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National Grid Requirements for Interconnection of Parallel Generation



***ESB 756 2017 Revision – Review of Changes for
NY Jurisdiction, version August 23, 2017***

By: National Grid, Retail Connections Policy & Standards



Safety Message

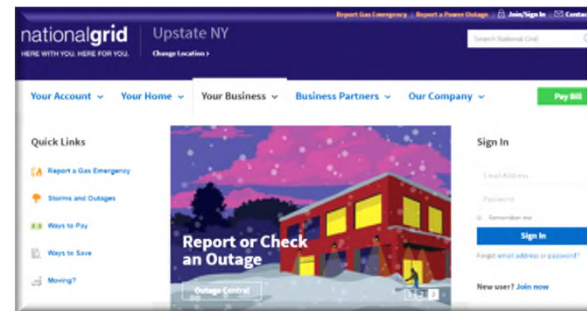
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Storm Communications – *Did you know?*

In the event of weather emergency, stay informed using local news outlets and National Grid's emergency communications channels.

- Nationalgrid.com
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- National Grid's Outage App



Objectives

- Importance of the Interconnection Process
- Interconnection Standards and Codes
- Overview of Service Point and the codes (NESC and NEC) and Key Points for Electric Service Requirements
- ESB 756 Update Process
- ESB 756 series 2017 Revision Change Highlights
 - *Main document*
 - *Appendix A and B for the NY Jurisdiction*
- Q&A

Importance of the Interconnection Process

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- Following the interconnection process is important because a DG system could present dangers to utility workers and the public if proper equipment is not installed.
- While robust and capable of handling minor disturbances, the quality of grid power is extremely important. The interconnection process ensures the DG meets safety, reliability, & power quality requirements with regard to:
 - Islanding
 - Substation backfeed
 - Transient Voltage Conditions
 - Noise and Harmonics
 - Frequency
 - Voltage Level
 - Machine Reactive Capability
- It is essential that each DG customer receive an interconnection agreement with the utility before installing any generation. You are proceeding at your own risk if you choose to install a system without utility approval.



Interconnection Standards & Codes - Regulatory Rules

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■ Federal Government

- **FERC SGIP** “Small Generator Interconnection Procedure”

<https://www.ferc.gov/whats-new/comm-meet/2013/112113/E-1.pdf>

■ Regional

- **NERC Standard FAC-001-2 - Facility Interconnection Requirements**
- **NERC Standard PRC-002-2 - Disturbance Monitoring and Reporting Requirements**

<http://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCCompleteSet.pdf>

■ State Government

➔ **New York Department of Public Service (NY DPS)**

- PSC NY Standardized Interconnection Requirements for Distributed Generation Connected to the Distribution EPS (NY SIR)

[http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/dcf68efca391ad6085257687006f396b/\\$FILE/SIR%20Final%203-17.pdf](http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/dcf68efca391ad6085257687006f396b/$FILE/SIR%20Final%203-17.pdf)

- Niagara Mohawk d/b/a National Grid Electricity Tariff, P.S.C. 220

➤ **Massachusetts Department of Public Utilities (MA DPU)**

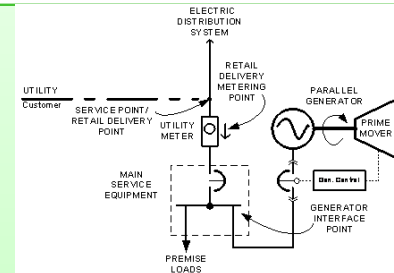
- Massachusetts Electric d/b/a National Grid tariff, M.D.P.U. 1320

https://www9.nationalgridus.com/non_html/1320%20-%20DG%20Interconnection%20Tariff_10.01.16.pdf

➤ **Rhode Island Public Utilities Commission (RI PUC)**

- Narragansett Electric d/b/a National Grid tariff, R.I.P.U.C. 2163

http://www9.nationalgridus.com/non_html/RI_DG_Interconnection_Tariff.pdf



Interconnection Standards & Codes – Industry Standards

IEEE standards applicable to DG installations:

- **IEEE 1547** “*Standard for Distributed Resources Interconnected with Electric Power Systems*”
- **IEEE 519** “*Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*”
- **IEEE 1453** “*Recommended Practice for Measurement and Limits of Voltage Flicker on AC Power Systems*”
- **IEEE C37.90.1** “*Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus*”
- **IEEE C37.90.2** “*Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers*”
- **IEEE C37.90.3** “*Standard Electrostatic Discharge Tests for Protective Relays*”

Interconnection Standards & Codes – Industry Product Standards

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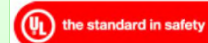
➤ Product Standards

