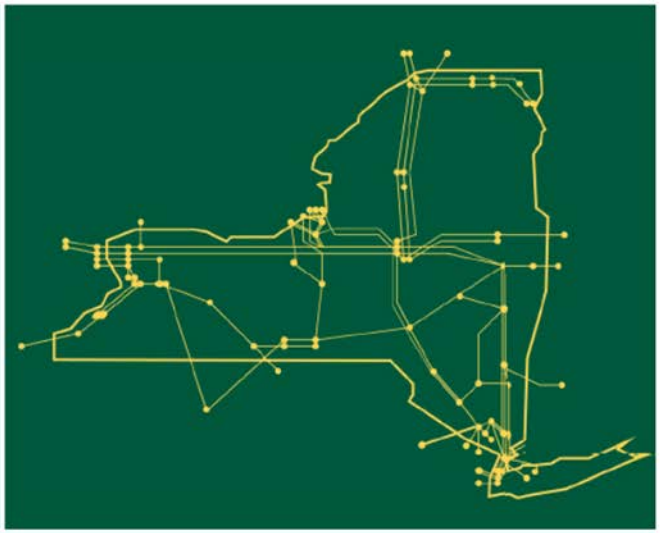

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