AGENCY: COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

TOPIC: Electricity Roadmap

REFERENCE: Written Question – Senator Carr

QUESTION No.: AI-117

1. CSIRO recently released a draft report called the Electricity Network Transformation Roadmap, which looks at the critical role of an integrated grid.

a. When is the final roadmap due?

b. Do renewable sources have the ability to supply baseload power and does this form part of an integrated grid?

2. On the Electricity Network Transformation Roadmap some of the goals included in the report are Zero net emissions in the electricity sector by 2050; Network charges being 30% lower than 2016; and \$414 annuals savings in average household electricity bills. Can these goals be achieved and what will be the role of renewable energy in meeting these goals?

3. Some of the biggest energy users are industry – we're talking smelting, steelmaking, cement, plastics and chemical, even paper and food production.

a. What options are there to improve the energy efficiency of energy-intensive industry users?b. What's the most efficient method to achieve these improvements? Do we need to be looking at more government incentives and co-investment, like in cogeneration power plants and storage facilities, or in more efficient production plant for example?

4. We are starting to see households install battery storage for energy storage. There are other energy storage solutions being developed such as pumped hydro.

a. What is the current situation in relation to these storage solutions and will these technologies increase the ability of renewables to deliver consistent baseload power?

5. Since 2013 has there been a reduction in the number of scientists working on energy? What's been the overall reduction?

a. What was the driver for these reductions? Reductions in revenue from government agencies/grants? Cuts to the appropriation in the 2013/14 Budget? Other reasons?

ANSWER

- 1. a. The final report of the Electricity Network Transformation Roadmap is scheduled to be released on 28 April 2017.
- 1. b. Using the most commonly understood meaning of baseload power (that is continuous electricity output) some renewable generation technologies such as biomass combustion and geothermal systems can provide continuous power throughout the day alone.

Other renewable electricity generation technologies such as solar and wind are inherently variable due to their weather dependence. In order to provide continuous power they need to be integrated with other technologies such as existing flexible generation capacity.

As the share of variable renewable generation increases and existing generation retires, further deployment of new flexible generation plant such as storage (e.g. batteries, pumped hydro) and

new gas peaking plant would be required. These integration costs are not prohibitive for the use of variable renewable generation.

2. The quantitative analysis that was conducted for the Electricity Network Transformation Roadmap gives us confidence that if the Roadmap milestones and actions are achieved, then the projected cost savings will be delivered. However, there are commercial, social and technological uncertainties associated with achieving each milestone which will determine whether or not the Roadmap will be delivered in full.

The Roadmap is technology neutral in that it does not depend on or require renewable energy technologies to achieve its goals. However, it recognises that customers will likely independently choose to take up rooftop solar panels in greater numbers, that state and federal renewable energy targets are in place or likely to be in place, and that some renewable electricity generation technologies are likely to be economically viable (inclusive of costs of variable renewable integration) under any emission reduction scheme associated with meeting climate targets. Therefore renewables are expected to play a significant role.

3. a. CSIRO has specific research projects which address specific items of equipment or processes in particular industries but has not developed an independent forecast of the options and likely energy efficiency improvements of energy intensive industries.

b. CSIRO has not conducted specific research on policy options for accelerating energy efficiency adoption in energy-intensive industries.

- 4. a. CSIRO is most familiar with battery storage technologies and notes that battery storage is a mature commercial technology which is broadening its reach into a wide range of applications as its costs continue to fall (due to global scale up of manufacturing capacity). CSIRO has not conducted any significant analysis of pumped hydro storage. As discussed in the answer to 1.b., CSIRO agrees that these storage technologies increase the ability of renewables to deliver consistent baseload power.
- 5. Prior to 1 July 2014 energy staff were spread across different parts of CSIRO so data is not available. Between 1 July 2014 and 16 March 2017 the number of energy scientists has fallen from 326 to 286, with most of this reduction occurring in the 2014-15 financial year. These numbers includes staff classified as research consulting, research management, research projects, research science and engineering, senior specialist and technical services. They do not include CSIRO affiliates (e.g. students, research fellows, visiting scientists) or casual employees, or scientists who may be working on energy-related projects in other CSIRO Business Units.

The reduction in energy scientists was driven by a number of factors including the soft external funding environment and changes to federal government programs in Carbon Capture and Storage, ARENA and ANLEC Research and Development.