ARPA-E
UL 2200, Utility Interactive Engine Generator System Assemblies

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WE ARE A GLOBAL FORCE

FOR GOOD

Certification
Validation
Inspection
Testing
Advisory & Training
Audit
Research
Standards

22 BILLION
UL MARKS APPEAR ON PRODUCTS ANNUALLY

700 MILLION
CONSUMERS WERE REACHED BY UL IN ASIA, EUROPE AND NORTH AMERICA

MORE THAN **580K**
FOLLOW-UP INSPECTION VISITS WERE CONDUCTED BY UL

1,485
CURRENT STANDARDS FOR SAFETY PUBLISHED BY UL

20,268
TYPES OF PRODUCTS EVALUATED BY UL

69,795
MANUFACTURERES PRODUCING UL CERTIFIED PRODUCTS

90,304
PRODUCT EVALUATIONS CONDUCTED BY UL

10,715 EMPLOYEES

152
LABORATORIES, TESTING & CERTIFICATION FACILITIES

SERVICING CUSTOMERS IN **106** COUNTRIES

UL2200

UL 2200

STANDARD FOR SAFETY

Stationary Engine Generator Assemblies

1 Scope

1.1 These requirements cover stationary engine generator assemblies rated 600 volts or less that are intended for installation and use in ordinary locations in accordance with the National Electrical Code NFPA 70; the Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37, the Standard for Health Care Facilities, NFPA 99, and the Standard for Emergency and Standby Power Systems, NFPA 110.

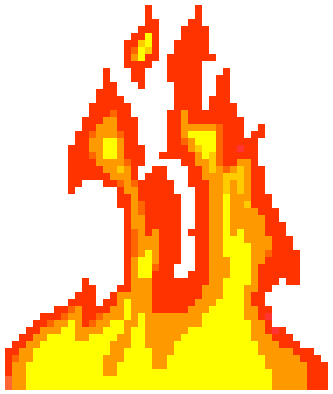
1.2 These requirements do not cover engine generator assemblies for use in hazardous (Classified) locations.

1.3 These requirements do not cover UPS equipment. That equipment is covered by the Standard for Uninterruptible Power Systems, UL 1778.

1.4 These requirements do not cover engine generator assemblies for marine use.

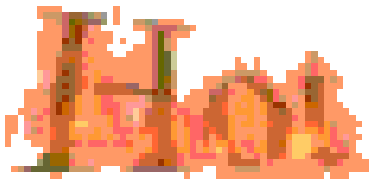
1.5 These requirements do not cover snow loading, wind loading, or seismic forces.

Most Traditional UL Equipment Safety Standards Evaluate

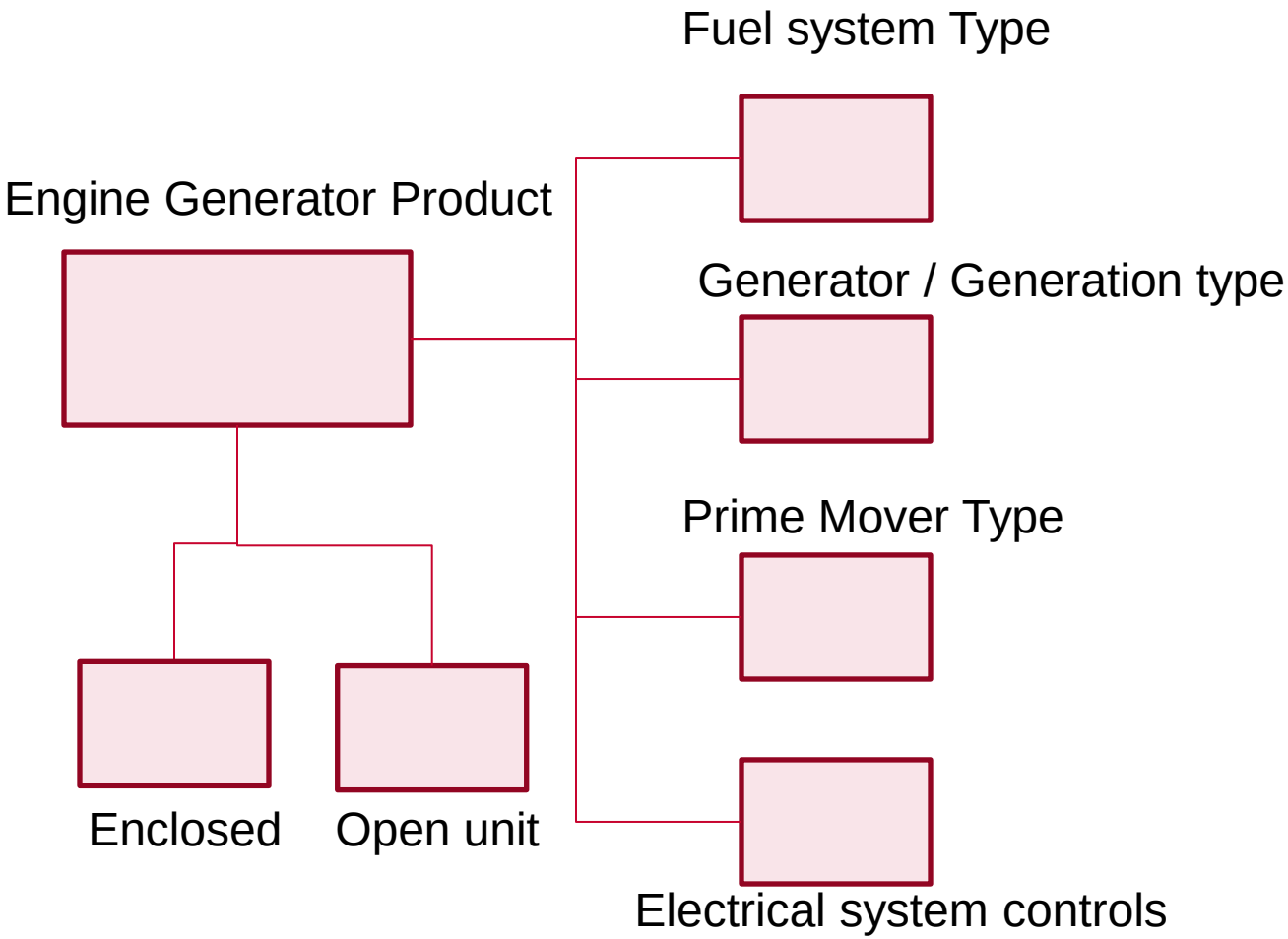


- Functionality
- Electrical Hazards
- Fire Hazards
- Mechanical Hazards
- Verification of electrical ratings
- UL2200 also addresses fuel systems

