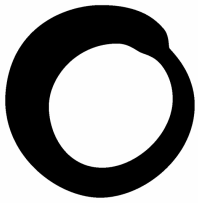
Friends of the Earth Cymru

Renewable Energy Consultation Response
5th July 2002

to the National Assembly for Wales



1. This Consultation Response replies to the recommendations proposed in the Renewable Energy Consultation (April-July 2002) by the Economic Development Committee of the National Assembly for Wales. In particular the response details what Friends of the Earth Cymru consider as feasible contributions to supplying Welsh electricity demand up to 2010 by the various renewable energy technologies with respect to Wales's natural resources.

2. Introduction

2.1 There is growing concern about the dangers of global warming and adverse climate changes caused by the burning of oil, coal and gas in power stations, homes, industry and vehicles. In response, many countries are investing in renewable energy generation schemes as a solution to this potentially catastrophic problem.

2.2 Wales has abundant natural energy resources that can be harnessed by renewable energy technologies to generate electricity, hot water and hydrogen fuel. Indeed, Wales has some of the highest tidal ranges in the world and the UK has about a third of Europe's wind energy resource.

2.3 Much if not most of this green or renewable energy resource can be harnessed to generate electricity and delivered to consumers at prices that are competitive if not significantly less than the costs of nuclear, oil, coal and even gas generated electricity.

3. Advantages

3.1 The advantages of renewable energy are numerous and significant. Renewable technologies generate energy cleanly and safely, emitting little or no dangerous global warming gases, acid rain gases or toxic air pollution.

3.2 In terms of national security, renewable energy schemes pose relatively minor opportunities for terrorists, in stark contrast to nuclear power facilities and their fuel and rad-waste transports. Indigenous renewable energy costs are stable whereas fossil fuel prices can vary due to world

events, particularly in the Middle East. Indeed, much of Wales's future energy needs can be generated indigenously forever, improving self-sufficiency and security of supply.

3.3 Most renewables also create more jobs per unit energy than fossil fuel or nuclear power generation. Schemes can be deployed in a widely distributed pattern across urban and rural areas, can be built quickly and are amenable to community ownership.

3.4 Friends of the Earth Cymru point out that renewable energy schemes such as windfarms, biomass and hydro schemes, under-sea turbines and tidal lagoons generally:

- are, or are forecast by the Government to be, mostly cheaper than fossil fuels and nuclear power, onshore wind significantly so
- emit few greenhouse gases unlike fossil fuels
- are relatively very clean and safe, emitting no or few damaging and costly acid rain gases or toxic air pollutants
- are an indigenous or self-sufficient and secure source of energy forever
- leave no toxic and expensive legacy of long-term radioactive waste and future waste management responsibilities
- would be widely distributed and non toxic offering difficult and far less tempting targets for terrorist attack than nuclear facilities
- give price stability, being little affected by world events and oil prices
- create more jobs per unit of energy than fossil fuel or nuclear generation
- would be widely dispersed in rural and urban areas providing wide economic opportunity for community involvement, financing and profit.

4. Environmental Targets

4.1 Below Friends of the Earth Cymru set out our reasons for estimating that over 6 TWhrs/year of current Welsh electricity demand could be generated by renewable sources by 2010. As current demand is about 19.5 Tera Watt hours per year (TWhrs/year) so 6 TWHrs/year is about 30% of current Welsh electricity demand. About half (3TWhrs/year) could be generated onshore and about half offshore.

4.2 We think that this output is a realistic possibility and environmentally necessary. Renewable technologies could be encouraged by progressive Assembly planning policies and financial support where needed. Indeed, 6TWhrs/year could actually be exceeded by some margin depending particularly on positive environmental assessments and public acceptance of new offshore generating technologies which could be very cost competitive.

4.3 If 30% of electricity generation by renewables is achieved in eight to nine years time then Wales could become a role-model especially to developing countries, as befits a nation with a world-leading remit to promote sustainable development.

4.4 It should also be remembered that emissions from UK power stations accounted for 28% of UK greenhouse gas emissions in 2000. Much needs to be done on every front to combat global warming.

