"Accessing Scotland's Underground Carbon Reserves - the Rationale"

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"Accessing Scotland's Underground Carbon Reserves - the Rationale"

- Underground Carbon Reserves = Coal, Coal Bed Methane, Shale Gas, Onshore Conventional Oil and Gas, North Sea Oil and Gas (leave Conventional Onshore and NS because of urgency with others)
- Carbon Usage
  - Energy
    - Heat
    - Electricity
  - Fuel
  - Petrochemical Feedstock

"Accessing Scotland's Underground Carbon Reserves - the Rationale"

rationale

/ˌraʃəˈnɑːl/

noun

a set of reasons or a logical basis for a course of action or belief.
"he explained the rationale behind the change"
synonyms: reason(s), reasoning, thinking, (logical) basis, logic, grounds, sense; More

Translations, word origin, and more definitions

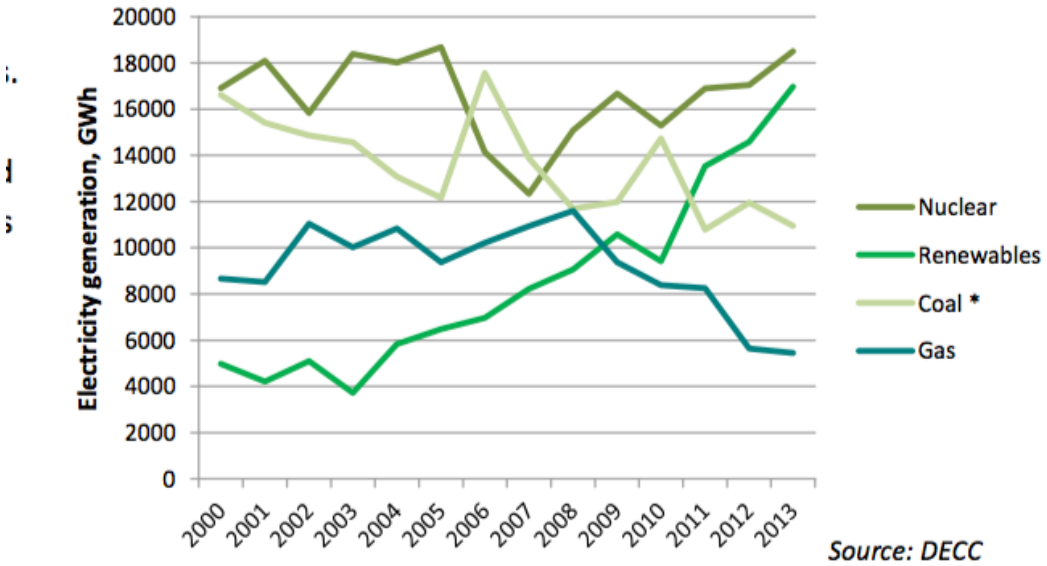
Tonight

Rationale and a Course of Action proposed regarding Scotland's underground carbon, relating to electricity generation (and petrochemical feedstock)

Some Context:- – The Role of the Scottish Government

1. Electricity Generation by Fuel (GWh), Scotland, 2000-2013

Figure 3.2: Electricity Generation by Fuel (GWh), Scotland, 2000-2013



Source: DECC

2. Scotland has a No-Nuclear policy: Scotland wishes to reduce its CO_2 contribution to Global Warming. Hence shift to renewables – Target 100% electricity generation by renewables by 2020

Some Context:– Global Warming Concepts and Commitments

- Global warming linked to CO_2 in the atmosphere
- Increasing CO_2 and increasing global temperature correlate
- Mankind is responsible for the increase in CO2 – burning of carbon-based fuels (1deg rise since 1890 and the begnning of industrialisation)
- If we limit CO2 production now we can possibly limit warming to 2deg C
- Over this, the effects will be catastrophic
- Scotland wants to lead the world in reaching zero-carbon generation
- Commitment - 100% Electricity generation in Scotland by 2020

Some Context:- The Role of the National Grid

- The (Grid)network carries electricity from the generators to substations where the voltage is lowered ready for distribution. The National Grid is responsible for balancing the system and managing generation output to make sure that it matches demand throughout the day, and that voltage and frequency are kept within acceptable limits (at all delivery points in the network) – termed "Managing Constraints"
- Scotland and England effectively separate parts of the network linked by an "Interconnector" with 3.3 GW capacity now, and with 2GW being added
- The function of the interconnector(s) is to export Scotland's excess power (the official position) and import power when Scottish generation is insufficient
- Scotland requires between 3 GW and 6 GW of supply
- National Grid balances generation from coal, gas, nuclear, renewables + imports and exports, driven by forecasted requirements in the first instance, then reaction to e.g. plant failure
- Balancing enabled by Electricity Market Reform: Capacity Market; Contracts for Difference – the latter to encourage investment in Renewables

Constraint payments

£7m

Cost of wind constraints 2012/13

£170m

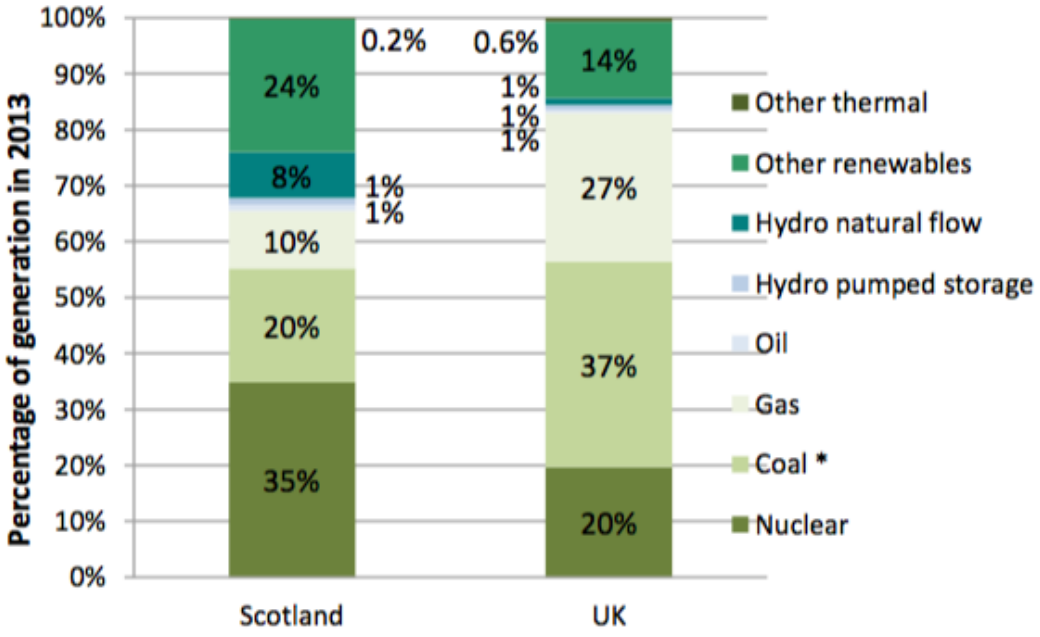
Total constraint costs 2012/13

1%

Cost of balancing on consumer bills

Some Context - The Role of the National Grid

Figure 3.4: Generation Mix (%) - Scotland and UK, 2013



*Coal includes a small quantity of non-renewable wastes.

