

GENERAL APPROACH Studies

ABERDEEN United Kingdom

12 % of the total EU energy consumption shall by 2010 be covered by renewable energy sources. This is the objective that the Community agreed on in its white book on "renewable energies". At the same time, a European-wide action plan has been set up. In order to achieve these goals, local communities do need to actively contribute to this. The City of Aberdeen – member of Energie-Cités - is therefore active in research and promotion of these energy sources. An extensive feasibility study initiated by the Regional City Council has been developed under the Altener programme.

GENERAL ASPECTS

Aberdeen city is located in the North East of Scotland in an area formerly known as Grampian region and which now comprises the unitary authorities of Aberdeen City, Aberdeenshire and Moray Councils. This area has approximately 500,000 inhabitants, of whom approximately 40% live in Aberdeen which is the largest settlement. Local business in the countryside is mainly tourism and agriculture, while the major income in the city is based on the offshore oil industry.

Climatic data:

Annual mean temperature: 7.9 °C



CONTEXT

A report on the feasible implementation of renewable energy sources (RES) was initiated by the Grampian Regional Council and continued by Grampian Enterprise when the Council was restructured. In 1997, the "Renewable Energy Business Opportunities in Grampian" report was therefore written by Garrad Hassan and Partners Ltd. and Coopers & Lybrand. The report was partly financed by the EU Commission, DG XVII and Grampian Enterprise. This feasibility study was divided into two parts: The assessment of renewable energy sources and assessment of local business development opportunities. These two subjects are both crucial for the implementation of renewable energy sources.

Aberdeen has a specialised course in renewable energy research at the Robert Gordon University and the University of Aberdeen: Aberdeen City Council recently resolved to support a strategy to develop this laboratory. The national development agency Scottish Enterprise has recently set up a cluster group of renewable energy companies and produced a report entitled 'The Renewable Electricity Business in Scotland', which indicates growing interest in renewable energy in the public and business sectors. Aberdeen City Council has been approached by businesses interested in developing the renewable energy sector and will be working with them to identify and exploit opportunities to do so.

EXPERIENCE OF ABERDEEN

The report and the work done by the Municipality to initiate it is a good example of local involvement and the use of a widespread viewpoint, both in accordance with local demand, local potential and local constraints, to analyse the possibility of implementing RES. The whole RES spectrum has been evaluated in terms of potential investment areas. The theoretical findings and the process of moving from this stage to actual RES applications is quite interesting.

Constraints

It is important to figure out whether the RES projects can cause a decrease in the unemployment rate in the area. Several aspects are direct constraints for the development of RES. These include a high production price per kWh power compared to the present production method, the complexity in producing power from many small plants and the problems inherent in weather dependent production (wind). The Grampian people live in a beautiful area which is also a constraint for developing RES. Basically, the municipality stipulated two different kinds of areas in the county where one should be careful about industrial development. These are areas which are aesthetically and recreationally related to human activity and areas which are sensitive as far as the ecosystem is concerned. When developing plans about erecting small plants, considerations about the grid should also be integrated. This leads to the following conclusion:

- Plants smaller than 100 kW should be within a 10 km range of a primary substation,
- Plants bigger than 100 kW but smaller than 2 MW should be within a 5 km range of a primary substation.
- Plants bigger than 2 MW should be within a 10 km range of the 33 kV system.

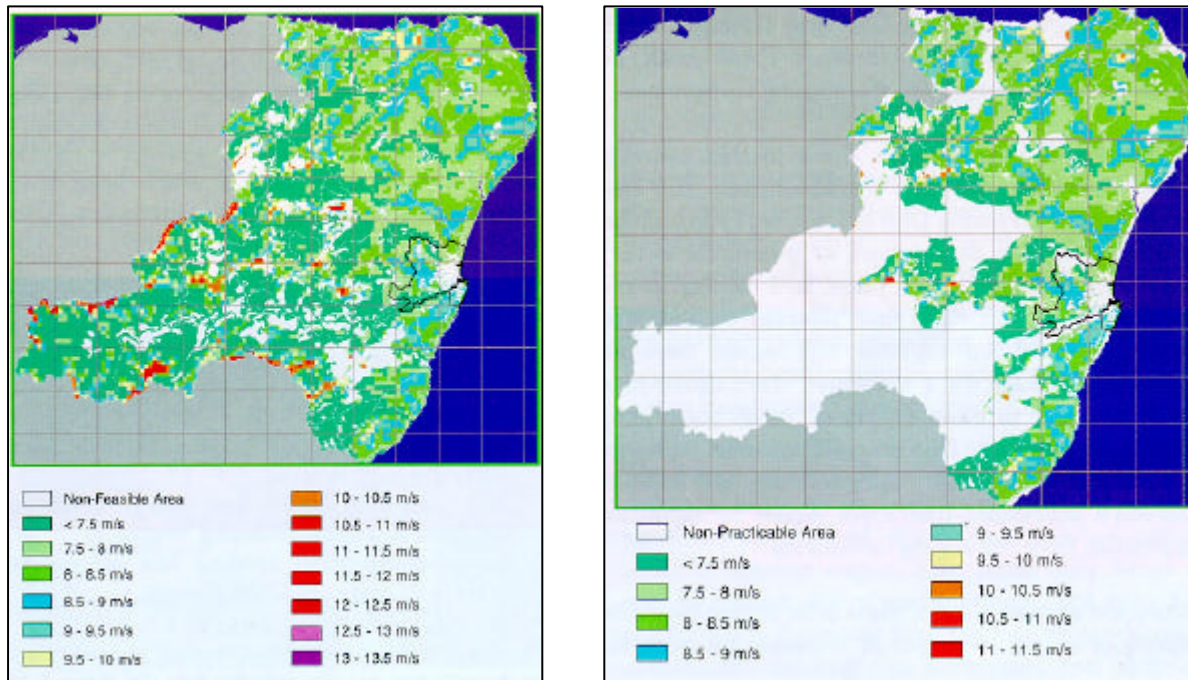
Taking all constraints into account, 5 "levels" were identified:

- **Total:** which equals the total energy content contained within the resource.
- **Technical:** limited only by the technical ability to extract energy from the resource.
- **Feasible:** further limited by the basic practical incompatibility.
- **Accessible:** further limited by development controls which may be specific to a particular technology.
- **Practicable:** further limited to what is both practical to undertake and acceptable to society.

Resources

Wind power

By far the most influential RES is wind power. The total wind energy resources were derived from computer estimates of annual mean wind speeds at 45 metres above ground level (a typical hub height for a modern commercial wind turbine). It was found that approximately 60 % of Grampian has wind speeds above 7.5 m/s and 25 % has above 8.5 m/s. Based on the assumption that the density of the turbines could be 3.6 MW/km² and that capacity factors (e.g. annual running hours) would be those already used for previous studies in Scotland with a wind speed limit of 8.5 m/s, it is estimated that the practicable potential for installed power in the area is 2,500 MW, which is assumed to correspond to a yearly electricity output of 7,850 GWh. The theoretical resources are then huge. The constraint concerning the limit of the average wind speed can be seen as quite important. The other constraints mentioned in the table above can also be viewed in the two maps of the area. It is clear that the figure to pay attention to is the "practicable" figure for an average wind speed of 8.5 m/s. (Installed power of 2,500 MW and yearly energy output of 7,850 GWh). This gives the amount of installed power that might one day become a reality. But in the process, to obtain these findings, it is important to include all the possible areas imaginable. This means that the average wind turbine is presumed to run at nominal power 3,100 hours/year.



Hydro power

Local knowledge is crucial for implementation of small scale hydro power. With respect to fishermen's interests and tourism and using the "practicable" level, 15 sites were selected. Four schemes inside Aberdeen could be an interesting package for a developer. It is predicted that the installed power from these plants could produce 7.3 MW which gives a yearly output of 29 GWh.

Biomass

Forest residues are accessible in the area. Adding to the constraints the fact that biomass should be transported a maximum distance of 75 kilometres, the power output would be 10 MW when using combined heat and power production (CHP) or 27 MW in heat-only mode. The potential of straw in the area is considered as non competitive and the potential is therefore regarded as non existent.

Waste

When talking about the use of waste the restrictions on where to locate the plants are not strict compared to hydro power for example. In general, the potential of animal waste is located outside the areas defined as recreational or sensitive in terms of the ecosystem. It should be added that the potential is also close to the grid. The potential is calculated to be 4 MW power with CHP and 11 MW when working in heat-only mode. Apart from Aberdeen city, the population density is fairly low in the region, which means that collection of household waste would be quite expensive in relation to the predicted energy output.

Local business opportunities in RES

The city of Aberdeen is quite famous for offshore engineering. This is simply because of the oil and gas production in the North sea. This should mean easy implementation of wind energy. Approximately 40 % of the investments in an offshore wind farm are in offshore technology. It is generally considered that the UK has sufficient "know how" in hydro power, gasification of biomass technologies and solar power. When completing the report, a survey was carried out to answer the question of how the current local product and service profile relate to the renewable energy technologies mentioned above. The aim was simply to investigate how the county of Grampian could gain from taking part in RES projects. Out of the 100 survey forms sent out to locally based companies in order to evaluate existing "know

how", only 18 forms were returned. Out of these 18 companies 8 were interested in taking part in RES projects and 4 had some experience in the area. There was a clear connection between the size of the company and the technology they were interested in. – The big companies were interested in investing in heavy biomass technology while the small companies seemed to prefer the cheaper solar power. In general, they all pointed out three major constraints: lack of financial resources, lack of expertise and lack of partners.

EVALUATION AND PERSPECTIVES

The report contains exact resource calculations with sites and energy output for all relevant RES. This is the case for both power and heat. The conclusion is that the resources of straw burning, solar power and landfill gas in this case are not sufficient for them to be exploited. All in all, the potential of RES for producing electricity can be summarised as follows:

Electricity RES	Power [MW]	Energy [GWh/a]
Wind	2,518	7,851
Hydro	7	29
Others	28	238
Total	2,553	8,118

It is quite important to pay attention to the high wind part in this. 96.7% of the current findings is solely wind energy. Three further conclusions can be made:

- The calculated potential for exploiting wind power is based on the presence of other (and higher) area interests other than the production of power. This is both in terms of pay back time and taking into consideration the use of local land.
- The first thing that springs to mind when talking business in Grampian is the offshore industry. It is expected that the offshore industry in the next century will benefit from the erection of wind turbine farms which will be worth some 2-3 billion € per year.
- It can finally be concluded that local companies in Grampian have a lack of export experience but an interest in workshops with the aim of acquiring knowledge in this area.

The study showed that there is potential in Grampian and that it would have positive effects on the local economy. But these companies need help from local authorities or other political bodies in order to be able to install RES.

FOR FURTHER INFORMATION

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