

Network Innovation Allowance Progress Report

Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form.

Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

Project Progress

Project Title

Dynamic Line Rating CAT1

Project Reference

NIA_SHET_0004

Project Licensee(s)

Scottish Hydro Electric Transmission

Project Start Date

Apr 2009

Project Duration

6 Years

Nominated Project Contact(s)

Ben Gloag

Scope

To install a CAT-1 Transmission Line Monitoring system on a SHE Transmission line and demonstrate whether it can enable dynamic line rating resulting in safe and cost-effective line operation close to its thermal rating.

Objective(s)

- 1 Investigate the ease of integration of CAT-1 proprietary software with SHE Transmission's SCADA system
- 1 Evaluate levels of additional capacity achievable on the trial line through use of the installed CAT-1 equipment
- 1 Verify the correlation between practical observations and the theoretical model already established
- 1 Investigate the extent to which the technology can be applied without need for physical line uprating
- 1 Estimate potential Capex and Opex savings from use of dynamic ratings based on the data obtained

Success Criteria

- 1 Successful installation of the CAT-1 system and collection of sufficient data from the monitoring phase
- 1 Successful utilisation of collected data to review and evaluate technical and financial benefits and hence establish recommendations on future viability of the technology

Performance Compared to the Original Project Aims, Objectives and Success Criteria

Objective: Investigate the ease of integration of CAT-1 proprietary software with SHE Transmission's SCADA system

Background investigations which have been ongoing into the CAT-1 communication system and necessary power requirements have highlighted significant challenges that need to be addressed prior to deployment, to ensure compliance with the SHE Transmission

SCADA system and ensure effective transition into 'Business as Usual'. The challenges are primarily associated with the following key components;

- ▷ data collection;
- ▷ security of data transmission; and the
- ▷ ongoing communication system maintenance and up-keep.

Evaluation of the CAT-1 protocol has provided confidence that the real time information is in a format compatible with the SHE Transmission SCADA System.

Further investigation is required to ensure the information from the CAT-1 system is delivered in a way that benefits the end user. Although the investigations already carried out in this area form a significant component of this objective, conclusions about ease of integration will be finalised when a review of the practical work done is performed on project completion.

Objective: Evaluate levels of additional capacity achievable on the trial line through use of the installed CAT-1 equipment

It is believed that the CAT-1 has potential, given the information gathered, to be put to use in several different ways. The founding of this conclusion is based upon learning gained from the installation of three CAT-1 cells installed on live 132kV line and internal stakeholder discussion with the Operational Team. This preliminary work increased understanding about the practicalities of deploying sag monitoring technology and has proven the concept. The current phase of the project aimed to target a line with enough power flow to demonstrate the full range of operation of the CAT-1 system as well as verify the viability of the constituent communication technology to work in a real time system application. These two foregoing elements are considered to be essential for the application of sag monitoring in dynamic line rating systems. Identification and access to a line suitable for further trials has been challenging due to a combination of factors such as operational constraints and ongoing Transmission upgrade work.

Detailed assessment of the real time communication infrastructure and tower identification for optimum performance is ongoing.

Objective: Verify the correlation between practical observations and the theoretical model already established

Drawing upon learning obtained from CAT-1 installations elsewhere, there is now the opportunity to build upon the design of theoretical model developed so far by taking it one step further to investigate how power flows in the network could handle the increased current. It may be possible through engagement with internal and external stakeholders to identify additional levels of verification that would enable the theoretical model to be used more widely, if the preliminary results indicated a close correlation. The process of developing a new theoretical model which builds on previous experience and which takes into account the increased duty of the nominated trial line is currently in progress. This objective will only be completed after the trial installation has been completed and run for the monitoring period.

Objective: Investigate the extent to which the technology can be applied without need for physical line uprating

From evidence of CAT-1 installations elsewhere and learning from the initial installation of the three CAT-1 cells on the 132kV line in Argyll, there is strong evidence to support the introduction of this technology. This NIA project concentrates on developing the real time integration of the CAT-1 cells into SHE Transmission SCADA system to create a dynamic line rating system. The extent to which this application can be realised is dependent upon completion of the preceding objectives.

Objective: Estimate potential Capex and Opex savings from use of dynamic ratings based on the data obtained

This objective is pending installation of the CAT-1 units.

Required Modifications to the Planned Approach During the Course of the Project

No modifications required as of 31 March 2014.

Lessons Learnt for Future Projects

Three dynamic line rating cells were placed on the live 132kV network in Argyll in 2008 (under IFI funding) and the key learning obtained from this trial is as follows;

Measurement of the system into which the dynamic line rating cells are to be placed is necessary as links need to be fabricated/machined with a high level of precision;

Evaluation of the CAT-1 protocol has provided confidence that the real time information is in a format compatible with the SHE Transmission SCADA System;

The power supply for the dynamic line rating cells needs to be from a combination of sources such as batteries, solar and wind, if a suitable low voltage mains supply is not accessible;

Positioning of the dynamic line rating auxiliary equipment needs to be considered to ensure ongoing maintenance activities can be carried out safely.

The associated communication technology used during the Argyll 132kV deployment was a dial-up link, over which a several weeks worth of data would be retrieved. Therefore the system had less onerous energy requirements and challenges around real time data transfer. The present dynamic line rating system under this NIA project has incorporated the lessons learnt from the earlier trial.