Source: DECC

Context Summary:- Scotland

- Concerns over global warming are driving Scotland's generation strategy
- No more nuclear (2023) or coal (2016). Gas (Peterhead) tolerated in lieu of CCS being delivered?
- 100% of electricity generated by renewables (wind) by 2020
- Surety of supply managed by the National Grid through interconnectors used to export or import supply from/through England

Rationale and CoA based on a Strategic Risk Management (SRM) approach.

Management

Technology

Understanding

\+ Goals

Ethics

Strategic Risk Management

Rationale and CoA based on a Strategic Risk Management (SRM) approach.

Management
Technology
Understanding
Goals
Ethics

Delivery

Course of Action

Rationale

\+

Strategic Risk Management → Certainty

SRM applied to Scotland's Carbon: Ethics + Goals

- Scotland can make responsible decisions about carbon usage
  - Responsible
    - Secure, sure and affordable supplies of energy, fuel and chemical feedstock
    - Environmental and Social Impacts acceptable - local and global (CO_2 and Global Warming)

Why are these appropriate Ethics and Goals?

- Secure, sure and affordable supplies of energy, fuel and chemical feedstock are requirements for a sound economy and stable, civilised society
- Society, rightly, is concerned about the environment and Global Warming – CO_2 (and CH_4)

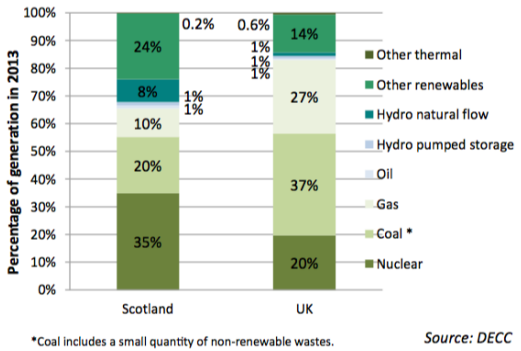
Consider Current Security

1. **Scotland electricity supply depends on the functioning of the (UK) National Grid – mixture of gas, coal, nuclear and renewables**

2. **From the Scottish Government:-**

"Energy security is at the top of the EU agenda following the Russian-Ukrainian gas conflict in 2014. The conflict has underlined the overall importance of a stable and abundant supply of energy for the EU citizens and economy. While Eastern and Baltics Member States are most directly affected by the disruption in gas flows, many other countries face security of supply challenges, including the UK, Ireland, France, Germany and Belgium. "

Figure 3.4: Generation Mix (%) - Scotland and UK, 2013



*Coal includes a small quantity of non-renewable wastes.

Source: DECC

3. **30% of UK gas delivered as LNG**

UK Gas Reserves
= 17days

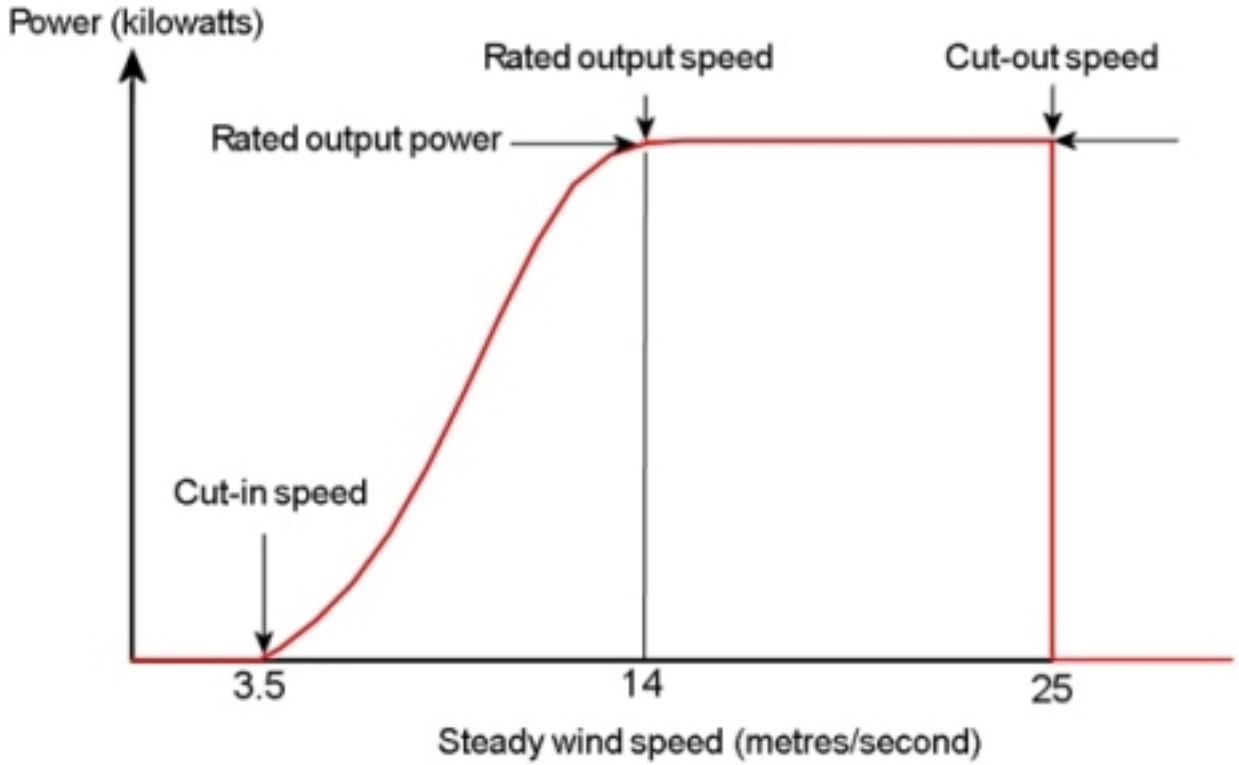
Current Security - Strait of Hormuz

July 2012

Iran threatens to mine the Strait of Hormuz, petroleum markets react, world economies take notice, and more U.S. and allied naval forces are sent to the region, upping the ante for Tehran and the U.S. Navy.

