IEEE Std 1547™-2018

Status of Adoption across the U.S.
January 2024

IEEE Standards Coordinating Committee 21 (SCC21)
Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage

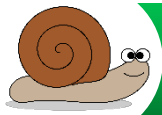
https://sagroups.ieee.org/scc21/standards/1547rev/

Courtesy of Electric Power Research Institute (EPRI)
https://www.epri.com/#/pages/product/000000003002012048/

IEEE Std 1547™-2018 Adoption Methods

General Reference

- Full adoption of standard by general reference
- Specification of
  - performance categories
    - normal category
    - abnormal category
  - functional settings (utility-required profiles)
  - standardized comms. protocols



Detailed Reference

- Full or partial adoption of std
- Clause-by-clause references
- Any additional requirements

EPRI's Generic TIIR Template & DER Settings Forms (3002022563)

Benefit: *Consistency to standard*

Risk: *Fragmentation of requirements, certification challenges, addl. costs*

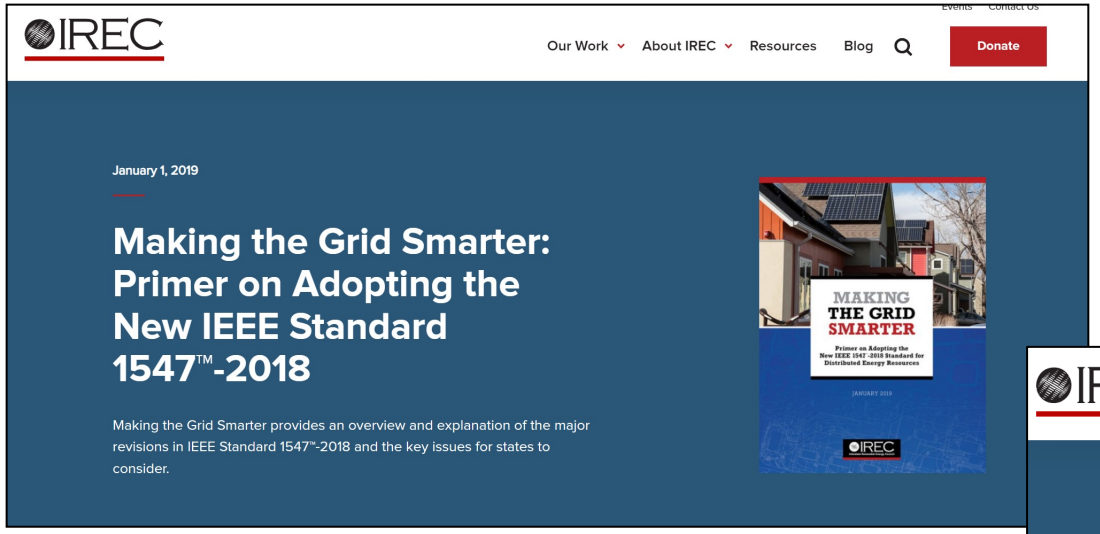
Full Specification

- All on the left
- Clause-by-clause own language
- Any additional requirements

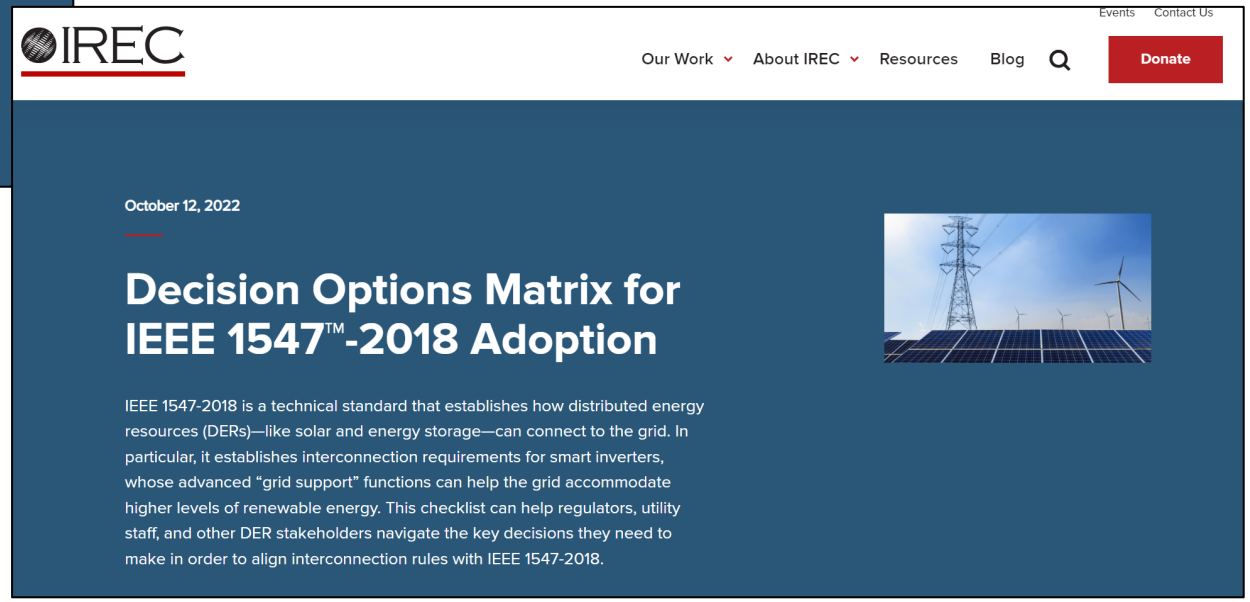
Benefit: *No need to buy standard*

Risk: *Inconsistencies to standard and fragmentation of requirements, certification challenges, additional costs*

IEEE 1547-2018 Adoption Resources



IREC USA's Making the Grid Smarter: Primer on Adopting the New IEEE Standard 1547™-2018



