

PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE
SAN FRANCISCO, CA 94102-3298



October 5, 2022

Advice Letter 6614-E, E-A

Sidney Bob Dietz II
Director, Regulatory Relations
Pacific Gas and Electric Company
77 Beale Street
San Francisco, California 94177
E-mail: PGETariffs@pge.com

**SUBJECT: Pacific Gas and Electric Company's Proposed Anti-Islanding Options
Guidance Section for its Interconnection Handbooks Pursuant to
R. 17-07-007 Rule 21 Working Group 4 Decision 21-06-006 Ordering
Paragraph 14**

Dear Mr. Dietz:

Advice Letter 6614-E-A is effective as of December 12, 2022.

Sincerely,

A handwritten signature in black ink that reads "Leuwam Tesfai".

Leuwam Tesfai
Deputy Executive Director for Energy and Climate Policy
Director, Energy Division

September 29, 2022

Advice 6614-E-A

(Pacific Gas and Electric Company ID U 39 E)

Public Utilities Commission of the State of California

Subject: Supplemental: Pacific Gas and Electric Company's Proposed Anti-Islanding Options Guidance Section for its Interconnection Handbooks Pursuant to R. 17-07-007 Rule 21 Working Group 4 Decision 21-06-002 Ordering Paragraph 14

Purpose

Pacific Gas and Electric Company (PG&E) hereby submits this supplemental Tier 2 advice letter to propose an anti-islanding options guidance section, pursuant to California Public Utilities Commission (CPUC, Commission) Decision (D.) 21-06-002, Ordering Paragraph (OP) 14 (on Proposal 18-f). The guidance section, once approved, will be incorporated into PG&E's Distribution Interconnection Handbook and Transmission Interconnection Handbook as "Appendix E - Conditions That May Trigger Direct Transfer Trip (DTT)."

This supplemental advice letter replaces the original advice letter in its entirety and includes revisions to the guidance section submitted in AL 6614-E in compliance with OP 14 to provide more detail in the examples. The revised guidance section has been provided in Attachment A to this advice letter.

Background**Rulemaking 17-07-007**

Rulemaking 17-07-007 the *Order Instituting Rulemaking to Consider Streamlining Interconnection of Distributed Energy Resources and Improvements to Rule 21*, was initiated in late 2017 where "the primary objective in this proceeding is to streamline the interconnection application process, which the adopted proposals aim to accomplish."¹

In the original scoping memo and subsequent refinements, the proceeding was broken into three phases. The issues to be addressed in the first phase was further divided

¹ D. 21-06-002 Background, p2

up between four working groups. Each Working Group convened with the Commission, the IOUs² and various other parties over a period, culminating in a final working group report. That report was then used to inform the Commission in the preparation of a final decision addressing implementation of the various working group's issues.

Pertinent to this advice letter, the November 16, 2018, Assigned Commissioner's Amended Scoping Memo and Joint Administrative Law Judge Ruling (Amended Scoping Memo) revised the scope and schedule for this proceeding in response to the Motion of the California Solar & Storage Association (CALSSA).

Working Group Four

Working Group Four first convened February 12, 2020, with twelve subsequent in-person and virtual meetings. On August 13, 2020, representatives of Working Group Four filed the final Working Group Four Report (Report). The final Working Group Four Report was submitted August 12, 2020.³ As noted in the Report, parties and other stakeholders participated in discussion of and developed proposals on the issues, including Proposal 18-f.⁴

Issue 18 was included as related to this advice letter and was among four issues identified in the Amended Scoping Memo. It is:

Issue 18: Should the Commission adopt changes to anti-islanding screen parameters to reflect research on islanding risks when using UL 1741-certified inverters in order to prevent unnecessary mitigations? If yes, what should those changes entail?⁵

Rule 21 defines islanding as:

Island; Islanding: A condition on Distribution Provider's Distribution System in which one or more Generating Facilities deliver power to Customers using a portion of Distribution Provider's Distribution System that is electrically isolated from the remainder of Distribution Provider's Distribution System.⁶

The isolation is often the result of a system fault, and can create unsafe situations on the distribution grid for utility personnel and other customers.

² The IOUs, or investor-owned utilities, consist of Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company.

³ [WG 4 Report](#) dated August 12, 2020.

