DFR Configuration Control

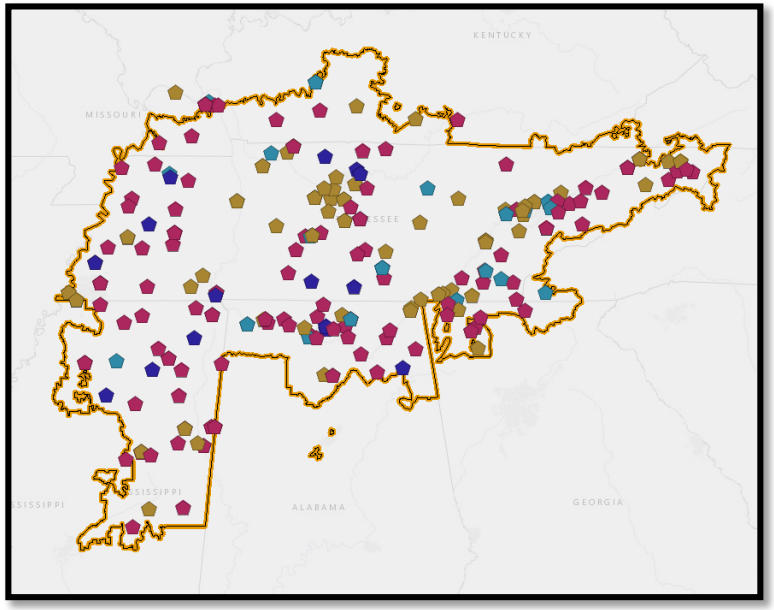
Solutions for Optimized Performance and Compliance

OpenPQ Dashboard Users Group – May 2021

TVA TENNESSEE VALLEY AUTHORITY

Tennessee Valley Authority (TVA)

- Generation and transmission owner/operator serving **10 million people** across seven states
- TVA employs a wide array of disturbance monitoring devices, including **digital fault recorders (DFR)** to establish grid visibility
- DFRs are being leveraged for a variety of growing business purposes
  - Fault analysis
  - Power quality monitoring
  - Equipment health status
  - Phasor measurement unit data



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Compliance History – 2006

- Disturbance monitoring equipment governed by a pair of North American Electric Reliability Corporation (NERC) standards that primarily delegate authority to the Regional Reliability Coordinator (RRC)

PRC-002-1

- **RRC** establish criteria for sequence of events (SER)
- **RRC** establish criteria for fault recording (FR)
- **RRC** establish criteria for dynamic disturbance recording (DDR)
- **RRC** establish criteria for data reporting
- **RRC** provide requirements to affected owners
- **RRC** periodically review requirements

PRC-018-1

- Time synchronization
- Disturbance data retrievable 10 days
- Installed per **RRC**
- Report data per **RRC**
- Archive data per **RRC**
- Maintenance and testing program

Compliance History – 2015

- To have adequate data to facilitate analysis of the Bulk Electric System (BES), NERC adopts a new standard for Transmission Owners (TO) and Generation Owners (GO) to identify specific requirements for disturbance monitoring equipment

PRC-002-2

- Identify BES buses per NERC methodology
- **Breaker position data for SER**
- **Electrical quantities for triggered FR**
- **Event length, recording rate, triggers for FR**
- Identify DDR buses per NERC methodology
- **Electrical quantities for triggered DDR (TO)**
- **Electrical quantities for triggered DDR (GO)**
- **Continuous recording for DDR data**
- **DDR data sampling rate**
- **SER, FR, and DDR time synchronization**
- Data archiving and reporting requirements
- Failed device/recording requirements

Setting controlled by DFR configuration file

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Configuration Control

- Detection of DFR status and configuration is fundamental element of control
- Visibility of a broad and diverse fleet of instrumentation presents logistical challenges
- Field changes for routine calibration, maintenance, or construction can be difficult to manage

