RESPONSE BY AIRTRICITY

TO PRELIMINARY CONSULTATION ON

RENEWABLE ELECTRICITY – A "2020 VISION"

Introduction

Airtricity has called on both Governments for some time to produce a comprehensive all-island energy policy. Investments in this sector be that a wind turbine, an extension of the grid or a CCGT plant, last for 20-25 years and will determine the island's energy security and competitiveness until year 2030. It is much too important an issue to be left to the current ad hoc approach.

To deliver an electricity system that is competitive, secure and meets our environmental obligations we need to have a 25-year plan. We need to envisage now what our generation mix is in 2010, 2020 and 2030. We need to understand the implications of short term over investment in and exposure to a particular generation fuel, and we need to understand the benefits of a diverse portfolio of generation assets. The design of the grid and the level of interconnection with other regions will also have a significant impact on the economics and security of supply. It is in this context that Airtricity welcomes this preliminary consultation as a first step to establishing the much needed 2020 Vision.

Against the backdrop of historically high energy prices, with North Sea crude oil prices over $67/barrel earlier this month and UK gas prices over 55 pence/therm, the timing of this consultation could not be more appropriate.

Responses to Questions in the Consultation Document:-

Question 1: What are the drivers for RES-E policy, and can they be prioritised?

The key drivers for RES-E policy are cost competitiveness and security of supply and our environmental obligations.

Cost Competitiveness

Renewables in the form of onshore wind is the most cost competitive form of energy generation in Ireland today even when compared with the most efficient CCGT Plant. At significant penetration levels there are increased system costs associated with the variable nature of wind, but as is highlighted in the SEI report 'Operating Resource Requirements as Windpower Penetration Increases in the Irish Electricity Systems' there are actual system benefits up to 10% penetration limits and only minor additional costs up to 30% penetration levels. Airtricity has commissioned a report from Shimon Awerbuch on the cost of power in Scotland which will be published in November. The report indicates that a generation portfolio that has onshore wind as 30% of that mix will deliver to Scotland a 5-10% reduction in electricity prices including balancing charges by 2010 over the mix projected by the national grid!!

(For an explanation of the portfolio theory see Appendix 1). The clear conclusion of SEI and Awerbuch's work is that Ireland will be at a significant cost/ competitive disadvantage to other regions in Europe, if it does not address its exposure to energy pricing and diversify its risk away from volatile imported fossil fuels.

Security of Supply

There are two aspects of security of supply; risk of physical interruption and risk to pricing volatility of one particular fuel – particularly when its price is correlated with other similar fuels.

The September 2005 ESRI report on "Aspects of Irish Energy Policy" noted that Ireland's share of electricity generated by gas in 2001 was double that of the EU average in the same year at 35% and that it is further predicted to grow to 58% by 2010. In 2003 the IEA in its country review recommended Ireland to "develop a clear policy on security of fuel supplies for electricity generation, including diversity of fuels, generation technologies and dual-fuelling, to avoid over dependence on imported gas in the long term". We have absolutely failed to do this.

There is currently a single point of failure for all gas imported onto the island. This relates to infrastructure associated with the Moffat compression station on the UK National Transmission System. There would be significant disruption to the island's economy by an interruption to gas flows, given the lack of gas storage on the island. Whilst it may be prudent to provide some reinforcement of additional gas infrastructure to reduce this risk, the scale and costs of these improvements should be evaluated against the costs/potential of securing additional energy supply from RES-E sources.

In terms of pricing volatility, the September 2005 ESRI report also reported on the correlation of various fuel types. The conclusion was that all fossil fuels are correlated, with oil and gas highly correlated, peat and coal are similarly correlated. The price of wind is the only technology that has no connection with the price of peat and is negatively correlated with coal, gas and oil.

Generation Portfolio Mix

One of the key elements in being able to drive forward RES-E policy is to examine the market rules/pricing signals for investment in generation. Misalignment between a "2020 Vision for Renewable Energy" and economic signals given to generation plant investors will result new capacity being built, which is incompatible with achieving a high level of renewables penetration. This is discussed in more detail later.