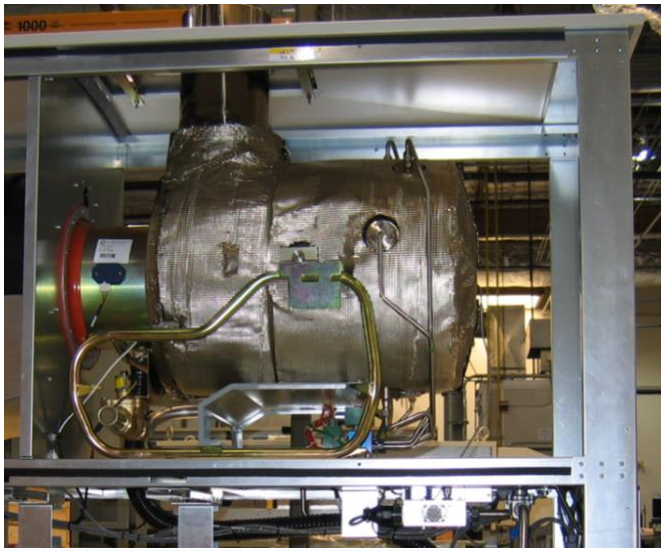
These hazards are evaluated and tested under normal and foreseeable abnormal conditions