Applicable standards:

➤ UL 1703 | UL 61730 | **UL 1741**

➤ **UL 1741 “Inverters,
Converters and Charge
Controllers for Use in
Independent Power
Systems”**

➤ IEC 61215 | IEC 61646 | IEC
61730



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Renewable Energies > Photovoltaics



<http://www.ul.com/>

✓ *Inspections are needed for safe, quality installations!*

NFPA

- **NFPA 70** “National Electrical Code” (**NEC**)
- **NFPA 70B** “Recommended Practice for Electrical Equipment **Maintenance**”
- **NFPA 70E** “Standard for Electrical **Safety** in the Workplace”
- **NFPA 850** “Recommended Practice for **Fire Protection** for Electrical Generating Plants and High Voltage Direct Current Converter Stations”

Interconnection Standards & Codes – Codes: The 2017 NEC

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Codes for Installing Renewable Energy Sources in Premises Wiring

- *Articles 690 & 691 National Electrical Code*
 - Requirements for Photovoltaic Installations
- *Article 692 National Electrical Code*
 - Requirements for Fuel Cell Installations
- *Article 694 National Electrical Code*
 - Requirements for Wind Electric System Installations
- *Article 705 National Electrical Code*
 - Requirements for Interconnected Electric Power Production Sources
- *Article 706 National Electrical Code*
 - Requirements for Energy Storage Systems

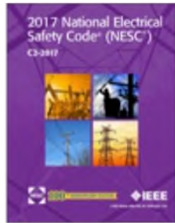


✓ *Inspections are needed for safe, quality installations!*

Overview of Service Point and the codes

(NESC and **NEC**)

(See: ESB 750 Figure 2-1)



➤ **Supply Side**
NESC Rule 011
NEC 90.2(B)

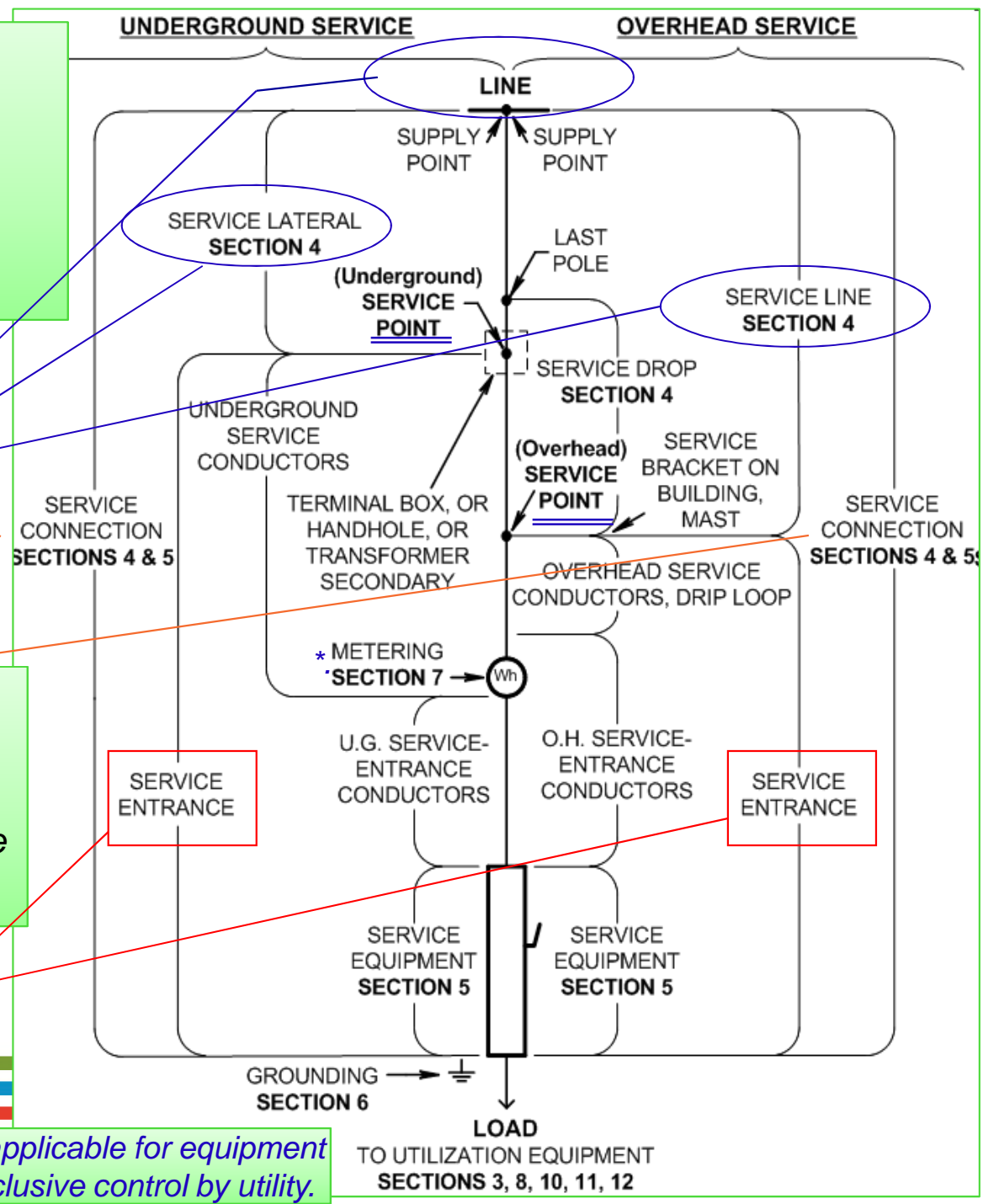
➤ includes the service lateral or service line, service entrance conductors, meter provision, service equipment, and grounding *where the Electric Utility has Mutual Interest*