IREC USA's Decision Options Matrix for IEEE 1547-2018

Common Performance Category / Capability Assignments

➔ Refer to IEEE 1547-2018 Annex B for justification

Normal Performance Categories

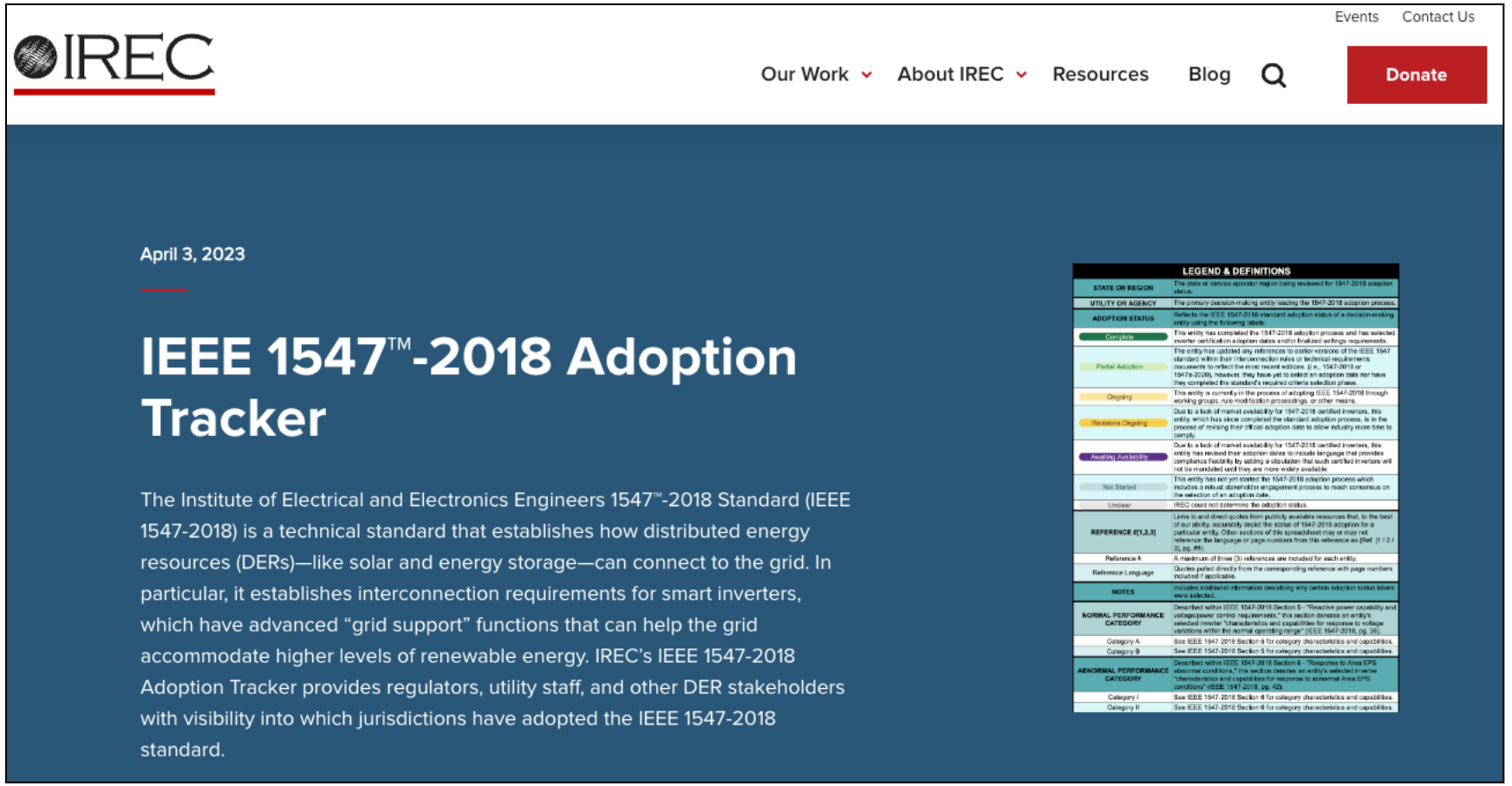
Power Conversion	Prime Mover / Energy Source	Category
Inverter	Solar PV, Battery Energy Storage	Category B
	Wind	Category B
	Hydrogen Fuel Cell	Mutual Agreement
Synchronous generator	Bio-/landfill gas, fossil fuel, hydro, combined heat & power	Category A
Induction generator	Hydro	Mutual Agreement

Abnormal Performance Categories

Power Conversion	Prime Mover / Energy Source	Category
Inverter	Solar PV, Battery Energy Storage	Category III [1] (amended)
	Wind	Category II
	Hydrogen Fuel Cell	Mutual Agreement
Synchronous generator	Bio-/landfill gas, fossil fuel, hydro, combined heat & power	Category I
Induction generator	Hydro	Mutual Agreement

