

## **CLOSING SUBMISSION**

**for the Grangemouth Community Council Interested Party Coalition  
(Constituent parties of coalition: Polmont Community Council, Bo'ness  
Community Council, Biofuelwatch, Friends of the Earth Falkirk, Friends of the  
Earth Stirling, River Carron Fisheries Management Group)**

**Public Inquiry into the proposed Biomass Power Station at Grangemouth  
Docks**

**Section 36 of the Electricity Act 1989  
The Town & Country Planning (Appeals) (Scotland) Regulations 2008  
20<sup>th</sup> June 2012**



**biofuelwatch**



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## **INTRODUCTION**

National Policy is supportive of renewable energy development. The UK and Scottish Governments have established challenging targets for the generation of electricity by means of renewable energy. That support is however not unqualified.

Specifically the Grangemouth REP can only be considered to be in the public interest if it were to make a worthwhile contribution to mitigating climate change, and if it had acceptable social and environmental effects. In our view neither is true.

Because the REP is intended to be almost 100% dependent on fuel imports, many of its effects will be felt in overseas countries with comparatively low levels of prosperity and with historically weak governance.

In determining this application, we urge Ministers to take a global view of sustainable development and apply the perspective set out in Scotland's Sustainable Development Strategy of 2005:

*"This strategy is based upon the principles of environmental justice. The ultimate goal is to secure a fairer world and a fairer future, enabling all people throughout the world to satisfy their basic needs and enjoy a better quality of life without compromising the quality of life of future generations. Our commitment to reducing the size of Scotland's global environmental impact is a reflection of our commitment to environmental justice."*

In our considered view, the REP will do little if anything to mitigate climate change, particularly in the short term because of its 'carbon debt' and its high rate of carbon emissions compared with cleaner renewable electricity technologies like wind and marine. Later in its planned life it will be generating electricity with a considerably higher carbon footprint than is recommended in advice to Government. This will be the case even after the carbon debt is written off (suggested by the Applicant to be as little as nine years - a figure we do not accept.)

The Applicant's case is that the climate impacts of the REP are positive and valuable. They stressed the importance of treating the proposal as a source of both low carbon heat and electricity to maximise the value. But their evidence seeking to make the case that the REP is a viable source low carbon heat was far from convincing.

In reality, the most likely outcome – despite the condition requiring heat connections to be installed to the property boundary – is that the REP will be operated for many years, if not for its whole life, without delivering substantial amounts of heat. It will therefore be inefficient, wasteful of natural resources and deprive other more beneficial uses for biomass as a heating fuel.

With minimal, if any climate benefits, there is the possibility that the REP would delay the urgent need to decarbonise Britain's electricity supply. As such, greater attention needs to be given to its adverse impacts.

Our evidence to the inquiry regarding these disbenefits addressed 5 main areas: 1) Principles and Policy: The compatibility of the Renewable Energy Plant with Scottish policy on renewable energy and biomass specifically; 2) Sustainability - the impacts of fuel sourcing and production on climate, biodiversity and people in other countries; 3) the consequences of the REP operations on local air quality and human health; 4) water pollution and fisheries impacts and 5) the effect on the visual amenity within Grangemouth.

## **1. PRINCIPLES AND POLICY**

### **Design of the REP Runs Counter to Scottish Government Policy**

Scottish Government policy recognises that biomass is not a renewable energy form which can be treated like other renewables. Biomass comes from burning predominantly a finite and fragile resource, wood, and depending on the conditions in which wood is grown and harvested, there are varying environmental and social consequences. Wood is also used by other industries and as such the Government recognises a need to use it as efficiently as possible, sustainably, and at an appropriate scale.

We believe that this proposal exemplifies a power station which could not be more at odds with the Scottish Government's chosen model of biomass. It is of an unprecedented scale, which, if granted permission will be Scotland's largest dedicated biomass power station. It will produce a vast amount of waste heat and will not maximise efficiency; due to its sheer scale, it will produce far too great an amount of heat proportionate to electricity which cannot be used and will have to go to waste. It will rely on imported wood and the through the application and at the inquiry, the Applicant has not shown evidence that it will be using imports sustainably – in fact, the

evidence points to quite the contrary.

### **The REP has a Large Electricity-only Component which wastes heat**

At the inquiry, the Applicant agreed that a substantial part of the proposal's generating capacity, namely 72.8 MWe of the 118 MWe total, adds only electrical output to the scheme and does not deliver additional heat (FE119, section 4.7 and 'Balance' column of Table 2). We put it to the Applicant that Table 2 of FE119 essentially illustrated that through not simply only having a back pressure turbine, a 72.8 MW electricity only element effectively is a core component of this plant design. The Scottish Government would be explicitly against a 72.8 MWe generating power station which delivered no heat. The Applicant claimed that splitting the plant in this way was an artificial approach. However, Mr Othen accepted that the CHP Quality Assurance scheme also has a method of calculating what fraction of total generating capacity qualifies as good quality CHP. This demonstrates that there is wide acceptance that the full capacity, along with inputs and outputs, of a CHP scheme needs to be split into parts (GN10.1 of Guidance Note 10, CD85).

The Applicant tried to justify the electricity only element of the plant by stating that the plant would not be financially viable without this electricity only element to it (note that Renewable Obligation Certificates are awarded per megawatt hour of *electricity* generated) (sections 4.7 and 4.9 of FE119).

This justification is not compatible with Scottish Government Policy on Biomass. The Draft Electricity Generation Policy Statement 2012 states, 'because of the multiple uses to which biomass can be put, the limits to supply, and the competition for that supply from other non-energy sectors, we need to encourage the *most efficient and beneficial* use of what is finite resource' (CD 70, paragraph 53, emphasis added). The Applicant must not be allowed to fall back on economic justifications for breaching Scottish Planning Policy. The point is that the Applicant has designed a plant which falls far short of maximising efficiency, and with a large-scale electricity only component within it simply to maximise its own gain.

### **Economic Justification for Electricity-only Component**

The Applicant suggested that 'real world' economics meant that back pressure turbines running at high efficiency, which would deliver efficiency levels up to 80%, were just not viable as part of this application. We understand that a high efficiency biomass CHP

plant is unlikely to be viable for the supply of steam to INEOS at Grangemouth, but we do not agree that *all* back pressure turbines are unviable. The reasons for an efficient Grangemouth CHP plant being unviable had been set out in section 7.2 of Mr Bradford's Inquiry Statement: Essentially, as the temperature of the heat load increases, the proportion of electricity output reduces and the proportion of heat output increases. Since renewable incentives are paid for electrical output, this gives poor viability for high temperature heat. A low temperature heat load, such as district heating or low pressure steam, would instead have a higher ratio of electricity to heat output and therefore a greater revenue and could be viable at a high overall efficiency. INEOS, by contrast, would require steam at a high pressure and correspondingly, a high temperature, resulting in a less financially favourable electricity-to-heat ratio.

The oil refinery therefore is simply not a suitable heat customer for a biomass CHP plant. The Coalition is not aware of any biomass CHP plant being used at any other oil refineries. The Coalition supporting documents also explain that a steam turbine is not suitable for high temperature heat loads, such as at oil refineries (see Coalition Documents, Principles & Policy Volume I, Doc 8, page 183). In DECC's "The Future of Heating" (4.18 page 82, FE49) it recognises that biomass will not be suitable for high temperature heat users, giving refineries as an example, and suggests Carbon Capture and Storage as an alternative way of reducing carbon.

We also note that if the steam output from the proposed REP doesn't generate sufficient income for viability on its own and needs cross funding from electricity revenue, as Mr Othen explained at the Inquiry, then it would seem to make little sense from a commercial angle to have a large steam output. If steam sales require cross funding from electricity profits, then it would make sense to minimise this drain on profits by reducing the steam output. As such, in our view it remains unlikely that the Applicant would choose to maximise sales to INEOS.

### **Likely Efficiency of Proposed REP**

The Applicant amended the Draft s 36 conditions in an attempt to give assurance that the plant would actually operate with a substantial heat output. The reasoning was that a plant designed for simultaneous delivery of heat and electricity would be larger and would then need to secure a heat contract before proceeding to construction. However the wording of Draft Condition 3 (FE 12 v4) is ineffective since it only requires a capability to supply heat in isolation, rather than requiring a capability to deliver a combination of heat and power. For example, a 100 MWe biomass power plant

intended to supply power only would require a boiler capable of supplying considerably more than 200 MWth of steam. Such a plant would then be technically capable of being configured to export 200 MWth of steam, by diverting steam away from power production, leaving a power output of less than 100 MWe under that plant configuration. If Draft Condition 3 were to have any effect, it would need to be amended to require that the plant is capable of exporting 200 MWth of steam *at the same time* as generating 118 MWe of electricity.

The economics of heat sales combined with the ineffective condition and the minimal involvement of INEOS so far means that the Coalition remains unconvinced that the plant would actually generate a substantial amount of heat. Mr Othen confirmed that the design is at an early stage and will continue to develop. In this vein, we would also point out that Forth Energy is currently also seeking consent for two 100 MWe plants which each have a maximum heat output of 30 MWth (page 2 of FE19). We see several reasons why the Applicant might want to re-design the Grangemouth REP to produce a reduced heat output, similar to their other applications, which would then be financially viable to operate.