➤ **Premises Wiring**



NEC 90.2(A)

* NESC applicable for equipment under exclusive control by utility.



Key Points for Electric Service and Parallel Generation Requirements – National Grid ESB 750 series

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Key Points for Electric Service Requirements:

- Require some means of **disconnect and main overcurrent protection**, i.e., service equipment.
- Billing **meters secure**.
- Interface points clear to **avoid potential operating and safety problems**.



Key Points for Parallel Generation Requirements:

- Company determines the **interconnect voltage and method of interconnection**.
- **Prior notification to and approval by the Company is required for any generation to be installed or operated in parallel with the Company EPS.**

What are the local rules that apply to DG interconnections?

- **National Grid ESB 756 Parallel Generation Requirements**
 - **Originates from the ESB 750 Series and applicable Company tariffs in each state jurisdiction**
 - **ESB 756 main document**
 - **Appendices to ESB 756 for Jurisdictional Requirements**

Key Points for Electric Service and Parallel Generation Requirements – National Grid ESB 750 series

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Each utility has their requirements pursuant to the regulations that govern them as varying from state-to-state based on the NESC.



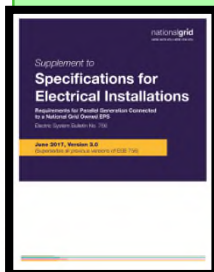
ESB 750 Specifications for Electrical Installations

ESB 756 General Requirements for Parallel Generation Connected to a National Grid Owned EPS

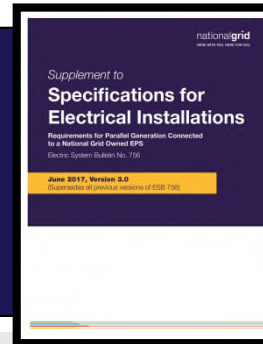
- **Appendix A** Requirements for Parallel Generation Connected to National Grid Facilities in **NY, MA, RI, NH, & VT** Not Applicable to State Regulatory DG Interconnection Requirements
- **Appendix B** Distributed Generation Connected To National Grid Distribution Facilities *per the NYS SIR*
- **Appendix C** Distributed Generation Connected To National Grid Distribution Facilities *per the MA SIDG*
- **Appendix D** Distributed Generation Connected To National Grid Distribution Facilities *per the RI SCDG*

✓ The Appendices to ESB 756 are intended for jurisdictional-specific requirements.