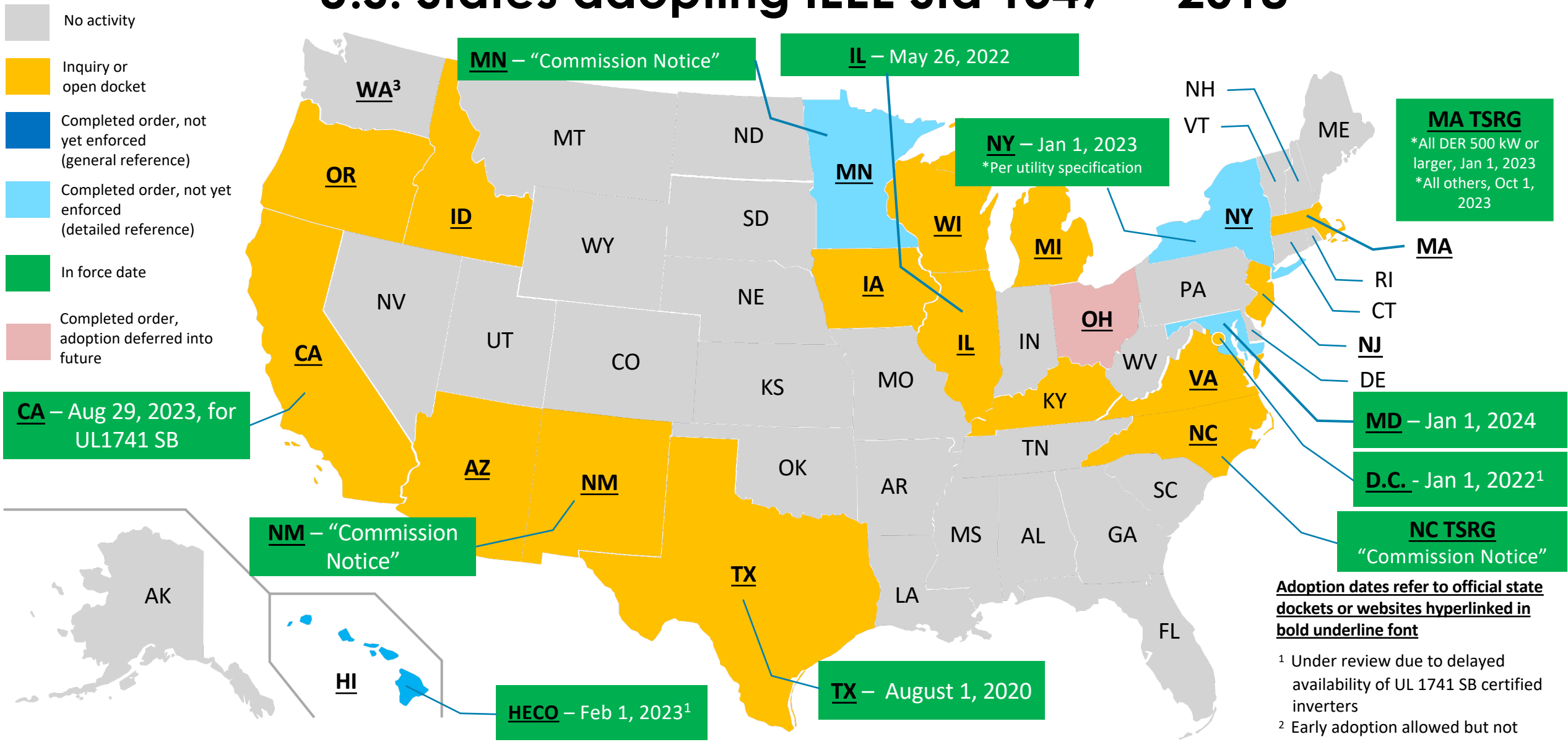
[1] Category II prior to Amendment

Tracking Adoption of IEEE 1547™-2018



IREC USA's IEEE 1547™-2018 Adoption Tracker

U.S. States adopting IEEE Std 1547™-2018



Adoption dates refer to official state dockets or websites hyperlinked in bold underline font

[1] Under review due to delayed availability of UL 1741 SB certified inverters

[2] Early adoption allowed but not required

[3] Reference to "latest" IEEE 1547

U.S. States adopting IEEE Std 1547™-2018
(updated since 01/25/2024)

Nr.	State	Docket Status	Adoption Method	Enforcement Date	Link
1	Arizona (AZ)	Open	N/A	N/A	https://apps.azsos.gov/public_services/Title_14/14-02.pdf
2	California (CA)	Open	Detailed Reference	August 29, 2023, for UL1741 SB	https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/rule-21-interconnection/smart-inverter-working-group Reference to California commission from sunspec: https://sunspec.org/wp-content/uploads/2023/03/2023-03-28-Letter-granting-Joint-Utilties-request-for-extension-regarding_-Res.-E-5000.pdf IREC's IEEE 1547™-2018 Adoption Tracker at https://irecusa.org/resourc es/ieee-1547-2018-adoption-tracker/ cites from an unpublished CPUC Letter granting JointUtilties request for extension regarding_ Res. E-5000, dated March 28, 2023:"The Commission finds that the Joint Utilities and non-utility stakeholders are in agreement on the benefits of the Joint Utilities' request for a five month extensionto transition to mandatory SB inverters and, therefore, grants the extension. This extension moves the deadline to August 29, 2023." (pg. 3)
3	Hawaii (HI)	Open	Detailed Reference*	October 1, 2022*	https://puc.hawaii.gov/energy/der/ https://www.hawaiianelectric.com/products-and-services/customer-renewable-programs/rooftop-solar/customer-energy-resource-(cer)-equipment
4	Idaho (ID)	Open	N/A	N/A	https://puc.idaho.gov/case/Details/6541; ID Power granted authority to establish Schedule 68 for interconnection: https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/IPC/IPCE2030/OrdNotc/20210309Final_Order_No_34955.pdf
5	Illinois (IL)	Open	General	May 26, 2022	https://www.icc.illinois.gov/programs/Interconnection-Working-Group; https://www.ilga.gov/commission/jcar/admincode/083/083004660000400R.html
6	Iowa (IA)	Open			https://www.legis.iowa.gov/docs/ACO/chapter/199.45.pdf
7	Kentucky (KT)	Exploration	N/A	N/A	Some stakeholders recommend KYPSC to open a IEEE 1547-2018 stakeholder process

* Likely to enter into effect **Likely to be changed

U.S. States adopting IEEE Std 1547™-2018
(updated since 01/25/2024)

