Interconnection Technical Working Group

April 29th, 2016
Substation Transformer Backfeeding: Background

Drivers behind Substation Transformer Backfeeding:
- Due to increased DER developer activity, substation transformer backfeeding has more potential to occur.
- During low load periods, generation output from DERs can reverse current flows from the substation transformer into transmission system.

Substation Transformer Backfeeding – Issues and Concerns:
- The electric system was designed for one-way power flow. Circuit protection and voltage regulation assumes that power flows in one direction only.
  - Some substation designs require reverse power flow relays looking into the transformers, which will trip if the relay senses reverse power flow.
  - Load tap changer (LTC) and feeder head voltage regulator controllers were designed to control voltage in the forward direction only.
  - Radially-supplied or tapped substations with delta-wye winded transformers may experience phase over-voltage during a ground fault.
- Protection and voltage control scheme re-designs will often be needed to allow backfeed into substation transformers.
Substation Transformer Backfeeding: JU Approach

- **JU’s current state for Substation Transformer Backfeeding:**
  - All overhead radial systems in NY allow substation transformer backfeeding, with design modifications as needed.
  - Substation transformer backfeeding will generally occur at lower levels of DER penetration and have greater impact on smaller substation transformers in more rural areas.
  - Voltage violations are likely to become a critical issue before substation transformer backfeeding.

- **Common Approaches by JU:**
  - LTC controllers to be replaced for where substation transformer backfeeding is anticipated, if not capable of bi-directional regulation with generation.
  - 3Vo protection is explored for delta-wye wounded transformers fed by a single source transmission line (either radial or tapped transmission lines) where there is a risk for voltage rise due to ground fault.
  - Preliminary benchmarking with other jurisdictions indicates that the JU’s approach is similar in many respects to what has been adopted elsewhere.
Anti-Islanding: Background

➢ SIR Requirement on Anti-islanding:
  - The generator-owner’s protection and control equipment shall be capable of automatically disconnecting the generation upon detection of an islanding condition and upon detection of a utility system fault.

➢ Islanding – Issues and Concerns:
  - Utility has no control of voltage and frequency in the islanded system, and this situation may result in damage to other customers equipment.
  - Islanding can interfere with manual or automatic re-closing of distribution network.
  - Worker safety is a concern.
  - High-speed protection is needed to prevent anti-islanding in situations where inverters will not be able to detect islanding.
Anti-Islanding: JU Approach

JU’s approach to anti-islanding:

- SANDIA recommendation followed by all utilities.
  - Aggregate AC rating of all DER should not exceed 2/3 of the minimum feeder loading.
  - If an island consists of both rotation and inverter based DER, confirm that sum of all rotating machine AC ratings should be less than 25% of the total DER.
  - A minimum of 2/3 of the DER inverters in the system should be from the same manufacturer.

- All JU companies currently use Direct Transfer Trip (DTT) to implement anti-islanding.

- Some utilities in JU are currently evaluating alternative options to DTT, because of the high cost and operational limitations.
  - Con Edison is currently evaluating monitoring frequency and phase orientation at the DER site and compares it to a reference point in their system. If the reference point and phase angle is similar to the DER, then DER is allowed to generate.
  - NationalGrid is exploring Power Line Carrier Frequency Signal.

New York SIR Application Process Overview

New York State SIR and Application Process for New DGs 5 MW or Less

- System Size
  - Less than 50kW
    - Expedited Application Process for Systems 50kW or Less
  - Greater than 50kW
    - Regular Application Process for Systems above 50 kW to 5 MW

Notes: For inverter based systems above 50 kW up to 300 kW, certified and tested in accordance with the most recent revision of UL 1741, applicants and utilities are encouraged, but not required, to use the expedited application process.
Flow Chart: Expedited Application Process for Systems 50kW or Less

Initial Communication from the Potential Applicant

- Inquiry Reviewed by Utility
- Applicant Files an Application

Application meets the requirements?

- NO
- YES

NO

Application Deemed Withdrawn

NO

Utility requested to witness the testing process?

- NO
- YES

Utility can remove project from the inventory if applicant doesn’t respond within 30 BDs of notification (certified letter)

Applicant sends the utility a written notification within 5 BDs of completion of such tests

Verification testing performed within 10 BDs of the system installation completion date

YES

Utility provides Formal Letter of Acceptance

No

Utility Provides Detailed Explanation of Deficiencies

Testing Passed?

- YES 5 BDs
- NO 5 BDs

Verification Tests

Utility Notified System Complete and/or Verification Test Requested

System Installation

Utility Sends Notification of Construction Approval and Executed Contract within 10 BDs of receipt of info

Applicant submits the additional information within 30 BDs of notification date?