http://www.nationalgridus.com/non_html/shared_constr_esb756.pdf



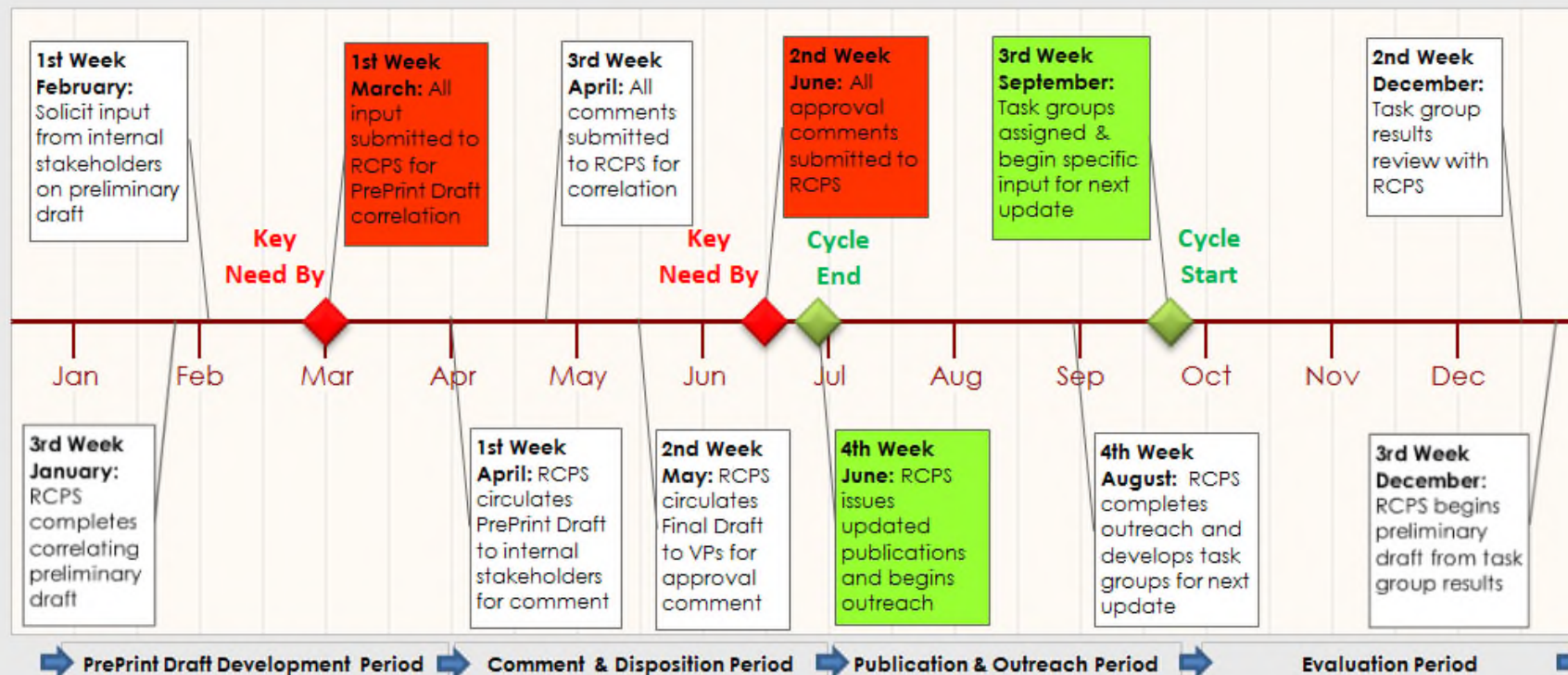
National Grid ESB 756: “The Update Process”



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National Grid ESB 756 Annual Revision Cycle Process

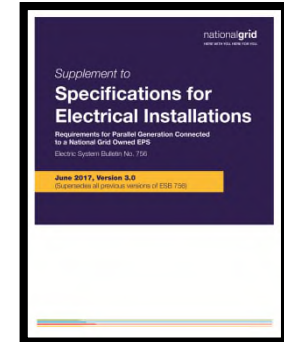


National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: Overall

- In full effect by September 1, 2017
- Various housekeeping items
 - Company branding
 - Correlated organization of sections for Appendices B-D
- New Revision Cycle Process
 - Annual cycle with publication in month of June
 - Interim Amendment for emergency changes (*internal to National Grid*)



National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: Overall (*cont'd*)

- Technical requirements and process are contained
 - Statutory language, requirements, process, agreements, etc. are located in the Company's specific state or Regional ISO jurisdictional tariff and referenced.
- Incorporated Company's latest best practices
 - Voltage & Frequency Protection & Control
 - Unintentional Islanding & Effective Grounding Protection
 - Monitoring & Control

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 – *This is the main document*

- Updated NERC and ISO references
- Removed ESB 756 Appendix E
 - National Grid no longer owns and operates the former Granite State distribution system in New Hampshire.
- Updated title of ESB 756 Appendix A
 - *“Requirements For Parallel Generation Connected to National Grid Facilities in New York, Massachusetts, Rhode Island, New Hampshire, and Vermont Not Applicable to State Regulatory Distributed Generator Interconnection Requirements”*

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A

■ New Purpose and Scope sections replace Preface

- **Covers** parallel generation connected to National Grid facilities in New York, Massachusetts, Rhode Island, New Hampshire, and Vermont Not Applicable to State Regulatory Distributed Generator Interconnection Requirements