Nr.	State	Docket Status	Adoption Method	Enforcement Date	Link
8	Maryland (MD)	Completed	Detailed Reference	January 1, 2022** (under review)	http://mdrules.elaws.us/comar/20.50.09 (2020) https://webapp.psc.state.md.us/newIntranet/AdminDocket/NewIndex3_VOpenFile.cfm?FilePath=//Coldfusion/AdminDocket/PublicConferences/PC44/273/PC44-IWGFinalReportConsolidatedPhaseIII-jb-051421.pdf (2021) MD implementation date to Jan 1, 2024, per link
9	Massachusetts (MA)	Open	N/A	*All DER 500 kW or larger, Jan 1, 2023 *All others, Oct 1, 2023 2/23/23 – inconsistent adoption	https://eeaonline.eea.state.ma.us/DPU/Fileroom/dockets/bynumber/19-55 (Docket) https://www.mass.gov/info-details/massachusetts-technical-standards-review-group (TSRG) https://www.mass.gov/doc/draft-in-progress-default-new-england-bulk-system-area-settings-requirement/download https://www.mass.gov/doc/tsrg-inverter-source-requirements-document/download
10	Michigan (MI)	Open	N/A	N/A	https://mi-psc.force.com/s/case/500t000000CwYNEAA3/in-the-matter-on-the-commissions-own-motion-to-promulgate-rules-governingelectric- Changed MI link
11	Minnesota (MN)	Completed	Detailed Reference	Commission Notice	https://mn.gov/puc/energy/distributed-energy/interconnection/ https://mn.gov/puc/assets/TIIR%20w%20CORRECTED%20Interim%20Implementation%20Guidance_tcm14-431321.pdf
12	New Jersey (NJ)	Open	N/A	N/A	Open Docket [link] Grid Modernization Study: New Jersey Board of Public Utilities (August 24, 2022) Docket No. QO21010085 - Proposed Rule Change https://publicaccess.bpu.state.nj.us/DocumentHandler.ashx?document_id=1281615

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U.S. States adopting IEEE Std 1547™-2018
(updated since 01/25/2024)

Nr.	State	Docket Status	Adoption Method	Enforcement Date	Link
13	New Mexico (NM)	Notice of Inquiry 20-00171	N/A	Commission Notice	https://onedrive.live.com/?authkey=%21AJKlY%5FS0wfPCgb8&id=5891771FBA4AFF14%212857&cid=5891771FBA4AFF14 https://www.nm-prc.org/rulemaking-proceedings/ (search for case# 21-00266-UT) Final notice, setting an enforcement date of, "Beginning on March 28, 2023 (or another date set by Commission order)": https://api.realfile.rtsclients.com/PublicFiles/9ce35ae9dd194163979349178e937b5f/771713f3-816d-4d7f-b6a9-6636e19aec58/21-00266%20-%20UT%20Final%20Order.pdf IREC's IEEE 1547™-2018 Adoption Tracker at https://irecusa.org/resourc es/ieee-1547-2018-adoption-tracker/ cites from an unpublished PRC Notice of PendingDate Change under Docket 21-00266-UT, undated:""The Commission FINDS AND CONCLUDES: (1) On November 30, 2022, the Commission issued the Final Order adopting the amendments to Rule 17.9.568 NMAC("Rule 568"). (2) Rule 568 established requirements for compliance with IEEE 1547 -2018 at 17.9.568.11 (A) NMAC stating; (A) Beginning on March 28, 2023 (oranother date set by Commission order), generating facilities shall be required to comply with IEEE 1547 -2018, and shall conform with the following minimumrequirements. (3) The Commission is aware of delays in certification and availability of the inverters and new equipment until a date later in the third or fourthquarter of 2023. (4) The Commission will select another date, as identified as an option in Rule 568, by subsequent Order to identify the new date for compliance in17.9.568.11 (A) NMAC after reviewing the status of the inverter certification and timelines for distribution of the equipment. (5) The previously selected date ofMarch 28, 2023 identified in 17.9.568.11 (A) NMAC will not be used for compliance with Rule 568."
14	New York (NY)	Completed	Detailed Reference	Utility Specific Jan 1, 2023 for National Grid, ORU, CHG&E, and PSEG LIPA April 1, 2023 (> 50kW) and June 1, 2023 (≤ 50kW) for ConEd	https://dps.ny.gov/system/files/documents/2023/02/2022-12-02-ny-ju-links-to-der-interconnection-technical-documentation_cs-modifieddocx.docx https://dps.ny.gov/system/files/documents/2022/11/may-2022-sir-final-dmm.pdf http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BA7780F50-4D4D-45D4-8B83-A1832488C12D%7D (2017) https://dps.ny.gov/distributed-generation-information Utility specific dates per IREC's IEEE 1547™-2018 Adoption Tracker at https://irecusa.org/resources/ieee-1547-2018-adoption-tracker/
15	North Carolina (NC)	Open	N/A	N/A	https://www.duke-energy.com/business/products/renewables/generate-your-own/tsrg Select North Carolina > Select either Duke Energy Carolinas or Duke Energy Progress https://www.duke-energy.com/_/media/pdfs/for-your-business/generate-your-own-renewable/tsrg/e100-sub101-dec-dep-report-ieee-1547-2018-results.pdf?la=en Comission resolution: https://www.duke-energy.com/_/media/pdfs/for-your-business/generate-your-own-renewable/tsrg/e100-sub101-dec-dep-report-ieee-1547-2018-results.pdf?la=en

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U.S. States adopting IEEE Std 1547™-2018
(updated since 01/25/2024)

Nr.	State	Docket Status	Adoption Method	Enforcement Date	Link
16	Ohio (OH)	Closed	Deferred to future	Deferred to future	https://puco.ohio.gov/utilities/electricity/resources/der-stakeholder-group https://dis.puc.state.oh.us/ViewImage.aspx?CMID=A1001001A21L15B44414B00097 – commission notice
17	Oregon (OR)	Open	N/A	N/A	https://apps.puc.state.or.us/edockets/docket.asp?DocketID=22475 https://apps.puc.state.or.us/orders/2023ords/23-319.pdf
18	Texas (TX)	Open	N/A	N/A	https://interchange.puc.texas.gov/Search/Documents?controlNumber=51603&itemNumber=1 https://interchange.puc.texas.gov/search/filings/?UtilityType=A&ControlNumber=53911&ItemMatch=Equal&DocumentType=ALL&SortOrder=Ascending
19	Virginia (VA)	Open	N/A	N/A	https://scc.virginia.gov/docketsearch/DOCS/7nqp01!.PDF
20	Washington D.C.	Open	N/A	Jan 1, 2022*	https://edocket.dcpsc.org/public/search/casenumber/fc1050
21	Washington State	N/A	General reference to IEEE 1547-2018 without any specs	July 20, 2018	https://app.leg.wa.gov/WAC/default.aspx?cite=480-108-999
22	Wisconsin	Open	N/A	N/A	https://apps.psc.wi.gov/ERF/ERFview/viewdoc.aspx?docid=426014