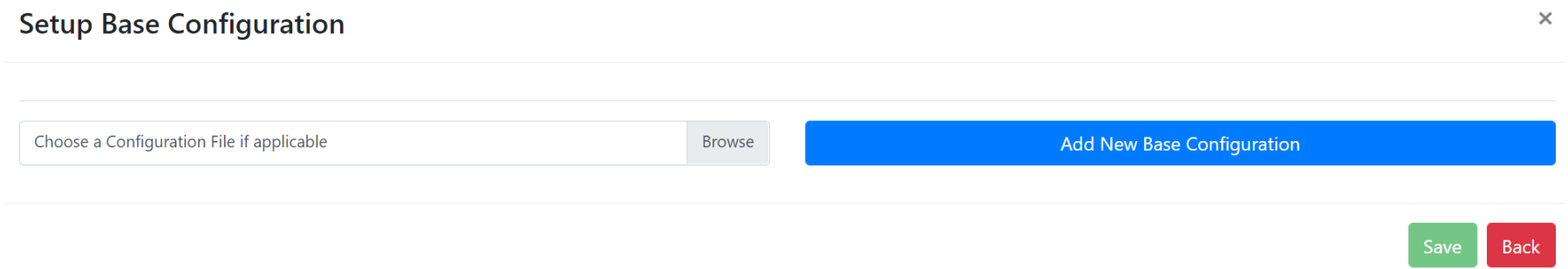
DFR reliability and device configuration control are not only best industry practices, but critical elements of PRC compliance

Strategy for Success

- TVA implementing miMD – an open-source maintenance and diagnostic monitoring application from Grid Protection Alliance (GPA)
- PRC-002 module developed with key objectives derived from the standard
  - Retrieve device configuration and status files
  - Scan the files for changes
  - Determine if changes have compliance and/or performance implications
  - Provide visibility to DFRs needing review or maintenance
  - Track required actions to resolution
- Retrieves information from a variety of field devices regardless of vendor

miMD PRC-002 (Base Configuration)

- Process begins with establishing a Base Configuration for a device to be managed within the application
- Base Configuration serves as the image against which all future files are measured
- A configuration file previously verified to meet the requirements of PRC-002-2 can be imported into the tool and parsed for line-by-line review



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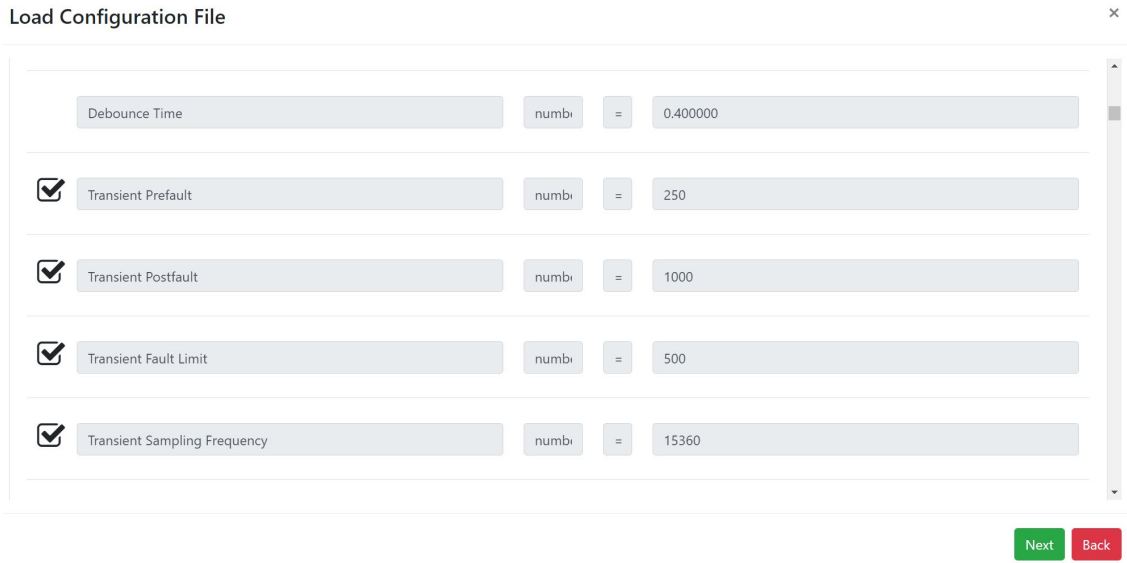
miMD PRC-002 (Base Configuration)

- Users select the line items of the configuration file that would result in potential compliance violations if changes were unreviewed/unapproved