The governments' renewable policy must address generation portfolio mix and ensure all agencies are aligned to ensure that market rules/signals enable the optimum investment decisions to be made to deliver the governments' renewable policies.

The conclusion must be that whilst gas would appear to be the favoured fuel for the most efficient fossil fuel technology, Ireland is already over-exposed to gas in terms fuel price risk versus our European competitors and there are serious deficiencies in terms of physical infrastructure which raise physical security of supply concerns with

regard to gas. There should be no further investment in CCGT plant in Ireland. The only additional gas plant should be OCGT which provided the necessary flexibility to support Renewables.

RES-E policy must therefore be one of the key drivers to reduce the island's exposure to fossil fuel pricing exposure and disruption to physical gas flows. Wind generation is the only real hedge in terms of security of supply for electricity generation. Unless RES-E policy actively increases the penetration of wind, the island's economy is seriously at risk to a loss of cost competitiveness, compared to our European competitors.

Environmental

The EU is currently committed under the Kyoto mechanism to meeting its obligations to reduce greenhouse gas emissions. An economic signal to achieve these targets is being provided through the EU Emissions Trading Scheme. Whilst imperfect currently, it is expected that refinements to the scheme will take place during the period up to 2020 to ensure that there are traded instruments to persuade companies to reduce emissions.

In the shorter term, RoI government faces a serious issue in terms of filling the gap between the emissions levels which were set in the 1st National Allocation Plan and the total allowance for Ireland established by the EU under the Kyoto Protocol. At current prices for CO2 permits, this could amount to some €400 million. Airtricity would urge the governments to ensure that during the next phase of the EU ETS, allocations for existing industries are cut back to ensure they fall within the overall national ceiling and that there is scope for credits for new entrants with more efficient plants, at the expense of incumbents with less efficient plants.

Airtricity is also clear that there is an obligation on the governments that they ensure that policies are put in place to reduce the impact of economic activities on the environment. Recent climatic events show that there is a serious problem to be addressed. Adoption of aggressive RES-E targets, together with a clear energy policy requiring agencies to implement processes to deliver those targets will ensure that governments are playing a full part in avoiding serious environmental consequences on the earth and its people both now and into the future.

Question 2: How should RES-E policy interact with other government policies (e.g. waste, agriculture, environment, etc.)?

Airtricity is actively working with a number of project developers not only involving wind technology but also involving biomass, anaerobic digestion and landfill gas.

There is clearly significant alignment in terms of the objectives of other government departments and indeed European Commission policy in terms of using products from other processes to be used to generate renewable electricity.

The key challenge is for joined up policy implementation. This can only happen in the context of an all island energy policy under which we can co-ordinate all relevant agencies in an aligned manner. For example, at a time when the island has an

insignificant amount of its electricity generated from renewable sources, no connection offers for wind generation projects have been issued for any project, which did not submit its connection application by the original moratorium date of 3rd December 2003. For non-wind renewable generation facilities, there have been extended delays (up to 6 months) in obtaining a grid connection for such sites. Private investors should not be subject to the cost uncertainty involved in enduring such delays.

Question 3: Do the opportunities or obstacles facing RES-E differ between the two jurisdictions?

There are significant differences between the obstacles facing RES-E between the two jurisdictions.

In Northern Ireland (NI), there is the benefit of the Renewables Obligation Certificates (ROCs) scheme, which provides sufficient revenue certainty to financiers of RES-E projects, despite underlying concerns about the pricing of electricity in Northern Ireland. There has also been pro-active dialogue and interaction between the system operator in Northern Ireland and wind farm developers, which has helped identify issues at an early stage.

Clearly, grid upgrade, planning criteria and Renewables connection strategies need to be developed for both regions. The planning processes in Northern Ireland are proving to be a major obstacle to building RES-E plants. In particular, the absence of deadlines for notified parties to respond to planning applications ensures that it can take 1-3 years for the planning process to run its course. Such extended timelines pose a major cost barrier for development of RES-S projects, particularly for smaller developers. This issue needs to be addressed urgently.

