Janet M. Audunson, P.E., Esq.
Senior Counsel II

December 5, 2017

VIA ELECTRONIC DELIVERY

Honorable Kathleen H. Burgess
Secretary
New York State Public Service Commission
Three Empire State Plaza, 19th Floor
Albany, New York 12223-1350

RE: Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (REV)

RFP FOR NON-WIRES ALTERNATIVE SOLUTIONS FOR VAN DYKE, BUFFALO 53, and GOLAH-AVON

Dear Secretary Burgess:

In accordance with the requirements of New York Public Service Law ("PSL") Section 27, Niagara Mohawk Power Corporation d/b/a National Grid ("National Grid") hereby submits for filing in Case 14-M-0101 the Request for Proposal ("RFP") for Non-Wires Alternative ("NWA") Solutions for three areas of electrical stress in the Delmar/Slingerlands, Buffalo, and Avon areas, respectively, to be formally issued no later than December 7, 2017. With this RFP National Grid is soliciting proposals for NWA solutions defined in the attached RFP Scope of Work document.

Please direct any questions regarding this RFP to:

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Thank you.

Respectfully submitted,

/s/ Janet M. Audunson

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Senior Counsel II

Enc.

cc: Tammy Mitchell, DPS Staff, w/enclosure (via electronic mail)
Marco Padula, DPS Staff, w/enclosure (via electronic mail)
Denise Gerbsch, DPS Staff, w/enclosure (via electronic mail)
Allison Manz, DPS Staff, w/enclosure (via electronic mail)
Carlos Nouel, w/enclosure (via electronic mail)
Cathy Hughto-Delzer, w/enclosure (via electronic mail)
Allen Chieco, w/enclosure (via electronic mail)
Fouad Dagher, w/enclosure (via electronic mail)
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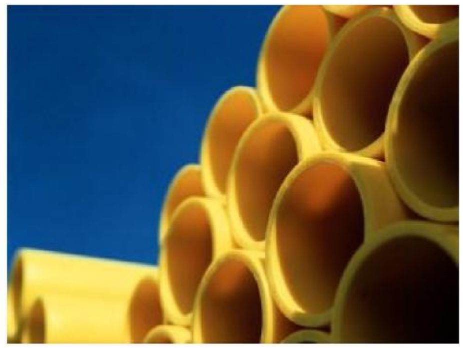
Pamela Echenique, w/enclosure (via electronic mail)
Carol Teixeira, w/enclosure (via electronic mail)
Lindsay Foley, w/enclosure (via electronic mail)
George Cruden, w/enclosure (via electronic mail)

nationalgrid



Request for Proposal (RFP)

Non-Wires Alternative Solutions
Project Development Services

RFP Scope of Work
(SOW)

December 4, 2017

Contents

Project Overview

	Problem Statement
	Bethlehem, NY (Van Dyke)
Description	1. **Reliability:** 8.0 MVA load at risk following an outage of one of the two 115/13.2 kV transformers in 2016 at the Krumkill station and associated feeders. The load at risk problem increases to 16.7 MVA by 2021 due to new commercial load (8.27 MVA) and 16.8 MVA by 2027 following normal load growth. Limited existing feeder tie point capacity due to highly loaded station transformers and feeders caused by new commercial load. 2. **Load Relief:** 8.0 MVA loading above normal operational levels (75% of feeder capacity at 6.92 MVA) and a resulting thermal overload of 161% (14.92 MVA) from 2021 onwards on the Krumkill 42153 feeder due to new commercial load (8.27 MVA)
Technical Information	• Krumhill 42153 feeder normal loading capacity (conductor ampere limit) is 9.24 MVA at 100% rating • Krumkill Bank 1 = 33.59 MVA name plate, summer normal 40.23 MVA

	Solution Requirements
	Bethlehem, NY (Van Dyke)
Technical Requirements	• **Request 1**: Maintain Krumkill 42153 feeder below 75% loading through to 2027. Solution will likely need to be downstream of the northern region of Slingerlands area due to location of the new commercial load • **Request 2:** Support 16.8 MVA of load for loss of Krumkill station transformer. Solution will likely need to be distributed across all three Krumkill feeders.
In Service Date	• Request 1 : Before June 2021 • Request 2: 8 MVA before June 2018 and 16.7 MVA total before June 2021
Duration per call	• Request 1 & 2: 24 hrs
Availability	• 99.5% minimum for both requests

	Solution Requirements - Bethlehem, NY (Van Dyke) - continued
Lifetime	• 10 years minimum
Call Response Time	• Request 1: within 1 hour • Request 2: within 5 minutes of an outage
Days of Week Needed	• All days
Time of Day	• Request 1 & 2: 24 hrs
Number of Times Called per Year	• Request 1: 365 days per year • Request 2: less than twice per year
Minimum Period between Calls	• Request 1: 0 hours • Request 2: unknown
Consecutive Days Called	• Request 1: every day • Request 2: Up to 2 days max

	Problem Statement
	Buffalo 53, NY
Description	1. An outage of one of 23/4.16 kV the three transformers, overloads the remaining two transformers to 137% of Summer Normal rating 2. An outage of any of the three 23 kV cables overloads remaining cables to 105%
Technical Information	• Three 23/4.16 kV 3.3 MVA (Summer Normal rating) transformers • Three 23 kV 12 MVA cables • Buffalo 53 + Buffalo Station 21 2017 load = 25 MVA

	Solution Requirements
	Buffalo 53, NY
Technical Requirements	• **Request 1:** 3.16 MW load reduction downstream of the Buffalo 53 Station to maintain the 23/4.16 kV transformers at 90% loading following the loss of a 23/4.16 kV transformer • **Request 2:** 3.16 MW load reduction downstream of the Buffalo 53 Station and a further 0.24 MW load reduction downstream at either Buffalo 53 or 21 Stations to maintain both cables and transformers at 90% loading following the loss of a 23 kV cable or 23/4.16 kV transformer outage
In Service Date	• Before June 2019 for both requests
Duration per call	• Up to 12 hours for both requests
Availability	• 99.5% minimum for both requests
Lifetime	• 10 years for both requests
Call Response Time	• Within 30 minutes of an outage for both requests
Days of Week Needed	• All peak load days for both requests
Time of Day	• Typically 9AM to 6AM (i.e. 21 hours) for both requests
Number of Times Called per Year	• Any time there is an outage of either a 23 kV cable or a 23/4.16 kV transformer
Minimum Period between Calls	• Duration between any two outages of either a 23 kV cable or a 23/4.16 kV transformer (including repair time)
Consecutive Days Called	• Could be up to 10 days (depends on whether it's a cable or transformer outage and the duration of peak load) for both requests

	Problem Statement
	Golah Avon, NY
Description	3. 34.5kV Golah-North Lakeville #217 overloads to 105% of its Summer Emergency rating for outage on the 116 Golah-North Lakeville 115 kV line 4. Low voltage problem below 90% on four 34.5 kV lines (216, 217, 218, 224) due to outage on the either the #110 Mortimer-Golah or the #116 Golah-North Lakeville 115 kV lines
Technical Information	• 217 34.5 kV feeder Summer Emergency rating = 27 MVA

	Solution Requirements
	Golah Avon, NY
Technical Requirements	• 8 MW of load reduction is required to address both the thermal loading and low voltage problems • Ideally the DER solution/s should be located near the North Lakeville Station or at any location downstream in alignment with the substation and associated feeder loading levels i.e. should not result in any interconnection problems
In Service Date	• Before June 2019
Duration per call	• 18 hours (during peak load event i.e. any time total North Lakeville load is above 30 MW)
Availability	• 99.5% minimum for both requests
Lifetime	• 10 years
Call Response Time	• A minimum of 1 hour before a peak load event (to prevent any low voltage violations in the event of an outage and any load shedding taking place)
Days of Week Needed	• Any time the North Lakeville load is above 30 MW
Time of Day	• Typically between 5 AM and 10 PM during winter and 9 AM to 10 PM during summer

	Solution Requirements - Golah Avon, NY - Continued
Number of Times Called per Year	• At a minimum twice per day during winter and once per day during summer
Minimum Period between Calls	• 6 hours
Consecutive Days Called	• Any time the North Lakeville load is above 30 MW

Please see the Technical Requirements section later in this document for more details on each of the above Problem Statements.

Introduction

National Grid is a gas and electric investor-owned utility serving nearly 3.3 million electric and 3.5 million gas customers through its subsidiary companies in Massachusetts, New York and Rhode Island. National Grid is committed to providing safe, reliable and affordable energy to all customers throughout our service territory. As a part of providing this service, National Grid is pursuing the potential implementation of Non-Wires Alternatives solutions in Upstate NY. Such implementation aligns with principles set forth by the NYS PSC Case 14-M-0101 – Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (REV).

National Grid has been pursuing Non-Wires Alternative Projects (“NWA’s”) across its service territories since 2011. Demand Response, solar, Combined Heat and Power (CHP), microgrid and other Distributed Energy Resources (DERs) have been studied and in some cases implemented in pilot projects intended to defer traditional electrical distribution equipment upgrades or “wires projects.”

This RFP seeks to identify specific market based DER proposals that, if implemented, would provide Non- Wire Alternative solutions for an area(s) of electrical stress described in the Project Overview. This RFP is open to all NWA approaches that display the potential to provide load relief and/or reliability in the area(s) identified. Proposed solutions should decrease peak load demand and increase reliability at the lowest reasonable cost possible. A potential solution provider may offer multiple solutions using different technologies, sizes and implementation schedules combined to form a portfolio.

To assist qualified bidders this document provides an overview of the project objectives, detailed business requirements and proposal submission information. As outlined in the RFP Schedule section of this document, bidders will have the opportunity to submit questions that assist in creating a proposal for this initiative. Please see the RFP Timeline Schedule for dates associated with RFP milestones below. The specific delivery terms and conditions will be worked out with the vendor in a formal contract following. receipt of a letter of intent.

Definitions

"Non-Wires Solutions" (NWS), also referred to as Non-Wires Alternatives (NWA), is the umbrella term for ensuring that a portfolio of alternatives to distribution and/or transmission lines is analyzed and considered in the planning and possible permitting of such facilities. A NWA could include any action or strategy that could help defer or eliminate the need to construct or upgrade components of a transmission and/or distribution system.

NWA's are defined and referred to as any demand response, distributed generation, energy storage, conservation or energy efficiency measure, generation altering pricing strategies that individually or in combination delay or eliminate need for upgrades to transmission and/or distribution system.

Deliverables & Main Tasks

This section describes the list of tasks and deliverables required for the bidder. Please provide detail in your proposal as to how your firm can perform each of the tasks below. All tasks should be responded to in the context of the project(s) listed in previous section (Overview). Proposals that do not provide the requested information below can be disqualified. Bidders must submit their proposals in the following format.

Executive Summary of Proposal

- Summary description of strategy and technologies bidder will implement to solve the problem.
- Summary cost information including:
  Annual cost for the operating period of ten years and if requires incremental operating expense, clearly defined incremental operating cost.

- **Table format is appreciated; sample below – table columns and rows adjusted by Bidder.**

	10 year annual Cost	**Incremental Operating Cost**	**Total Annual Cost based on X annual operating hours. If applicable**	**Guaranteed MW available thru 10 year contract period.**	**Guaranteed MWh available thru 10 year contract period.**	**Improvement to CAIDI and/or SAIFI when applicable.**
Installation of XYZ system	**$**	**$/kwh**	**$**			
Installation of ABC system	**$**	**$/kwh**	**$**			
Total Cost for 10 years operating agreement	**$**	**$**	**$**			

Experience

- Firm's core business and organizational structure (including partners, if any)
- Firm qualifications, service offerings & relevant project experience
- At least 3 references of prior industry specific work that is similar in nature and relevant to solution proposed. This should include:
  - Client contact information
  - Project location
  - Description of the solution provided
  - Commercial operation date
  - Construction/implementation timeline
- Any other relevant information supporting and validating the proposed solution
- Project Team:
  - Please describe the staff and experience of the employees that will be working directly with National Grid (resumes should be included as appendix)
  - Team organization chart with position descriptions

Project plan and schedule

- Detailed plan to implement the solution including:
  - Scope of work & execution strategy
  - Customer acquisition and marketing plan
  - Financing, including transaction structures and pricing formulas
  - PMO Methodology:
    - Key milestones/detailed timeline from contacting to implementation to completion of the proposed solution
    - Detailed schedule
    - National Grid system outage requirements to install your proposed solution
    - Risk mitigation methodology and schedule recovery approach
    - Project reporting approach, i.e. M&V
  - Operation and Maintenance plan (if applicable)
- Cutoff date by which the contract must be signed so as for the project to be completed before June 1st, 2018 or the earliest operational date feasible if not June 1st, 2018. (applicable for DERs)
- Approximate dates by which 50% and 100% of the estimated load reduction will be achieved (applicable for DR)(C)

Project approach and methodology

- Technology/Solution description and performance characteristics including:
  - Electrical One-Line diagram of proposed interconnection to the National Grid System
  - Geographical map showing approximate/proposed location(s) of the proposed solution/s Land does not need to be procured until after contracts are signed.
  - Accurate and validated (preferably independently verified) performance characteristics of the proposed solution/s
  - Clear definition of all communication and IT interfaces with the utility
  - Proposed protection scheme that integrates with the utility
  - Control scheme to maintain system stability and transition from grid to island modes (if applicable)

  - Any reactive power/voltage support capabilities and response time
  - The minimum and maximum level of load reduction available
  - The possible capacity (kWh) or duration of relief (h)
  - The frequency at which each DER can be called upon reliably
  - Any constraints that would impact the resource availability
  - Performance characteristics of the technologies proposed
- Specification and details associated with implementing the proposed solution including but not limited to:
  - Location of the facility
  - Approximate footprint including height, width and required clearances of proposed solution/s
  - Noise levels of proposed solution
  - Land acquisition costs - approximate
  - Permitting requirements
  - Operation of DER
  - Management/cost of wholesale market benefits
  - Net cost to power/charge the DER Please review our commercial rates here: https://www9.nationalgridus.com/niagaramohawk/business/rates/rates.asp
  - Identify lifecycle expectancy for all major components including but not limited to batteries, inverters, solar panels and generators
  - Identify specific equipment warranties for all major components including but not limited to batteries, inverters, solar panels and generators.
  - Identify changes in equipment capacity degradation over expected life time
- Define measurement and verification procedures, forecasting and notification processes and ways of integration with utility monitoring, communications and control systems
- Describe other uses for the proposed DER and any constraints those uses may have on the availability of the resource for the use in response to electric system needs (e.g. participation in the wholesale market)
- Description of the flexibility and applicability of the technology
- Risks, Barriers, Challenges with your proposed solution (e.g. Permits, Land Acquisitions, Construction Risk, Operating Risk)
- Detailed Energy Benefits associated with proposed solution
- Availability and Reliability:
  - The ability of proposed solution to provide permanent and temporary load relief will be considered, along with dependability & benefits that would be provided to the grid
- Community Impact:
  - Provide information on elements of the proposal that affect the community both positive and negative including, but not limited to, associated GHG emissions, waste streams and management, job creation potential, and community disruption.

<u>Commercial</u>

- Provide a fixed payment (monthly or annual) Energy Service Agreement (ESA) for a 10-year minimum term (includes OPEX and CAPEX), including the following considerations:
  - Provide list a buy-out/transfer or contract extension option terms
  - Bidder is welcome to provide optional supplementary ESA(s) with various terms that are better aligned to respondent's solution

    - Any wholesale market participation benefits from the proposed solution/s should be subtracted from the offered ESA price, as only the bidder will receive the monetary value
    - Interconnection costs to the National Grid system should not be included in the initial proposal but will be included at a later date once determined by National Grid (if the bidder is selected)
        - Please do not request to be added to the National Grid interconnection queue until instructed by National Grid
- Respondents should identify all funding streams that may be utilized to mitigate cost impact to the Company's customers (i.e., wholesale market participation revenue, State and Federal funding opportunities etc.)
- Cost of land (if applicable) should be included as a separate fee (National Grid is unable to provide any land)
- Financial Statements for past 3 years should be included as an Appendix
- Legal Claims
- Exceptions to National Grid Terms and Conditions (if any)
- Exceptions to the RFP Proposal requirements (if any)
- Under Performance/Liquidated Damages – Respondents should note that failure to deliver load relief committed to as part of any solution may result in liquidated damages to National Grid as provided for by the contract between respondent and National Grid:
    - Respondents are put on notice that if a Respondent' solution is selected, then respondent will be required to furnish security to National Grid that demonstrates, among other things, financial capabilities to pay liquidated damages in the event that the respondent fails to satisfy its Load Reduction Guaranty during the period required

Instructions for Bidders

Proposal

Please provide a concise written proposal under 50 pages (excluding appendixes) for ease of review. There will be sections to upload additional documents on our website. Bidders are encouraged to provide alternate cost-effective proposals designed for average/optimized load in conjunction to peak/requested load (as described in Problem Statement Document(s))

Evaluation Criteria

- Conformance with technical requirements outlined in this document
- Sizing Flexibility (ability to reduce the magnitude of the proposed MW Reduction)
- Feasibility of the proposed solution
- Development and Schedule risk, as well as risk of maintaining performance through the contract term
- Site Control
- Ability to Permit Project
- Ability to meet proposed in service date
- Exceptions to agreement
- Quality of Proposal
    - Financing Plan
    - Financial Qualifications
    - Management Experience
    - History of equipment reliability over claimed lifetime
    - Reasonableness of claimed per-unit load reduction

- Cost for the required Non-Wire Alternative
- Black Start Capabilities/Availability and Reliability
- Integration with the T&D System, including ability to meet a COD earlier than planned
- Community Impacts
- Environmental Impacts
- Contractor Experience
- Savings from the T&D system

Partnering

If your firm wishes to bid on only one of the components of this RFP and are looking to partner please let us know if you wish to share your contact information with the other bidders of this RFP. We can then post your contact information for the other bidders who are also willing to share their information. This may help with collaboration and provide opportunities to firms that may not already know or have a partner that provides one or more of the services requested in this scope of work.

Business Case Criteria

The Benefit Cost Analysis Handbook which was filed with Initial Distributed System Implementation Plan (DSIP) on June 30, 2016 outlines three distinct tests which help evaluate each potential deployment approach from a variety of standpoints.

