

# Technical Rationale

## Project 2019-04 Modifications to PRC-005 Reliability Standard PRC-005-7 | May 2023

### PRC-005-7 – Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance

#### Rationale for Applicability Section

Section 4 has been revised to include Section 4.1.4 entities registered as underfrequency load shedding (UFLS)-only Distribution Providers (DPs). This addition to the Applicability Section was made for consistency with changes made to NERC's FERC-approved Risk-Based Registration (RBR).

#### Rationale for Requirements R1, R2, R3, R4 and R5

Requirements R1-R5 were updated to include entities registered as UFLS-only DPs for consistency with changes made to NERC's FERC-approved RBR.

#### Rationale for Revised Definition

As part of Project 2019-04 to modify PRC-005-6, the Standard Drafting Team (SDT) recognized the need to modify the definition of Protection System. The modifications to Protection System are necessary to provide clarity on the inclusion of components of control systems which measure and utilize similar quantities as protective relays and perform similar functions as protective relays. The revised definition of Protection System is as follows.

One or more of the following components:

- Protective relays, or components of control systems, which respond to measured electrical quantities and provide protective functions;
- Communications systems necessary for correct operation of protective functions;
- Voltage and current sensing devices providing inputs necessary for the correct operation of protective functions;
- Station dc supply associated with protective functions (including station batteries, battery chargers, and non-battery-based dc supply); and/or
- Control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices.

#### Measured Electrical Quantities

The SDT recognized the need for clarity in the phrase "respond to electrical quantities" due to the fact that nearly all measured quantities are converted to electrical signals prior to input into protection and control systems. Measured electrical quantities are those that represent Primary ac or dc voltage and current for applicable Facilities (such as generating unit terminal voltage and current, excitation current or excitation voltage). This also includes any quantities derived from voltage and current measurements;

such as Frequency, Real and Reactive Power, and phase angles. Signals converted from non-electrical measurements; such as speed, temperature, or vibration are excluded.

### **Protective Functions**

The SDT recognized the need to clarify which functions within protective relays and control systems meet the criteria of a protective function for inclusion in the Protection System definition. The SDT used the following criteria to establish which functions meet the criteria of protective functions for inclusion in the definition.

Functions that are implemented to initiate or prevent the automatic isolation of Facilities:

- To protect power system Elements;
- To maintain Stability; or
- In response to detected faults.

Functions not applicable to the definition include those which do not initiate or prevent automatic isolation (such as limiters or functions which only provide indication) or devices which do not respond to the aforementioned scenarios; such as those detecting malfunctions of an excitation system, or automatic switching of capacitor banks for the purpose of voltage-control).

Protective functions focus on the action being performed and not the equipment itself, which allows for exclusion of components or functionality within the relay or control system that are not performing a protective function.

### **Evaluation of Functions**

The SDT performed an analysis of IEEE device numbers<sup>1</sup> using the criteria above as an example of the analysis to determine which functions should be considered for inclusion in Protection Systems. The results of the example analysis were consistent with the analysis performed by the SPCWG in *SPCS Order 758 Sudden Pressure Relay Report*, which was performed in response to FERC Order 758 to determine which protective functions not included in the Protection System definition should be considered for inclusion in PRC-005. A list of all Institute of Electrical Electronics Engineers (IEEE) device numbers, including a description of each device, is included in Appendix A. Each device was evaluated to determine applicability, the results of which can be seen in Appendix B.

### **Frequently Asked Questions**

1. **Are protective functions which respond to injected electrical signals (such as active field ground protection) included within the scope of the Protection System definition?**  
Because the signal is still a measured electrical quantity and is being used to calculate an electrical quantity (resistance), this type of protective function should be considered for inclusion in the Protection System definition, assuming that all other criteria are met.

