Agenda - Y Pwyllgor Amgylchedd a Chynaliadwyedd

Lleoliad:

Ystafell Bwyllgora 3 - y Senedd

Dyddiad: Dydd Iau, 22 Hydref 2015

Amser: 09.30

I gael rhagor o wybodaeth cysylltwch a:

Martha Da Gama Howells

Clerc y Pwyllgor

0300 200 6565

SeneddAmgylch@Cynulliad.Cymru

1 Cyflwyniad, ymddiheuriadau a dirprwyon

2 Cynnig o dan Reol Sefydlog 17.42 i benderfynu gwahardd y cyhoedd o'r cyfarfod ar gyfer y canlynol: Eitemau 4 a 6

3 Ymchwiliad i "Dyfodol ynni callach i Gymru?"

09:30-10:45 (Tudalennau 1 - 32)

David Clubb, Renewable UK

Yr Athro Malcolm Eames, Sefydliad Ymchwil Carbon Isel, Prifysgol Caerdydd

Chris Blake, Cyfarwyddwr y Cymoedd Gwyrdd

Papur 1

Papur 2

4 Trafod y dystiolaeth (yn breifat)

10:45 - 11:00

5 Ymchwiliad i "Dyfodol ynni callach i Gymru?"

11:00 - 12:15

Nigel Turvey, Rheolwr Dylunio a Datblygu, Western Power Distribution

Scott Mathieson, Cyfarwyddwr Cynllunio Rhwydwaith a Rheoleiddio, Scottish Power Energy Networks

6 Trafod y dystiolaeth (yn breifat)

12:15 - 12:30

Mae cyfyngiadau ar y ddogfen hon

Mae cyfyngiadau ar y ddogfen hon

Cynulliad Cenedlaethol Cymru Pwyllgor Amgylchedd a Chynaliadwyedd	National Assembly for Wales Environment and Sustainability Committee
Dyfodol Ynni Craffach i Gymru?	Smarter energy future for Wales?
Ymateb gan RenewableUK Cymru (Saesneg yn unig)	Response from RenewableUK Cymru
SEFW 03	SEFW 03

Cynulliad Cenedlaethol Cymru
National Assembly for Wales

A smarter energy future for Wales

A response to the consultation by the Environment and Sustainability Committee, prepared by David Clubb

About RenewableUK Cymru

1. RenewableUK Cymru is the trade body for all forms of energy in Wales except fossil fuel and nuclear. Our remit includes all renewables, energy storage, smart grids and green buildings
2. Our vision is of a sustainable Wales which makes full use of its renewable energy resource, and our mission is to maximise the benefits to Wales of that resource
3. We are involved in the 'smart energy' sector through our management of the Smart Energy Wales event[1] as well as the management of various social media platforms to share information about the topic and participation in collaboration to support 'real life' projects

The energy mix

How can we decarbonise our energy system at a sufficient pace to achieve the necessary reductions in emissions (to contribute to the prevention of global average temperature rise)?

4. Wales' contribution to global carbon emissions is evidently modest; however, the per-capita contribution is very high – some 40% higher than the global average which is itself unsustainable for long-term environmental sustainability

