

All Energy Conference

A Case for Hydrogen ?

Aberdeen 25th May 2005



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What is happening



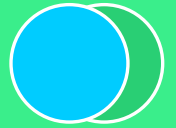
- **We face the biggest energy transition since the industrial revolution**
 - **The scale is colossal**
 - **Investment world wide today is measured in \$billions**
- **The unremitting drivers are**
 - **Global warming**
 - **Oil and Gas Insecurity** **Geopolitical/supply demand balance**
 - **Global economics** **>\$50/bbl \$100/bbl being suggested**
 - **Electrical grid instability** **across the world**

Market Indicators

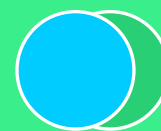


- Fuel cell developments are emerging across the world
 - And accelerating
- Fuel cell based products are emerging
- Pace of development is accelerating
 - Some still deny its existence
 - Some say it will be 10-20 years away
 - Some still just can't or wont see it
- Hydrogen as a fuel vector is now an accepted fact
 - Question is only when, In some cases how
- National strategies are being unveiled world wide
 - except UK (Scotland may develop one, Wales is)
- Levels of research are soaring
- **No industry has experienced such an array of forces, ever**

Scotland/Remote Community Threat



- We share the same environmental risks faced by mankind
 - Global warming
 - Rising population
 - Depleting resources
- However the immediate threat I agree is economic
 - Not transport congestion
 - Not air quality
- Global energy costs are the most significant threat to Scotland
 - Northern and Western Isles will be most affected,
 - There after North of the highland line
 - With them the entire country

