

**Office of Utility Regulation Supplementary paper submitted to Energy Policy Steering Group – March 2008**

**Executive Summary**

- *The Energy Policy Steering Group has requested views from the OUR on the merits and demerits of introducing a carbon tax, in particular to ensure GEL burns the minimum amount of fossil fuel on-island to generate electricity.*
- *A carbon tax can take several forms. It may be useful to distinguish between a tax that seeks to recover the abatement cost and one that recovers the social cost of greenhouse gas emissions.*
- *An abatement cost is essentially a measure of the cost of mitigating against the effects of greenhouse gas emissions. This might be applied across all sectors. How this tax is implemented, and the level itself, are dependent on what abatement initiative will be funded from the tax.*
- *A social cost attempts to include the lifetime cost to society of a unit of greenhouse gas. This could be targeted at electricity generation for example given it has an option other than on-island sourced electricity. It is conceptually different from the market price of carbon, which reflects the value of traded carbon emission rights to those in the market. It is also different to an abatement cost, which reflects the cost of reducing emissions, as opposed to the damage imposed by creating emissions.*
- *A carbon tax seeking to recover or fund abatement costs seems less effective as a measure given it essentially penalises outcomes and is arguably less likely to incentivise alternative behaviour. Its success is heavily reliant on consumer response to price changes, which are invariably inelastic for products such as electricity.*
- *A social cost of carbon is more easily targeted to incentivise more imported electricity. This can be built into the regulatory framework, and relatively easily incorporated into GEL's despatch decisions.*

- *The merit order of GEL's despatch would be substantially influenced by a social cost of greenhouse gas emission when it is £25/tCO<sub>2</sub>. Given this, it should lead to a substantial reduction in GEL's on-island generation.*
  
- *However, OUR's initial estimates show there is a limit to the share of the Island's total electricity demand which the interconnector can provide. Within existing interconnector availability the upper limit appears to be around 70% of total volumes for the 2007/08 year for example. Thereafter, the key constraint to achieving further reductions is the available interconnector capacity rather than the economic merit order.*
  
- *A long-term investment decision in an additional interconnector, or renegotiation of capacity limits with Jersey Electricity, could be driven by a merit order that takes account of the social cost of carbon. But this would need to be a stable measure that GEL could rely on for several decades when deciding its investment plans as these investments will have long asset lives.*

## **Introduction**

The Energy Policy Steering Group has expressed a wish to find a way in the report to ensure that Guernsey Electricity burns the minimum amount of fossil fuel on island to generate electricity. The OUR understands that the preference is to encourage importation of electricity from EDF where this source requires much lower carbon emissions.

Employing standard economic theory, a carbon tax can be economically justified to the extent that it corrects for a market failure. Market failure is argued to exist where an externality is not adequately taken into account in the economic decision making framework. Authoritative papers such as that by Professor Stern, argue that failure to take account of the economic cost of greenhouse gas emission (be they in health, costs of adaptation or corrective action) lead to a sub-optimal economic decision, with adverse welfare benefits, since society is less well off as a consequence.

The OUR suggests the Steering Group might consider a carbon tax which can take several forms. There appear to be two frontrunners in most of the published works. The first of these, could be described as a tax to recover the abatement costs, the second as a social cost of greenhouse gas emissions. The objective of these costs informs not only how they are introduced, but also their level.

### **Abatement cost**

Abatement cost is the cost of reversing, compensating for, or in some sense mitigating against the effects of greenhouse gas emissions from an economic activity. In the case of electricity emissions from burning fuel oil, the abatement cost could be the cost entailed in funding energy efficiency initiatives for example, or the financing of renewable energy projects. The OUR's calculations suggest that over the next ten years an abatement cost range between £8 and £880 per ton of CO<sub>2</sub> starkly demonstrates the range and scale of costs under consideration.

The most obvious advantage of such a carbon tax is that it converts what is currently an external cost into a real cost when a business emits greenhouse gases. It is also not necessarily sector specific, since it is targeted at emissions rather than economic

activity. A carbon tax in the form of an abatement measure also benefits from being relatively easy to implement and the purpose for which it is raised is readily identifiable, provided of course that the income from such a tax is ringfenced.

A disadvantage is that its success in changing economic behaviour relies on the degree of price elasticity for the good or service produced. If the tax is on the producer, it can be passed onto the consumer. Where the consumer is price inelastic, the abatement tax will not alter producer behaviour as the consumer will continue to buy the product. The producer, who doesn't bear the cost, has no incentive to reduce its greenhouse gas emissions if its customers continue to demand the product even at these higher prices. A further disadvantage is that such a tax is regressive in that the less well off will pay a higher proportion of their income on this tax, than those who have a higher income. This can occur even if the lower income earner consumes less carbon intensive products than the higher earner.