---

<sup>1</sup> IEEE Standard C37.2, 2008

- 2. Is crowbar overvoltage protection included within the applicability of Protection System?**  
Since crowbar overvoltage protection does not in itself isolate an Element, it would not meet the criteria for inclusion in the Protection System definition. However, the devices which initiate the crowbar action should be analyzed for applicability based on additional actions that they perform; such as direct tripping of the Element.
- 3. Are high-speed ground switches included within the applicability of a Protection System?**  
The PRC-005-2 SDT classified high-speed ground switches as an interrupting device if the ground switch is utilized in a Protection System and forces a ground Fault to occur that then results in an expected Protection System operation to clear the forced ground Fault. The SDT believes that this is essentially a transferred-tripping device without the use of communications equipment. If this high-speed ground switch is "...designed to provide protection for the BES..." then this device needs to be treated as any other Protection System component. Likewise, functions which actuate high-speed ground switches to protect power system Elements to maintain stability or in response to detected Faults are considered protective functions.
- 4. Are functions which protect an Element when it is offline considered "protective functions"?**  
If the Element is offline, the function in question cannot initiate isolation of the Element because it is already isolated. For this reason, functions which only protect the Element when offline are not included.
- 5. Are functions which protect individual equipment malfunctions; such as bridge failures, individual component failures (capacitor can failure detection), or controller failures considered "protective functions"?**  
If the function is tripping the element for a failure in the Element itself using a measured electrical quantity, it should be included. Controller failures or loss of ability to control would not be included because the controller is not an Element. For example, a Static VAR Compensator (SVC) control system using measured electrical quantities to detect bridge failures and initiate isolation of the SVC would be a protective function.
- 6. Are field current measurements through a shunt resistor considered "measured electrical quantities"?**  
Yes. Since the quantity being measured is electrical, and being used to derive an electrical quantity (field current), this is considered a measured electrical quantity.

## Appendix A – IEEE Device Numbers and Functions

The devices in switching equipment are referred to by numbers, according to the functions they perform. These numbers are based on a system which has been adopted as standard for automatic switchgear by IEEE. This system is used on connection diagrams, in instruction books, and in specifications.

### 1 – Master element

An initiating device, such as a control switch, voltage relay, float switch etc., that serves either directly, or through such permissive devices as protective and time-delay relays, to place an equipment in or out of operation.

### 2 – Time-delay starting or closing relay

A device that functions to give a desired amount of time delay before or after any point of operation in a switching sequence or protective relay system, except as specifically provided by device functions 48, 62 and 79 described later.

### 3 – Checking or interlocking relay

A device that operates in response to the position of a number of other devices, (or to a number of predetermined conditions), in an equipment to allow an operating sequence to proceed, to stop, or to provide a check of the position of these devices or of these conditions for any purpose.

### 4 – Master contactor

A device, generally controlled by device No. 1 or equivalent, and the required permissive and protective devices, that serve to make and break the necessary control circuits to place an equipment into operation under the desired conditions and to take it out of operation under other or abnormal conditions.

### 5 – Stopping device

A control device used primarily to shut down an equipment and hold it out of operation. [This device may be manually or electrically actuated, but excludes the function of electrical lockout (see device function 86) on abnormal conditions.]

### 6 – Starting circuit breaker

A device whose principal function is to connect a machine to its source of starting voltage.

### 7 – Rate-of-rise relay

A relay that functions on an excessive rate of rise of current.

### 8 – Control power disconnecting device

A disconnecting device, such as a knife switch, circuit breaker, or pull-out fuse block, used for the purpose of respectively connecting and disconnecting the source of control power to and from the control bus or equipment.

### 9 – Reversing device

A device is used for the purpose of reversing a machine field or for performing any other reversing functions.

### **10 – Unit sequence switch**

A switch used to change the sequence in which units may be placed in and out of service in multiple-unit equipment.

### **11 – Multifunction device**

A device that performs three or more comparatively important functions that could only be designated by combining several of these device function numbers. All of the functions performed by device 11 shall be defined in the drawing legend or device function list.

### **12 – Over speed device**

A device, usually a direct connected speed switch that functions on machine over speed.

### **13 – Synchronous-speed device**

A device s such as a centrifugal speed switch, a slip frequency relay, a voltage relay, an undercurrent relay, or any other type of device that operates at approximately the synchronous speed of a machine.

### **14 – Underspeed device**

A device that functions when the speed of a machine falls below a pre-determined value.

### **15 – Speed or frequency matching device**

A device that functions to match and hold the speed or the frequency of a machine or of a system equal to, or approximately equal to, that of another machine, source, or system.

### **16 – Data communications device**

A device that supports the serial and/or network communications that are part of the substation control and protection system.

