

05 May 2017

TO WHOM IT MAY CONCERN

The undersigned certifies that PPA Energy (Pty) Ltd ("PPA") provided the following services:

Project name: Abu Dhabi Assessment of TRANSCO Scheduling and Dispatch for RSB

Abu Dhabi Energy Regulator (RCB) required a review of the System Operator (TRANSCO system operator for 400 kV and 220 kV network) to determine how does the current scheduling and dispatch process compare against international benchmarks and which improvements can be recommended. The systems, procedures and operational practice are subject to a detailed review to ensure they can accommodate the new developments and associated arrangements such that these can be run safely, maintain standards of system security whilst demonstrating necessary efficiencies.

PPA Energy was sub-contracted to Pöyry to review the System and Market Operator unit commitment, real time dispatch and AGC systems for Abu Dhabi Energy Regulator (RSB). The power plants in Abu Dhabi produce both electricity and water. The review is to determine if scheduling and dispatch is economic whilst maintaining system security. The tools are also to be evaluated for fit for purpose for future plans which include a significant portion of inflexible nuclear plants and intermittent renewable energy plants.

The process involved data gathering and development standard IEEE turbine-governor model parameter estimations and calculations. The different turbine-governor models will then be validated using frequency recordings collected. A unit commitment, dispatch and AGC model developed in MATLAB and Simulink is used to estimate the economic performance of scheduling and dispatch whilst producing potable water.

Dr Chown assisted TRANSCO to implement recommendations from the project. The results of the implementation of the recommendations was a conservative estimated fuel saving of 3-4% as published in Cigre paper "A project for enhancement of economic scheduling & despatch process in ADWEA system"

Start date: October 2013

Finish date: September 2014

Contract value: > \$100,000.00

We confirm that PPA Energy executed its scope of the work to our satisfaction.

We were pleased with the depth of expertise and commitment that Dr Chown brought to the process. His engagement was instrumental for the overall success of the project. We'd be pleased to work with Dr Chown on similar projects in the future.

Yours faithfully



Andrew Morris
Head of Office – Director