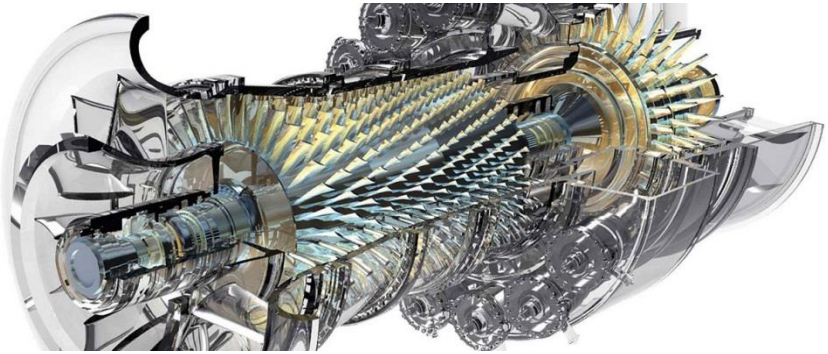


Engine Generators

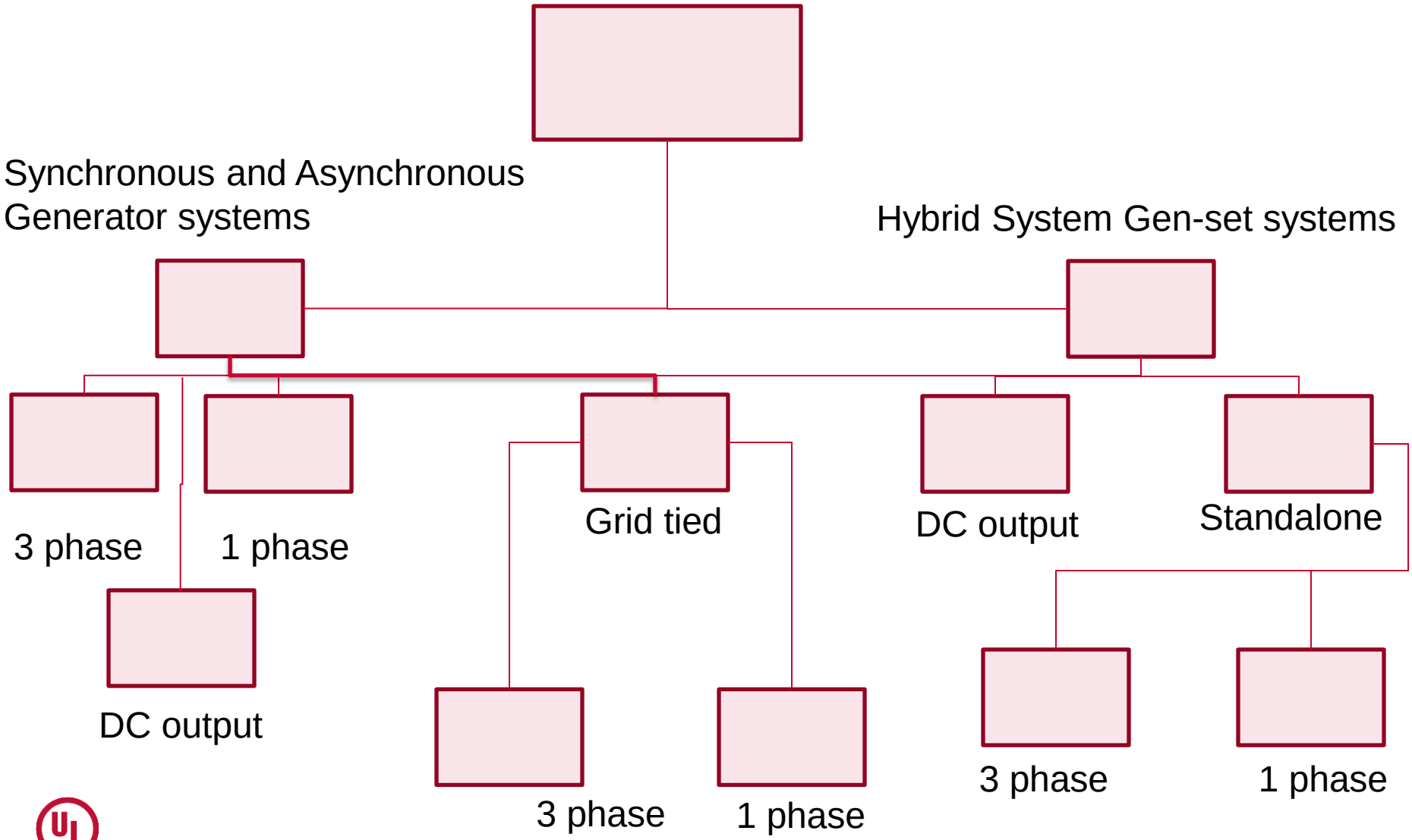


Expanded Engine-generator Types and Sizes

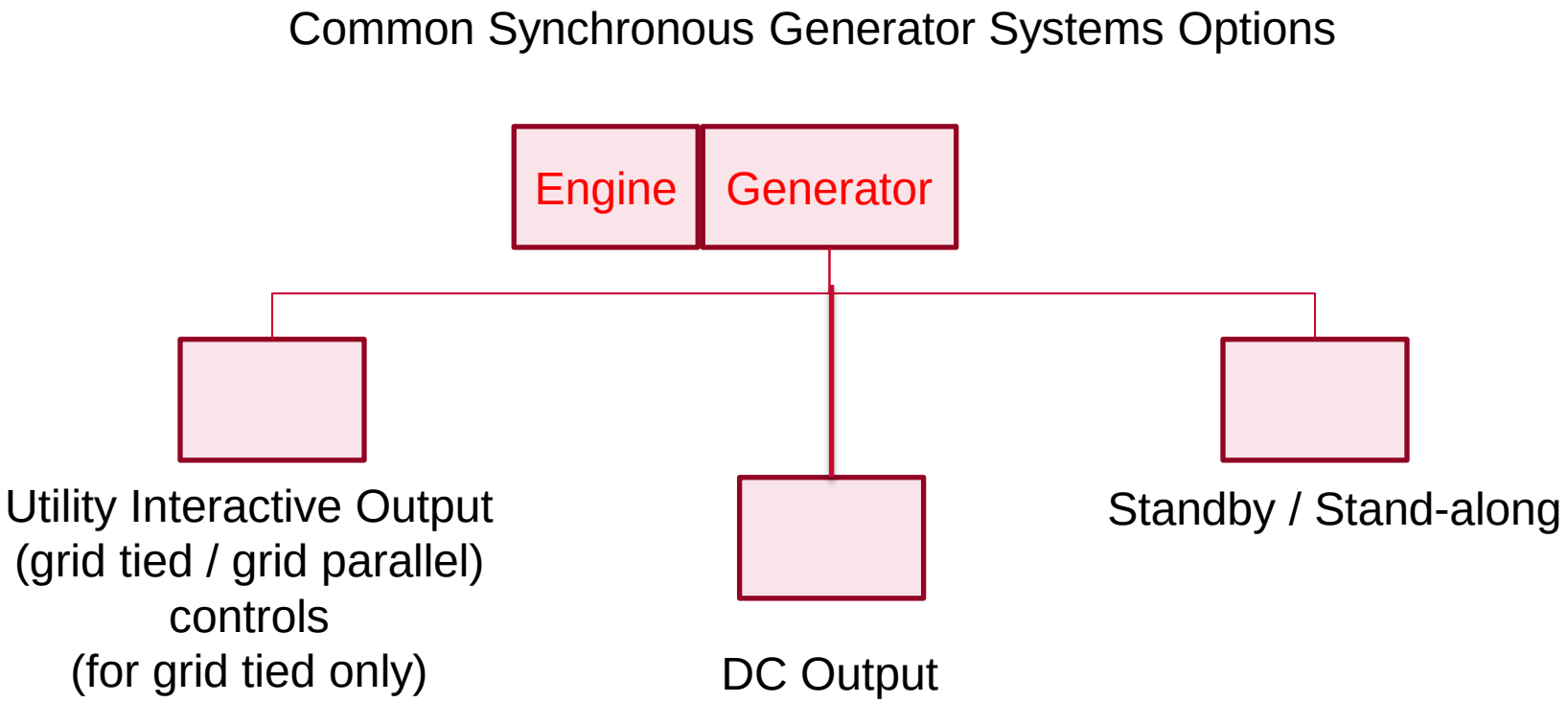




Generator / Generation Types

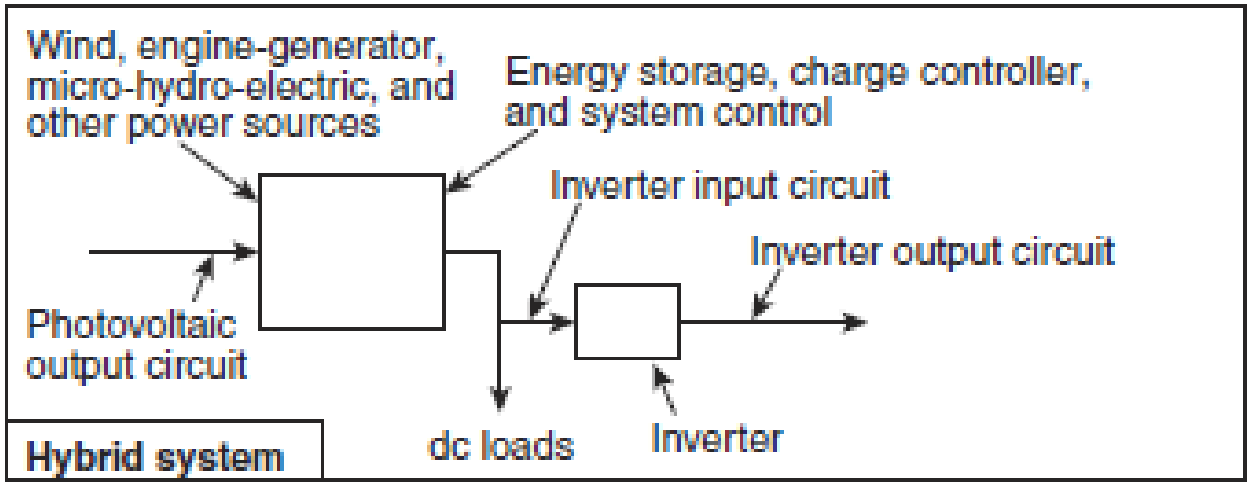


Synchronous Generator Systems

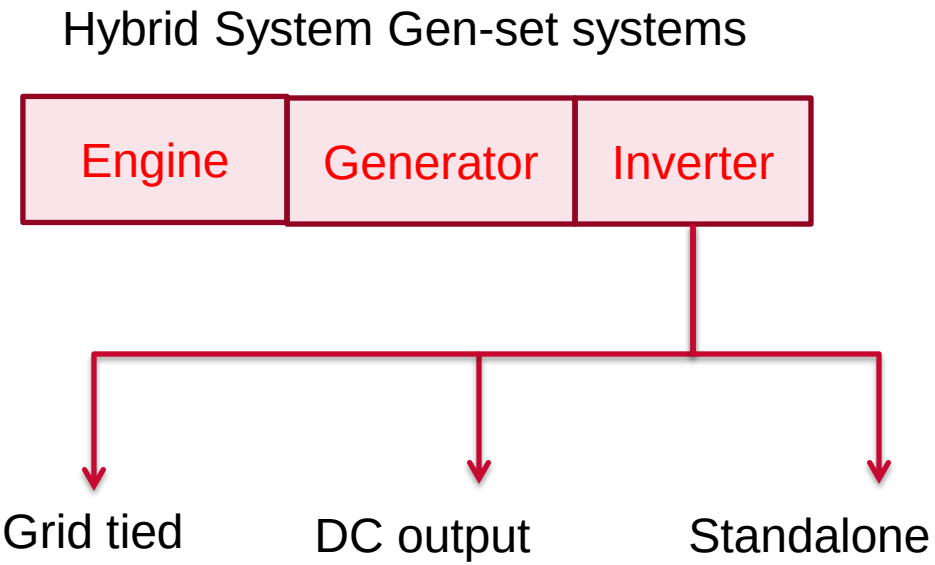


Hybrid System Gen-set

NEC 70



Hybrid System Gen-set Systems



FTSR.GuideInfo
Engine Generators

View Listings Page Bottom

Engine Generators

Guide Information for Building Materials

Guide Information for Electrical Equipment for Use in Ordinary Locations

GENERAL

This category covers stationary electrical generating equipment driven by gasoline, LP-gas, natural gas or diesel-fueled internal combustion engines.

This category does not cover engine generator assemblies mounted on trailers intended for temporary installation.

This category does not cover engine generator assemblies intended for marine use.

Certified stationary engine generator assemblies are rated 600 V or less and are intended for installation and use in accordance with ANSI/NFPA 70, "National Electrical Code," ANSI/NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines," ANSI/NFPA 99, "Health Care Facilities," and ANSI/NFPA 110, "Emergency and Standby Power Systems."

