

# *National Grid Local System Plan*

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*Needs Assessment/Potential Solutions*

*PAC Meeting*

*September 12, 2008*

# Purpose of Local System Plan (LSP)

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Per Attachment K – Local, the LSP is a report that:

- ◆ Describes projected improvements to non-PTF that are needed to maintain reliable customer service.
- ◆ Reflects:
  - LSP Needs Assessments
  - Corresponding transmission system planning and expansion studies
- ◆ Identifies:
  - Local Planning Process
  - Criteria, Data, and Assumptions

# LSP Communication

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- ◆ LSP is communicated to the PAC at the end of an ISO-NE PAC RSP meeting once a year.
  - If more time is required then separate meetings can be arranged
- ◆ ISO-NE posts the materials not less than 3 business days prior to the meeting.
- ◆ PAC, Transmission Customers, and other Stakeholders have 30 days to provide any written comments for consideration by National Grid.
  - National Grid's contact:  
Gabriel Gabremicael  
Mgr Transmission Planning, New England  
National Grid  
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Westborough, MA 01582

# LSP Communication Cont.

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- ◆ Each PTO is individually responsible for publicly posting and updating the status of its respective LSP and the transmission projects arising therefrom on a website in a format comparable to the manner in which RSP plans and projects are posted on the RSP Project List.
- ◆ The ISO-NE RSP project list links to each individual TO's LSP project list.
- ◆ National Grid's project list is located at:
  - [http://www.nationalgridus.com/oasis/filings\\_studies.asp](http://www.nationalgridus.com/oasis/filings_studies.asp)
    - "LSP - LTP Transmission Projects - August 2008"

# Approach to Updates

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- ◆ National Grid intends to update the posted project list on a quarterly basis to reflect changes on projects.
- ◆ A LSP project list is required to be updated at least annually.
- ◆ A presentation of the LSP will be made annually.

# LSP Project List

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- ◆ LSP Project List is a cumulative listing of proposed regulated transmission solutions that may meet LSP needs.
- ◆ Lower voltage facilities contained in the LSP Project List pertain to facilities supplying our wholesale municipal customers.
- ◆ LSP Project List contains the status of each non- PTF project:
  - Concept
  - Proposed
  - Planned
  - Under Construction
  - In Service

# LSP Project List

## Project Status Descriptions

(may vary slightly from RSP definitions)

Concept	Project is under consideration as possible solution to a need, but little or no analysis is available
Proposed	National Grid has internally determined that the project is an appropriate solution to a need, but has not yet obtained Proposed Plan Approval (PPA) from ISO-NE (I.3.9 ISO-NE approval)
Planned	PPA has been approved (if required) and has internal approval.
Under Construction	Project has PPA approval and has internal approval.
In Service	Project is complete.

# Local System Planning Process

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- ◆ Local studies can result from:
  - Load Growth
  - Area Reliability Assessments
  - Point of Delivery Request from Customer
  - Generator Interconnection Request
- ◆ Planner summarizes the results from the needs assessment and provides: Criteria, data and assumptions used in study
- ◆ Planner builds study cases with proposed alternatives
- ◆ Planner determines the most effective solution
- ◆ Planner summarizes the results of the solutions study

# Criteria

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- ◆ All National Grid facilities that are part of the interconnected National Grid system shall be designed in accordance with the National Grid Transmission Planning Guide.
- ◆ The National Grid Transmission Planning Guide is posted on our website under:
  - [http://www.nationalgridus.com/transmission/c3-8\\_standocs.asp](http://www.nationalgridus.com/transmission/c3-8_standocs.asp)  
as: Transmission Planning Guide

# Data and Assumptions

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## Resources for studies:

- ◆ NEPOOL Library cases for loadflow and short circuit studies
- ◆ CELT Report Load forecasts for NE wide loads
- ◆ Customer provided forecasted loads and relevant data for local areas

