

**Institution of Mechanical Engineers (IMEchE)  
Summary of Experts Meeting on Distributed Energy Systems**

Dates: 27-28 January 2009  
Venue: Grovefield House Hotel, Burnham, Buckinghamshire

Attendees:

Prof. Ian Arbon	Engineered Solutions
Ashley Bateson	Hoare Lea
Bob Beith	Consultant
Dr Nick Bell	World Alliance for Decentralized Energy
Rupert Blackstone	Arup
Godfrey Boyle	Open University
Nick Bristow	Renewable Energy Systems (RES) Ltd
David Cameron	Scottish Renewables
Jackie Carpenter	Energy21
Helen Daniels	Facilitator
Andy Ford	UK Green Building Council & Fulcrum Consulting
Nick Hall-Stride	Carbon Trust
Dr Gareth Harrison	University of Edinburgh
Hergen Hays	Department of Energy & Climate Change (DECC)
Jim Hopwood	Facilitator
Casimir Iwaszkiewicz	Inbuilt Ltd
Martin Kemp	Centre for Alternative Technology (CAT)
Anna Kulhavy	Office of Gas & Electricity Markets (OFGEM)
Daniel Kenning	Hoare Lea
David Linsley-Hood	Centre for Alternative Technology (CAT)
William Orchard	Orchard Partners Ltd
Martin Orrill	British Gas New Energy
Brian Robinson	IMEchE
David Smith	Energy Networks Association
John Thorp	Thameswey Group
Robert Tudway	London Development Agency
Sara Turnbull	Arup
Dr Nigel Wilkinson	National Grid
Philip Wolfe	Renewable Energy Association
Simon Woodward	Utilicom
Paul Yiannouzis	London Climate Change Agency

**Introduction**

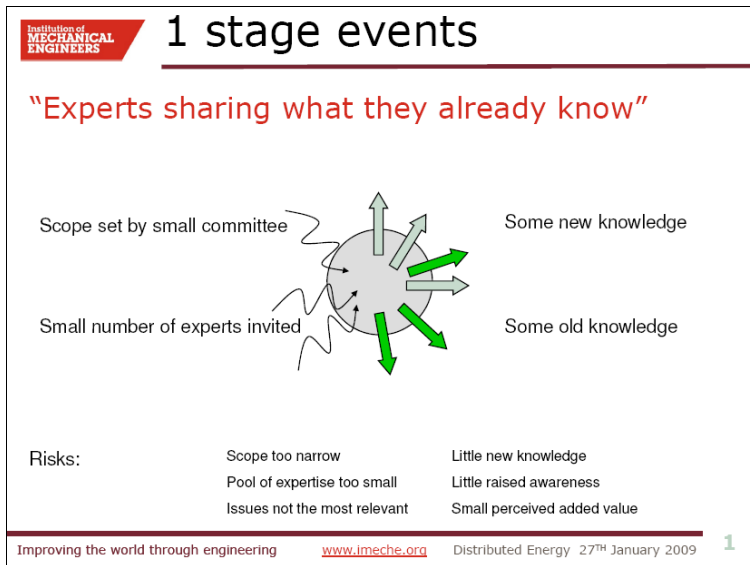
Brian Robinson (Head of Energy at IMechE) opened the meeting with a welcome and description of the Institution's 4 Key Themes (Energy, Environment, Transport and Education). He explained that the Institution saw Distributed Energy Systems (DES) as having great potential to contribute to the development of a sustainable energy future for the UK, and had arranged this Experts Meeting to explore that potential and find ways to bring about their more rapid implementation.

**Structure & Purpose of Meeting**

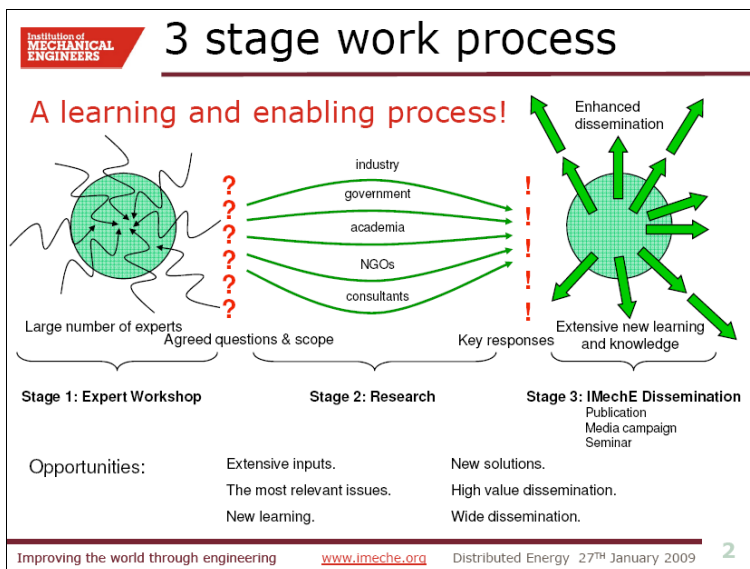
Daniel Kenning (Chairman of IMechE Energy, Environment & Sustainability Group) then gave a short presentation to explain how the Experts Meeting was the first stage in a three stage process to generate and disseminate new learning. The main output from the Meeting was expected to be a set of "research" initiatives to fill gaps in knowledge and develop implementation plans for DES. The results of these initiatives (Stage 2) would be presented at a seminar in Woking later this year (Stage 3, 17 November 2009).

