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Proposed A-B-C MODEL for the distributed Generation and storage of electricity.

Proposed to the CER

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Executive Summary

This paper is to highlight the potential of micro electricity generation and distributed storage. We propose an interrelated model – the A-B-C model for customers who would require under 100 kW generating capacity. This would allow for approximately 90% of electricity customers to plan their energy costs in a reasoned and predictable manner. We estimate that this will provide for approximately 40% of the existing yearly electricity demand of approx 23,000 Gwh, should there be a 60% take up of the model. We estimate it would cost an additional 1% to 10% on top of the PES (public electricity supply) cost over 13 years depending on the price of oil and related fossil fuels.

We submit that the COMMISSION FOR ENERGY REGULATION (CER) is required to balance the *reasonable demands* of customers in a rapidly changing environment of post oil peak economics. It is estimated by the ISEA, through averaging 20 studies over the last 22 years that the ultimate recoverable resource of oil is 1.86 trillion barrels. The world has used half of this amount so the world economy is currently sitting on top of the bell curve of oil supply (post peak) with gas production reaching peak in 5 years time.

The recent consideration of the FCV (fuel cost variation) gave notice to the market that centralised generators need to balance the risk of fuel cost variations . It is proposed by the ISEA to recognise this reality however it also recognises that the FCV was an indicator of a more significant problem which is that of security of electricity supply. The A-B-C Model plans to spread the risk between the customer and supplier in a reasoned manner.

We submit that the following example of the ABC model would be understandable to customers without a specific expertise in electricity generation or renewable energy thereby promoting a take up rate of approximately 60 % of eligible customers.

We call this the A-B-C model:

Plan A:	Centralised grid power
Plan B:	Solar Photovoltaic panels; Solar thermal panels; biomass Combined Heat and Power (CHP); small scale wind power.
Plan C:	Storage in batteries integrated into appliances coupled with distributed storage batteries. The target capacity is 10 Gwh.

It is submitted that without appropriate information about Plan A, it is not possible for individual customers to reasonably size Plan B or plan C for their purposes. The costs of Plan B and C have traditionally been declared uneconomic by the CER, however should a customer have reason to anticipate or experience uncontrollable costs or a power failure that promises to be a precursor to future power failures then the economic calculation changes immediately. The "reasonable" question for the customer is how fast and how cheaply can he gather renewable energy for his own needs to compensate for unpredictable performance of Plan A.

It is submitted that the CER could recognise this economic argument prior to customers experiencing the pain of loss through power failure. It is further submitted that a ten year programme of decreasing feed-in tariffs are required to build capacity at a rate that is likely to compensate for loss of performance of Plan A. The advantage of the ABC model to the central grid generators and suppliers is three fold :

- Capital costs are redistributed to the private sector and liabilities for failure of the grid are reduced, should early action be initiated.

- The load on the system of central generation is reduced in line with the potential supply of fossil fuel allowing for a focus on larger industrial and commercial customers

- The central grid can reinforce power quality by the distributed storage which can be controlled by a remote electronic responsive load devise.

Introduction

The ISEA recently submitted a discussion document to CER on the proposal from the ESB for a fuel cost variation (FCV) mechanism. Preparing this submission gave us an insight into the need to spread risk in a balanced and reasoned manner that focuses on the every day needs of approximately 90% of the electricity customers. This figure of 90% of customers who require under 100kW of generating capacity is a speculative figure due to lack of concise customer information.

This paper is produced to highlight the potential of micro generation and distributed storage. We propose an interrelated model – the A-B-C model. This will allow the majority of electricity customers to plan their energy costs (in the era of post peak oil production) in a manner which they can sell to their bank. We estimate that this will provide for approximately 40% of the existing yearly electricity demand, should there be a 60% uptake by the targeted customers who require less than 100 kW generating capacity.

Interaction of Energy Sectors

There are three main energy sectors:
electrical;
heating;
transport.

Of these three, electricity generation is the only policy area controlled by government through the CER. The electricity market influences the heating market for storage heating, hot water heating and to a growing extent the heat pump market and air conditioning market. The direct heating market is controlled to a lesser extent by CER by its control of the gas market. The transport sector is influenced in a minor manner through Luas and Dart, however electric cars could also have an impact on policy in the future.

CER policy for electricity generation therefore has a domino effect on distributed generation and related sectors such as heating. It is therefore strategically impossible for renewable energy policy to progress in an effective manner since there is a current policy vacuum in the area of micro generation under 100 kW. There are three suspected reasons why this vacuum exists. One being that pre peak economics calculated all costs in competition with an oil supply, which was always in the comfortable position of exceeding the demand. The second is that micro generation has been perceived by the policy makers as an area of uncontrollable multiplicity, in comparison to central generation.
The third reason has been a concentration of policy on large scale renewable sources such as wind since they are closer in organisational terms to centralised fossil fuel generation.

It is submitted that the CER can either wait for the numerical logic of oil supply and demand to change or more reasonably, they can anticipate the change and act accordingly. We argue further that should the latter option be embraced by the CER then what was considered previously as uncontrollable multiplicity, is seen an urgent engineering necessity, to balance a delicate system engineered on pre peak logic.