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# LSP Projects

# LSP – Concept Status

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Load Growth	2013		Union Loop Study	Concept	Quick loadgrowth of Patriot Place Mall may overload existing supply of 23 kV and 13.8 kV.	Develop a 115 - 13.8 kV supply point in the Foxborough / Wrentham / Plainville area near Gillette Stadium with a 115 - 13.8 kV 24/32/40 MVA LTC transformer. Options: 1. Extend E-1 115 kV line from East Sub. 2. Construct a new 115 kV line from West Walpole Sub 3. Extend E-1 from Easton Sub to West Walpole Sub with a tap 4. Construct new underground 115 kV line tapped off of C-181N/D-182N to Crocker Pond Sub and convert it to 115-13.8 kV
Load Growth	06/2011		Dupont 115-13 kV Substation Transformer Addition	Concept	DuPont transformer will overload in 2010.	Add 2nd Xformer with a summer normal capacity of 60 MVA & 115 kV circuit breaker.
Point of Delivery Request from customer	06/2012		Avon area - new 115-13.8 kV substation.	Concept	3 substations; Stoughton , Parkview, and Ames will all be loaded above 100% SN rating by summer 2012.	Proposal of a new 115-13.8 kV substation in Avon, MA. The transformer for the proposed Avon substation would be a 115 - 13.8 kV 24/32/40 MVA with a summer normal loading capability of 50 MVA
Load Growth	03/2012		Tewksbury Substation - two new 115/13 kV #2 transformers.	Concept		

# LSP – Concept Status (Continued)

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Load Growth	06/2011		Meadowbrook substation - two new 115-13 kV transformers.	Concept	10 feeders exceeds summer normal ratings by 2012 in the town of Lowell and Chelmsford, MA & loading on 11 transformers will exceed summer emergency ratings under a contingency within the next 4 yrs.	Proposal of two new 115/13.2kV, 33/44/55 MVA, LTC transformers
Load Growth	06/2012	Marlboro Area Study	2nd 115-13 kV transformer at E. Main St. sub in Westboro	Concept	Due to Load growth need in area a second distribution transformer is needed	2nd 115-13.8 kV 40 MVA transformer
Area Reliability Assessment	2013		New 115 kV line (OH or UG) from Sudbury (NSTAR) sub to Hudson (Municipal) sub. or	Concept	Due to Load growth in the area, low voltage issues at Northboro Rd substation, & overloading on W23W (69 kV) line & E-157 (115 kV) line.	Considering New 115 kV line (OH or UG) from Sudbury (NSTAR) sub to Hudson (Municipal) sub. or
Area Reliability Assessment	2013		Convert W23W line 69 kV to 115 kV from Northboro Rd sub to Marlboro sub & upgrades substations	Concept	Due to Load growth in the area, low voltage issues at Northboro Rd substation, & overloading on W23W (69 kV) line & E-157 (115 kV) line.	Part of potential solution is to convert W23W and G7 (69 kV lines) to 115 kV from Northboro Rd sub to Marlboro sub and South Marlboro sub
Area Reliability Assessment	2012		Sandy Pond substation remove distribution load from tertiary windings of 345 -115 -23 kV transformer and install 115-23 kV substation.	Concept	reliability concern of serving 23 kV off of 345-115-13 kV transformer tertiary	install new 115 kV source to supply 23 kV load.
Point of Delivery Request from customer	06/2010		W. Warwick substation 115-12.5 kV	Concept	Heavy loading issues on 23 kV & 12.47 kV distribution systems in the area of West Warwick, Coventry, Warwick, and Cranston.	Proposal of a new 115-12.5 kV substation with a 115 - 12.5 kV 24/32/40 MVA transformer

# LSP – Concept Status (Continued)

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Load Growth	06/2011		Norwell Sub replace 115-13 kV transformer	Concept	The Norwell transformer was operating at 104% of summer normal rating during 2006. Norwell Sub has a transformer rated 15/20/25 MVA with a 28 MVA summer-normal rating.	Replacement of this transformer with one rated 24/32/40 MVA with a summer-normal rating of 50 MVA would provide an increase of about 22 MVA
Generator Interconnection Request	12/2010	ISO-NE Queue Position 233	ISO-NE Queue Position 233	Concept	ISO request for interconnection System Impact Study for 3 breaker 115 kV ring bus at S-171 115 kV line	
Point of Delivery Request from customer	TBD		Ayer substation relieve distribution load from tertiary windings of transformer and propose to install two 115-23 kV transformers at Devens proposed 115 kV substation.	Concept	move 13 kV feeders from Ayer 201 Station and off 115/69/13 kV transformers to relieve contingency loading issue for loss of single transformer	Alternative 1: Install two 115-13 kV 40 MVA transformers off proposed Devens 115 kV station and move 13 kV feeders from Ayer 201 Station. Alternative 2: Reconfigure 115 kV at Ayer substation to accommodate two 115 - 13 kV transformers.
Load Growth	2011		Pascoag - 2nd 13.8 kV feeder	Concept	Existing supply line is approaching it's thermal limits.	2nd 13.8 kV feeder