Iran's top naval commander, Adm. Habibollah Sayyari, late last year warned that closin the strait would be "easier than drinking a glass of water." The Obama administration publicly dismissed the threat as "aber rattling," but also privately informed Tehran that attempting to close the strait would trigger a U.S. military response.

Consider Current "Surety" of Wind Power



Typical wind turbine power output with steady wind speed.

Consider Current Affordability

Year	
2000	28
2001	35
2002	35
2003	23
2004	31
2005	24
2006	24
2007	26
2008	33
2009	30
2010	31
2011	24
2012	15
2013	25
2014	9

Consider Affordability

Year	Deaths in Scotland due to Hypothermia
2000	28
2001	35
2002	35
2003	23
2004	31
2005	24
2006	24
2007	26
2008	33
2009	30
2010	31
2011	24
2012	15
2013	25
2014	9

SRM; Understanding + Technology

- Understanding developed by observation of operations and research – understanding needs to be shared if risks are to be properly understood and managed
- Technology is developed and applied, driven by understanding
- Shared, credible understanding of the fundamentals and the roles that technology plays in managing risks is key to public perception and the role of government

SRM; Management

- Management of the carbon production/utilisation process ensures that ethics are adhered to and goals achieved
- Management encourages evolution through the development and sharing of understanding, and the contributions that improved technology can make
- The role that Management plays in managing risks is key to public perception
- But with regard to Energy, Management is also practiced by the Government(s) via policy and regulations

So, use Coal and the Longannet Complex as originally conceived as an SRM worked example, and as a basis for assessment of other means of generating electricity

Focus – Longannet 2.4GW coal fired powerstation currently produces about 20 - 25% of Scotland's electricity. Capable of producing 40% of peak demand. Due to close 2016

Longannet - Conventional Coal Power Generation

Coal, Longannet Complex – how good a generation model?

Longannet Complex – how did it measure up regarding Ethics + Goals?

Focus: Longannet currently generates about 25% of Scottish electricity		
Risk	**Management of Risk?**	**Comment**
Secure	Very Good	Supply of Scottish coal Now 50%? of supply imported?
Sure	Very Good	6 months coal supply can be stockpiled, 4 boilers, 8 gen sets: therefore some plant redundancy
Environmental Impact	Very Poor	CH4 from mine ventilation and desorption from stockpiled coal From the stack – particulates, NOx, metal pollutants, CO2 But continual improvement of particulate and NOx emissions: CO2 emissions – trial of CCS capture technology, then project cancelled
Social Impact	Very Good	Thousands of jobs, direct and indirect, (although many high risk)
Economics	Very Good	Scottish coal therefore no foreign currency: employee spending: British technology for export Coal is an international commodity

What Longannet risks can evolving Understanding + Technology mitigate?

Longannet Environmental Impact Mitigation Measures

- Particulate emissions
- NOx
- CO_2 - CCS (1.5bn vs 1bn offered, cancelled 2011)

Management pursued these to no avail!

Management by Government - A very recent attempt to save Longannet

"The call was made at the highest level by the First Minister to the Prime Minister - but he refused point blank to help, nor did he accept that there was anything to correct despite the fact that the discriminatory charging regime meant that Scottish Power has to pay around £30 million a year more than a similar power station in South East England."

Shale Gas

(Moratorium in Scotland)

Shale Gas – how does it measure up regarding Ethics + Goals?

Focus: Scotland could have substantial reserves of Shale Gas		
Risk	**Management of Risk?**	**Comment**
Secure	Very Good if proven	
Sure	Good	Wells can't be switched on and off – will need storage as a buffer – cavern storage, LNG or hydrogen
Environmental Impact	Better to Very Good	20% less CO_2 than coal if burned, CCS potentially provides very low CO_2 emissions But – public perception of fracking
Social Impact	Very Good	Impact can be minimalized – drilling pads + hydraulic transport of water, mud and sand But – public perception of fracking
Economics	Potentially Very Good	Shale gas changed USA fuel economics and possibly geopolitics

What Shale Gas risks can evolving Understanding + Technology + Management mitigate?

- Fracking (Understanding) – Powerful anti-lobby; Well-minded but ill-informed; potential show stopper because of Government sensitivities; understanding, technology and management can overcome their objections; challenge is to transfer understanding to the anti-frackers, i.e. address their anti-fracking tenets

An anti-fracking Tenet

- Tenet: Fracking can causes earthquakes that are a threat to our wellbeing
- Understanding: True regarding cause, but so does nature, with no ill-effects. See BGS data below

Earthquakes around the British Isles in the last 50 days

Click on an earthquake for further information

Earthquakes around the British Isles in the last 50 days

Last updated: Sat, 07 Nov 2015 14:40:22 GMT (GMT)

Date	Time (UTC)	Lat	Lon	Depth (km)	Mag	Int	Region	Comment
2015/11/03	07:22:19.9	55.719	-5.501	11	0.6		CLACHAN,ARGYLL & BUTE	
2015/11/03	06:23:53.6	51.020	-2.605	4	1.1		ILCHESTER,SOMERSET	
2015/11/02	14:31:38.2	52.987	-5.510	9	1.1		IRISH SEA	70KM SW HOLYHEAD
2015/11/01	03:07:04.3	52.910	-3.404	15	0.3		LLANDRILLO,DENBIGHSHIRE	
2015/10/30	22:56:14.8	56.714	-6.425	3	1.6		COLL,ARGYLL & BUTE	OFFSHORE LOCATION
2015/10/30	08:55:18.9	48.315	-4.151	4	2.6		BRITTANY,NW FRANCE	170KM SW JERSEY
2015/10/29	05:38:06.7	54.345	-2.216	7	0.5		HAWES,NORTH YORKSHIRE	
2015/10/29	04:51:00.9	55.704	-5.311	7	0.5		ARRAN,NORTH AYRSHIRE	
2015/10/28	17:32:37.5	53.224	0.458	12	1.5		SKEGNESS,LINCOLNSHIRE	OFFSHORE LOCATION
2015/10/27	07:16:33.9	56.365	-5.468	3	0.4		OBAN,ARGYLL & BUTE	5KM SOUTH OBAN
2015/10/25	12:33:56.2	55.597	-3.234	2	1.4		PEEBLES,BORDERS	7KM SSW PEEBLES
2015/10/24	07:18:08.3	52.986	-2.383	10	1.4		MADELEY,STAFFORDSHIRE	
2015/10/22	23:59:44.6	54.588	-2.940	4	0.7		DOCKRAY.CUMBRIA	
2015/10/19	05:25:40.4	56.661	-5.178	7	0.2		BALLACHULISH,HIGHLAND	
2015/10/18	23:50:00.0	50.432	-5.071	6	1.0		NEWQUAY,CORNWALL	
2015/10/18	00:39:24.7	55.742	-5.447	7	0.4		CLACHAN,ARGYLL & BUTE	
2015/10/16	06:29:01.4	57.195	-5.682	2	0.7		LOCH HOURN,HIGHLAND	
2015/10/16	00:21:18.0	51.672	-3.168	2	0.9		NEWBRIDGE,CAERPHILLY	
2015/10/13	00:27:12.6	53.039	-3.732	10	0.4		PENTREFOELAS,CONWY	
2015/10/11	21:02:47.4	57.193	-5.679	3	0.6		LOCH HOURN,HIGHLAND	
2015/10/11	02:46:05.5	53.569	2.204	6	2.1		SOUTHERN NORTH SEA	90KM NE CROMER
2015/10/10	23:45:54.4	55.774	-5.296	8	0.4		SKIPNESS,ARGYLL & BUTE	
2015/10/10	12:28:01.0	57.117	-5.341	9	0.5		KINLOCH HOURN,HIGHLAND	

