NERC SMWG Outline for Role-Based Synchrophasor Training (RBST)

1. Introduction to Synchrophasor Technology

- **Overview of Synchrophasors**
  - Definition and basic principles
  - Historical development and evolution
- **Importance in Modern Power Systems**
  - Benefits and applications
  - Case studies and success stories

2. General Training for All Departments

- **Basic Concepts**
  - Phasor Measurement Units (PMUs)
  - Data acquisition and synchronization
- **System Integration**
  - Communication networks
  - Data management and storage
- **Regulatory and Compliance Requirements**
  - Standards and protocols (e.g., IEEE C37.118)
  - Compliance with NERC and other regulatory bodies

3. Department-Specific Training Modules

A. Transmission Planning

- **Synchrophasor Applications in Planning**
  - Grid stability analysis
  - Load forecasting and capacity planning
- **Case Studies**
  - Real-world examples of synchrophasor use in planning

B. Transmission Operations

- **Tailored Advanced Fundamental Concepts**
  - Synchrophasor Theory
  - Distribution Devices
  - Data Quality
- **Real-Time Monitoring and Control**
  - Situational awareness
  - Voltage stability and oscillation detection
- **Event Analysis**
  - Post-event analysis and reporting
  - Tools and software for operational use

C. Protection and Control

- **Tailored Advanced Fundamental Concepts**
- **Enhanced Protection Schemes**
  - Wide-area protection
  - Adaptive relaying
- **Fault Detection and Isolation**
  - Faster and more accurate fault location
  - Coordination with traditional protection systems

D. Distribution Operations

- **Tailored Advanced Fundamental Concepts**
  - Synchrophasor Theory
  - Distribution Devices
  - Data Quality
- **Distribution System Monitoring**
  - Integration of PMUs in distribution networks
  - Voltage and frequency monitoring
- **Outage Management**
  - Improved fault detection and restoration
  - Coordination with AMI (Advanced Metering Infrastructure)

E. Information Technology (Data Management)

- **Tailored Advanced Fundamental Concepts (Deep Dive)**
  - Networking
  - Data Concentration
  - Protocols (C37.118, IEEE 2664-2024 (STTP)
  - Data Quality
  - PMU Devices
- **Data Handling and Storage**
  - Big data challenges and solutions
  - Data security and privacy
- **Integration with IT Systems**
  - SCADA and EMS integration
  - Data analytics and visualization tools

F. Research and Development

- **Advanced Fundamental Concepts (Deep Dive)**
  - Synchrophasor Theory
  - Networking
  - Data Concentration (Software)
  - Protocols (C37.118, IEEE 2664-2024 (STTP)
  - Data Quality
  - Hardware Devices
- **Innovative Applications**
  - New algorithms and methodologies
  - Pilot projects and experimental setups
- **Collaboration with Academia and Industry**
  - Joint research initiatives
  - Funding opportunities and grants

G. Compliance

- **Regulatory Framework**
  - Understanding compliance requirements
  - Regular audits and reporting
- **Best Practices**
  - Ensuring continuous compliance
  - Training and certification programs

H. Executive Leadership

- **Strategic Importance of Synchrophasors**
  - Long-term benefits and ROI
  - Integration into corporate strategy
- **Decision-Making and Policy**
  - Policy development and implementation
  - Risk management and mitigation

I. Maintenance and Field Services

- **Advanced Fundamental Concepts (Deep Dive)**
  - Synchrophasor Theory
  - Hardware devices
  - Commissioning/Configuration/Testing
  - Data Quality
- **Installation and Maintenance of PMUs**
  - Best practices for installation
  - Routine maintenance and troubleshooting
- **Field Data Collection**
  - Techniques for accurate data collection
  - Safety protocols and procedures

J. Customer Service and Support

- **Understanding Synchrophasor Data**
  - Basic interpretation of data for customer inquiries
  - Communicating benefits to customers
- **Support and Troubleshooting**
  - Common issues and solutions
  - Escalation procedures

4. Practical Workshops and Hands-On Training

- **Simulation Exercises**
  - Real-time scenarios and problem-solving
- **Field Training**
  - Installation and maintenance of PMUs
  - On-site troubleshooting

5. Assessment and Certification

- **Training Format**
  - Instructor-led
  - Online courses
- **Knowledge Checks**
  - Quizzes and tests for each module
- **Certification**
  - Role-based certification upon completion
  - Continuous education and re-certification

6. Continuous Improvement and Feedback

- **Feedback Mechanism**
  - Regular feedback from participants
  - Iterative improvement of training content
- **Updates and Refresher Courses**
  - Keeping up with technological advancements | Periodic refresher courses