National University of Ireland, Galway
Ollscoil na hÉireann, Gaillimh

Energy Research Centre (ERC),
Environmental Change Institute (ECI);
National University of Ireland Galway (NUIG).

NUIG would like to state that this is a well-argued and well-written comprehensive document that clearly identifies the need for continuous and well-funded research to provide the necessary knowledge and people needed to provide answers (short term, medium term and future) to the growing environmental and energy demands being posed in Ireland (and worldwide) by current and future generations.

The following lists the responses to Irish Energy Research Council's document ***An Energy Research Strategy for Ireland*** by NUIG academic staff engaged in Energy Research at NUIG Energy Research Centre (ERC).

- There has been and continues to be a history of large scale energy engineering in Ireland. Examples include Ardnacrusha (large scale hydro power), Turlough Hill (Pumped storage), the Arklow Banks (Wind Energy) and Wavebob (Wave Energy). Ireland has successfully marketed this engineering knowledge worldwide though companies like ESB International. The prototype Wavebob energy conversion device was built at Harland & Wolff involving significant cross border collaboration and will provide significant opportunities in the design, construction and marketing of wave energy conversion devices in the future;
- SME's are coming to the fore that supports the manufacture of novel components to support the manufacture of sustainable energy devices (e.g. wind turbines). An example is EireComposites that supports prototyping of innovative and scaleable manufacturing techniques for very large wind turbine equipment;
- SME's are developing that provide both engineering consultancy services and tools in energy design & management to a range of industries significant within the Irish and worldwide contexts. Industries supported include the Pharmaceutical, ICT and BioTech;
- Significant 'clustering' of national research strengths is **already occurring** and being funded by state agencies that include Enterprise Ireland (EI), Science Foundation Ireland (SFI), Sustainable Energy Ireland (SEI) and the Irish Research Council for Science Engineering and Technology (IRCSET). Examples include a 'buildings cluster' that is focusing on researching and developing novel methodologies, tools and techniques that support holistic environmental and energy management is buildings. Research projects being driven by a

coordinated cluster include BuildWise (EI WiSen cluster), ITOBO (SFI Strategic Research Cluster), NEMBES (HEA-PRTL4 cluster in networked embedded systems). Similar clustering activities have occurred and continue to occur in areas that include power electronics (EI PEIG) and future clusters being developed include Transportation and Health;

- It is essential that clarity is achieved with respect to these clusters from both a research and development perspective and integration of both funding agency activities and coordinated Industry Advisory Groups. Industry Advisory Groups have a significant role to play not just in applied research but also in informing basic research objectives;
- It is important to clearly outline the role of the institutes within each university and the best way of fostering inter-institutional collaboration with respect to developing 'critical mass' in research relating to environment and energy. Significant collaborations are already occurring between researchers in ECI (NUIG), ERI (UCC), NCBES (NUIG), ERI (UCC), NEMBES (CIT), MRI (NUIG) etc along the lines of strategic national priorities that include Ocean energy, Bioenergy/Biofuels and Energy & Buildings;
- There needs to be clear coordination of research activities to support obligations relating to existing and emerging EU directives relating to Energy and Environment and to potential/emerging commercial opportunities;
- There is already significant world-class research activity in NUIG in areas that include BioEnergy, Combustion Technologies, Environmental and Energy Modelling, Environmental Technologies, Energy & Buildings, Power Electronics, Biomedical Engineering, Informatics with significant University commitment demonstrated through the funding of research institutes that include MRI, NCBES, ECI, DERI all in line with the NDP and SSTI. Also, a New Engineering Building (14,000m^2) due to be complete by 2012 will not only house all of the College of Engineering and Informatics (CoEI) but will provide both undergraduate and postgraduate training in sustainable environmental and energy technologies;
- There needs to be a focus on current as well as future needs. In particular research relating to combustion activity is not mentioned in this document. World Energy Outlook 2007 has stated that "improvements in efficiency as the most cost effective way of achieving cuts in emissions". NUIG has significant research strengths in this area (http://c3.nuigalway,ie);
- It is felt that there may be an over reliance on Sustainable Energy Ireland in the implementation and coordination of the proposed strategy;

- There is no mention of other energy sources and technologies such as Nuclear, Geothermal, Fuel Cells and Energy Storage;
- Wind Energy does not seem to get adequate treatment in the document. Particularly in light of the fact that Ireland has some of the best resources of wind power;
- There is not significant detail on how energy sources mapping could be (and is) a valuable research activity;
- There is not sufficient treatment of academic/industrial partnerships and how these partnerships could provide the way forward in not only applied research but basic research activities;
- There is no detailed treatment of the social aspects (human factors) of sustainable environmental and energy solutions in regard to the sourcing of and design, construction and operation of novel energy solutions;
- NUIG would like to see the following additions to Exhibit 8.2 (P.33). Please add the following points
    - Assessment of hydrodynamic/environmental conditions to optimise technical potential of energy extraction;
    - Replace point 2 with Modelling of energy extraction from devices and laboratory tank testing;
    - P30. 10.1: Each of the bullet points should include the term 'ocean energy resources';
    - SEI should be involved in developing inventories and stimulating private sector involvement. Te OEU and PAD should be communicating closely as some of the work is similar;