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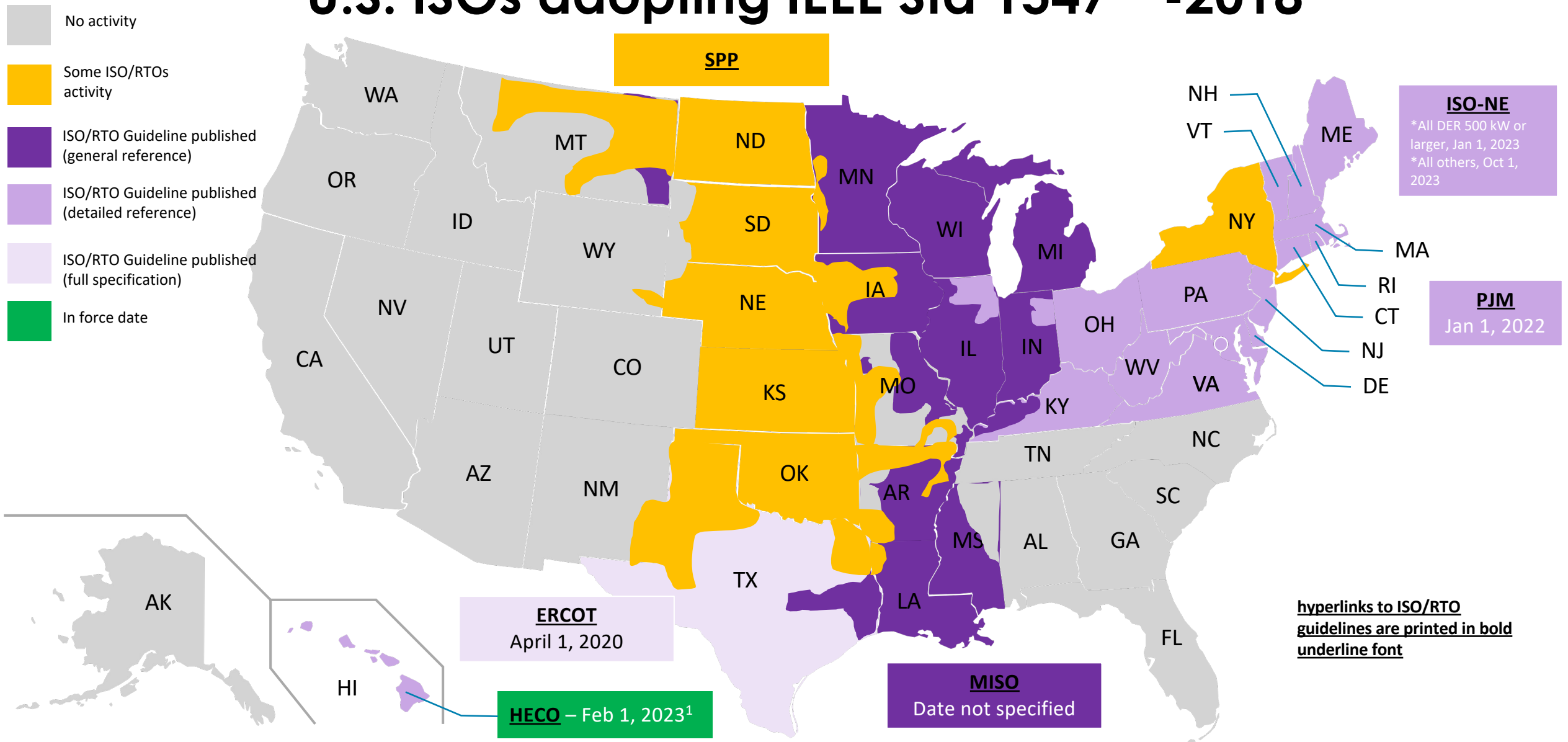
U.S. ISOs adopting IEEE Std 1547™-2018



hyperlinks to ISO/RTO guidelines are printed in bold underline font

U.S. ISOs adopting IEEE Std 1547™-2018 (updated since 01/31/2024)