# LSP – Proposed Status

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Point of Delivery Request from customer	06/2010		New Hopkinton Sub 115-13 kv	Proposed	Found concerns in SWRI area of projected loading on feeders, Xformers, & dist. supply lines in excess of summer normal/emergency capability.	New 115 - 13 kV Substation in SWRI area with a 115 - 13.2 kV 24/32/40 MVA transformer
Point of Delivery Request from customer	TBD	Newport Area Study	Newport Area Supply Reinforcements	Proposed	To address all distribution loading, short circuit duty, reactive support and reliability concerns through 2016	Tap the 3763 line (69 kV) north of the Newport Mall to supply a new substation with 1 69 - 13 kV transformer and 3 - 13 kV feeders
Load Growth	2012	Quincy Area Upgrade	Field Street/North Quincy Supply Upgrades	Proposed	Needs for this project is load growth in the area of Quincy. The major problems in the study area are contingency overloads (130%) on the 115-13.8 kV supply transformers. Operating issues exist, such as the inability to switch and sectionalize the 115kV supply system while it is energized.	At Field St., the existing T3 and T4, 115-13.8 kV 40 MVA transformers will be replaced with 55MVA units. N. Quincy #11 substation will be expanded by adding two additional 115-13.8 kV transformers, T3 and T4. Also 115kV circuit switchers and breakers will replace disconnect switches to provide live line sectionalizing and enhanced protection on the Edgar 532 and 533 lines that supply Field S. #1 and N. Quincy #11 substations.
Load Growth	2009	Worcester Area Reinforcements (associated with an RSP Project)	Vernon Hill - Install 2 115-13 kv transformers	Proposed	Current transformer normal loading at 100% of nameplate rating	Replace existing transformer with two new 40 MVA 115-13 kV transformers.

# LSP – Proposed Status (Continued)

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Load Growth	2011	Devens Area Study	New Devens 115 kV substation	Proposed	see slides ahead	see slides ahead
Load Growth	2011		Ayer substation install 2 in-line 115 kV breakers	Proposed	see slides ahead	see slides ahead
Load Growth	2011		Convert 69 kV lines from Ayer to Devens to 115 kV (Portion of U-21E and V-22E lines)	Proposed	see slides ahead	see slides ahead

# LSP – Planned Status

Need	Projected In-Service Month/Year		Project	Current Status	Needs Assessment	Solutions
Point of Delivery Request from customer	10/2010		Extend existing E-1 115 kV line to Mansfield Substation.	Planned	Mansfield Municipal Electric Department plans to construct a new 115-13.8 kV substation.	An extension of E-1 is required to supply the new substation with a 115-13.8 kV, 44 MVA transformer.
Load Growth	07/2010	Merrimack Valley/North Shore Reliability Project (associated with an RSP Project)	Re-conductor Meadowbrook - N. Chelmsford portion of I-161 and A-153 115 kV lines	Planned	Thermal overload on I-161 & A-153 for loss of one onto the other.	Re-conductor with 795 ACSR.
Load Growth	2011	Central / Western Massachusetts Upgrades (associated with an RSP Project)	Palmer - install new 115-23 kV transformer and circuit switcher.	Planned	See Western MA study	Alternative 1 (planned): Install a 20 MVA 115-23kV transformer at Palmer in year 2011. This transformer will serve local 23 kV load in the Palmer area. Alternative 2: Convert the 23 kV distribution system to 13 kV and install 115-13 kV transformer.
Area Reliability Assessment	2010		Webster St. - add three 115 kV circuit switchers and new control house.	Planned	See Western MA study	Alternative 1 (planned): Install 115 kV circuit switchers on high side of Webster St 115-13kV transformers. Install new control house. Alt. 2 Install 115 kV ring bus with six 115 kV breakers at Webster St. Space issues, as well as high cost.
Area Reliability Assessment	2015		Carpenter Hill - install 115-69 kV 56 MVA autotransformer and low side breaker.	Planned	See Western MA study	Alternative 1 (planned): Install a 115-69kV 56 MVA autotransformer at Carpenter Hill in year 2015. This transformer will function as the primary 69 kV supply to E Webster Substation. The backup supply to E Webster will be from Millbury. Alternative 2: Install a 4th 115-69kV autotransformer at Millbury (may not be sufficient space) in year 2015. Also, install additional capacitor banks at E Webster station.