- NO
- YES

NO

10 BDs

Meter Change Performed

YES*

Application considered in queue on date it’s deemed complete

10 Business Days (BD)
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

1. Initial Communication from the Potential Applicant
   - Inquiry Reviewed by Utility
2. Applicant submits a Pre-Application report with non-refundable $750 fee
   - Utility provides Pre-application Report Results within 10 BDs
     - If applicant applies to interconnect ≤ 15 BDs, $750 applied towards the application fee
3. Applicant Files an Application ($750 Fee)
   - Application meets the requirements?
     - YES*
     - NO
     - Application meets the requirements? *Application considered in queue on date it is deemed complete
4. Utility Sends Notification of Application Acceptance to Customer within 10 BDs of receipt of info
5. Verification Tests & Interconnection
   - Verification testing performed within 10 BDs of the system installation completion date
   - Applicant sends the utility a written notification within 5 BDs of completion of such tests
6. Final Acceptance and Utility Cost Reconciliation (expanded in Slide 13)
7. Utility Sends Notification of Construction Approval and Executed Contract
8. Project Construction
   - The applicant shall build the facility in accordance with the utility-accepted design; utility commence construction of system modification and metering requirements if required

* Application considered in queue on date it is deemed complete.
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

Utility Performs Preliminary/ Supplemental Screening Analysis and Develops a CESIR if required

1. Complete Application Received
   - Utility Performs a Preliminary Screening Analysis

2.Screens A through F
   - Utility provides results within 15 BDs of screens completion

3. Applicant passed all screens and no upgrades required?
   - NO
     - Utility Sends Notification of Construction Approval and Executed Contract
     - Within 30 BDs, interconnection shall be removed if no response received
   - YES
     - Applicant has 10 BDs to notify the utility whether proceed to:

4. Applicant has 10 BDs to notify the utility whether proceed to:
   - NO
     - Applicants that elect to proceed to Supplemental Analysis shall provide a nonrefundable fee of $2,500 with their response.
   - YES
     - (i) Preliminary Analysis results meeting

5. If applicant fails to notify next steps within 30 BDs, interconnection shall be removed

6. Need for Supplemental Analysis Identified?
   - NO
     - System Upgrade and Construction Approval (expanded in Slide 10)
   - YES
     - Applicant notifies utility within 10 BDs whether proceed to (ii), (iii) or (iv)

7. Applicant notified utility whether proceed to (ii), (iii) or (iv)
   - NO
     - YES
       - Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes
   - YES
     - Utility completes Supplemental Review within 20 BDs (Screens G through I)

8. Utility estimates construction costs on system modification in CESIR

9. Applicant pays advanced payment of 25% of the estimated costs within 60 BDs

10. Applicant notifies utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

11. Utilities Sends Notification of Construction Approval and Executed Contract within 15 BDs

12. System Upgrade and Construction Approval

13. Utility Sends Notification of Construction Approval and Executed Contract; Applicant has a total of 120 BDs to provide full payment upon executed contract

14. Utility performs CESIR if required

15. Utility complete CESIR (expanded in Slide 12)

16. Utility estimates construction costs on system modification in CESIR

17. Applicant passed all the screens and no upgrades required?
   - NO
     - YES
       - Utility estimates construction costs on system modification in CESIR

18. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

19. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

20. Applicant pays advanced payment of 25% of the estimated costs within 60 BDs

21. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

22. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

23. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

24. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

25. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

26. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

27. Applicant pays advanced payment of 25% of the estimated costs within 60 BDs

28. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

29. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

30. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

31. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

32. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

33. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

34. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

35. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

36. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

37. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

38. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

39. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

40. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

41. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

42. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

43. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

44. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

45. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

46. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

47. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

48. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

49. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

50. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)

51. YES
   - Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

52. Utility sends Notification of Construction Approval and Executed Contract within 15 BDs

53. Utility is not required to begin procurement or construction until full payment received; utility retains the right to re-assess the project’s inventory position if the applicant exceeds either of these timeframes

54. Applicant notified utility whether proceed to (iii), (iv) or a Supplemental Analysis Results Meeting (expanded in Slide 11)
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

System Upgrade and Construction Approval

1. **NO Need for Supplemental Analysis Identified**
   - Upgrade Needed?
     - **YES**
       - Utility provides the applicant a non-binding cost estimate within 15 BDs
         - Applicant Respond?
           - **YES**
             - Applicant responds within 15 BDs
               - **YES**
                 - Remove from queue
               - **NO**
                 - **NO**
                   - **NO**
                     - Timeline exceeds 15 BDs, or 30 BDs if extension provided?
                       - **YES**
                         - Applicant requests 15BD extension
                       - **NO**
                         - Applicant withdraws application
     - **NO**

2. **Utilities Sends Notification of Construction Approval and Executed Contract within 15 BDs**
   - Applicant Respond?
     - **YES**
       - Applicant accepts proposed upgrades
     - **NO**
       - Utility Sends Notification of Construction Approval and Executed Contract within 15 BDs

3. **Utility Sends Notification of Construction Approval and Executed Contract within 15 BDs**
   - **NO**
     - Applicant requests 15BD extension
   - **YES**
     - Applicant accepted proposed upgrades
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

Supplemental Analysis Results meeting

Applicant notifies utility within 10 BDs whether proceed to:

- (iii) Full CESIR
- (iv) Withdraw the Interconnection Request

Supplemental Analysis Results meeting

Need for CESIR Identified?

NO

Upgrades Needed?