Even if the plant were to operate with 200 MWth of steam exports and 100 MWe of electricity exports, giving a total useful output of 300 MW, then the total losses of the plant would be 213 MW. This is calculated by subtracting the 300MW useful output from the thermal input into the plant, which is 513.28 MW (Table 1 of FE 119). Again, this runs counter to Scottish Policy, which favours maximum efficiency.

The overall plant efficiency would be 58%. This is calculated by dividing the 300 MW useful output by the thermal input into the plant, which is 513.28 MW. The total losses from the plant in this case would be 42%. We consider that the use of net calorific values to obtain higher efficiency values is misleading, since quoting the efficiency at 72% suggests that the total losses are only 28% rather than the correct value of 42%.

We also note that the Applicant used gross calorific values in its CHP Feasibility Study (CD1) at section 4.2.1 where the overall efficiency is anticipated to be 60%.

The efficiency figures quoted in the Draft Electricity Generation Policy Statement are clearly based on gross calorific values since the maximum value shown is 90%. When using net calorific values, efficiencies of over 90% are possible, for example the 93.8% shown at Table 2 of FE119.

## **Distinct Role for Biomass in Scottish Government Energy Policy**

In attempting to clarify the biomass policy objectives, Miss Sullivan incorrectly claimed in FE1 section 4.4 that all non-CHP thermal generation was 30 to 35% efficient. However, it was shown that both coal and gas are used at much higher efficiency for electricity generation than is possible for biomass. Mr Othen agreed under cross examination that biomass is a difficult fuel in comparison with fossil fuels: it has a low calorific value compared with fossil fuels. As such, there are corresponding difficulties in transporting and combusting wood. The parasitic energy used by the plant is also higher than for coal or gas, with 18 MWe being used to run the plant itself. On the other hand, when comparing fuels used for heat only, biomass is quite similar to coal and gas, with all being capable of around 90% efficiency. This informs why the Scottish Government's first preference is for biomass to be used for heat only or highly efficient CHP.

## **The District Heating Network Proposal**

The Applicant has attempted to show that the power station would be contributing to the well-being of the local community by producing hot water capable of supplying a District Heating Network ('DHN'). We remain unconvinced.

Under cross-examination, Mr Wilson did not fully answer the questions of *who* and *how* the infrastructure for the District Heating Network would be paid for. Answers to these basic questions we believe are fundamental to help the community to distinguish between whether the DHN is purely a selling point for the plant or whether it would come to fruition in the real world.

We also note that the original DHN design according to the 'Assessment Of District Heating Supply Opportunities for the proposed Grangemouth Biomass Renewable Energy Plant' (CD66) was based on the assumption that money would be coming from the Renewable Heat Incentive at a rate of 2.6 p/kWh. That report recommended, '[confirmation] that the scheme will be supported by RHI, *as this is the key to the commercial viability of the project.* It is recommended that Forth Energy engage with the Department of Energy and Climate Change (DECC) and the Scottish Executive to confirm that the project as proposed would be eligible for support, that there is no intention to amend the scheme in a way that would reduce the support, and that RHI as proposed is likely to be ratified by the Scottish Executive.' (CD 66, s 7.4, p 48,

emphasis added). Since the time of the publication of that report, the RHI scheme has been cut to 1p/kWh; so Mr Wilson's inability to answer the questions surrounding the RHI compound our doubts as to who is expected to fund the scheme.

Even if the DHN were to come to fruition, we do not consider that the Applicant's Community Heat Enterprise Group' model as shown through Mr Wilson's Report on Renewable Heat (FE2, section 4, diagram) offers community benefits, nor opportunities for community ownership of energy. Under the model, the involvement of the community is channelled purely through the Council. The community is not otherwise defined or identified as a stakeholder.

Moreover, through the DHN, Forth Energy would own the thermal energy; other stakeholders would at most simply have a possible involvement in owning the pipework; a key distinction. Whilst Mr Wilson was keen to emphasise that the value of heat need to better be recognised, in our opinion, the community would never be able to experience the benefits of the value of the heat.

Further, we consider that in reality, there would be little incentive for Grangemouth residents to switch to using the DHN. Under cross-examination, Mr Wilson states that for customers, use of thermal energy from the DHN would be 10% cheaper than using gas. We do not consider that this 10% reduction would be enough incentive for residents to make the switch given that houses would have to be retrofitted to take hot water.

Therefore, the reality of the proposal is that Grangemouth residents would be offered the possibility for involvement in the pipework (not energy ownership) of an unregulated heat supply with the undetermined end customers. We do not consider that this model would be considered attractive and thereby gain leverage to get off the ground.

The model proposed by the Applicant, in our view, runs counter to the 2020 Renewables Routemap (CD76). paragraph 1.1.5 states, 'Scottish Ministers are determined to see the benefits from our indigenous energy resources flow through to the people of Scotland. In particular there is an opportunity for a transformation in the level of local ownership of energy.' This proposal offers no such transformation. We would stress that we recognise the importance of renewable heat but believe that this can be better and more appropriately achieved through microgeneration schemes and through the use of heat pumps. In our view, the District Heating Network is an incomplete proposal which would not offer significant benefits to the community or

opportunities for community ownership and we are unconvinced that it will be achieved through the plant being given consent.

### **Potential competition for wood from other users of timber**

The original application documentation foresaw that 10% of the biomass feedstock would originally come from wood from Scotland, and that this situation would 'improve' (CD1, Sustainability Statement, paragraph 3.5.2) to 30% from 2025 onwards (Table 1). There have been concerns from existing timber industries including from the Wood Panel Industries Federation that their industries would be unable to purchase timber at competitive costs due wood scarcity as a result of the bioenergy industries which are subsidised.

As such, the Applicant introduced Draft Condition 6 (FE 12 v4) which precludes the Applicant from using virgin wood grown in the UK unless otherwise agreed by Scottish Ministers. Miss Sullivan stated that the Applicant had worded Condition 6 in such a way that it would be possible to implement. However, we believe that this condition is worded in such a way that the onus lies, as is normal practice, upon Scottish Ministers to enforce the condition should the Applicant breach the condition. We consider that a condition restricting the sourcing of wood to imports would constitute a breach of one of the basic principles of the World Trading System, namely the principle of non-discrimination. As such, it would not be enforceable by Scottish Ministers. This much is reflected by the Scottish Government, which states in its Renewables Obligation Consultation Document (CD98, paragraph 3.10), 'Ministers have considered various options to mitigate the impact of large scale biomass demand on existing users of this limited resource. One option may be to condition any large-scale consent under s 36 to require woody biomass supply to be imported, *but this is likely to be open to legal challenge.*' (emphasis added)

Even if Condition 6 were deemed to be enforceable, Condition 6 does not apply to the sourcing of recovered wood domestically. The Applicant confirmed at the inquiry that it was still its intention to source up to 212,000 tonnes of wood fuel domestically (CD 1, Chapter 18, 'Traffic and Transport', paragraph 18.5.26), which would come from recovered sources. Mr Kerr confirmed through his evidence to the inquiry that this would still constitute a threat to the Wood Panel Industries Federation, which uses a significant portion of recovered wood in its processes. He also confirmed that such competition would displace his industry, which is considered to be higher up in the Scottish Waste Hierarchy, which favours reusing and recycling recovered materials

above incinerating them. The Coalition considers that such potential displacement would be in violation of Scottish Policy on Waste, and Biomass specifically.

**Conclusion: Scottish Policy on Biomass must be viewed holistically: large scale applications and those using imports are not the preferred option**

The question was put to us of what alternatives would we envisage to deliver baseload electricity and the delivery of the renewable heat targets for Scotland?

In the case of baseload electricity, we believe that given the level of concern over whether this REP will in fact deliver greenhouse gas emissions savings and given our evidence to support this (see section 2 on Sustainability), the REP may in fact run directly counter to what it is supposed to achieve and therefore cannot be considered to be a viable contributor to baseload electricity.

We note that there is an increasing trend towards storing electricity which would make it feasibly to rely more heavily on renewable energy solutions which do offer *genuine* carbon savings and without adverse human rights and social consequences. The Institution of Mechanical Engineers has published a helpful study on this, entitled 'Electricity Storage' (May 2012). We also note that the Scottish Government has placed a particular emphasis on reducing our energy demand by 12% (CD 70, p 5) which we fully support.

In the case of renewable heat, we believe that the scale of this particular plant is such that it will compete significantly for wood within Scotland and will therefore make it harder for small-scale, highly efficient, off-grid heat biomass installations to compete for wood. Coupled with our reservations as to whether 200MWth will in fact be delivered to INEOS, we believe that the installation will in fact make it harder for Scotland to achieve its renewable heat target.

We would stress that we are strongly in favour of renewable heat and would like to see Scotland achieve its target. As such, we believe that microgeneration schemes and the use of heat pumps are far more appropriate ways to do so.

