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PRESENTED BY THE WATERLOO INSTITUTE FOR SUSTAINABLE ENERGY

Tuesday November 5, 2019
3:00 pm – 4:00 pm
DC 1302

COMPRESSED AIR ENERGY STORAGE: A MEGAWATT OR A GIGAWATT?

Maurice B. Dusseault, Professor, Petroleum Geomechanics, Earth and Environmental Sciences, University of Waterloo

The Electricity Future of the World will evolve to a combination of large-scale integrated grids and smaller grids that may be isolated or with limited connectivity. I suggest the following classification for discussion:

- Classic Grid: multiple GWs
- Microgrids: 20 MW to a GW
- Local grids: 0.5 to 20 MW

Furthermore, the Electricity Future of World requires massive inputs of carbon-free energy, and the realistic options at present are hydro, nuclear, wind, solar and geothermal sources. However, microgrids and local grids cannot use nuclear power, hydro is very dependent on the geography and social acceptance, and the advent of small-scale modular transportable nuclear power systems is a generation away, if it ever transpires (It may be left behind by other developments).

Compressed Air Energy Storage – CAES – is a mechanical energy storage concept that involves taking poor quality energy (the variable component of wind and solar for example) or excess energy and compressing air into a vessel. Later, when needed, the air is released through power generator systems (options are available) and part of the energy is recovered. CAES promises to be cheaper than other energy sources, socially acceptable (most of it is underground), and far less environmentally impactive.

We will explore some of the issues related to CAES at the grid scale (a GW, for example) and at the local scale (several MW). Issues of geomechanics, mechanics, and thermal energy storage or use will be addressed. Of all options available, it seems that CAES may be the most flexible and adaptable energy storage approach.

Biography

Maurice B. Dusseault is a professor of Geological Engineering in the Earth and Environmental Sciences Department, University of Waterloo, Waterloo, Ontario, Canada. He spent three years as a roughneck and drilling mud technician prior to completing his BSc (1971) and PhD (1977). From 1977 to 1982, he occupied a Research Professor Chair at the University of Alberta funded by the Alberta Oil Sands Technology and Research Authority. During this period, he developed novel skills and broad experience in new production technologies and drilling rock mechanics. In 1982, he became Chairman of the Geological Engineering Program at Waterloo and was Director of the Porous Media Research Institute from 1995 to 2000. Maurice carries out research in petroleum geomechanics (drilling, hydraulic fracturing, reservoir geomechanics), and is the recognized world expert in new production methods, deep waste sequestration in sedimentary basins, and reservoir geomechanics.

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