Nr.	RTO/ISO	Guideline Status	Adoption Method	Enforcement Date	Link
1	Alberta Electric System Operator (AESO)	Published	Detailed Reference Modified Category II, references C22.3 No.9-2020	December 31, 2021	https://www.aeso.ca/assets/Uploads/DER-Ride-Through-FINAL-26MAR2021.pdf
2	California ISO (CAISO)	No activity			
3	Electric Reliability Council of Texas (ERCOT)	Published September 11, 2020	Full Specification (only for resources participating in the ERCOT markets)	April 1, 2020 (exceptions may apply to resources with earlier initial synchronization date)	http://www.ercot.com/content/wcm/key_documents_lists/203876/212NOGRR-11_Board_Report_081120.doc
4	ISO New England	Published in 2018, under revision	Detailed Reference General Reference	June 1, 2018: UL 1741 SA June 1, 2022*: UL 1741 SB * Exception for DER < 100 kW: October 1, 2022	New URP: https://www.mass.gov/doc/tsrg-inverter-source-requirements-document/download https://www.mass.gov/doc/draft-in-progress-default-new-england-bulk-system-area-settings-requirement/download SRD 1.1: https://www9.nationalgridus.com/non_html/ISO_New_England_Source_Requirement_Document-2018-02-06.pdf
5	Midcontinent Independent System Operator (MISO)	Published	General Reference	Date not specified	https://www.misoenergy.org/planning/generator-interconnection/ieee-1547/
6	New York ISO (NY ISO)	No activity			
7	Independent Electric System Operator (IESO)	Under development	Detailed Reference Modified Category II, references C22.3 No.9-2020		https://www.ieso.ca/-/media/Files/IESO/Document-Library/system-reliability/2019-IESO-Operability-Assessment.ashx
8	PJM Interconnection	Published	Detailed Reference Full Specification	January 1, 2022	https://www.pjm.com/-/media/committees-groups/task-forces/derrttf/20190913/20190913-pjm-guideline-for-ride-through-performance-rev1.ashx
9	Southwest Power Pool (SPP)	Initiation of stakeholder coordination	TBD	TBD	https://www.spp.org/events/calendar/mdag-focus-group-net-conference-20230221/ https://www.spp.org/Documents/68842/mdag%20focus%20group%20agenda%20&%20background%20materials%20220230221.zip https://www.spp.org/Documents/69026/Joint%20ESWG-TWG%20Agenda%20&%20Background%20Materials%2020230329.zip

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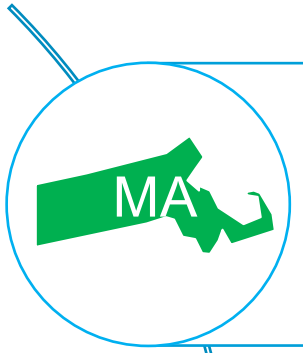
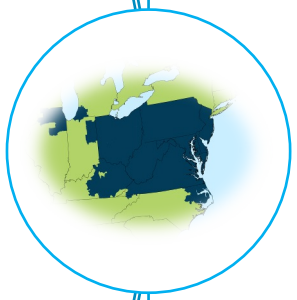
RTOs/ISOs Guidelines for IEEE Std 1547™-2018 Adoption



ISO New England – UL 1741 SA (stopgap) and UL 1741 SB (2022 onwards)

Jan 1, 2023*
Exception for DER < 500 kW: Oct 1, 2023

- Coordination between ISO-NE and the MA's utilities in the Massachusetts TSRG
- Reference to UL 1741 SA as a stopgap to verify DER ride-through capability in the interim (Link)
- Detailed reference to IEEE 1547-2018 for all DER; UL 1741 SB certification required for inverters-based DER (Link)



PJM Interconnection – UL 1741 SA/SB

Jan 1, 2022

- Initiation of formal stakeholder proceedings in 2019
- Published PJM *Guideline for Ride Through Performance of Distribution-Connected Generators* for voluntary DER ride-through in Oct 2019 (PJM Website)
- Established minimum ride-through requirements and trip time settings

Midcontinent Independent System Operator (MISO) – UL 1741 SB

date not specified

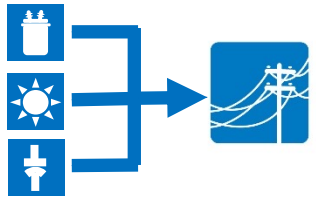
- MN PUC requested stakeholder process, see MISO's IEEE 1547 website
- Published the MISO Guideline for IEEE Std 1547-2018 Implementation (Link)
- Established the regional ride-through capabilities and trip time settings

See also NERC's Reliability Guideline
Bulk Power System Reliability Perspectives on the Adoption of IEEE 1547-2018 (March 2020)

Functional Settings Determine Utilization of New Capabilities

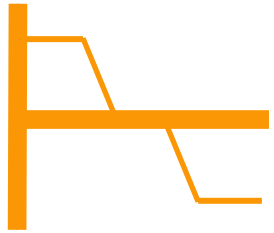
IA-URP
(site specific)

Utility-Required Profile for Specific Site
- Included in site-specific interconnection agreement (IA)
- May result from site-specific interconnection screenings



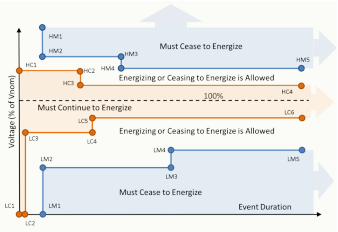
DU-URP
(distribution utility specific)

Utility-Required Profile for Distribution Service Area
- Included in interconnection agreement template
- Specific to Distribution Utility's practices, e.g., automatic re-closing, distribution circuit characteristics, operating practices



Regional-URP[1]
(state-wide or similar)

Utility-Required Profile for Region and/or ISO/RTO Reliability Region
- Consideration of distribution and bulk system impacts.
- May include some settings other than the SRD's default values