### **17 – Shunting or discharge switch**

A switch that serves to open or to close a shunting circuit around any piece of apparatus (except a resistor), such as a machine field, a machine armature, a capacitor, or a reactor.

Note: This excludes devices that perform such shunting operations as may be necessary in the process of starting a machine by devices 6 or 42, or their equivalent, and also excludes device 73 function that serves for the switching of resistors.

### **18 – Accelerating or decelerating device**

A device used to close or to cause the closing of circuits that are used to increase or decrease the speed of a machine.

### **19 – Starting-to-running transition**

A contactor that operates to initiate or cause the automatic transfer of a machine from the starting to the running power connection.

### **20 – Electrically operated valve**

An electrically operated, controlled, or monitored valve used in a fluid, air, gas, or vacuum line. Note: The function of the valve may be indicated by the use of suffixes.

### **21 – Distance relay**

A relay that functions when the circuit admittance, impedance, or reactance increases or decreases beyond a predetermined value.

### **22 – Equalizer circuit breaker**

A breaker that serves to control or to make and break the equalizer or the current balancing connections for a machine field, or for regulating equipment, in a multiple unit installation.

### **23 – Temperature control device**

A device that functions to raise or to lower the temperature of a machine or other apparatus, or of any medium, when its temperature falls below or rises above a predetermined value.

Note: An example is a thermostat that switches on a space heater in a switchgear assembly when the temperature falls to a desired value as distinguished from a device that is used to provide automatic temperature regulation between close limits and would be designated as 90T.

### **24 – Volts per hertz relay**

A relay that functions when the ratio of voltage to frequency exceeds a preset value. The relay may have an instantaneous or a time characteristic.

### **25 – Synchronizing or synchronism check**

A device that operates when two ac circuits are within the desired limits of frequency, phase angle, or voltage to permit or to cause the paralleling of these two circuits.

### **26 – Apparatus thermal device**

Functions when the temperature of the protected apparatus (other than the load-carrying windings of machines and transformers as covered by device function number 49) or of a liquid or other medium exceeds a predetermined value; or when the temperature of the protected apparatus or of any medium decreases below a predetermined value.

### **27 – Under voltage relay**

A relay that operates when its input voltage is less than a predetermined value.

### **28 – Flame detector**

A device that monitors the presence of the pilot or main flame in such apparatus as a gas turbine or a steam boiler.

### **29 – Isolating contactor**

A device used expressly for disconnecting one circuit from another for the purposes of emergency operation, maintenance, or test.

### **30 – Annunciator relay**

A non-automatically reset device that gives a number of separate visual indications upon the functioning of protective devices and that may also be arranged to perform a lock-out function.

### **31 – Separate excitation device**

A device that connects a circuit, such as the shunt field of a synchronous converter, to a source of separate excitation during the starting sequence; or one which energizes the excitation and ignition circuits of a power rectifier.

### **32 – Directional power relay**

A relay that operates on a predetermined value of power flow in a given direction or upon reverse power flow such as that resulting from the motoring of a generator upon loss of its prime mover.

### **33 – Position switch**

A switch that makes or breaks contact when the main device or piece of apparatus that has no device function number reaches a given position.

### **34 – Master sequence device**

A device such as a motor operated multi contact switch, or the equivalent, or a programming device, such as a computer, that establishes or determines the operating sequence of the major devices in an equipment during starting and stopping or during other sequential switching operations.

### **35 – Brush-operating or slip-ring short circuiting**

A device used for raising, lowering or shifting the brushes of a machine; short-circuiting its slip rings; or engaging or disengaging the contacts of a mechanical rectifier.

### **36 – Polarity or polarizing voltage device**

A device that operates, or permits the operation of, another device on a predetermined polarity only or that verifies the presence of a polarizing voltage in an equipment.

### **37 – Undercurrent or under power relay**

A device that functions when the current or power flow decreases below a predetermined value.

### **38 – Bearing protective device**

A device that functions on excessive bearing temperature or on other abnormal mechanical conditions associated with the bearing, such as undue wear, which may eventually result in excessive bearing temperature or failure.

### **39 – Mechanical condition monitor**

A device that functions upon the occurrence of an abnormal mechanical condition (except that associated with bearings as covered under device function 38), such as excessive vibration, eccentricity, expansion, shock, tilting, or seal failure.