While NI does not appear to have a grid access problem per se, the requirement for attaining planning permission before a grid offer can be issued is serving to mask the inherent shortage of connection nodes deemed suitable under current transmission planning criteria. To date the connection of renewable generators there has not generally warranted 'deep' system reinforcement works but this will change as penetration levels increase. The current NI wind quarterly report[1] indicates that a non-cumulative amount of approximately 350MW of unconstrained capacity can currently connect to the NIE network at the eight identified nodes. This amount will reduce significantly once the effects of interaction, quantified in the 'participation matrix', are calculated.

There should be clear alignment between the energy policy, planning policy and tax incentives to promote investment in Renewables.

Very shortly in NI another issue will face developers. Under current connection charging policy SONI pass charges for deep reinforcement works back to the embedded generator. While this method of charging may be appropriate for large centrally dispatched plant with high capacity factors, it is less appropriate for wind powered plant. Unless connection charging policy is revised to apportion charges on

[1] NI Wind Quarterly Report – July 2005

the basis of system use this will constitute a significant financial barrier to many projects. A TUoS charging mechanism, similar to that applied in ROI is recommended.

In RoI, the planning process has, in principal, run more smoothly. Although there are a number of exceptions in terms of the attitude of County Councils to wind farms, the government has attempted to provide more certainty to the process in terms of timelines for resolution for planning issues in general and in providing central government guidelines for how wind farm planning applications should be handled at a county level. Airtricity would highlight however, that the current planning permission validity period of five years is inadequate when the system operator takes several years to issue grid offers and a further 3-10 years to build the necessary grid infrastructure to enable firm network access. Airtricity would contend that all planning permission durations for renewable plant should be extended to fifteen years duration.

Until recently, there has been a semi-hostile attitude adopted by the system operator in RoI in terms of wind farm connection applications. This manifested itself most overtly in the application by ESBNG to have a moratorium imposed on new wind farm connection applications in December 2003. During the past 20 months, the system operator has been dealing with the applications for grid connection, which were made prior to December 2003. No clear system or methodology is in place yet to deal with any applications submitted post December 2003 and a number of deficiencies have been highlighted recently in the connection process[2]. Unless these are resolved urgently, this will prove to be a major obstacle to increasing RoI's penetration of renewable energy.

The lack of a consistent and coherent support mechanism for RES-E projects has also proved to be a major obstacle. The "stop/start" nature of the AER competitions and the flawed nature of these competitions have failed to deliver RES-E generation projects.

RoI policymakers could benefit from the positive benefits of the ROCs scheme and system operator strategy in NI, whilst the NI policymakers could learn from the planning processes in place in RoI.

Question 4: Are there areas of RES-E policy that should not be considered on an all-island basis and why?

There are a number of "temporary legacy" issues which will need to be dealt with separately between the two jurisdictions. Examples of these would be the legacy power contracts in NI and their impact on ability of NI to absorb large quantities of RES-E. However the aim should be to reduce these issues during the period 2006-2020, so that during the period 2010 onwards, alignment is achieved gradually.

One issue that may remain outstanding is the application of carbon taxation at the consumer level (e.g. carbon tax in RoI or CCL in NI). However the treatment of costs arising from the EU Emissions Trading Scheme should be aligned.

[2] Group Processing Scheme – A Developer's Perspective; http://www.eirgrid.com/EirGridPortal/Regulatory Affairs

Question 5: To what degree are RES-E policies currently aligned – North & South?

There would appear to be little current alignment between RES-E policies – North & South. This reflects a lack of integrated planning and co-ordination on RES-E. Therefore the initiative of the governments' in undertaking this consultation is to be applauded. One example of the lack of alignment relates to the manner in which output from NFFO and AER (RoI equivalent of NFFO schemes) is treated. NFFO power is auctioned off to independent supply companies. Output from AER contracts is contracted to ESB PES.

A further example of the lack of alignment between the two jurisdictions relates to the target levels for electricity sourced from renewable sources. It is important that this alignment takes place as soon as possible as this will facilitate the alignment of support mechanisms without the introduction of distortionary cost impacts between the two jurisdictions.