5. Economic Opportunities

5.1 The awesome threat of global warming should not cloud the economic opportunities and social benefits of pursuing what could be called a green industrial revolution. In harnessing Wales's energy resources, the renewable energy industry in Wales would support a healthy fabric of employment in rural hills, valley towns, historic ports and seaside resorts.

5.2 Wales's target would rival Denmark's whose 2010 target is 29% (see para 2.6 on page 6 of the NAW Consultation document). Reducing emissions from other sectors, such as transport could also require significant electricity generation for the production of hydrogen. The hydrogen powered technologies themselves offer further commercial and employment opportunities.

5.3 To help achieve 6 TWhrs/year of renewable electricity generation by 2010, Friends of the Earth Cymru think that the Assembly should set TARGETS and also MINIMUM COMMITMENTS for renewable technologies. This would help inform a supporting planning framework and financial policies.

5.4 For the reasons outlined above we fully support the EDC Recommendations 1 (a), (b) and (c) and Recommendation 2 on targets. In the next section we give reasons for proposing specific targets.

6. Targets and Commitments for Production or Demand

6.1 Targets and Commitments

6.1.1 Targets can be expressed in different ways and can mean different things to different people. An 'ambitious target' can be very different to a 'minimum commitment'. In supporting several new technologies as a group where the pace of advancement and deployment is unpredictable it may be more stimulating to set both. The target can be used to set planning framework and funding policy, and a commitment would indicate the minimum level to be achieved within that framework and policy.

6.1.2 Friends of the Earth Cymru considers that targets and minimum commitments be set to help achieve the recommendations. Both should be expressed in terawatt hours per year which is simply an amount of electricity. However it can be informative to illustrate such amounts as a percentage of Welsh electricity production or demand. Unfortunately this can also lead to confusion. The amount of electricity generated in Wales (production) is different to Welsh electricity demand and consumption.

6.2 Production and Consumption

6.2.1 Production from power stations in Wales is about 30 TWhrs/year. Welsh demand is about 20 TWhrs/year, the balance of about 10 TWhrs/year is transmitted to England. The 1.4 GW gas-fired power station at Connah's Quay in North Wales supplies parts of north west England. South Wales imports some electricity from England. As regards consumption, electrical losses within the

centralised energy industry and along the transmission network, results in electricity DEMAND exceeding end-user CONSUMPTION by about 15%.

6.2.2 A 10 % production target for Wales may imply 3 to 4 TWhrs/year by 2010 but such a target depends on what schemes in Wales may be operating at that time. This is because a 2010 forecast has to make predictions about ageing large power stations like Wylfa, and future electricity exports to England. A 2010 consumption target is also unknown because it is likely to change (up or down) by 2010. Electrical efficiency improvements, associated policies and costs, and changes in consumption patterns are likely to have occurred.

6.3 Percentage

6.3.1 Even so, in addition to expressing targets in TWhrs/year, we think that for explanatory purposes it would also be useful to express them in percentage terms. However, we think that any percentage target should be set in the context of current Welsh electricity demand rather than overall electricity production in 2010 Wales. Also, the National Assembly has a legal duty for sustainable development and Wales should clearly express and address its own ecological footprints in the first instance.

6.4 Specific Targets and Commitments

6.4.1 Below, Friends of the Earth Cymru estimate that somewhere between 3.8 to 10.2 TWhrs/year of electricity could feasibly be generated by renewable energy schemes by 2010. We think it reasonable that a target of 6 Tera Watt Hours per year by 2010 is set by the Assembly equivalent to 30% of current Welsh electricity DEMAND (or 20% of current PRODUCTION).

6.4.2 THIS TARGET DOES NOT INCLUDE LARGE TIDAL LAGOONS OR A LARGE WINDFARM IN THE CAMDDWR REGION OF MID WALES.

6.4.3 ANY CONTRIBUTIONS FROM SUCH LARGE SCHEMES SHOULD BE ADDITIONAL TO THE 6 TWHR/YEAR TARGET

6.4.4 We also propose that a 2010 MINIMUM COMMITMENT to 1.2 TWhrs/year generation by onshore wind turbines and 0.6 TWhrs/year from biomass technologies are adopted by the Assembly. These commitments would help establish a regional wind energy planning framework and any fiscal support policies for biomass schemes.