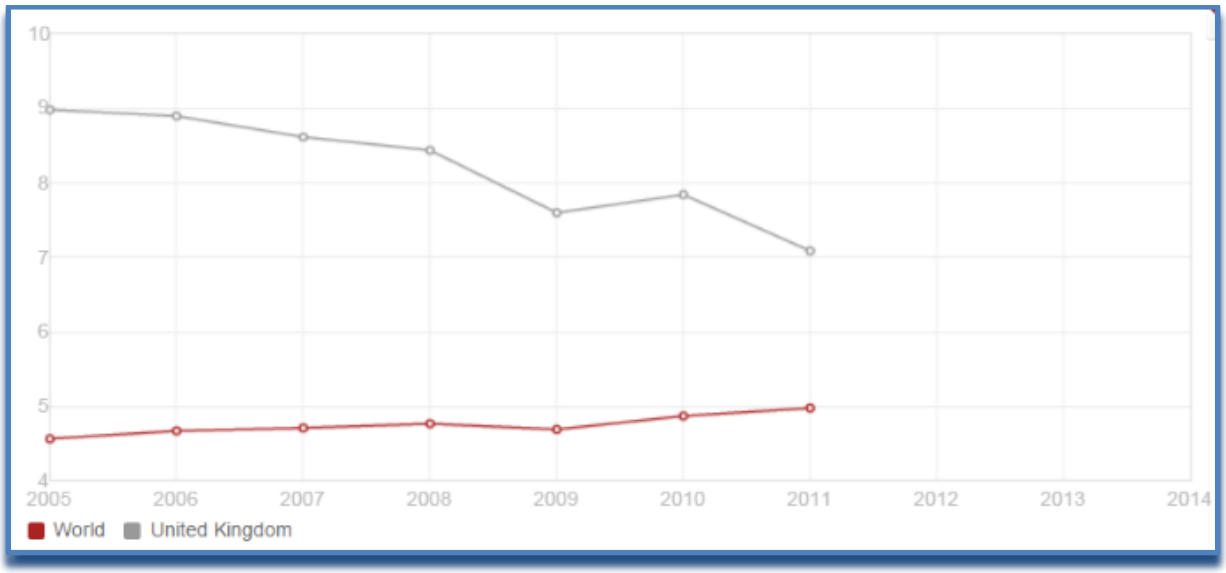


Figure 1: Per capita emissions of Carbon Dioxide (metric tonnes). Source: World Bank[2]

5. Wales' emissions have fallen in Wales by only 12% since 1990, compared with 30% across the UK[3]

[1] To be held on 16th September 2015 www.smartenergy.wales
[2] http://data.worldbank.org/indicator/EN.ATM.CO2E.PC/countries/1W-GB?display=default
[3] The Climate Change Commission

6. The pace of decarbonisation needs to be considerably greater than historic trends in order to meet our moral obligation to contribute globally, as well as our legal obligation in forthcoming legislation via the Environment Bill[4] and our contribution to the UK's carbon budget[5] (particularly the 4th carbon budget)

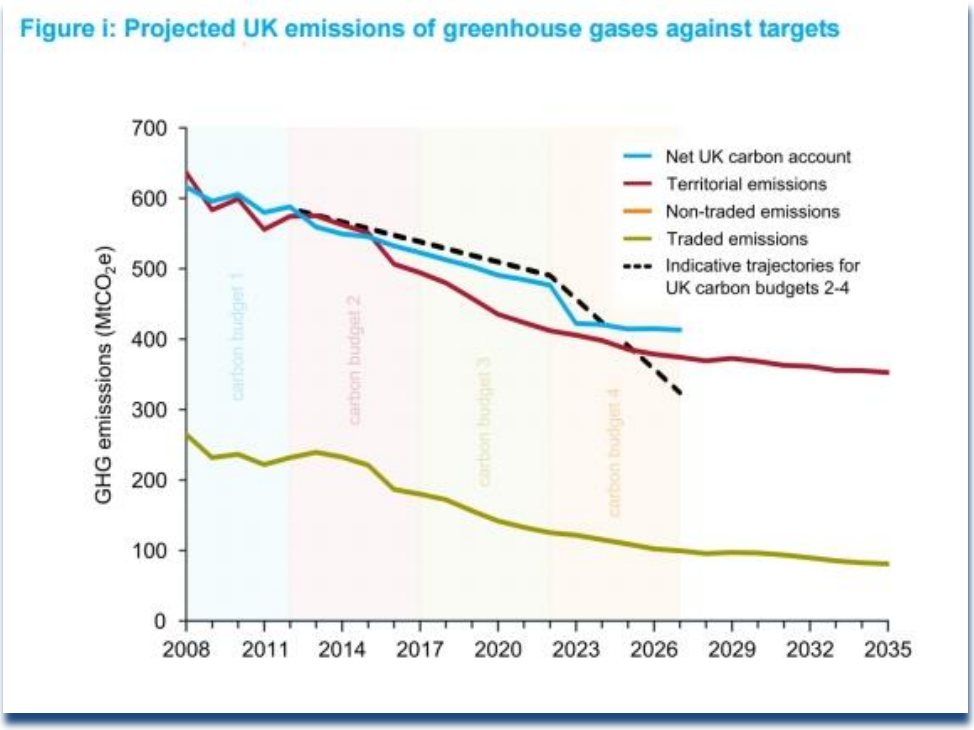


Figure 2: The UK is projected to miss the 4th GHG budget by a huge margin (DECC)

