WPD INNOVATION
Transforming the electricity network

ANM System Architecture Changes

Technical Specification & Implementation

September 2022

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Version Control

Issue	Date
1.0	02/09/2022

Publication Control

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Contents

1. Introduction

This document provides a functional specification for the implementation of short-term post-fault ratings (STPFR) to the existing ANM control system architecture.

This document builds on the high-level technical implementation of STPFR delivered under the Overhead Line Power Pointer project to determine the post-fault rating of OHL conductors based on real-time reported conductor temperature measurements. This was trialled in a non-live operational environment as part of OHL Power Pointer.

1.1. Scope

This technical specification will build on the following:

- A review of the existing ANM system architecture.
- Provide options for implementing necessary changes to the ANM system architecture to support the use of STPFRs.
- An assessment of failover arrangements of the ANM system in the event that conductor temperature information becomes unavailable.

The proposed functional specification and solution architecture is based on an ANM system implementation that is capable of receiving and utilising real time short-term post-fault ratings.

Based on the feedback from ANM system providers where the term DLR has been used, this has been updated to STPFR for consistency and the avoidance of doubt.

2. Technical Specification

2.1. Introduction

This section outlines the technical requirements of the ANM system to incorporate the use of STPFRs. It focuses on the connection between the WPD PowerOn and the ANM system.

2.2. System Requirements

Requirement No.	Requirement/ Procedure	Description
1	The ANM system would require the rating value(s) to be sent to the ANM system every 5 seconds or greater.	Values sent at a higher frequency would be accepted but the operating period of the ANM system would only take most recent value is used in the ANM calculations. STPFR will change at a slower rate even though the response can be quicker
2	The ANM system requires the rating to be in either amps or MVA.	This is predefined during the configuration of the ANM system.
3	The ANM would apply the rating value to the specified circuit/transformer at the next calculation cycle.	This would then be used in curtailment calculations and may affect DER (Distributed Energy Resource) set-points. There would be a delay between receiving the rating value and issuing a new DER set-point, this period may be up to twice the ANM operating period. The STPFR will be valid for 10 minutes on a continuously rolling window.
4	A fixed de-rating factor may be applied to the rating value.	This would provide a safety margin to accommodate the various system latencies and would be fixed during the ANM system configuration.
5	The rating value may also be used by the N-1 Contingency Rating calculation.	In this instance the N-1 rating module would use the dynamic value as the basis for calculating pre-fault ratings in accordance with WPD specification SD11. This would then be used in ANM real time calculations. The STPFR ratings are valid to use in N-1 scenarios because STPFRs are deterministic based on measured conductor temperature.

3. Options For Implementation

3.1. Introduction

This section provides an overview of the available implementation strategies. Each strategy has been assessed to select the preferred method of implementation based on the ease of integration with the source STPFR system to the ANM.

3.2. Implementation Strategies

Three strategies are available for passing the STPFR value from the source STPFR system to the ANM.