The A-B-C Model

The basis upon which reasonable demands can be discussed has to include realistic options to fossil fuel or nuclear power. We submit that the following example of a model would be understandable to customers without a specific expertise in electricity generation or renewable energy. We call this the A-B-C model:

Plan A: Centralised grid power

Plan B: Solar Photovoltaic panels; Solar thermal panels; biomass; Combined Heat and Power (CHP); and small scale wind power.

Plan C: Storage in batteries integrated into appliances coupled with distributed storage batteries. Batteries have a dual function. They provide protection for customers in a blackout and a load balancing device for the grid operator.

The A-B-C model is designed to cater for all categories of customers:

industrial;
commercial;
retail;
residential;
agricultural;
institutional.

Plan A

We submit that Plan A will rapidly become uncompetitive in price and unpredictable in performance in a post peak scenario and customers shall need a Plan B and a Plan C to sustain their businesses, social projects and residential requirements.

The existing system of centralised power generation is seeking to cope with the first stages of oil supply price uncertainty, as evidenced by the FCV proposal. The next stage is likely to be one of uncertainty due to security of supply of both oil and gas. The timing of this second stage is unpredictable due to increased demand for oil from China and the uncertain political climate in Russia regarding Siberian Gas. This current model of centralisation cannot function without a guaranteed supply of fossil fuel or the introduction of nuclear energy generation.

The CER, therefore, could consider a distributed system thus spreading the risk over the entire customer base in a reasoned and balanced manner by encouraging and facilitating Plan B and Plan C within a time frame that will allow the customer to compensate for the uncertain future performance of Plan A. The future costs of plan A are estimated under appendix 3 by using a best and worst case scenario of fossil fuel costs.

Plan B

The value of distributed generation increases with the likelihood or experience of a Plan A power failure. The costs to a business of a power failure are multi dimensional as follows:

- Loss of use of capital intensive plant
- Labour downtime
- Delayed cash flow due to late order delivery
- Lack of budgetary control
- Loss of confidence in planned expansion
- Loss of share value
- Diversion of management time from planned operations to management of unscheduled confusion.
- Loss of market share
- Costs of hiring Specialists to advice and research solutions to failures of Plan A.

These costs could become threatening to the commercial health of a business (and to the country), which would in turn lead to reduced tax income for the government and will make it difficult to attract new international business.

The costs and value involved in distributed generation therefore are not comparable directly to the price per kWh of centralised power supply because the additional costs of a failure in Plan A are significant and are different for each customer.

The costs of distributed generation are variable, however they can be simplified and reduced by appropriate planning of infrastructure, energy management and well informed assessment of the risks of Plan A.

It is submitted that without appropriate information about Plan A, it is not possible for individual customers to reasonably size Plan B for their purposes. Each technology in plan B has different cost profiles and performance profiles . It is advised that the customer balances the seasonal advantages of all the technologies with their site characteristics to obtain optimum security of energy supply. The technologies of photovoltaic panels, solar thermal panels, and small scale wind power have all 30 year track records with micro biomass CHP a year or two away from product launches.

It is further submitted that Ireland has a unique low density distribution of property which is advantageous to ground based solar installations independently of the main building or facility, with irradiation levels equivalent to northern Europe. Our growing environment for biomass and the wind speeds are the best in Europe. The target is ambitious at 40% of current demand and does require an integrated government policy to remove all barriers and trip wires to its progress.

The diversified small scale of the distributed generation reduces the planning permission roadblocks to the expansion of the capacity and the energy is collected and used on site reducing transmission losses. Plan B also allows for the customer to build their own capacity gradually, while using the existing grid infrastructure for mutual support between the central grid and the customer.

The target capacity over a ten year period is 9283 Gwh . The total demand of 23,000 Kwh is based on data from 2002 and since the demand growth is uncertain in the future it has been assumed that this figure shall remain relatively stable over a thirteen year period. This assumption is made since the rising cost of electricity induces a more efficient management of power and that the central grid shall probably reduce the imports of fossil fuels in line available supplies. There is an assumption also that the large scale renewable power sources such as wind wave and tidal power shall have a greater penetration of the market in the region of 20%.

Plan C

This storage would have two potential purposes. The first would be protection against power failures and the second would provide a balancing mechanism for grid power quality controlled by an electronic responsive load devise.

The local benefit to individuals is obvious. In the residential market a growing number of appliances have built in storage batteries and in the commercial market there are a wide range of UPS systems. Three-hour battery backup lights are normal for emergency lighting and this system could be readily encouraged for normal lighting. The central benefit of Plan C is only evident when there is substantial distributed capacity available. The technology of responsive load devices is at pre-commercial stage and its execution can be expedited with policy direction. It is assumed in Appendix 2 that the average household would invest €1,000 for 6 kW storage and the average commercial business would spend a minimum of €30,000 for 180 kWh. The target capacity for Plan C is suggested as 10 Gwh.