The Applicant will surely state that, in any case, the Renewable Energy Plant falls within the range of efficiencies identified by the Scottish Government, which are between 50-70%. However, the Coalition submits that this is to cherry-pick Scottish Policy on Biomass, which must be viewed holistically. Scottish Policy on biomass

recognises the need to encourage the most efficient and beneficial use of what is a finite resource.

The Government states specifically with regards to large scale biomass that it believes that operators of large biomass stations will find it harder to use the heat generated (CD 70, paragraph 53, bullet point 4) which is the case here, as 213 MWh will be wasted. It states further that biomass power stations should be scaled appropriately to make efficient use of available heat and local supply (CD 70, paragraph 53, bullet point 4).

Moreover, Government policy is not explicitly in favour of using imported biomass. It states, '[imported biomass] should be used in plants that support *maximum* heat use' (CD70, paragraph 53, final bullet point). As shown above, this power station does not support 'maximum heat use', as 72.8 MWe contribute no heat, and 213 MWth are wasted.

Finally, Government Policy states that imported biomass is only permissible if evidence of price, availability and sustainability can be shown. Evidence of sustainability at the stage of consent is therefore at the crux of any large scale application which relies on using imported wood. As shown for several reasons below, this REP does not show evidence of sustainability; to allow the Application to proceed to the Conditions stage would therefore be contrary to Scottish Policy.

## **2. SUSTAINABILITY**

Scottish Policy on Biomass would prefer to see biomass used on a scale which is appropriate to local supply of wood. Imported wood is to be used exceptionally, and only if evidence of sustainability is shown (see *inter alia* CD 70, paragraph 53). We do not have confidence that such evidence of sustainability has been shown – on the contrary, we believe there is compelling evidence that the plant will be unsustainable. On this basis, we do not believe that the plant accords with Scottish Planning Policy on Biomass and should therefore not be allowed to proceed to the Conditions stage. In any case, we also comment on the reasons why, in our view, Draft Condition 7 would be unable to achieve its aim of ensuring sustainability.

### **Climate impacts & the Carbon Debt**

The rationale for using biomass as a fuel in thermal power stations is that the net carbon emissions are lower than those from fossil fuels. Large savings in carbon emissions are deemed to occur because replacement or additional biomass is assumed to sequester the combustion emissions from the power station. The European Union methodology for assessing the climate impacts of biomass energy makes a straightforward assumption that all combustion emissions are sequestered by re-growth.

This conventional position has been challenged over many years by scientific authorities who say that the time delay to sequester emissions (the carbon debt) should be taken into account. Particularly with the pressing need to reduce atmospheric CO<sub>2</sub> levels in the near term, such as this decade. More recently, scientific opinion has also highlighted the significance of 'additionality', posing the question: is it reasonable to assume, as the official position does, that the existence of biomass combustion emissions in the atmosphere actually causes re-growth to happen faster than it would have done anyway?

The Applicant has acknowledged the inaccuracy of the EU official position, i.e. the exclusion of the carbon debt, by including the temporal aspect of the biomass carbon cycle in his two reports on fuel sustainability.

But as the inquiry heard during examination of both sides' evidence, the extent of the carbon debt and the certainty with which it can be predicted are controversial. In the Applicant's second report (Updated Sustainability Appraisal - FE4) they give more detail on the possible fuel types than was provided in the earlier report (FE13).

Mr Grenfell claimed that SISTech had modeled the length of the carbon debt according to 'realistic' fuelling scenarios, and that based on these scenarios, the Renewable Energy Plant could deliver carbon savings within three to nine years of the operation of the plant.

Even after much examination, we found Mr Grenfell's explanations regarding the carbon debt for the three fuelling scenarios set out in FE4 confusing and unsupported by adequate numerical data. The Coalition does not challenge the methodology or mathematical precision used in the Carbon debt studies. What we challenge is whether the fuel sourcing assumptions contained to generate such favourable results were indeed 'realistic'.

The fuelling scenarios did not reflect those contained within the Poyry report, 'Availability and Sustainability of biomass supply options' (FE 10). FE10, according to Miss Sullivan's evidence reflects 'a realistic assessment of the current biomass fuel supply available to Forth Energy.'

From FE4 we discover that the fuelling plan upon which SISTech modeled the greenhouse gas emissions is to be largely based on imported fuel derived from energy crops, e.g. Eucalyptus and American Giant Reed. The latter is not grown commercially for large-scale biomass fuel and was not considered as a potential fuel crop in the FE10. The former was only considered as a potential fuel source coming from Brazil according to FE10, and Mr Quaranda gave evidence to the inquiry that it is not being grown on a large commercial scale in the Southern US. We do not accept that there is enough data on these crops, which will be grown in overseas countries for the Applicant to have calculated with such precision the period of carbon debt – or the energy and carbon inputs required to grow, harvest and process them.

Furthermore, a range of crops and trees were included within FE10 which had rotation periods far longer than 7 years, which was assumed as the rotation period for the purposes of the carbon debt modeling and thus crucial to the assumption of such a fast payback time. FE10 considered fuels including pine, mixed forests, interior and coastal forests, with rotation cycles which ranged between a fastest rotation of 7 years for Brazilian-grown eucalyptus, up to 140 years for spruce grown in Canada East (for the range of different rotation cycles for the feedstocks identified, see FE 10, Figures 8 (US Southeast), 13 (Canada East), 17 (Brazil), 20 (Russia), 24 (British Columbia)).

Mr Quaranda and Miss Hanna both gave evidence to the inquiry that a study by the Biomass Energy Resource Center, 'Biomass Supply and Carbon Accounting for Southeastern Forests,' (Coalition Documents, Fuel & Sustainability, Vol II, Doc 1) has modeled the carbon debt of wood fuel coming from forests in the Southern US, i.e. a region explicitly within the sourcing area for Forth Energy. The study found that the carbon debt for trees harvested from within that region ranges from 35-50 years.

We believe if the carbon debt study had been modeled in true reflection of the realistic fuels identified in FE10, it would have shown the REP's carbon debt to be much longer. We consider that it is far more likely that the REP will produce more greenhouse gas emissions than fossil fuels within the lifetime of its operation, thus ironically running counter to the fundamental reasons for using renewable energy.

As a result, we submit the Applicant's projections that the REP will give a net climate benefit within a few years are open to considerable uncertainty.

### **Carbon intensity of the plant (without carbon debt)**

Notwithstanding these doubts on the validity of the predicted carbon debt and the effect this uncertainty has on assessing the overall climate performance of the REP, we viewed it as essential that the inquiry gained a fuller understanding of its carbon footprint using the more favourable EU official assessment (i.e. without carbon debt).

The Applicant provided data in FE4 showing the (non-carbon debt) carbon intensity of three fuelling scenarios. They ranged from 197.45 kgCO<sub>2</sub>e/MWh to 254 kg CO<sub>2</sub>e/MWh. These all achieve the threshold set currently for Renewable Obligation Certificates (285.12), and for comparison are all below 50% of the UK average grid intensity in 2008 (571).

The Applicant suggested in FE4 that the UK grid would be decarbonised to 300 kgCO<sub>2</sub>e/MWh by 2020 and to between 120 and 260 kgCO<sub>2</sub>e/MWh by 2030. It was not established exactly where their figures for 2030 originated. Our point in examination was that the Committee on Climate Change (CCC) has advised UK government to adopt a target figure for grid carbon intensity in 2030 of just 50 kgCO<sub>2</sub>e/MWh. If this target were achieved it would mean that in 2030 the REP would be generating electricity with a carbon intensity up to five times that of the average for the national grid.

In FE10, the executive summary refers to a suggestion (from the CCC) that the carbon intensity threshold for biomass electricity be reduced from 285.12 to 200 kgCO<sub>2</sub>e/MWh. Mr Grenfell confirmed that carbon intensity estimates he had prepared for the applicant's Updated Sustainability Appraisal (FE4) were either at this level in one case or well in excess of it in two cases.

Our submission is that even using the EU methodology for assessing the carbon footprint of the REP, its climate performance is only marginally beneficial, and this benefit will be diluted quickly in coming years as other lower-carbon forms of renewable electricity are introduced to drive grid de-carbonisation.

Finally, we explored how much confidence there would be that **additional** biomass would be planted and grown to maturity to offset the REP's combustion emissions. Mr

Grenfell correctly (in our view) acknowledged that neither Forth Energy, the Scottish Government, nor OFGEM would have responsibility for this; rather it is simply assumed that an emerging biomass supply chain will ensure it happens. Nor would eligibility for Renewable Obligation Certificates depend on additional biomass planting and growth to maturity.

Without a higher level of confidence and accountability, our view is that it is mistaken to proceed on the basis that the REP's combustion emissions will be cancelled out by additional biomass growth.

### **Fuel supplies: energy crops versus the right to food**

The applicant will be sourcing up to 90% of their fuel from overseas including a substantial proportion from developing countries.

Miss Hanna's evidence reported that the European Parliament have concluded that increased competition for woody biomass is resulting in negative direct and indirect impacts on land use worldwide (Coalition Documents, Fuel & Sustainability Vol I, Doc 6).