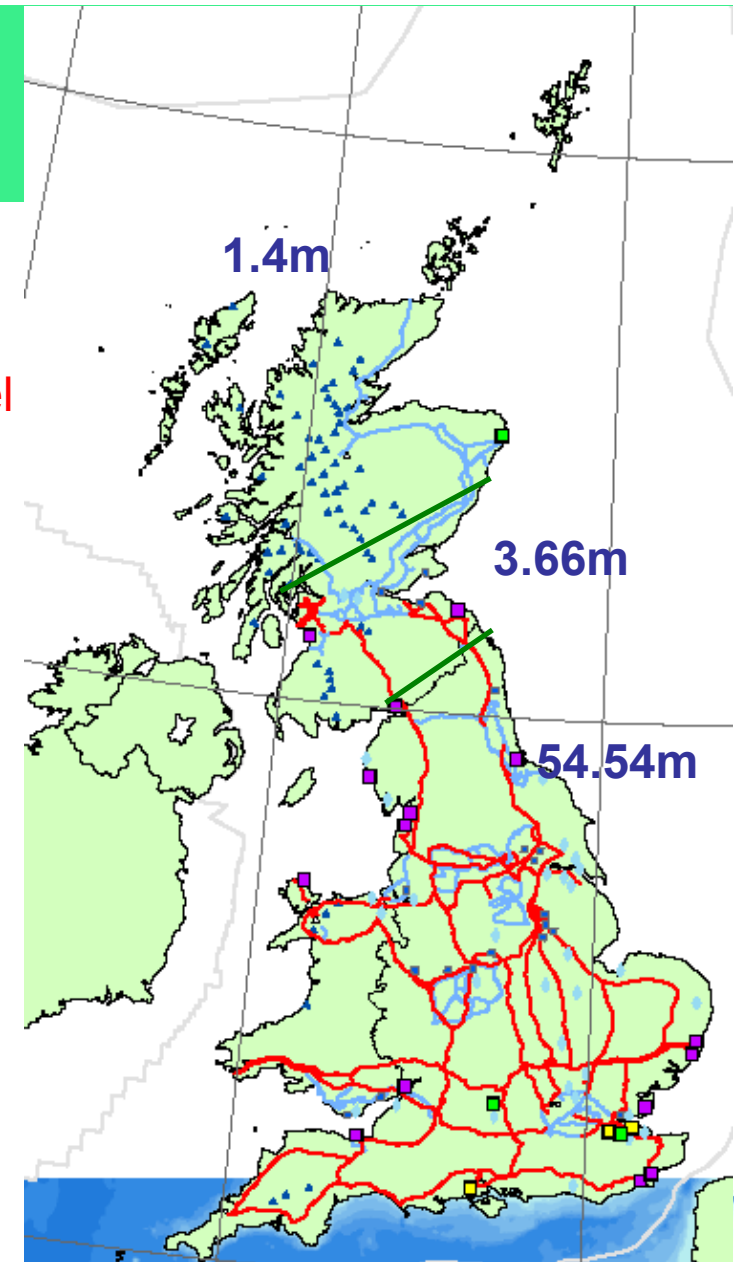


How will threats manifest itself

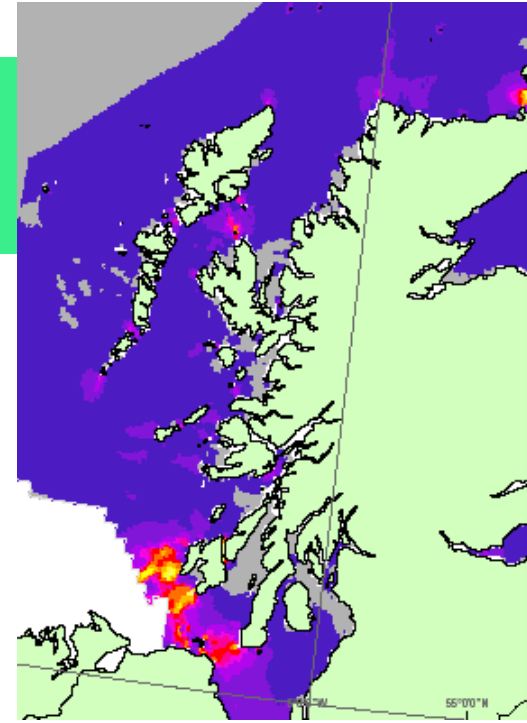
- Immediate effect, rising UK energy costs
 - Transport fuel, cars, busses, ferries
 - Domestic fuel costs, Gas, LPG, Calor Gas, Kerosene, Electricity
 - Cost of food and essentials through higher transport costs
- Delayed impact of rising world wide energy costs
 - Food processing energy costs
 - Food transport costs
 - Consider the air miles on food in your fridge
 - Consider transport costs of or exports
 - Rising farm input costs, Potash, and Nitrogen (delivered by ammonia from natural gas)
- Longer term
 - Transport costs will affect inward flow of tourists
 - Could affect outward flow of exports

Opportunities for Scotland

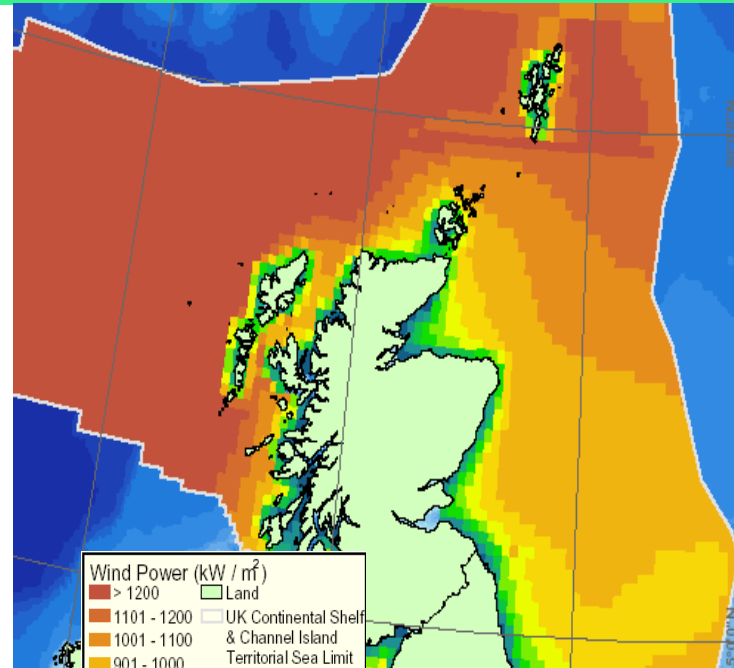
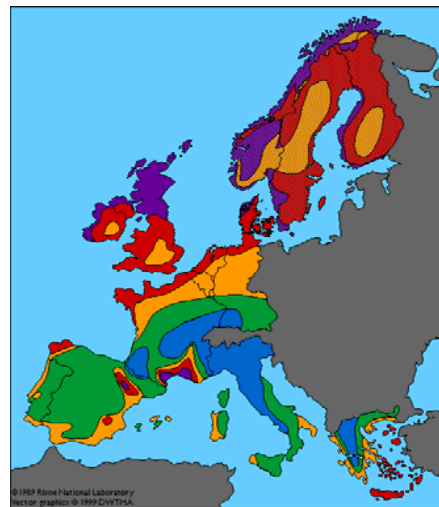
- Total energy demand 780TWh (SEEF)
 - all forms oil gas electricity derv etc.
 - 80% is non Grid transport/heating/cooking fuel
 - 502mboe, (SEEF)
 - £25billion crude oil costs
- 708 TWh available excluding bio energy (Dti)
- 8% UK population, say 35% UIK land mass
 - North Highland line 28% Scots pop. 65% landmass