Question 6: How should all-island RES-E policy inform and be informed by EU and UK RES-E Policy?

Airtricity thinks that Best Practice on a worldwide basis should be examined to benchmark existing policies and determine what new policy instruments should be used as part of RES-E policy.

EU policy can often set high level targets and give guidelines, as can UK RES-E policy. In the absence of an explicitly stated national energy policy, the EU targets often set policy at a national level. However the island faces particular issues which are not faced by most of the larger EU countries including UK. Most other countries have a significant proportion of their generation mix largely insulated from fossil fuel pricing – either through a large proportion of nuclear power and/or hydropower. The All-island system has access to no nuclear power and an insignificant amount of hydropower.

It is therefore critical that one of the key outputs from this consultation process is the development of an All-Island Renewable Energy Policy and Strategy, which clearly has to be compatible with EU Directives and UK Energy Policy.

Question 7: What effects will interconnection (North-South & East-West) have on RES-E, and how should it be operated and regulated?

North-South Interconnection

The current primary benefits of north south interconnection are[3] reduced costs due to:

i) Sharing of spinning reserve and cross border rescue flows

ii) Facilitating opportunistic trading

[3] ESBNG 2005 Forecast statement

Further North-South interconnection is an obvious pre-requisite to further effective penetration of renewables in Ireland. It will enable additional sharing of resources and trading as well as enhanced system security and reduced system costs.

A number of issues exist with the current north south interconnector set-up and limitations imposed due to the possibility of system separation. Any proposed expansion must be sufficiently robust to eliminate or minimise the system separation issue that currently limits north south interconnector flows, thereby allowing full market trading between the regions.

Generation in Northern Ireland has traditionally tended to be located predominantly in the east of the province. This has resulted in the west, particularly the south west, having a weak grid infrastructure. As Fermanagh and Tyrone contain the majority of NI wind resource, significant grid investment is required in this region. A second 275kV loop, extending from Coolkeeragh to Dungannon via Strabane and Omagh is currently under consideration by the system operator. Airtricity consider this the obvious and optimum solution. This then leaves the optimum path for a second interconnector to be in the west of Northern Ireland extending south, via Enniskillen, significantly strengthening the areas of best wind resource and reinforcing the traditionally weak grid infrastructure in the north and west of the Republic of Ireland.

East-West Interconnection
The benefits are similar to those arising from further north south interconnection:

a) To facilitate trading and promote competition in the marketplace
b) Reducing overall generation investment though sharing of resources
c) Reducing reserve requirements with associated cost and environmental benefits
d) Minimising wind generation variability across the regions
e) Improve security of supply

Further interconnection to the UK is thus an obvious pre-requisite to further effective renewables penetration in Ireland. Airtricity foresee Ireland's wind resource providing a high grade commodity tradable to the UK, transcending the well known UK North-South limitations. However, progress since the Minister's press release in February has been very slow. Renewed impetus must be placed on this project to ensure delivery of 1,000MW of interconnection before 2020. Airtricity would feel that the market should decide power flow and reserve allocations. Trading arrangements for the East-West interconnector should be aligned with those of the Moyle interconnector.

Question 8: What could the level of penetration of RES-E electricity be in 2020 on the island of Ireland? (Please include any analysis that supports your response.)

The main factors affecting the potential for renewable penetration by 2020 are:

1. **Available sites;** onshore and offshore. Given the current level of applications and expressions of interest in both jurisdictions there do not seem to be any immediate limitations in the availability of potential sites for wind.
2. **Network capacity;** The Garrad Hassan report, commissioned by the Irish regulators in 2003 indicated that up to 3,300MW could be connected to N-1 levels of security without requiring transmission system reinforcement. Clearly this will increase over the timescale of interest as the grid continues to evolve and strengthen. With further grid reinforcement the figure can be increased if required. The potential to connect 6,000MW and beyond to the Irish grid by 2020 is entirely feasible. Beyond 6,000MW we would envisage robust links to the UK and Europe, bypassing any potential backbone constraints in Ireland.
3. **System capability** to handle wind. The necessary hardware and control infrastructure is now in place, via revised Grid Codes, to control an infinite amount of wind powered plants on the Irish power system. There are no system limitations.
4. **Economic limitations arising from available system capacity.** These will be defined by:
    i) **Interconnection.** The establishment of links with other regions is necessary to minimise potential constraints imposed at higher penetration levels.
    ii) **Plant portfolio mix.** The ability to generate will eventually be limited by the flexibility of the portfolio of conventional plant connected to the Irish system.