### **40 – Field relay**

A relay that functions on a given or abnormally low value or failure of machine field current, or on an excessive value of the reactive component of armature current in an ac machine indicating abnormally low field excitation.

### **41 – Field circuit breaker**

A device that functions to apply or remove the field excitation of a machine.



**42 – Running circuit breaker**

A device whose principal function is to connect a machine to its source of running or operating voltage. This function may also be used for a device, such as a contactor, that is used in series with a circuit breaker or other fault protecting means, primarily for frequent opening and closing of the circuit.

**43 – Manual transfer or selector device**

A manually operated device that transfers the control circuits in order to modify the plan of operation of the switching equipment or of some of the devices.

**44 – Unit sequence starting relay**

A relay that functions to start the next available unit in multiple unit equipment upon the failure or nonavailability of the normally preceding unit.

**45 – Atmospheric condition monitor**

A device that functions upon the occurrence of an abnormal atmospheric condition, such as damaging fumes, explosive mixtures, smoke, or fire.

**46 – Reverse-phase or phase-balance**

A current relay is a relay that functions when the polyphase currents are of reverse phase sequence or when the polyphase currents are unbalanced or contain negative phase-sequence components above a given amount.

**47 – Phase-sequence or phase-balance**

A voltage relay that functions upon a predetermined value of polyphase voltage in the desired phase sequence, or when the polyphase voltages are unbalanced, or when the negative phase-sequence voltage exceeds a given amount.

**48 – Incomplete sequence relay**

A relay that generally returns the equipment to the normal, or off, position and locks it out if the normal starting, operating, or stopping sequence is not properly completed within a predetermined time. If the device is used for alarm purposes only, it should preferably be designated as 48A (alarm).

**49 – Machine or transformer thermal**

A relay that functions when the temperature of a machine armature winding or other load-carrying winding or element of a machine or power transformer exceeds a predetermined value.

**50 – Instantaneous over current relay**

A relay that functions instantaneously on an excessive value of current.

**51 – Ac time over current relay**

A relay with either a definite or inverse time characteristic that functions when the ac input current exceeds a predetermined value, and in which the input current and operating time are independently related or inversely related through a substantial portion of the performance range.

**52 – Ac circuit breaker**

A device that is used to close and interrupt an ac power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.



**53 – Exciter or dc generator relay**

A relay that forces the dc machine field excitation to build up during starting or that functions when the machine voltage has built up to a given value.

**54 – Turning gear engaging device**

An electrically operated, controlled, or monitored device that functions to cause the turning gear to engage (or disengage) the machine shaft.

**55 – Power factor relay**

A relay that operates when the power factor in an ac circuit rises above or falls below a predetermined value.

**56 – Field application relay**

A relay that automatically controls the application of the field excitation to an ac motor at some predetermined point in the slip cycle.

**57 – Short-circuiting or grounding device**

A primary circuit switching device that functions to short circuit or ground a circuit in response to automatic or manual means.

**58 – Rectification failure relay**

A device that functions if a power rectifier fails to conduct or block properly.

**59 – Over voltage relay**

A relay that operates when its input voltage is higher than a predetermined value.

**60 – Voltage or current balance relay**

A relay that operates on a given difference in voltage, or current input or output, of two circuits.

**61 – Density switch or sensor**

A device that operates on a given value, or a given rate of change, of gas density.

**62 – Time-delay stopping or opening relay**

A time-delay relay that serves in conjunction with the device that initiates the shutdown, stopping, or opening operation in an automatic sequence or protective relay system.

**63 – Pressure switch**

A switch that operates on given values, or on a given rate of change, of pressure.

**64 – Ground detector relay**

A relay that operates upon failure of machine or other apparatus insulation to ground, or on flashover of a dc machine to ground.

Note: This function is assigned only to a relay which detects the flow of current from the frame of a machine or enclosing case or structure of a piece of apparatus to ground, or detects a ground on a normally ungrounded winding or circuit. It is not applied to a device connected in the secondary neutral of a current transformer, or in the secondary neutral of current transformers, connected in the power circuit of a normally grounded system.

### **65 – Governor**

The assembly of fluid, electrical, or mechanical control equipment used for regulating the flow of water, steam, or other media to the prime mover for such purposes as starting, holding speed or load, or stopping.

