

## Essential training for new staff in the power industry

The SOS Intl PowerStarters program was developed to easily fit into your initial operator training program and provide an introduction to the Bulk Electric System (BES). PowerStarters is now grouped into three different programs to best fit your training needs.

This content-rich training introduces the new operator or trainee to the power grid, and its components and operations. It also helps you comply with NERC's requirement for initial operator training to orient new hires to the electric grid.

### Who Needs PowerStarters?

New recruits, line crews moving into system operations, and new staff heading into Marketing Operations all need the orientation and fundamental knowledge that comes with PowerStarters.



## PowerStarters Level 1

### Area Control Error Equation

Students will learn the application and importance of the ACE equation, including:

- How to define, describe, and properly calculate the ACE equation
- Calculating Net Interchange Actual and Net Interchange Scheduled
- Understanding and calculating Actual and Scheduled Frequency
- Causes of Inadvertent Interchange
- Generator reaction due to loss or increase of load within the ACE equation

### Blackout Events

This courses provide students with an understanding of the history of reliability and major blackouts. Key subjects include:

- Root causes of the six most significant blackouts in North America
- Regulations, processes, and procedures NERC established to help prevent blackouts from recurring

### Critical Infrastructure Protection Version 6

This course introduces students to the security measures established to protect facilities, equipment, and data against compromise that could lead to misoperation or instability in the BES. Students will learn:

- How to identify and protect BES Cyber Assets
- How to use the prevent, detect, defend, and recover strategy to protect BES Cyber Assets
- How to establish physical access controls to protect BES Cyber Assets
- How to establish electronic access controls to protect BES Cyber Assets
- How to respond to and recover from a cyber incident

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## Effective Communications

This course is designed to improve personal communication with elements focusing on industry-specific communications techniques. Students review examples of good and poor verbal, written, and electronic communication of information, while following a learning path tied specifically to an area of expertise – System Operations, Power Delivery and Field Operations, and Customer Service. Students will understand:

- The five elements of effective communication
- Three-part communication
- The five W's of effective communication
- Barriers to effective communication
- Best practices for effective communication
- Practical aids to communication

## FERC Standards of Conduct (SOC)

The FERC Standards of Conduct (SOC) course is designed to educate students on the FERC SOC and how employees in the transmission and marketing areas of a public utility or interstate natural gas pipeline should apply them in day-to-day activities. Course details include:

- The overall functions of FERC and the FERC SOC expectations
- The Independent Functioning Rule and the Conduit Rule

## Geomagnetic Disturbances

This course explores the roots and impacts of geomagnetic disturbances (GMDs) within the electric utility industry, including:

- Definition of GMDs
- The causes of GMDs
- The impact of GMDs on the BES
- How the SpaceWeather Prediction Center predicts and reports upcoming GMDs
- Proper operator reaction to GMDs

## Human Error Prevention

The Human Error Prevention course teaches students to mitigate errors and develop a system for recognizing and managing human behavior while developing a culture of reliability excellence and building a learning organization through:

- Understanding the difference between Human Performance and Behavior
- Investigating types of Human Errors and error precursors
- Creating awareness of situations in which people are most susceptible to making errors
- Identifying common traps and mental biases that influence system operators
- Understanding the impact of an organization's environment and culture

## Math for Energy Professionals

This course introduces students to the mathematical operations required for system operations responsibilities such as:

- Equations and formulas used in daily system operations activities
- Powers (exponentiation), square roots, scientific notation, and graphing
- Basics of trigonometry and how it is used in mechanical and civil engineering
- Trigonometric functions such as sine, cosine, tangent, and cotangent

## Power System Fundamentals

This course provides an overview of the BES and the components used in the generation, transmission, and distribution of electricity as well as the NERC Reliability Standards that govern grid operations. This course is designed for non-engineer power professionals to understand technical aspects of the electric grid such as:

- Interconnected power system operations
- Generation and power plant characteristics
- Transmission
- Substation and system protection
- Control center operations
- Other basic components of the power system