Another anti-fracking Tenet

- Tenet: Fracking pollutes groundwater with harmful chemicals
- Understanding:
  - Fracking done at depth below aquifers
  - Self-sealing nature of the rocks here
  - Chemicals declared and can be deemed safe

Another anti-fracking Tenet

- Tenet: Drilling plus Fracking will invade the countryside bringing noise, pollution and increased traffic, and reduce house prices
- Understanding + Technology + Management
  - Inconveniences are temporary and in any case can be minimised using managed technology, e.g hydraulic transport, regulations
  - Essential for the economy – failure of the economy is a much bigger threat to house prices
  - Compensation will be paid to communities to give them an opportunity of a “lift”

Fracking Understanding – UK Government Inspired

The UK Government's Chief Scientific Adviser, Sir John Beddington FRS, asked the Royal Society and the Royal Academy of Engineering to review the scientific and engineering evidence and consider whether the risks associated with hydraulic fracturing (often termed 'fracking') as a means to extract shale gas could be managed effectively in the UK.
The key findings of this review were:

- **The health, safety and environmental risks can be managed effectively in the UK**
- **Fracture propagation is an unlikely cause of contamination**
- **Well integrity is the highest priority**
- **Robust monitoring is vital**
- **An Environmental Risk Assessment (ERA) should be mandatory**
- **Seismic risks are low**
- **Water requirements can be managed sustainably**
- **Regulation must be fit for purpose**
- **Policymaking would benefit from further research.**

Fracking Management Challenges

- Government and Industry need to find a way that produces a rational debate – involving learned societies and the studies that already have been done
- Appropriate Regulation must be in place or developed
- But - Scottish Government's approach – instigate an "evidence-based approach" to investigation before re- considering moratorium presents challenges – what credible "evidence" will be presented and given proper weighting?

UCG

(Moratorium in Scotland)

UCG – how does it measure up regarding Ethics + Goals?

Focus: Scotland has very substantial coal proven and understood coal reserves		
Risk	**Management of Risk?**	**Comment**
Secure	Very Good	
Sure	Good	Wells can be switched on and off
Environmental Impact	Better to Very Good	CCS required if burned as fuel: Less so if syngas converted to chemical feedstock But – public perception of "lighting a fire under their feet"
Social Impact	Very Good	Impact can be minimalized – drilling pads in brown field sites But – public perception of "lighting a fire under their feet"
Economics	Potentially Very Good	Influenced by price of natural gas, but what price Security?

What UCG Gas risks can evolving Understanding + Technology + Management mitigate?

- UCG accesses coal seams through boreholes that can be effectively sealed, unlike conventional coalmine shafts (Oxygen in, water out)
- Scottish rocks are relatively soft and self-sealing
- Oxidation (Fire) needs oxygen to be fed to it

An anti- UCG tenet

- Fires will “be lit beneath our feet” and will get out of control
- Understanding
  - No oxygen, no fire
  - Numerous incidences of mine fires in conventional deep coalmines in Scotland – these were extinguished by excluding oxygen
  - Proposed sites are in any case offshore

Another anti-UCG tenet

- Pollutes groundwater with harmful chemicals will pollute aquifers and flow to the surface
- Understanding
  - UCG at depth below aquifers and rocks above are self-sealing (stress levels and nature of rocks)
  - Boreholes can be plugged, preventing flow upwards (this can't be done with traditional mine shafts)

Another anti-UCG tenet

- Drilling plus UCG plant will invade the countryside bringing noise, pollution and increased traffic, and reduce house prices
  - Drilling/processing sites liable to be brown field with a history of accommodating industrial traffic and processes
  - Unlike before, uplifting funding will be made available to adjacent communities

UCG Management Challenges

- Government and Industry need to find a way that produces a rational debate
- And maintains appropriate regulation
- Scottish Government's approach – Instigate an "evidence-based approach" to fracking before considering moratorium

Wind Power

(Rush to Renewables)

Wind – how does it measure up regarding Ethics + Goals?

Focus: Scotland committed to all electricity from renewables by 2020		
Risk	**Management of Risk?**	**Comment**
Secure	Very Good	
Sure	Not sure without storage	Scotland behind in the provision of storage
Environmental Impact	Carbon neutral?	
Social Impact	Objections raised at some sites	
Economics	Subsidised	

Consider "Surety"

The Times 5th November

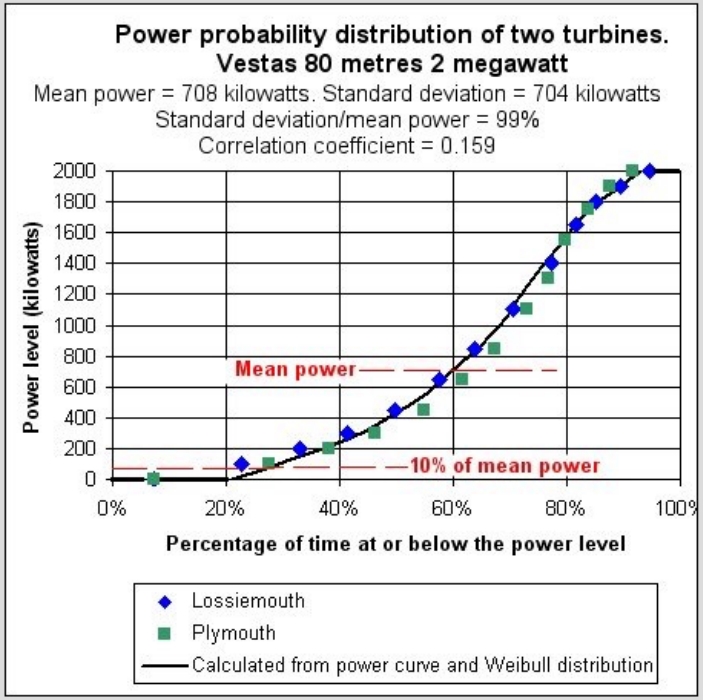
National Grid used an emergency measure to keep the lights on for the first time yesterday after the unexpected shutdown of two power stations in northern England. Factories and other large consumers of power were paid to switch off or use back-up diesel generators to reduce the risk of blackouts.

