

0 What: Transmission and Distribution Power Systems Model Mapping (11.2.1)

0.1 Abstract:

This work defines strategies for integrating standards across different environments to support different real-time and back-office applications. Strategies call for defining key applications and evaluating the available standards for meeting the requirements of such applications. Modeling of the electric power system, multifunctional IEDs, and definition of standard methods for reporting events and exchanging relay settings will meet the requirements for improvements of the efficiency of many protection, control, engineering, commissioning and analysis tasks. Field equipment can supply the raw data for objects and measured parameters used across the enterprise based on the standard models and file formats defined.

0.2 Description:

Advanced protection, automation, and control applications will benefit from a utility-wide communication infrastructure. The information requirements of these Smart Grid applications must be identified and standardized to the level required to achieve interoperability. Use cases describing the application are the basis for this. Information needs then must be mapped to the existing transmission and distribution power system models. The existing models need to be extended where required.

This work develops an approach for integrating the application-level communications from several standards. The IEC 61850 standard provides a basis for field equipment communications and provides semantics for communications with field equipment, including real-time operations as well as non-operational data, such as condition monitoring. The IEC 61968 and IEC 61970 provide the structure and semantics for integrating a variety of back office applications. The models of the transmission and distribution power system are available in IEC 61970 and IEC 61968-11. Some of the information to be added may be retrieved from devices supporting IEC 61850. Some of the Smart Grid applications that need this information may reside in devices supporting IEC 61850. Therefore, an extension of the IEC 61850 models may be required as well.

An automated verification of the different settings of the components of a power system will be essential in the future to prevent system failures due to misconfiguration that may lead to blackouts. In order to make these applications possible across the power system, standardization of the setting information is required. In addition to setting information of the individual devices, these applications also may require enhanced information about the power network, such as line characteristics or topology. IEEE PES PSRC Working group H5 is in the process of completing the protection settings object models and defining a common data format for exchange between applications.

Other standards to be considered are IEEE PC37.239, which defines a Standard Common Format for Event Data Exchange (COMFEDE) for Power Systems, and IEEE PC37.237, which defines a Recommended Practice for Time Tagging of Power System Protection Events.

0.3 Objectives:

- Develop strategies to expand and integrate MultiSpeak, IEC 61850, IEC 61968, IEC 61970, IEEE PC37.237 (Time Tagging), IEEE PC37.239 (COMFEDE) and the future IEEE Common Settings file format for Smart Grid Applications.
- Develop a summary of information required from the power system for various Smart Grid applications. – covered by PAP 08 Tasks
- Map that information with the already defined models from MultiSpeak, IEC 61970, IEC 61968-11, and IEC 61850. – covered by PAP 08 Tasks
- Coordinate with the SDO to extend the existing models. – covered by PAP08 Tasks
- Identify setting information that is required to perform an automatic verification of the power system configuration to prevent failures due to mis configurations. This information shall include both settings in the devices as well as parameters of the power network that need to be available for verification. – long-term issue (two-year effort) and is Use Case-based; step one: IEEE group work PSRC H5; key: how can we do setting verification?
- Coordinate with the SDO to extend the existing standards with that information.

0.4 Why:

This work can enable the effective integration of field-equipment data and information with that used for enterprise back-office systems. Many existing applications require manual conversion between different proprietary formats. A standards-based approach for system models, protection settings, and event-reporting data exchange will improve the efficiency of many Smart Grid-related tasks. This integration can enable many new applications that may not be possible by just operating in one environment.

0.5 Where:

The integration of these standards would take place across the enterprise where field equipment operations need to integrate with back-office systems. Models and settings will be implemented in multifunctional IEDs at different levels of the substation and electric power system hierarchy. They will be used also in analysis, testing, commissioning, asset management, automatic analysis, and protection coordination tools. Several interfaces will be involved through the development of the standards that are targeted for their environment.