The EESG three-stage learning process grew out of a strategic workshop run by the Board of EESG to identify how best to apply the resources available to EESG, in the context of IMechE as a learned society, to “improve the world through engineering” in the field of “energy, environment and sustainability”. We concluded that the conventional straightforward process of running events is not equal to the challenges of sustainability, and that instead we should first seek the input of experts to identify “what do we not know that we need to know. Then we should spend time answering those questions, then run an event to disseminate this new learning.

The first diagram below summarises the risks of a “one-stage process” in the field of sustainability, where there are many unknowns, and where there are many channels of information already.



The diagram below summarises how we see the benefits of a three-stage process, ensuring the key questions are identified by the best available expertise, the key new learning that is needed is generated, and the dissemination is as effective as possible. EESG has already initiated some enhanced dissemination methods, including helping universities to set up peer-group dissemination activities.



## **Why are Distributed Energy Systems important?**

Attendees were asked to describe, in one sentence, why they felt DES were important to them. A range of answers followed and are summarised below:

Distributed Energy Systems...

- Will have a major impact on existing energy suppliers;
- Present a range of low cost carbon reduction opportunities;
- Will be needed if the UK is to meet its 2020 renewable energy target;
- Allow for better use of resources;
- Can reduce our dependence on natural gas;
- Help to achieve climate change and energy security goals;
- Provide support to rural communities and areas off the gas grid;
- Can address the needs of different communities in different ways;
- Provide a route from the current unsustainable energy system to a more sustainable one;
- Facilitate a move from passive to active networks;
- Are essential to meeting the full potential of renewables, including biomass;
- Present a learning opportunity for engineers and architects;
- Provide greater flexibility in energy supply;
- Build in robustness to supply networks;
- Highlight the importance of Combined Heat & Power;
- Emphasise the importance of a "bottom-up" as well as a "top-down" approach;
- Have potential to engage energy consumers;
- Support energy efficiency improvements;
- Enable a reduction in distribution losses;
- Can facilitate a move towards energy services/comfort, rather than energy supply/use;
- Bring resilience to the local level in case of national network failure;
- Are important weapons in the arsenal for achieving long term energy goals;
- Empower and regenerate communities;
- Are implementable at all scales between national/centralised and very small/microgeneration;
- Improve the efficiency of electricity generation.

## **What has gone well with the development of Distributed Energy Systems so far, and what has been difficult?**

Attendees were then asked to work in small groups to answer these questions regarding the current state of DES implementation in the UK, based on their own experiences. A summary of their individual perceptions follows:

### What has gone well?

- There is increased awareness of the major policy drivers, e.g. climate change;
- New requirements in planning, regulations and policy initiatives are helping;
- There are improved, co-operative ways of working, more cross-disciplinary communication, and people are being brought together;
- Ordinary people are now more interested in energy issues;
- There is a heightened awareness of heat as an energy issue, as well as electricity;
- There are local suppliers of most technologies;
- Distributed Energy is "on the agenda";
- Feed-In Tariffs are in the Energy Act 2008;
- Clear objectives are shared by all layers of local, regional and national government;
- There is lots of enthusiasm;
- Skills are being developed;
- There is proven technology available;
- There are good opportunities for bio-methane injection into natural gas pipelines.