Certified stationary engine generator assemblies may be used in emergency and standby power systems, provided the installed system complies with applicable codes.

COMMON UL 2200 APPLICATIONS

Residential

Industrial Commercial

Municipal Buildings

Radio and Cell Towers

Farms CCN FTPU/7

Oil Rigs: note some sites are classified areas:
CCN FTWG, Raw natural gas: CCN FTPU/7

COMMON COMPONENTS

Component Generator – UL 1004-1, -4, -9 (JZGZ2)
Ventilation system fans
Engine types: reciprocating, gas turbines, other
Fuel delivery: valves, regulators, liquid, gas, low and high pressure systems
Oil lubrication systems
Cooling systems
Exhaust systems
Emissions Controls (DEF)
Combined Heat and Power (CHP)
Control Panel – UL 6200 (FTPM/2)

ENGINES

Controlled Features

Engine Ratings (Horse Power or kW / MW).

Engine Aspiration (Normal, Super-Charged, Turbo-Charge, axial, centrifugal gas turbine).

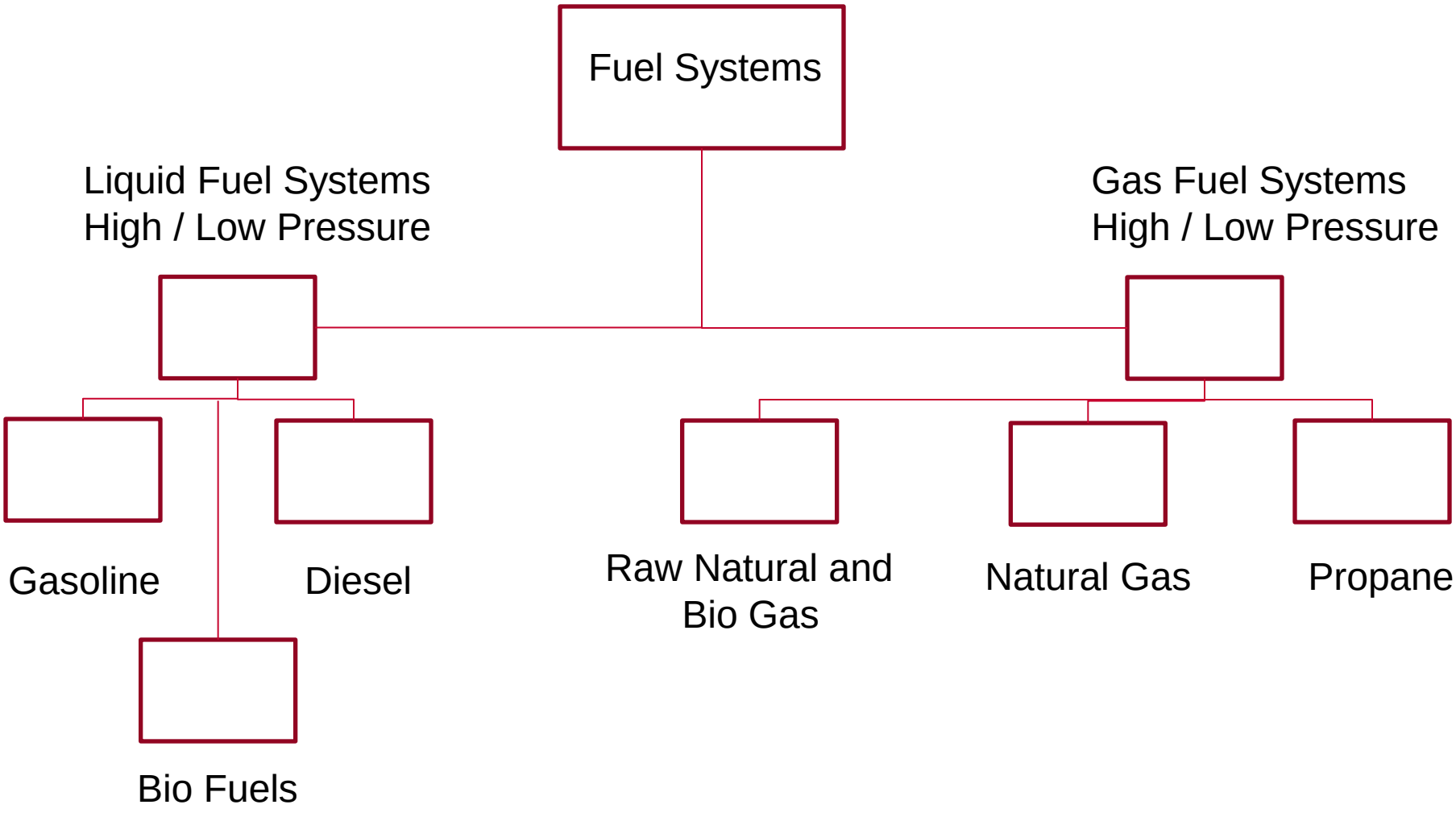
Manufacture name, model.