⁴ IBID p4

⁵ IBID p6, 11

⁶ Current Rule 21 sheet 26

And anti-islanding in Rule 21 is defined as:

*Anti-Islanding: A control scheme installed as part of the Generating or Interconnection Facility that senses and prevents the formation of an Unintended Island.*⁷

Currently Rule 21 Screen L includes an islanding test.

Also, Rule 21 in discussing Screen L notes, “PG&E will temporarily apply anti-islanding tests until the resolution of Issue 18* in R. 17-07-007, Working Group Four Report made effective in PG&E’s tariffs.”⁸

By way of background, the Report notes:

If a fault occurs on the distribution system, any Distributed Energy Resource (DER) connected to the system must quickly de-energize (or go off-line) so that there is not an unintentional “island” formed (i.e., a portion of the distribution grid remains energized). Unintentional islanding, which is defined as an unplanned island that last greater than two seconds, is a concern....” [and goes on to describe five risks that result from islanding.]⁹

While individual inverters must be certified as being anti-islanding, the Report goes on to explain a specific area of concern that needs to be addressed in Issue 18:

Anti-islanding capability has always been tested on the individual inverter level per the test procedures of IEEE 1547.1. Recent research [footnote 22] has shown that there may be distribution system concerns that affect the ability of an individual inverters to successfully detect an island. For instance, it has been shown that interactions between inverters and rotating machines can decrease anti-islanding effectiveness. It has been shown that some anti-islanding algorithms may be more effective than others, and different algorithms have less to do with any individual inverter (since all are certified to have adequate individual anti-islanding capabilities) and more to do with a variety of different types of interactions between equipment on the distribution system. As a result, it is becoming clear that unintentional islanding is a distributions system issue, and yet individual inverters are being called on to address the issue.

Footnote 22: Gonzalez, A. Ellis, M. Ropp, C. Mouw, D. Shutz and S. Perlenfein, “Unintentional Islanding Detection Performance with Mixed DER Types,” Sandia

⁷ IBID sheet 26

⁸ IBID sheet 159

⁹ Report p14

National Laboratories report SAND2018-8431, July 2018, <https://www.osti.gov/servlets/purl/1463446M>¹⁰.

Additionally, some DER that use non-inverter based “rotating machine” types of generators, PG&E conducts additional screening of [such] DERs for the risks of islanding, and when those DERs fail those screens they may be required to install reclosers on machine generators and/or Direct Transfer Trip (DTT) at the substation so that they can be shut down or separated from the transmission system during a grid outage or fault, for which the customer is required to pay. This can add significant costs in the interconnection (~\$500,000 for DTT and ~\$80,000 for recloser) and significant delays (18-24 months). It is claimed this requirement can impact project economics.¹¹

As a result of the above concerns, Nine Proposals (Proposals 18-a through 18-i) were presented in the Report to address the anti-island concerns raised in Issue 18. Proposal 18-f is the subject of this advice letter.

Proposal 18-f is to “*Develop a Guidebook of Anti-islanding Options*” whereby “*the CPUC, utilities, and developers should work together to develop a guide that provides anti-islanding options, clearly identifies the cost of each option, and sets out the circumstances when it will be required.*” p13

In the Report’s Proposal Discussion, the Working Group recommends:

Costs in this “Interconnection Guidebook” should be all-inclusive. The Guidebook, while not a binding regulatory document, should provide clear guidance to project developers so that they know exactly what circumstances will trigger a requirement for DTT [Direct Transfer Trip] and what circumstances or steps can be taken to avoid DTT. There should be clear metrics and examples provided so that developers do not have to guess about potential requirements.

Utilities should not be allowed to require more than what is in the Guidebook unless they demonstrate the need for additional measure in a timely manner. For instance, if the Guidebook says that DTT is not required if an end of the line fault [EOL] can be seen and the generator tripped in 120 cycles (two seconds), then the utility should not be able to deviate from that without clear written explanation as to why something more than the Guidebook recommendation is needed.