■ Section 1.0 General

- Pointed reference of requirements in secondary grid and spot network distribution systems to ESB 756 Appendices B, C, and D



National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 1.0 General (*cont'd*)

- Updated Phase Balance and Voltage Tolerance for PCC voltage delivery requirement
- Included DER aggregator communications requirement with the Company
- Included more information of system impacts to be evaluated in the General Electrical Issues
- Added a process for $\geq 69\text{kV}$ systems upon written request to Company for investigating feasibility of a tap only for small generator facilities

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 1.0 General (*cont'd*)

- Added specific requirements of a generator facility nameplate
- Under “Types of Generators or Other Parallel Sources”
 - Added automatic voltage control requirement to Synchronous gen.
 - Clarified Inverter Systems demonstrating compliance to IEEE 1547 and UL 1741
 - Included energy storage systems (ESS) and Microgrids (Facility/Campus-style and Community)

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 1.0 General (*cont'd*)

➤ Under “Limitations”

- Updated conditions limiting DER operation for safety & reliability
- Added requirement for export of surplus energy
- Revised Peak Shaving Generation for clarity and including Regional ISO programs like “Behind-the-Meter”

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 2.0 Project Management

➤ Clarified responsibilities for:

- Sale of a generator facility
- Switching protocol with the Company's EPS
- Required telecommunication services to arranged by the Generator-Owner
- Communication of wholesale dispatch signals
- Application process, study, interconnection agreement, and cost payment

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 3.0 Service Installation

- Clarified Metering for the specific jurisdictional wholesale, retail, and Regional ISO requirements

■ Section 4.0 Plant Requirements

- Clarified Telemetering requirements including telecommunications installation steps and requirements
- Added voltage & frequency ride through and trip points requirements to meet two standards, IEEE 1547 and NERC PRC-024-2 depending on size and type of generator facility

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 4.0 Plant Requirements (*cont'd*)

- Added clarity to revised section on anti-islanding protection control for merchant power generator facilities
- Added reference to ESB 756 Appendices B, C, and D for specific technical requirements of parallel generation up to 10MVA interconnected under 15kV to the Company EPS
- Clarified calibration and witness test requirements of Company-designated protective devices

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix A (*cont'd*)

■ Section 5.0 Operating

- Clarified emergency conditions warranting the Company to disconnect a generator facility
- Clarified when tele-protection and/or telemetering/SCADA is inoperable that it warrants the Company to disconnect the generator facility
- Specified the Generator-Owner's responsibility when the generator facility unexpectedly trips

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B – *For NY*

■ Updated Purpose and Scope sections

➤ **Covers** parallel generation connected to National Grid's EPS that are net metered generation sources ("Net Metered Classes") 2 MW or less or non-net metered generation sources with a nameplate rating of 5 MW or less including other distributed energy resources (DER).

■ Relocated "Applicable Codes, Standards, and Guidelines" to Section 3.0 and added Section 4.0 "Definitions" for terms defined in this Appendix.

➤ See next slide for old to new section comparison chart



National Grid ESB 756: 2017 Revision Change Highlights

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ESB 756B September 2015 Version 3.0		ESB756B June 2017 Version 4.0	
Section #	Section Title	Section #	Section Title
Section 5.8.8	Anti-Islanding	Section 7.6.12	Unintentional Islanding Protection for DER
Section 5.4.1	Service Equipment Requirements	Section 7.2.1	Service Equipment Requirements
Section 5.4.2	Company Revenue Metering Requirements	Section 7.2.2	Company Revenue Metering Requirements
Section 5.5	Transformer	Section 7.3	Transformer
Section 5.5.3.1 Section 5.3.4	Primary and Higher Voltage Serviced Customer-Generators/Neutral Stabilization, Ground Fault, and Grounding	Section 7.3.2.1	Effectively Grounded, Four-wire Multi-grounded 3-phase Wye EPS
Section 5.6	Manual Generator Disconnecting Means	Section 7.4	Manual Generator Disconnecting Means
Section 5.7	Generator Interrupting Device Requirements	Section 7.5	Generator Interrupting Device Requirements
Section 5.8.6	Solar Photovoltaic Generation Requirements/All Other Parallel Generation Equal or Above 500kW	Section 7.6.1 Section 7.6.2	Type Tested (Certified) Equipment/Non-Type Tested Equipment
Section 5.8		Section 7.6.3	Number of Relays Required
Section 5.8.3	Protective Relay and Trip Circuit Hard-Wire Requirement	Section 7.6.5	Protective Relay and Trip Circuit Hard-Wire Requirements
Section 5.7.2 Section 5.8.2	Local Power Supply Requirements/Protective Relay Power Requirements	Section 7.6.5 Section 7.6.6	Protective Relay and Trip Circuit Hard-Wire Requirements/Protective Relay Test Switch Requirements
Section 5.8	Protection and Protective Equipment Requirements	Section 7.6.7 Section 7.6.11	Voltage Relay Devices/Utility Grade Protective Device Settings and Verification
Section 5.8	Protection and Protective Equipment Requirements	Section 7.6.10	Overcurrent Relay Devices
Section 4 #10 Appx A Section 4	Plant Requirements/Automatic Switching and Protective Devices	IEEE 1547 Section 4.2.6	N/A
Section 5.8.5	Non-Type Tested Equipment	Section 7.6.3	Number of Relays Required
Section 5.8.1.1	Current Transformers ("CT")	Section 7.6.4.1	Current Transformers ("CT")
Section 5.8.1.2	Voltage Transformers ("VT") and Connections	Section 7.6.4.2	Voltage Transformers ("VT") and Connections
Appendix A	Synchronizing Devices	Section 7.6.9 Section 7.6.11.2	Synchronizing Devices/Synchronism Check Setting Requirements for all types of Generation
Appendix A/IEEE 1547	Instrument Transformers for Protective Device Relays	Section 7.6.11	Utility Grade Protective Device Settings and Verification