Test	Key Question Answered	Calculation Approach
Societal Cost Test	Is there a net reduction in societal costs?	Compares the costs incurred to design and deliver projects, and customer costs with avoided electricity and other supply-side resource costs (e.g., generation, transmission, and natural gas); also includes the cost of externalities (e.g., carbon emissions and other net non-energy benefits)
Utility Cost Test	Is there a net change in utility system costs and what is the impact of the proposed solution on average customer bills?	Compares the costs incurred to design, deliver, and manage projects by the utility with avoided electricity supply-side resource costs
Rate Impact Measure	How will utility rates be affected?	Compares utility costs and utility bill reductions with avoided electricity and other supply-side resource costs

Each test attempts to address the complexities involved in large scale investments with a unique understanding of how utility expense translates into tangible savings and improvement for all impacted parties. Even though the benefit and cost calculations for the three tests have many overlaps the SCT is considered as the primary cost-effectiveness measure.

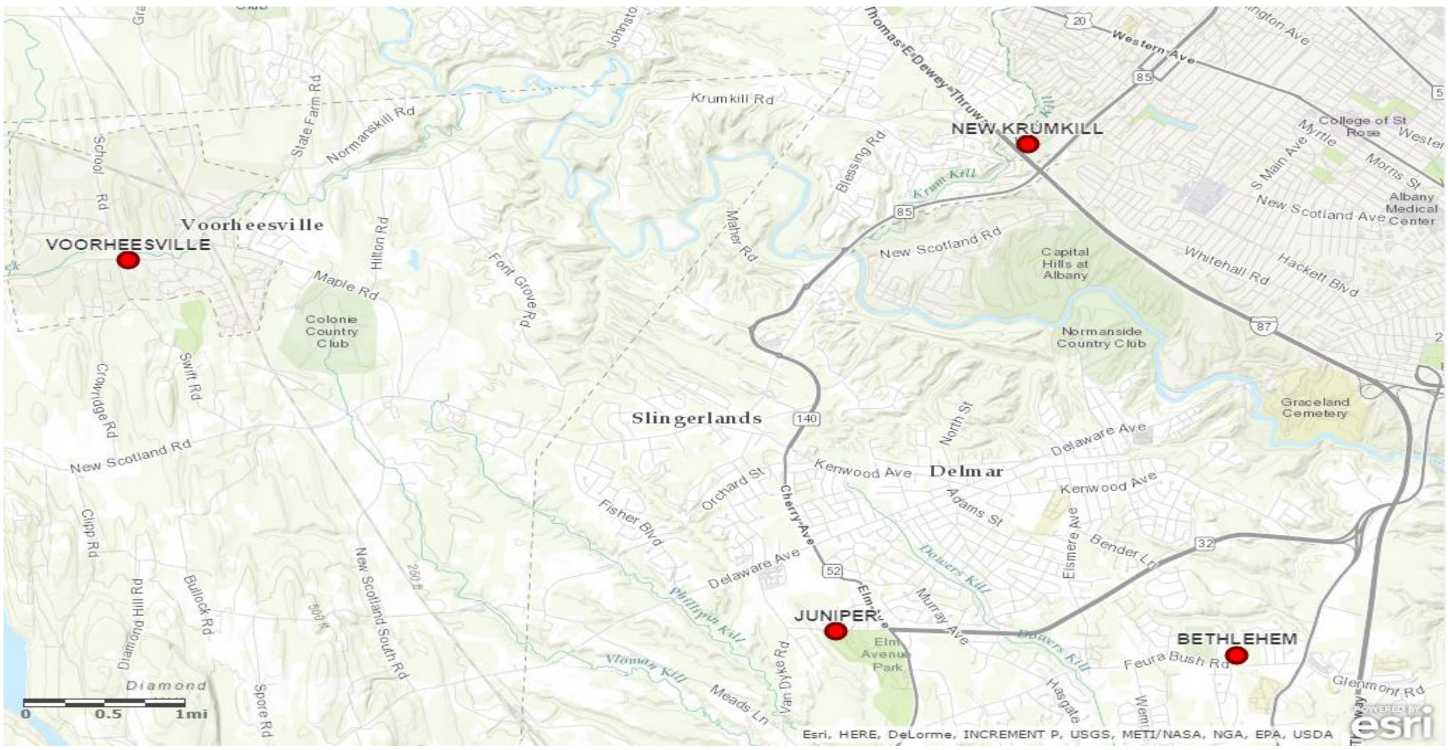
The BCA handbook further outlines common input assumptions and sources that are applicable statewide and utility specific inputs that may be commonly applicable to a variety of project-specific studies. For example, it is stated that the after-tax utility weighted average cost of capital should be used as the discount rate across all metrics.

RFP Schedule (Estimated and subject to change)

- RFP Launch: 12/4/17
- Bidders questions submitted to ARIBA for discussion on upcoming bidders call: 12/15/17
- Bidders Conference Call: 1/5/18
- Last date to submit questions: 1/12/18
- Proposals Due: 1/19/18

Technical Requirements – Bethlehem, NY (Van Dyke)

The 42153 feeder out of the Krumkill station serving an area in Capital Region of New York south of Albany requires load relief and has increasing "Load at Risk" issues. 8.27 MVA of expected new commercial and industrial load in Bethlehem, will cause feeder 42153 loading beyond normal ratings. The local distribution system is interrupted for any single contingency as it is of radial configuration with N-0 criteria. Feeder ties exist with several neighboring feeders / substations which are within their normal operating conditions and would pick up a portion of the load. Substations in the local area include; Bethlehem (021), Voorheesville (178), New Krumkill (421) and Juniper (446). These serve customers situated in different zip codes forming Towns of Bethlehem and New Scotland and portions of the City of Albany. As part of NY REV guidance order, National Grid is seeking NWA solutions that could potentially provide delivery infrastructure avoidance value, reliability and operational benefits.



As shown below, these four substations together serve around 18,500 customers:

	Bethlehem (021)	Voorheesville (178)	New Krumkill (421)	Juniper (446)
Residential	5,067	5,803	6,196	282
Commercial	364	506	334	42
Total	5,431	6,309	6,530	324

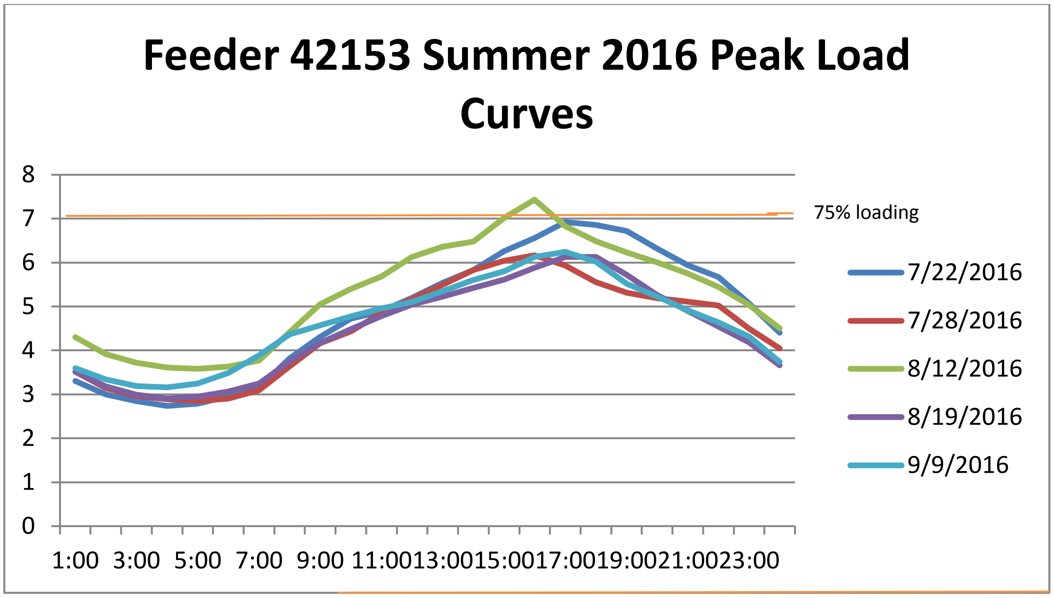
The table below presents customer allocation per zip code of Bethlehem (021), Voorheesville (178), New Krumkill (421) and Juniper (446) substations as well as feeder ties with neighboring stations. The bold numbers indicate the total customers served by a particular substation.

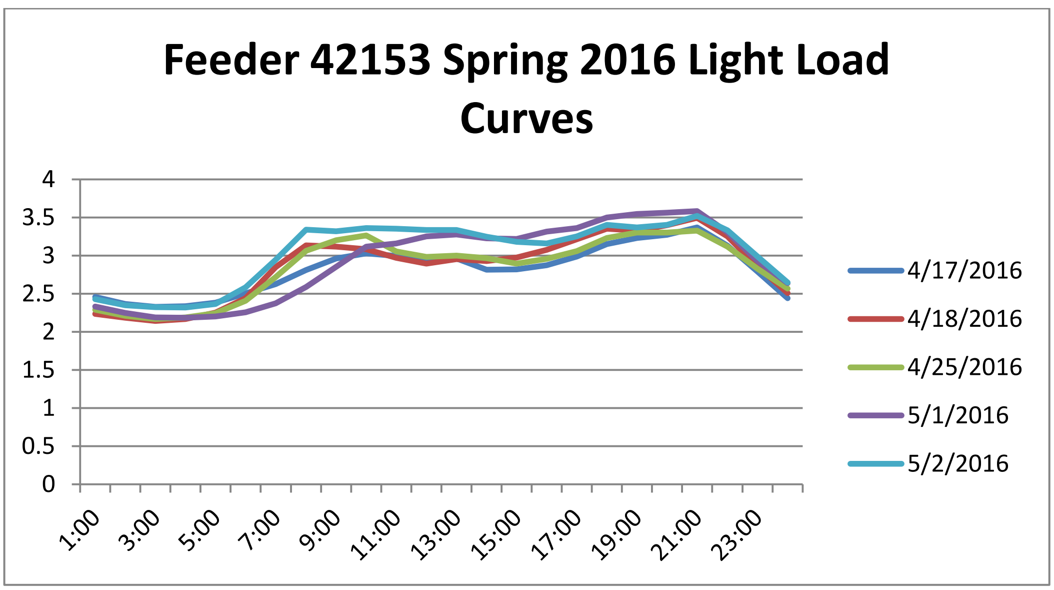
Feeders	Zip Codes 12054	12067	12077	12158	12209	12009	12023	12059	12186	12159	12203	12084	12041	12053	12208	Other Areas	Grand Total
021	**1809**	**177**	**2435**	**939**												9	**5369**
55	468	1	785														1254
56	7	2	737	10													756
58	1334	174	913	929												9	3359
149			**14**	**1527**												11	**1552**
164			**77**		**6**											99	**182**
178	**801**		**1**			**278**	**256**	**837**	**2827**	**1186**	**3**	**8**				56	**6253**
52	801		1						497	1109	2					11	2421
51						87	256	837	771							43	1994
53						191			1559	77	1	8				2	1838
276	**1404**	**66**							**115**	**16**			**261**			2	**1864**
283				**1**		**1850**	**111**							**246**		68	**2276**
327					**2**						**2199**					2	**2203**
371										**428**		**1108**				3	**1539**
421	**70**				**165**				**1**	**1352**	**2041**	**1**			**2802**	12	**6444**
52									1	3					802		806
51					165						1179	1			1323	9	2677
53	70									1349	103				7		1529
26											284				592	1	877
27											475				78	2	555
446	**310**																**310**
Grand Total	**4394**	**243**	**2527**	**2467**	**173**	**2128**	**367**	**837**	**2943**	**2982**	**4243**	**1117**	**261**	**246**	**2802**	**339**	**27992**

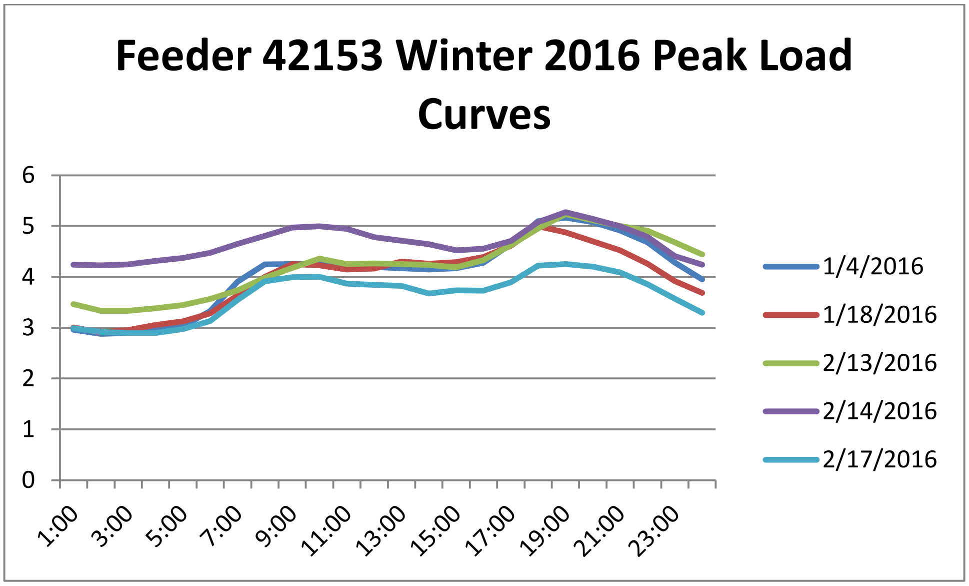
The following table presents transformer capacities for the four substations. The Company forecasts the Van Dyke Area load to grow by 1.8% between 2016 and 2031.

Transformer	Normal Capacity (MVA)	Actual Summer 2015 (MVA)	Forecasted Peak 2017 (MVA)	Forecasted Peak 2026 (MVA)
New Krumkill	40.2	21.4	22.6	22.9
Voorheesville	25.9	18.9	21.1	20.3
Bethlehem	30.0	19.0	20.0	22.9
Juniper	3.25	0.6	0.6	0.6

The loading profile of Feeder 42153 is presented in the following graphs.






Feeder 42153 Winter 2016 Peak Load Curves
6
5
4
3
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13:00
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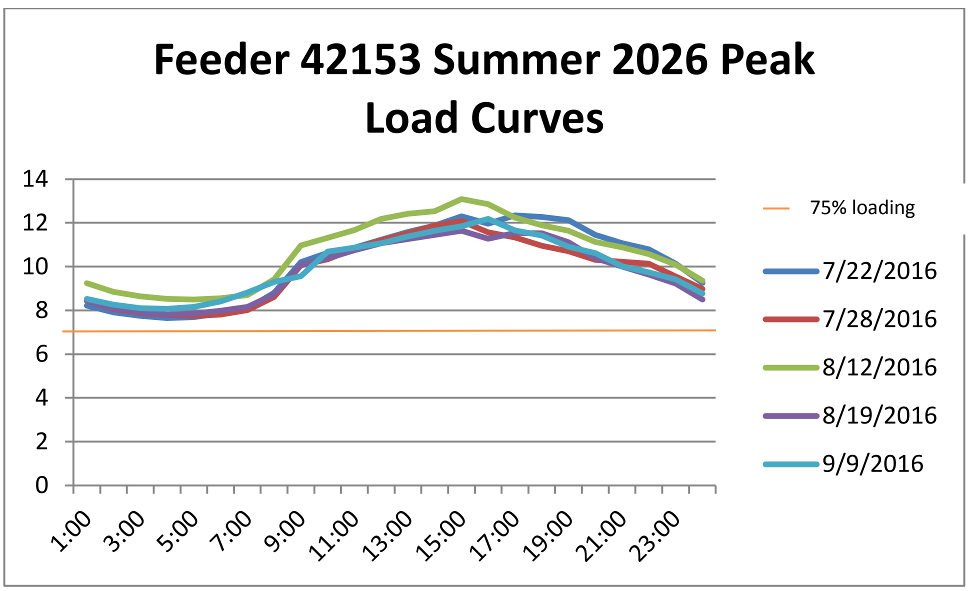
2/17/2016


Feeder 42153 Summer 2026 Peak Load Curves
14
12
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11:00
13:00
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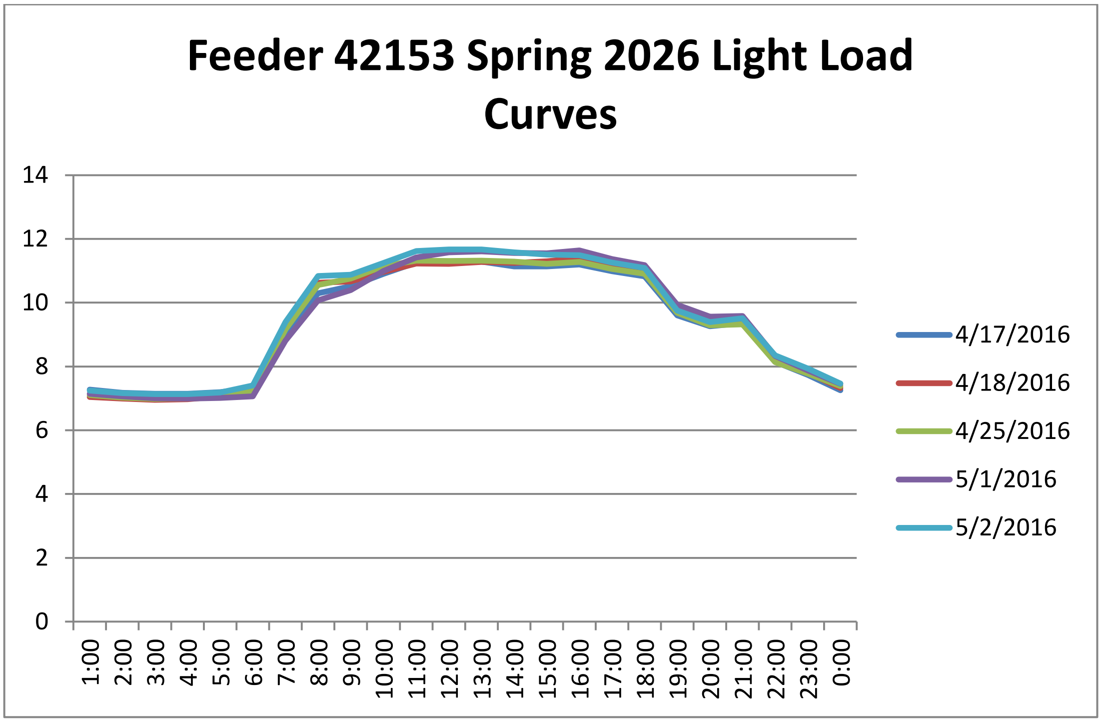
8/12/2016
8/19/2016
9/9/2016