# LSP – Planned Status (continued)

Need	Projected In-Service Month/Year		Project	Current Status	Needs Assessment	Solutions
Area Reliability Assessment	01/01/2010	West Amesbury	Merrimac, MA Municipal Install 23kV Loadbreak Transfer	Planned	This project is part of a new 345-115kV and 115-23kV and 115-13kV substation at West Amesbury. The project below is part of the scheme. This was necessitated by changes in fault duty and the reworking of the 23kV lines in the area of the new West Amesbury substation.	Replace line reclosers with loadbreak switches on the feed to Merrimac Municipal.
Load Growth	2009	Greater Rhode Island Transmission Reinforcements (associated with an RSP Project)	Woonsocket substation. 115-13 kV transformer addition	Planned	Provides permanent supply for growing load in NW RI to replace temp 115-13 kV Xformer at West Farnum when tertiary winding failed.	Alternative 1 (planned): Install a 115-13 kV, 24/32/40 MVA transformer at Woonsocket substation. Alternative 2: Replace West Farnum 345-115-13 kV transformer. Alternative 3: Build permanent 115-13 kV switchyard at W. Farnum
Area Reliability Assessment	2011		Conversion of Jepson 69 kV substation to 115 kV substation	Planned	See GRI study	
Area Reliability Assessment	2011		Dexter Substation Changes	Planned	See GRI study	

# LSP – Planned Status (continued)

Need	Projected In-Service Month/Year		Project	Current Status	Needs Assessment	Solutions
Area Reliability Assessment	2011	Bellows Falls Substation Revitalization (associated with an RSP Project)	Replace the three existing 3-winding GSU's with two new 2-winding 115-6.6 kV GSU's	Planned	Environmental concerns and asset conditions lead to the need to replace the GSU's and much of the switchyard equipment at Bellows Falls. Transmission planning studies have identified the need to upgrade transmission facilities in the area including certain Bellows Falls terminal equipment. In addition these studies identified the need to install additional 46 kV and 69 kV transformation at Bellows Falls.	Alternative 1 -Maintain existing equipment. This alternative was not recommended as it would include high transformer refurbishment cost and it does not reduce the environmental and maintenance risks, nor address asset separation. Alternative 2 - Replace equipment in kind. This alternative was not recommended due to the cost of replacement with increased ratings of equipment, upgrades to equipment switching, protection and metering systems and it does not address the separation of assets. Alternative 3 - Replace the GSUs with two-winding units and install a single, three winding 115-69-46 kV transformer. This alternative was not recommended because it creates a single mode failure for two voltage supplies. Alternative 4 (planned) -Replace the GSUs with two-winding units and add new, independent transformers for the 46 kV and 69 kV supplies, fed directly from the 115 kV bus. This option also includes the replacement of 115 kV oil circuit breakers and oil-filled potential transformers.
Area Reliability Assessment	2011		Install a new 115-69 kV, 33.6/44.8/56 MVA autotransformer (No. 4) and a new 115-46 kV, 30/40/50 MVA autotransformer (No. 5)	Planned		
Area Reliability Assessment	2011		Remove the existing 69-46 kV, 8 MVA autotransformer (No. 3).	Planned		
Area Reliability Assessment	2011		Install two new 115kV circuit switchers (4T-115 and 5T-115)	Planned		
Area Reliability Assessment	2011		Install one new 69 kV GCB (G33).	Planned		
Area Reliability Assessment	2010		Upgrade Line 4401 46 kV from Vilas bridge to National grid/CVPS demarcation point	Planned		
Area Reliability Assessment	2010		Bridge Street sub (GMP) remove National Grid 6.9 kV transformer	Planned		

