

Award-winning papers in 2014

Papers published in *Energy* are eligible for awards from the Institution of Civil Engineers. Papers from any of the ICE journals can be nominated for several awards. In addition, each journal has awards dedicated to their specific subject area.

On Friday 9 October 2015, ICE president David Balmforth presented awards to the following papers published in *Energy* in 2014. The editorial panel nominated their best papers and an awards committee chaired by Quentin Leiper allocated the awards.

James Watt Medal

The James Watt Medal, for papers with substantial mechanical engineering content, was awarded to Hammond and O'Grady (2014).



ICE President David Balmforth (centre) with the winners of the James Watt Medal Geoffrey Hammond and Áine O'Grady

Abstract

Upstream environmental burdens arise from the need to expend energy resources in order to extract and deliver fuel to a power station or other users. They include the energy requirements for extraction, processing/refining, transport and fabrication, as well as methane leakages from coal mining activities – a major contribution – and natural gas pipelines. The upstream carbon dioxide emissions associated with various power generators and UK electricity transition pathways towards a 'low carbon' future have been evaluated on a 'whole systems' basis. Carbon dioxide capture facilities coupled to fossil-fuelled plants are shown, for example, to deliver only a 70% reduction in greenhouse gas emissions (including both upstream and operational emissions), in contrast to the normal presumption of a 90% saving. In addition, the present UK greenhouse gas trajectories associated with transition pathways to 2050 are found to differ significantly from those produced by the British government's Department of Energy and Climate Change and its independent Committee on Climate Change. These bodies do not currently account for upstream, 'fugitive' greenhouse gas emissions. Therefore, there will actually remain further emissions upstream that are unaccounted for, even if the current UK carbon dioxide equivalent reduction targets are apparently met.

George Stephenson Medal

The George Stephenson Medal, presented to the second best paper published in all the ICE journals, was awarded to Beswick *et al.* (2014).

Abstract

In recent years, geological disposal of radioactive waste has focused on placement of high- and intermediate-level wastes in mined underground caverns at depths of 500–800 m. Notwithstanding the billions of dollars spent to date on this approach, the difficulty of finding suitable sites and demonstrating to the public and regulators that a robust safety case can be developed has frustrated attempts to implement disposal programmes in



Winners of the George Stephenson Medal Fergus Gibb, Geoff Beswick and Karl Travis, with ICE President David Balmforth (second left)

several countries, and no disposal facility for spent nuclear fuel exists anywhere. The concept of deep borehole disposal was first considered in the 1950s, but was rejected as it was believed to be beyond existing drilling capabilities. Improvements in drilling and associated technologies and advances in sealing methods have prompted a re-examination of this option for the disposal of high-level radioactive wastes, including spent fuel and plutonium. Since the 1950s, studies of deep boreholes have involved minimal investment. However, deep borehole disposal offers a potentially safer, more secure, cost-effective and environmentally sound solution for the long-term management of high-level radioactive waste than mined repositories. Potentially it could accommodate most of the world's spent fuel inventory. This paper discusses the concept, the status of existing supporting equipment and technologies and the challenges that remain.

REFERENCES

- Beswick AJ, Travis KP and Gibb FGF (2014) Deep borehole disposal of nuclear waste: engineering challenges. *Proceedings of the Institution of Civil Engineers – Energy* **167**(2): 47–66, <http://dx.doi.org/10.1680/ener.13.00016>.
- Hammond GP and O'Grady Á (2014) The implications of upstream emissions from the power sector. *Proceedings of the Institution of Civil Engineers – Energy* **167**(1): 9–19, <http://dx.doi.org/10.1680/ener.13.00006>.