Feeder 42153 Spring 2026 Light Load Curves
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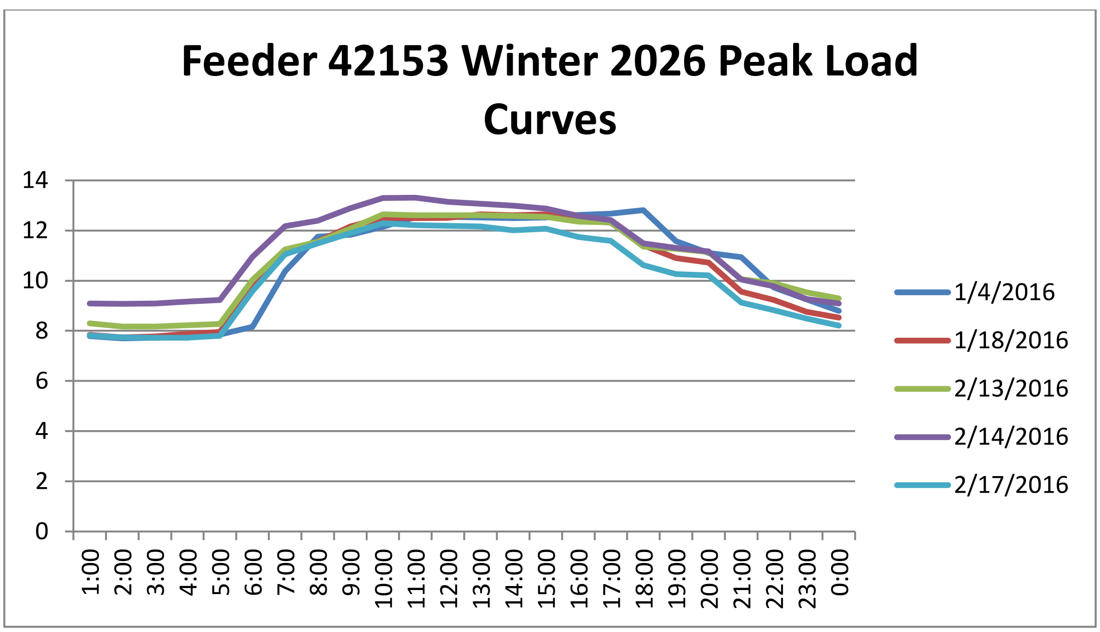
5/1/2016
5/2/2016


Feeder 42153 Winter 2026 Peak Load Curves
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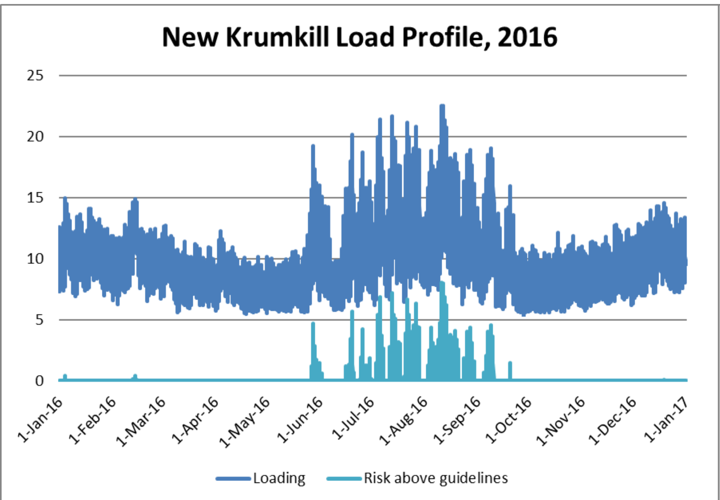
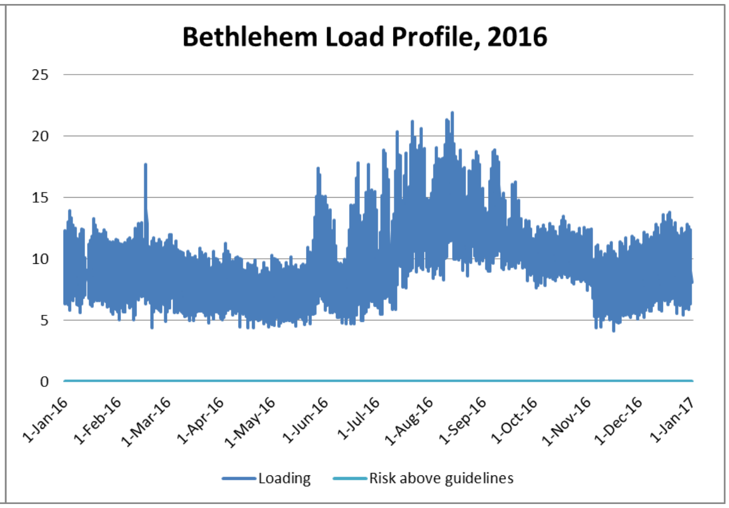
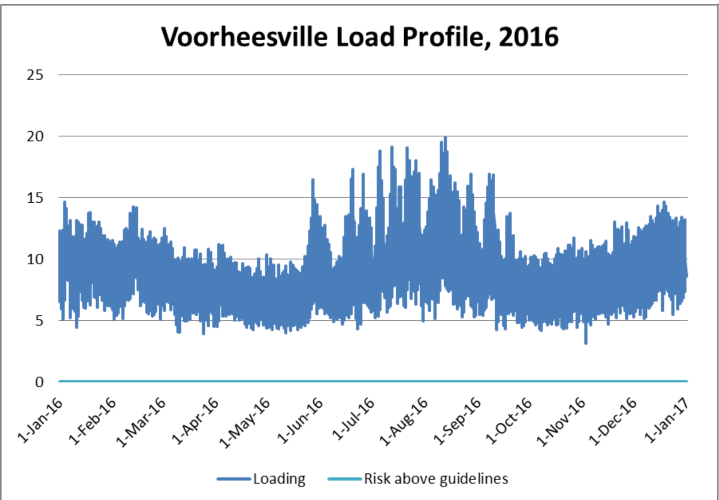
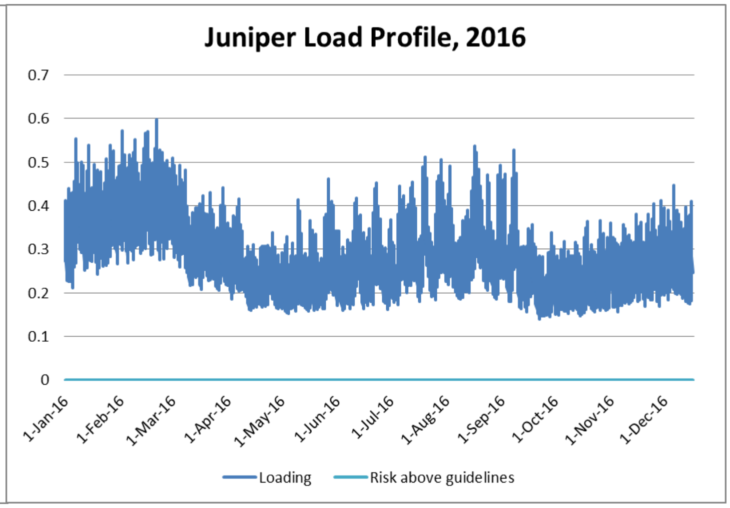
2/14/2016
2/17/2016

The loading profile of each substation is presented below



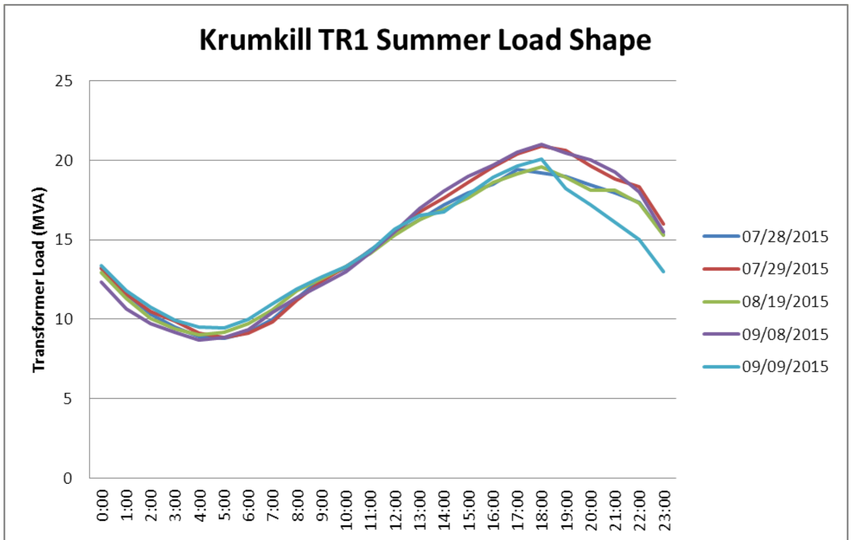


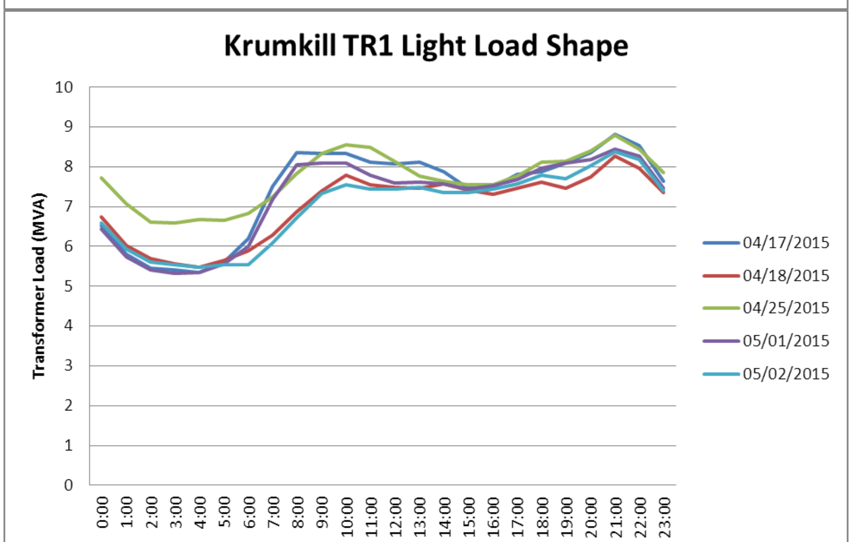


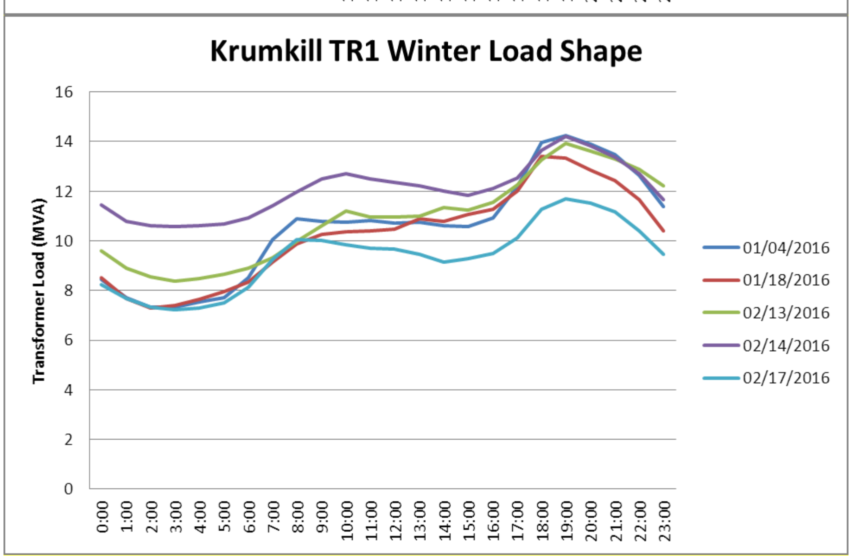


The charts below depict daily load curves for several summer, light load and winter peak days in 2015/2016.

Krumkill:







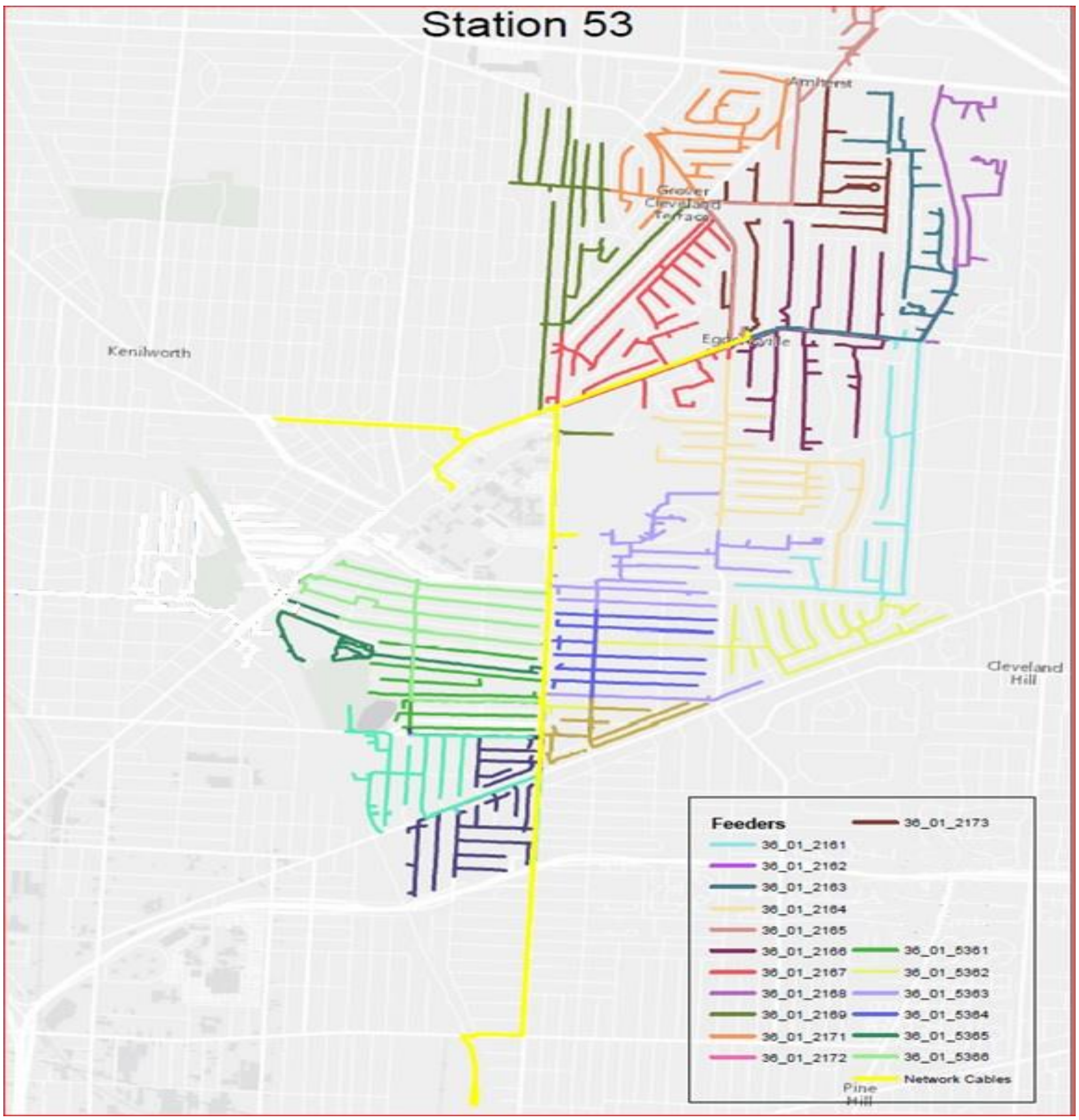
The following feeder data by substation is taken from the National Grid System Data Portal. Although models are often better at providing insight rather than answers, individual feeder loading and hosting capacity along with other NWA information can be derived from the following table.