0.6 How:

The activities related to this task will require coordination with many SDOs. Strategies for integration of the different standards shall be developed in cooperation with the SDOs involved.

This work shall identify and/or develop key requirements and use cases that define the type of integration needed across these standards. Information requirements for the different Smart Grid applications need to be identified. This work needs to involve the different stakeholders and domain experts.

The mapping of that information on the existing models as well as the extension needs to be done by the relevant working groups (IEC TC57 WG10, 13, 14 and 19). This work shall contribute technical support to the SDOs.

The completion of the settings data objects in protection logical nodes will be done in working group H5 of the IEEE PSRC (Juergen Holbach, Chairman). Following the completion of this work, the logical nodes in IEC 61850 will be updated. A PAR will then be submitted to define a file format for setting data exchange based on the IEC 61850 substation configuration language. The work based on this action plan shall contribute technical input.

Other SDOs involved are IEEE PSRC WG H3 (IEEE PC37.237) and H16 (IEEE PC37.239).

0.6.1 Task Descriptions

The task 5 to 9 identified are the same tasks as identified already in PAP 08. While in PAP 08 the focus for the use cases shall be on Distribution grid management, here the focus of the use cases shall be on transmission and distribution models.

0.6.1.1 Task 1

Investigate impact of IEEE PC37.239 (COMFEDE) on CIM and 61850. This shall be done together by the CIM/IEC 61850 harmonization task force of WG19 (M. Goodrich) and by IEEE PSRC H16 (Pierre Martin).

0.6.1.2 Task 2

Create team to identify Use Cases for setting information that is required to perform an automatic verification of the power system configuration. This shall be done by IEEE PSRC.

0.6.1.3 Task 5

Create a team to identify and develop Smart Grid focused master list of critical use cases. This shall be done by the T&D DEWG.

0.6.1.4 Task 6

The team created as result of task 5 shall create Smart Grid focused master list of critical Use Cases with suggested priority.

0.6.1.5 Task 7

The team shall based on the list and priorities defined in task 6 create and/or refined the Smart Grid use cases.

0.6.1.6 Task 8

WG19 Smart Grid TF shall review the use cases from task 7, confirm the priority and shall assign them to the appropriate WGs or other entities.

0.6.1.7 Task 9

The appropriate WG shall develop the requirements and build the models for the use cases assigned from Task 8. It is important that, in the case that a use case requires updates and extensions of models in e.g. both CIM and IEC 61850, that these updates are done in parallel and coordinated.

0.6.2 Deliverables

The following deliverables will be prepared:

- A report stating the impact of PC37.239 on CIM and IEC 61850
- Master list of critical use cases as result of task 6
- New / refined use cases as result of task 7
- Updates of models as result of task 9

In addition, the team set up as task 2 will create use cases for automatic verification of settings.

0.7 Who:

Project Team
NIST Lead: Jerry FitzPatrick
EPRI Lead: Christoph Brunner
SDO Lead: Christoph Brunner Convenor IEC TC57, WG10
Other SDOs: IEEE PSRC H3 Committee Chair Bill Dickerson IEEE PSRC H5 Committee Chair Jürgen Holbach IEEE PSRC H16 Committee Chair Mark Adamiak IEEE Power Systems Relay Committee, Communications Subcommittee: Veselin Skendzic IEC WG13 Convenor Terry Saxton IEC WG14 Convenor Greg Robinson
Users Groups: UCAlug Mark Adamiak
Technical Team: Alex Apostolov (Member IEC TC57, WG10, 19, IEEE PSRC H3, H5 and H16)

0.7.1 When:

Task Description	Completion Date
Task 1: Impact of IEEE PC37.239	Q4-2009
Task 2: Team to investigate setting information	tbd
Task 5: Create SG use case team	09-2009
Task 6: Use case master list	Q4-2009
Task 7: Use cases refined	Q2-2010
Task 8: Review and assign use cases	Q2-2010
Task 9: Develop models	continuous; all by Q4-2010