6.4.5 We think that 6 TWhrs/year is a realistic possibility which could be encouraged by supportive economic development policies. Indeed, it could actually be exceeded by some margin depending particularly on positive environmental assessments of new offshore generating technologies. The table below details what we regard as the likely range of feasible contributions to electricity demand up to 2010 from the various renewable energy technologies.

6.4.6 Friends of the Earth Cymru consider that renewable energy generation between 2010 and 2020 should also increase by a substantial degree towards a zero-carbon electricity system.

7. Renewables Target Feasibility

7.1 A 6 TWhrs/year by 2010 renewables target or 30% of demand may sound challenging but it only reflects the potentially abundant renewable resources around Wales relative to its electricity consumption. In fact, the scale of the change in generation mix is little different to that which has occurred over the last 10 years at UK level.

7.2 The switch from coal to gas power generation in the 1990s represented a shift of 33% of UK generation capacity (25 Giga Watts or GW) according to the National Grid Company (Facilitating the Future Report July 2001). And over the next 20 years almost half of all the power stations in England and Wales (38 GW of capacity) are expected to be retired. In comparison, overall demand in Wales requires sufficient capacity to cover the 2.2 GW average output needed.

7.3 As it happens, the resulting increased demand for natural gas is causing concern in terms of energy security as the UK will become a net gas importer in the next few years. Renewables are fundamentally different to natural gas in that the resource does not run out, nor do they produce much carbon dioxide or acid gases.

7.4 The successful deployment of the various different renewable technologies will depend to some degree on Assembly policies and public as well as private funding. Assembly support would be demonstrated if it sets a commercially stimulating target for renewable energy generation by 2010 and ensured policies and funding priorities enable such a target to be achieved in practice.

7.5 Energy efficiency improvements can reduce current demand in which case the percentage contribution from renewable schemes would be higher than stated below. For example, electrical efficiency improvements of 33% by 2010 would mean that the 6 TWhrs of renewables would supply 45% of Welsh demand.

7.6 Detailed below are the renewable energy technologies that Friends of the Earth Cymru estimate could generate 6 TWhrs/year of current Welsh electricity demand by 2010. The lower figure of the range represents likely minimum output by 2010, the higher figure represents the likely maximum achievable by 2010 if the various technologies progress well in a supporting policy framework (see also Annex A and B for comparative purposes):

8. Feasible Range of Electricity Generation by 2010

8.1 Each 0.2 TWHrs/year is equivalent to 1% of current Welsh demand

Onshore Renewables	Possible TWhrs/year	% of Demand	Existing Schemes
Onshore windfarms	1.2 - 2.2	6-11 %	2.3 %
Biomass schemes	0.6 - 1.0	3-5 %	~
Hydro schemes	0.2 - 0.4	1-2 %	1 %
Solar photovoltaic (PV)	0.2+	1+ %	~
Landfill tips and mines gas	0.2 - 0.4	1-2 %	1 %

8.2 Friends of the Earth Cymru estimate that between 2.4 - 4.2 TWhrs/year could be generated by onshore schemes. We propose that a TARGET of 3 TWhrs/year is reasonable (see section below).

8.3 As Wales has the planning powers for most onshore renewables a MINIMUM COMMITMENT for 1.2 TWHrs/year for onshore wind and 0.6 TWhrs/year for biomass would help in establishing a planning and policy framework for reasons detailed in the 'Onshore Schemes' section below.

8.4 We estimate that between 1.6 - 6.0 TWhrs/year could potentially be generated by offshore schemes, or 1.6 - 3.4 TWhrs/year not including large tidal generators. We propose that a TARGET of 3 TWhrs/year is reasonable (see Section below).

Offshore Renewables	Possible Twhrs/year	% of Demand	Existing Schemes
Offshore windfarms	0.8 - 2.2	4-11+%	-
Marine current turbines	0.6 - 1.0	3-5 %	-
Tidal (lagoon) generators	0.2 - 2.8	1-14 %	-

8.5 There may also be other small demonstration technologies by 2010 such as geothermal and offshore wave power schemes. There is also the possibility of large tidal (lagoon) generators in Liverpool Bay or the Severn Estuary. One large scheme could provide more than 10% of current Welsh demand.