Concluding from points 1, 2, & 3 above the question of determining a theoretical maximum is somewhat academic as there are no actual practical or technical limits to penetration that cannot be overcome. The limitations are purely economic/commercial.

A more appropriate question may be, "what steps do we need to take now to ensure an optimum economic and technical environment for connection of sustainable energy plant". The answer will be defined by:

1. Plant portfolio mix
2. Level of interconnection with other regions
3. Network capability

Plant portfolio will have a profound effect on system economics and hence penetration, especially at higher penetration levels. Therefore it is imperative that the effects of national plant portfolio be carefully studied and optimised so as not to pose a future barrier to renewables penetration. The imminent retiring of a number of large conventional power plants, together with the large Combustion Plant Directive in 2008 set deadlines for key irreversible plant portfolio decisions that will affect renewables penetration up to and beyond 2020. These must not be automatically replaced with CCGT plant. Insufficient study has been carried out to date on the effects of non-flexible plant on renewables penetration. It is imperative that this is carried out fully and immediately. The results should guide energy policy and Grid

Code requirements. Further installation of large inflexible plant should be avoided in the interim.

Question 9: How should suggested levels of penetration be decided?

Extensive research needs to be urgently undertaken to ascertain potential levels of renewables penetration on the island of Ireland and to identify the key limiting factors. A further study should then be carried out with the main focus on how to maximise renewables penetration. In particular we need to fully understand the true cost of variable renewable power to the system. To date these have been grossly overstated – see Appendix 2.

Optimum plant portfolio, optimal infrastructure upgrades and enhanced system operating strategies should all be examined with view to steering policy and steering system design to accommodate maximum levels of renewable generation minimum cost to the consumer.

Question 10: Should NI and RoI be seeking to lead in any technologies?

Pump priming of R&D to encourage commercial development in focused RES-E technologies where the island has a natural resource advantage should be undertaken. Once near commercial development has taken place, support schemes should be established to enable full commercial exploitation of the RES-E technologies in which the island has a natural advantage. This could be through a ROCs scheme, supplemented where necessary by grant aid, either in form of capital grants or relief from operation expenses. Two potential opportunities are listed below:

1. A number of research institutions[4] have recently commenced serious investigations into initiatives to manage wind variability by matching wind plant output to controllable load. For example, wind power, during high periods of the daily production cycle, can be used to store thermal energy in the form of domestic water or space heating at remote and dispersed load centres. The concept is not new and has been applied in Ireland for some years by SONI and the ESB to flatten the load curve and increase utilisation of conventional plant. The demand elasticity introduced has been shown to have a significant reduction in system costs. This enhanced application to offset the variability from wind powered plant is expected to achieve further system benefit and cost reductions.

   Secondary benefits arising from any such initiative would be the possibility of using the scheme for network congestion management, load shedding and reserve minimisation. We believe that intelligent DSM and storage techniques should be incorporated into the 2020 vision. Ireland is an ideal test bed for any such scheme and the application is global in nature.

[4] B. Fox and D. Flynn, Queen's University Belfast, 'Managing Intermittency of Wind Generation with Heating Load Control' ; G. Strbac, UMIST, 'Role of Storage and DSM in Integration of wind Power; S. Awerbuch, University of Sussex, 'Restructuring our Electricity Networks', March 2004.

2. The transmission and distribution networks in Ireland are largely passive devices. They have a number of protection relays installed to trip faulted sections of the network, but no processing capacity to fully optimise network (especially renewable) resources.