The Guidebook could also provide explanations of the different utility interconnection systems and requirements (e.g., why PG&E’s system is different from the other utilities and what that means in practice), and many of the other issues covered in the Background Section of this report to provide context to

¹⁰ Report p21

¹¹ Report see p17

*developers and others, as well as much more clear guidance on likely requirement and options to prevent unintended islanding.*¹²

Decision 21-06-002¹³

Decision 21-06-002 was issued to address the remaining Phase 1 issues including those from Working Group 4. Pertinent to this advice letter, it address Proposal 18-f. On this proposal D. 21-06-002 notes:

*Our objectives throughout this proceeding have been improving efficiency, transparency, certainty, and clarity. [Footnote 105: D.20-09-035 at 2.] We find [the guide] to be a reasonable proposal, as it could improve both transparency and clarity for developers in the PG&E service territory. However, we revise the proposal such that it is only applicable to PG&E because, unlike PG&E, neither SDG&E nor SCE perform anti-islanding screening based on Sandia studies. [footnote 106: Report at 41-42. See also SCE Opening Comments, December 18, 2020 at 12-13 and SDG&E Opening Comments, December 18, 2020 at 12-13.] Proposal 18f should be adopted with the modification that it is not applicable to SDG&E or SCE. No later than 90 days from the issuance of this decision, PG&E shall initiate discussion of this guide. One year from the issuance of this decision, PG&E shall submit a Tier 2 Advice Letter seeking approval of the guide, the request for approval shall describe stakeholder and Energy Division collaboration.*¹⁴

Ordering Paragraph 14

In D. 21-06-002, OP 14, the Commission directs that:

*14. Proposal 18f is adopted and only applies to utilities that perform enhanced anti-islanding screening based on Sandia studies. Required utilities shall work with developers and the Commission's Energy Division to **develop a guide that provides anti-islanding options, clearly identifies the cost of each option, and sets out the circumstances when it will be required.** No later than 90 days from the issuance of this decision, Pacific Gas and Electric Company (PG&E) shall initiate discussion of this guide. **Not later than one year from the issuance of this decision, PG&E shall submit a Tier 2 Advice Letter seeking approval of the guide. The request for approval shall describe stakeholder and Energy Division collaboration.***
[emphasis added]

¹² Report see p41

¹³ [D. 21-06-002](#) - Decision Addressing Remaining Phase I Issues - Issued June 4, 2021

¹⁴ D. 21-06-002 p48

Discussion of the Guide and Collaboration with the Energy Division

PG&E made several attempts to reach out to stakeholders to solicit discussion and comment on the guide. At the June 24, 2021, Smart Inverter Workshop, PG&E presented a slide deck on its proposals. In early August 2021 and mid-January 2022 PG&E reached out to parties, but received no feedback. PG&E was in discussion with Energy Division throughout this time-period. PG&E is proceeding to submit the guide proposal in this advice letter.

Advice Letter 6614-E

Advice Letter 6614-E was submitted on June 3, 2022. While no protests were received, PG&E received questions from the CPUC requesting more detail and clarification, as noted in the next section below.

This Advice Letter

Attachment A to this advice letter proposes a guidance section to comply with OP 14, which will be included in both PG&E Transmission- and Distribution-Interconnection Handbooks following the effective date of this advice letter.

As previously noted, the guidance section has been revised in this supplemental advice letter to include more detail in the examples.

Protests

Pursuant to GO 96-B, General Rule 7.5.1., PG&E request to maintain the original protest and comment period designated in Advice Letter 6614-E and not reopen the protest period.

Effective Date

Pursuant to General Order (GO) 96-B, Rule 5.2, this advice letter is submitted with a Tier 2 designation. PG&E requests that this Tier 2 supplemental advice submittal become effective on December 12, 2022, to coincide with anticipated implementation of these updates into PG&E's online application portal, *YourProjects*.

Notice

In accordance with General Order 96-B, Section IV, a copy of this advice letter is being sent electronically to parties shown on the attached list and the parties on the service list for R.17-07-007. Address changes to the General Order 96-B service list should be directed to PG&E at email address PGETariffs@pge.com. For changes to any other service list, please contact the Commission's Process Office at (415) 703-2021 or at Process_Office@cpuc.ca.gov. Send all electronic approvals to PGETariffs@pge.com.