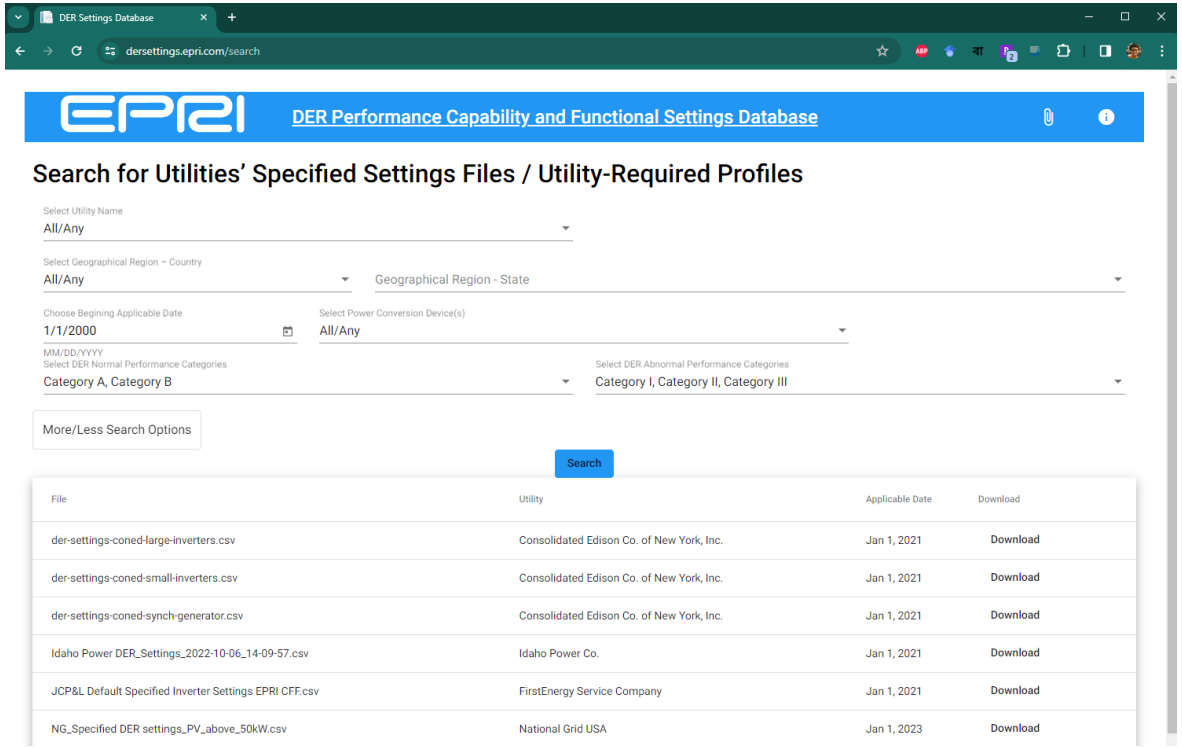
Adopted SRD[1] with Default Values
(state-wide or similar)

Source Requirements Document
- Preferably IEEE Std 1547-2018
- Otherwise: CAR21, HR14H, etc.

IEEE SA
STANDARDS ASSOCIATION

[1] Based on decision by Authority Governing Interconnection Requirements (AGIR), may be a public utilities commission or similar

EPRI's DER Settings Database



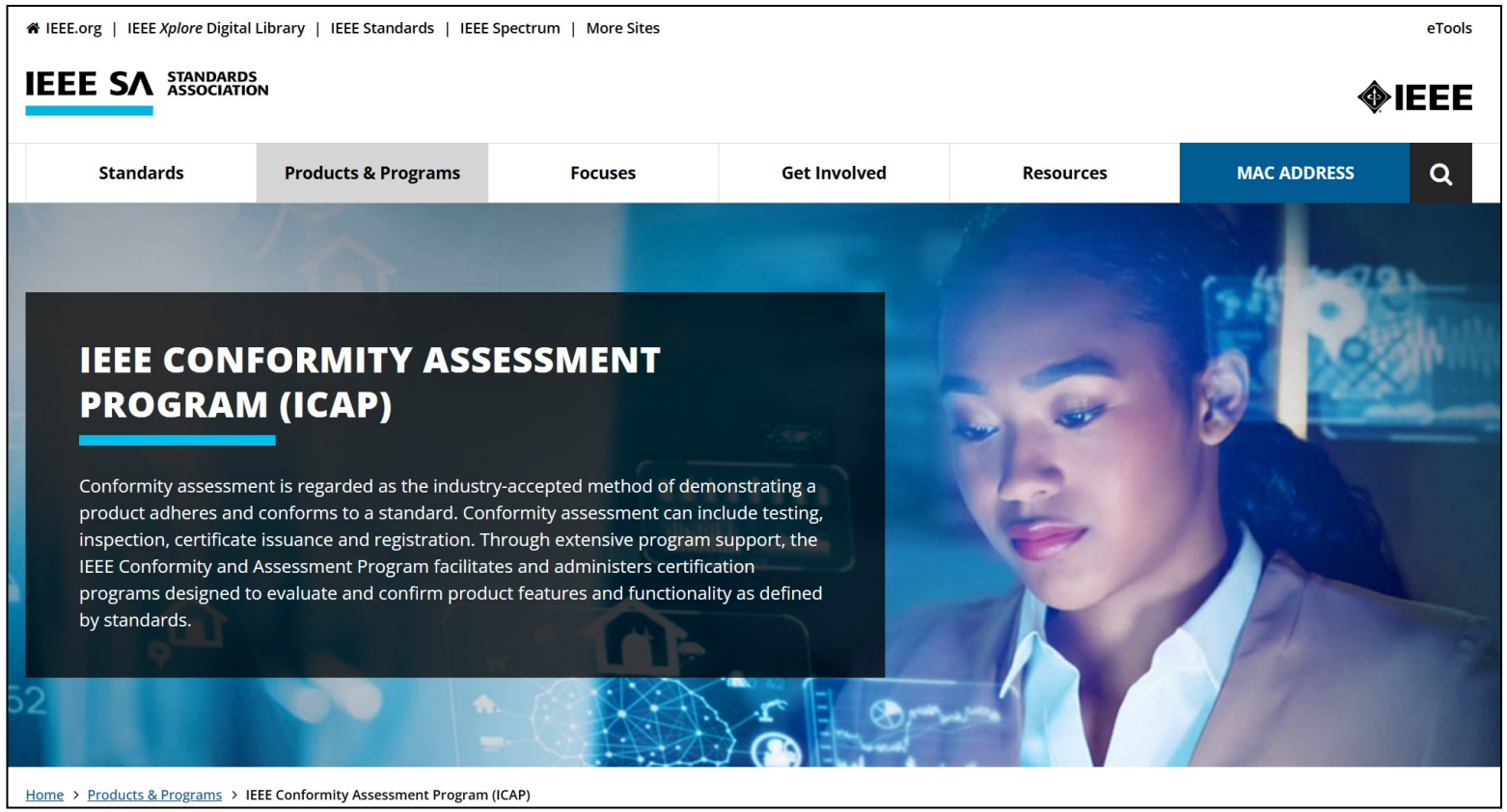
- dersettings.epri.com
- The DER Settings Database stores information on normal and abnormal performance capability requirements and DER configuration settings, in the form of a CSV file, for DER interconnecting in compliance with IEEE Std 1547™-2018.
- Anyone can search and download
- Only authorized utility personnel can upload

