

Attachment 1 – System Operator High Level Cost Estimate

Introduction

This document provides broad estimates for the System Operator implementation of Stage 1 of the Electricity Commission's proposed Multiple Frequency Keeper scheme. These estimates are based on the foreseeable tasks the System Operator would need to undertake to complete this work to the point where the new regime would be operational.

Background

The Electricity Commission has signalled its intention to proceed with the recommendations of the Kema "Multiple Frequency Keepers Investigation Alternatives" report & pursue a centralised AGC-based frequency regulation scheme.

Overall implementation of this scheme spans a number of phases, which are (broadly):

- establish centrally controlled frequency regulation via AGC to a single frequency keeper in each island
- establish a voluntary frequency regulation market & incorporate co-optimisation of frequency regulation, energy & reserves in System Operator scheduling & dispatch tools
- establish a full frequency regulation market

The following comments are limited to estimating the effort in establishing stage 1 AGC as a centralised frequency keeping service.

Scope & Assumptions

The scope of this estimate is based on the following work breakdown items:

- AGC licence
- Creation of AGC model for NZ power system/market environment
- Customisation of AGC to dispatch HVDC regulation component
- Customisation of Test & Training Simulation Environment to support AGC regulation component.
- Dynamic system studies to establish appropriate frequency bias factors for each island (including variability).
- Provision of high-resolution redundant frequency measurements to SCADA
- Provision of control signal outputs via SCADA
- Solution testing
- Business process development
- Travel
- Training - business process
- Training - technical
- Transition
- Project Management

The following explicit assumptions have been made in relation to this estimate:

- Control signals will be issued via SCADA to existing Transpower RTUs at generator sites
- Control signal redundancy will be achieved by simultaneously issuing control signals to multiple sites
- Frequency keeper selection process will not change significantly from current
- Change of frequency keepers in AGC will be manual
- Transpower IST processes will be adhered to in the solution development
- The estimates make no provision for EC specific project management or oversight costs
- The estimates do not include the costs of Dispatch rule changes and Genco replacement which the SO regards as a phase 1 requirement. A Genco replacement is separately estimated at \$1.5m.

- Ongoing support costs are not included but are estimated to be \$0.1m pa.

Work Breakdown Estimates

Item	Description	Estimate (NZD)
AGC Licensing	Initial licensing for the portion of AGC functionality anticipated to be used for Multiple Frequency Keepers is 150,000 USD, per Areva's quotation.	200,000.00
AGC Model	Performed by Transpower SME (20days), Areva consultation (10 days)	50,000.00
AGC HVDC Customisation	Estimate 20 days effort (Areva developer), 40 days Transpower SME effort to incorporate HVDC control loop	100,000.00
TTSE Customisation	Estimate 20 days (Areva Developer) + 20 days (external contractor) to incorporate AGC regulation into TTSE environment	100,000.00
System Studies	Estimate 40 days Transpower resource to establish frequency bias factors & model system stability with control loop lags	50,000.00
Redundant Frequency Telemetry (SCADA)	Estimated cost to provide high availability & high frequency (1-2 s) frequency measurement data to SCADA in each island	60,000.00
Control signal outputs via SCADA	Estimated cost to provide control signal outputs to 2 RTUs per frequency provider in each island (assume 4 frequency providers per island) @ \$5000/control signal output	80,000.00
Solution Testing	Estimate 12 week (60 day) duration for testing, incorporating 1 Transpower SME & 1 Transpower Coordinator, 0.5 FTE Areva Resource	300,000.00
Business Process Development	Establish ground rules for use of AGC within System Operator business process. Estimate 30 days.	40,000.00
Travel	2 visits to Areva of ~10 days during implementation	30,000.00
Training – Business Process	Develop BP training (10 days) & delivery to Energy/Security Coordinator group (50 days)	80,000.00
Training – Technical	Develop technical support training (5 days) & deliver to support team (~20 days)	35,000.00
Transition	Develop system migration plan + transition plan for commissioning application (25 days)	35,000.00
Project Management	1 FTE for project management, doubling as test manager, assuming total duration 9 months (195 days)	320,000.00
Sub-total		1,480,000.00
Contingency (20%)		296,000.00
Estimated Costs for SO Implementation of Multiple Freq Keeper Stge1		\$1,800,000