Scotland's Unique Opportunity

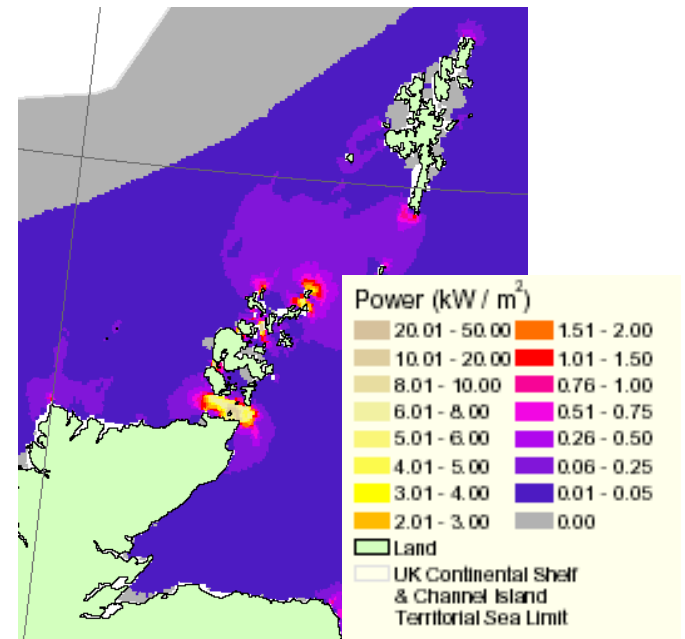


Capacity 188 TWh/year



m/s	W/m ²	m/s	W/m ²	m/s	W/m ²	m/s	W/m ²	m/s	W/m ²	m/s	W/m ²
>6.0	>250	>7.5	>500	>8.5	>700	>9.0	>800	>11.5	>1800		
5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800		
4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200		
3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0-8.5	400-700		
<3.5	<50	<4.5	<100	<5.0	<150	<5.5	<200	<7.0	<400		

Capacity 516 TWh/year



Scotland's Response



- We cannot solve the worlds energy nor GHG problems
- We are not a global manufacturer nor likely to be
- We have good research
 - Say 16 tops in 9 Universities
 - out of some 3,000 world wide who're better equipped and financed
 - Might get lucky, better odds than Lotto
- But We can take action to address our energy supply
- We must start now,
- Consequences of delay?
 - we could end up competing for the world's for staff, technologies and resources

Redefine the problem



- Our most fundamental threat is energy costs
- What can we do to eradicate our dependence on fossil hydrocarbons
 - Don't confuse this with our existing oil industry
 - Like it or not it will be around for the foreseeable future

Our Strategy



- Concentrate on using our renewable energy
 - **LOCAL** hydrogen production, (renewable electricity and biogas)
 - **LOCAL** hydrogen consumption
 - Using any technologies possible FC & Combustion
- With Hydrogen infrastructure
 - We can deploy any technologies from anywhere in the world
 - We will deploy fuel cell technologies and combustion technologies
 - Use our oil and gas skills base
- With Cheap hydrogen and an infrastructure
 - We will be attractive as a pilot market
- Without cheap hydrogen we cannot participate in the hydrogen revolution

Scio-Economic Drivers



- Drivers are Defensive and Progressive
- Defensive Drivers
 - The very viability of communities is threatened if costs rise
- Progressive Drivers
 - Highland communities totally self reliant on **locally** produced energy
 - Every energy £ spent remains in the community, (bar tax)
 - Typically 95-97p in £ in petrol leaves the community
 - Local Business and Employment opportunities
 - Jobs for **young** people, a communities lifeblood
- This is not a model favoured by global utilities
- Environmental Dividend
 - Deliver on the above and GHG reduction is a given
 - **Energy production to consumption with zero environmental impact**

SiGEN
FUEL CELL POWER SOLUTIONS



Edin Court Theatre Inverness

Opened 1976

30 years is not such a long time



- I walked to school past this theatre as it was being built
 - I decided to do electronics instead of architecture
- Pre Thatcher days, HIDB was around, utilities all nationalised
- Few computers existed, usually Banks and MOD
- Bill Gates was still at school
- Richard Branson was running his record shop
- The Internet did not exist
- Mobile phones were star trek communicators
- The oil industry had only just started in Scotland

It can't be done?

Do we have a choice?