If the Applicant was going to achieve a shorter carbon debt, then the prime source for the REP's fuel will be plantations of 'energy crops' which have been established for this purpose. These plantations would be large ranging from 30 to nearly 100 square miles per plantation. Many would be of Eucalyptus, a plant native in Australia but an introduced species to the plantations in tropical and sub-tropical developing countries. The establishment of these plantations would have extensive biodiversity and human rights impacts.

In our view these issues call into question the overall sustainability of energy crops, which is key since Scottish Government policy is that imported biomass can only be used if it is sustainable. Issues surrounding their sustainability have been explicitly recognised by the European Parliament (Coalition Documents, Fuel & Sustainability Vol I, Doc 6, page 12)

We were asked in the inquiry to say if we believed Scottish ministers would be able to assure sustainability. Our response remains that it wouldn't be able to tackle all of the issues: if it excluded energy crops as a fuel type in order to ensure that the right to food was not prejudiced, then how would it equally be able to guarantee a fast carbon

debt payback time? It would not. There are simply too many overlapping and interrelated sustainability issues, which would be impossible to tackle. Sustainability must be viewed holistically.

### **Biodiversity impacts**

When monoculture plantations are established the rich biodiversity of the land used is destroyed. Those established on both previously forested land and open grassland destroy or threaten plant life, bird, insect and animal life. Herbicides have to be used in the early stages to suppress the native indigenous vegetation in order to allow the non-native trees become established.

Mr Quaranda's evidence clearly confirmed the long term impacts of pine plantations on biodiversity in SE USA, from 'certified' plantations, and gave compelling evidence to the inquiry that certification schemes such as the SFI cannot adequately protect against the erosion of natural forests. His evidence showed that the SFI scheme allowed for the logging of endangered forests, the conversion of natural forests to plantations, large-scale clear-cutting, the use of toxic chemicals in forest management, and that the system was so poor that even if wood were to come from a well-managed forest, it would be impossible to tell, because the mark of the stamp is so little respected. This evidence has been compounded by 90 top scientists in the US (Coalition Documents, Fuel and Sustainability Vol II, Doc 10).

The Applicant's evidence indicates that there are 6.8 million hectares of plantations in Brazil (FE14). In our view this represents a very considerable, possibly permanent, destruction of biodiversity in that country.

### **Human Rights impacts**

Monoculture plantations such as Eucalyptus are commonly established on the best more fertile land close to a good water supply. To obtain land for these plantations the local people are often driven from the smaller plots of land they have worked on for generations.

This land meets local peoples' food and energy needs, and the basis for an income to provide for other needs, school and medical fees, and the ability to purchase basic necessities. Being removed from the most productive land to that of a more marginal nature with poorer access to water, and having to re-establish their housing and begin

land preparation from scratch will mean that these people will become more deeply impoverished.

The Applicant (FE4 and FE14) argues that they will source their wood in an ethical manner, ' --- from sustainably managed forests or plantations ---- in terms of forestry operations and in terms of land use and land procurement.'

Our submission is that this intention is optimistic rather than realistic.

The Applicant admits (FE14) for example that it is unlikely that degraded Amazonian pastures would be used to grow biomass, as, without government intervention, it would remain more profitable to use more productive land despite higher land costs. The growing of energy crops on more productive land is the issue highlighted in the European Parliament's report (Coalition Documents, Fuel & Sustainability Volume I Document 6) as being responsible for driving local people from their land, and away from adequate water. The report gives clear evidence that people's human rights are being abused to grow biomass for the European market. Moreover, it highlights the need to recognise that such abuses can occur *indirectly* or through what it has termed as *leakage* effects: It states,

'It is also important to note that due to "leakage effects" in markets through a) the competition between woody bioenergy and other uses for woody biomass and b) competition between market demand for woody biomass in the EU and other regions/ countries, the range of indirect impacts due to biomass plantations is even greater than the direct impacts of woody biomass production for export to the EU's bioenergy sector. It is therefore difficult to draw a clear link between the increased demand of woody biomass in the EU and one particular impact of the extraction of woody biomass in a specific country.'

(page 9)

As such, to condition the Applicant to only source its wood from particular regions may not tackle the overall problem as there will be knock-on impacts in an increasingly competitive market for wood.

The Applicant intends to rely on international certification systems like the FSC, SFI and PEFC to provide an assurance of fuel sustainability. It is our view that certification systems can only address sustainability on the level of individual plantations, and do not consider the wider knock-on effects resulting from the increase in demand for wood

and energy crops, for example the macro effects of diverting land away from food production towards energy crops.

The need to respect human rights is not contained in the sustainability criteria as contained within the Renewables Obligation (Scotland) Order 2011. A consultation on the sustainability criteria is due to commence between Ofgem and the Scottish Government, however, it is understood that human rights impacts are not due to be included in a revision to the sustainability criteria.

### **Indirect Land Use Change**

Miss Hanna gave evidence to the inquiry on the adverse indirect land use change impacts of using bioenergy. 'Indirect land use change' (hereinafter, 'ILUC') refers to the knock on impacts, (human rights-related or environmental), which are incurred due to the increased pressure on land availability caused by bioenergy consumption (also known as 'leakage effects'). The Applicant recognizes ILUC impacts as a key concern which would need to be addressed (CD 1, Sustainability Statement, paragraph 8.5.1).

It was put to Miss Hanna that the Applicant could be obligated to account for greenhouse gas emissions occurring from ILUC as part of the Sustainability Plan which would be imposed on it through Draft Condition 6. We maintain that this would be impossible to implement, for the following reasoning, which requires an exploration of the evolution of the sustainability criteria for biomass from the EU down through to the UK and Scotland:

The sustainability criteria for biomass mirror the sustainability criteria which govern the use of biofuels in the transport sector. The biofuels sustainability criteria were developed as part of the Renewable Energy Directive (CD3) and are contained in Article 17 and Annex V of that Directive.

The criteria for biofuels are harmonised at the European level, whereas setting the criteria governing biomass is a devolved matter. The European Commission, however, recommended to Member States that they adopt sustainability criteria for biomass which were the same as those for biofuels, 'for consistency,' (FE 71, page 6) and the UK and Scotland have done as such through the Renewables Obligation (Scotland) Amendment Order 2011 (CD 25, hereinafter the 'RO'). Hence, the sustainability criteria governing biomass are contained within the RO, and will take effect in 2013.

The criteria include a methodology to quantify emissions from biomass combustion, which is based upon a Life Cycle Assessment. **The Life Cycle Assessment does not take into account Indirect Land Use Change impacts. Nor do the sustainability criteria require a respect for human rights as part of bioenergy sourcing.**

Since the inception of the Renewable Energy Directive, the omission of accounting for ILUC emissions has come under criticism from civil society organisations and Member States, including the UK. The methodology gives the impression that biofuels produce more carbon emissions savings than they really do. This crucial omission was, however, noted within the Renewable Energy Directive itself: pursuant to Article 19(6) of that Directive, the Commission has been under a statutory obligation to report on emissions from Indirect Land Use Change, and quantify them if appropriate, since December 2010.<sup>1</sup> It did report on emissions from Indirect Land Use Change and recognized that a policy change was needed, but notwithstanding the statutory obligation the Commission has remained unable to quantify ILUC emissions, due to a combination of technical and politically charged difficulties surrounding their quantification.

This crucial omission has thus been inherited from the biofuels sustainability criteria down to the devolved biomass sustainability criteria.

The Scottish Government is due to consult on the sustainability criteria with OFGEM in the coming months; however it is not considered realistic that it will introduce Indirect Land Use Change emissions into the Life Cycle Methodology. The UK's Bioenergy Strategy (FE 122) recognizes the urgency with which the EU needs to quantify emissions from Indirect Land Use Change in respect of biofuels, and the UK continues to call on the Commission to take action on ILUC. But at the same time, FE 122 also suggests that a move to quantify emissions from ILUC in respect of biomass would only follow such a move in respect of biofuels at the European level. (see Box 19 at page 63).

### **Could sustainability issues be addressed through a sustainability plan approved by and enforced by Scottish Ministers?**

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<sup>1</sup> Under cross-examination Miss Hanna stated that the statutory obligation on the Commission was imposed since December 2009 – we correct this to December 2010, pursuant to Article 19(6) of the Renewable Energy Directive (CD3)

It was put to Miss Hanna that it was impossible to project with certainty that the REP would be unsustainable, because Draft Condition 7, which envisages a biomass sustainability plan to be approved and overseen by Scottish Ministers, would be a post-consent solution to any sustainability concerns. We maintain that this would be impossible.

Firstly, to ensure that the carbon debt would be as fast as has been modeled by SISTech, a condition could, for example, be introduced to stipulate that the only feedstocks which could be used in the plant would be energy crops with a rotation period of maximum of 7 years, and that replanting would have to occur. However, as explained through the European Parliament report, the use of energy crops has knock on impacts onto the basic and fundamental right of access to food, because growing energy crops competes with food production. A maximization of energy crop use would therefore have a knock on impact on human rights. The maximization of energy crops also has knock on adverse impacts on biodiversity and natural ecosystems. By contrast, if Ministers were to prioritise a respect for human rights as part of a biomass sustainability plan, this may work to exclude the sourcing of energy crops, which would make a short payback period impossible.

