

3 JUNE 2013
LIVERPOOL RANGE WIND FARM
COMMUNITY CONSULTATION COMMITTEE
SUMMARY WIND FARM COST OF ENERGY DOCUMENTS TABLED

The following documents were tabled at CCC meeting No 1 in relation to wind farm costs of energy, both in an Australian and global context. As requested by the CCC, Epuron has reviewed the documents and provides a brief summary for discussion purposes.

1. Comment on the Australian Energy Technology Assessment (AETA) prepared by Bureau of Resources and Energy Economics (BREE)
[Canberra concedes wind, solar to be cheapest energy by 2030](#)
 - The AETA dated 2012, prepared by BREE, states that it provides the best available and most up-to-date cost estimates for 40 electricity generation technologies under Australian conditions.
 - In the 2012 report the Australian government's chief energy forecasting body has published a dramatic revision of its cost estimates, predicting that onshore wind and solar PV will deliver the cheapest forms of energy by 2030 – with solar PV dramatically cheaper than all other energy forms by 2050.
 - The report slashes its previous estimates of the cost of a whole range of renewables technologies, and in some cases doubles the predicted cost of coal-fired generation in the decades to come.
 - The cost of gas generation is predicted to remain relatively unchanged.
 - The government's report said that by 2030 some renewable technologies, such as solar PV and wind, are expected to have the lowest cost of energy (LCOE) of all of the evaluated technologies.
 - Key findings of the AETA 2012 report include:
 - Estimated costs of several fossil fuel-based electricity technologies differ from previous studies, primarily as a result of a carbon price and higher projected market fuel prices.
 - Estimated costs of solar photovoltaic technologies have dropped dramatically in the past two to three years as a result of a rapid increase in the global production of photovoltaic modules.
 - Differences in the cost of generating electricity, especially between fossil fuel and renewable electricity generation technologies, are expected to diminish over time.
 - Biogas and Biomass electricity generation technologies in 2012 are some of the most cost competitive forms of electricity generation and are projected to remain cost competitive out to 2050.
 - By 2030 some renewable technologies, such as solar photovoltaic and wind on-shore, are expected to have the lowest LCOE of all of the evaluated technologies.
 - Among the non-renewable technologies, combined cycle gas (and in later years combined with carbon capture and storage) and nuclear power, offer the lowest LCOE over most of the projection period and they both remain cost competitive with the lower cost renewable technologies out to 2050.
 - For some technologies, LCOE is projected to increase over time. This is because of a projected weakening of the Australian-dollar exchange rate from its current historic highs that will increase the cost of imported power plant components in Australian dollar terms and also because of projected increases in labour costs in excess of the consumer price index. In addition, for fossil-fuel technologies that generate CO₂ emissions, increased costs are projected from assumed increases in the carbon price out to 2050.
 - The results indicate that Australia's energy future is likely to be very different to the present. This has profound implications for electricity networks, how energy is distributed and Australia's ability to meet its targeted greenhouse gas emissions reductions.

2. International Renewable Energy Association (IRENA)
[Renewable Power Generation Costs in 2012](#)
 - IRENA was established in 2009 and promotes the accelerated adoption and sustainable use of all forms of renewable energy around the world.
 - The 2012 IRENA report states that it provides the most current and comprehensive analysis of the costs and performance of renewable power generation technologies available around the world today.
 - Renewable power generation technologies now account for around half of all new power generation capacity additions worldwide.
 - The report highlights that renewables (where available) are increasingly becoming the most competitive option for new grid supply and swift grid extension.
 - The levelised cost of electricity (LCOE) worldwide is declining for wind, solar PV, CSP (concentrated solar power) and some biomass technologies, while hydropower and geothermal electricity produced at good sites are still the cheapest way to generate electricity.
 - LCOE is the average lifetime levelised cost of electricity generation.

3. Forbes.com
[Why it is the end of the line for wind power](#)
 - The article discusses the US federal production tax credit on wind investments which expires on 1 January 2014 and contrasts with views put forward by the US wind power industry.
 - Will the US extend the production tax credits (again) and if not will this spell the end of the wind industry.
 - In the US for the past 20 years the production tax credit has offset about 30% of the cost of building wind turbines. Add to that the “renewable portfolio standards” for green energy mandated by 29 states, and as a result the US has seen wind farms spring up across the country.
 - Since 2007 nearly 40% of all the new electricity capacity built in the US has been wind.
 - Wind now generates roughly 3.5% of U.S. electricity.
 - According to US authorities the LCOE for new wind is about 8.2 cents/kWh. Advanced clean coal plants cost about 11 cents/kWh, the same as nuclear, while natural gas plant comes in at about 6.3 cents/kWh.
 - While costs of wind in the US are declining in comparison to competing technologies it doesn't always take into account other associated costs such as grid connection.
 - The articles goes on to estimate the true cost of wind balanced against other costs such as grid connection in remote locations and predicts cost of wind could be double in those circumstances.

4. National Renewable Energy Laboratory (NREL)
[Recent Developments in the Levelized Cost of Energy from U.S. Wind Power Projects](#)
 - The NREL (US) report is dated February 2012 and has a stated objective to;
 - Develop consistent LCOE estimates for wind in the US.
 - Estimate the amount of available land that would exceed certain CF and LCOE thresholds.
 - Conduct various case analyses.
 - Main results of the analysis found;
 - Turbine design advancement over recent years has led to an enormous increase in capacity factors.
 - LCOE for wind is estimated to be at an all-time low for 2012-13 (tested with a number of sensitivities).

- The proliferation of turbines designed for lower wind speeds has narrowed the gap between the LCOE of high and low wind speed sites, increasing the economic attractiveness of developing wind projects in lower wind speed areas.
- Land area exceeding capacity factor thresholds has increased dramatically.
- Land area exceeding LCOE thresholds has also increased substantially.
- Key conclusions of the study are;
 - Economic attractiveness of wind projects in recent past was reduced due to increased capital cost, move toward lower wind speed sites, and lower electricity prices.
 - Examination of historical trends in capital costs and capacity factors, individually, gives an incomplete picture of technology advancement as well as historical & current developments.
 - Recent declines in turbine prices & improved technology have reduced the estimated LCOE of wind; LCOE for projects being planned today in fixed resource areas is estimated to be at an all-time low.
 - Considering plausible assumptions for not only capital cost and capacity factor, but also O&M, financing & availability, the LCOE for 2012-2013 projects is estimated to be as much as ~24% and ~39% lower than the previous low in 2002-2003 in 8 m/s and 6 m/s (at 50 m) resource areas, respectively (with the PTC/MACRS); when only considering capital cost and capacity factor, the reduction is ~5% and ~26%.
 - Technology advancement for lower wind speeds has narrowed the gap in LCOE between lower and higher wind speed sites; choice of 30% ITC/Treasury Grant may have further encouraged development in lower wind speed sites, especially in 2009-2010.
 - The amount of land area meeting or exceeding certain capacity factor and LCOE thresholds has substantially increased as a result of these technology improvements and helps alleviate to a degree transmission and siting barriers.
 - Technology advancement & learning still applies to onshore wind, despite its relative maturity, but all modes of technical advancement must be considered rather than emphasizing individual parameters
 - Despite these recent and impressive technological advancements, three counter-veiling factors may intervene to raise the LCOE for wind:
 - Potential for increased pricing if demand for wind turbines begins to catch up with supply, or if other exogenous influences are triggered (e.g., higher commodities and/or labour costs).
 - Potential continued move towards lower wind speed sites as a result of severe transmission/siting limitations.
 - Potential near-term loss of federal PTC/ITC/Treasury Grant.