ADVICE LETTER SUMMARY

ENERGY UTILITY



MUST BE COMPLETED BY UTILITY (Attach additional pages as needed)

Company name/CPUC Utility No.: Pacific Gas and Electric Company (ID U39 E)

Utility type:

- ELC GAS WATER
 PLC HEAT

Contact Person: Kimberly Loo

Phone #: (415) 973-4587

E-mail: PGETariffs@pge.com

E-mail Disposition Notice to: KELM@pge.com

EXPLANATION OF UTILITY TYPE

ELC = Electric GAS = Gas WATER = Water
 PLC = Pipeline HEAT = Heat

(Date Submitted / Received Stamp by CPUC)

Advice Letter (AL) #: 6614-E-A

Tier Designation: 2

Subject of AL: Supplemental: Pacific Gas and Electric Company's Proposed Anti-Islanding Options Guidance Section for its Interconnection Handbooks Pursuant to R. 17-07-007 Rule 21 Working Group 4 Decision 21-06-002 Ordering Paragraph 14

Keywords (choose from CPUC listing): Compliance

AL Type: Monthly Quarterly Annual One-Time Other:

If AL submitted in compliance with a Commission order, indicate relevant Decision/Resolution #: D.21-06-006

Does AL replace a withdrawn or rejected AL? If so, identify the prior AL:

Summarize differences between the AL and the prior withdrawn or rejected AL:

Confidential treatment requested? Yes No

If yes, specification of confidential information:

Confidential information will be made available to appropriate parties who execute a nondisclosure agreement. Name and contact information to request nondisclosure agreement/ access to confidential information:

Resolution required? Yes No

Requested effective date: 12/12/22

No. of tariff sheets: N/A

Estimated system annual revenue effect (%): N/A

Estimated system average rate effect (%): N/A

When rates are affected by AL, include attachment in AL showing average rate effects on customer classes (residential, small commercial, large C/I, agricultural, lighting).

Tariff schedules affected: N/A

Service affected and changes proposed¹: N/A

Pending advice letters that revise the same tariff sheets: N/A

¹Discuss in AL if more space is needed.

Protests and correspondence regarding this AL are to be sent via email and are due no later than 20 days after the date of this submittal, unless otherwise authorized by the Commission, and shall be sent to:

California Public Utilities Commission
Energy Division Tariff Unit Email:
EDTariffUnit@cpuc.ca.gov

Contact Name: Sidnev Bob Dietz II. c/o Megan Lawson
Title: Director, Regulatory Relations
Utility/Entity Name: Pacific Gas and Electric Company

Telephone (xxx) xxx-xxxx: (415)973-2093
Facsimile (xxx) xxx-xxxx: (415)973-3582
Email: PGETariffs@pge.com

Contact Name:
Title:
Utility/Entity Name:

Telephone (xxx) xxx-xxxx:
Facsimile (xxx) xxx-xxxx:
Email:

CPUC
Energy Division Tariff Unit
505 Van Ness Avenue
San Francisco, CA 94102

Clear Form

Attachment A

Appendix E - Conditions That May Trigger Direct Transfer Trip (DTT)

Appendix E

Conditions That May Trigger Direct Transfer Trip (DTT)

The following conditions and configurations may result in the need for generation DTT and can be used as a general guide of when DTT is required. This is not an exhaustive list; detailed studies are required to finalize DTT requirements.

Transmission Interconnections

Transmission interconnections do not enable active anti-islanding therefore will require DTT in many cases. Refer to the following figures for typical DTT interconnections listed under Configurations.

Note: The DTT configurations are specifying distribution interconnections but can also apply to transmission interconnections.

Distribution Interconnections requiring transmission DTT

Distribution interconnections may require DTT under the following conditions, refer to [Distributed Generation Protection Requirements Bulletin TD-2306B-002](#) for specific requirements.

- Existing aggregate generation > 50% of minimum gen to load ratio.
- Mix of certified (UL1741SA/SB) and uncertified generation (synchronous machines and wind-turbine generation)
- Distribution Substation Transmission Source configuration.
 - Radial – Generation is tied to a bus via a dedicated transmission line, there is only one source.
 - Loop station with one source or two sources (for contingencies assume one source is out of service)
 - Station with three sources (DTT would not be required from the transmission sources)

Distribution Generation Protection Requirements Bulletin (TD-2306B-002) is linked to PG&E's [Distribution Interconnection Handbook \(DIH\)](#) and is updated to include any changes to the evaluation screens or protection requirements.