# LSP – Construction Status

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Point of Delivery Request from customer	12/2009	Merrimack Valley/North Shore Reliability Project (associated with an RSP Project)	New W. Amesbury 115-23 kV and 115-13 kV substations tapped off of (394) line between Ward Hill and Seabrook	Construction	The proposed West Amesbury substation will alleviate the loading issue at King Street substation and the 23 kV sub-transmission lines and the 13.8 kV distribution circuits in the area.	Alternative 1 (planned): 115-23 kV, 55 MVA transformer & 115-13.8 kV, 20 MVA transformer supply point at West Amesbury. Alternative 2: Extend two 115 kV lines from King Street Substation, B-154N and C-155N to a new 115-23 kV substation at West Amesbury.
Load Growth	05/2009		Install 115 kV taps to Lynn Substation from Q-169 & A-179	Construction	Determined the need to remove the existing 13.8 kV indoor substation and install a new outdoor low profile 13.8 kV substation within the existing Lynn #21 substation. Presently, Lynn #21 substation is served via two three winding 115/23/14 kV transformers #6 & #7. During contingency loss of transformer #7, the load on transformer #6 is approaching 100% of its summer emergency capability. The proposed addition will alleviate potential loading of the existing transformers during contingency and will provide capacity for future load growth in the area.	Install three new transformers 115-13.8 kV 55 MVA nameplate rating for the new proposed low profile substation along with circuit switchers and required relays for protection schemes. Install the proposed substation within the existing Lynn #21 substation fence by tapping the Q-169 and A-179 115 kV radial tap lines.

# LSP – Construction Status (continued)

Need	Projected In-Service Month/Year	Major Project	Project	Current Status	Needs Assessment	Solutions
Point of Delivery Request from customer	06/2009		Rutland area new 115/13 kV substaion.	Construction	Improve reliability to load by off-loading 69 kV system fed out of Wachusett.	Alternative 1 (planned): Build new 115-13kV, 40 MVA transformer substation in the town of Rutland MA. This substation will be connected to the B-128 115 kV line which presently connects Millbury substation to Harriman substation. The B-128 line will loop in and out of the new Rutland substation with remote controlled load break switches. Alternative 2: Convert an existing 13 kV line to 69 kV from Holden MA to Rutland MA. Upgrade the existing Rutland Substation. Install a new 69-13.8kV transformer, new control house and all associated equipment. Ultimate configuration of the substation would be for two feeders. No ROW exists for the 69 kV line.
Load Growth	2009	Worcester Area Reinforcements (associated with an RSP Project)	Cooks Pond Substation #23 - two new 69-13.8 kV transformers.	Construction	Replace existing 10MVA transformers with 20 MVA transformers.	Alternative 1(planned): Replace existing 10 MVA transformers with 20 MVA transformers. Alternative 2: Install additional distribution breakers and circuits at Webster Street #6 substation. Alternative 3: Increase distribution capacity at Greendale # 24 substation.