	Sub-Feeder	Voltage Level (kV)	Summer Rating		2016 Peak		2017 Peak		MAX 3-ph (MW)	MIN 3-ph (MW)	DG Connected (MW)	DG Queued (MW)	Refresh Date
			MVA	Amp	MVA	Amp	MVA	Amp					
BETHLEHEM	02155	13.2	10.08	441	7.98	349	8.41	367.88	10.0	0.30	0.126	0.024	7/17/2017
	02156	13.2	10.06	440	4.14	181	4.36	190.79	10.0	0.15	0.271	2.309	7/17/2017
	02158	13.2	10.06	440	8.57	375	9.04	395.29	10.0	0.04	2.734	0.042	9/12/2017
SELKIRK	14952	13.2	11.07	484	4.57	200	4.82	210.82	10.0	0.1	1.249	0.164	9/13/2017
TRINITY	16443	13.2	7.18	314	4.73	207	4.99	218.2	9.2	0.3	0.153	0.984	9/5/2017
VOORHEESVILLE	17851	13.2	11.41	499	5.51	241	5.81	254.04	10.0	0.2	0.678	4.369	8/8/2017
	17852	13.2	11.41	499	7.59	332	8.00	349.96	10.0	0.10	0.507	5.963	9/12/2017
	17853	13.2	11.41	499	6.29	275	6.63	289.88	10.0	0.09	0.501	0.055	9/12/2017
UNIONVILLE	27652	13.2	10.06	440	5.56	243	5.86	256.15	7.6	0.1	0.441	1.724	9/13/2017
ALTAMONT	28356	13.2	9.19	402	5.81	254	6.12	267.74	10.0	0.0	0.756	5.582	8/3/2017
MCKOWNVILLE	32751	13.2	8.85	387	6.93	303	7.30	319.4	10.0	0.3	0.106	0.000	8/3/2017
PINEBUSH	37154	13.2	8.55	374	5.62	246	5.93	259.31	10.0	0.6	0.166	0.007	8/7/2017
NEW KRUMKILL	42126	4.16	3.17	440	2.16	300	2.28	316.23	10.0	0.4	0.141	0.050	8/7/2017
	42127	4.16	3.17	440	1.24	172	1.31	181.31	NA	NA	0.113	0.011	NA
	42151	13.2	9.24	404	8.25	361	8.70	380.53	10.0	0.19	0.477	0.224	9/13/2017
	42152	13.2	9.24	404	2.49	109	2.63	114.9	10.0	0.34	0.257	0.035	8/7/2017
	42153	13.2	9.24	404	6.93	303	7.30	319.4	10.0	0.09	0.299	1.271	8/7/2017
JUNIPER	44651	13.2	3.29	144	0.57	25	0.60	26.35	9.2	0.1			8/7/2017

Hosting Capacity shown in the table above is an estimate of the amount of DER that may be accommodated without adversely impacting power quality or reliability under current configurations and without requiring infrastructure upgrades (installing a recloser or remote terminal unit at the Point of Common Coupling, replacing a voltage regulating device or controller to allow for reverse flow, substation-related upgrades including 3V0 protection, or others)

Technical Requirements – Bethlehem, NY (Van Dyke)

Buffalo 53 Substation in National Grid's Frontier Operating Region (NIMO load zone West) is serving an area in northeast section of Buffalo, NY. Area loading has increased to a level at which the capacity of the transformers and cables feeding the station exceeds the threshold established in the National Grid Distribution Planning Criteria. The local distribution system is interrupted for any single contingency as it is of radial configuration with N-0 criteria. Feeder ties exist with neighboring Buffalo 21 Station which is within its normal operating conditions and would pick up a portion of the load. As part of NY REV guidance order, National Grid is seeking NWA solutions that could potentially provide delivery infrastructure avoidance value or other reliability and operational benefits. These solutions could connect to a circuit, load or one of two distribution substations, collectively called "Buffalo 53 Area".



As shown below, these two substations together serve around 8,910 customers:

	Buffalo Station 53	Buffalo Station 21
Residential	4,055	4,375
Commercial	247	233
Total	4,302	4,608

The table below presents customer allocation per zip code of Buffalo Station 53 and Station 21. The bold numbers indicate the total customers served by a particular substation.

	Zip Codes					
Feeders	**12054**	**12067**	**12077**	**12158**	**Other Areas**	**Grand Total**
53	**970**	**560**	**1913**	**1**	**69**	**3513**
61	536	15	523		18	1092
62	434		586		39	1059
65		253	83		2	338
66		292	424		10	726
63			296	1	0	297
64			1		0	1
21		**1**	**50**	**4504**	**1**	**4556**
61			49	403	1	453
63				259	0	259
64				461	0	461
65				199	0	199
66				488	0	488
67				627	0	627

	Zip Codes					
Feeders	12054	12067	12077	12158	Other Areas	Grand Total
68				118	0	118
69		1	1	843	0	845
71				600	0	600
72				2	0	2
73				504	0	504
Grand Total	**970**	**561**	**1963**	**4505**	**70**	**8069**

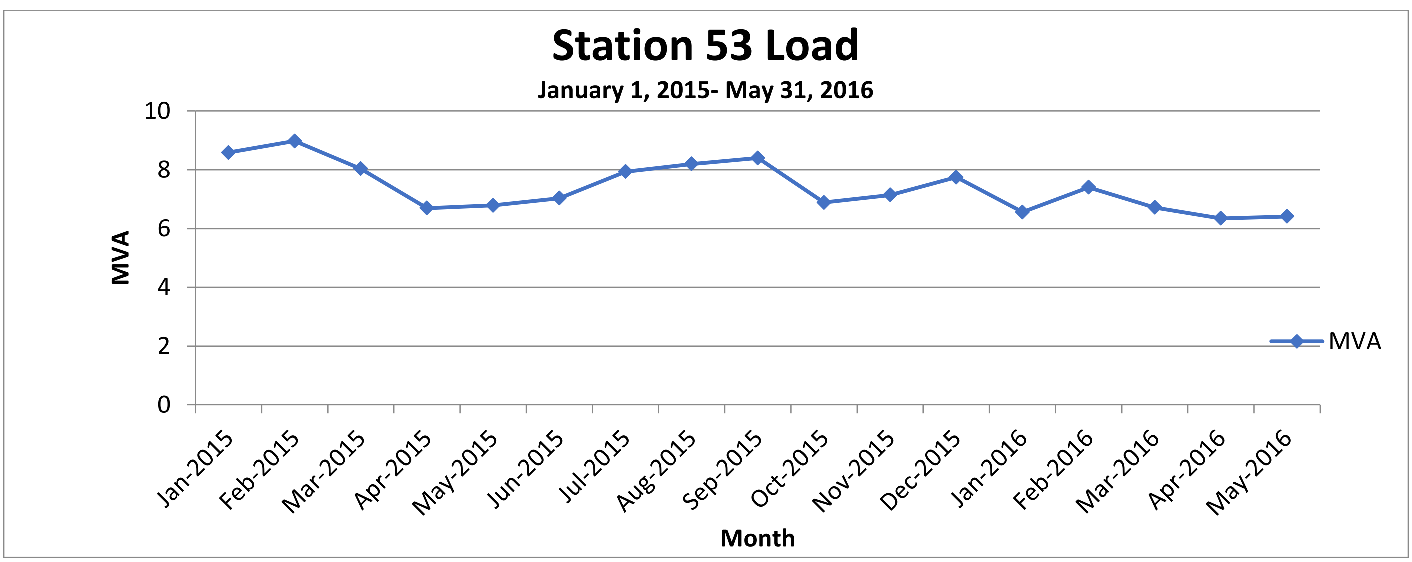
Buffalo 53 is an indoor station with three 23-4.16kV, 2.5/3.125MVA OA/FA transformers, induction regulators and six feeders. For the summer 2015 (and 2016) peak load condition, an N-1 transformer outage where one of the transformers at Station 53 were out of service, the remaining 2 transformers would be at 120% over its Summer Normal Rating and 105% over its Summer Emergency rating. Likewise, an N-1 cable outage will cause the remaining two cables to be 105% over the cables' Normal Rating.

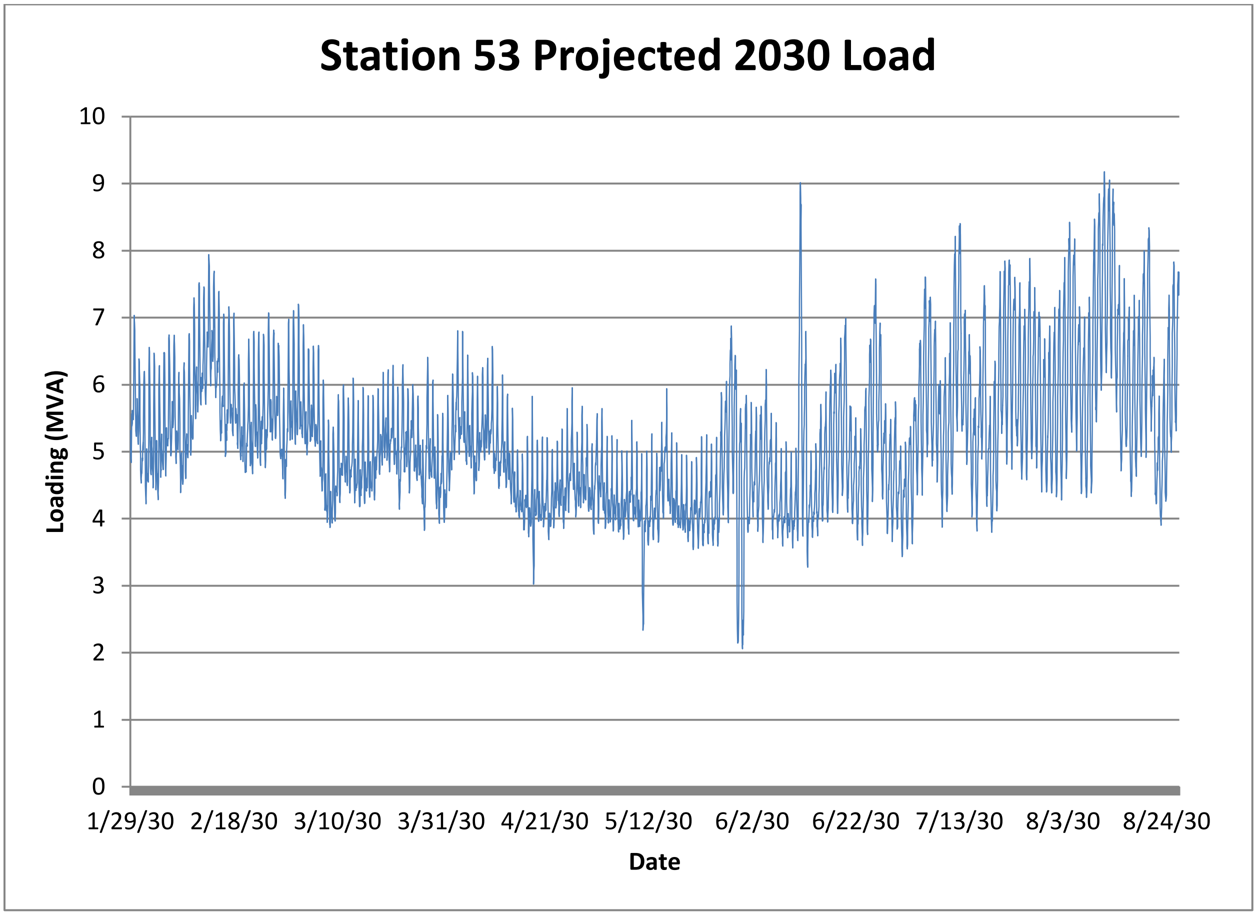
		System Voltage (kV)		Rating (MVA)	
Substation	**Transformer ID#**	**High Side**	**Low Side**	**Summer Normal**	**Summer Emergency**
STATION 53	#1	23	4.16	3.3	4.1
STATION 53	#2	23	4.16	3.3	4.1
STATION 53	#3	23	4.16	3.3	4.1
STATION 21	#1	23	4.16	5.02	5.61
STATION 21	#2	23	4.16	5.02	5.61
STATION 21	#3	23	4.16	5.02	5.61
STATION 21	#4	23	4.16	5.02	5.61

Load forecasts for the Western Division (Zone A&B) were developed by National Grid's Electric Load Forecasting group in November 2015. The table below shows a 95/5 weather adjusted growth rate for year 2016 through 2030. This forecast is based on the peak load of 8.5MVA as seen in the summer season in 2015 as well as 2016.

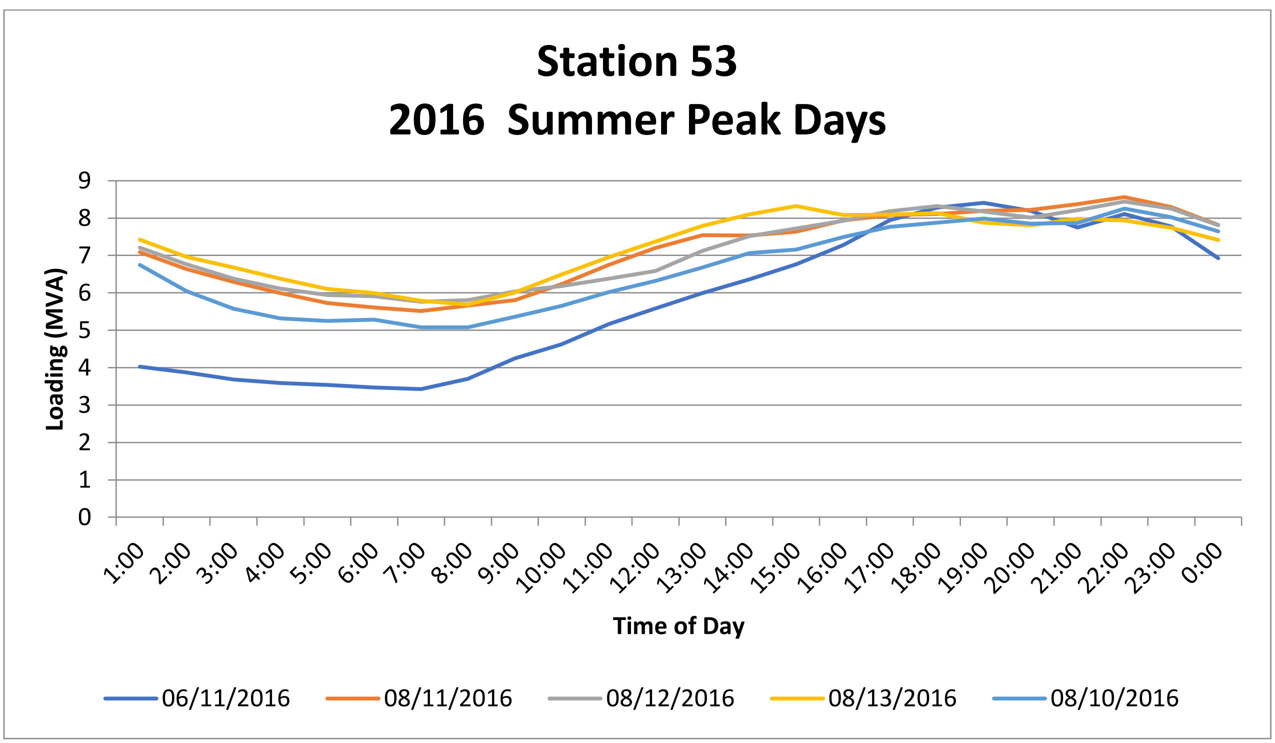
Year	% Growth	MVA
2016	0.40%	9.05
2017	0.10%	9.06
2018	-0.30%	9.03
2019	-0.50%	8.99
2020	-0.30%	8.96
2021	-0.20%	8.94
2022	-0.10%	8.93
2023	0.10%	8.94
2024	0.10%	8.95
2025	0.20%	8.97
2026	0.30%	9.00
2027	0.30%	9.02
2028	0.30%	9.05
2029	0.30%	9.08
2030	0.40%	9.11

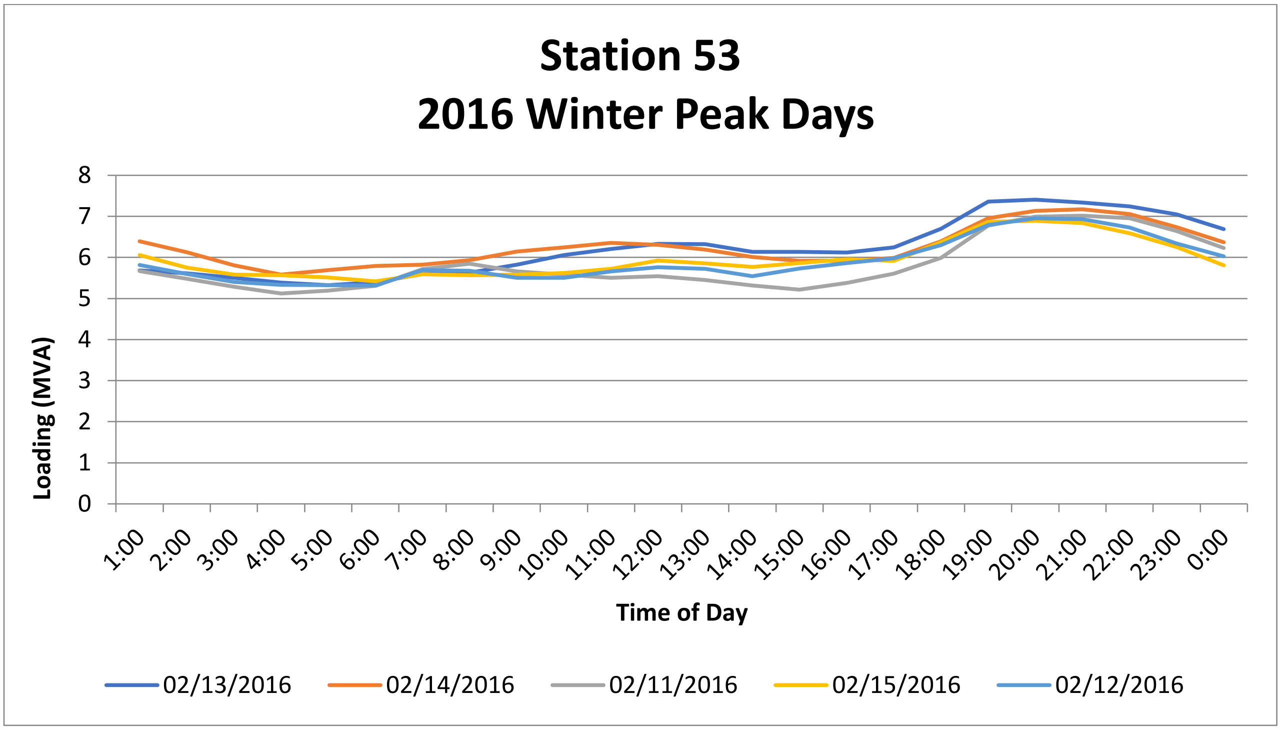
The following figures show the expected loading for year 2030 based on the growth rate factor in Table 1.





The following charts depict the daily load profile for Station 53 during selected Summer and Winter peak days.





