System Protection Based SIPS

Study Committee B5, PS 2
Q2.06: What are the key innovation for an intelligent algorithm-based protection and how to address challenges during the application of the proposed protection schemes?

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System Protection Based SIPS

Contingency Action Solutions

- **Measure -** Power Flow at all key points
- **Detects -** Disturbance
- **Action Solution -** Less than 250 ms
- **Key Characteristics:**
  - Supports existing protection and metering devices and protocols
  - Can support complex network topologies
  - Advanced notice of interconnection trip to operators

Detection and Dampening of System Oscillations

- **Measures -** Power Flow at all key points
- **Detects -** Oscillations
- **Action Solution -** In ms or seconds
- **Sources and range of oscillations:**
  - 0.01Hz to 0.1Hz – Expanded GIC range
  - 0.1Hz to 1.0Hz – Inter-area oscillations
  - 1.0 to 10Hz – Forced Oscillation range
  - 10 Hz to 55 Hz– Sub Synchronous Oscillation range. Forced oscillations can also occur in the lower end (10 to 15 Hz) of this range.

Testing of System Protection Based SIPS

Testing Methodology - Type Tests

Functional Element Tests
- Individual devices;
- Performance of measure and protection elements.

Interoperability Tests
- Communication between devices;
- Interoperability - same level and different levels.

Integration Tests
- Interoperability between all devices.

System Tests
- Validation functional performance;
- Steady-state & dynamic tests;
- Negative tests.

Testing Methodology - Methodology Tests

Black Box Testing
- Outputs must comply the specification;
- Tests based on specification.

White Box Testing
- Behavior and structure;
- Monitor signals between IED's.

Top-down Testing
- SAT or upgrades, after IED's tested;
- If test fails, a level down must be tested to identify the failure.

Bottom-up Testing
- Lower-level functions on IED's;
- Type testing or homologation.

Group Discussion Meeting