8.6 Our overall range estimate is 3.8-10.2 TWhrs/year or 19-51% by 2010. Below we describe why we consider that 6 TWHrs/year by 2010 is a reasonable target comprising 3 TWhrs/year from onshore schemes and 3 TWhrs/year from offshore schemes.

9. How 6 TWhrs/year could Be Generated by Renewables By 2010

9.1 Onshore Renewables

9.1.1 Onshore Windfarms: Our estimate 1.2 - 2.2 TWhrs/year or 6-11% of current Welsh demand by 2010

9.1.2 Currently, there are about 340 medium sized wind turbines in 15 windfarms in Wales (mostly in the 330kW to 600kW size totalling 153 MW of Installed Capacity). They supply an average of 46 MW or about 2.3% of Welsh demand.

9.1.3 More schemes are currently being drawn up or are within the planning system which could feasibly supply an additional 4-8% of demand by 2010. The Cefn Croes scheme alone (39x1.5 MW turbines) in mid Wales could supply nearly 1%.

9.2 Targets

9.2.1 Based on DTi projections, the British Wind Energy Association estimates that an additional 290 MW of installed capacity (440 MW IC overall) is needed in Wales to meet the UK Government's Kyoto commitments. This would probably require somewhere between 290 – 390 additional turbines (eg 340 turbines of 850kW capacity) onshore in Wales. The large Cefn Croes turbines in mid Wales and the Tir Mostyn scheme awaiting approval in Denbighshire would account for about 80 MW of the additional 290 MW of capacity, or nearly 100 turbines in the example above.

9.2.2 The 440 MW of windfarms would supply 6% of Welsh demand excluding the benefit of locally generated electricity termed embedded generation. This benefit occurs because locally generated electricity from windfarms and other localised renewables can avoid some of the transmission losses incurred along the National Grid. The DTi are considering ways in which embedded generation can be fiscally credited

9.2.3 If this embedded generation benefit is included, and also a contribution from smaller and domestic wind generators (1kW-50kW), the total contribution from onshore windfarms and turbines in Wales could total about 7% of current Welsh demand by 2010.

9.3 Planning Aspects

9.3.1 To enable regional and Local Authority planning decisions to be taken in a national context Friends of the Earth Cymru think that a MINIMUM COMMITMENT should be made by the Assembly. Considering the vast onshore wind resource a planning framework for onshore windfarms should take account of this commitment and also for additional publicly supported schemes.

9.3.2 We believe that Local Authorities in conjunction with assessment methods being developed by the CCW and advice from the TAN 8 Working Group could identify areas that are more suitable and less suitable for onshore wind farm development.

9.3.3 However, we do not believe that it is the remit of the CCW, planning officers or indeed planning inspectors to decide the visual acceptability of potential wind farm proposals in given areas on behalf of the public. The public and elected representatives have to balance wider issues, ranging from electricity cost, alternative schemes, to terrorist threats in their consideration of visual acceptability.

9.3.4 Considering the UK's Kyoto commitments in particular Friends of the Earth Cymru support an onshore wind target of 440 MW Installed Capacity or a **MINIMUM COMMITMENT to 1.2 TWHrs/year by 2010**. We would also welcome further schemes that are publicly supported and have a satisfactory Environmental Impact Assessment.

9.3.5 This could include a very large 330 MW wind farm, which may be proposed by the Camddwr Trust, if it is supported by a majority of the public in the region. The largest Camddwr scheme would itself supply nearly 5% of current Welsh consumption. When turning at full speed, such a 330 MW wind farm would generate more electricity than the 300 MW the Trawsfynydd nuclear power station averaged. We think that a large Camddwr scheme should not undermine potential wind farm developments in other areas of Wales.

9.4 Public Support

9.4.1 Public support may currently be difficult to assess due to widespread misinformation about wind energy and the Assembly could disseminate reliable information to the public. Despite long and concerted claims to the contrary intermittency is a minor issue not a major problem in our view, and all-inclusive energy payback times are in the order of three months, not 25 years.