National Grid declined to say which businesses had reduced power consumption but typically they would include oil refineries, smelters or steel foundries. The scheme is profitable for businesses, which were paid up to £2,500 per megawatt hour to switch off compared with a normal electricity price of about £50 per megawatt hour.

Last month, it emerged that the operator of Britain's high-voltage transmission network had been forced to boost the spare capacity of the system to prevent it from falling to only 1.2 per cent, the lowest level for at least a decade.

Several coal-fired power stations have closed in the past two years and much of the new generating capacity has been wind and solar farms, which are inherently unpredictable.

The shortage of electricity yesterday was amplified by a lack of wind power – the result of a low pressure front over the UK. All of Britain's windfarms were generating just 300 megawatts of electricity, or 0.68 per cent of the nation's total supplies yesterday evening.



Surety: From the WWF:- 2014 a "massive year" for wind and solar power in Scotland - new data published

3 January 2015

Following a record final month, 2014 proved to be a "massive year" for wind and solar power in Scotland, new figures published today (Saturday 3 January) reveal.

Analysis by WWF Scotland of data [2] provided by WeatherEnergy found that for the month of December…

- Wind turbines alone provided around 1,279,150MWh of electricity to the National Grid, enough to supply the electrical needs of 164% of Scottish households, that's enough for 3.96 million homes – and a record for 2014.
- Maximum output was on 10th December, when generation was an estimated 65,970MWh, enough to supply 6.34 million homes for the whole day – equivalent to 262% of all Scottish households.
- Minimum output was on 4th December, when generation was an estimated 9,295MWh, enough to supply 893,000 homes – equivalent to 37% of all Scottish households.
- Wind turbines generated enough power to supply over 100% of Scottish households on 25 out of the 31 days of December.

Surety: http://euanmearns.com/scotland-gagging-on-wind-power/

Last week I had a post called Flat Calm Across the UK focussing on the spell of what seems to be uncommonly calm weather across the UK and Northern Europe. In this post I add wind data for Denmark and Germany for the months of September and October. On 19th October, for several hours, the combined output of 55 GW of wind turbines was less than 1.5 GW, that is below 3% average load. It was effectively flat calm across the whole of Northern Europe, not just on this occasion but on several other occasions in this two month period.

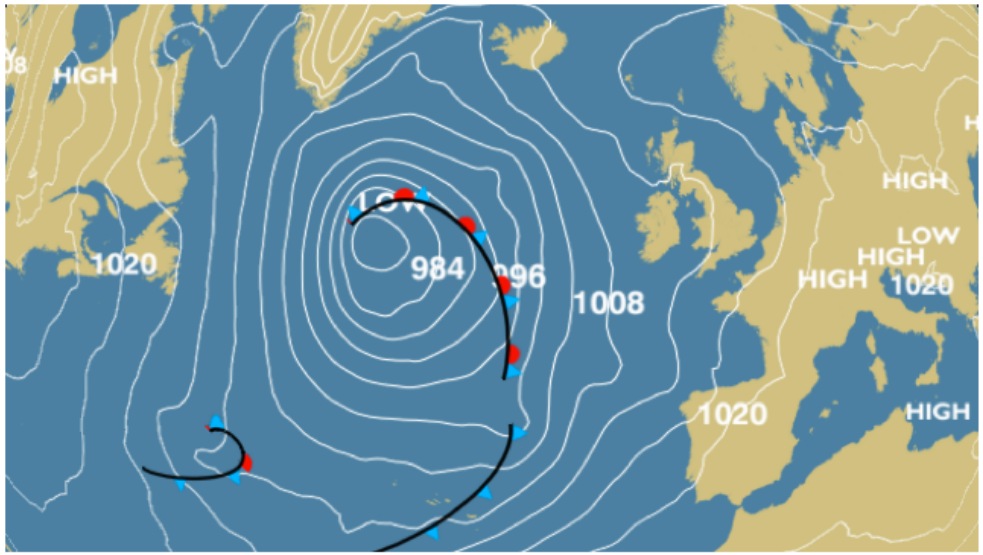
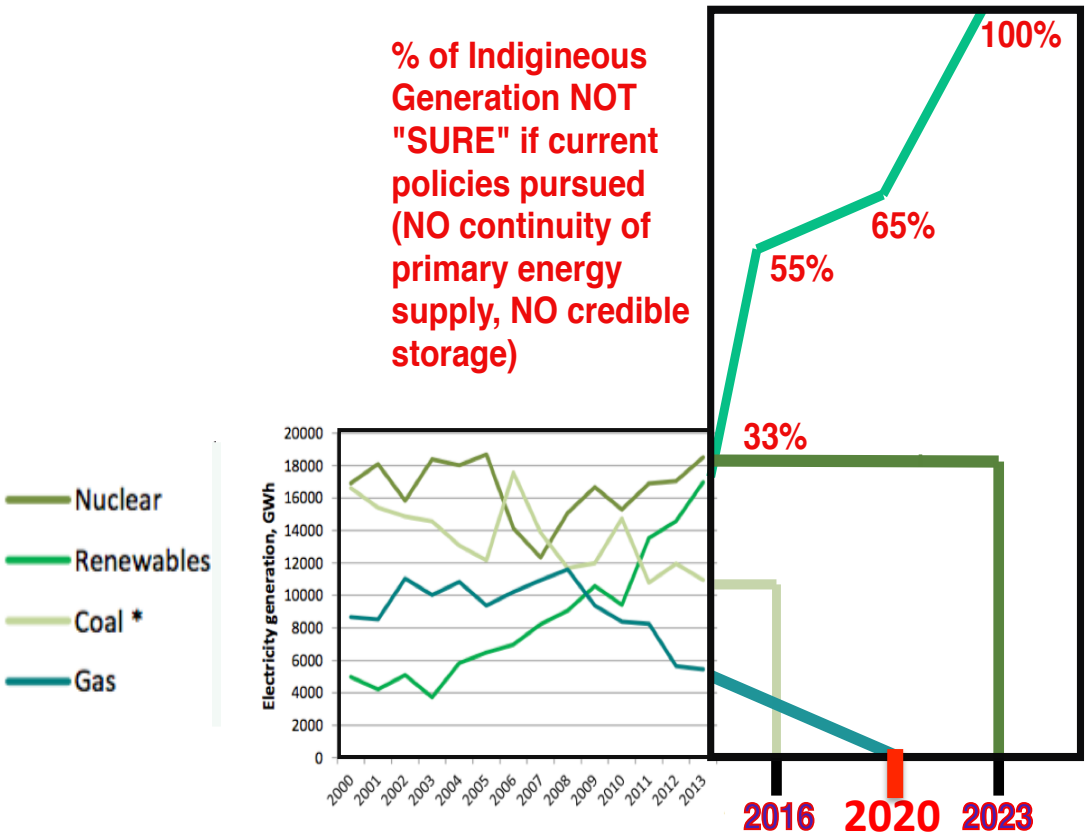