Secondly, the high carbon intensity of biomass even ignoring the carbon debt could not be tackled through a condition.

Thirdly, the protection of biodiversity cannot be ensured through a requirement to use certification schemes.

Fourthly, human rights impacts might not be able to be tackled through a condition as, by their nature, the majority of such impacts occur *indirectly*.

Fifthly, as explained above, it is not considered feasible that Scottish Ministers could come up with a methodology to account for greenhouse gas emissions in respect of ILUC in advance of the European Commission doing so in respect of biofuels. We have no time frame for when this will happen given that the Commission has been embroiled in debate over ILUC emissions, we cannot say with certainty when the issue will be resolved.

**Conclusion: The only way to ensure sustainability is through an implementation of the precautionary principle which requires refusal of the REP**

We have shown that:

- (1) The carbon debt analysis was flawed and as such the renewable energy plant runs the risk of producing more carbon dioxide emissions than the fossil fuels within its lifetime, thereby speeding up rather than tackling climate change;
- (2) Not factoring in the carbon debt, the REP would still produce up to 5 times the amount of carbon than that which the Committee on Climate Change (CCC) has advised the UK government to adopt as a target figure for grid carbon intensity for 2030. Furthermore, the carbon intensity of two out of the three fuelling scenarios hypothesized in FE4 were in excess of the Climate Change Committee's recommended carbon intensity threshold for biomass electricity of 200 kgCO<sub>2</sub>e/MWh, as cited in FE 10. As such, even using the EU methodology for assessing the carbon footprint of the REP, its climate performance is only marginally beneficial, and this benefit will be diluted quickly in coming years as other lower-carbon forms of renewable electricity are introduced to drive grid de-carbonisation;
- (3) There may be significant adverse human rights impacts (the right to food especially) as a result of using energy crops, which have been recognized by the European Parliament; so any condition requiring the Applicant to only use fast growing crops with growth periods of up to 7 years only, whilst potentially tackling the erroneous assumptions of the carbon debt study, may have knock-on adverse human rights impacts as energy crops often compete with food crops, thereby having an impact on people's basic human right to food;
- (4) Certification schemes cannot ensure the protection of biodiversity and of natural forests;
- (5) Whilst a range of human rights impacts of using bioenergy are recognized by the European Parliament, but the respect for human rights is not a component part of the current sustainability criteria on bioenergy;
- (6) The greenhouse gas emissions of Indirect Land Use Change for bioenergy are not currently taken into account although they are recognized as significant, and there is no time frame for their incorporation into the sustainability criteria or other policy mandates; such inclusion would follow a cue from the European Commission.

(7) All of these issues could not be tackled through Draft Condition 7.

It was put to the Coalition that sustainability standards for biomass are 'work in progress'. We agree. However, there is far too much at stake for the REP to be granted permission before such work is completed and with too much scientific and political uncertainty surrounding how best to approach such work. The respect for fundamental human rights; the need to properly quantify indirect land use change emissions from burning bioenergy; the need to adequately quantify the carbon debt remain recognized, but unresolved issues. A cautionary approach must be used rather than the REP being granted permission in the hope that sustainability issues would be ironed out years down the line.

The Precautionary Principle of Environmental Law (Principles 15 of the Rio Declaration 1992) is a fundamental guiding principal on environmental policy. It states:

'Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.'

This application presents threats of serious or irreversible damage (human rights impacts; increased greenhouse gas emissions; unaccounted greenhouse gas emissions from indirect land use change; threats to biodiversity). Lack of full scientific certainty (for example, around quantifying emissions from Indirect Land Use Change) shall not be used as a reason to postpone cost-effective measures to prevent environmental degradation (in this case, refusing permission for the plant). We do not have any doubt as to the competence of Scottish Ministers in ensuring a respect for sustainability. We do believe, however, that in these circumstances, the only way that they can ensure such respect would be by refusing permission for the REP.

### **3. AIR QUALITY**

#### **Impacts of air pollution on human health – local perception**

It is accepted that air quality and impacts on human health can be material considerations in determining planning applications. Courts have also recognised that fear of harm does not have to be scientifically justified to be a material consideration.

The Court of Appeal in *Newport Borough Council v the Secretary of State for Wales and Browning Ferris Environmental Services Ltd (1997)* concluded that the perception of a health risk by the public was a material planning consideration, referring to “a perceived fear, which by itself could affect the amenity of the area”.

The Kidderminster Inspector (APP/E1855/A/01/1070998, 10 July 2002) supporting Worcestershire County Council’s decision to refuse planning permission for an incinerator concluded that the public perception of risk was ‘*a negative factor of some significance*’ in that case. He set out a number of factors which exacerbate the public’s perception of risk:

- *Scientific claims of public safety in the past have proved to be wrong (e.g. BSE).*
- *The Environment Agency is not able to state categorically that any waste management option is safe.*
- *Studies can’t prove there is no link between incineration and health, only that no link has been proved.*
- *There are many examples where licence conditions have not been observed.*
- *There is doubt whether pollution control regimes will be properly applied and enforced and that judgements on pollution control issues are correct.*
- *The public’s perception of risk can be very different from scientific estimates.*

Residents of Grangemouth are worried that the air pollution that would be produced by the proposed Renewable Energy Plant poses an additional risk to their health. The inquiry heard Kathleen McIntosh’s evidence to this effect. She believes her asthma attacks are triggered by local air pollution. She thinks the authorities ought to be taking steps to improve air quality rather than giving consent for a new large source of pollution on the expectation that it would be mitigated by various measures to be taken by others, and would be adequately monitored and controlled by the regulatory authority SEPA.

The applicant put forward evidence showing that INEOS is intending to implement measures to reduce its emissions of Sulphur Dioxide. The coalition did not challenge this, but in his evidence, Mr. McIntyre could not give a categorical assurance that these measures when introduced would ensure there would be no further breaches in Grangemouth of air quality objectives set for Sulphur Dioxide.

Mrs. McIntosh reasoned that the improvements in air quality that might result from the work being undertaken for INEOS should benefit local residents and not be seen as headroom for another polluter to start up.

Based on prior history Mrs. McIntosh expressed doubts that the regulator SEPA would be able to ensure that local air quality would improve or would meet objectives. She cited the known 761 breaches in Grangemouth of an air quality objective set for Sulphur Dioxide.

Grangemouth has a long history of air pollution from industrial sources. Efforts to improve air quality under Falkirk Council's Air Quality Action Plan have so far failed to prevent breaches of regulated objectives for Sulphur Dioxide over the last four years for which data is available.

The big hope is that INEOS' flue gas desulphurisation project will bring about significant improvements in air quality. Mr. McIntyre could not however categorically assert that there would be no breaches once the INEOS work is complete.

Our submission is that for the local population there is continued uncertainty about future air quality, even without the additional air pollution introduced by the proposed Renewable Energy Plant. They have a very reasonable expectation that the health impacts of continued poor air quality should be given due weight in determining the application.

### **Impacts of air pollution on human health –experts' perspective**

Professor Watterson's statement was not examined, but we draw the Reporter's attention to the point he made concerning the limitations of the approach taken to assess the impacts of air pollution from the proposed Renewable Energy Plant

"In contrast to the approach taken, an integrated public health impact assessment would draw together environmental impact assessments, environmental health impact assessments, occupational health and safety impact assessments and social impact assessments. It would also include ethical and social as well as scientific considerations. It would avoid simple reductionist arguments about processes which do not fully consider the following factors:

- *combined effects of pollution from existing and new processes*

- *the role of mixtures in public health threats*
- *the role of low level exposures to pollutants and the 'historic' doses that communities may have received linked to cumulative exposures*
- *the role of endocrine disruptors in pollution that may affect public health*
- *the role of asthmagens in pollution that may affect public health*
- *the role of carcinogens in pollution that may affect public health and low dose effects*
- *the position of vulnerable communities exposed to pollutants. The World Health Organization (WHO) and other have recently emphasised the threats presented to children, older people and those with illnesses such as respiratory diseases*
- *use of community, health and deprivation profiles of the area surrounding the plant and documentation of any 'discriminatory' aspects of the proposal"*

In examination Mr. McIntyre for the applicant outlined how air quality objectives and limit values are set to protect human health. He confirmed that the process takes account of clinical evidence and opinion but that economic considerations are also given weight. The consequence is that the Regulated objectives and limit values are compromises between the need to protect human health and the costs to the economy as a whole of maintaining high air quality.

Mr. McIntyre said he believed that the values set as air quality objectives took account of the effects of air pollution on sensitive individuals across the whole population. However, he could not confirm if the methodology took any account of the history of prior exposure to air pollution and the effect of the combination of different pollutants. Professor Watterson's statement indicates that the methodology does not take full account of these factors.