The Capacity potential of micro generation under 100kW

The potential capacity is significant and the ISEA submit the following figures from appendix 1 and 2 as an impetus to a more detailed study by the CER. It includes technologies not represented currently by our association and other associations such as wind or biomass have not been encouraged to research the economic potential of micro generation. It is reasonable to include these estimates since they fall within the same policy area of under 100kW for consideration by the CER. The assumptions made and the detailed calculations are presented in a manner that invites rigorous examination , which we would hope would be the appropriate response to this discussion paper in the context of our whole argument.

Summary of capacity of small scale micro generation = 40% of yearly electricity demand of 23,000Gwh.

The potential for distributed storage is estimated at 10 GWh.

These figures could of course be expanded if the commercial environment is created by the CER through further adjustment of the feed in tariff. The distributed generation industry would then be challenged to respond in an equally imaginative and ambitious manner.

Costs of the A-B-C model to the public

The proposed principle is to reasonably distribute the costs in a manner that balances risks, responsibilities and benefits in a manner calculated to maintain maximum equilibrium in competition with projected fossil fuel costs and security of supply.

The main variable involved with implementing this principle is that contracting fuel supply has no historical precedent for numerical logic. So caution would advise that the worst case scenario be acknowledged and agreed between parties. Should the worst case scenario not materialise in the predicted time frame then security shall have been purchased at a premium. This premium is calculated in appendix 3 as 4.8% of the PES. Most pragmatic businesses and home owners would accept this premium cost since the value would no doubt exceed the cost in the next financial period since the fuel for renewable energy is free (with the exception of biomass) and the economic cohesion of their organisation would therefore have a competitive position in relation to those customers who rely totally on the central grid.

It is submitted that the risks of taking no action, for the CER (representing government) , the ESB and property owners are all equally severe. The responsibility for action is therefore reasonably well balanced among all three parties, with the CER briefed under the 1997 regulations to balance costs to achieve the function of energy security for the maximum number of customers in a timely fashion.

In appendix 3 the cost to the PES of a feed in tariff of 50 cent decreasing over a 13 year period in increments of 5%. The net additional cost on a customers bill would average an extra 1% to 5% (10% would be the maximum) of the PES unit cost depending on fossil fuel costs over that period. For technologies such as solar thermal it is proposed that a credit be applied to the ESB bills in the same numeric logic as the other micro generators, on the basis that it displaces substantial central generating capacity.

Summary of the proposed A-B-C model

- **The ABC model can distribute risk in a reasonable manner by encouraging 90% of customers to plan their own Plan B and Plan C ahead of experiencing loss through uncontrollable costs or power failure of plan A. The ABC model targets a 60% take up of the scheme.**
- **The pending reality of contracting fossil fuel supplies has no historic precedent for calculating the numerical logic, therefore caution would advise that the worst case scenario is acknowledged and agreed between the parties. The cost to the customer of accepting the ABC Model would represent an average 1% to 5% (Max 10%) extra on their ESB bill. They also get a contract to purchase their power at 50 cent per Kwh for the first year and reducing by 5% per annum over a 13 year period.**
- **The electricity storage target of 10 Gwh is also achievable under the scheme. This would have a dual benefit of customer protection and centralised balancing of power quality.**

Conclusion

The value of distributed generation and electricity storage far exceeds the price per kWh of currently generated electricity under Plan A and it is argued that customers should not be subject to education through pain of loss but rather by reasoned argument and good planning.

It is further argued that the CER is mandated to co-ordinate and expand distributed generation by addressing reasonable demands by customers. There is no evidence of this reasoned discourse at present on a micro scale, which on closer examination of 90% of customers it reveals an opportunity to plan for substitution of up to 40% of the grid on a whole year basis.

The additional potential of distributed storage of the order of 10 GWh would contribute to grid stability and greater penetration of other renewable systems operating on a larger scale.

The industrial implications of this scale of substantial distributed generation are possibly of interest to all parties however there is no evidence that appropriate strategic industrial thinking is active at the appropriate levels. It is submitted that the CER are the appropriate body to advise the Minister in this regard, however, it is suspected they can only carry out this function effectively with government support and acknowledgment of the nature of the problem. The recent withdrawal of the carbon tax indicates a possible adjustment of the pending government priorities which encourages the view that a concerted effort is in train to find simple solutions at reasonable cost.

The proposed FCV represented not only a confused attempt to spread the risk of oil price uncertainty between the ESB and customer, but more significantly it represented a mindset of centralised thinking which demonstrates an over reliance on the current model of Plan A. It is submitted finally that effective technological thinking on a micro scale does have the potential to be replicated in a manner that has a growing impact on the macro balance if the majority of customers needs are accommodated in a reasonable manner.

References ***CER discussion document on the proposed Fuel Cost Variation Mechanism***
Irish Solar Energy Society Submission the CER on the FCV 23.8.04
The Coming Oil Crisis by C.J. Campbell

Appendices
1 Capacity of micro generation
2 Capacity of distributed storage
3 Cost of the ABC Model.