Figure 1 *Atlantic pressure chart from the BBC / Met office for 4th November 2015. This has been a fairly typical configuration for several weeks with high pressure over Europe, the North Sea and the UK resulting in regional calm conditions. Weather fronts move through which are clearly visible from the wind generation data, but then the high re-establishes and calm conditions return. Atlantic depressions have been tracking to the north of the UK on a deeply meandering jet stream.*

What Wind Power Risks can evolving Understanding + Technology + Management mitigate?

- Surety (Intermittent)
  - Problem caused by Rush to Renewables without storage provision – so provide storage
    - Batteries not suited to scale - pose ethical problems
    - Compressed air caverns?
    - Pump storage most suited to scale
      - Coire Glas will have storage capacity of 30 GWh. 600MW Generating capacity - 2020?
- Otherwise depend on imports across the interconnectors

Surety:- The Significance of Current Practice if Demand Remains the Same



Requirement equivalent to 6GW generating capacity operating 24/7

So imports through National Grid will have to increase!

Scotland Electricity Generation

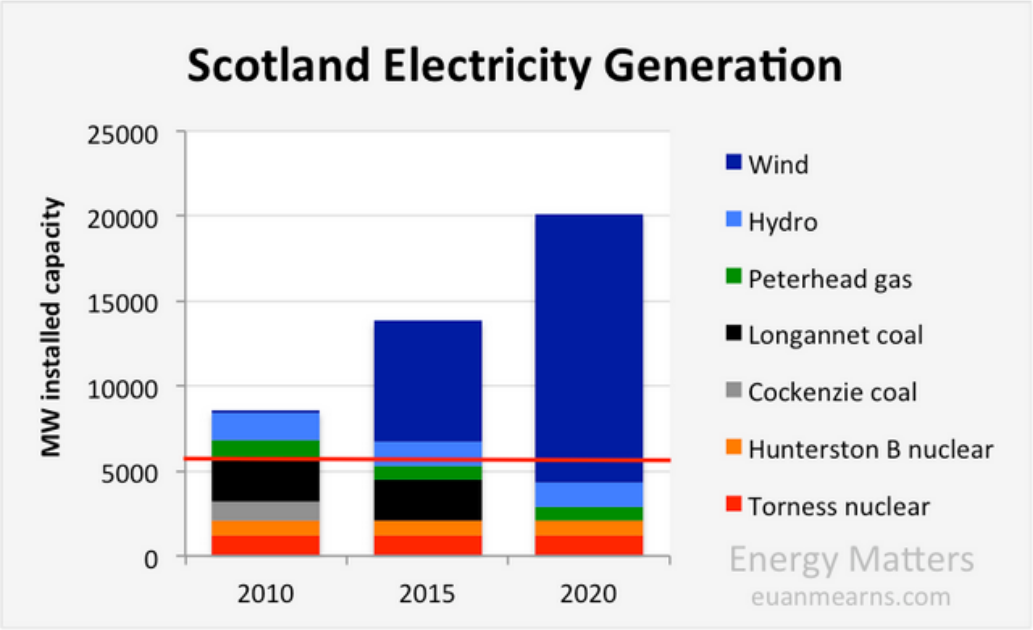
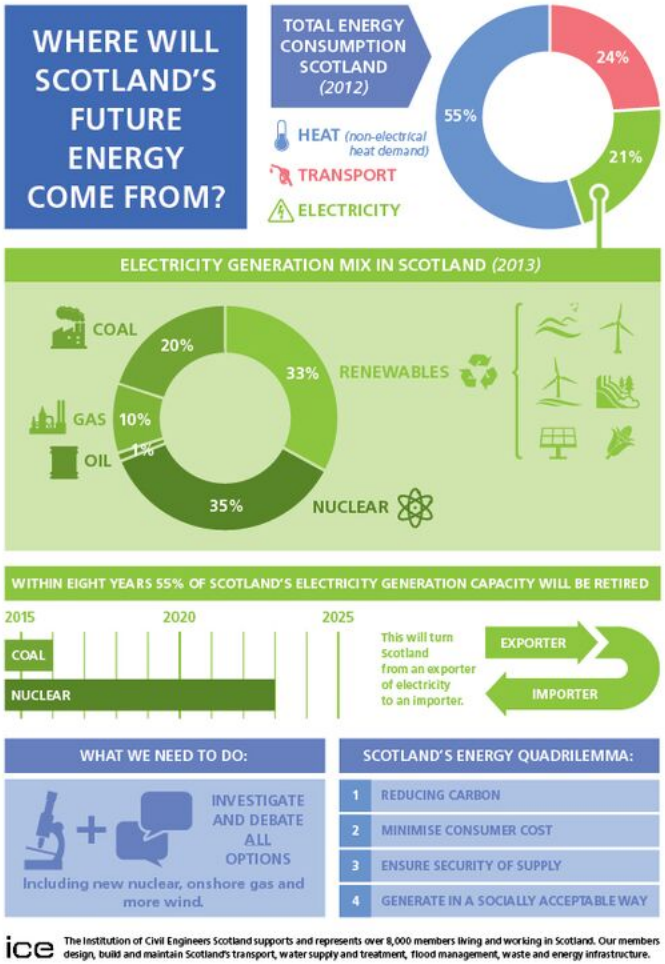