   Instead of constraining renewable generating plant during system contingencies such as line outages, future power systems will understand and correlate system requirements with actual network capability. Instead of constraining 'non-firm' renewable generation during potential network overloads intelligent control systems will allow for optimal generation output for a given circuit configuration. The opportunity exists for Ireland to lead the field in this area given the topology of our network and the rapid plans for increasing renewables penetration. A significant R&D program is required.

Funds should be clearly directed towards a very limited number of RES-E technologies where the island had a natural advantage.

Question 11: What type of plant (RES-E) should be promoted through appropriate financial, regulatory and/or planning policies?

The island has few indigenous energy resources of the conventional "fossil fuel" nature. However its does enjoy natural resources in terms of one of the best wind regimes in Europe both onshore and offshore, a powerful tidal system and a natural ecosystem which favours virtually all-year round growing season for some crops.

In examining the potential RES-E electricity sources which could implement a 2020 vision for supplying renewable energy, first attention should be paid to the policies required to maximise the exploitation of these natural resources. The island of Ireland must have as much control as possible over its electricity generation supply.

Onshore and offshore wind, tidal generation and biomass generation are the RES-E plant most likely to have a secure, indigenous source of "fuel", which could be effectively exploited and should be main targets in RES-E policy.

Question 12: What primary policy mechanisms should be put in place to meet the suggested penetration levels and how should it be applied? What prices are required?

The island's experience is that there are three barriers to the development of a significant RES-E penetration; institutional, regulatory and economic.

Institutional: In RoI this refers to the lack of planning by the system operator to prepare the grid infrastructure for the changed nature of generation; in particular a significant amount of embedded generation in western regions which were traditionally deficit in electricity. In NI this refers to the lack of a well defined, time-bounded planning process which delivers certainty to project developers in terms of resolution of planning issues. In the North and South there is a lack of a coherent planning strategy for the optimum portfolio of plant to meet future energy requirements.

Regulatory: The current regulatory environments have been established to deal with large-scale fossil fuel generators and supply companies, in markets dominated by ESB and NIE. They have not been tasked with ensuring that their actions must be compatible with meeting RES-E targets. This manifests itself in a number of different ways; in NI renewable supply companies are subjected to a large imbalance charge of 60%, which is well in excess of charges which can be justified in a non-regulated imbalance market. Such charges hinder the demand-pull from customers for renewable energy; in RoI renewable power has received a lower price for spill than power from fossil fuel sources.

Economic: There needs to be a coherent, sustainable, stable economic support mechanism for RES-E technologies that are close to economic viability. The key challenge for most RES-E technologies is that they are capital intensive, with low variable costs. They contrast sharply with fossil fuel plant, which have a relatively lower (per MWh of production) capital cost, but higher variable costs. For example in the 2006 BNE decision by the CER, variable costs accounted for 77% of the BNE price set. In terms of a wind farm, variable costs would be less than 10% of its costs, with the fixed cost of servicing the capital expenditure accounting for over 90% of its costs.

Fluctuating wholesale markets which set electricity prices using volatile fuel cost inputs are not compatible with the financing requirements for RES-E technologies. The purpose of support mechanisms is to guarantee a floor price for the output from such technologies so that financing can take place.

Given the importance of ensuring that there is a sustainable, yet effective mechanism put in place as a support mechanism, Airtricity favours the use of a market driven support mechanism. Such a mechanism should give confidence over the required financing period by providing a floor price that can be used by the banks for financing. The in-built security mechanism in a market-driven support scheme is that if over a period of time the combined value of energy and support scheme is sufficient to incentivise a large number of projects, the target will be met and the value of the support mechanism will correct downwards with delivery. This does require an integrated approach with the institutional and regulatory authorities to ensure that there are no other barriers to delivery, once the economic incentives are in place.

Airtricity believes that given the recent increases in turbine prices and costs of grid connections, a support level of 6.5-7 c/kWh is required, with offshore wind level requiring support in range 9-10c/kWh. In this context it is important to note that current UK ROCs scheme enable suppliers to provide floor prices to developers in excess of £50/MWh (€75/MWh). Unless the island provides schemes of similar value, projects outside the island will be developed at the expense of local projects.