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- In Sections 5.0, 5.2, 5.3, removed much of the NYS SIR process information and the former Exhibit 1.
 - *Now makes reference to the NYS SIR itself for the latest information.*
- Section 5.1.1 is added to note where additional technical data may be needed at time of application.
 - Control Diagrams, interconnection facility equipment data sheets, site plan, Energy Storage Systems (ESS), and Facility or Campus-style Microgrids.

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

- In Section 5.3, clarified
 - Peak shaving generation for “behind the meter” services
 - NY Building Code requirements
 - CESIR report purpose and main content
- In Section 5.4, consolidated and updated secondary network considerations during the application process.
- Included payment requirements in Section 5.5 that are applicable to CESIR reports.

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 6.0,

- Arc Flash *added* to list of potential issues
- *Removed former table* on typical DG connection planning limits due to availability of online tools such as “Red Zone Map” and the Pre-Application Report process in the NYS SIR
- *Described DER saturation* and that the Company specifies the voltage delivery system for connection

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.0,

- Clarified nameplate requirements for inverter-based and rotating machine generation
- Added general requirements for *facility or campus-style microgrid connections*

■ In Section 7.1,

- Added voltage tolerance at the PCC's nominal voltage delivery from the Company
- Clarified neutral stabilization, ground fault, and grounding

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.2,

- Added Exhibit 5 and *requirement for 500 kW and greater DER Customer to be primary served and metered*
- Clarified *telecommunication provisions by DER Customer for Company-owned metering*

■ In Section 7.3,

- Added requirement for the *500 kVA maximum transformer size the Company will supply for a new secondary connected DER where the non-DER premises electricity use is 500 kVA or less*

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.3, (*cont'd*)

- Added requirement for *conditions when an existing Company-owned transformer may need to be replaced*
- Clarified the section on effectively grounded, four-wire multi-grounded 3-phase Wye EPS and *if the effective grounding means is unavailable the DER facility shall be disconnected*

■ In Section 7.4, clarified manual generator disconnect switch access, clearances, contact information, and arrangement requirements

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.5,

- Added *high voltage side interrupting device* requirement for primary wye grounded–secondary delta, and for primary delta interconnection transformers

■ In Section 7.6,

- Clarified overall protection and protective equipment requirements
- Clarified *accuracy requirements* for CTs & added those for VTs
- Clarified protective relay test switch requirements
- Added *test switch exception* where relay inputs are supplied and tested with a control cable, such as some recloser installations.

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.6, (*cont'd*)

- *Voltage and Frequency Ride Through requirements included for voltage and frequency relays*
 - Added table for set points and synch check requirements
 - *Note: Consistent with IEEE1547, all default voltage and frequency time delays in Table 7.6.11.1-1 are total clearing times (set relay time delay + relay time + interrupting device time), and the set relay time may need to be lower than the times given in the table to account for relay and interrupter time.*

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.6, (*cont'd*)

- Clarified Company verification of relay testing requirements
- Added *new unintentional islanding practice requirements* into the former anti-islanding section
 - Includes the PCC Recloser requirements when certified DER situations are presented at certain thresholds on a radially supplied Company EPS
 - Identifies when reclose blocking is needed at feeder line reclosers
 - Specifies when DTT is a necessary requirement