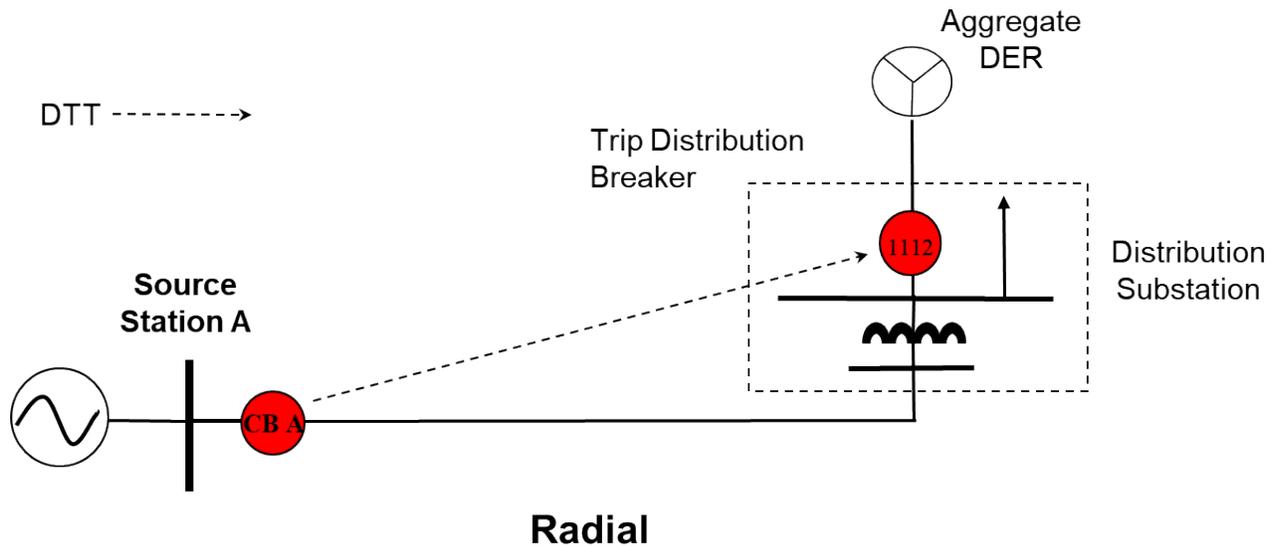
Configurations

Radial

In this configuration, the generator will island the Distribution Substation if Circuit Breaker (CB) A is opened. Mitigation could consist of DTT initiated from CB A open status, Station A bus differential, and line protection relays. A CB Maintenance switch is not required in this case since it's the only source; if the breaker is open the generator should be off-line.

Appendix E

Conditions That May Trigger Direct Transfer Trip (DTT)

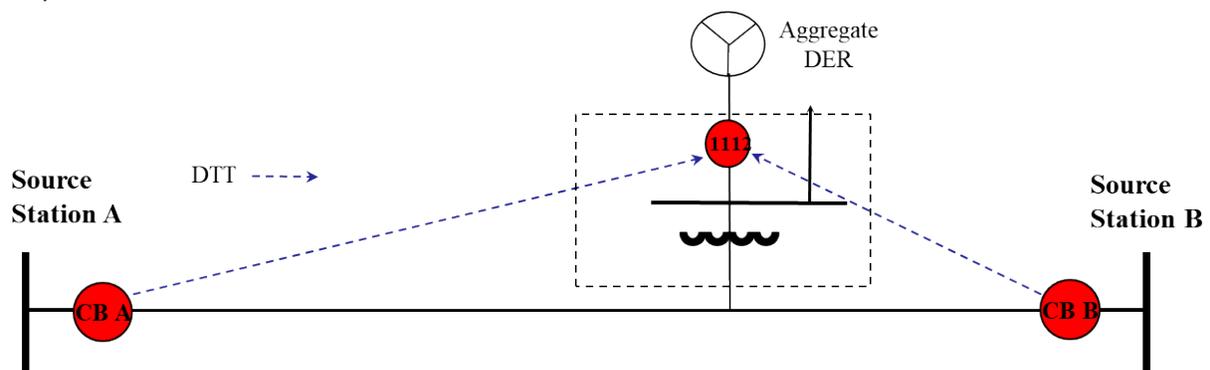


Two Terminal

In this configuration the generator is tripped from the line relays on either end. Station A or B bus differential tripping and CB Open status could be included with a separate Relay Cut-Out (RCO) to allow gen tripping when the opposite terminal CB is open. RCO is a two positions selector switch. When RCO is operated to "Cut-In" position, then DTT would be enabled from bus differential tripping and when RCO is operated to "Cut-Out" position, then DTT would be disabled from bus differential tripping.

Each of the source stations can have three or more sources. If the source station has two sources only, then source station will be considered as a loop station and additional condition for loop with one source open (discussed later in the section) has to be considered. If the source station has only one source, then it would be considered radial and radial configuration conditions (discussed above) would apply.