A series of current institutional and regulatory barriers must be removed in addition to the establishment of a long term, sustainable, market driven support mechanism. Airtricity strongly contends that the current UK ROCs system should be introduced on an all-island basis. This would provide the confidence to suppliers to give developers a fixed offtake price of sufficient value to enable financing of many RES-E technologies.

Question 13: What supporting schemes are appropriate, and for what technologies?

It is important that base support scheme is established in a manner which gives longer term confidence to the investment/financing community. Airtricity favours the UK ROCs scheme as it has a proven track record of enabling RES-E technology projects to be financed and delivered.

Constant "tinkering" with the value of such a scheme will undermine its confidence. Therefore grants, in the form of capital or relief from operating costs should be used to "plug" any gap between the revenues from the "base" ROCs scheme and the costs of the more "frontier" RES-E technologies. The advantage of doing it in this manner, is that the grant levels can be adjusted to ensure deliverability of other RES-E as the costs of some RES-E technologies reduce over time (e.g. offshore wind) and new RES-E technologies "appear" (e.g. tidal stream generation) and require more significant support.

Question 14: What are the principal obstacles for RES-E penetration to 2020? How can they be addressed?

A major obstacle is the mindset of system operations conditioned to operate large centralised energy flows. The deeply flawed but still quoted ESBNG February 2004 report[5] sought to quantify the economic implications on conventional plant of increasing wind penetration in Ireland is evidence of that. The only benefit of this report was to highlight the fact that an inflictable generation mix will add significant cost to a system that seeks high penetration of sustainable Renewables.

For some time Airtricity and the IWEA have urged for action, intervention and direction on a policy to steer the plant portfolio issue forward. Specific policy, backed by expert scientific research, is urgently required in this area. Although this issue has been largely side-stepped historically, partly due to its technical and political complexity this is the key item that needs to be addressed in the 2020 vision.

Forecasting is not seen as a major barrier to wind penetration in a technical sense as measures can be implemented to cope with variable plant output or forecasting errors. However, accurate forecasting is required to minimise overall system operating costs. This is best carried out by the TSO. The considerable progress by the TSO in this area should be supported and encouraged.

New Single Electricity Market (SEM) has the potential to encourage or be an obstacle to RES-E penetration. The detail market rules could have a significant impact e.g. gate closure times. Short gate closure times such as those used in the UK of 1 hour support Renewables, as their variability and the ability to forecast it is very good in such short time frames. A 12 hour gate closure is good for a big fossil fuel plant but would not support Renewables as forecasting techniques are not yet reliable enough in that time period. A 12 hour gate closure without significant caveats would make it

[5] Impact of Wind Power Generation in Ireland on the Operation of Conventional Plant and the Economic Implications, ESB National Grid, February 2004

too risky to trade wind on the system. We must ensure SEM rules are specifically designed to support Renewables.

Question 15: What are the impacts of increased RES-E on the power system and operation? How can they be addressed?

Increased penetration of renewable generation causes a number of well documented effects on system reserve, frequency control, fuel consumption, merit order scheduling, system inertia etc. The capability of the system to deal with those effects, positive and negative, depends almost entirely on the portfolio of plant at the system operator's disposal. As has previously been stated there are no technical limitations to the amount of Renewables that can be put on the system. Improvements in forecasting and reinforcement of the grid will all lead to lower costs.

As outlined in questions 1, 7, 8 & 9 RES-E policy must strive towards attainment of an optimum portfolio of plant (including interconnection and grid infrastructure) that reduces fuel pricing exposure, exceeds renewables targets and minimises cost to the consumer in the longer term,

Question 16: What are the implications for future policy of different scales of RES-E (e.g. distributed generation versus large scale wind)? How could they be planned for and facilitated?

In Airtricity's opinion a diversified portfolio of large and small plants is required. On the one hand a number of small plants installed at distribution level makes best use of the distribution asset and site diversification seeks to minimise power fluctuations due to wind output or severe network faults.