### **66 – Notching or jogging device**

A device that functions to allow only a specified number of operations of a given device or equipment, or a specified number of successive operations within a given time of each other. It is also a device that functions to energize a circuit periodically or for fractions of specified time intervals, or that is used to permit intermittent acceleration or jogging of a machine at low speeds for mechanical positioning.

### **67 – Ac directional over current relay**

A relay that functions on a desired value of ac over current flowing in a predetermined direction.

### **68 – Blocking relay**

A relay that initiates a pilot signal for blocking of tripping on external faults in a transmission line or in other apparatus under predetermined conditions, or that cooperates with other devices to block tripping or to block reclosing on an out-of-step condition or on power swings.

### **69 – Permissive control device**

Generally, a two-position device that in one position permits the closing of a circuit breaker, or the placing of an equipment into operation, and in the other position prevents the circuit breaker or the equipment from being operated.

### **70 – Rheostat**

A variable resistance device used in an electric circuit which is electrically operated or has other electrical accessories, such as auxiliary, position, or limit switches.

### **71 – Level switch**

A switch that operates on given values, or on a given rate of change, of level.

### **72 – Dc circuit breaker**

A circuit breaker used to close and interrupt a dc power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.

### **73 – Load-resistor contactor**

A contactor used to shunt or insert a step of load limiting, shifting, or indicating resistance in a power circuit, or to switch a space heater in circuit, or to switch a light, or regenerative load resistor of a power rectifier or other machine in and out of circuit.

### **74 – Alarm relay**

A relay other than an annunciator, as covered under device function 30, that is used to operate, or that operates in connection with, a visual or audible alarm.

### **75 – Position changing mechanism**

A mechanism that is used for moving a main device from one position to another in an equipment; for example, shifting a removable circuit breaker unit to and from the connected, disconnected, and test positions.

### **76 – Dc over current relay**

A relay that functions when the current in a dc circuit exceeds a given value.

### **77 – Telemetry device**

A transmitter used to generate and transmit to a remote location an electrical signal representing a measured quantity, or a receiver used to receive the electrical signal from a remote transmitter and convert the signal to represent the original measured quantity.

### **78 – Phase-angle measuring or out-of-step**

A relay that functions at a predetermined phase angle between two voltages, or between two currents, or between voltage and current.

### **79 – Ac reclosing relay**

A relay that controls the automatic reclosing and locking out of an ac circuit interrupter.

### **80 – Flow switch**

A switch that operates on given values, or on a given rate of change, of flow.

### **81 – Frequency relay**

A relay that responds to the frequency of an electrical quantity, operating when the frequency or rate of change of frequency exceeds or is less than a predetermined value.

### **82 – Dc load-measuring reclosing relay**

A relay that controls the automatic closing and reclosing of a dc circuit interrupter, generally in response to load circuit conditions.

### **83 – Automatic selective control or transfer relay**

A relay that operates to select automatically between certain sources or conditions in equipment or that performs a transfer operation automatically.

### **84 – Operating mechanism**

The complete electrical mechanism or servomechanism, including the operating motor, solenoids, position switches, etc., for a tap changer, induction regulator, or any similar piece of apparatus that otherwise has no device function number.

### **85 – Carrier or pilot-wire receiver relay**

A relay that is operated or restrained by a signal used in connection with carrier-current or dc pilot-wire fault directional relaying.

### **86 – Lockout relay**

An electrically operated hand or electrically reset auxiliary relay that is operated upon the occurrence of abnormal conditions to maintain associated equipment or devices out of service until it is reset.

### **87 – Differential protective relay**

A protective relay that functions on a percentage, or phase angle, or other quantitative difference between two currents or some other electrical quantities.

**88 – Auxiliary motor or motor generator**

A device used for operating auxiliary equipment, such as pumps, blowers, exciters, rotating magnetic amplifiers, etc.

**89 – Line switch**

Used as a disconnecting, load interrupter, or isolating switch in an ac or dc power circuit. (This device function number is normally not necessary unless the switch is electrically operated or has electrical accessories, such as an auxiliary switch, a magnetic lock, etc.)

**90 – Regulating device**

Functions to regulate a quantity or quantities, such as voltage, current, power, speed, frequency, temperature, and load, at a certain value or between certain (generally close) limits for machines, tie lines, or other apparatus.