Controlled external engine components

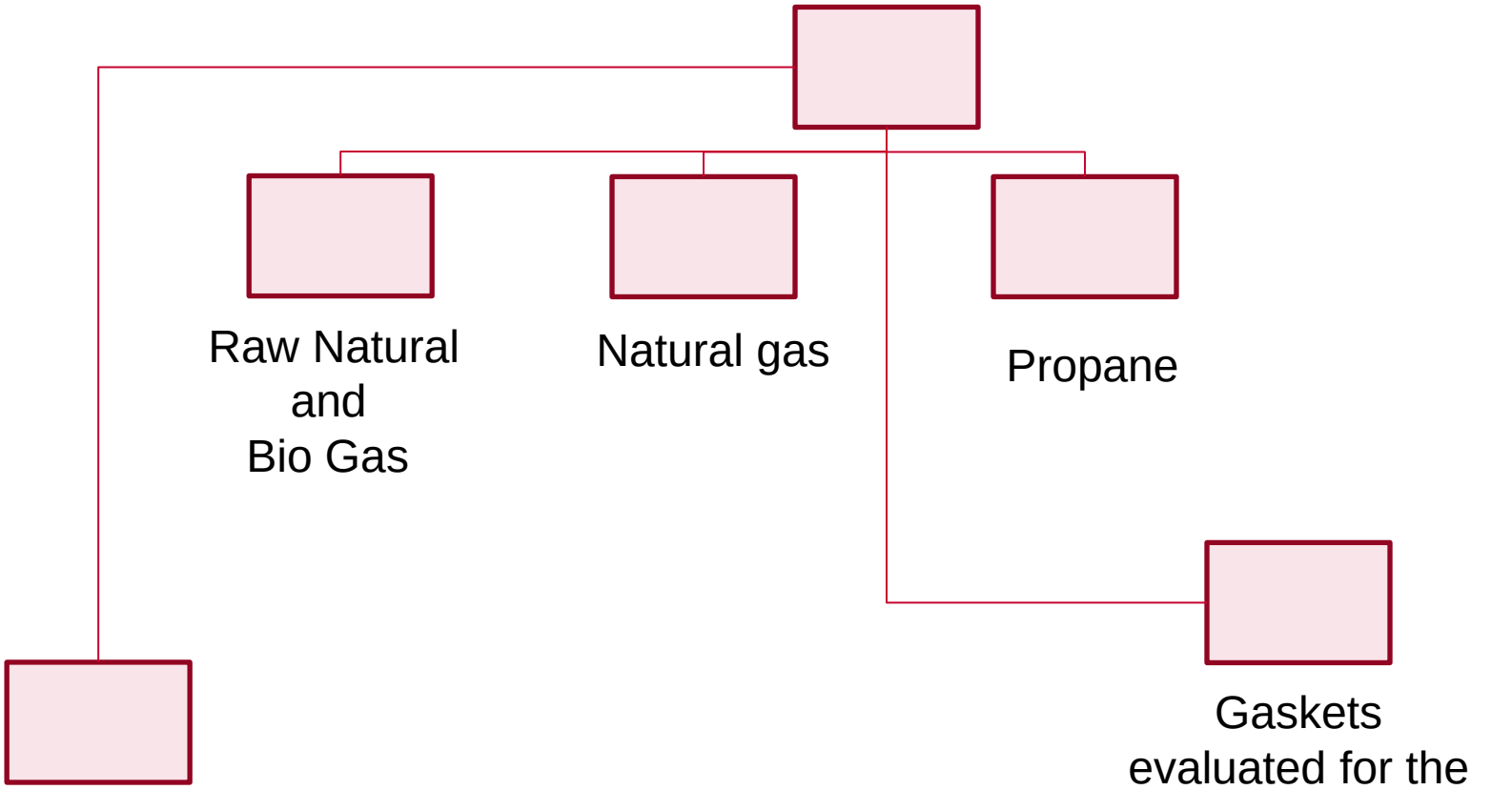
Fuel piping, fuel valves, oil, electrical sensors, gas turbine engine controls, support systems and thermal insulation are evaluated.

