



**SUBMISSION IN RESPONSE TO CER CONSULTATION
ON WIND GENERATION – SYSTEM SECURITY ISSUES**

***"Wednesday 3rd December 2003 - Views and Comments Sought by
Commission for Energy Regulation on ESB National Grid Paper"***

Submitted by: **Sustainable Energy Ireland**
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1. PREAMBLE

SEI welcomes the opportunity to respond to the CER's recent consultation on ESBNG's recommended wind connection moratorium, and to the associated concerns over future electricity system stability and reliability which may arise in the event of high levels of penetration of wind turbines on the national grid. SEI believes that the questions raised by ESBNG are valid. The issues posed by ESBNG have relevance to all grid operators in responding to increased penetration from intermittent power conversion technologies. There are technical, regulatory and commercial issues that will require attention. They have impacts, not only as detailed in the consultation document, but for the entire electricity market (including consumers). Thus mitigation efforts cannot be undertaken in isolation from the broader market.

Maintaining the reliability of the power system is critical. As ESBNG notes, "...a number of complex technical issues relating to wind generation must be resolved." SEI is actively engaged in securing rigorous and actionable research that will inform these issues. These are detailed later in this submission.

In practice Ireland may encounter problems with increased wind penetration earlier than those countries in the EU (and elsewhere) where wind development is significantly more developed. This is due to the specific nature of the Irish electricity network, most particularly its relative isolation, robustness (in terms of both wires and generation adequacy), recent reduced availability rates (increased FOR), concentrated primary demand and inertia levels. The fact that all generators have (to varying degrees) unpredictable output (non-zero probabilities) should be acknowledged in the discussion on intermittent RE generation on the grid.¹ It is critical to rely on international advice and experience from (at a minimum) U.K, German and Danish grid operators, wind manufacturers, and electricity suppliers.

It is important to note that there are other current processes that will affect and will be affected by the outcomes of this consultation process and the questions it poses. These include: ESBNG Wind Code Review, CER (S.I. 304) New Market Arrangements, EC Directive on RES-E (RES-E 2001/77/EC), and the upcoming DoCMNR consultation process on RE support policy. All of these processes have varied and complex interrelationships which, if ignored will serve to make any conclusions invalid.

¹ Indeed, system availability in Ireland declined to roughly 80% in 2003 due to, *inter alia*, increased forced outage rates on the Irish system (ESBNG).

2. SEI'S VIEW OF THE IMPACT OF THE ESBNG PROPOSALS UPON ACHIEVEMENT OF NATIONAL RENEWABLE ENERGY TARGETS

The proposals outlined in the ESBNG letter of 1/12/2004 may, if implemented as stated, have an avoidable adverse impact upon progress towards achieving Ireland's renewable energy targets. In particular the proposal outlined in point 4 on page 2 of the letter has near-term negative implications for the potential contribution that wind energy can make to meeting Ireland's target of 500MW of additional renewable electricity generation capacity to be installed by 2005. It should be noted that wind energy is projected to account for over 90% of the 2005 target and no other renewable electricity technology is at an appropriate stage of development in Ireland to make a comparable contribution.

The nature of the potential adverse impacts can be summarised as follows:

- (i) Delay in wind farm construction due to deferral of connection authorisations may result in expiry of planning permission before construction can commence for some projects.
- (ii) The proposed "revised interim technical provisions" may involve changes to the selection of wind turbine make or model which could have cost implications and may require a modification to planning permission, both of which may involve further delays.
- (iii) The extra costs and delays to projects may compromise their financial viability.
- (iv) The uncertainty brought about by the above circumstances may reduce investor, financier and developer confidence in the Irish wind energy sector and thus compromise its growth.
- (v) Connection of wind farm projects in Northern Ireland may continue unhindered and these may capture a majority of the capacity of the all-island system to absorb intermittent electricity generation.

SEI therefore contends that, due in the main to the sudden manner of their introduction, the ESBNG proposals run counter to the need "to promote competition in the generation and supply of electricity". If implemented as proposed, they may conceivably inflict long-term damage to confidence in the Irish electricity generating sector as a whole.

SEI does not concur that acceptance of the ESBNG proposals as they stand is necessarily required to avert an impending catastrophic compromise of system security. An effective and conservative grid code currently defends system security. The addition of scheduled increments of wind capacity over the next six months is unlikely to impact upon system reliability. It is anticipated that the new grid code sections for wind will result in modification of many current grid code requirements as they apply to wind. Due to the current deficit in dynamic modelling capability, the system benefits of adopting these modifications will not be quantifiable. More definitive evaluation of the effects of increased wind generation on system operation is required.

The letters and documents which accompanied the December 3rd CER web-site announcement variously referred to system security, stability and reliability. It should be noted that system reliability is a function of both system security and system adequacy. While system security may potentially be adversely affected by the addition of wind generation, system adequacy will initially improve with the addition of wind generation. The important distinctions between these different parameters need to be recognised in the evaluation outlined above.