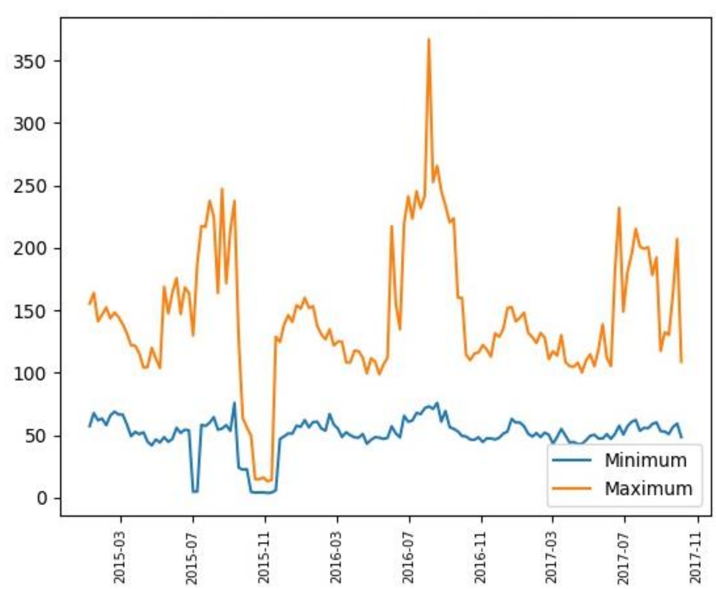
Based on peak load of 8.5MVA, an N-1 transformer outage where one of the transformers at Station 53 were out of service, the remaining 2 transformers would be at 120% over its Summer Normal Rating and 105% over its Summer Emergency rating. Likewise, an N-1 cable outage will cause the remaining two cables to each be 105% over there Normal Rating of 12MVA per cable.

The following feeder data by substation is taken from the National Grid System Data Portal. Although models are often better at providing insight rather than answers, individual feeder loading and hosting capacity along with other NWA information can be derived from the following table.

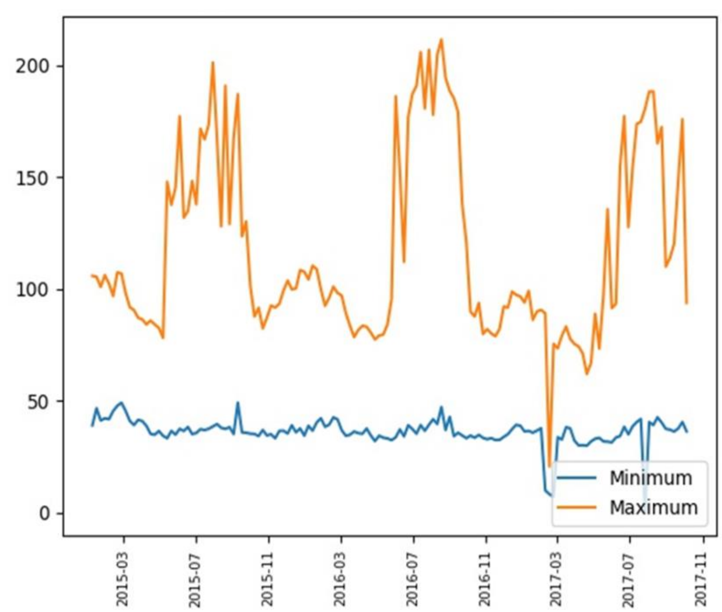
Sub-Feeder	Voltage Level (kV)	Summer Rating		2016 Peak		2017 Peak		DG Connected (kW)	DG Queued / Applications (kW)
		MVA	Amp	MVA	Amp	MVA	Amp		
2161	4.16	2.16	300	1.48	206	1.53	212.24	26.0	0.0
2163	4.16	2.16	300	1.15	159	1.18	163.82	NA	NA
2164	4.16	2.16	300	1.42	197	1.46	202.97	24.0	0.0
2165	4.16	2.16	300	0.79	110	0.82	113.33	10.3	3.8
2166	4.16	2.16	300	1.79	249	1.85	256.54	61.6	0.0
2167	4.16	2.16	300	1.92	267	1.98	275.09	22.3	0.0
2168	4.16	2.16	300	1.02	141	1.05	145.27	9.6	0.0
2169	4.16	2.16	300	1.95	271	2.01	279.21	4.0	16.5

Sub-Feeder	Voltage Level (kV)	Summer Rating		2016 Peak		2017 Peak		DG Connected (kW)	DG Queued / Applications (kW)
		MVA	Amp	MVA	Amp	MVA	Amp		
2171	4.16	2.16	300	1.35	187	1.39	192.66	3.9	0.0
2172	4.16	2.16	300	0.53	74.00	0.55	76.24	18.0	0.0
2173	4.16	2.16	300	1.25	173	1.28	178.24	7.1	0.0
5361	4.16	1.92	266	1.26	175	1.30	180.3	NA	NA
5362	4.16	1.92	266	1.32	183	1.36	188.54	19.6	0.0
5363	4.16	1.92	266	1.57	218	1.62	224.6	73.5	15.2
5364	4.16	1.92	266	1.30	180	1.34	185.45	3.7	0.0
5365	4.16	1.92	266	1.12	155	1.15	159.69	NA	NA
5366	4.16	1.92	266	1.46	202	1.50	208.12	10.0	0.0

Individual Feeder Amperage Curves provided below represent information collected by Remote Terminal Units (RTU) installed on the company's electric network. Not all of the company's circuits utilize RTU technology (i.e. feeder 2172, and all feeders on Buffalo 53) and for these this more detailed information is not available. Additionally, this data is provided as is, without warranty and contains raw data (i.e. anomalies have not been edited).



Feeder 2161



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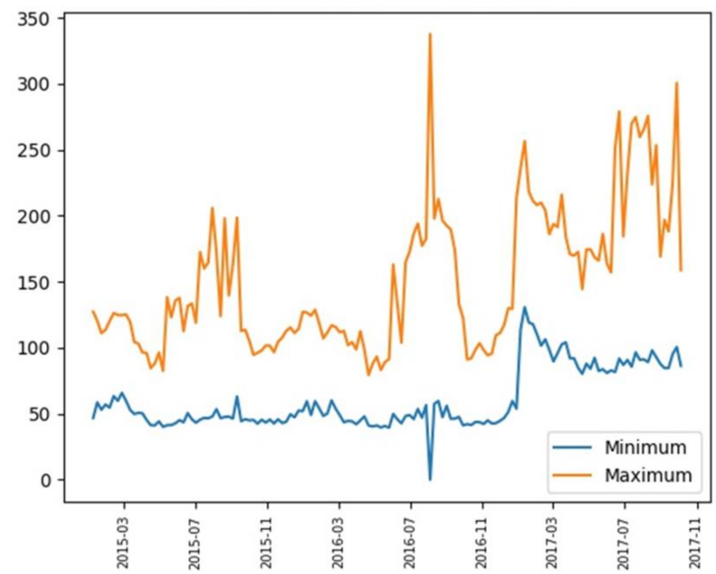

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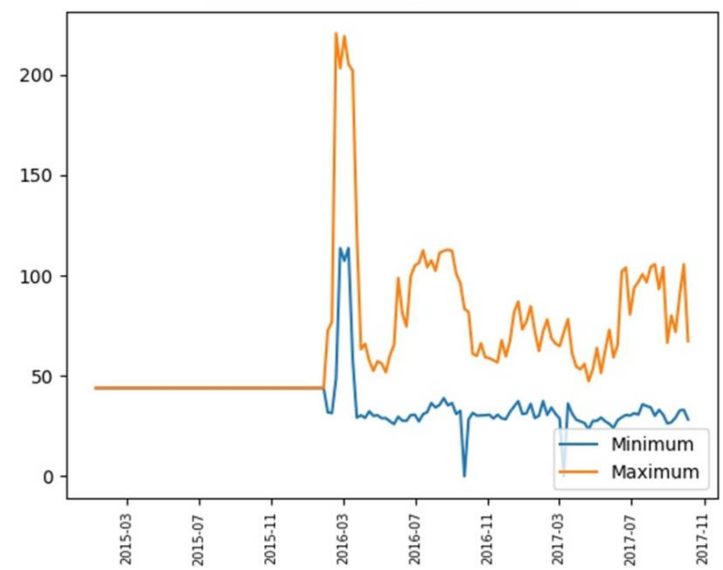

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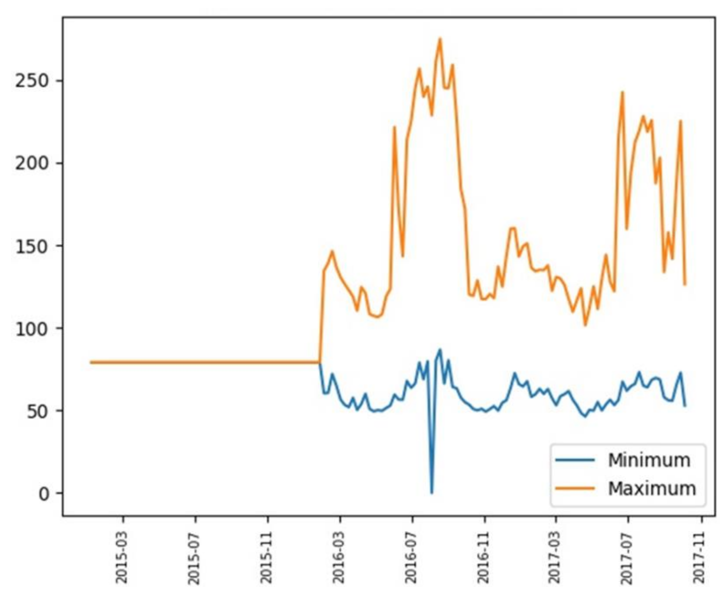

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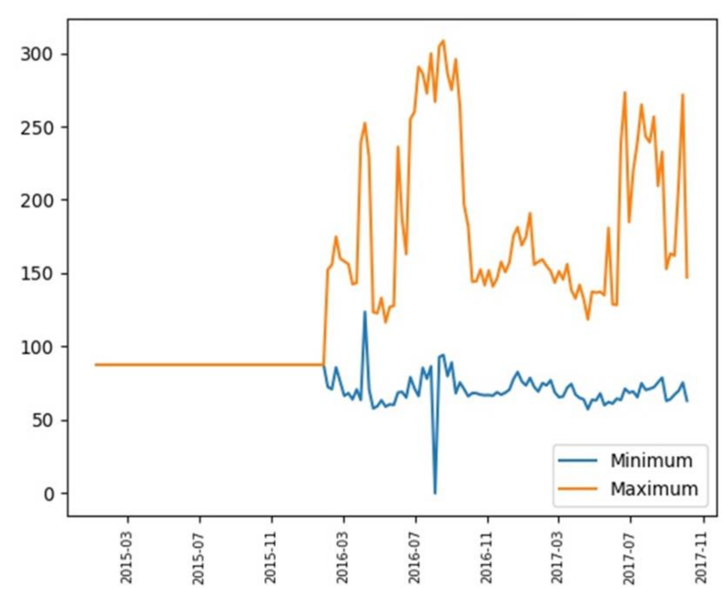
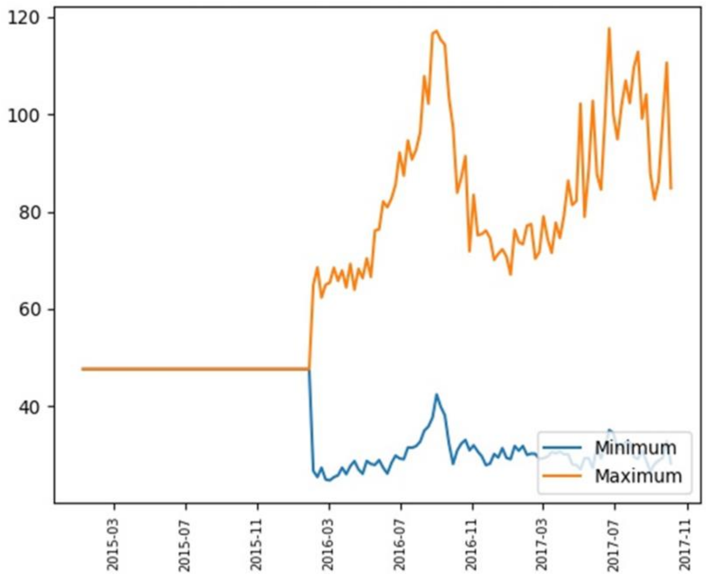
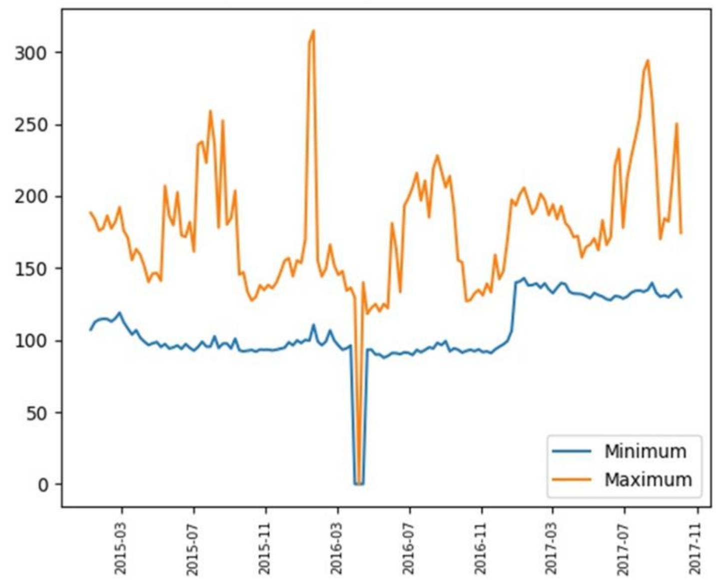


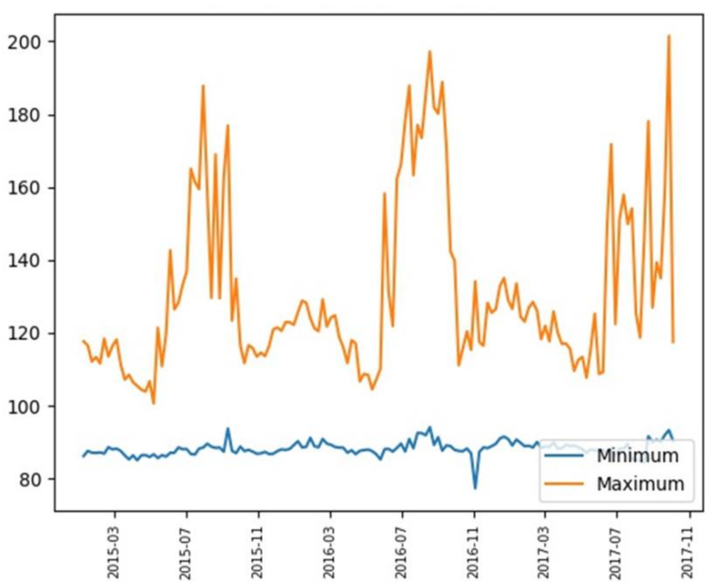
Feeder 2167



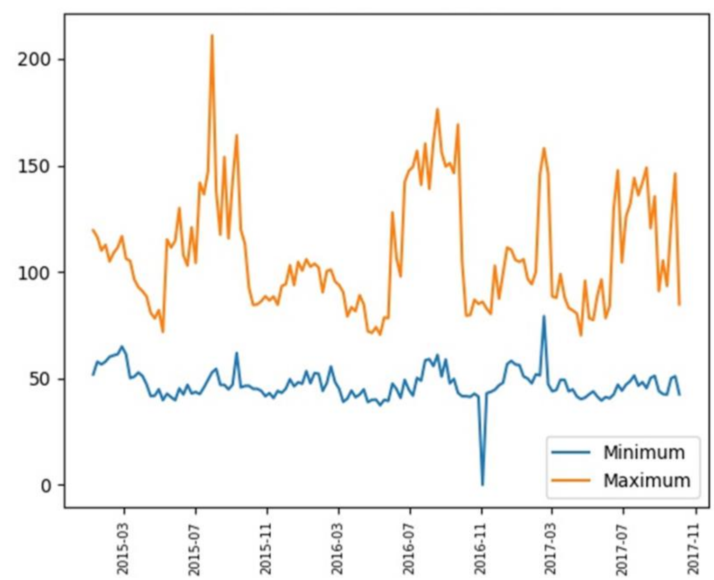
Feeder 2168



Feeder 2169



Feeder 2171



Feeder 2173

WAYS TO REMEDY CHALLENGES

A traditional solution to reduce peak load on a substation, improve reliability and provide contingency in case of transformer or cable failure, would be to: (1) reconductor the existing cables feeding Station 53 (2) install a new 2.5/3.125MVA transformer, (3) expand the 4.16kV station bus with additional breaker positions, and (4) build additional feeder ties. The additional feeder positions and distribution feeder reconfigurations would increase local capacity for new connections, reduce system losses, and reduce adverse impact of a fault on the distribution system.

NWA solutions proposed by vendors will be evaluated against the benefits of traditional T&D equipment (listed above). Although a traditional T&D solution would not be expected to be in-service until 2022, it is preferred that the NWA solution be in place before June 2019. It is understood that such a target may not be possible for certain DERs.

National Grid is exploring NWA solutions to achieve one or more of the following: (1) defer the need for a traditional solution; (2) reduce the scale of a traditional solution; or (3) augment the benefits of a traditional solution. To address the specific system deficiencies at Buffalo 53 Area the preferred approach is to postpone the required investment in distribution and/or transmission equipment with a NWA solution (#1).

Approximately 3.4MW of DER on Station 21 or Station 53 feeders will delay the need to expand the substation. The DER would be required to be in-service for up to a 12-hour period. The timing of forced outages cannot be planned for and the DER must be able to be called upon for these forced outages.

Several factors determine the ability and cost of implementing NWA to the Buffalo 53 Area electric system. Actual system needs will depend on several different factors, including weather conditions, unavailability of other resources and coincidence factors. For an accurate assessment, actual interconnection requirements and costs must be defined by considering the specific project location, operating characteristics and timing.

According to National Grid's Implementation Proposal for the Value Stack Component of VDER Phase One tariff which was filed May 1st, 2017 on NY PSC's website, both Buffalo Station 53 and 21 are proposed locational system relief value (LSRV) areas. Buffalo Substation 53 has an LSRV cap of 1.3MW, while Substation 21 has 0.9MW cap. As both VDER and NWA initiatives seek to relieve the same locational constraints, candidates for NWA should not include LSRV revenue as a potential benefit. The bidder is advised that projects that qualify for the LSRV tariff must forego that compensation if the solution is selected as an NWA project.