YES

Utility provides the applicant a non-binding cost estimate within 15 BDs

Applicant Responds?

YES

Applicant responses within 15 BDs

Applicant accepted proposed upgrades

Applicant requests withdraw application

NO

Timeline exceeds 15 BDs, or 30 BDs if extension provided

Remove from queue

YES

Applicant notifies utility within 10 BDs whether proceed to:

- Full CESIR
- Withdraw the Interconnection Request

Utility Sends Notification of Construction Approval and Executed Contract within 15 BDs

Applicant notifies utility within 10 BDs whether proceed a full CESIR or withdraw

NO

If applicant fails to notify next steps within 30 BDs, interconnection request shall be removed from the queue
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

Full CESIR

Applicant notifies utility of intent to move forward with CESIR

Utility provides CESIR cost estimate within 5 BDs of notification

Applicant notifies decision within 10 BDs of receiving cost estimate

Proceed to a Full CESIR

Withdraw the Interconnection Request

The CESIR shall be completed within 60 BDs, absent extraordinary circumstances

For systems above 2 MW up to 5 MW, a mutually agreed-upon schedule for a CESIR for these systems will not exceed an additional 20 BDs, or 80 BDs in total

Applicant provides detailed interconnection design package, contact information, authorization and payment of associated costs within 30 business days?

YES

Detailed interconnection design package complete?

YES

Utility notifies within 10 BDs and provide detailed explanation

NO

NO

NO

NO

NO

Applicant provided authorization to proceed and paid the fees?

YES

CESIR begins upon confirmed receipt and acceptance of provided info and fees

Applicant notifies decision within 10 BDs of receiving cost estimate

Utility notifies within 5 BDs of notification

If applicant fails to provide complete design package, authorization, CESIR fees or other information within 30 BDs, the Interconnection Request shall be removed from the queue

NO

Applicant provided authorization to proceed and paid the fees?

YES

YES

Proceed to a Full CESIR

Withdraw the Interconnection Request
Flow Chart: Regular Application Process for Systems above 50 kW to 5 MW

**Final Acceptance and Utility Cost Reconciliation**

1. Utility witnessed the verification testing? **NO**
   - System Passed? **NO**
     - Utility provides a formal letter of acceptance for interconnection within 10 BDs of testing
   - System Passed? **YES**
     - Utility provides detailed explanation of the deficiencies within 10 BDs of testing

2. Results submitted indicate system passed? **No**
   - System Passed? **NO**
     - Utility issues to the applicant a formal letter of acceptance for interconnection within 10 BDs

3. Results submitted indicate system passed? **YES**
   - System Passed? **NO**
     - Utility issues to the applicant a formal letter of acceptance for interconnection within 10 BDs
     - Utility prepares a final reconciliation invoice of actual cost minus the application fee and advance payments by applicant
   - System Passed? **YES**
     - Utility issues to the applicant a formal letter of acceptance for interconnection within 10 BDs
     - Utility submits invoice within 30 BDs of final approval

4. Request to set a date and time with applicant to witness operation of the DG system within 10 BDs
   - This witness verification must be completed within 20 BDs of request

5. System Passed?
   - **No**
     - Utility provides detailed explanation of the deficiencies within 10 BDs
   - **YES**
     - Utility issues a formal letter of acceptance for interconnection within 10 BDs
     - Utility issues a formal letter of acceptance for interconnection within 10 BDs

6. Utility submits invoice within 30 BDs of final approval
   - The applicant receives either a bill for balance or reimbursement
   - A formal complaint interposed by the applicant? **YES**
     - If the applicant is not satisfied, a formal complaint may be filed with PSC
   - **NO**
     - Utility reserves the right to lock the generating system offline.

7. Utility issues to the applicant a formal letter of acceptance for interconnection within 10 BDs
   - Utility prepares a final reconciliation invoice of actual cost minus the application fee and advance payments by applicant

8. Utility issues a formal letter of acceptance for interconnection within 10 BDs
   - Utility issues a formal letter of acceptance for interconnection within 10 BDs

9. System Passed?
   - **No**
     - Utility provides detailed explanation of the deficiencies within 10 BDs
   - **YES**
     - Utility issues a formal letter of acceptance for interconnection within 10 BDs
     - Utility issues a formal letter of acceptance for interconnection within 10 BDs

10. The applicant receives either a bill for balance or reimbursement
    - A formal complaint interposed by the applicant? **YES**
      - If the applicant is not satisfied, a formal complaint may be filed with PSC
    - **NO**
      - Utility reserves the right to lock the generating system offline.

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    - Utility prepares a final reconciliation invoice of actual cost minus the application fee and advance payments by applicant

14. Utility submits invoice within 30 BDs of final approval
    - The applicant receives either a bill for balance or reimbursement
    - A formal complaint interposed by the applicant? **YES**
      - If the applicant is not satisfied, a formal complaint may be filed with PSC
    - **NO**
      - Utility reserves the right to lock the generating system offline.
Screening Items for Discussion

- Red-zone map will be provided by the end of second quarter, 2016.
- How do developers envision tracking all the SIR timelines?
- When do developers envision applying for the supplemental screening process?
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