9.4.2 Onshore turbines are also likely to be the lowest cost major renewable technology, hardly the uneconomic subsidy-hungry intruder as portrayed by some. The rural and local economy benefits from rents, rates, scheme construction and land management contracts and component manufacture. This is in addition to the small number of maintenance jobs focused on by opponents. There is no substantive evidence of tourism being damaged by the presence of windfarms so far, and some evidence of them being visitor attractions.

9.4.3 Visual impact is also a matter of subjective opinion. For example, more residents around the Taff Ely scheme say that the wind farm makes the scenery more interesting (29%) than those who say it spoils the scenery (17%), most described it as alright. Turbines are required to be removed after the contract period so landscape damage is minimal and visual impact is temporary.

9.4.4 Taking account of all these factors we estimate that onshore wind turbines could supply somewhere between 6-11% of current demand by 2010. Considering the above, Friends of the Earth Cymru propose that the Assembly should make a MINIMUM COMMITMENT of 1.2

TWHrs/year by 2010 and ensure that the planning framework enables additional publicly supported schemes to be deployed.

10. Biomass Schemes: Our estimate 0.6 - 1.0 TWhrs/year or 3-5% by 2010

10.1 Biomass is the name given to schemes which burn or convert forestry wastes, wood wastes and energy crops to produce electricity, hot water, biofuels or hydrogen. New techniques are being developed which could result in many farms diversifying to growing energy crops and providing much-needed rural income.

10.2 The SEL Renewable Resource study (Table 6.2) estimates that biomass could, by 2010, generate 1.3 TWhrs/year of electricity (6.5% of Welsh electricity demand) and a further 2.6 TWhrs/year of hot water (avoiding several percent of Welsh electricity demand). Yet biomass is not the easiest or cheapest renewable to deploy and requires political interest and support to attract commercial interest and confidence.

10.3 Large biomass schemes based on existing technologies can have traffic and local environmental drawbacks. Biomass generation may well also be relatively pricey (PIU 2020 estimate: 5 pence/Unit) compared to onshore wind farms (1.5 pence). Even so, Assembly supported and innovative schemes could account for more than 5% of Welsh demand by 2010. Research at Glamorgan University on direct conversion of biomass to hydrogen could be especially important.

10.4 A 36MW straw-fired power station has just opened near Ely. It will generate over 0.27 TWhrs/year, consuming about 200,000 tonnes of straw per year collected from a 50 mile radius. The output of this one scheme is equivalent to 1.4 % of Welsh demand. Friends of the Earth Cymru would recommend smaller schemes, and preferably technologies suited to individual farm-scale deployment.

10.5 Britain's first dung-fired (methane) power station is currently being commissioned in Holsworthy in Devon. The plant will run on slurry collected from around 30 farms and Farmatic UK want to start many similar plants around the UK.

10.6 To stimulate biomass technology and deployment Friends of the Earth Cymru propose that the Assembly should make a **MINIMUM COMMITMENT of 0.6 TWhrs/year by 2010** (3% of current electricity demand) to be generated by biomass schemes. The commitment would ensure that biomass development is not cramped by deployments of other well developed and or less expensive renewables.

10.7 Useable hot water production of up to 1 TWhr/year could result from such a biomass commitment. However, although we support high percentage targets for hot water usage from fossil fuel CHP schemes, setting targets for hot water usage from innovative biomass technologies may be less useful. We are open to any emerging points on this.

11. Hydro Schemes: Our estimate 0.2 - 0.4 TWhrs/year or 1-2% by 2010

11.1 There are already a number of medium and small scale hydro schemes in Wales generating 0.21 TWHrs/year or about 1% of current demand. Significantly increasing the overall output from hydro schemes would be limited by ecological damage caused by over abstraction from sensitive watercourses. The SEL resource study estimates that up to about 2% of current demand by 2010 would be achievable.

12. Solar Photovoltaic: Our estimate 0.2 TWhrs/year or 1+% by 2010

12.1 Solar PV systems, be it panels or tiles, are still relatively expensive. Systems are best deployed in new building construction to keep costs down. Demonstration and grant aided schemes may drive up the overall capacity. Unless there are significant cost breakthroughs (hence the + sign in the estimate) the total output by 2010 could remain quite small. However, the Assembly could support indigenous development work and specify PV on new public and private sector building.