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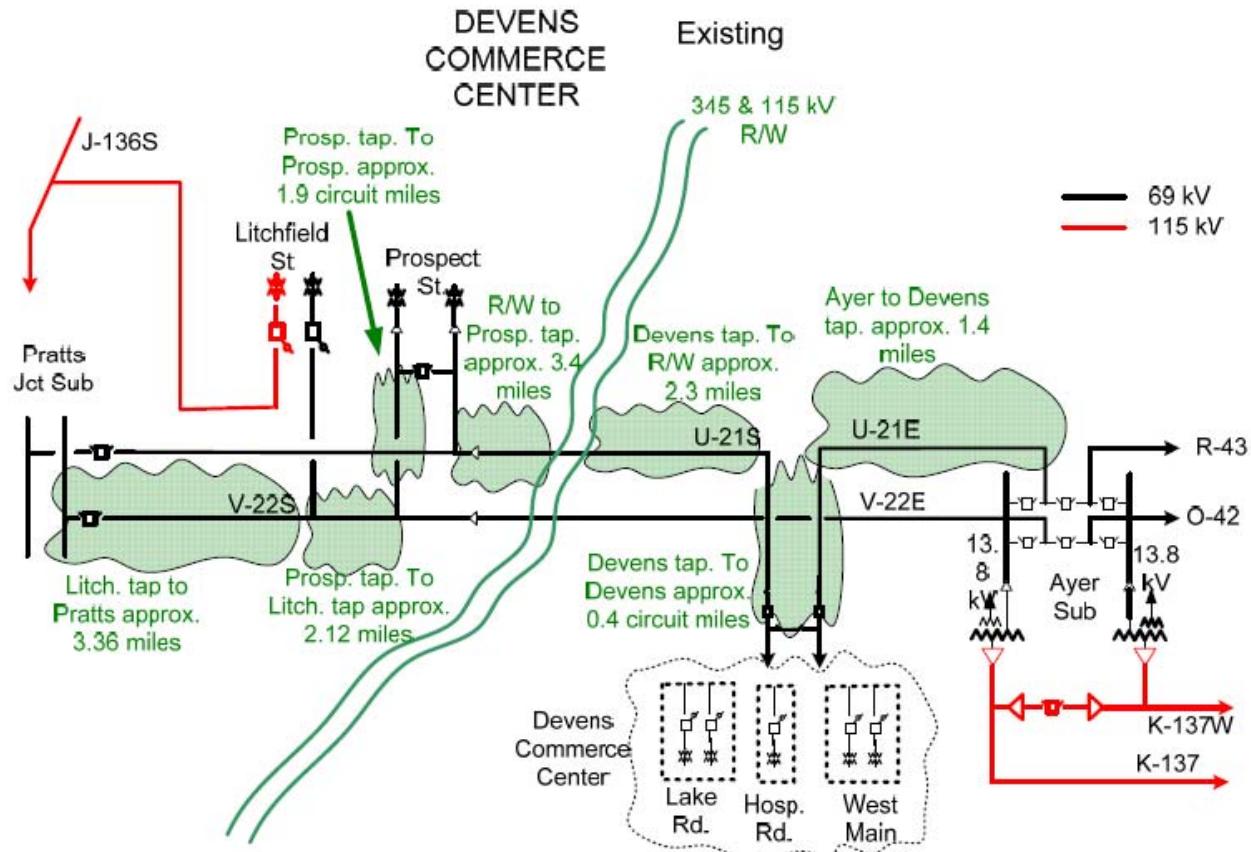
Introduction of a local study  
resulting in a Proposed PTF solution  
- *DEVENS*

# Needs Assessment – *Devens*

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- ◆ Devens Commerce Center – wholesale client of New England Power (NEP)
- ◆ Developer of Devens, Mass Development estimates 2007 peak of 21 MW will be 100 MW by 2017
- ◆ Presently Devens is served via two 69 kV radial lines

# Needs Assessment – *Devens*



Drawing not to scale  
GG 10-1-07

# Needs Assessment – *Devens*

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# Needs Assessment – *Devens*

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- ◆ The option of supplying the proposed load growth at Devens via the existing 69 kV facilities was evaluated.
- ◆ For loss of either T4 or T6 at Ayer, the other transformer will NOT be able to supply the projected long term load growth at Devens and the area load supplied out of Ayer substation.
- ◆ Based on the load growth, the existing facilities will be able to serve the projected load up to the year 2009 based on load forecast of 50 MW by 2009.
- ◆ Beyond 50 MW, the U-21 bus work at Pratts Jct becomes overloaded for loss of the Devens Supply from Ayer.

