



# Proficiency Certification

## **Electric Power – System Operator** *(Including Reliability, Balance & Transmission)*

**APT's Proficiency Certification Program** in Electric Power Systems is based on a set of objectives that are valuable to the industry, the employer and the student. This program incorporates strategically designed curriculum to maximize the knowledge and skills in the electric power industry. This certification program consists of two levels of proficiency. **Level I** provides the important knowledge components needed to confidently work in this specialization. **Level II** builds the student's knowledge and skills to the level to proficient. **This certification credit applies towards APT's Associate Degree in Applied Sciences – Electric Power Systems.** This program is a must for those interested in a lifelong career in electrical power systems and wants to be productive, proficient, and recognized.

***Note:** APT is recognized by the North American Electric Reliability Corporation as a continuing education provider who adheres to NERC Continuing Education Program Criteria. These classes provide NERC CE Hours.*

### Program Objectives

- **Provide opportunity** for entry level students to become NERC credentialed electric power system operators
- **Proficient in system reliability, voltage control and load shedding** under normal and emergency conditions
- **Demonstrate proper control and restoration techniques** during normal and emergency system conditions
- **Demonstrate situational awareness for reliable grid operations** in accordance to NERC standards
- **Explain equipment functions and ratings** during normal and emergencies
- **Describe the various system protection components** and their applications for system reliability
- **Apply NERC Standards throughout the courses**
- **Demonstrate skills learned through power simulators**
- **Apply credit towards NERC CEHs and College Credits.**

### Features and Benefits

- Course curriculum, objectives and learning outcomes target employment and industry needs
- Interactive instruction from highly qualified and experienced instructors
- No prerequisites!
- State-of-the-art curriculum that is always updated
- Flexibility in scheduling
- **APT** considers prior experience or other accredited courses towards certificate and degree credit.

### Courses

#### **Level I Certification** (Competent; 120 hrs, 15 days)

- PC100 Electric Power System Fundamentals (24 hrs)
- PC101 Power System Equipment (16 hrs)
- PC102 Distribution Systems (24 hrs)
- PC103 Switching, Grounding & Safety (16 hrs)
- PC104 Protection Principles (16 hrs)
- PC105 Monitoring & Control (16 hrs)
- PC150 Communications & Telecommunications (8 hrs)

#### **Level II Certification** (Proficient; 120 hrs, 15 days)

- PC200 Generation Principles (24 hrs)
- PC215 Interconnected Systems (16 hrs)
- PC220 Reliability & Security (including Cyber Security) (16 hrs)
- PC230 Voltage Control & Collapse (16 hrs)
- PC240 Emergency Operations (16 hrs)
- PC245 Emergency Operations II (16 hrs)
- PC250 Situational Awareness (8 hrs)
- PC255 Situational Awareness II (8 hrs)

**Program Hours:** 240 (30 days), up to 240 NERC hrs.

### Accreditation



**APT** is accredited by the U.S. Department of Education's Distance Education and Training Council (DETC).



All courses qualify for CEUs (Continuing Education Units) approved by the International Association of Continuing Education and Training



**APT** is recognized by the North American Electric Reliability Corporation.



**APT courses are approved by Veterans Administration, GI Bill and DANTES!**

**Contact APT for more information!**

[www.aptc.edu](http://www.aptc.edu)

**(800) 431-8488**

**LEVEL I (Competent)****PC100 Electric Power System Fundamentals (24 hrs) [NERC: 20-CEH, 20-OT, 0-STD, 0-SIM, 20-EOP, 24-P]**

Agencies ◦ Terminology ◦ Generation ◦ Transmission ◦ Substations ◦ Distribution ◦ Protection ◦ Interconnections ◦ Control Centers ◦ Telecommunications ◦ Basic Concepts (circuit components, Ohm's Law, AC/DC, single-phase, three-phase, delta and wye)

**PC101 Power System Equipment (16 hrs) [NERC: 14-CEH, 14-OT, 4-STD, 4-SIM, 14-EOP, 16-P]**

Substation Layouts ◦ Transformers ◦ Breakers ◦ Switches ◦ Arresters ◦ Capacitors ◦ Reactors ◦ Control Buildings ◦ Batteries & Chargers ◦ Lines (design, maintenance, vegetation and underground) ◦ Operating Ratings (substation equipment and lines)

**PC102 Distribution Systems (24 hrs) [NERC: 16-CEH, 16-OT, 0-STD, 4-SIM, 16-EOP, 24-P]**

Radial ◦ Overhead ◦ Underground ◦ Metering ◦ Consumption ◦ Protection Overview ◦ Voltage Control (regulators, line drop compensators, capacitors and reactors) ◦ Load Balance ◦ Power Quality ◦ Service Reliability ◦ Automation

**PC103 Switching, Grounding & Safety (16 hrs) [NERC: 16-CEH, 16-OT, 0-STD, 0-SIM, 14-EOP, 16-P]**

Switching & Tagging ◦ Grounding Systems ◦ Ground Potential Rise ◦ Safety (touch-step, personal protective equipment) ◦ Equipment Testing ◦ Arc-Flash ◦ NESC Clearances ◦ PCB ◦ MSDS