Figure 1 *The rapidly changing face of electricity generation in Scotland. Wind power seems destined to grow from virtually nothing in 2010 to 15.8 GW come 2020. Maximum power demand in Scotland is 6 GW (red line).*

http://euanmearns.com/scotland-gagging-on-wind-power/ 12/1/15

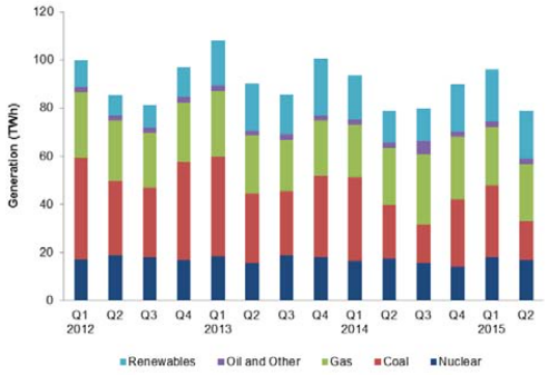
Institution of Civil Engineers

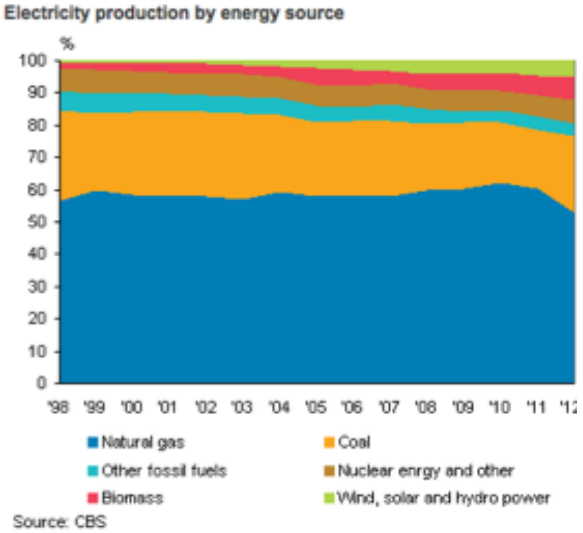


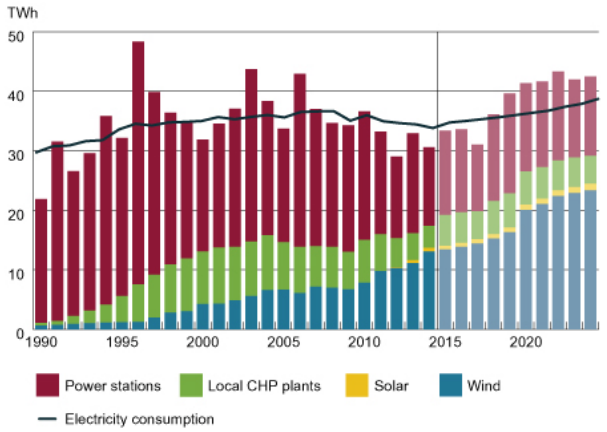
29/10/15

Where could National Grid imports to Scotland come from?

- England
- Europe – Netherlands
- Europe – Denmark







This is hypocritical !

Other measures when demand exceeds supply:-

- Current Measures:-
  - Buy short term supplies from small generators at high rates
    - (some diesel sets)
  - Shut consumers down and compensate
- Measures proposed here
  - Install adequate storage, beginning now, but this will take about 8 years if the current proven technology of pump-storage is used (Scotland has the necessary topography)
    - Note 1. Coire Glas pump storage could be operational around 2021, and will have 50hrs at 600MW generation capability
    - Note 2. "Adequate storage" needs to be defined – could be based on the number of low wind generation days expected e.g. when the load factor on turbines falls below an average of
  - And/or make Shale Gas and UCG work, ultimately with CCS: store gas/ switch wells off/on

Other measures when wind power supply exceeds demand

- Export, provided there is a demand
- Or install storage, beginning now
  - Large scale
- Stand down Gas, Shale Gas and UCG

What are we heading towards?

- A Nation dependent on the National Grid for (expensive) electricity imports because of the intermittent nature of wind power as long as it stands alone without sufficient storage
- Impaired ability to respond to social responsibilities, and a pricing structure for energy that grows inequalities
- A weakened economy and reduced international influence at a time when Global Warming poses increasing challenges
- AND we are only publically addressing CO_2. The big coming challenge is CH_4 release from the sea and permafrost. A very potent positive feedback for Global Warming. We need to be a fully functioning Nation to cope with this.

So where am I?

- Very worried – until recently there was little effective properly informed debate (engagement) about energy security, surety and affordability, even though there are some voices out there. Fracking has dominated the debate so far.

The Royal Academy of Engineering, The Royal Society and The Royal Society of Edinburgh's opinions also ignored

Prof Paul Younger

So where am I?

- More opinion
- But no storage!

THE TIMES
Scottish news

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Wind power is 'supported by seven out of ten Scots'

Mike Wade
Published at 12:01AM, March 18 2015

Many believe wind farms blight areas of natural beauty
Getty Images

More than seven in ten Scottish adults support the continued development of wind power as part of the energy mix, an independent survey has found.

The poll was last night acclaimed by industry lobbyists and ministers as proof of widespread support for the Scottish government's energy policy.

Fergus Ewing, the energy minister, welcomed "a growth of 20 per cent" in public backing, while Scottish Renewables, the industry body that commissioned the poll, insisted "the vast majority of Scots support wind power".

Countryside campaigners were quick to point that the YouGov survey had described wind as only one power source within a wider energy mix.

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So where am I?

- **Wake up call 4th November 2015 (Times)**

National Grid used an emergency measure to keep the lights on for the first time yesterday after the unexpected shutdown of two power stations in northern England. Factories and other large consumers of power were paid to switch off or use back-up diesel generators to reduce the risk of blackouts.

National Grid declined to say which businesses had reduced power consumption but typically they would include oil refineries, smelters or steel foundries. The scheme is profitable for businesses, which were paid up to £2,500 per megawatt hour to switch off compared with a normal electricity price of about £50 per megawatt hour.

The measure, known as the demand side balancing reserve, was introduced last year to cope with the shortage of generating capacity and had not been used until yesterday.

So where am I?

- More public voices, more encouraging:-

THE TIMES

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We've blown it by rushing towards wind power

Matt Ridley

Published at 12:01AM, November 9 2015

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So-called cleaner energy has in reality created a dirtier, costlier and less reliable electricity industry. It's time for a rethink

Suppose that a government policy had caused shortages of bread, so the price of a loaf had shot up and was spiking even higher on certain days. Suppose that the high price of bread was causing massive job losses. Suppose that the policy was justified on the grounds that the bread was now coming from farmers whose practices were better for the environment, but it turned out they were probably worse for the environment instead. There would be a rethink, right?

