Utility-Interconnected Photovoltaic Systems:

Evaluating the Rationale for the Utility-Accessible External Disconnect Switch

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External Disconnect Switch Discussion

- Utility-Accessible, Visible-Break, Lockable Switch (AC-Side, Inverter-Based Systems)
- Typically Required by Utilities
- Considered Unnecessary by System Integrators and Customers
- The EDS is Rarely Used By Utilities
Why Utilities Ask for EDS

- To Protect Line Workers
- To Protect Line Equipment
- In the Event of a Feeder Outage
- Isolation of All Power Sources
- Isolation of Customer Problems
Prime Focal Points for Utilities

• Safety (NESC, OSHA)
  – National Electrical Safety Code
  – Occupational Safety and Health Administration

• Reliability (S.A.I.D.I. - S.A.I.F.I. etc.)
  – System Average Interruption Duration Index
  – System Average Interruption Frequency Index

• Cost (Capital and Expense)
  – Capital Investments (Return On Investment)
  – Expenses (Some Expense Not Recoverable)
Utility Line Work Practices

- New Construction
  - Test and Ground – Work “Cold”

- Electric System Trouble
  - Assume Energized – Work “Hot”

- Timely Restoration of Outages
  - Safe and Fast Outage Restoration Critical
Critical PV Application Standards

• IEEE 1547-2003 (Interconnection Requirements)
  – Cornerstone Standard Interconnection
  – Addresses Point of Common Coupling

• UL 1741 (Equipment Requirements)
  – Sets Standards for Grid-Connected Equipment
  – Units Disconnect from Grid with Voltage/Frequency Variations

• National Electrical Code (Facilities)
  – The adopted “Law” in Most Jurisdictions for Customer Installations
Utility Accessible EDS - Redundant

- PV Systems Have Many Disconnects
- Utilities Tend to Ignore Using EDS
- PG&E and SMUD Don’t Require EDS (Considered Best Practice)
- Some PUCs Have Eliminated EDS Requirements or Defer to Utilities
Typical "Listed and Labeled" Inverter

- DC Disconnect
- DC Breaker
- Intelligent Relay
- AC Breaker
- AC Disconnect

Main Disconnect Breaker Panel
- Back-Fed Breaker 240 VAC
- Main Disconnect
- 120/240 VAC Bus
- Neutrals/Grounds Not indicated

Utility Meter
- Line in from Utility
- DC GFCI not shown

List of disconnecting Means
1. DC Disconnect
2. Inverter DC Breaker
3. Inverter Intelligent Relay
4. Inverter AC Breaker
5. AC Disconnect
7. Main Disconnect
8. Meter

Notes:

1. AC Disconnect not required by all States nor all Utilities
2. Some panels may Not have a Main Disconnect
Who Has Eliminated the EDS Requirement?

- SMUD
- PG&E
- Arkansas, Florida, New Jersey, others
Report Recommendations

- The EDS is Redundant for Tier 1, Inverter-Based Systems
- Utilities Will Require EDS if Given the Choice, but Will Not Use the EDS
- Recommend SD Rule that EDS is a Customer Choice/Option
Discussion