NOTE: Subject to changes in forecasted needs, solution pricing, as well as any other applicable costs and benefits, National Grid is targeting to procure demand response and/or generation/storage that could supply the substation(s) load in its entirety or a large portion of it. During normal operation, any excess power could be exported to the National Grid System. Depending on such factors as economics, portfolio fit, quantity of offers received, and potentially other qualitative factors, National Grid could conceivably utilize several different NWA solutions.

KEY CUSTOMER PROFILES

The following tables were derived from the National Grid's Customer Load Data, which generally covers the 2016 calendar year (exceptions include shorter time periods and/or later start/end date). Highly accurate data can be very difficult and costly to produce; hence, the following should be used for information purposes only. "Max" values represent the peak of the largest single customer while "Avg" values represent the average mean value of all customers on the associated feeder.

		KW ANALYSIS - RESIDENTIAL					
	Sub-Feeder	Max kW (YR)	Avg kW (YR)	Max kW (SUM)	Avg kW (SUM)	Max kW (WINT)	Avg kW (WINT)
Buffalo 21	2161	8.17	1.03	8.17	2.25	6.85	1.01
	2163	11.99	1.01	11.99	2.33	4.31	0.94
	2164	64.91	0.98	64.91	2.14	34.90	0.98
	2165	9.67	0.69	9.67	1.58	2.38	0.68
	2166	12.20	1.14	12.20	2.53	5.71	1.12
	2167	54.87	0.89	54.87	1.93	37.26	0.89
	2168	5.47	0.87	5.47	1.87	3.35	0.85
	2169	17.94	0.64	17.94	1.35	7.42	0.65
	2171	6.26	0.64	6.26	1.37	3.52	0.64
	2172	22.28	13.02	22.28	22.28	15.53	15.53
	2173	22.68	0.76	22.68	1.66	9.57	0.75
Buffalo 53	5361	34.60	0.82	34.60	1.42	23.48	1.18
	5362	10.77	0.83	7.98	1.51	10.77	1.16
	5363	7.83	0.71	7.83	1.22	7.01	1.06
	5364	0.81	0.45	0.81	0.81	0.60	0.60
	5365	6.02	0.76	6.02	1.25	5.62	1.24
	5366	7.22	0.72	7.22	1.23	4.86	1.01

- There is no peak kW data available for residential customers and the values given are approximated
- Peaks among residential users vary drastically (as demonstrated by differences between maximum and average yearly values) which might be due to having a multifamily building on a single utility meter, homes that use electricity for heating etc.

		KW ANALYSIS - COMMERCIAL					
	Sub-Feeder	**Max kW (YR)**	**Avg kW (YR)**	**Max kW (SUM)**	**Avg kW (SUM)**	**Max kW (WINT)**	**Avg kW (WINT)**
Buffalo 21	2161	28.20	7.05	24.80	6.20	26.30	6.58
	2163	157.6	17.51	157.6	17.49	129.6	14.41
	2164	15.9	3.10	15.9	1.77	15.1	2.51
	2165	96	16.20	96	16.20	70.4	12.53
	2166	31.9	4.64	31.9	4.64	27.3	3.34
	2167	51.2	6.97	51.2	7.08	43.2	4.93
	2168	54.4	23.36	54.4	22.90	34.8	17.43
	2169	109.6	8.69	97.5	7.36	109.6	6.75
	2171	52.6	7.66	52.6	7.41	46.1	5.65
	2173	72	7.52	72	7.27	55.2	6.28
Buffalo 53	5361	44.8	4.02	44	3.47	41.2	3.57
	5362	51.2	6.13	51.2	6.02	48.8	3.92
	5363	30.4	4.34	30.4	4.34	27.6	3.94
	5365	34.4	2.21	27.4	2.08	34.4	2.14
	5366	52	12.72	52	12.67	39.6	9.54

- Peaks among commercial users tend to be very high for a few users (as demonstrated by differences between maximum and average yearly values)

Several customer characteristics can be inferred by comparing summer and winter consumption, Max and Avg values both on individual feeders and related to others.

	KWH ANALYSIS - RESIDENTIAL												
	Sub-Feeder	Total kWh (YR)	Max kWh (YR)	Avg kWh (YR)	Total kWh (SUM)	% Total (YR)	Max kWh (SUM)	Avg kWh (SUM)	Total kWh (WINT)	% Total (YR)	Max kWh (WINT)	Avg kWh (WINT)
Buffalo 21	2161	4,054,002	31,273	9,029	2,195,843	54.16%	17,903	4,934	991,844	24.47%	14,991	2,209
	2163	2,168,263	37,923	8,886	1,202,745	55.47%	26,267	5,096	504,503	23.27%	9,449	2,068
	2164	3,854,253	289,840	8,546	2,034,923	52.80%	142,160	4,689	966,267	25.07%	76,440	2,142
	2165	1,129,661	29,951	6,073	630,781	55.84%	21,181	3,466	267,408	23.67%	5,219	1,494
	2166	4,548,426	47,532	9,953	2,456,628	54.01%	26,724	5,533	1,119,497	24.61%	12,514	2,450
	2167	4,616,659	286,560	7,838	2,442,678	52.91%	120,160	4,233	1,143,804	24.78%	81,600	1,942
	2168	830,889	22,606	7,623	441,246	53.11%	11,986	4,086	203,818	24.53%	7,338	1,870
	2169	4,422,168	71,280	5,577	2,305,372	52.13%	39,280	2,967	1,126,297	25.47%	16,240	1,420
	2171	3,098,595	23,487	5,563	1,625,671	52.46%	13,705	2,999	783,670	25.29%	7,701	1,407
	2172	114,080	NA	114,080	48,800	42.78%	NA	48,800	34,000	29.80%	NA	34,000
	2173	3,225,050	91,400	6,636	1,726,066	53.52%	49,680	3,641	799,224	24.78%	20,960	1,644
Buffalo 53	5361	7,261,244	166,599	7,182	3,003,415	41.36%	75,772	3,112	2,594,353	35.73%	51,431	2,574
	5362	7,165,252	45,135	7,304	3,140,797	43.83%	17,471	3,313	2,480,642	34.62%	23,577	2,531
	5363	1,814,459	41,734	6,257	728,098	40.13%	17,148	2,667	674,382	37.17%	15,342	2,325
	5364	3,966	NA	3,966	1,773	44.70%	NA	1,773	1,305	32.90%	NA	1,305

	KWH ANALYSIS - RESIDENTIAL										
Sub-Feeder	Total kWh (YR)	Max kWh (YR)	Avg kWh (YR)	Total kWh (SUM)	% Total (YR)	Max kWh (SUM)	Avg kWh (SUM)	Total kWh (WINT)	% Total (YR)	Max kWh (WINT)	Avg kWh (WINT)
5365	2,022,586	24,377	6,697	734,562	36.32%	13,182	2,731	820,234	40.55%	12,297	2,725
5366	4,364,951	33,731	6,281	1,778,903	40.75%	15,815	2,683	1,535,234	35.17%	10,640	2,212

- Customers on Buffalo-53 5364 feeder and Buffalo-21 2172 do not satisfy the 15/15 customer privacy rule, therefore some values have been omitted

		KWH ANALYSIS - COMMERCIAL										
	Sub-Feeder	Total kWh (YR)	Max kWh (YR)	Avg kWh (YR)	Total kWh (SUM)	% Total (YR)	Max kWh (SUM)	Avg kWh (SUM)	Total kWh (WINT)	% Total (YR)	Max kWh (WINT)	Avg kWh (WINT)
Buffalo 21	2161	96,625	NA	24,156	35,736	36.98%	NA	8,934	32,599	33.74%	NA	8,150
	2163	753,860	NA	50,257	417,841	55.43%	NA	27,856	187,198	24.83%	NA	12,480
	2164	86,491	NA	8,649	40,343	46.64%	NA	4,483	22,748	26.30%	NA	2,275
	2165	726,158	NA	60,513	366,934	50.53%	NA	30,578	185,229	25.51%	NA	15,436
	2166	483,910	NA	15,610	258,319	53.38%	NA	8,333	111,776	23.10%	16,571	3,606
	2167	947,061	NA	24,923	501,381	52.94%	NA	13,551	221,445	23.38%	NA	5,828
	2168	419,753	NA	59,965	208,466	49.66%	NA	29,781	112,313	26.76%	NA	16,045
	2169	1,313,538	NA	25,260	637,362	48.52%	NA	12,257	362,663	27.61%	NA	6,974
	2171	1,021,559	NA	23,757	527,727	51.66%	NA	12,273	248,077	24.28%	NA	5,769
	2173	444,063	NA	24,670	207,152	46.65%	NA	11,508	122,927	27.68%	NA	6,829
Buffalo 53	5361	1,261,475	NA	15,574	526,290	41.72%	NA	6,579	426,926	33.84%	NA	5,271
	5362	1,516,478	NA	19,954	731,276	48.22%	NA	9,750	456,777	30.12%	NA	6,010
	5363	179,520	NA	25,646	77,076	42.93%	NA	11,011	59,920	33.38%	NA	8,560
	5365	363,932	NA	10,398	139,101	38.22%	NA	4,215	133,244	36.61%	NA	3,919
	5366	1,473,914	NA	47,546	680,451	46.17%	NA	21,950	423,760	28.75%	NA	13,670

- All feeders do not satisfy the 15/15 customer privacy rule, therefore Max kWh values have been omitted

POTENTIAL SOLUTIONS

National Grid-targeted NWA solutions are required to be greater than the requested peak demand reduction described in this document in order to accommodate coincidence factors and unavailability of programs. These potential NWA solutions include: Distributed Generation, Demand Response, Energy Efficiency, Energy Storage and other resources that can meet the identified load relief.

To achieve timely reductions, National Grid will evaluate potential NWA solutions based on:

- Customer availability and intent
- Timeliness
- Efficiency of resources
- Reliability of load reduction
- Flexibility of resources
- Availability of resources
- Commercially proven technology

The following table provides an indicative list of NWA solutions rated against key attributes. It should be noted that the ratings represent basic technical capability rather than actual current applications.

Technology	Type	Cost	Scalability	Generating Capacity	Distribution Capacity	Voltage Regulation	Frequency Regulation	Load Following	Balancing	Spinning Reserve	Non-Spinning Reserve	Black Start
Combined Heat and Power	Generator	$$$$	○	●	●	●	●	●	●	●	●	◕
Distributed Solar	Generator	$$$$	◑	◔	◔	○	○	○	○	○	○	○
Distributed Solar with an Advanced Inverter	Generator	$$$$	◑	◔	◔	●	●	◔	○	○	○	○
Energy Storage	Storage	$$$$	◕	◕	●	●	●	●	●	●	●	●
Thermal Storage	Storage	$$$$	◕	◑	◔	○	○	◔	●	○	○	○
Interruptible Load	Load Shaping	$$$$	◔	○	○	○	○	○	●	●	●	○

Direct Load Control	Load Shaping	$$$$	◔	◑	○	○	○	○	●	●	●	○
Behavioral Load Shaping	Load Shaping	$$$$	◔	◔	◔	○	○	◔	◔	○	○	○
Energy Efficiency	Load Reduction	$$$$	◔	◑	◔	○	○	○	○	○	○	○

Legend

○ Unsuitable to perform the specific service

◔ May be able to provide some support

◑ Able to provide partial support

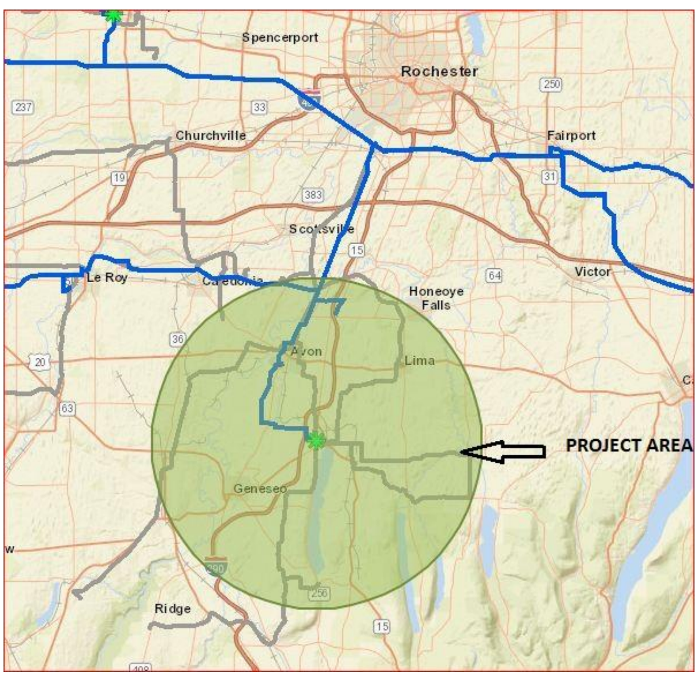
◕ Able to perform a service

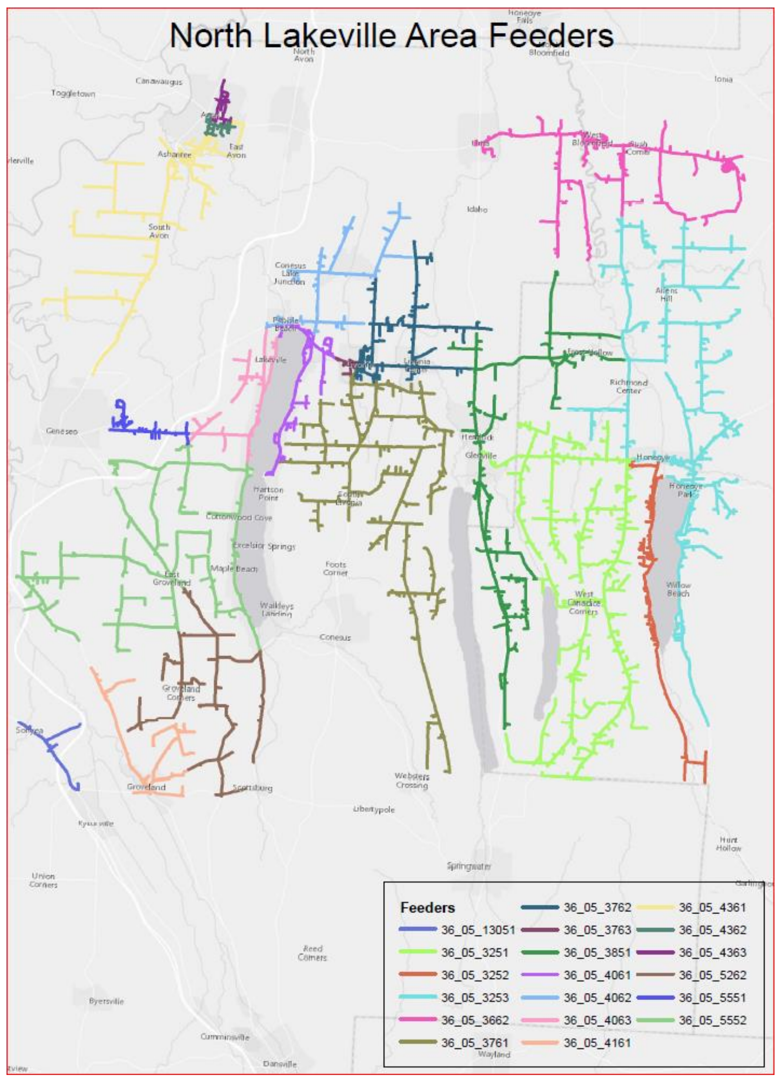
● Well suited to perform the specific service

Technical Requirements – Golah Avon

A rural area in West Region of New York, south of Rochester is experiencing reliability issues. Outages on the 115kV circuits, Golah-North Lakeville Line 116 will create overload and low voltage exposures and Mortimer-Golah Line 110, will create low voltage exposure on four 34.5kV circuits: Golah-North Lakeville Lines 216 and 217, North Lakeville- Ridge (RG&E service territory) Line 218, and North Lakeville –Richmond Line 224. The local distribution system is of radial configuration with N-0 criteria and transfers to neighboring stations are not possible due to geographic and franchise boundaries. A fault on any section of the 115kV Line 116 will cause the North Lakeville 115/34.5kV transformer to backfeed so that some customers on the 115kV network can be served. This condition would cause the 34.5kV Golah-North Lakeville #217 to overload to 105% of its Summer LTE rating. There are 4.8kV and 13.2kV distribution station & circuits supplied from the 34.5kV system.

As part of NY REV guidance order, National Grid is seeking NWA solutions that could potentially provide delivery infrastructure avoidance value or other reliability and operational benefits. These solutions could connect to a circuit or load downstream of the Lakeville station, collectively called "North Lakeville Area". Project area as well as feeder map from nine substations serving the North Lakeville Area; Avon (43), Lima (36), Livingston (130), Livonia (37), Richmond (32), Conesus (52), Groveland (41), Lakeville (40) and Hemlock (38) are shown on the figures below:





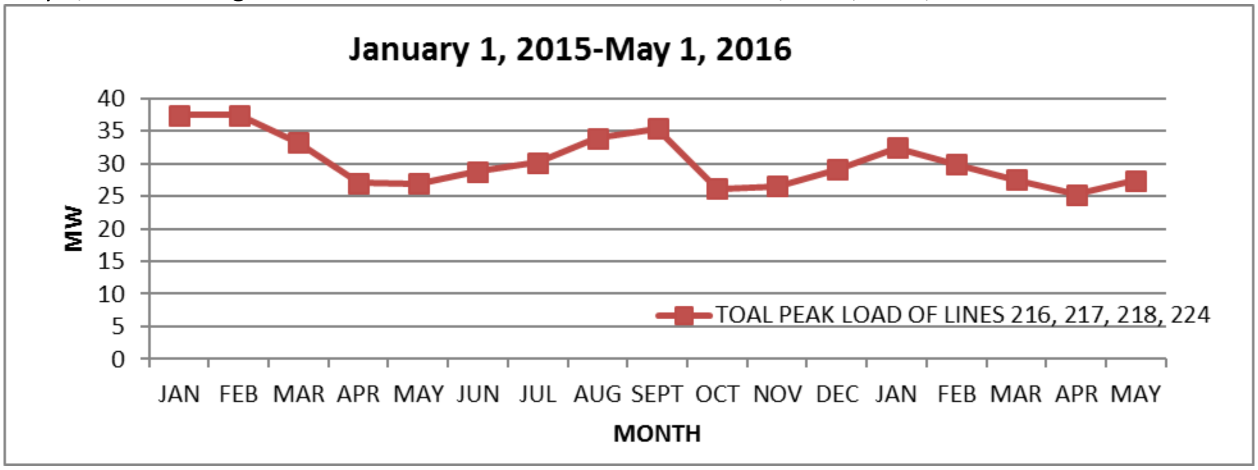
As shown below, these nine substations together serve around 12,420 customers:

	Avon	Lima	Livingston	Livonia	Richmond	Conesus	Groveland	Lakeville	Hemlock
Residential	1,231	1,631	NA	1,749	2,771	1,337	139	1,733	553
Commercial	176	133	NA	175	349	126	19	206	52
Total	1,407	1,764	40	1,924	3,120	1,463	158	1,939	605

The table below presents customer allocation per zip code in Livingston and Ontario counties of Avon (43), Lima (36), Livingston (130), Livonia (37), Richmond (32), Conesus (52), Groveland (41), Lakeville (40) and Hemlock (38) substations. The bold numbers indicate the total customers served by a particular substation.