Engine Generator Fuel Systems

Fuel System Types

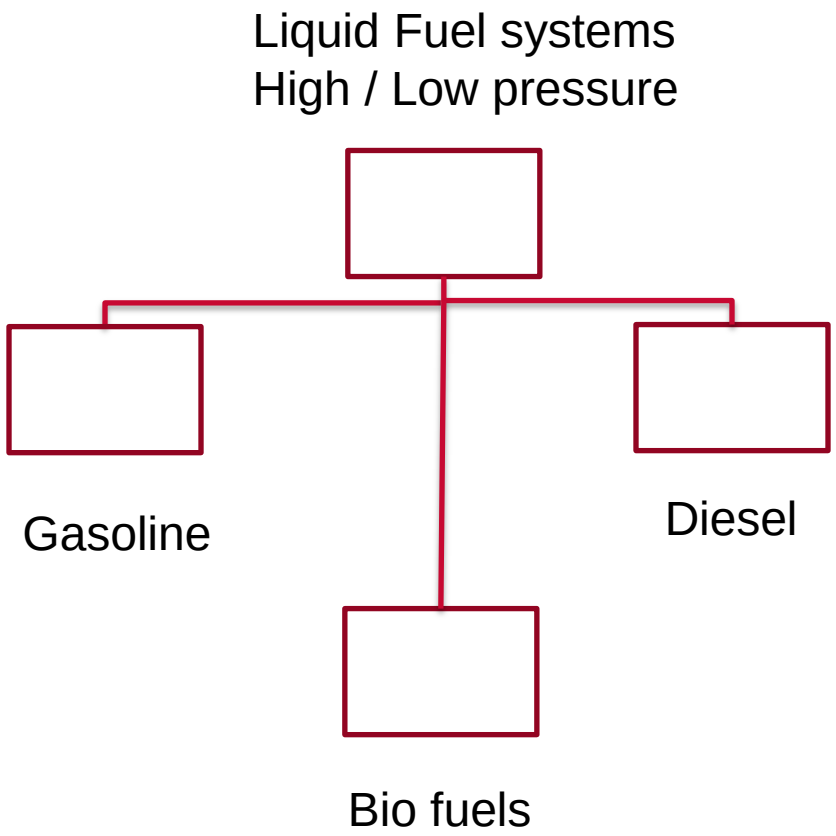


Gas Fuel systems



Liquid Fuel systems

UL2200 Includes specific requirements for liquid fuel systems and if you have questions please contact UL.



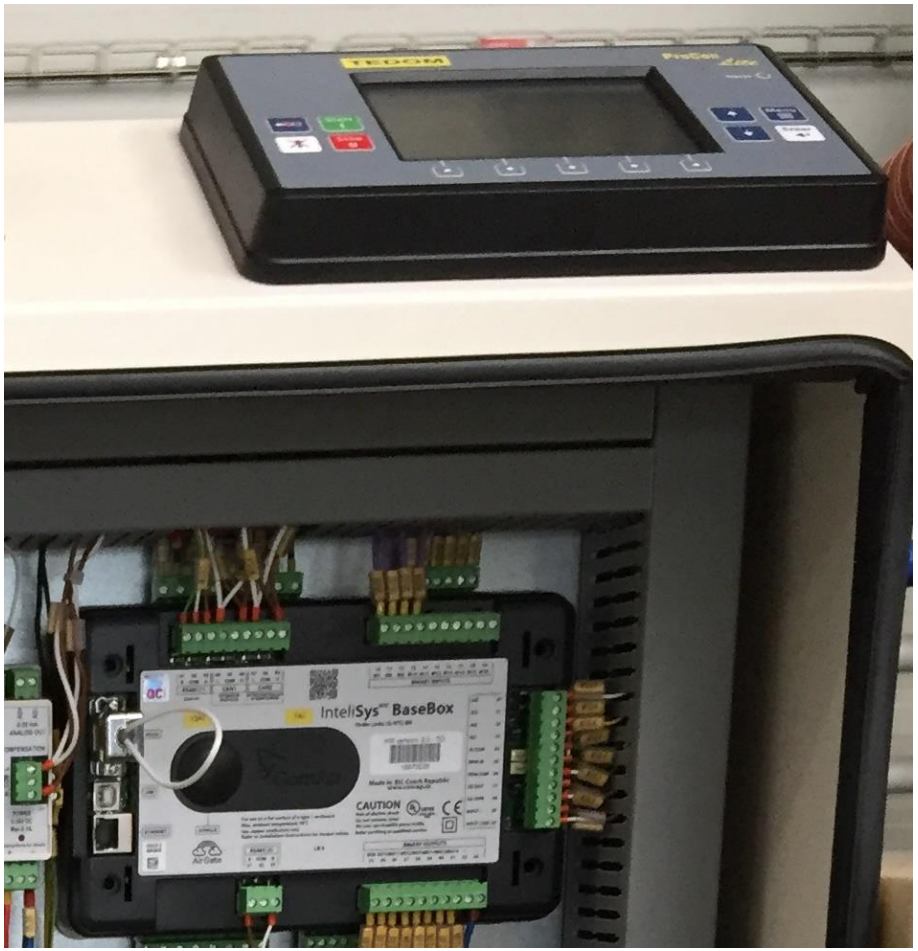
Controls

UL 6200 1st Ed. Programmable Controls for Power Generation Equipment

40.2 – Utility Interactive Control Requirements reference to UL 1741.