The coalition referred in evidence and during examination of Mr McIntyre to Guidelines issued in 2005 by the World Health Organisation in which they recommended maximum exposure limits for a number air pollutants including Sulphur Dioxide. The Guidelines say, " *...there is a basis for revising the 24 -hour guideline for SO<sub>2</sub> downwards adopting a prudent precautionary approach to a value of 20 µg/m<sup>3</sup>.*"

Data from Falkirk Council's most recent Air Quality Progress Report (FE63) shows at Fig 6.1 (page 49) that in 2010 the highest 24-hour average concentrations recorded at eight monitoring stations ranged from 28 to 119 µg/m<sup>3</sup>. The assumed background 24-hour mean level for SO<sub>2</sub> in the applicant's Environmental Statement, at Table 9.8, is

22.3 µg/m<sup>3</sup>, and a Process Contribution of 12.2 µg/m<sup>3</sup>, with a resultant PEC of 34.5 µg/m<sup>3</sup>.

The WHO recommendation to adopt a value of 20 µg/m<sup>3</sup> for the average 24 hour exposure limit has not been transposed into EU or Scottish regulations for the protection of human health. It is nonetheless an authoritative view of the significance to human health of repeated exposure to elevated levels of SO<sub>2</sub>.

### **Local Air Quality impacts – significance**

The applicant has always acknowledged that the area containing and surrounding the site of the proposed development is subject to poor air quality. The applicant has also acknowledged that there are continuing breaches of the Objectives and Limit Values for the Purposes of Local Air Quality Management (included in the Air Quality Standards (Scotland) Regulations 2010).

An Air Quality Management Area (AQMA) was declared in 2005 in Grangemouth in recognition of the potential for breaches of the 15-minute mean SO<sub>2</sub> Air Quality Standards objective. Monitoring data since that declaration has shown that a breach of the 15-minute objective has been recorded by at least one monitoring station in the AQMA in 2007, 2008, 2009 and 2010.

The applicant's Environmental Statement (ES) confirms that the air emissions of the proposed development would include Sulphur Dioxide and other pollutants injurious to human health. It was not disputed that these emissions would add to concentration levels experienced by people living in the vicinity of the development.

The ES presented the results of computer modelling to support the applicant's view that the impact of this additional pollution on human health would be "insignificant". Specifically the ES estimated that the development would "*contribute a maximum of 9.2% to the 15-minute mean Air Quality Objective for SO<sub>2</sub>... and contributions to the hourly and daily mean AQOs are predicted to be 5.1% and 9.7% respectively*". On the basis that these contributions are below 10% of the objective, the applicant describes them as "not significant".

However, FE68 (EPUK Biomass and Air Quality Guidance for Scottish Local Authorities) states that, "*There is no specific Government guidance on determining the significance of air quality impacts within an air quality assessment and the definition of what is a*

*significant impact therefore ultimately lies with the judgement of the individual local authority. The Environmental Protection UK document 'Development Control: Planning for Air Quality' contains guidance on assessing significance which can assist in this area."*

Under examination, Mr. McIntyre accepted that using the significance description scheme in this second EPUK document (FE56), the impact would be categorised as **moderate adverse**. An increase in concentration levels of between 5 and 10% of the Objective is categorised by EPUK as 'medium', and the impact of this change in situations where the resultant levels are just below or are above the Objective/ Limit Value is 'moderate adverse'. (page 18 of FE56).

## **Conclusion**

The applicant's modelling of the effects of additional air pollution concluded that there would be no adverse impacts on human health. The inquiry however heard that scientific understanding of the health impacts of air pollution is evolving, and that regulated standards for air pollution levels do not guarantee that adverse health impacts will not arise.

The health impacts of air pollution from this development are not adequately understood. It would seem prudent, precautionary and wise from a public health perspective not to site it within Grangemouth.

The applicant accepts that the significance of additional sulphur dioxide pollution from the proposed REP might be described as 'moderate adverse' rather than as 'not significant' using 2010 guidance from EPUK.

The applicant is not able to guarantee that the installation of flue gas de-sulphurisation equipment at INEOS will mean that concentration levels of sulphur dioxide in Grangemouth do not exceed regulated objectives.

Local residents have endured poor air quality for many years and want to enjoy the benefits of any improvement resulting from the work at INEOS. They do not want that improvement negated by new pollution.

The duty of Scottish Government as set out in The Air Quality Standards (Scotland) Regulations 2010 is "to endeavour to maintain the best air quality compatible with

*sustainable development*". We submit that the proposed REP will prevent Scottish Government from making progress towards meeting this duty.

Scotland's Sustainable Development Strategy of 2005 pledged that, "*This strategy will also give priority to improving the quality of life of individuals and communities in Scotland, securing environmental justice for those who suffer the worst local environments.*" We respectfully submit that high levels of air pollution in Grangemouth mean the local community is already one of those suffering a poor local environment.

#### **4. WATER POLLUTION AND FISHERIES**

Our evidence at the hearing session showed that the proposed development would have significant long-term negative environmental impacts on the River Carron's aquatic environment and the River Carron's current and future migratory fish populations.

The preferred location for the REP's Option 1 blow down effluent discharge pipe has been chosen for economic capital cost reduction reasons only, and not for best environmental practice reasons.

Our evidence confirmed that there are currently four effluent diffusers in the deep-water channel of the Firth of Forth, from around Grangemouth Industry (Ineos, BP Kinneil, Calchem and Dalderse STW) that set a precedent, based on lack of dilution in the River Carron channel.

In our view, the applicant has not properly assessed if blow down effluent could be discharged back into the Grangemouth dock instead of into the River Carron. We suggested that the REP blow down pipe could be routed out into the deep-water channel of the Firth of Forth, at the end of North Shore Road, in the section of the Firth of Forth that is not part of the Special Protection Area (SPA).

Our evidence highlighted the current environmental pressures suffered by the River Carron, which focused on reservoir water abstractions, the consequential low river flow rates and lack of available dilution for pollution incidents and industrial effluent discharges.

In our Supplementary Report we compared the river's normal summer freshwater flow with that of the proposed biomass plant's blow down effluent flow (1m<sup>3</sup>/second vs.

0.93 m<sup>3</sup>/second), to show how catastrophic an accidental or unplanned release of thermal effluent would be on fish survivability in the 2.25km narrow river channel downstream of the proposed Option 1 discharge pipe location.

**Designations, WFD Classifications, Habitats Directive, SPA's, UKBAP, FABAP, RBMP, FMP**

In our evidence we showed that the proposed development would be contrary to the aims of the EU Water Framework Directive (EU WFD) for the River Carron; contrary to the aims of SEPA's River Basin Management Plan (RBMP) for the River Carron and its 14 WFD Classified Baseline Water bodies; contrary to the aims of the EU Habitats Directive for the protection and conservation of Annex II Species - European River Lamprey and Atlantic Salmon, and contrary to the UK Biodiversity Action Plan (UKBAP) and Falkirk Area Biodiversity Action Plan (FABAP) for the conservation of River Lamprey, Atlantic Salmon and Sea Trout, and contrary to the RCFMG's River Carron 2010-2015 Fisheries Management Plan (FMP) for the regeneration of the River Carron.

We drew the inquiry's attention to the fact that the current Special Protection Area (SPA) is located to the immediate north of the proposed Option 1 blow down effluent pipe location, and the REP'S polluting effluent will consequently have an adverse environmental impact on this SPA in terms of invertebrates and invertebrate habitats as an important bird migration route food source.

The River Carron is classified under the European Commission's Water Framework Directive (WFD). The WFD, which came into force on 22 December 2000, establishes a new, integrated approach to the protection, improvement and sustainable use of Europe's rivers, lochs, estuaries, coastal waters and groundwater. Scottish Ministers have committed to implementing the Water Framework Directive.

The River Carron catchment contains 14 baseline surface water bodies (ones with a catchment area greater than 10km<sup>2</sup>) including five heavily modified water bodies and three artificial water bodies (canals).

River Carron catchment water bodies were classified by SEPA in 2009 as having either Poor, Moderate or Good Ecological Status. The classification scoring for each water body is made up of over 20 factors including the Fish Species and Fish Populations present.

Under the WFD, all classified water bodies within the River Carron Catchment must achieve "Good Ecological Status" by at least 2027. This is stated in the SEPA River Basin Management Plan River Carron Profile 2009.

Any industrial development, which could derogate this River Basin Management Plan objective, is unacceptable and contravenes the WFD objectives as stated in SEPA document, 'The Future for Scotland's Waters, Guiding Principles on the Technical Requirements of the Water Framework Directive', May 2002.

The proposed REP will significantly affect populations of migratory fish in the River Carron including River Lamprey, Atlantic Salmon and Sea Trout, all of which are confirmed species as stated in the Falkirk Area Biodiversity Action Plan 2011 – 2014 (FABAP).

River Lamprey is a European Protected Fish Species and receives conservation status under Annexes II and V of the EU Habitats Directive Appendix III of the Bern Convention and is on the UKBAP Priority List.

The reduction in upstream adult and downstream juvenile fish migration survivability as a direct result of the REP blow down effluent discharge will negatively impact River Carron fish populations and this could cause a derogation in WFD classification, and will contravene the WFD objective of achieving "good ecological status" for many of the River Carron catchments water bodies. This environmental impact is unacceptable.