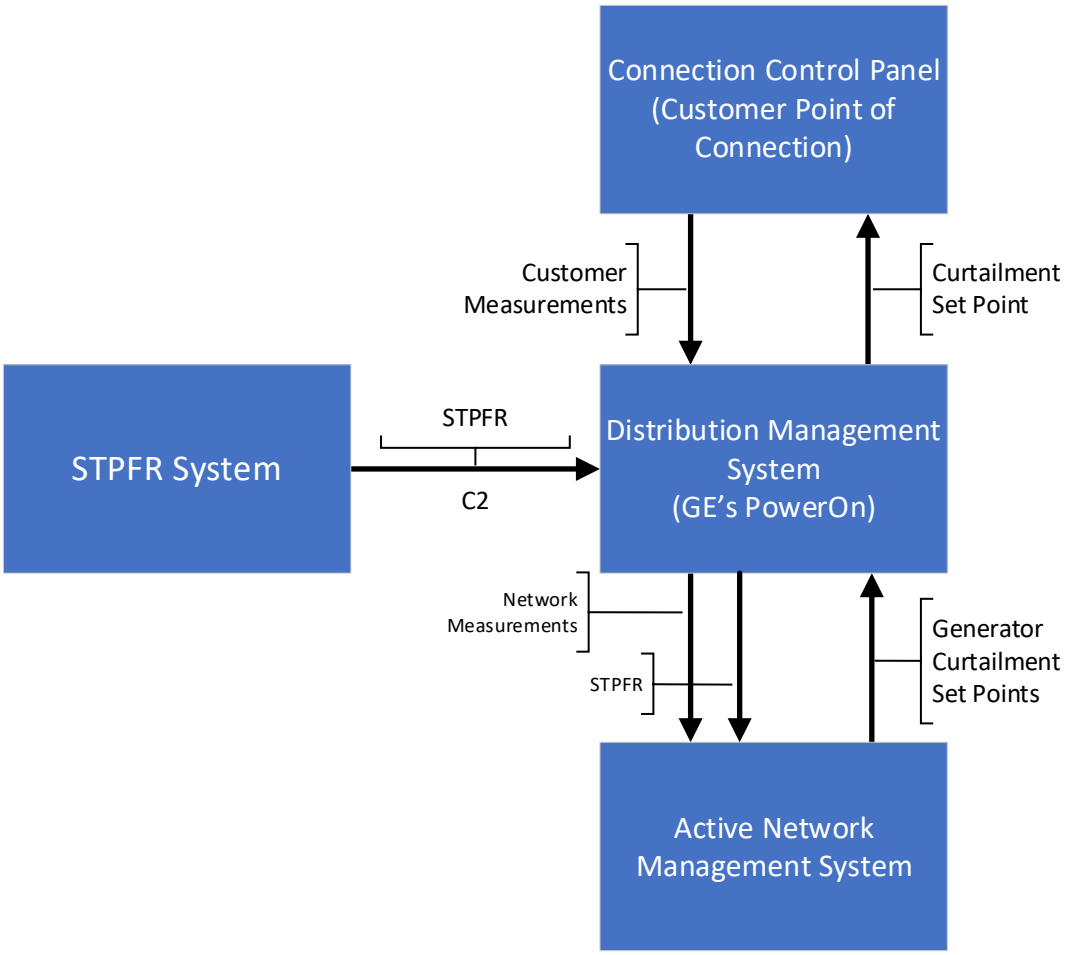
1. The STPFR system can send the STPFR value(s) directly to the WPD PowerOn. These are then included in the PowerOn to ANM ICCP transfer set, in conjunction with the majority of other ANM signals
2. The STPFR system can send the STPFR value(s) via DNP3 directly to the ANM system FEP (Front End Processor).
3. The STPFR system can send the STPFR value(s) via a RESTful API directly into the ANM database.

The preferred method of implementation is by using the STPFR system to send the value(s) directly to the WPD PowerOn. This avoids the creation of multiple interfaces to the ANM system (which in turn has an undesirable IT maintenance burden).

4. Architecture Implementation

4.1. Introduction

This section illustrates the proposed system architecture between WPD PowerOn and the ANM system.



It is expected that the STPFR will be delivered in the same ICCP transfer set as the network measurements. Additionally, the ANM system will have access to a set of static ratings that are used by default if the STPFR is unavailable via the ICCP transfer set.

5. Conclusion

This document has provided a functional specification of the technical requirements for the ANM implementation of the short-term post-fault rating of overhead line conductors based on real-time reported conductor temperature measurements.

This specification has covered the following:

- A review of the existing ANM system architecture.
- Provide options for implementing necessary changes to the ANM system architecture to support the use of STPFRs.
- An assessment of failover arrangements of the ANM system in the event that conductor temperature information becomes unavailable.

Following from this technical specification and implementation document, a series of technical documents will be produced to:

- Provide an updated specification for the derivation of STPFR alongside an end-to-end system architecture risk assessment (WP2)
- Detail the network use cases and quantified benefits of the STPFR solution (WP3).
- Produce a specification for the ANM system including a proposed system architecture (WP4).
- Generate a finalised cost-benefit analysis of the STPFR solution and drafted policy recommendations WP5).

Glossary

Abbreviation	Term
STPFR	Short-Term Post-Fault Rating
DER	Distributed Energy Resource
FEP	Front End Processor

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