13. Other technologies: Our estimate 0.2 - 0.4 TWhrs/year or 1-2% by 2010

13.1 Landfill tips and mines produce and leak methane, a powerful greenhouse gas. The methane can be collected and burnt to provide useful energy. Existing schemes supply about 1% of demand and further schemes are estimated to increase this to about 2%.

13.2 There may also be other demonstration technologies by 2010 both on and offshore, such as geothermal and offshore wave power schemes. Again, Welsh RD&D and manufacturing could play a significant role if encouraged and supported.

14. Offshore Renewables

14.1 Offshore Windfarms: Our estimate 2+ TWhrs/year or 10+% of current Welsh demand by 2010

14.2 There are currently three proposals for offshore windfarms around the Welsh coast, each of 30 turbines, two in Liverpool Bay and one off Porthcawl. The turbine sizes are likely to be 2-3 MW but 5MW turbines are under discussion by at least one developer:

North Hoyle (NWP)	60 MW	- 30 * 2 MW turbines
Rhyl Flats (COWL)	90 MW	- 30 * 3 MW turbines
Porthcawl	90 MW	- 30 * 3 MW turbines

14.3 If all schemes are built according to plan and timescale then the first round of offshore turbines would represent 240 MW of installed capacity by 2005. Assuming a load factor of 33% this would represent about 84 MW of average annual output, which is about 4% of Welsh electricity consumption.

14.4 Future tranches of offshore windfarms are currently being considered by Energy Minister Brian Wilson in the period to 2010. If only three more similar wind farm developments were deployed in further tranches, this may represent an additional 300-450 MW of capacity assuming slightly larger turbine output (3-5 MW plus) currently under development. This would represent an additional 5-7 % of average annual consumption.

14.5 Assuming only six windfarms being constructed before 2010 would likely see the total output exceeding 10% of current Welsh demand. Furthermore, there is a large wind energy resource offshore which can be exploited to generate energy and Welsh jobs.

14.6 Electricity generated by offshore windfarms (2.0-4.0 pence/Unit) is about twice the price of that from onshore windfarms (1.0-2.0) but is still cheaper than new nuclear construction (3.0-4.0) or biomass (4.5-6.0) according to the Cabinet Office Energy Review (PIU 2020 estimates). See Annex B for full PIU cost ranges.

15. Marine Current Turbine Arrays: Our estimate 0.8 - 1.0 TWhrs/year or 4-5% by 2010

15.1 Sea currents, especially around headlands can be very powerful. To extract energy from such currents two different devices are being built and tested off the Devon coast and in Milford Haven. Commercial schemes could be ready by 2005 and generation costs (2.5-4.0 pence/Unit) are very favourable.

15.2 Assembly investment could possibly realise manufacturing as well as deployment and maintenance jobs in peripheral ports such as Holyhead and Pembroke Dock. Exploitable currents exist off the north coast of Anglesey, Penllyn and south Wales. Cambrian Engineering Ltd in Bangor who make turbine towers and potentially monopiles (metal sea-bed foundations) have suggested Holyhead for future expansion due to its clear strategic location close to the central Irish Sea.

15.3 Marine Current Turbines Ltd has suggested a likely installation rate for underwater turbines in the fast flowing marine currents off the Welsh coast. First deployments would occur in 2005/6 at 10 MW per year, rising to 100 MW per year by 2010. Further substantial deployments may occur after 2010 depending on the scale of resource which is potentially many hundreds of MW.

15.4 If 2006 is assumed to be the first deployment year then the following installation rates may be feasible:

2006 - 10 MW of installed capacity
2007 - 20 MW
2008 - 40 MW
2009 - 70 MW
2010 - 100 MW

15.5 Hence by 2010 there could be 240 MW of installed capacity. The Capacity Factor (CF) for such turbines is about 33% so the average annual output by 2010 may be 80 MW, which is about 4% of Welsh electricity consumption. Other types of marine current or tidal stream devices could add to this output.