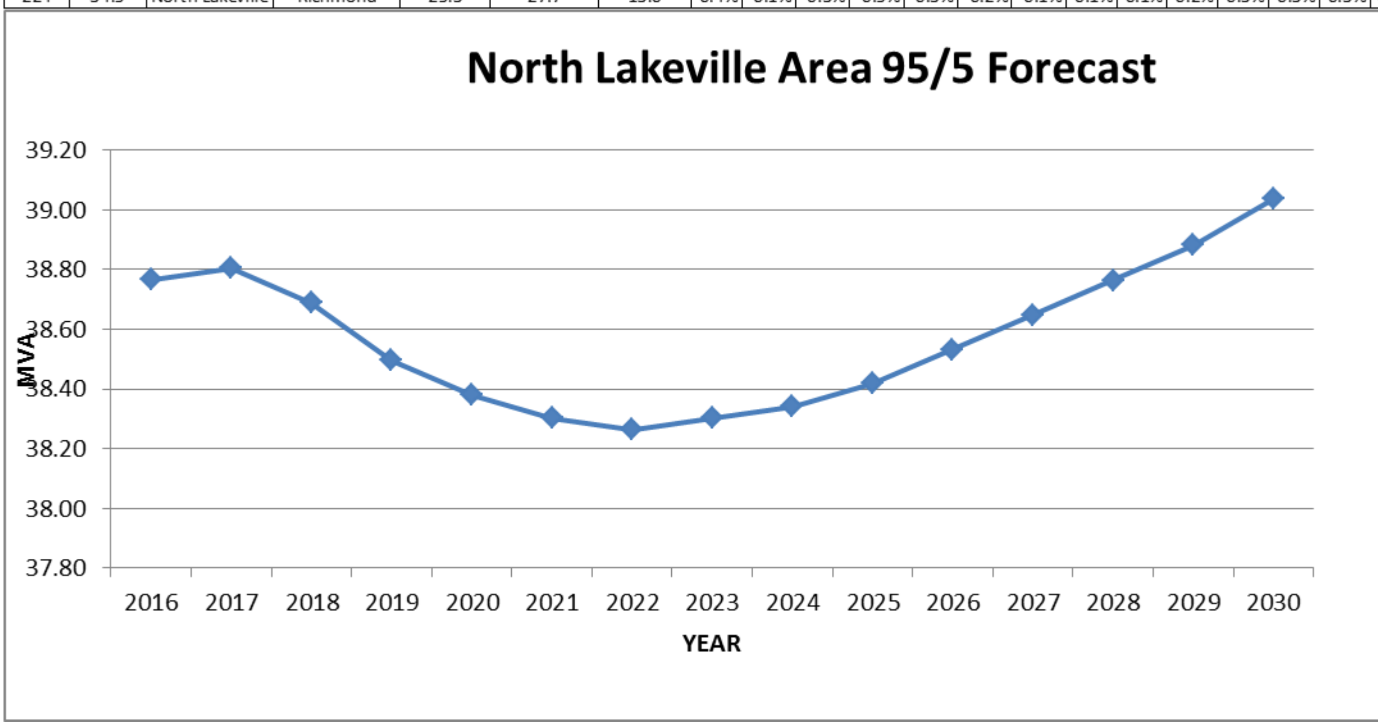
	Zip Codes																
Feeders	**14466**	**14487**	**14560**	**14480**	**14211**	**14171**	**14471**	**14141**	**14414**	**14469**	**14435**	**14437**	**14454**	**14462**	**14485**	**Other Areas**	**Grand Total**
32	**408**	**23**	**339**				**26**									**2**	**798**
40		**667**		**209**			**1**									**35**	**912**
36					**585**	**69**		**93**								**24**	**771**
40		**127**		**232**					**108**				**383**		**51**	**23**	**924**
62		124		121					108						51	23	427
63		3		111									383			0	497
43									**1330**				**61**			**1**	**1392**
62									480							0	480
61									541				61			1	603
63									309							0	309
52		**174**							**1**		**1101**		**51**	**121**	**1**	**2**	**1451**
62											28		49	121		1	199
61		174							1		1073		2		1	1	1252
32	**12**	**59**					**1967**			**214**						**4**	**2256**
53	12	59					1170			214						4	1459
52							797									0	797
36										**332**					**318**	**191**	**841**
37	**78**	**1525**									**206**				**48**	**51**	**1908**
62		757									1				48	51	857
61	78	594									205					0	877
63		174														0	174
130												**42**		**1**		**0**	**43**
41												**1**		**144**		**11**	**156**
38	**266**	**117**	**175**												**42**	**0**	**600**
Grand Total	**764**	**2692**	**514**	**441**	**585**	**69**	**1994**	**93**	**1439**	**546**	**1307**	**43**	**495**	**266**	**460**	**344**	**12052**

Load forecasts for the Western Division (Zone A&B) were developed by National Grid's Electric Load Forecasting group in November 2015. The model used for this analysis consists of National Grid's system loads from January 1, 2015 through May 1, 2016. The figure below shows the total load on lines #216, #217, #218, #224.

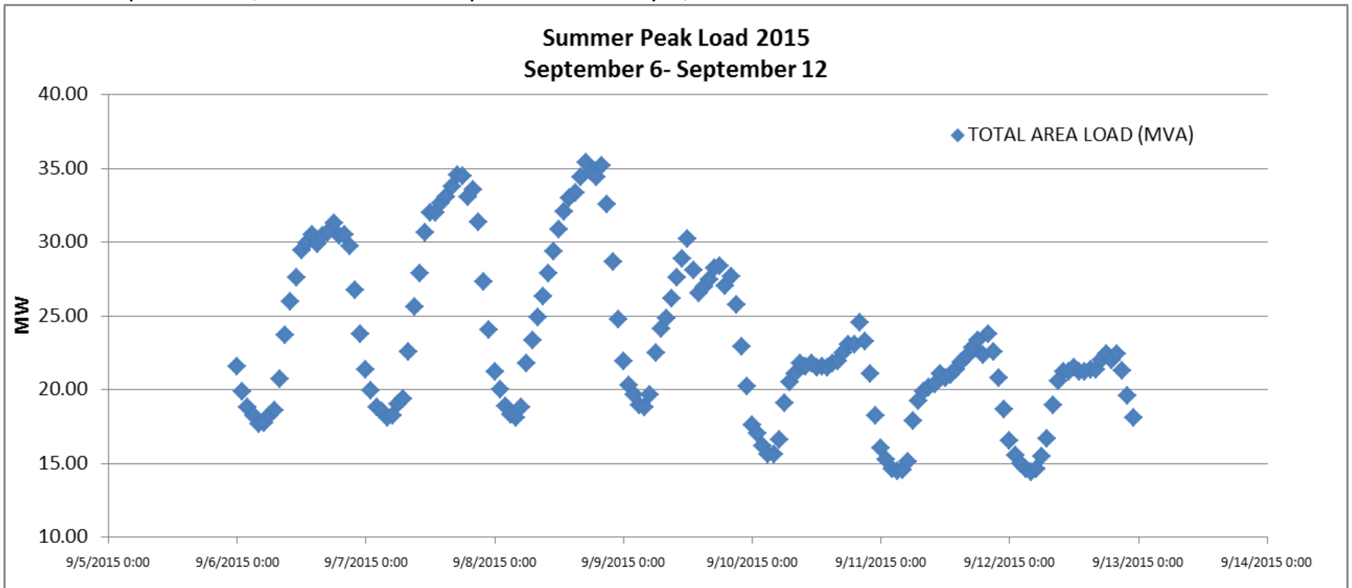


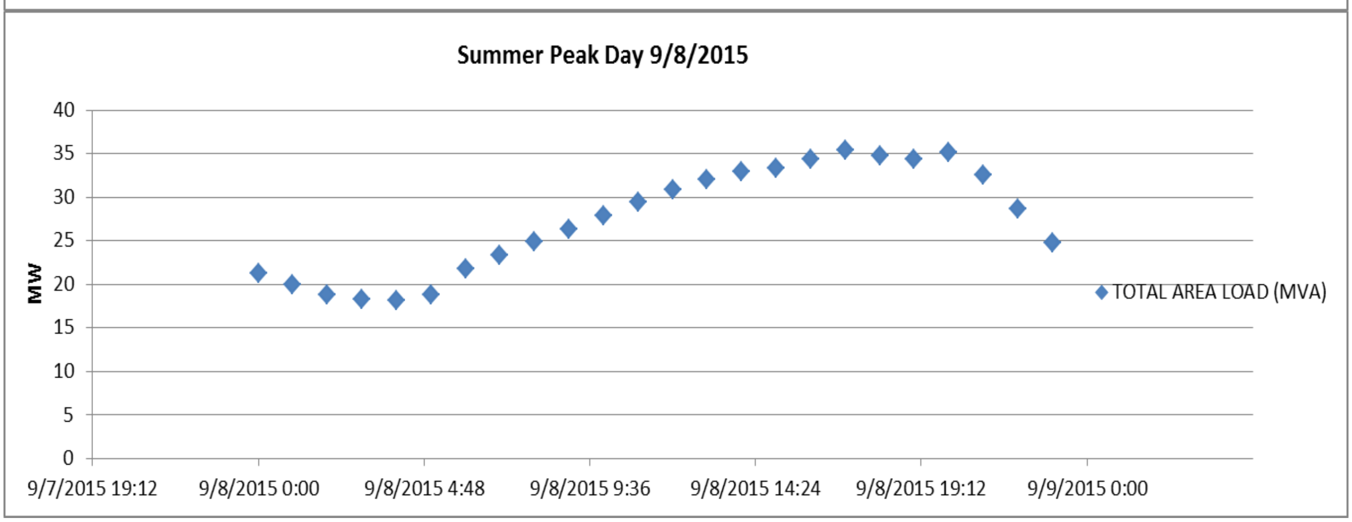
The table and figure below show the weather normalized load forecast for the period 2016 to 2030:

Circuit	Voltage (kV)	From	To	Summer Normal (MVA)	Summer Emergency (MVA)	2015 Peak Load (MVA)	GROWTH RATE 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
216	34.5	Golah	North Lakeville	26	27	2.2	0.4%	0.1%	-0.3%	-0.5%	-0.3%	-0.2%	-0.1%	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%
217	34.5	Golah	North Lakeville	25	27	4.2	0.4%	0.1%	-0.3%	-0.5%	-0.3%	-0.2%	-0.1%	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%
218	34.5	North Lakeville	Ridge (RG&E)	20.0	20.8	16.4	0.4%	0.1%	-0.3%	-0.5%	-0.3%	-0.2%	-0.1%	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%
224	34.5	North Lakeville	Richmond	25.3	27.7	13.6	0.4%	0.1%	-0.3%	-0.5%	-0.3%	-0.2%	-0.1%	0.1%	0.1%	0.2%	0.3%	0.3%	0.3%	0.3%	0.4%

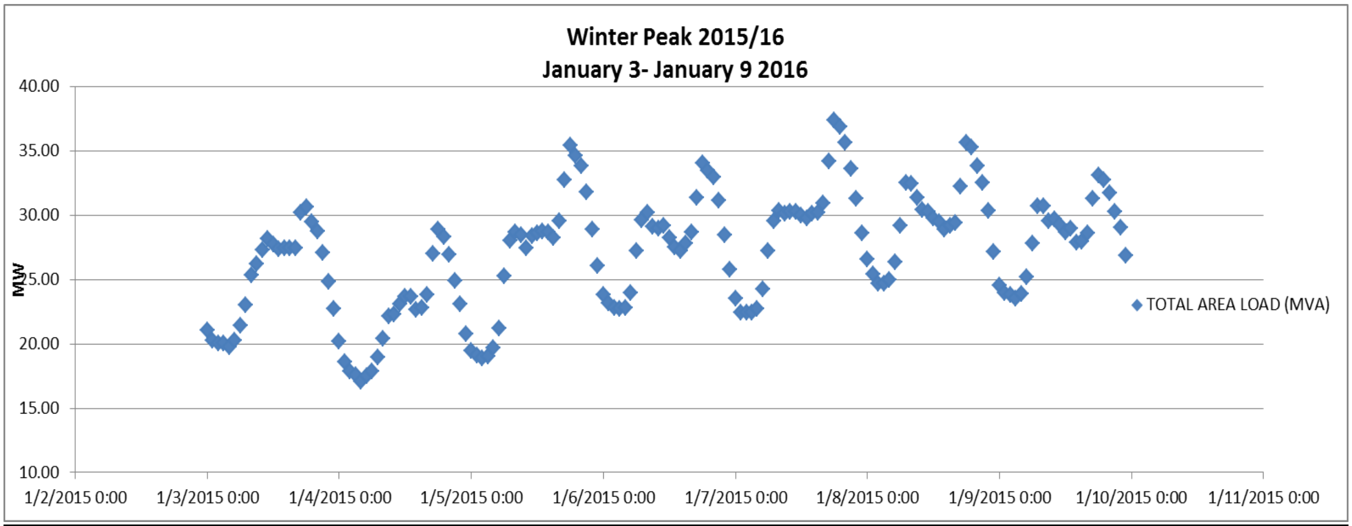


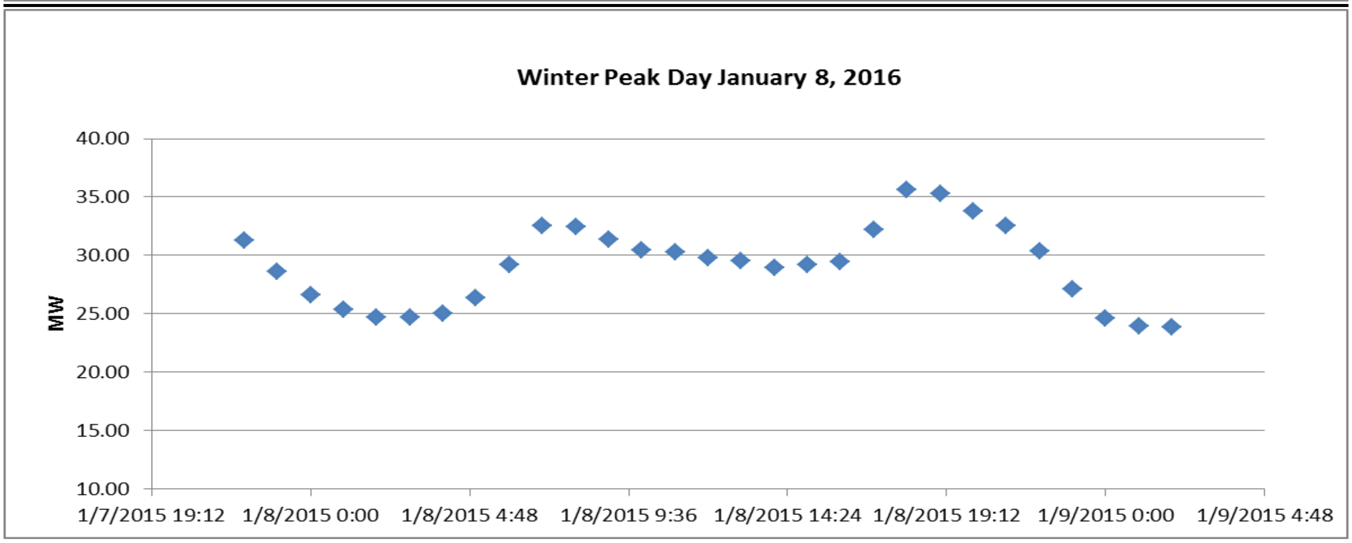
Normal loading on area facilities is currently within normal equipment ratings and is not forecasted to be overloaded. Lines 216 & 217 are presently loaded to approximately 20% and 30% of its Summer Normal ratings, respectively. The North Lakeville transformer is loaded to 30% while the Golah transformer is loaded to approximately 20% of their Summer Normal rating. Lines 224 and 218 (RG&E territory) are loaded up 30% and 70 % of its Summer Normal Rating, respectively.
The following figures depict the load profile for the summer and winter periods in 2015. The area reached summer peak load on September 8, 2015 and winter peak on January 4, 2016.





The area is summer peaking and these conditions can occur seasonally from the beginning of June to mid-September. These days can occur on any day of the week, and are more typical on weekdays. Daily peaks typically occur in the evening between 6pm and 7pm. The maximum load at risk exposure can occur between 12pm (noon) and 10pm during a heat wave.





The following table presents transformer capacities for the nine distribution substations and two sub-transmission stations from which the area is being supplied.