7. The supply of electricity makes up 36% of the UK's CO_2 emissions, and is the single largest component of the GHG emission mix[6]. Transport and the residential sector make up the next two largest components. Energy use therefore utterly dominates the GHG emission mix (64% of the total)

8. Of these components, the simplest and cheapest methods of decarbonisation are

    a. Reduction of energy use at the point of use through behaviour change, energy efficiency, modal shift and change of infrastructure

    b. Reduction of carbon emissions for provision of electricity and heat by shifting to renewable generation

What mixture of distributed generation resources best meets Wales' renewable energy needs in respect to the supply of a) electricity, b) gas, and c) heat?

9. My research in 2014 demonstrated that the likely dominant renewable electricity generation by 2050 would come from onshore wind, offshore wind and solar photovoltaics[7]. This research has been rapidly dated due to the difficulties of the three major renewable electricity sectors in dealing with current UK Government policy,

[4] A target of an 80% reduction in GHG emissions by 2050 is proposed
[5] Projected UK emissions of greenhouse gases against targets
[6] Provisional 2014 figures from DECC
[7] Unpublished but available from http://tiny.cc/walesenergyroutemap

although it is likely that onshore wind and solar electricity will be the biggest growth areas of a greatly depleted sector over the next five years

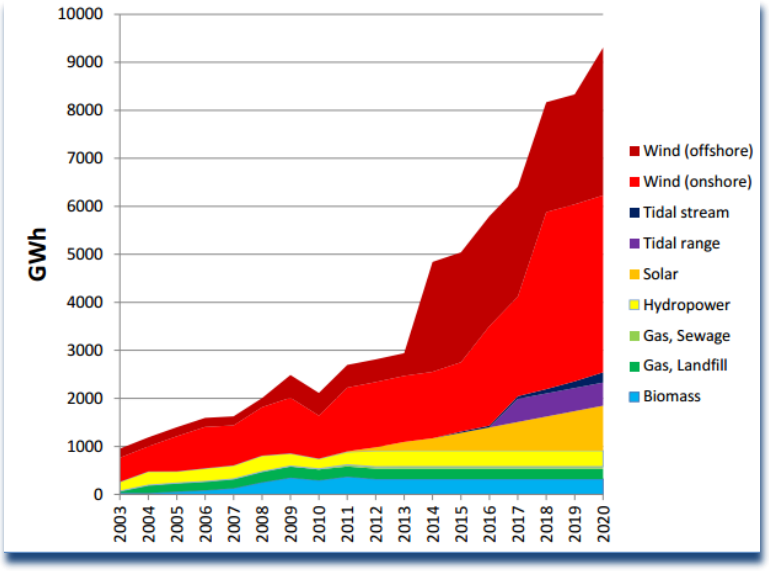


Figure 3: Potential for renewable energy in Wales (2014 research)

10. The same research indicated that the strongest growth in renewable heat to 2020 would come from 'commercial' (larger scale) biomass, but with heat pumps and domestic biomass also making significant contributions. I believe that this underestimates the potential for solar thermal to make an impact, because this technology could be incorporated easily into each new-build (domestic and commercial) via building regulations for a low cost. A good example of this policy is the solar ordinance in Spain, although other good examples include Portugal, Ireland and Israel[8]

The Grid

How does the grid distribution network in Wales enable or restrict the development of a new smarter energy system?