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

■ In Section 7.7,

- Relocated former EMS-RTU section and renamed to “*Monitoring & Control*” (M&C)
- Notes *where a PCC recloser is required or requested and approved, EMS-RTU requirement is waived*, since SCADA requirements will be extracted from the Company’s PCC recloser for EMS purposes
- Added *general RTU installation requirements* when a Company RTU is specified for equipment installation and communications media provisions at the DER facility

National Grid ESB 756: 2017 Revision Change Highlights

□ Major Changes: ESB 756 Appendix B (*cont'd*)

- New Section 7.8 added to cover inverter-based generator voltage and frequency control to comply with present IEEE 1547a
 - *While the capability is permitted, the functions shall be disabled by default unless otherwise approved by the Company.*
- New Section 8.0 to cover testing and commissioning requirements for complex DER installations

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- Section 9.0 on Operating, for complex DER installations
 - Adds *Sequence of Operations (SOO) requirements*
 - Specifies *switching and event reporting protocol*

Note: This was already required for most projects per section 7.3.2 and Appendix A of ESB 751.

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- Section 10.0 on PQ Compliance Verification,
 - Adds Electricity Tariff requirement that the *Customer-Generator is responsible for the cost of any Company system modifications/additions to mitigate disturbance caused by the DER facility*
 - Added *transient overvoltage, load rejection overvoltage (LROV) requirements for the DER facility to be maintained by the Customer-Generator*

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- Added Section 11.0 on Facility Audit where the *Company reserves the right to check installation for compliance*
- Section 12.0 on Disconnection by the Company, adds
 - Where there is *lack of DER facility maintenance*
 - When *protective relaying and/or tele-protection is unavailable*
 - When *operating control equipment (SCADA) is inoperable*
 - Where the *Company's area EPS is in an abnormal operating condition*

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- Figure 4 updated typical DER facility $3V_0$ requirements
- Added Figure 5 for Typical Overhead Single Primary Service Configuration in NY for Large DER Installations
 - *See the Company's ESB 753 for primary meter pole installation specification requirements*
 - *All Company-owned service lateral facilities and equipment on private property, e.g. PCC Recloser, will require easements*

National Grid ESB 756: 2017 Revision Change Highlights

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□ Major Changes: ESB 756 Appendix B (*cont'd*)

- Exhibit 6 updated net metering compliance verification checklist for certified DER
 - *Typical for 300 kW or less aggregate DER at a service point/PCC*
 - *General updates*
 - *Certified DER only*

Q&A

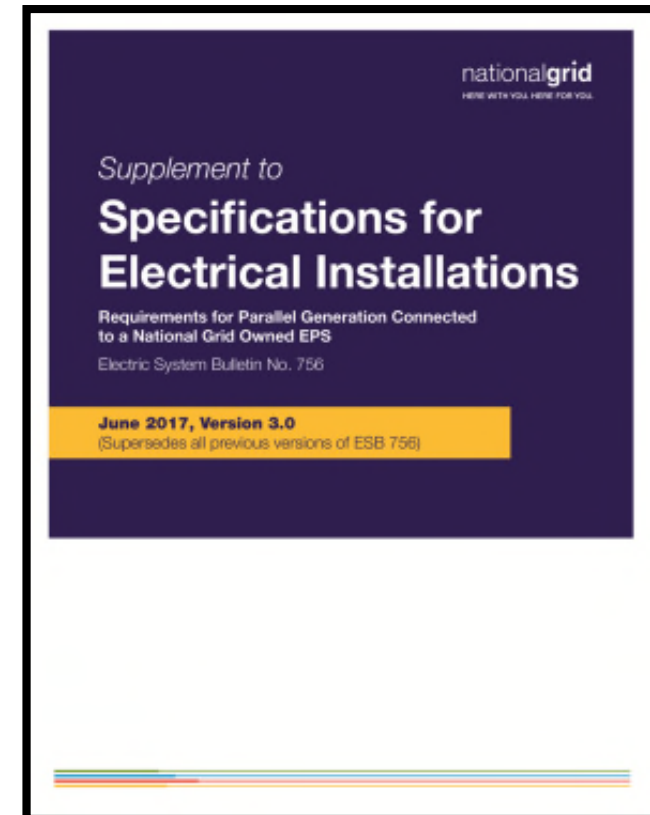


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■ *What we covered:*

- ✓ Importance of the Interconnection Process
- ✓ Interconnection Standards and Codes
- ✓ Overview of Service Point and the codes (NESC and NEC) and Key Points for Electric Service Requirements
- ✓ ESB 756 Update Process
- ✓ ESB 756 and Appendices A & B 2017 Revision Change Highlights



FREQUENTLY ASKED QUESTIONS

ESB 756-2017 REVISION

AUG.-SEP. 2017 WEBINARS

When is the ESB 756-2017 document effective?