A consequence of a carbon tax of this form may be that energy intensive industries such as oil and gas look to move off the island as they are likely to bear the larger burden of the tax. If this is a credible risk, it might be addressed in the same way as New Zealand, where energy intensive companies are exempted from the carbon tax, but required to commit to reducing greenhouse gas emissions.

### **Social cost**

A social cost of carbon recognises the wider costs of the build-up of greenhouse gas emissions on society. The social cost of carbon measures the full global cost today of an incremental unit of carbon (or equivalent amounts of other greenhouse gases) emitted now, summing the full global costs of the damage it imposes over the whole of its time in the atmosphere. It measures the scale of the externality that may be built into decisions on policy and investment options in government. It is conceptually different from the market price of carbon, which reflects the value of traded carbon emission rights to those in the market given constraints on supply of these rights to emit. It is also different to an abatement cost, which effectively reflects the cost of reducing emissions, as opposed to the damage imposed by creating emissions.

The Stern Review calculated a social cost of greenhouse gas emissions that equates to £25/ tCO<sub>2</sub> in 2007 terms.

A carbon tax of this form could be introduced for all activities that generate greenhouse gas emissions, or it might be placed on specific businesses where the States take the view their contribution to greenhouse gas emissions is of a scale to warrant such a measure. In the case of GEL, for example, this could be applied within the price control framework where the definition of an 'efficient merit order despatch' requires GEL and the regulator to take account of the social cost of carbon when GEL chooses between on-island and off-island generation sources. Such a system would shift the economic incentive toward off-island sourcing of electricity. Since Edf sourced electricity is predominantly carbon free for Guernsey purposes<sup>1</sup> it can be argued this is not simply displacing greenhouse gas emissions to another location. GEL's current price control runs until March 2011.

### **Conclusions**

An abatement cost approach would, in the OUR's view, provide a mechanism that 'pushes' against the outcome of a more narrow view of market efficiency, i.e. one where the costs of greenhouse gas emissions are not taken directly into account in economic decisions by a business, but penalised after the fact. The extent to which a carbon tax imposed in this way will lead to changes in the internal operating decisions depends largely on whether consumers adjust to the higher costs from the carbon tax. In the OUR's view, consumer price inelasticity for energy intensive products may limit changes in consumer behaviour. The OUR would also take the view that this form of carbon tax is least preferable where the funds raised are used as a venture capitalist fund in projects like renewable energy. Without significant change in behaviour and with uncertain outcomes and long payback periods even if they did become commercially viable, the Island could be paying more without reducing greenhouse gas emissions over the near to long term, while the measures in which the tax funds are invested may simply not be achieved give the risk of new technology investments generally.

The alternative, where a more targeted approach is taken and a requirement is placed on specific economic activity, such as power generation, to factor the social cost of carbon into its decision making processes offers a number of benefits. The greatest of which seems to be that it is a mechanism that works within the decision making process leading to more desirable outcomes from an environmental

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<sup>1</sup> There are arguments that manufacturing and other processes related to nuclear power plants and hydro plants has entailed the generation of greenhouse gases, however given these are already sunk costs they do not seem to be a relevant consideration for actual units imported to Guernsey over future years.

perspective as opposed to compensating for outcomes, and the risk this in some cases entails.

The OUR would however caution against expectations that this offers a complete fix to carbon emissions. By way of example, for the year 2007/08 it is the case that initial calculations suggest at prevailing heavy fuel oil prices, using a social cost of carbon of £25/tonne of CO<sub>2</sub> 's in GEL's merit order despatch decisions would lead to a reduction of share of on-island generation to around 30%. However, constraints on the availability of the interconnector to GEL limit the amount this source can provide to about 70% of the Island's demands even where the merit order favours off-island sourced electricity. A key factor is the contractual capacity available on the interconnector. The physical capacity on the interconnector is in fact 60MW and GEL will frequently approach levels of utilisation of this magnitude during the year. However, GEL is contractually limited to an entitlement of no more than 16MW capacity on the interconnector. This implies that if Jersey Electricity requires the remaining capacity for its own needs GEL cannot demand more than 16MW from the interconnector. This conflict is most likely to occur in the winter months when Jersey Electricity will be fully exploiting the interconnector capacity it is entitled to and it is therefore the period in the year that accounts for most of GEL's greenhouse gas emissions.

GEL's evaluation of further investment in an interconnector will be informed by the relative costs of despatch, comparing on-island to off-island sourced electricity. Since such investments have lifespans of 20-30 years, there are obviously limits to the ability to predict input prices over such a time horizon. If GEL were required to include an allowance for the social cost of carbon in its despatch decisions this adds a further uncertainty to the investment decision. It is therefore vital that the States of Guernsey takes account of the long-term nature of such investment decisions and constructs a carbon tax that informs such decisions in a reliable way.