# Solutions – *Devens*

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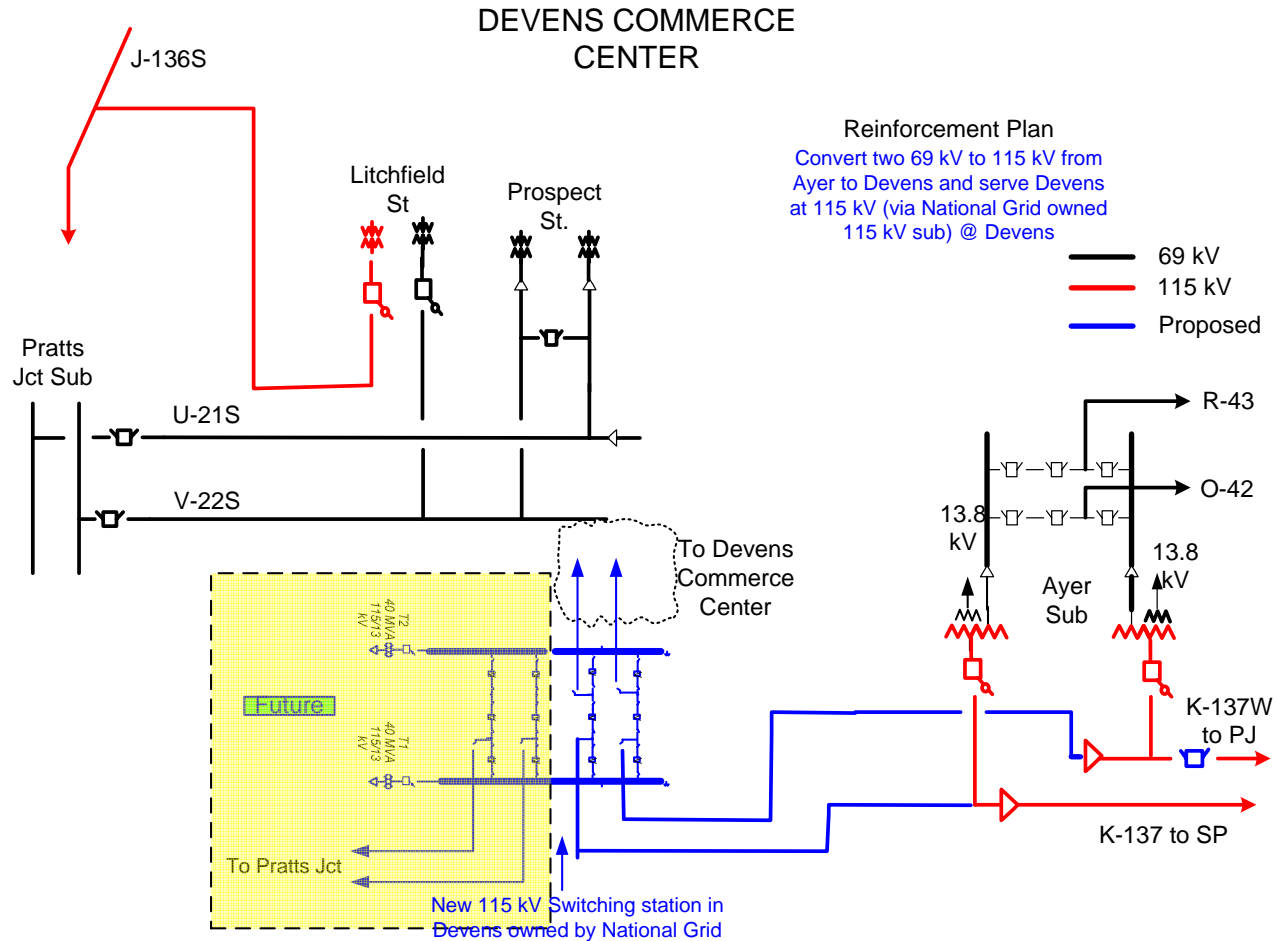
- **Addition of (2) 115-69 kV transformers at Ayer**
  - Looked at the addition of (2) 115/69 kV 56 MVA transformers at Ayer by paralleling the existing two 115/69 kV transformers (in which case loss of one 115 kV line will take out one set of parallel transformers).
  - Analysis showed that the remaining two transformers will not be able to supply the total Ayer substation load during contingency.
  - The site is not large enough to build out a breaker and a half substation to avoid the loss of two transformers with a line.

# Solutions – *Devens*

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- ◆ **Alternative 1 (*proposed*) – Convert U21E and V22E and a new 115 kV switching station at Devens Commerce Center**
  - Convert two existing 69 kV lines (U21E and V22E), approximately 0.3 miles from Ayer substation to a proposed Devens 115 kV substation, abutting the existing transmission right-of-way utilizing 1590 ACSR conductor.
  - At Ayer substation, reconfigure the tap lines on K-137 and K-137W;
  - At a proposed Devens substation, install a new 115 kV air insulated switching substation. The installation includes two full 115 kV bays with a total of 6 circuit breakers and associated equipment.