### **Technical & Environmental Infeasibility of Effluent Discharge Location**

We showed that it is technically infeasible for the proposed blow down effluent discharge location of Option 1 to provide a minimum of 50 times dilution of the effluent flow during ebb tide, which is needed to meet SEPA's initial mixing and dilution requirements. At best, a dilution rate of 28 times is available for Mean High Water Spring Tides and 17 times for Mean High Water Neap Tides.

We also showed that the REP's blow down effluent timings are flawed, since the proposed design discharge time of 2.5 hours is physically impossible at the proposed Option 1 effluent discharge location. The ebb tide river level at the Option 1 pipe location will reduce by up to 2.0m/hour, and the actual river level will reduce to zero flow passing the pipe in less than 2.5hrs, stopping mixing of the discharge effluent with river water.

We provided evidence that the River Carron tidal channel is the only migration route available for migratory fish in the River Carron catchment to and from the Sea. Atlantic Salmon and Sea Trout juveniles migrate down through the River Carron tidal channel in March, April and May, and River Lamprey migrate down through the River Carron tidal channel in July and August. Sea Trout adults migrate upstream through the River Carron tidal Channel in April, May and June, whilst Atlantic Salmon adults migrate upstream through the River Carron tidal channel from March through to end November in each year and surviving Kelts migrate back to sea in November, December and January. Adult River Lamprey migrate upstream during October, November and December. Migrations occur all year round in both directions.

We gave evidence that blow down effluent from the REP cannot be discharged into the River Carron channel without failing SEPA's, 'WAT-SG-11 Water Use Guidance for Modelling Coastal and Transitional Discharges, Section 11.2 Initial Dilution & Mixing Zones'.

### **Inaccurate CORMIX thermal discharge modelling assumptions and predictions**

In our view, the applicant has not made a proper environmental assessment. It has not used the CORMIX thermal discharge modelling correctly. The results of the assessment are therefore not reliable

Mr Henderson (Pisces Conservation Ltd) stated in his Supplementary Report May 2012 that the CORMIX model parameters were based on "assumptions and predictions"

Their model incorrectly used too high a river velocity and consequently produced a narrower modelled thermal plume.

From the description given under examination by the applicant, we conclude that the velocity results of the survey conducted in September 2010 were not accurate. An RCFMG survey in May 2012 found river ebb tide velocities to be far lower. The applicant has not taken account of these low mixing velocities in the environmental assessment and not made a proper assessment of its impacts on the river channel aquatic environment or on the SPA adjacent to the river channel.

The environmental assessment is also deficient because worst-case river water temperatures have not been used (including worst-case River Carron temperatures

and climate change predictions for increased future air and water temperatures), and worst-case river widths were also not considered.

We raised concerns that the REP blow down effluent discharge temperature will be 12degC above ambient temperature (over 30 degC in summer) and will be fatal for migrating River Lampreys (thermal death point 26-27degC), fatal for Atlantic Salmon (thermal death point 28.7degC) and fatal for migrating Sea Trout (thermal death point 26degC).

Fish fatalities would occur if any adult fish were to swim into the plume on upward migration or if juvenile fish entered the plume whilst migrating downstream on an ebb tide and they were to become trapped in that hot section of river channel immediately below the discharge pipe.

In our view the CORMIX modelling should be re-done using accurate worst-case input factors as set out in the Appendix. We are confident that the results will show more conclusively that the SEPA requirements will not be met, and that the Option 1 location for the blow down discharge is not viable.

The inquiry heard from Mr McGlashan for the applicant that the Carron river bed has become shallower in recent years, compared to the Admiralty Chart river depths at low tide. In the context of the thermal polluting effluents behaviour, the model cannot be considered valid if the River Carron's bed changes from year to year.

### **Dissolved Oxygen Concentrations, Effluent Oxygen Concentrations and Oxygen Demand - the impacts REP Blowdown Effluent will have on migratory fish survivability and River Carron fish populations**

Survey work carried out by RCFMG has shown that dissolved oxygen levels in the river are currently too low for salmonid fish species to survive at low river flows. The cause is treated effluent discharge coming from the Dalderse Sewage Treatment Works, which is not far upstream from the Option 1 discharge location proposed for the REP.

Because the river channel's dissolved oxygen levels are already depleted to levels harmful to migratory salmonids, the River Carron cannot afford any further reduction in dissolved oxygen levels, which may be caused by a further industrial effluent discharge.

The applicant has stated that the blow down effluent from the REP will not have a biological oxygen demand. This is incorrect. Typical Plant Boiler Blow down effluents have a Biological Oxygen Demand (BOD) of 2 to 5mg/l oxygen demand. The REP blow down effluent will have a similar BOD of up to 5mg/l, which will further reduce the River Carron Channels dissolved oxygen content.

The applicant has stated that biocides are used to stop fouling organisms colonising in the cooling water system and to ensure operator safety by suppressing bacterial film formation. Biocides kill living organisms to reduce scale, slimes, algae, mollusc and other organic growths within the process plant.

When blow down effluent comes into contact with the air, decomposition of these dead organisms occurs; the levels of oxygen fall rapidly as the organisms decompose and oxygen users increase, which in turn creates a biological oxygen demand. In worst cases, the water may become completely de-oxygenated.

In addition, the effluent will itself contain very little dissolved oxygen because it is a hot water effluent and could be as high as 40degC in the future. For this reason alone, the discharge pipe cannot be located in the River Carron Channel. The environmental risk and consequences are too high.

The applicant has stated that there is no risk that a body of oxygen-poor water will remain within the estuary. This is incorrect.

In our view, the REP blow down effluent could significantly reduce fish migration survivability in the River Carron, which could devastate migratory fish stocks. We consider this is an unacceptable impact.

### **Other Unconfirmed and Un-assessed Environmental Impacts**

The applicant confirmed at the inquiry hearing that the REP design includes a cooling water blow down sump and possibly a boiler blow down tank (or sump). No details have been provided as to what might happen when either collection sump fills to maximum capacity (say during scheduled planned plant maintenance, unplanned plant shut down, or emergency), when the River Carron tidal regime does not allow for the blow down effluent to be discharged.

The applicant has not confirmed if the boiler blow down effluent will be combined with the cooling water blow down effluent prior to being discharged into the River Carron Channel. The applicant did not confirm if the more concentrated and more harmful boiler blow down effluent would be pumped directly into the River Carron on its own without being diluted by the cooling water blow down effluent.

The applicant has not confirmed if the development will abstract water out of the River Carron Channel. The river cannot afford any more abstraction. The RCFMG requested a Section 36 planning condition on this item.

The applicant has not confirmed if the development will require a secondary (back up) water supply for plant process water, or if there is an intention to source this back up supply from the municipal potable water mains. Any connection made to the mains for secondary (back up) process water will be an indirect form of further abstraction out of the River Carron catchment via existing catchment reservoirs and potable water treatment plants. The RCFMG requested a condition on this item.

The applicant has not confirmed where the REP fire fighting firewater supply will be sourced and if it will be sourced from the River Carron. The RCFMG raised this concern in their Objection letter dated October 2010.

The applicant has not confirmed how biocides will be stored and if the REP drainage system will be routed into the River Carron.

The applicant has not confirmed if any stockpiles of contaminated recycled biomass wood will leach contaminants into the REP drains system and if the plant drainage system will be routed into the River Carron.

The RCFMG understand that if INEOS do not contract to take steam from the Forth Energy Biomass Plant, and there is non-delivery of heat, not only will the overall design of the plant have a lower efficiency , but the quantities of blow down effluent discharged into the River Carron will be greater than if steam was exported to INEOS. The export of process Steam to INEOS is therefore very important for the River Carron's environment as the environmental impacts surrounding water pollution and fisheries issues are directly related to process steam export.

## **Conclusion**

Best environmental practice has not been considered. The proposed design (Option 1 Biomass Plant Blowdown Effluent Discharge Location) will not meet current environmental policies and directives.

The Environmental Assessment is deficient in terms of accuracy, basis, comprehensiveness, correctness, failure to include important information and data, and its overall transparency in stating the true pollution impacts on the River Carron's environment. The long-term environmental consequences from incorrect assessment of the proposed development would be significant.

The Option 1 location is not a viable option technically or environmentally. The RCFMG requested a Condition that the effluent be discharged out into the deep water channel of the Firth of Forth.

The applicant cannot guarantee the REP blow down effluent will not kill migratory fish or guarantee it will not affect fish migrations or guarantee it will not affect River Carron catchment migratory fish populations.

The applicant cannot guarantee the REP blow down effluent discharge will not affect the WFD classification (by reduction in fish species and fish populations) of any of the 14 baseline water bodies within the River Carron catchment, upstream of the REP.

The applicant cannot guarantee the REP blow down effluent will not affect the Special Protection Area (SPA) invertebrate populations and its effects on migratory birds.

### **Condition Requests relating to Water Pollution & Fisheries Issues**

We lodged requests for conditions to be attached to any Section 36 and planning consent. The applicant requested that no conditions relating to Water Pollution & Fisheries be discussed either at the Conditions Hearing Session, or during the Hearing Session for Water Pollution & Fisheries Issues. By the end of the Inquiry, no conditions relating to Water Pollution & Fisheries Issues had been discussed nor agreed.