Utilities using EPRI's DER Settings Database

File	Utility	Date of enforcement
der-settings-coned-large-inverters.csv	Consolidated Edison Co. of New York, Inc.	Jan 1, 2021
der-settings-coned-small-inverters.csv	Consolidated Edison Co. of New York, Inc.	Jan 1, 2021
der-settings-coned-synch-generator.csv	Consolidated Edison Co. of New York, Inc.	Jan 1, 2021
Idaho Power DER_Settings_2022-10-06_14-09-57.csv	Idaho Power Co.	Jan 1, 2021
JCP&L Default Specified Inverter Settings EPRI CFF.csv	FirstEnergy Service Company	Jan 1, 2021
NG_Specified DER settings_PV_above_50kW.csv	National Grid USA	Jan 1, 2023
NG_Specified DER Settings_PV_below_50kW.csv	National Grid USA	Jan 1, 2023
O&R_Specified Settings_PV_above_50kW.csv	Orange & Rockland Utilities, Inc.	Jan 1, 2023
O&R_Specified Settings_PV_below_50kW.csv	Orange & Rockland Utilities, Inc.	Jan 1, 2023
SS_Example_1.csv	Electric Power Research Institute (EPRI)	Jan 1, 2021

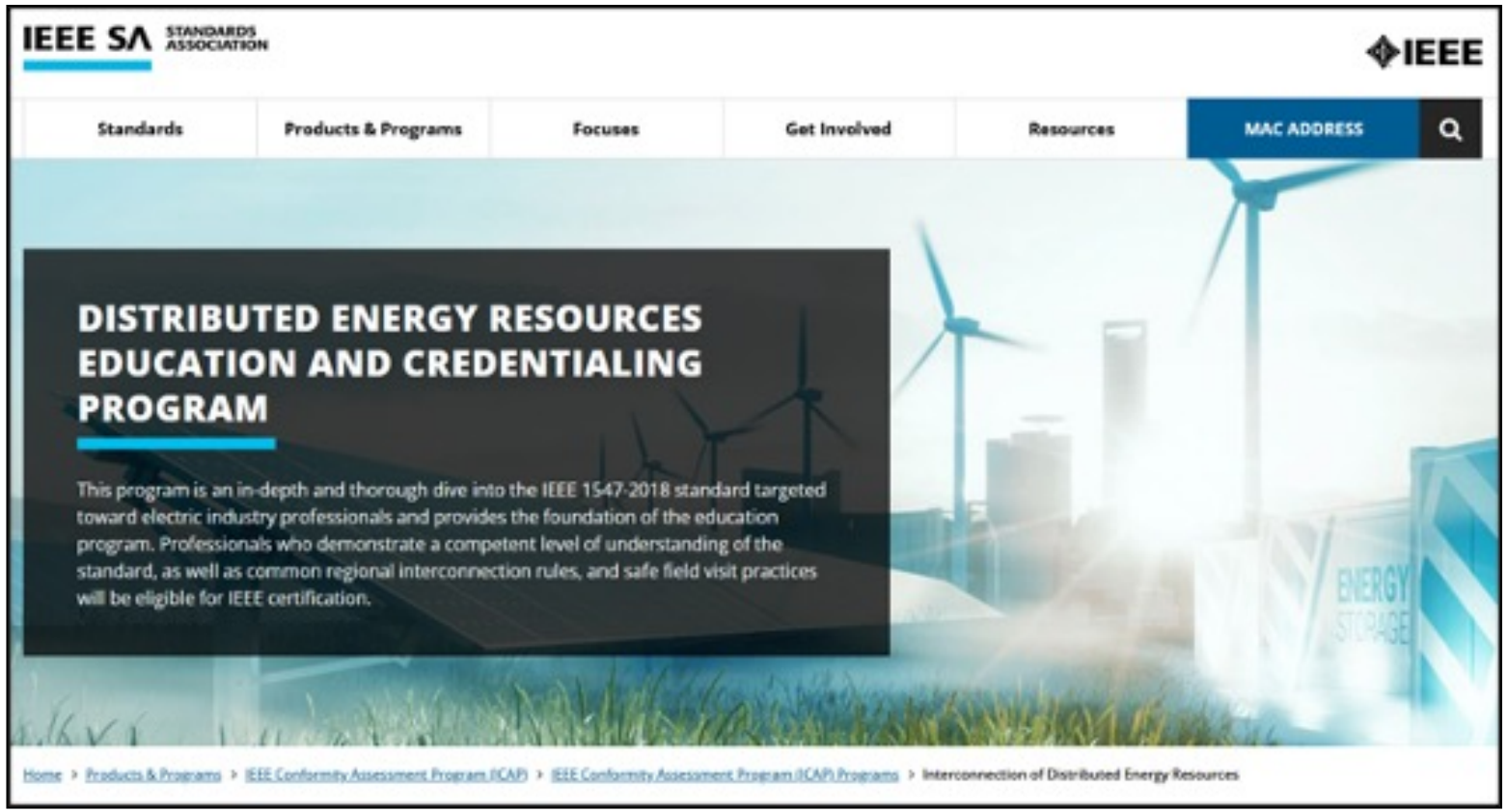
*dersettings.epri.com

IEEE 1547-2018 Application Resource



IEEE SA - IEEE Conformity Assessment Program (ICAP)

IEEE 1547-2018 Application Resource



IEEE SA – IEEE Distributed Energy Resources Education and Credentialing program

For suggested updates, please contact EPRI or use the form at the bottom of this website.