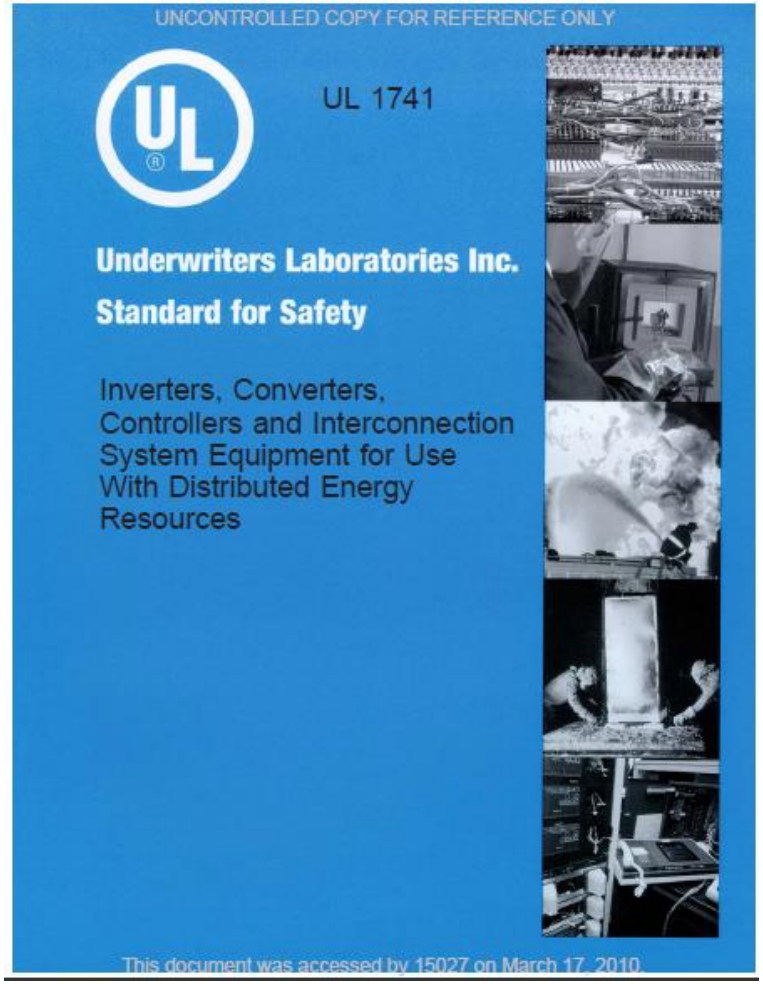
Control Circuits

Fuel Valve Testing



UL 1741 Covers Power Conversion and Protection Equipment for the Following Types of Distributed Generation products:

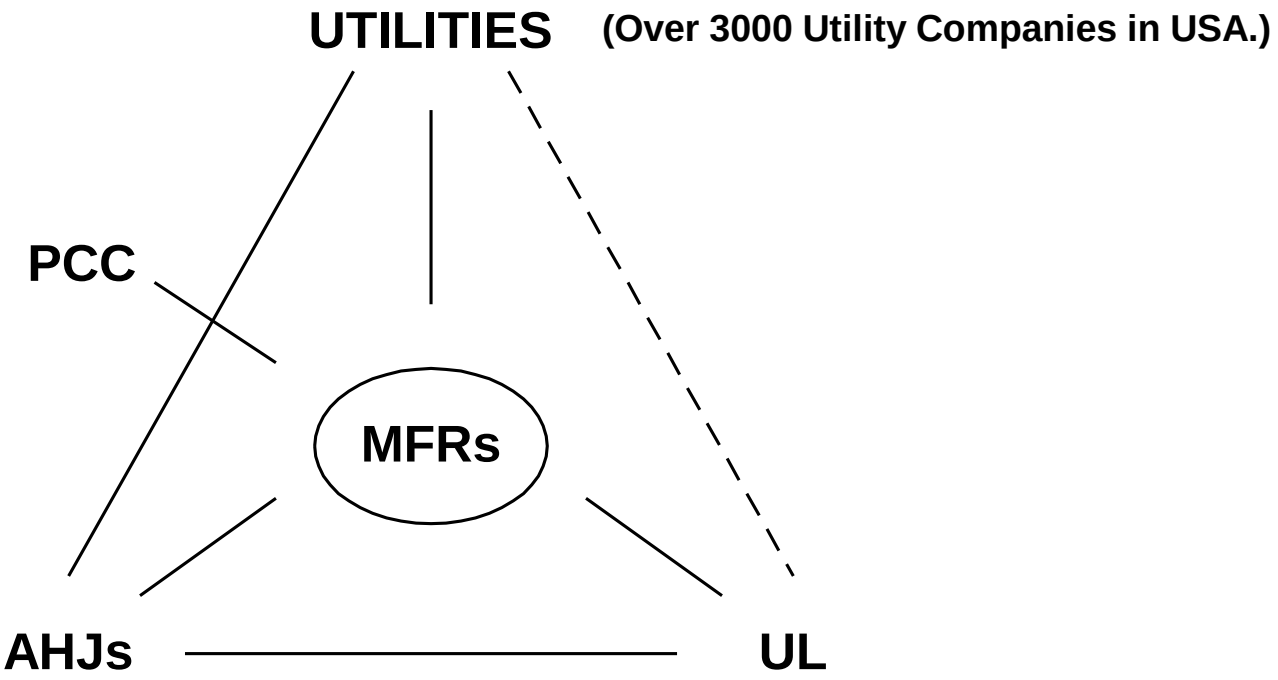
Photovoltaics, PV
Fuel Cells
Micro-turbines
Wind and Hydro Turbines
Engine Generator Set
Utility Interactive Inverters
Stand Alone Inverters
Multi-Mode Inverters
AC Modules
Charge Controllers
PV Balance of Systems,
Combiner Boxes, GFDIs, etc



Impacts and Benefits

This linkage between UL1741 and IEEE 1547 has resulted in a set of standardized interconnection requirements and procedures that are being used to evaluate utility interconnected DG products for both electrical safety and utility interconnection to address the needs of Electrical AHJs and Utility Interconnection Engineers.

US Electrical Architecture / Power Grid and National Electrical Code



Many North American Utilities have adopted the UL 1741/ IEEE 1547 certification as the basis for their interconnection program, and has greatly reduced the conflicts between individual AHJ and Utility requirements to reduce interconnection delays and costs.