## Reactive Power Fundamentals and Voltage Control

In this course students become familiar with the concept of voltage control and learn to work with the associated equipment and controls:

- NERC Standards that pertain to voltage control
- Various equipments' capabilities in effective voltage control
- Voltage control use in real time operations
- Problem solving and diagnosis with voltage control equipment
- Various techniques for utilizing voltage control equipment in real time operations

## Reliability and Functional Entities

This course introduces or reviews the regulation history in the electric utility industry covering:

- Roles, relationships, and responsibilities of FERC, NERC, Regional Reliability Organizations, and Entities
- NERC's use of mandatory standards to ensure BES reliability
- NERC Reliability Functional model
- Roles and responsibilities of the NERC Functional model components

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## PowerStarters Level 2

### Electric Power Principles

Electric Power Principles provides a foundation of knowledge for anyone working in the bulk electric industry. Your new staff will learn about:

- Ohm's Law and the basic power and energy formulas
- Circuits in series and in parallel
- Electromagnetism, inductance, capacitance, and the relationship between voltage and current
- Phasors, phase angles, power angles, torque angles, and synchronizing
- The basic operation of transformers, conductors, and generators

### Fundamentals of System Protection

Your new recruits will learn about safeguards built into the BES including:

- Types of protective relays and relay technologies
- Functions and limitations of various system protection equipment types
- How relays work together for total system protection
- Recognition of fault conditions including some practice in fault event detection
- How system protection schemes operate to minimize equipment damage

### Power Plant Principles

In this course students will learn the types of power plants and their operating principles as a basis for system operations responsibilities. Highlights of what they will learn include:

- The variety of power plant types
- Efficiency and heat related to the operation of a power plant
- Fuel options for power plants
- Qualities and production techniques for various power plant fuels
- Steam generation in the power plant boiler
- Conversion of heat energy to mechanical energy in the turbine

### Transmission Equipment Principles

New power industry workers need to understand how the power gets from the plant to the consumer. In this course your staff will learn:

- The principles of transformers
- The various types of transformers
- The construction and significant components of circuit breakers
- Switching devices
- The various types of switching

Finally, they will learn how to recall and apply the appropriate NERC Reliability Standards to the issues surrounding transmission facilities.

### Voltage Control

In this course, students learn how system operators work to ensure voltage levels, reaction flows, and reactive resources are monitored, controlled, and maintained within limits in Real-time to protect equipment and ensure reliable operation of the Interconnection, including:

- Electric power principles
- Generators and transmission lines
- Voltage and power control equipment



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## Pricing Information

Our PowerStarters program will introduce your students to the BES and help prepare them for their new roles. We have grouped our PowerStarters courses into three groups – Level 1 provides basic introductory information, Level 2 brings them to the next stage in the training process, and PowerStarters Complete provides them the entire range of PowerStarters courses.

### POWERSTARTERS FOR NERC PREP

|          | PRICE    |
|----------|----------|
| LEVEL 1  | \$ 1,300 |
| LEVEL 2  | \$ 1,100 |
| COMPLETE | \$ 2,300 |

|   | LEVEL 1 | LEVEL 2 | COMPLETE |
|---|---------|---------|----------|
| Area Control Error Equation                   | X       |         | X        |
| Blackout Events                               | X       |         | X        |
| Critical Infrastructure Protection Version 6  | X       |         | X        |
| Effective Communications                      | X       |         | X        |
| Electric Power Principles                     |         | X       | X        |
| FERC Standards of Conduct                     | X       |         | X        |
| Fundamentals of System Protection             |         | X       | X        |
| Geomagnetic Disturbances                      | X       |         | X        |
| Human Error Prevention                        | X       |         | X        |
| Math for Energy Professionals                 | X       |         | X        |
| Power Plant Principles                        |         | X       | X        |
| Power System Fundamentals                     | X       |         | X        |
| Reactive Power Fundamentals & Voltage Control | X       |         | X        |
| Reliability and Functional Entities           | X       |         | X        |
| Transmission Equipment Principles             |         | X       | X        |
| Voltage Control                               |         | X       | X        |



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