**91 – Voltage directional relay**

A relay that operates when the voltage across an open circuit breaker or contactor exceeds a given value in a given direction.

**92 – Voltage and power directional relay**

A relay that permits or causes the connection of two circuits when the voltage difference between them exceeds a given value in a predetermined direction and causes these two circuits to be disconnected from each other when the power flowing between them exceeds a given value in the opposite direction.

**93 – Field-changing contactor**

Functions to increase or decrease, in one step, the value of field excitation on a machine.

**94 – Tripping or trip-free relay**

Functions to trip a circuit breaker, contactor, or equipment, or to permit immediate tripping by other devices; or to prevent immediate reclosing of a circuit interrupter if it should open automatically, even though its closing circuit is maintained closed.

**95 95, 96, 97, 98, 99 –**

Used only for specific applications on individual installations where none of the assigned numbered functions from 1 to 94 is suitable.

## Appendix B – Analysis of IEEE Device Numbers

**Table C-1: Initial Screening of Devices**

Device Number	Function	Analysis	Should the function be considered for inclusion as component in Protection System?
1	Master Element	Control Function	No
2	Time-Delay Starting or Closing Relay	Control Function	No
3	Checking or Interlocking Relay	Control Function	No
4	Master Contactor	Control Function	No
5	Stopping Device	Control Function	No
6	Starting Circuit Breaker	Primary Equipment - Control	No
7	Rate-of-rise Relay	Protective Function which responds to electrical quantities	Yes*
8	Control Power Disconnecting Device	Control Function	No
9	Reversing Device	Control Function	No
10	Unit Sequence Switch	Control Function	No
11	Multifunction Device	Contains Protective Functions which respond to electrical quantities	Yes*
12	Overspeed Device	Protective Function which does not respond to electrical quantities	No
13	Synchronous-Speed Device	Control Function	No
14	Underspeed Device	Protective Function which does not respond to electrical quantities	No
15	Speed or Frequency Matching Device	Control Function	No
16	Data Communications Device	Supporting Communications Device	No
17	Shunting or Discharge- Switch	Control Function	No
18	Accelerating or Decelerating Device	Control Function	No

**Table C-1: Initial Screening of Devices**

Device Number	Function	Analysis	Should the function be considered for inclusion as component in Protection System?
19	Starting-to-Running Transition Contactor	Control Function	No
20	Electrically Operated Valve	Primary equipment	No
21	Distance Relay	Protective function	Yes*
22	Equalizer Circuit Breaker	Control Function	No
23	Temperature Control Device	Control Function	No
24	Volts-per-Hertz Relay	Protective Function	Yes*
25	Synchronizing or Synchronism Check	Control Function	No
26	Apparatus Thermal Device	Might be protective function, but does not respond to electrical quantities	No
27	Undervoltage Relay	Might be protective function depending upon application	Yes*
28	Flame Detector	Does not protect Element and does not respond to electrical quantities	No
29	Isolating Contactor	Control Function	No
30	Annunciator Relay	Provides information that is advisory in nature	No
31	Separate Excitation Device	Control Function	No
32	Directional Power Relay	Might be a protective function, depending upon the application	Yes*
33	Position Switch	Control Function	No
34	Master Sequence Device	Control Function	No
35	Brush-Operating or Slip-Ring Short-Circuiting Device	Control Function	No
36	Polarity or Polarizing Voltage Device	Control Function	No
37	Undercurrent or Underpower Relay	Might provide Protective Function depending on application	Yes*

**Table C-1: Initial Screening of Devices**

Device Number	Function	Analysis	Should the function be considered for inclusion as component in Protection System?
38	Bearing Protective Device	Might be a protective function, but it does not respond to electrical quantities	No
39	Mechanical Condition Monitor	Might be a protective function, but it does not respond to electrical quantities	No
40	Field Relay	Protective Function	Yes*
41	Field Circuit Breaker	Non-BES interrupting device	No
42	Running Circuit Breaker	Control circuitry which might be associated with Protective Function, but not a function itself	N/A
43	Manual Transfer or Selector Device	Control Function	No
44	Unit Sequence Starting Relay	Control Function	No
45	Atmospheric Condition Monitor	Might provide protective function, but does not respond to electrical quantities	No
46	Reverse-Phase or Phase- Balance Current Relay	Might provide Protective Function depending on application	Yes*
47	Phase-Sequence or Phase Balance Voltage Relay	Might provide Protective Function depending on application	Yes*
48	Incomplete Sequence Relay	Control Function	No
49	Machine or Transformer Thermal Relay	Protective function, but does not respond to electrical quantities	No
50	Instantaneous Overcurrent	Protective Function	Yes*
51	AC Time Overcurrent Relay	Protective Function	Yes*
52	AC Circuit Breaker	Control circuitry which might be associated with Protective Function, but not a function itself	N/A
53	Exciter or DC Generator Relay	Control Function	No
54	Turning Gear Engaging Device	Control Function	No
55	Power-Factor Relay	Control Function	No
56	Field Application Relay	Control Function	No