# Alternative 1 (proposed)

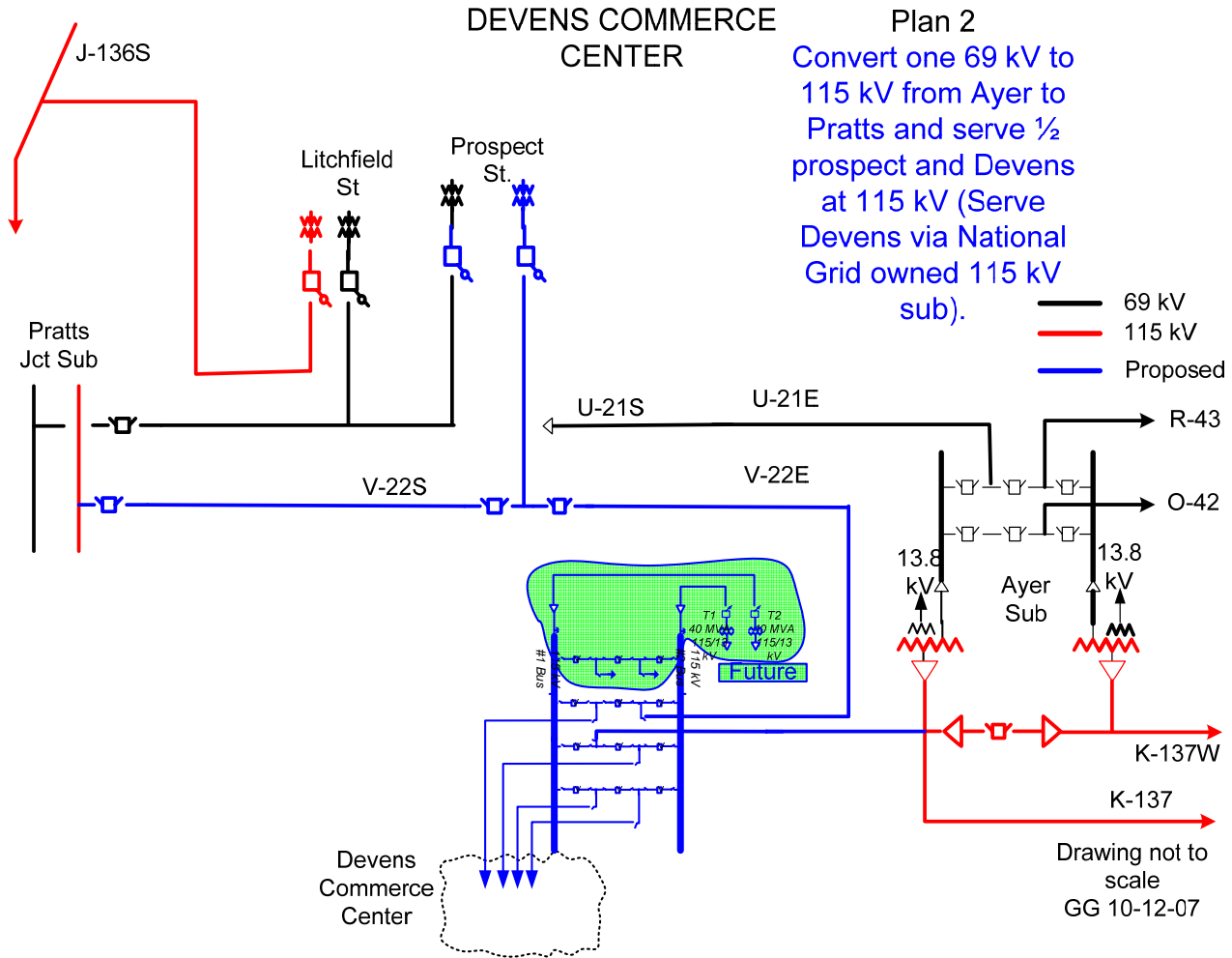


# Solutions – *Devens*

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- ◆ **Alternative 2 – Convert V22E and V22S and serve Devens at 115 kV**
  - Convert the V22 main line from Ayer substation to Pratts Junction substation from 69 kV to 115 kV and tap to Prospect St. substation with 1590 ACSR.
  - At Ayer substation, reconfigure K-137 and K-137W by installing a 115 kV pole.
  - At Devens substation, install a new 115 kV air insulated switching substation. The installation includes two full 115 kV bays with a total of 6 –circuit breakers and associated equipment.
  - At Prospect Street substation; Install two 115 KV in-line gas circuit breakers and associated structures. Replace one 69-13 kV transformer and associated equipment with one 115-13 kV, 40 MVA transformer.
  - At Pratts substation, install one 115 kV Circuit Breaker and associated equipment.

# Alternative 2



# Questions

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