Source station can have any bus configuration (such as double bus, breaker and a half, ring bus etc.)



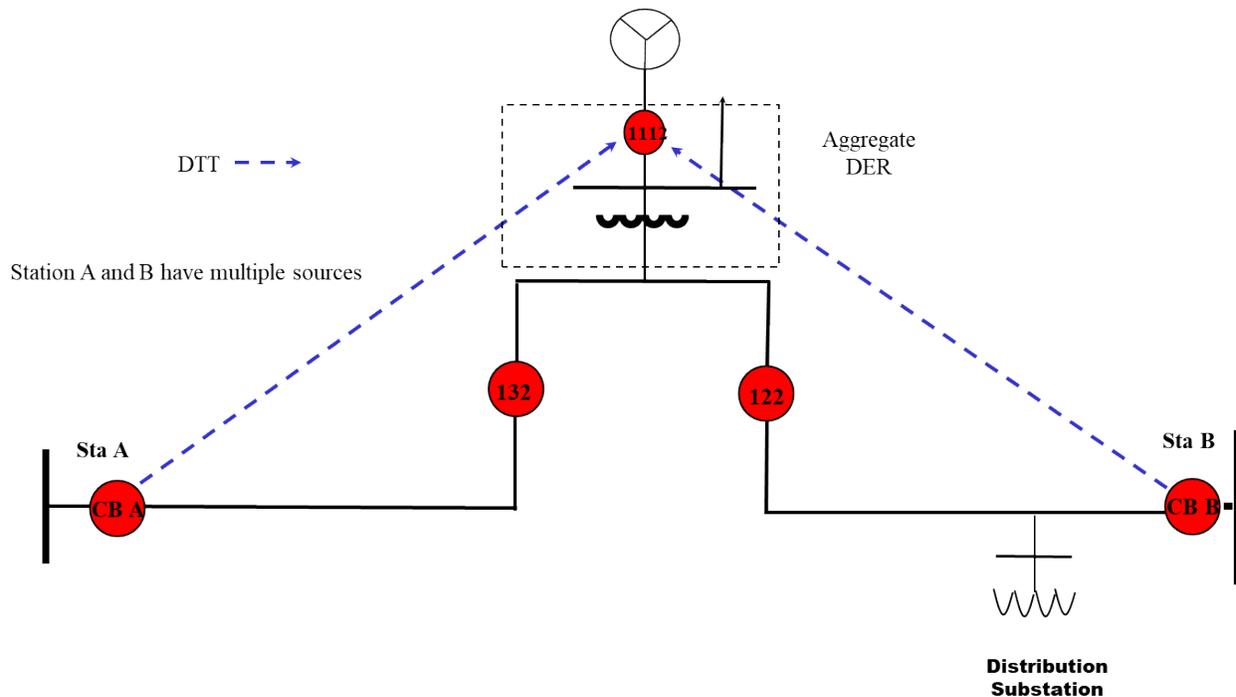
Internal

Appendix E

Conditions That May Trigger Direct Transfer Trip (DTT)

Loop Station Configuration

In this configuration the generator could island the Distribution Substation if CB A or CB132 is open and then CB B is opened. The generator is tripped via DTT which is initiated from either the CB status, bus differential or line protection relays from either side. In this configuration DTT is only required if one of the sources from Station A or Station B is unavailable. In order to simplify the DTT scheme, the DTT can remain cutout until either the Station A or Station B sources is opened at which point the in-service source terminal DTT is cut-in.