**Table C-1: Initial Screening of Devices**

Device Number	Function	Analysis	Should the function be considered for inclusion as component in Protection System?
57	Short-Circuiting or Grounding Device	Control circuitry which might be associated with protective function, but not a function itself	N/A
58	Rectification Failure Relay	Might provide protective function	Yes*
59	Overvoltage Relay	Might provide protective function	Yes*
60	Voltage or Current Balance Relay	Might provide protective function	Yes*
61	Density Switch or Sensor	Might provide protective function, but does not respond to electrical quantities	No
62	Time-delay Stopping or Opening Relay	Control Circuitry which may be associated with applicable Protective Function	Yes*
63	Pressure Switch	Might provide protective function, but does not respond to electrical quantities	No
64	Ground Detector Relay	Might provide Protective Function depending on application	Yes*
65	Governor	Control device	No
66	Notching or Jogging Device	Control Function	No
67	AC Directional Overcurrent Relay	Protective Function	Yes*
68	Blocking Relay	Might provide Protective Function depending on application	Yes*
69	Permissive Control Device	Control Function	No
70	Rheostat	Control Function	No
71	Level Switch	Does not protect Element	No
72	DC Circuit Breaker	Control circuitry which might be associated with Protective Function, but not a function itself	N/A
73	Load-Resistor Contactor	Control Function	No
74	Alarm Relay	Provides information that is advisory in nature	No
75	Position-Changing Mechanism	Control Function	No

**Table C-1: Initial Screening of Devices**

Device Number	Function	Analysis	Should the function be considered for inclusion as component in Protection System?
76	DC Overcurrent Relay	Protective Function	Yes*
77	Telemetry Device	Control Function	No
78	Phase-Angle Measuring or Out-Of-Step Protective Relay	Might provide Protective Function depending on application	Yes*
79	AC Reclosing Relay	Control Function	No
80	Flow Switch	Control Function	No
81	Frequency Relay	Protective Function	Yes*
82	DC Load-Measuring Reclosing Relay	Control Function	No
83	Automatic Selective Control or Transfer Relay	Control Function	No
84	Operating Mechanism	Control Function	No
85	Carrier or Pilot-Wire Receiver Relay	Communication System that might be associated with protective function, but not a function itself	N/A
86	Lockout Relay	Control circuitry that might be associated with protective function, but not a function itself	N/A
87	Differential Protective Relay	Protective Function	Yes*
88	Auxiliary Motor or Motor Generator	Primary equipment	No
89	Line Switch	Primary equipment	No
90	Regulating Device	Control Function	No
91	Voltage Directional Relay	Might be protective function depending upon application	Yes*
92	Voltage And Power Directional Relay	Protective Function	Yes*
93	Field-Changing Contactor	Control Function	No
94	Tripping or Trip-Free Relay	Control Circuitry which may be associated with protective function, but not a function itself	N/A

**Table C-1: Initial Screening of Devices**

<b>Device Number</b>	<b>Function</b>	<b>Analysis</b>	<b>Should the function be considered for inclusion as component in Protection System?</b>
95	(Reserved For Special Application)	Not applicable	N/A
96	(Reserved For Special Application)	Not applicable	N/A
97	(Reserved For Special Application)	Not applicable	N/A
98	(Reserved For Special Application)	Not applicable	N/A
99	(Reserved For Special Application)	Not applicable	N/A

\*Function must meet additional criteria of protective function guidance (initiating or preventing automatic isolation) for inclusion as a Protection System component.

## Appendix C – Protection System Decision Tree