Station	High Side (kV)	Low Side (kV)	Nameplate (MVA)	Summer Normal (MVA)	Summer Emergency (MVA)
Avon Station 43	34.5	4.8	3.75/4.687	4.9	6.4
Conesus Lake Station 52	34.5	4.8	2.5/3.125	3.3	4
Groveland Station 41	34.5	4.8	3.75	3.75	n/a
Hemlock Station 38	34.5	13.2	3.75/5.25	4.4	5.4
Lakeville Station 40	34.5	4.8	4.2/5.25	6	7.1
Lima Station 36	34.5	4.8	2.5/3.125	3.3	4.3
Livingston 130	34.5	13.2	1.5	3.75	n/a
Livonia Station 37	34.5	4.8	4.24	5.7	6.8
Richmond Station 32	34.5	13.2	7.5/10.5	10.9	13.6
North Lakeville	115	34.5	28/37/46	51	58
Golah	115	34.5	25/33.333/41	48.13	51.73

The following feeder data by substation is taken from the National Grid System Data Portal. Although models are often better at providing insight rather than answers, individual feeder loading and hosting capacity along with other NWA information can be derived from the following table. Not all information is available at this time and additional clarifying or supporting information might be made available to potential respondents after the NWA RPF is released.

	Sub-Feeder	Voltage Level (kV)	Summer Rating		2016 Peak		2017 Peak		MAX 3-ph (MW)	MIN 3-ph (MW)	DG Connected (MW)	DG Queued (MW)	Refresh Date
			MVA	Amp	MVA	Amp	MVA	Amp					
Livingston	13051	13.2	2.29	100	1.26	55	1.30	56.67	2.0	0.27	0.0	0.0	8/8/2017
Richmond	3251	13.2	8.92	390	1.58	69	1.63	71.09	0.9	0.04	69.0	10.0	9/11/2017
	3252	13.2	8.92	390	1.37	60	1.41	61.82	10.0	0.08	12.6	0.0	8/8/2017
	3253	13.2	8.92	390	3.86	169	3.98	174.12	10.0	0.08	91.7	2000.0	8/16/2017
Lima	3661	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	3662	4.8	2.79	336	2.08	250	2.14	257.57	NA	NA	27.8	0.0	
Livonia	3761	4.8	3.67	441	2.68	322	2.76	331.75	NA	NA	169.4	8.6	
	3762	4.8	3.67	441	2.10	253	2.17	260.66	NA	NA	19.1	1992.0	
	3763	4.8	3.24	390	0.88	106	0.91	109.21	NA	NA	4.0	0.0	
Hemlock	3851	13.2	11.75	514	2.13	93	2.19	95.82	6.5	0.06	45.8	7.5	8/8/2017
Lakeville	4061	4.8	4.27	514	2.56	308	2.64	317.33	NA	NA	NA	NA	
	4062	4.8	4.27	514	1.19	143	1.22	147.33	NA	NA	15.0	5.0	
	4063	4.8	2.79	336	NA	NA	NA	NA	NA	NA	20.2	0.0	
Groveland	4161	4.8	2.01	242	0.41	49	0.42	50.48	NA	NA	0.0	0.0	
Avon	4361	4.8	2.79	336	1.85	223	1.91	229.75	NA	NA	52.1	0.0	
	4362	4.8	3.67	441	1.29	155	1.33	159.69	NA	NA	1137.0	0.0	
	4363	4.8	3.67	441	0.89	107	0.92	110.24	NA	NA	8.8	0.0	
Conesus	5261	4.8	3.67	441	2.64	317	2.72	326.6	NA	NA	67.9	1.8	
	5262	4.8	3.67	441	0.72	87	0.75	89.63	NA	NA	10.0	0.0	

Hosting Capacity shown in the table above is an estimate of the amount of DER that may be accommodated without adversely impacting power quality or reliability under current configurations and without requiring infrastructure upgrades (installing a recloser or remote terminal unit at the Point of Common Coupling, replacing a voltage regulating device or controller to allow for reverse flow, substation-related upgrades including 3V0 protection, or others)

WAYS TO REMEDY CHALLENGES

Typically, traditional T&D solutions to address these concerns would consist of reconducting Golah-North Lakeville Lines 216 and 217 reconductoring projects are intended to improve capacity and voltages on the 34.5kV system supplied by the Golah and North Lakeville Stations. By reconductoring the lines, the area loads would not need to be shed for outages of the 115kV circuit or 115-34.5kV transformer outages at North Lakeville. Additionally, additional feeder ties could be built to increase the contingency transfer capabilities to reduce load at risk to levels within acceptable criteria. The traditional solution would not be expected to be in-service until 2022.

National Grid is exploring NWA solutions to achieve one or more of the following: (1) defer the need for a traditional solution; (2) reduce the scale of a traditional solution; or (3) augment the benefits of a traditional solution. To address the specific system deficiencies at North Lakeville Area the preferred approach is to postpone the required investment in distribution and/or transmission equipment with a NWA solution (#1). It is preferred that the NWA solution be in place before June 2019, however, it is understood that such a target may not be possible for certain DERs.

Several factors determine the ability and cost of implementing NWA to the North Lakeville Area electric system. Actual system needs will depend on several different factors, including weather conditions, unavailability of other resources and coincidence factors. For an accurate assessment, actual interconnection requirements and costs must be defined by considering the specific project location, operating characteristics and timing.

Approximately 8MW of DER is required in the area supplied by the nine National Grid's 34.5kV system substations. The location of DER on Lines 216, 217, 218 or 224 would improve the voltage response in the area to remain at least 90% during pre and post contingency and forestall the need to reconductor Golah-North Lakeville Line 217. It is predicted that additional 500kW per year will be required depending on how the load growth varies from forecast. Depending on the nature of the NWA, this level of DER penetration may not be possible without creating other system concerns, including potential significant infrastructure upgrades to accommodate the NWA solution.

The DER would be required to respond to a forced or planned 115kV or 34.5kV outage. The DER solution would be required to be in-service for up to a 18 hour period. It can be permanent generation that can export power into the larger power system during normal operation and support the area during fault conditions. The timing of forced outages cannot be planned for and the DER must be able to be called upon for these forced outages.

NOTE: Subject to changes in forecasted needs, solution pricing, as well as any other applicable costs and benefits, National Grid is targeting to procure demand response and/or generation/storage that could supply the substation(s) load in its entirety or a large portion of it. During normal operation, any excess power could be exported to the National Grid System. Depending on such factors as economics, portfolio fit, quantity of offers received, and potentially other qualitative factors, National Grid could conceivably utilize several different NWA solutions.

KEY CUSTOMER PROFILES

The following tables were derived from the National Grid's Customer Load Data, which generally covers the 2016 calendar year (exceptions include shorter time periods and/or later start/end date). Highly accurate data can be very difficult and costly to produce; hence, the following should be used for information purposes only. "Max" values represent the peak of the largest single customer while "Avg" values represent the average mean value of all customers on the associated feeder.

		KW ANALYSIS – COMMERCIAL					
	Sub-Feeder	Max kW (YR)	Avg kW (YR)	Max kW (SUM)	Avg kW (SUM)	Max kW (WINT)	Avg kW (WINT)
Livingston	13051	181.20	15.98	33.60	3.58	96.40	8.92
Richmond	3251	20.3	1.54	16.9	1.41	20.3	1.45
	3252	18.4	1.19	13.1	0.74	18.4	1.07
	3253	68	4.21	68	3.94	64.8	3.42
Lima	3661	80	5.46	64	4.69	80	5.22
	3662	84.8	5.49	84.8	5.20	73.6	4.51
Livonia	3761	24.5	3.17	23.2	2.74	24.5	2.83
	3762	108.8	6.31	108.8	6.06	75.2	5.03
	3763	43.6	3.46	43.6	3.36	43.6	2.91
Hemlock	3851	340	11.60	340	11.14	39.2	4.52
Lakeville	4061	214.4	12.42	214.4	12.08	117.6	10.34
	4062	393.6	14.33	372	13.17	340.8	12.11
	4063	26	2.30	11.9	1.25	26	1.95
Groveland	4161	21.8	3.07	12.2	1.91	20	2.57
Avon	4361	75.6	5.59	75.6	5.24	66.8	4.23
	4362	144.8	8.41	138.4	8.07	140	6.21
	4363	37.6	7.18	37.6	6.63	36.4	5.60
Conesus	5261	173.6	3.20	173.6	3.18	20.8	1.01
	5262	25.6	1.58	24.2	1.51	25.6	1.57

- Peaks among commercial users tend to be very high for a few users (as demonstrated by differences between maximum and average yearly values)

	KW ANALYSIS – RESIDENTIAL						
	Sub-Feeder	**Max kW (YR)**	**Avg kW (YR)**	**Max kW (SUM)**	**Avg kW (SUM)**	**Max kW (WINT)**	**Avg kW (WINT)**
Livingston	13051	50.56	1.67	50.56	3.72	16.15	1.62
Richmond	3251	10.88	1.09	9.15	1.60	10.88	1.79
	3252	16.90	0.69	16.90	1.28	9.45	0.82
	3253	8.72	0.79	8.72	1.41	5.74	0.99
Lima	3661	67.36	0.73	67.36	1.30	33.75	0.97
	3662	61.66	0.90	61.66	1.76	10.52	1.01
Livonia	3761	18.75	1.09	18.75	1.93	10.21	1.35
	3762	25.35	1.01	25.35	1.90	14.79	1.18
	3763	7.06	0.56	7.06	1.10	4.42	0.60
Hemlock	3851	9.56	1.02	9.56	1.71	6.71	1.33
Lakeville	4061	29.42	0.90	29.42	1.60	11.91	1.25
	4062	11.20	1.04	11.20	1.93	6.22	1.25
	4063	14.02	0.82	14.02	1.58	6.71	0.94
Groveland	4161	4.87	0.90	4.87	1.67	3.52	1.07
Avon	4361	8.00	0.95	8.00	1.87	6.88	1.06
	4362	5.00	0.67	5.00	1.37	4.16	0.73
	4363	8.13	0.88	8.13	1.87	7.41	0.91
Conesus	5261	13.95	0.84	13.95	1.54	7.40	1.02
	5262	100.73	1.57	100.73	2.86	44.38	1.82

- There is no peak kW data available for residential customers and the values given are approximated
- Peaks among residential users vary drastically (as demonstrated by differences between maximum and average yearly values) which might be due to having a multifamily building on a single utility meter, vacation homes which are not used throughout the year or homes that use electricity for heating

Several customer characteristics can be inferred by comparing summer and winter consumption, Max and Avg values both on individual feeders and related to others.

	KWH ANALYSIS – COMMERCIAL												
	Sub-Feeder	**Total kWh (YR)**	**Max kWh (YR)**	**Avg kWh (YR)**	**Total kWh (SUM)**	**% Total (YR)**	**Max kWh (SUM)**	**Avg kWh (SUM)**	**Total kWh (WINT)**	**% Total (YR)**	**Max kWh (WINT)**	**Avg kWh (WINT)**
Livingston	13051	151,551	NA	12,629	47,842	31.57%	NA	3,987	36,940	24.37%	NA	3,078
Richmond	3251	419,993	NA	7,924	164,900	39.26%	NA	3,233	159,875	38.07%	NA	3,017
	3252	326,139	29,761	3,507	128,920	39.53%	13,545	1,386	112,079	34.37%	12,000	1,205
	3253	2,968,881	352,800	14,844	1,388,587	46.77%	157,680	6,943	825,733	27.81%	105,040	4,129
Lima	3661	884,406	NA	18,049	321,118	36.31%	NA	6,690	344,258	38.93%	NA	7,026
	3662	1,564,908	NA	18,630	722,604	46.18%	NA	8,602	427,904	27.34%	NA	5,094
Livonia	3761	539,433	NA	10,178	241,674	44.80%	NA	4,560	164,392	30.47%	22,078	3,102
	3762	1,501,272	NA	17,256	706,897	47.09%	NA	8,316	420,868	28.03%	NA	4,838
	3763	424,292	NA	12,123	203,224	47.90%	NA	5,806	114,948	27.09%	NA	3,284
Hemlock	3851	876,226	NA	16,851	416,921	47.58%	NA	8,175	244,088	27.86%	NA	4,694
Lakeville	4061	4,622,788	533,120	38,847	2,148,531	46.48%	NA	18,522	1,389,812	30.06%	145,965	11,679
	4062	883,076	NA	19,197	362,400	41.04%	NA	7,878	263,794	29.87%	NA	5,735
	4063	255,087	NA	7,971	111,561	43.73%	NA	3,599	76,585	30.02%	NA	2,393
Groveland	4161	175,250	NA	9,736	68,559	39.12%	NA	3,809	62,802	35.84%	NA	3,489
Avon	4361	1,512,748	NA	19,394	761,891	50.36%	NA	10,025	304,804	20.15%	NA	3,908
	4362	1,483,942	NA	21,506	696,584	46.94%	NA	10,095	288,339	19.43%	NA	4,179
	4363	588,735	NA	21,026	305,458	51.88%	NA	11,748	102,898	17.48%	NA	3,811
Conesus	5261	846,165	NA	8,296	459,123	54.26%	NA	4,501	205,275	24.26%	17,200	2,013
	5262	157,670	NA	6,855	67,909	43.07%	NA	2,953	47,228	29.95%	NA	2,053

Several feeders do not satisfy the 15/15 customer privacy rule, therefore Max kWh values have been omitted.

	KWH ANALYSIS – RESIDENTIAL											
	Sub-Feeder	Total kWh (YR)	Max kWh (YR)	Avg kWh (YR)	Total kWh (SUM)	% Total (YR)	Max kWh (SUM)	Avg kWh (SUM)	Total kWh (WINT)	% Total (YR)	Max kWh (WINT)	Avg kWh (WINT)
Livingston	13051	409,284	NA	14,617	220,143	53.79%	NA	8,153	99,175	24.23%	NA	3,542
Richmond	3251	7,117,351	42,647	9,553	2,550,438	35.83%	20,049	3,508	2,921,793	41.05%	23,819	3,922
	3252	4,245,969	78,900	6,031	1,950,917	45.95%	37,006	2,799	1,267,832	29.86%	20,694	1,801
	3253	8,665,118	33,282	6,904	3,791,864	43.76%	19,099	3,083	2,712,431	31.30%	12,576	2,163
Lima	3661	4,592,990	280,880	6,361	1,903,673	41.45%	147,520	2,841	1,527,861	33.27%	73,920	2,131
	3662	5,986,819	194,440	7,909	2,858,205	47.74%	135,040	3,857	1,668,162	27.86%	23,040	2,204
Livonia	3761	7,854,170	83,537	9,543	3,436,840	43.76%	41,058	4,233	2,435,770	31.01%	22,357	2,960
	3762	6,827,840	111,040	8,879	3,118,086	45.67%	55,520	4,163	1,985,389	29.08%	32,400	2,582
	3763	671,508	33,039	4,866	306,990	45.72%	15,467	2,398	181,671	27.05%	9,689	1,316
Hemlock	3851	4,894,498	47,359	8,964	2,023,554	41.34%	20,936	3,747	1,596,270	32.61%	14,697	2,924
Lakeville	4061	6,172,754	107,520	7,843	2,686,384	43.52%	64,440	3,493	2,157,846	34.96%	26,080	2,742
	4062	3,462,390	49,325	9,088	1,573,508	45.45%	24,522	4,219	1,042,346	30.10%	13,621	2,736
	4063	3,326,829	57,856	7,170	1,575,386	47.35%	30,711	3,455	957,061	28.77%	14,684	2,063
Groveland	4161	1,092,155	24,647	7,914	494,458	45.27%	10,669	3,663	322,584	29.54%	7,712	2,338
Avon	4361	4,357,145	33,275	8,299	2,113,639	48.51%	17,522	4,088	1,219,195	27.98%	15,074	2,322
	4362	2,414,833	26,200	5,904	1,184,351	49.04%	10,960	2,998	656,237	27.18%	9,101	1,608
	4363	2,177,215	44,690	7,748	1,131,361	51.96%	17,805	4,099	555,223	25.50%	16,234	1,983
Conesus	5261	8,504,316	61,080	7,395	3,809,459	44.79%	30,560	3,371	2,577,792	30.31%	16,200	2,242
	5262	2,404,089	NA	13,738	1,082,161	45.01%	NA	6,255	699,207	29.08%	97,200	3,995

- Customers on Livingston 13051 and Consesus 5262 do not satisfy the 15/15 customer privacy rule, therefore some values have been omitted
- Cooling degree days are driving the summer consumption higher throughout the affected area

POTENTIAL SOLUTIONS

National Grid-targeted NWA solutions are required to be greater than the requested peak demand reduction described in this document in order to accommodate coincidence factors and unavailability of programs. These potential NWA solutions include: Distributed Generation, Demand Response, Energy Efficiency, Energy Storage and other resources that can meet the identified reliability need.

To achieve timely reductions, National Grid will evaluate potential NWA solutions based on:

- Customer availability and intent
- Timeliness
- Efficiency of resources
- Reliability of load reduction
- Flexibility of resources
- Availability of resources
- Commercially proven technology

The following table provides an indicative list of NWA solutions rated against key attributes. It should be noted that the ratings represent basic technical capability rather than actual current applications.

Technology	Type	Cost	Scalability	Generating Capacity	Distribution Capacity	Voltage Regulation	Frequency Regulation	Load Following	Balancing	Spinning Reserve	Non-Spinning Reserve	Black Start
Combined Heat and Power	Generator	$$$	○	●	●	●	●	●	●	●	●	◕
Distributed Solar	Generator	$$	◑	◔	◔	○	○	○	○	○	○	○
Distributed Solar with an Advanced Inverter	Generator	$$$	◑	◔	◔	●	●	◔	○	○	○	○
Energy Storage	Storage	$$$$	◕	◕	●	●	●	●	●	●	●	●
Thermal Storage	Storage	$$	◕	◑	◔	○	○	◔	●	○	○	○
Interruptible Load	Load Shaping	$	◔	○	○	○	○	○	●	●	●	○
Direct Load Control	Load Shaping	$$	◔	◑	○	○	○	○	●	●	●	○
Behavioral Load Shaping	Load Shaping	$	◔	◔	◔	○	○	◔	◔	○	○	○
Energy Efficiency	Load Reduction	$	◔	◑	◔	○	○	○	○	○	○	○

Legend

○ Unsuitable to perform the specific service

◔ May be able to provide some support

◑ Able to provide partial support

- Able to perform a service
- Well suited to perform the specific service

System Data Portal

Please see visit the National Grid System Data Portal for more information that is available online via the following link:

http://ngrid.maps.arcgis.com/apps/MapSeries/index.html?appid=4c8cfd75800b469abb8febca4d5dab59&folderid=8ffa8a74bf834613a04c19a68eefb43b