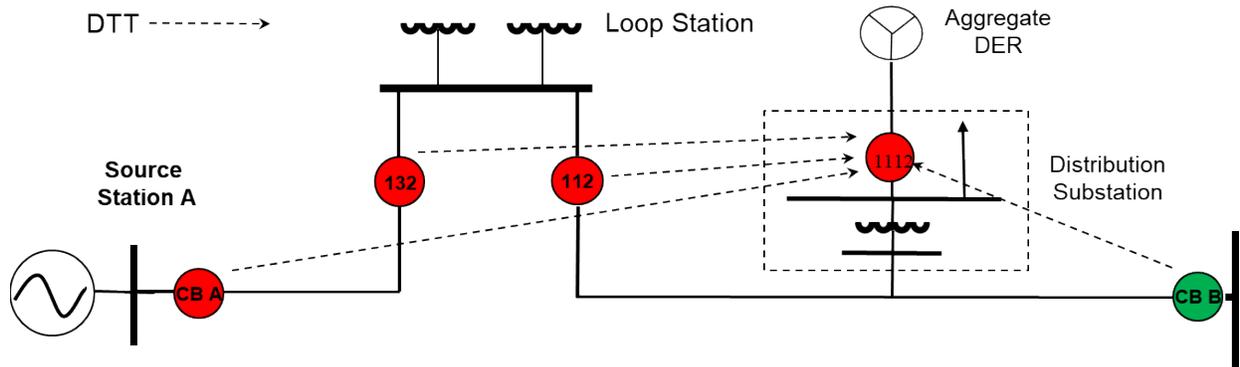
Loop Station Configuration

Loop with one Source

In this type of loop configuration, the generator could island the connected load if the path from the generator to the system is opened. This can occur if Station A, CB A or either CB 132 or CB 112 is opened. To prevent an island under these conditions DTT can be initiated from the CB open status, the bus differential and line protection relays from each of the breakers. It should be noted that when CB B is closed and has a source behind it, DTT from CB A, and CB 132 will be cut-out.

Appendix E

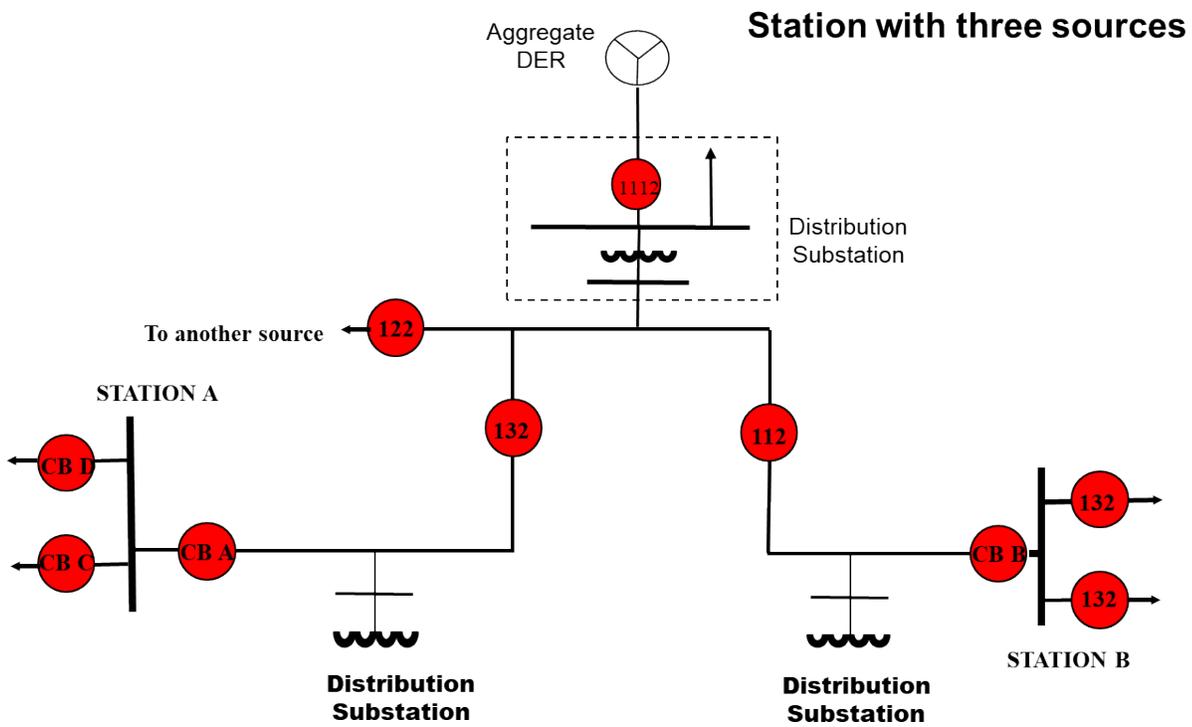
Conditions That May Trigger Direct Transfer Trip (DTT)



Loop with one source

Station with Three Sources

For interconnection with three sources DTT would not be required from the transmission terminals, however, hardware DTT may be required at the interconnection station.



Appendix E

Conditions That May Trigger Direct Transfer Trip (DTT)

Substitute Breakers

If a breaker is substituted for above configurations, then the substitute breaker should provide the same DTT trip functions as the original breaker.