**PC104 Protection (16 hrs) [NERC: 14-CEH, 14-OT, 6-STD, 8-SIM, 14-EOP, 16-P]**

Faults ◦ Fuses ◦ Relay Types ◦ Sensing Equipment ◦ Control Circuits ◦ Distribution (under-frequency, undervoltage, overcurrent, series reactors and reclosing) ◦ Transmission (zones, differential, breaker failure, out of step, pilot, phase comparison, transfer trip and single pole tripping) ◦ Interconnection ◦ Special and Intelligent Schemes ◦ Disturbance Monitoring Equipment ◦ Transmission Loadability

**PC105 Monitoring and Control (16 hrs) [NERC: 16-CEH, 16-OT, 4-STD, 8-SIM, 16-EOP, 16-P]**

Monitoring System Conditions ◦ Equipment Organization ◦ SCADA (master & remotes) ◦ E-Tagging ◦ EMS ◦ Time Error Correction ◦ Automatic Time Error Correction ◦ Satellite Time Calibration ◦ Intelligent Devices ◦ Substation Automation

**PC150 Communication and Telecommunications (8 hrs) [NERC: 6-CEH, 6-OT, 2-STD, 0-SIM, 6-EOP, 8-P]**

Communications & Coordination ◦ Effective Communications ◦ Departmental and Entities ◦ Best Practice ◦ Telecommunications Systems ◦ Fiber Optics ◦ Microwave ◦ Power Line Carrier ◦ Circuit Types and Classes ◦ Reliability

**LEVEL II (Proficient)****PC200 Generation Principles (24 hrs) [NERC: 20-CEH, 20-OT, 6-STD, 16-SIM, 20-EOP, 24-P]**

Power Transfer ◦ Frequency Stability ◦ Automatic Generation Control (AGC) ◦ Generator Excitation ◦ Power System Stabilizers ◦ Generator Speed Droop ◦ Generator Capability Curve ("D") ◦ Operating Reserves

**PC215 Interconnected Systems (16 hrs) [NERC: 16-CEH, 16-OT, 12-STD, 12-SIM, 16-EOP, 16-P]**

Interconnected Systems ◦ Agreement Types ◦ Responsibilities ◦ Dynamics of Interconnected Systems (islands, motor starting, ACE, Bias) ◦ Protection ◦ Frequency/Voltage Load Shedding ◦ Load Flow ◦ Available Transfer Capability (ATC) ◦ Total Transfer Capability ◦ Capacity Benefit Margin ◦ Transmission Loading Relief ◦ Interconnection Reliability Operating Limits ◦ Disturbance Control Standard ◦ Interchange Schedules ◦ Dynamic Transfers ◦ Source ◦ Sink Balancing Authorities

**PC220 Reliability and Security (16 hrs) [NERC: 16-CEH, 16-OT, 4-STD, 12-SIM, 16-EOP, 16-P]**

Control Center Operations ◦ System Reliability Concepts ◦ Reliability Awareness ◦ Equipment Reliability ◦ System Reliability ◦ Cyber Security (terminology, application, situational awareness, vulnerability analysis, studies, drills, threats) ◦ Security Improvement

**PC230 Voltage Control and Collapse (16 hrs) [NERC: 16-CEH, 16-OT, 4-STD, 12-SIM, 16-EOP, 16-P]**

Voltage Control Concepts (excitation, reactive support, regulators, static var compensators, power factor correction and load control) ◦ System Operating Limits (derivation, normal, emergency, flexibility) ◦ Voltage Collapse (types, causes, actions, responsibility)

**PC240 Emergency Operations (16 hrs) [NERC: 16-CEH, 16-OT, 12-STD, 12-SIM, 16-EOP, 16-P]**

Responsibilities (TO, RC, BA, GO) ◦ System Emergencies ◦ Real Time Contingency Analysis ◦ Load Shedding ◦ System Restoration ◦ Line Loading ◦ Load Restoration ◦ Offline System Analysis Tools ◦ Backup Control Centers ◦ Backup Operating Plans ◦ Sabotage ◦ Responses ◦ Congestion Management.

**PC245 Emergency Operations – II (16 hrs) [NERC: 16-CEH, 16-OT, 12-STD, 12-SIM, 16-EOP, 16-P]**

Area Control Error (ACE), Interconnection Islands, Real Time Contingency Analysis, System Restoration and Black Start.

**PC250 Situational Awareness (8 hrs) [NERC: 8-CEH, 8-OT, 4-STD, 6-SIM, 8-EOP, 8-P]**

Situational Awareness ◦ Situation Analyses ◦ Manage and Control Operations ◦ Operating Tools ◦ Best Practices ◦ Conditional Awareness

**PC255 Situational Awareness – II (8 hrs) [NERC: 8-CEH, 8-OT, 0-STD, 6-SIM, 8-EOP, 8-P]**

Voltage and Frequency Limits ◦ MW Reserves ◦ System Operating Limits ◦ Interconnection Reliability Operating Limits ◦ Forecasting ◦ Contingency Analysis ◦ Disturbance Control Standard (CPS1 and CPS2) ◦ Warning Signs