PRESENTATION ABSTRACTS

Storage and its strategic impacts on Smart Grid
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Energy storage is an essential enabling technology in energy management. Increased number of population, more industrialisation trends and more electrical energy centric development forced to think about the future energy potential. In conventional ways of producing electricity, the main sources of energy are Coal, natural gas and petroleum oil. All these sources are carbon-based and store carbon as potential energy and release it when burned which causes greenhouse gas emission a major culprit in climate change and global warming. Australia's reliance on coal-fired power makes it one of the world's highest per-capita greenhouse gas emission rates. To meet the future electricity demand and to minimise the emission of greenhouse gases, renewable energy (RE) sources like wind, solar, hydro, tidal, biomass or geothermal are the alternative options to adopt and they are naturally replenished.

The greatest problem associated with renewable forms of energy, such as wind and solar is that of variability of supply. Variability occurs due to natural factors like day/night cycle, location, cloud, temperature, change of air pressure, sun and moon effect on earth etc. Due to these factors it is not possible to achieve continuous supply from solar and wind and also level of energy fluctuation exists. To overcome these issues, a safe and efficient means of storing renewable energy is needed so that all available energy from the renewable source can be captured and supplied to the grid or the user when it is needed. Energy storage is therefore often referred to as the key to unlocking the door of renewable energy.

According to the weather data from Bureau of Meteorology (BoM), Australia, NASA and Warwick Weather it is found that Australia has great potential for solar and wind energy. From different form of energy storing methods Pumped hydro, Compressed Air Energy Storage (CAES), Thermal Energy Storage (TES), flywheel, hydrogen, batteries, capacitors, and Superconducting Magnetic Energy Storage (SMES) are used in different renewable energy conservation process. The use of grid-connected intermittent energy sources such as solar and wind can benefit from grid energy storage system. While interconnecting RE sources and storage system to the grid, the grid receives supply from all these sources and depending upon the load demand and the energy intensity of wind and solar these sources output power will vary. The focus of this study is to find the impacts on the grid ie assessing the power quality of the grid at load side when supply comes from storage as well as RE sources and the grid. This research will finally develop the mitigation techniques to overcome these impacts of storage on smart grid by evaluating the power quality at the load side. This will be helpful for the power utility companies and communities to develop a climate-friendly sustainable power system for the future.

In order to find the impacts a real life experiment will be done at the CSIRO RE Integration facility and a simulation model will be developed using PSS SINCAL to find the mitigation techniques and finally it will be validated at the CSIRO facility again.

Assessing the success of ecosystem rehabilitation on open cut coal mining in the Bowen Basin, Queensland Australia

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Achieving mine closure is intrinsically linked to the selection and successful rehabilitation of a suitable post mining land use. The diverse localities and nature of mining operations require flexible, adaptable and progressive rehabilitation techniques in order to achieve this objective. Similarly, standardised, comparative and repeatable methods for assessing the success of ecosystem rehabilitation are desirable. In Queensland Australia environmental evaluations, that quantify the risk of a rehabilitated site failing, are vital to obtaining progressive or final rehabilitation sign off.

Key aspects important to rehabilitated ecosystem assessments are characterisation of their states, identifying their transitional trajectories and assessing their resilience. A two stage assessment process is presented. The first stage involves comparative analyses of rehabilitation site monitoring data against reference or analogue sites (similarity assessments) and the second stage consists of scenario based future state simulations to determine resilience and to assess risk based potential failure (prognostic simulations). Ecological structure analysis (clustering and ordination) and probability based cellular automata spatial modelling are the respective tools and techniques employed.