PRC-002-2 R4



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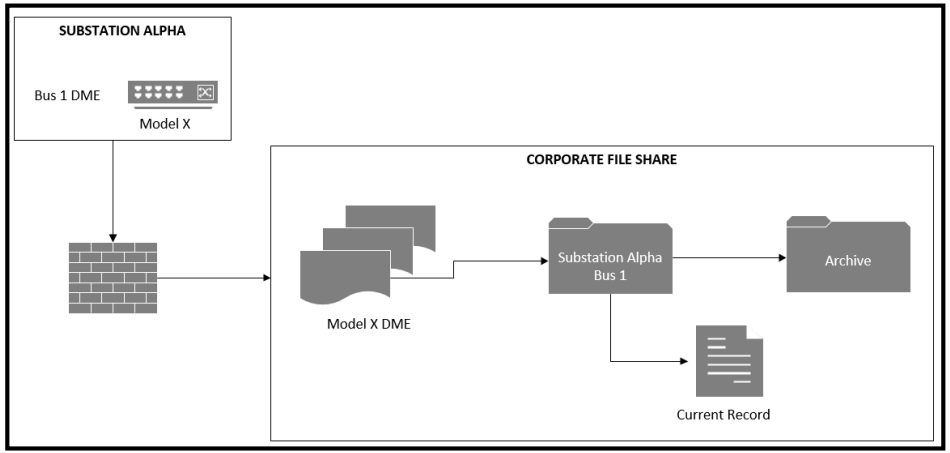
miMD PRC-002 (Device Status)

- miMD interfaces with an OpenMIC for retrieval of configuration and diagnostic files
  - Features a customizable schedule and a customizable mask for specific types of files
- Retrieved configuration files are routed to a repository and compared against the record on file
- Files that include ANY change supplant the existing, which is moved to an archive



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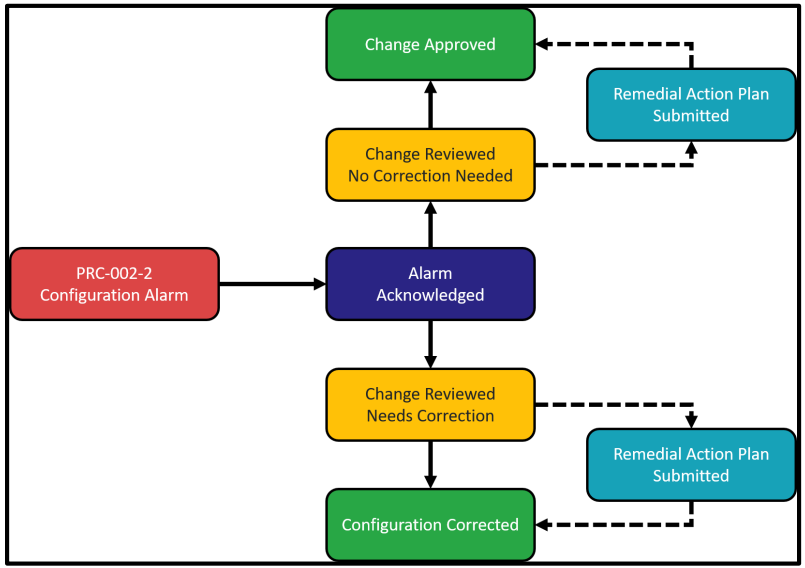
miMD PRC-002 (Change Management)

- Each time the file of record updates for a device set up within miMD, the application determines if the change occurred in a PRC-002-2 related field (Base Configuration)
- Changes flagged within these compliance fields will initiate work flow of change management



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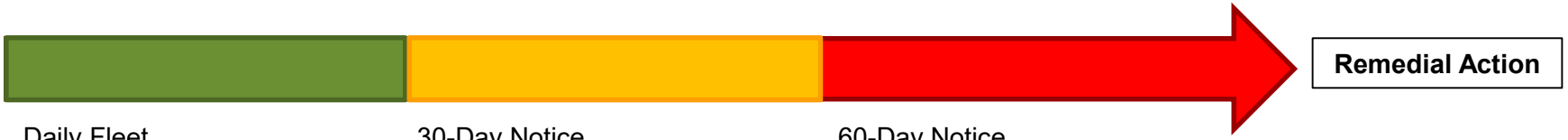
miMD PRC-002 (Notifications)

- In order to maintain awareness of compliance status, users can manage email notifications from the system via a self-subscription service in which schedules and geographic areas can be customized by job role.

- For a device that reaches a non-compliant state, additional email notifications are distributed if the device remains non-compliant at 30-day and 60-day intervals as the action deadline approaches

- In the event a device cannot be returned to a compliant state within the 90 days the standard requires, the remedial action plan can be identified and logged within miMD



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Conclusion

- PRC-002-2 compliance drives the need for DFR configuration visibility and control
- Increased DFR fleet size and diversity enhances the need for an automated approach
- miMD provides TVA the functionality to address these needs through a systematic approach
  - Maintain constant contact with the fleet
  - Identify change as it occurs
  - Notify appropriate owners to track to resolution
  - Provide an historical record for future reporting purposes


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