### What has been difficult?

- Lack of a political leadership, a deliverable strategy, joined-up thinking and appropriate resources;
- Skills shortages;
- Lack of ownership of life-cycle benefits for potential investors;

- Lack of knowledge sharing due to competitiveness pressures;
- Absence of full supply chain capability – invent, manufacture and install;
- Lack of predictable, long lasting financial incentives that internalise the externalities;
- Consumer consumption and awareness of generation impacts not linked;
- Lack of proper metrics to compare options;
- Lack of expertise and resources in planning system;
- Too many regulations and tensions between business-as-usual incumbents and new entrants;
- Money and mobilising it – getting a business case together and banks not lending unless it's "blue chip";
- Lack of policies for existing building stock;
- Lack of policies for development of heat networks;
- Inadequate payback for small-scale DE;
- Poor co-operation from network operators and OFGEM – hard for small organisations to find right points of engagement;
- Finding new clients;
- The existing economic model is no longer fit for purpose, too short-term;
- Commercial driver is still to sell more energy, not reduce demand;
- Lack of detailed knowledge of the technologies;
- Too much complexity – of drivers, solutions, decentralisation and new technologies;
- Lack of DE teaching in undergraduate degree courses;
- Capital costs of networks;
- There isn't enough time for incremental change;
- Government targets keep changing;
- Lack of incentives for mixed-use developments;
- Lack of a "bottom-up" feasibility analysis to support national targets;
- Lack of grants for development projects;
- Small companies don't have power or scale to make a big difference;
- Lack of electricity storage technologies discourages off-grid projects and limits penetration;
- Lack of design standards for DE means different systems can't connect together easily;
- Existence of anti-renewables groups;
- Complexity of grants;
- Lack of local suppliers;
- Lack of incentives and structure for a heat market;
- Consumer acceptance of DE.

### **What are the best opportunities for research/development projects amongst the experts for taking the DES agenda forward?**

Attendees were then asked to come up with ideas for further work that could/should be done to help the development of Distributed Energy Systems. Individual ideas were first discussed and refined in small groups, and each group then presented their collective project ideas. The full set of potential projects are summarised and listed below:

- An holistic, community analysis to derive specifications for best-practice spatial solutions and model developments;
- Assessment of how to make best use of existing opportunities, e.g. when boilers need replacing, targeting the conversion of off-gas-grid properties to biomass/bio-methane;
- Develop the sales pitch and mechanisms and intervention strategies to make DE "a want item" in the minds of consumers and community groups;
- Establish how to remove the regulatory barriers to best practice mechanical and electrical approaches to large buildings, e.g. improve BREEAM requirements;
- Provide greater confidence to the market about future support mechanisms;
- Pull together performance data;
- Assess potential for novel piped heat supply networks;
- Assess potential for 500KWe CHP plants on existing transformer sites;
- Options for smart metering of heat and power;
- Assess local energy storage opportunities/needs;
- Assessment of suitability of carbon prioritisation – are there other issues to consider?
- Analysis of the practicalities of bio-methane injection into the natural gas grid;

- Development of a streamlined regulatory system for heat and power;
- Develop good design standards for district heating and technical standards for bio-gas;
- Assess capability to meet incoming needs of National Grid, including need for NG and network operators to be visible with their requirements;
- Assess skills needs and credibility gaps;
- Address requirement to show best value/most sustainable way of reducing CO2, and how to reward it;
- Assess how to move from delivery via “wilful individuals” to broader package for implementation;
- Identify and change the common drivers to produce a replicable model for Local Authorities;
- Develop a methodology to evaluate heat load acceptability, and understand how to build a business case;
- Analysis of workable commercial structures, learning from existing models such as co-ops and LLPs;
- Quantify and evaluate existing incentives, with case studies for farms, small urban areas, individual houses and large city areas;
- Develop education schemes, e.g. in degree courses and for financiers, and communication routes, e.g. OU and BBC;
- Establish requirements/feasibility/credibility of a self-starting market for DE;
- Develop concept diagrams for distribution, and analysis to allow choice;
- Develop quality standards for equipment, including DIY. Redesign and extend the microgeneration accreditation scheme;
- Assess options to bridge gap between capital grants and feed-in tariffs;
- Develop designs for local “island” networks for electricity and heat, and how to switch in and out of national grid(s);
- Develop a strategic plan for new regulatory systems for gas and electricity companies;
- Assess opportunities and threats of development of UK manufacturing and supply chain, in conjunction with existing IPPR work.

**What projects will the experts and Institution take forward between now and September 2009?**

The experts then filtered and refined the above list of opportunities into 7 projects that they were themselves willing and able to take forward between now and November 2009, such that the projects’ results could be published at the seminar (Stage 3). All projects should aim to be complete by end of September 2009, to allow their findings and results to be included in an IMechE DES report and disseminated at the November seminar.

The projects are listed in the following table:

<b>Project – new learning opportunity</b>	
1	What package of measures is needed to facilitate the easy replication of heat distribution networks in the UK?
2	How do we make use of communication tools, e.g. the BBC and OU, to make DES a “want item” for consumers and communities?
3	How should “Energy Islands” be designed and managed?
4	What are the practicalities and potential for bio-methane injection into the gas network?
5	How can we better educate and inform planners of the potential for DES?
6	What future network scenarios are feasible and what actions are needed to bring them about?
7	What are the practicalities and potential for local energy storage?