Approved Communication mediums

The signal can be carried via various means sorted by viability.

- Digital Telephone lease line
 - Pros – Rely on local telco infrastructure
 - Cons –Communication circuit may not be protection grade, may not operate during a fault., Installation of costly equipment, reoccurring monthly lease line cost can be expensive. Installation can take six months or more.
 - Unit costs – For single DTT application, unit cost is \$300k per terminal. Communication medium for DTT application may include T-1 lease or equivalent communication medium (like Multiprotocol Label Switching (MPLS)). The cost does not include T-1 lease or equivalent cost that can vary widely.
 - The cost is based on 2022 unit-cost and could vary based upon yearly inflation.
- Wireless Spread spectrum
 - Pros – Cost effective installation, no external communication channel required.
 - Cons – Line of sight for transmitter and receiver required. Limited effective distance.
 - Unit costs - For a single DTT application, unit cost is \$400k for substation and \$150k for the generation facility. For each repeater station unit cost is \$100k.
 - The cost is based on 2022 unit-cost and could vary based upon yearly inflation
- Fiber Optic
 - Pros – Reliable fast communications.
 - Cons – Fiber and equipment installation can be costly and expensive.
 - Unit costs – Underground or Overhead costs \$1.5 million up to 1 Mile. Each additional mile is an extra \$1 million.
 - The cost does not include ageing pole replacement to run fiber

Appendix E

Conditions That May Trigger Direct Transfer Trip (DTT)

- The cost is based on 2022 unit-cost and could vary based upon yearly inflation.
- Microwave
 - Pros – Fast communications
 - Cons – Equipment and installation can be costly and time consuming.
 - Unit costs – Microwave Tower: \$500k, Each Additional Dish: \$300k
 - The cost is based on 2022 unit-cost and could vary based upon yearly inflation.

**PG&E Gas and Electric
Advice Submittal List
General Order 96-B, Section IV**

AT&T
Albion Power Company

Alta Power Group, LLC
Anderson & Poole

Atlas ReFuel
BART

Barkovich & Yap, Inc.
Braun Blasing Smith Wynne, P.C.
California Cotton Ginners & Growers Assn
California Energy Commission

California Hub for Energy Efficiency
Financing

California Alternative Energy and
Advanced Transportation Financing
Authority
California Public Utilities Commission
Calpine

Cameron-Daniel, P.C.
Casner, Steve
Center for Biological Diversity

Chevron Pipeline and Power
City of Palo Alto

City of San Jose
Clean Power Research
Coast Economic Consulting
Commercial Energy
Crossborder Energy
Crown Road Energy, LLC
Davis Wright Tremaine LLP
Day Carter Murphy

Dept of General Services
Don Pickett & Associates, Inc.
Douglass & Liddell

East Bay Community Energy Ellison
Schneider & Harris LLP
Engineers and Scientists of California

GenOn Energy, Inc.
Goodin, MacBride, Squeri, Schlotz &
Ritchie
Green Power Institute
Hanna & Morton
ICF
International Power Technology

Intertie

Intestate Gas Services, Inc.
Kelly Group
Ken Bohn Consulting
Keyes & Fox LLP
Leviton Manufacturing Co., Inc.

Los Angeles County Integrated
Waste Management Task Force
MRW & Associates
Manatt Phelps Phillips
Marin Energy Authority
McClintock IP
McKenzie & Associates

Modesto Irrigation District
NLine Energy, Inc.
NRG Solar

OnGrid Solar
Pacific Gas and Electric Company
Peninsula Clean Energy

Pioneer Community Energy

Public Advocates Office

Redwood Coast Energy Authority
Regulatory & Cogeneration Service, Inc.

Resource Innovations

SCD Energy Solutions
San Diego Gas & Electric Company

SPURR

San Francisco Water Power and Sewer
Sempra Utilities

Sierra Telephone Company, Inc.
Southern California Edison Company
Southern California Gas Company
Spark Energy
Sun Light & Power
Sunshine Design
Stoel Rives LLP

Tecogen, Inc.
TerraVerde Renewable Partners
Tiger Natural Gas, Inc.

TransCanada
Utility Cost Management
Utility Power Solutions
Water and Energy Consulting Wellhead
Electric Company
Western Manufactured Housing
Communities Association (WMA)
Yep Energy