15.6 An early Assembly funded marine current resource study could give Wales and edge in helping attract potential developers to Wales, along with Objective One funding. The University of Bangor may be well placed to conduct such as study.

16. Tidal Lagoon Generators: Possible schemes may generate 0.2 - 2.8 TWhrs/year or 1-14% by 2010

16.1 The tidal range of the Severn Estuary is the second highest in the world, and Liverpool Bay also has very high ranges. Energy can be extracted from the rising and falling tides by trapping and releasing water in large rock-walled lagoons. The generator walls would be very similar to a rock breakwater and would house water turbines within their structure. The coast facing wall would typically be about a mile or so offshore and could also provide both habitat and coastal defence. Some lagoon schemes could also become major visitor attractions especially if designed with visitors in mind.

16.2 The world's first tidal generator is being planned for Swansea Bay. It would generate an average of 20MW equivalent to 1% of demand. A larger scheme enclosing about 20 square miles is also being considered for Liverpool Bay which could generate about 260 MW or 12% of demand. Generators would provide predictable power and can also have a storage capability.

16.3 A small number of large schemes in the Severn Estuary could rival the output of the proposed Severn Barrage but would cover about half the area and would be much cheaper. The developers say that tidal generators are commercially attractive and would not require public funding.

16.4 At a combined output of possibly over 2GW tidal generators in the Severn Estuary could be more than a direct replacement for the ageing Hinckley nuclear power station. This station is due for closure in 2011 and the site is a proposed location in England for a new AP 1000 reactor design according to the nuclear industry. A second nuclear site at Hunterston, Scotland is also proposed for an early AP1000 replacement.

16.5 Whether large lagoon schemes are given approval will very much depend on site-specific environmental assessments and wider public consideration and acceptance, so are additional to our 30% target. Assembly support in principle to tidal generators could assist in realising world leading schemes and providing significant baseload renewable electricity by 2010.

17. Planning Powers and Devolution

17.1 Renewable energy targets set now by the Assembly will in part be aspirational. This is because the Assembly does not yet have power to give consent for ONSHORE energy schemes over 50 MW, or any OFFSHORE schemes because the planning powers currently reside with the DTi. However, following formal Local Authority and Assembly approval for onshore schemes over 50 MW the DTi is probably unlikely to refuse to give a final permission.

17.2 We think that the Assembly should call for the relevant on and offshore planning powers to be devolved. In the meantime, investing to maximise shore-side installation, maintenance and particularly manufacturing jobs could create employment especially in hard-pressed Objective One areas (eg, Holyhead, Pembroke Dock)

17.3 We support EDC Recommendation 3 (a), (b) and 4. We also support Recommendation 5 (a), (b) and (c) for reasons given above.

17.4 We would suggest particular emphasis on Recommendation 6 about the development of skills in all parts of the country. Education and training in subjects and skills as diverse as basic plumbing to hydrogen economics will be fundamental to a successful outcome.

18. Summary

18.1 The world-wide generation of electricity and energy by renewable energy technologies is a major part of the solution to global warming, the Earth has abundant natural energy resources. Wales is particularly fortunate to have large wind and tidal resources. Renewables are also cost-competitive, clean, safe and secure and can benefit people, wildlife and planet in numerous important ways.

18.2 Renewable energy technologies also present a variety of significant economic opportunities of sufficient potential for Wales or other countries to experience a green industrial revolution, similar to the wind industry in Denmark.

18.3 For a country with a world-leading remit for sustainable development the social, environmental, economic and political opportunities should not to be missed. Setting energy generation targets and minimum commitments as part of a supportive planning and policy framework would enable the opportunities to be realised.

18.4 For all these reasons Friends of the Earth Cymru calls on the Assembly to do all within its powers and influence to seize such opportunities.