For bread, read electricity. The government needs to rethink its electricity policy. Last week's emergency was a harbinger of worse to come: because the wind was not blowing on a mild autumn day, the National Grid had to call for some large electricity consumers to switch off, and in addition offered to pay up to £2,500 a megawatt-hour — 40 times the normal price — for generators capable of stepping into the breach at short notice.

THE TIMES

Blackout fears over Britain's creaking energy network

Marcus Leroux
Published at 12:01AM, November 11 2015

The growth of wind power means national grids need to be modernised
Rodrigo Arangua/AFP /Getty Images

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One of the world's leading authorities on energy security has criticised Britain for under-investing in its ageing electricity network after emergency measures were taken last week to keep the lights on.

The International Energy Agency said incidents that led to National Grid using the "last resort" of paying large energy users to cut their demand would happen increasingly unless investment in infrastructure was increased.

So where am I?

- Most encouraging:-

29/10/15 Institution of Civil Engineers Scotland

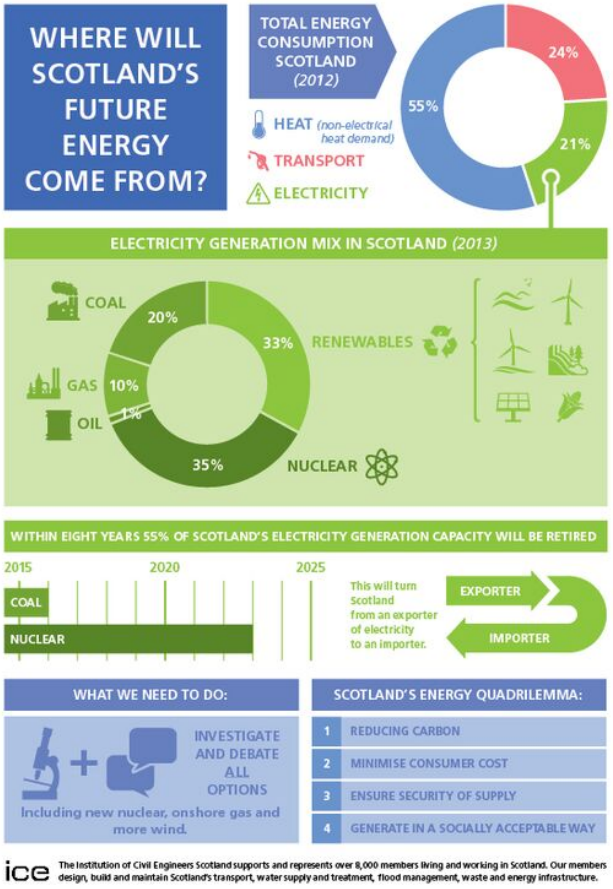
Call for the Scottish Government to ensure that the debate on the pros and cons of wind, nuclear and onshore gas and their place in Scotland's future energy mix is informed by independent, scientific, expert advice.

Prof Gary Pender, Chair of the Institution of Civil Engineers Scotland Committee:-

"We will be calling for a national debate on how we, as a country, deal with this to ensure that we have a resilient supply with sufficient capacity for the long term.

"Energy policy is hugely politically controversial, with wind power, nuclear power and onshore gas extraction provoking particularly emotional and politically motivated responses. We need to move beyond this at times irrational and ill-informed discourse about all these forms of energy generation, and conduct a thorough, expert-informed assessment of the right approach for Scotland.

"Energy is the part of Scotland's infrastructure network which concerns us most, and we encourage the Scottish Government, working with the UK Government, to provide a clearly articulated vision for the future. Decisions must be made on evidence and resilience, not on emotion and politics."



So where am I?

- **More news today**

The IEA today down-rated the trustworthiness of the UK's electricity network, despite showing great confidence last year

Our Mission

The IEA is an autonomous organisation which works to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA has four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide.

Finally – the Rationale pt 1

1. The rush to renewals without the provision of sufficient storage has been irresponsible
2. Scotland will lose access to secure, sure and affordable supplies of energy and electrical power: Electrical power will have to be imported via the National Grid due to the intermittent nature of wind power to be a significant risk when no matching storage is provided
3. This has the potential to create weakened economy and reduced international influence at a time when Global Warming poses increasing challenges
4. Along with this will come impaired ability to respond to social responsibilities, and a pricing structure for energy that maintains inequalities
5. Our Goal must be to prevent 2, 3 and 4 happening
6. AND we are only addressing CO_2. The big coming challenge is CH_4 release from the sea and permafrost. A very potent positive feedback for Global Warming. We need to be a fully functioning Nation to cope with this

Finally – the Rationale pt 2

7. There are four solutions

   Provide sufficient storage – this is a long term deliverable Coir Glas 8 years?

   Shale Gas – as soon as possible – 3 years?

   UCG – as soon as possbile – 3 years?

   Keep Longannet - immediate

8. All have "image" challenges that may/are preventing their implementation

9. These challenges can be solved to high ethical standards using understanding technology and management approach, underpinned by the transfer of understanding and a developing confidence by the electorate in the engineers', scientists' and managers' abilities to deliver

10. In addition, Shale Gas and UCG production will also support Scotland's petrochemical industry

11. The major challenge is in transferring understanding and confidence to the electorate

And the Course of Action

- Organise the Learned Institutions and Unions that support the Rationale into an appropriately named working party - with the prime objective of engaging the electorate and Governments in properly grounded evidence-based discussion and decision making
- In particular devise a strategy for sharing the necessity and the feasibility of supporting wind generation with Shale Gas and UCG in a responsible manner

Scottish Government's Previous Position – How quickly things can change!

PLEDGE 5: We will support development and implementation of clean fossil fuel technologies in Scotland, through collaboration with academia, industry and other interested parties.

Closing Remarks – MIS and Risk Management

- The routes of the MIS go back to 1878
- The West of Scotland Institute was formed to reduce risks in mining, following the Blantyre Explosion in 1877 which killed over 200 people, This was to be done by developing and applying the science of mining (shared understanding)
- They could adopt an autocratic approach to making and implementing policy
- Today the MIS has an opportunity to contribute to the management of a significant risk – that Scotland will not have a secure, sure, affordable and ethically acceptable supply of electricity.
- In these democratic internet-informed days communication and the building of influence are essential, sharing "ground-truthed" understanding and generating confidence in our ability to innovate and manage to mitigate risks. This is best achieved by an alliance of learned societies and organisations that recognise the risks involved and share understanding and confidence to propose and promote measures to mitigate these risks
- Exploratory talks should be initiated immediately

Acknowledgements

- Many sources found on the internet and stored in Evernote – happy to share this file
- Contact: briangdsmart@outlook.com