The practicable and interim alternatives to ESBNG's proposed course of action must therefore be identified and evaluated. The deficiency in the capability to model the effects of wind power upon system stability must also be addressed as a matter of urgency. SEI advocates that the issues such as these should be dealt with in order of priority by a working group convened specifically to address the issues which will arise as a consequence of increasing renewable electricity penetration.

3. SEI CONTRIBUTION IN THIS FIELD

The evolution of the electricity supply system (generation, transmission, and distribution) and its associated control and operation in a manner that explicitly provides for the fair and transparent treatment of renewable electricity generation, should be informed by rigorous analysis and recourse to international experience. This needs to include detailed reference to the specifics of the Irish electricity market structure and the unique features of its electricity landscape (RE penetration, RE resources, transmission and distribution constraints, generation capacity margins, etc.).

SEI recognised the need to address several of the issues highlighted in the ESBNG "Interim Policy on Wind Connections" some time ago. As a result, SEI has commissioned four key studies relevant to this consultation process, each of which will serve to inform the discussion and provide a basis for solutions. SEI has also to date supported an additional four relevant research projects through its RE RD&D programme. This work and the studies in particular have benefitted from the input and cooperation of a wide group of stakeholders including the CER and ESBNG. The intent is to provide independent and qualitatively acceptable analysis informed by international experience which is based on detailed knowledge of the Irish electricity system and market. SEI believes that the outputs of these studies will serve to inform all actors and especially the group established to address ESBNG concerns. The studies are to be completed by the beginning of the second quarter of 2004. Details of these studies and projects are attached as Annex 1.

SEI intends to commission further work to address issues surrounding expansion of the capacity of renewable electricity and CHP associated with movement towards sustainable energy. This programme of work would be best overseen as part of a collaborative programme by a group comprising representation of the relevant parties.

SEI has commissioned a technical expert in wind turbine grid integration to provide a short paper reviewing the ESBNG recommendations against the background of previous work, detailing current international best practice in this field and to propose a possible work programme to address the current wind turbine dynamic modelling capability deficit.

In addition SEI has also been working towards Irish participation in Task 21 of the International Energy Agency's Wind R & D Implementing Agreement. This Task has the objective of developing and validating generic dynamic models of wind turbines and wind farms for system studies. The work is highly relevant to the problems which ESBNG have highlighted in their technical paper. Experts from Finland, Sweden, The Netherlands, Norway, Portugal, Denmark and USA will collaborate within the task to optimise models which have been developed within their respective organisations and to validate them using data collected during system events at wind farms. SEI has recently granted funding to the Electricity Research Centre at UCD to participate in the Task on Ireland's behalf. Utilities from the USA participated in the last meeting of the group and representatives from ESBNG will be invited to attend the next meeting, which is in Göteborg in Sweden on March 2nd and 3rd 2004.

4. SEI'S CONCLUSIONS AND RECOMMENDATIONS

ESBNG's proposed course of action must be considered in the context of the key tenets of Irish electricity legislation. Any decision must also take account of medium and long term electricity system requirements resulting from Government policy on renewable energy. In particular, in arriving at a decision, the Commission should give careful consideration to the manner in which it will reconcile its duty not to discriminate unfairly between holders of, and applicants for, licences and authorisations, and to have regard to the need to promote the use of renewable, sustainable or alternative forms of energy, with the requirement to have regard to promoting the continuity, security and quality of electricity supply.

The imminent transposition of EC Directive 2001/77/EC into national legislation, and its requirement that transmission and distribution system operators guarantee the transmission and distribution of renewable electricity, should also be anticipated.

SEI does not accept that ESBNG have provided sufficient justification to set aside the agreed procedures for the connection of wind farms. No immediate or quantified threat to system operation has been substantiated in the ESB submission. Incomplete understanding of all possible future effects of incorporating high levels of wind power into the electricity system is not a justification for a complete moratorium or for imposing additional, as yet undefined, technical criteria.

- Projects with connection agreements should not, without explicit technical case by case justification, be subject to additional technical criteria.

There may, however, be a valid case for control of the rate of wind power connection. This might be implemented in a manner similar to that which applied in allocating scarce gas transmission capacity in 2000. However, a coherent justification for implementing such a control mechanism and setting associated limits would have to be set out by ESBNG and the rules for its equitable implementation would have to be drafted and applied through the generator licencing process for example.

SEI believes that the manner in which ESBNG has sought to rectify the perceived stability and system security challenges and concerns is flawed in that it places too much present weight on a future contingency. There is time to establish a process within a specified work programme which will systematically address the technical concerns and possible associated mitigating options. This will need to be done in a coherent and transparent manner and begin promptly in the New Year.

SEI believes that the process is best undertaken within the framework of a group, whose remit would encompass oversight of an ongoing work programme for renewable electricity and CHP grid integration. The group would be informed by ESBNG, but not entirely guided by that entity.