Annex A

Wales Electricity Facts and Figures for Comparative Purposes:

To facilitate easier comparison between different technologies the table below lists the AVERAGE annual output of various electricity generating stations, schemes, proposals, and possibilities in Wales (this is not a comprehensive list). Note that some power is exported to England and CF means Capacity Factor which takes account of the intermittency and or down-time of the various technologies:

Generation required to supply current electricity demand Which would comprise a combination of the generators below:	2,200 MW
Connahs Quay CCGT (1,400 MW) assuming 90% CF	1,260 MW
Aberthaw Coal (1,500 MW) assuming 30% CF	450 MW
Wylfa nuclear station rated at 1,000 MW (average to date)	660 MW
Trawsfynydd nuclear station, closed (lifetime average)	300 MW
Windfarms Include:	
Llandinam (103 x 300kW turbines)	9.3 MW
Parc Cynog (5 x 600kW turbines)	1.0 MW
Total windfarms constructed (onshore)	46.0 MW
Mynydd Clogau (17 turbines) Approved	3.0 MW
Cefn Croes Approved	17.6 MW
Tir Mostyn Awaiting Decision	6.4 MW
Llandinam Extension (23 turbines) Proposed	6.3 MW
Camddwr Trust (165 x 2MW turbines) Possible Proposal	100 MW
BWEA and current Friends of the Earth Cymru onshore target by 2010	135 MW
Offshore Wind Resource	? Large MW
First Offshore Tranche (3 farms of 30 x 3MW turbines)	84 MW
Subsequent Tranches (each farm of 30 turbines each 5MW rating)	50 MW
Other technologies: (? - Resource Assessments needed)	
Marine Current Resource (various locations)	?100-1,000MW
Tidal Lagoon Generators (Severn Estuary resource)	?100-2,000MW
Swansea Bay Tidal Lagoon Generator Possible Proposal	20 MW
Rhyl Lagoon (large 20 sq mile scheme) Possible Proposal	265 MW
Severn Barrage proposal	2,170 MW
Dinorwig Pumped Storage (for 5 hours)	288 MW

Note again: these outputs are AVERAGE output not Installed Capacity

Annex B

Government Energy Review 2002 - Unit Cost Estimates by 2020 (PIU Report)

Below are the Unit (kWhour) electricity generation cost range estimates for 2020 for various electricity generating technologies as forecast by the Government's Cabinet Office Performance and Innovation Unit. Note that a typical household consumes over 4,000 Units per year costing about 7 pence per Unit from the electricity provider.

Onshore wind	1.0 - 2.0	pence per kWhr
Gas	3.0 - 3.5	(inc 1p for sequestration)
Offshore wind	2.0 - 4.0	
Tidal Flow	2.5 - 4.0	
Near Shore Wave	3.0 - 4.0	
Energy crops	4.5 - 6.0	
Offshore wave	4.0 - 6.0	
Solar PV	10.0 - 16.0	
Micro CHP	2.5 - 3.5	
Large CHP	< 2.0	
Nuclear	3.0 - 4.0	
Coal (IGCC)	3.0 - 3.5	
Coal	3.0 - 4.5	

Sequestration means that the carbon dioxide gas not released to the atmosphere (eg pumped into old oil and gas wells) so as not to cause a global warming effect.

Annex C

Welsh Demand and Consumption in Figures

Welsh end-user electricity CONSUMPTION has been estimated to be over 16 TWhrs/year, though precise figures are commercially sensitive. Consumption varies to some degree on some major users such as Anglesey Aluminium Ltd and steel production at Corus.

Due to various transmission and internal electricity industry losses totalling about 15%, this consumption probably requires over 19 TWhrs/year of DEMAND. However, renewable energy schemes can avoid some internal and transmission losses because they are physically closer to the consumer and the fuel is delivered free (except biomass).

The annual output of 2,200 MW of continuous generation is 19.3 TWhrs/year (2,200 MW x 24 hours x 365 days = 19.27 TWhrs/year). Consequently, we assume in this briefing that current Welsh DEMAND is 19-20 TWhrs/year, and that 1% of demand can be supplied by renewable energy schemes averaging 22 MW a year.

Intermittency of generation is a relatively minor technical problem in our view as the National Grid runs enough reserve to cover the loss of a major conventional power station in case of a sudden failure or lightning strike on the transmission lines. In the medium to long term various storage technologies including the electrolysis of water to generate storable hydrogen fuel will minimise any problems caused by intermittency even at very high levels of renewable energy generation.

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