One the other hand large wind farms, including offshore, serve to best meet renewable targets. Opening up the east of the island to either onshore or offshore Renewables would give greater geographic dispersion and therefore reduce variability and cost. A balanced portfolio is required with further North-South and UK interconnection to minimise security impacts from very large (super-size) sites when they become available.

Question 17: How should the costs and benefits of RES-E electricity be measured and quantified?

RES-E technology generation will enable the following issues to be addressed:

- Reduction in greenhouse gas emissions levels from what otherwise have taken place, which can be costed at the prevailing penalty/price for such emissions.
- Diversification of risk away from volatility in fossil fuel pricing. The work undertaken by Shimon Awerbuch, Appendix 1, has identified that by using accepted financial portfolio risk methodology, the benefit of increasing penetration of wind to the system (in Scotland) is a 5-10% reduction in electricity prices with a 30% + wind generation penetration.
- In terms of security of supply, the risk of a disruption to the island's economy of a disruption to gas flows would be enormous. A very conservative way of measuring such disruption would be to use a probabilistic assessment of the

risk of disruption and multiply that by a Value of Lost Load for the gas-fired generation that would be lost to the island during such disruption.

- The current price of some Renewables is competitive with CCGT power.

Question 18: What are the costs and benefits of increased RES-E penetration on Island of Ireland?

A reduction in electricity costs in the region of 5-10% through the portfolio effect on the generation mix. The benefits of increased penetration can be measured in terms of avoided penalties/compliance costs for compliance with Emissions Trading limits, reduction in volatility in electricity prices as a result of a significant proportion of electricity from RES-E technologies and an improvement in the cost competitiveness of the economy as a result of avoided exposure to fossil fuel cost inputs and low cost marginal pricing of electricity post debt repayment period on RES-E plant.

Question 19: What work streams should be included in a work programme to facilitate RES-E goals

Airtricity proposes that the following work streams need to be addressed as a matter of some urgency:-

- Commission Shimon Awerbuch to carryout a special portfolio analysis for the island of Ireland to establish the optimum economic generation mix for the island
- Based on the results from the economic study there should be a further study to assess optimum plant mix in an all-Ireland power system from a technical viewpoint. This would also address the operation of existing generation plant in terms of additional control systems to enable plant to operate more flexibly and at lower minimum generation levels. This study would therefore have both technical and economic aspects to it.
- The potential for Demand Side Management in reducing reserve requirements and costs.
- Examination of the optimal grid upgrades to accommodate expected penetrations of renewables plant
- Study to assess optimal renewables connection strategy for both jurisdictions
- Study to devise, assess and quantify enhanced system operating strategies for high renewables penetrations
- Review of connection processes North and South
- Incorporation of learned information into a coherent and complete RES-E policy
- Engagement with NI planning authority to seek streamlining of NI planning process
- Engagement with dept of Environment & Local Govt., County Councils and An Bord Pleanála to seek extension of planning permission duration in RoI to fifteen years

- Review of transmission planning criteria for renewables plant
- Review of Grid Code requirements for conventional plant operating in a portfolio with high levels of renewables
- Review of connection charging policy in NI (for deep reinforcement works)
- Engage with RoI policy makers to test feasibility for alignment with ROC scheme
- Role of interconnection in enabling more RES-E generation to be connected to the system
- Kick-start East-West interconnector and plans for 1,000MW interconnection
- Introduction of incentives to facilitate appropriate R&D in key focus areas
- Assessment of where we are at and where we need to go with forecasting
- Assessment of the real potential for offshore wind to contribute a significant increase to RES-E generation, including requirement for grid infrastructure to tap into and exploit this resource.
- A review of the role of emerging RES-E technologies (tidal and biomass) in providing further RES-E output.
- Potential for harmonisation of renewable support mechanisms and implementation plan to address this issue.
- A reality check on the new market rules in SEM will aid or hinder developers to deliver targets/policies contemplated by this consultation
- A review of the grid contestability rules and the process to deal with grid connections to ensure that these do not remain barriers to achieving RES-E penetration goals.