SEI will continue to commission independent research on priority issues relating to the incorporation of renewable electricity into the Irish electricity system. SEI has endeavoured to obtain input from relevant stakeholders when specifying such research. However, the situation that has arisen in relation to wind farm connections highlights the necessity of multilateral co-ordination in prioritising key research topics and allocating the necessary resources to address them. As already stated, SEI believes that a key outcome from the current consultation should be the institution of a group with a remit and resources to identify electricity system issues which will arise as a result of Government policy on renewable energy, and to direct a structured work programme to address those issues.

ANNEX 1

CURRENT SEI COMMISSIONED STUDIES AND FUNDED R & D.

A. Commissioned Studies

- Study:** Renewable Energy in the New Electricity Market
Awarded To: The Brattle Group and Henwood Energy
Description: Under this study the impacts of various detailed market design choices on intermittent and non-dispatchable energy generation will be investigated. The study will entail detailed technical, economic, financial, and regulatory analysis. The deliverable should serve to increase the understanding of the various impacts of market design on the economic and (to some extent) operational viability of wind energy and other RE (biomass CHP, landfill gas, etc.) production in the Republic of Ireland.
 The study will utilize a large pool of expertise to undertake a comprehensive investigation of market design decisions on RE generation. The study will include suggestions for design options and their associated monetary and technical implications. It will include analysis of dispatch and pricing, reserves, and contracting, but will not address certification.
- Study:** Costs & Benefits of Embedded Generation
Awarded To: PB Power
Description: This study will undertake a comprehensive technical, financial and economic cost benefit analysis of the impacts of distributed generation in Ireland. It will examine commercial and technical arrangements that might be put in place which would minimise costs and maximise benefits and the impacts that these might have upon electricity suppliers, the Transmission System Operator (TSO), the Distribution System Operator (DSO), the embedded generator and the electricity consumer.
- Study:** Impacts on operating (and load following) reserves of increased wind penetration
Awarded To: Ilex, UCD, Queens, UMIST
Description: This study is a detailed technical and economic analysis of the impacts of increased wind penetration on the operation of and provision for electricity system operating reserves in the Irish context. A quantification of this impact will be produced.
- Study:** Economic Analysis of Policy Mechanisms
Awarded To: EEG, Ecofys, Distributed Energy, UCC
Description: A study on the impacts (economic, regulatory and policy related) of various fiscal instruments for supporting renewable energy generation. The study will include detailed economic, financial, and regulatory analysis.

B. Funded R&D

Project	Development of a short range ensemble prediction system for wind energy forecasting in Ireland
Awarded To Description	University College Cork Wind Energy Forecasting
Project	Country Representative - IEA R&D Wind Agreement 21
Awarded To Description	Electricity Research Centre, UCD Development of dynamic computer models of wind turbines to facilitate analysis of the impact of increased wind penetration on electricity system operation and assist in the solution of problems associated with the electrical connection of wind farms.
Project	Offshore Wind and Industry Development
Awarded To Description	Riso National Laboratory The study examines the key requirements to meet potential targets for the deployment of offshore wind energy in Ireland. Also potential opportunities for the deployment of an industry supplying the wind market in Ireland & overseas.
Project	Investigation into Potential Reduction in CO ₂ Emissions and Efficiencies generated through the use of highly accurate near real-time Support Vector Machine based Technology in Electricity Demand Forecasting at the Central grid dispatcher
Awarded To Description	Tuesday Communications Ltd/Marketmaker Software Ltd The study investigates the reduction in short term demand forecasting error (MAPE), reduction in excess reserve margin, reduction in Co ₂ emission and increase in dispatch efficiency.
Project	Wind Turbine Design and Method of Implementation which is Ideally Suitable for Use at Small Irish Windfarms
Awarded To Description	Saporito Limited The project proposes to research and investigate in a scientific way at the test site a type of wind turbine and a method of installation for Irish small windfarm sites that (1) has an electro-mechanical system which does not contain a gearbox, (2) has a blade diameter which is a prudent compromise between energy capture and blade reliability, (3) has an electrical system and method of grid-connection that provides high power quality and voltage control , and (4) has high long-term reliability and maintenance back-up.
Project	Proposal for the Definition of a Monitoring Programme for Irish Wind Farms
Awarded To Description	CENER (Spanish Renewable Energy National Centre) The scope of this project is to establish and report on the technical status and contractual conditions that exist with current Irish wind farm projects and to make recommendation on future best practice. The project will also address the need to establish an ongoing monitoring program for Irish wind turbines.
	<ul style="list-style-type: none"> • The implementation of a tool that allows and simplifies the comparison of the performances and maintenance figures

between different wind farms and different types of WTGs (wind turbine generators).

- The control of failures of the different components installed at the WTGs, allowing the generation of statistics and the identification of serial failures.
- The surveillance of the warranty compromises (Warranties of energy/power curve, availability, power factor and mechanical warranties) established between the different customers and the wind turbine suppliers.
- The establishment of a system that allows and supports, in future stages and if required by the wind farm operators, the implementation of predictive maintenance programs for the early detection of failures, which improves the availability and optimizes the maintenance works.

SEI welcomes detailed inquiries or suggestions by stakeholders that may be included in the various research projects. All of the final reports will be in the public domain once completed.