Existing Power Conversion & Grid Interconnect Standards

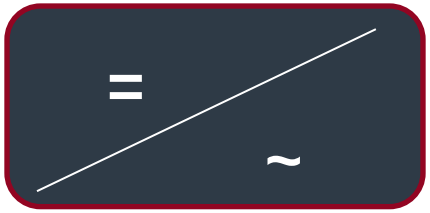
IEEE 1547 Interconnection System Requirements	**IEEE 1547.1** Interconnection System Testing	**UL 1741** Power Conversion & Interconnection Equipment
• Voltage Regulation • Disconnects • Monitoring • Islanding • Power Quality	• Temperature Stability • Response to Abnormal Voltage • Response to Abnormal Frequency • Synchronization • Protection from EMI • Surge Withstand • Paralleling Device • DC Injection • Unintentional Islanding • Reverse Power • Open Phase • Reconnect after disturbance • Harmonics	• Construction • Testing Normal and Abnormal • Protection Against Risks of Injury to Persons and Connected Equipment • Ratings, Markings and Instructions • Specific DR Tests for Specific Technologies • Production Line Testing • Certifications Address NEC and Electric Utility Interconnection Needs

This linkage between UL1741 and IEEE 1547 established a set of standardized interconnection requirements and procedures that are being used to evaluate utility interconnected DG products for both electrical safety and utility grid interconnection to address the needs of Electrical AHJs and Utility Interconnection Engineers. *Note - These products work well for lower percentages of grid penetration.*

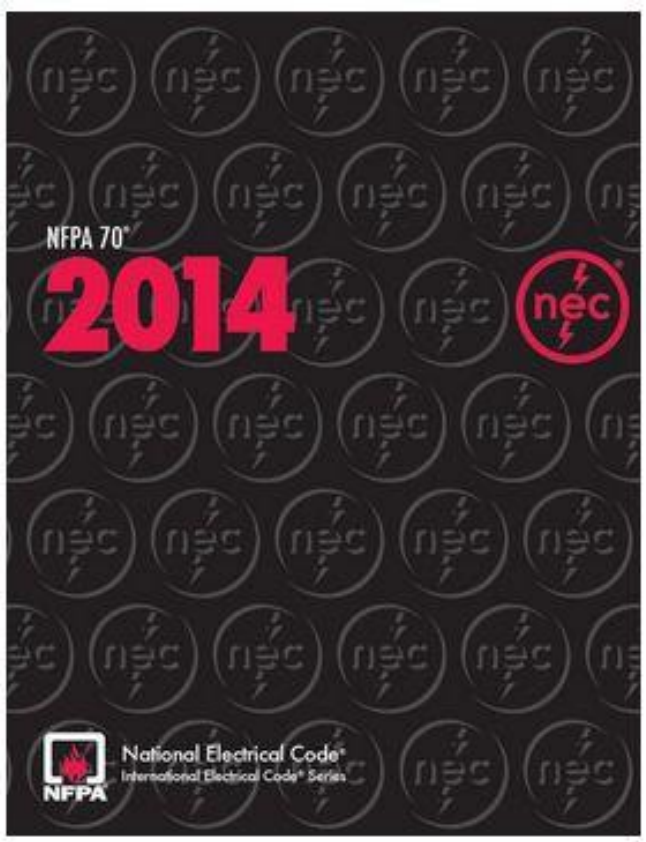
UL 1741 SA – Modern Grid Support Interconnection

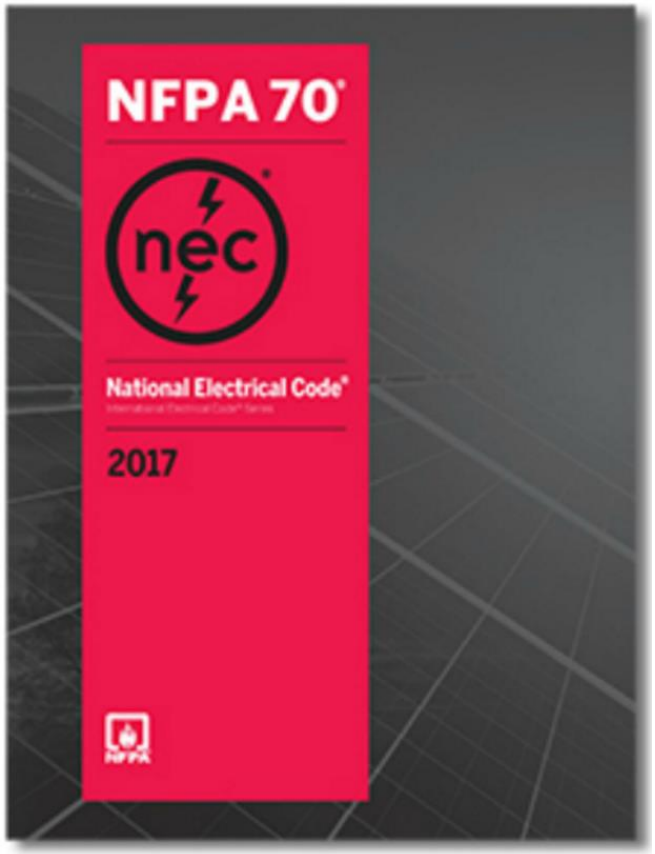
What Tests are Part of UL 1741 SA?

Required Tests	Optional Tests (Depends on SRD Being Utilized)
• Anti-Islanding (with advanced features active during test) • Low/High Voltage Ride Through • Low/High Frequency Ride Through • Must-Trip Test • Ramp Rate (Normal & Soft-Start) • Specified Power Factor • Volt/VAr Mode	• Frequency Watt • Volt Watt



NFPA 70 NEC - National Electric Code





Article 705 Interconnected Electric Power Production Sources.

705.6 Equipment Approval. All equipment shall be approved for the intended use. Interactive inverters for interconnection to systems interactive equipment intended to operate in parallel with the electric power system including, but not limited to, interactive inverters, engine generators, energy storage equipment, and wind turbines shall be listed and or field labeled for the intended use of interconnection service.

Transition from New Conceptual Designs into Marketable Products

- Many new fantastic innovative product ideas.
- Most of these new products will need to comply with building codes before they can be accepted for general use in the US or Canada.
- Sometimes these new and innovative products do not neatly fit into existing codes, standards and certification categories.
- UL works with industry to develop new codes and standards to facilitate getting new technologies certified and accepted in the field.

Ultimate Goal

- Increase renewable energy safety with the help of the renewable energy industries, thought leaders, AHJs, Utilities and other interested parties, develop and maintain appropriate installation codes, standards and certifications.
- This will permit easier entry for mfrs into their target markets.
- Facilitate a streamlined process where renewable energy equipment and systems may be designed, produced, evaluated, certified, sold, installed and operated in a smooth and agreeable manner for all parties.

QUESTIONS?

THANK YOU.