#### **Condition 1.**

For Environmental Reasons, the REP Blowdown Effluent Discharge Pipe for the Cooling Water System Blow-Down Effluent (including the Plants Boilers Blow-Down Effluent) shall be routed out into the deep-water channel of the Firth of Forth to discharge at that location, and not discharge into the River Carron Channel at any point. The

discharge point in the Firth of Forth will be downstream (East) of the River Carron confluence.

**Condition 2.**

The applicant shall not connect to the municipal potable water mains nor use municipal potable water mains water for use within the industrial plant process. Any secondary water back-up supply for industrial plant water or process water use shall be sourced directly from the Grangemouth Dock Impoundment only, if required.

**Condition 3.**

No water shall be abstracted out of the River Carron for the entire life of the REP.

**5. VISUAL IMPACT**

At the Hearing Session on 28 May 2012 our witness Mr Mark Haldane presented verbal evidence with regards the siting, location, scale and mass of the proposed REP on behalf of the Coalition.

We explored several topics of discussion including:

- Similar biomass plants already in Scotland such as Stevens Croft (albeit considerably smaller in size)
- Site selection and possible alternative sites.
- Configuration of the proposed REP.
- Location within the town of Grangemouth and the relationship of the proposed REP in terms of scale and mass with surrounding established industry, and the civic and residential core of Grangemouth.
- Comparison with other large structures both in and outwith Grangemouth.

In addition, following the Hearing Session all parties had the opportunity to attend the Site Visit on 7 June 2012 which allowed a conducted tour of the proposed development site within the port of Grangemouth as well as visits to some of the immediate surrounding areas within Grangemouth.

**Viewpoints, photomontage and their usefulness**

Rebecca Simpson for the Applicant confirmed that the use of photomontages in assessing visual impact is only one of a number of tools available to assist both professionals and the public to reach an understanding of scale, mass and location.

While we understand that the selection of viewpoints and the subsequent production of the photomontages presented by the Applicant within its application documents (which were later updated for inclusion within its evidence) were arrived at through consultation, we have to question the wisdom of having only two viewpoints within the town of Grangemouth. We consider that the inclusion of only two viewpoints is wholly inadequate when considering the sensitivity of the proposed REP on the residents of Grangemouth.

Chris Malcolm for the Applicant questioned the usefulness of the photomontages presented by the Coalition. While we would accept that the alternative photomontages presented within the Coalition's evidence are not produced to the same required technical standards as those produced by Forth Energy and that as stated by Chris Malcolm they often give an aerial view not experienced by the public, we would venture that they do give an relevant and acceptable alternative view which does show the scale and mass of the development in particular relation to the town centre location. The photomontages presented by the Coalition have relevance and should not be dismissed.

### **Forth Energy Chapter 10 – Landscape and Visual, GMA Design Concept Statement – inaccuracies and context**

In our review of both documents we have highlighted several inaccuracies and inconsistencies.

The height, scale and mass of existing surrounding buildings are not adequately considered. This has the effect within both documents of giving the initial impression that the proposed REP sits comfortably within the whole landscape and its immediate surroundings. This is simply not the case.

It was confirmed by Forth Energy at the hearing that the significant building next door to the proposed REP – Shed H – is in fact 15.50m to ridge and about 10.50m to eaves. It is understood (and this was noted during the Site Visit) that this is the highest of the warehouse buildings within the port. Most other buildings are in the region of 6.00m to eaves particularly on North Shore Road. All significantly less than the generalisation by Forth Energy and GMA that within the port, buildings are 20m or more.

That said there are some tall structures. The buildings of the Biomar plant were mentioned. No accurate information on the height of these structures was confirmed either in evidence, at the Hearing or the Site Visit. The cranes (albeit of light construction) associated with the container area within the port were also mentioned and were again considered further at the Site Visit. Again confirmation of the height of the cranes has been ambiguous and not fully understood in our view. The cranes in the port are owned by Forth Ports and will we expect be regularly inspected and certified. All heights and clearances must be known. As such we would have expected clear unambiguous advice as to the height of these structures.

The buildings outwith and immediately on the border of the site are all significantly less than 20m in height. The ASDA supermarket is one of the higher buildings and is circa 12.00m high.

In context, all of the major buildings within the proposed REP from the Mixed Fuel Store up are all significantly higher than any buildings in the immediate vicinity. Buildings of a scale and mass anywhere close to that proposed by the REP are a considerable distance from the town centre location and well within the INEOS complex.

### **Location and site selection**

FE have stated that factors such as the INEOS heat load, quayside location and road access all contributed to the selection of the site. No other sites within the port of Grangemouth were deemed acceptable to FE.

We would suggest that the overriding factor with the Grangemouth REP site selection (and indeed the other FE proposals at Dundee and Rosyth) and what Forth Ports bring to the proposal is the quayside location. It is unequivocal that the proposal requires large amounts of imported woody biomass – up to 1.5 million tonnes – with at least 90% coming by sea. Sustainability issues and how this proposal sits with policy are adequately addressed elsewhere. We would assert that the primary factor in site selection was availability of Forth ports quayside location and what opportunities the proposal brings to their port operations. All other matters are secondary we believe.

Given that the site selection is primarily based on quayside location and that the overall design configuration of the REP is based on 118MWe and 200MWh, thereby dictating the building envelope, we further assert that little consideration has been

given to the proposed plants proximity to the town centre and the large quantity of near housing. We find it implausible that the EIA reports there will be no significant impact on housing and residential properties.

### **Architecture + Design Scotland**

We refer to the 13 July 2010 report by Architecture + Design Scotland and repeat the following text:

*"However, the proximity of the site to the existing town centre, and any proposals for such a plant, must include necessary measures to mitigate issues of scale and immediate context, in addition to the wider land seascape."*

Rebecca Simpson on behalf of Forth Energy acknowledged the significance of this wording in her report.

We would further add that due to the inaccuracies contained within the Forth Energy and GMA documents as explained above and in our evidence a somewhat skewed assessment of scale and context has been presented to Architecture and Design Scotland so far. It is significant in our view that their report has been based on inaccurate baseline information. The extract text above provides the only note of caution in what otherwise reads as a glowing report. We can only speculate their view if presented with accurate baseline information.

We do not feel that the matters of scale and immediate context have been addressed and question whether they can be despite the intentions of the GMA design.

### **Town centre location**

As mentioned the proposed REP sits incongruously in the town. There is a clear disconnect on many levels.

There is a clear separation from the industrial site of INEOS on the East side of the town where buildings of similar (although smaller) scale and mass are present. The 110m stack proposed by FE would be the tallest single structure in Grangemouth.

The plant has no context with the immediate town centre location visually or in terms of mass and scale. In terms of mass and scale the plant is something of an outlier, sitting on its own and remote from other large scale industry in the town.

The proposals visually take reference from containers within the port producing an amplified stack of containers which are far greater in scale than present port operations by some margin. There is no context here in relation to the Grangemouth townscape.

Overall in terms of mass and scale we are left with the impression that there is a lack of sensitivity to the needs of the people of Grangemouth.

### **Comparison with other large structures**

We are well used to the large structures that are some distance away from the town centre on the eastern edge of the town at INEOS.

Significant structures here include cooling towers at circa 63m and the highest flare stacks (which most people in Grangemouth can identify) at circa 90m. As stated these are some distance away. The proposed boiler hall and the stack are taller than any other similar structure in the town.

Chris Malcolm made reference to tall buildings that GMA have worked on in the Glasgow Harbour area; we would point out that much of the development here has replaced the Meadowside granary which was one of the tallest buildings in Glasgow and one of the largest brick built structures in Europe. Accordingly there is a historical context to both mass and scale in this example.

Undeniably, by comparison, the proposed structures are larger than any other single building in the area, particularly in terms of height. They are simply too large in the town setting.

### **Site Visit**

During the site visit we made available access to the flat on the upper level of the building known locally as the Salvesen Building.

This part of the visit was attended by Mr Trevor Croft along with Michaela Sullivan, Chris Malcolm, Bernard Whittle and Mark Haldane only.

What was demonstrated by the views afforded from this property location is the proposed REP plant's disconnect with the surrounding industry and its relatively isolated situation along with the general close proximity to the town centre and the large amount of housing running South and away from the site.

## **Conclusion**

The people are well used to industry and commerce and the buildings and structures that come along with such development.

We also appreciate the setting of our town in the Forth Valley enjoying the proximity to the rivers and the surrounding views outwards to the Ochils and further North up to the Trossachs in particular. As stated at the Hearing we live in a carseland area that in our view has its own beauty and points of interest. Because we are hosts to significant industry we value the views from town possibly more than most and are determined to prevent any loss of visual amenity. There would be severe loss of visual amenity if the REP is constructed.

We firmly believe that this proposal is wrong on so many levels; the matter of inappropriate mass, scale and location along with the lack of integration with the town centre are key points to be carefully considered. We would urge that on this basis that the proposed REP be refused consent.