The June 2017 edition of ESB 756 and its appendices A-D are effective Sep. 1st, 2017. This applies to all new generator applications received on that date. Applications already in process under the previous ESB 756 edition are grandfathered with the current National Grid practices used in their evaluation as incorporated into the June 2017 version at the time of executing an interconnection agreement.

How will notifications be made when an interim amendment is made to ESB 756 and any of the appendices A-D until the next revision of the document?

National Grid's most current version of ESB 756 will be posted on their jurisdictional websites and notes that printed copies are not document controlled. When an interim amendment (IA) is made, the revised ESB 756 file will be posted on National Grid's MA, NY, and RI jurisdictional distributed generation websites along with an information notice. Applicants should review National Grid's jurisdictional websites for the most recent version at the time of project application.

For large inverter-based solar photovoltaic (PV) projects, for example 20 MW at subtransmission delivery voltages, is the equipment required to be certified?

National Grid recommends the interconnecting inverters in large installations to be UL 1741 certified when considering the unintentional islanding protection requirements in ESB 756 appendices B-D. For non-certified inverters, a utility grade intertie protective relay will be required to provide for the parallel generation protective functions controlling the generator facility's main automatic interrupting device. The facility will be evaluated for direct transfer trip (DTT) based on the project size and load levels per section 7.6.12.4 in ESB 756 Appendices B-D where applicable. Projects applicable under ESB 756 Appendix A may be subject to overriding transmission requirements by FERC and/or NERC.

Who is responsible to provide the utility grade protection relay at the PCC?

It is the generator-owner's responsibility to provide the protective devices in their facility connecting to the point of common coupling (PCC) on National Grid's electric power system (EPS). Where National Grid has a PCC Recloser installation connecting to the generator-owner's system, the same requirement applies within the generator facility. Certain redundant protective functions required may be unnecessary in the generator facility that is supplied by a National Grid PCC Recloser; see Section 7 in ESB 756 appendices B-D for details.

What are National Grid's maintenance requirements for a generator facility's connection to the EPS?

National Grid's ESB 755 covers operation and maintenance requirements for electric services greater than 600 volts; however, these also apply to parallel generation at lesser PCC delivery voltages such as 208V and 480V. Although presently written for the NY jurisdiction, much of the switching protocol and maintenance practices are also applicable in the MA and RI jurisdictions. ESB 756 references NFPA 70B for the generator-owner's consideration in developing their own maintenance program along with equipment

manufacturer instructions. NFPA 70E is also referenced to ensure those performing the operations and maintenance work safely with electrical equipment.

How does National Grid plan to update for the upcoming IEEE 1547 revision?

National Grid expects to issue an interim amendment (IA) when the standard is finalized, and/or beforehand as Regional ISO requirements for new projects are presently being discussed. At present, the frequency trip settings in ESB 756 and its appendices A-D are consistent with IEEE 1547a and the upcoming revision to IEEE 1547. National Grid expects to make changes to voltage trip settings and may require ride through based on Regional ISO needs in the near future.

References:

National Grid's Distributed Generation websites:

- NY: <https://ngus.force.com/s/article/ka10W00000wnmsQAA/Useful-Links-for-Distribution-Generation-Projects-in-Upstate-NY>
 - MA: https://www9.nationalgridus.com/masselectric/home/energyeff/4_interconnection-process.asp
 - RI: http://www9.nationalgridus.com/narragansett/business/energyeff/4_interconnection-process.asp
- ESB 750 and ESB 756 are available on National Grid's website at:
https://www9.nationalgridus.com/niagaramohawk/construction/3_elec_specs.asp

Regional ISO generation related websites for the applicable jurisdiction:

- NY:
http://www.nyiso.com/public/markets_operations/services/planning/documents/index.jsp?docs=interconnection-studies/other-interconnection-documents,
http://www.nyiso.com/public/markets_operations/documents/technical_bulletins/index.jsp, and
http://www.nyiso.com/public/markets_operations/documents/manuals_guides/index.jsp
- MA, NH, RI, & VT: <https://www.iso-ne.com/system-planning/system-plans-studies> and
<https://www.iso-ne.com/participate/rules-procedures/operating-procedures/?load.more=1>

Revision History:

Version	Date	Revision Description
1.0	09-12-2017	First issue resulting from Aug. 28-Sep. 7, 2017 jurisdictional webinars