Professor to present vision for zero-carbon future for UK

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A University of Nottingham professor is to outline his vision for a UK powered completely by renewable energy by 2030 in an open lecture taking place later this month.

Professor Seamus Garvey, of the University's Department of Mechanical, Materials and Manufacturing Engineering, will speak on the potential of vast floating offshore 'energy farms' off the UK coastline, which could produce 'green' electricity at a fraction of the cost of its nearest competitors.

Professor Garvey said: "Imagine for a moment that renewable energy was the cheapest way to source power and that this power could be dispatched on demand. Imagine further that the landscape did not have to be blighted by man-made structures to gather that power.

"The impact on the world would be profound: secure low-cost energy supplies for most countries, reduction in the environmental assault that is most mining and oil/gas extraction and some hope of curtailing climate change not dependant on politics."

Professor Garvey recently launched his own spin-out company — NIMROD Energy Ltd — which is based on the Integrated Compressed Air Renewable Energy Systems (ICARES) research which he has been developing since early in 2006.

The technology is centred on a simple premise — using giant wind

turbines to compress and pump air into huge undersea Energy Bags™ anchored to the seabed — or geological formations where deep water is not available. The high pressure air would be expanded in special turbo-generator sets to provide electricity as required — not just when the wind is blowing.

Professor Garvey's open lecture, Scaling Up Renewables, will address important questions relating to the future of renewable energy technologies, including:

- At a system level, what do we actually need from renewable?
- What do the laws of engineering scaling tell us about achievable costs per unit energy and how these vary with scale?
- At what scale does it become essential for some devices — wind turbines in particular — to change profoundly in design?

The lecture will be held in two parts, with the first half being generally accessible to a non-engineering audience. It will outline the scale of Professor Garvey's vision — one thousand 500m-diameter wind turbines with cable-braced rotors driven by nearly 1,000 tonnes of moveable pistons inside each one, all supported on 3D floating frameworks far offshore. They would store around 100 million cubic metres of compressed air stored deep under water in salt-domes and Energy Bags™ and would feature around 200 million tonnes of material (largely seawater) in floating thermal stores and around 300 expander-generator units each rated at 250 MW. Professor Garvey also envisages it providing a significant boost to UK manufacturing, with 75 per cent of the technologies being British made.

The second part of the lecture will be more technical and aimed at

engineers and engineering students. It will explain what drives cost for mechanical renewable (wind/wave/tidal) and present structural capacity as a tool for quantifying cost. It will reveal why compressed air is an ideal intermediate form between wind and electricity, outline why wind turbine rotor structures, towers and main bearings must change as scale rises and examine at a fundamental level how power can best be converted from a very slow-rotating frame. Finally, it will discuss the need for a larger diameter for effective thermal storage in underwater air-containment.

Professor Garvey added: "I will be ending the lecture with a challenge for my audience of engineers — can they find any errors in my reasoning and is there anything within the laws of engineering that would prevent us from developing this technology at this scale? I would also be extremely interested in hearing views on whether they believe we have the skills and prowess as an engineering community within the UK to achieve this ambitious vision."

Provided by University of Nottingham