11. The grid and distribution network in Wales severely curtails the ability of projects, particularly small and medium sized, to connect to the grid. This issue is very well described by Chris Blake in his open letter about the problems connecting a small hydro project in mid Wales[9]

12. The huge problems in grid capacity across large areas of mid and west Wales could be considered as an opportunity to incentivise innovation in the smart grid and storage sectors, particularly if structural funds are used to financially support projects which demonstrate a diminishing need for upgraded or new infrastructure

13. These ideas are currently being worked on by Jane Forshaw of Local Partnerships, and there are strong synergies with the Energy Park concept which is being developed jointly by RenewableUK Cymru and Natural Resources Wales[10]

[8] See European Solar Thermal Industry Federation information
[9] "The grid that wasn't there – a dispatch from the front line of renewable energy"
[10] An early draft of the concept video can be seen at tiny.cc/EnergyParkVideo

What changes might be needed in terms of ownership, regulation, operation and investment?

14. We do not have sufficient expertise to be able to comment on this issue in depth; however the current regulatory system is overly biased in favour of limiting cost rises, and against pro-actively allowing speculative development of grid in order to allow likely connection for future (renewable) energy development

Storage

How can energy storage mechanisms be used to overcome barriers to increasing the use of renewable energy?

15. Energy storage is the other side of the renewable energy 'coin'. There are no implications for overall system stability, security or operation for low levels of renewable energy penetration. For variable generation of up to 34% of electricity generation – compatible with the UK's targets for 2020 – additional interconnectors of 9GW and storage of 4GW is sufficient[11]

16. Energy storage can also be used to obviate the need to upgrade or install new grid capacity. Locally installed energy storage could – in principle – be able to connect islands of generators and users without the need for 'wider' grid connection. However these projects entail significant commercial risk, and would almost certainly need to be underpinned by public sector support

17. Heat storage would remove barriers to adoption of some renewable heat generation, particularly solar thermal, but seasonal heat storage has huge technical challenges of which some are currently being addressed by research programmes such as SPECIFIC[12]

Ownership

To investigate the desirability and feasibility of greater public and community ownership of generation, transmission and distribution infrastructure and the implications of such a change

18. We have insufficient knowledge of this area to make a response

Energy efficiency and demand reduction

How can the planning system and building regulations be used to improve the energy efficiency of houses (both new build and existing stock)?

19. Building regulations are the primary tool for determining the energy efficiency of new and existing building stock. RenewableUK Cymru laments the huge missed opportunity presented by the decision to improve the energy efficiency of new homes by only 8% in 2013

20. We call for a huge increase in energy efficiency requirements for new-build (domestic and commercial properties) in order to support the skill base of our construction sector, and to prepare our construction companies for the forthcoming requirement for all new buildings to be 'close to zero carbon' by 2020[13]

[11] "Technical benefits of energy storage and electricity interconnections in future GB power systems"
[12] www.specific.eu.com
[13] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF

21. Zero carbon buildings would also be more affordable, as they are cost the same, or very nearly the same, as 'business as usual' properties,[14] and pay back far more than the additional construction cost through reduced energy bills over their lifetime

What would the environmental, social and economic impacts be if Wales set higher energy efficiency standards for new build housing? (e.g. Passivhaus or Energy Plus)

22. If new build housing had much higher energy efficiency standards, the lifetime energy use would be drastically reduced. This would reduce greenhouse gas emissions, fuel bills, fuel poverty and would increase the skill requirement for the construction sector in Wales

23. Social impacts would include reduced mortality and morbidity due to improved temperatures and reduced exposure to indoor pollutants[15]

24. Economic impacts would include:

    a. Cost savings to the NHS through reduced mortality and morbidity; economic value of this is estimated at £2.46bn over the next 50 years, or £49m per year[16]

    b. Whole-life savings to residents of £19,500 per household over 25 years of occupancy[17]

    c. Improved business opportunities to Wales-based companies involved in the engineering or construction sector improving their skill base and the export potential for goods and services

How can communities, businesses and industry contribute to transforming the way that Wales thinks about energy? Does the answer to this challenge lie in enabling communities to take greater responsibility for meeting their future energy needs?

25. Enabling communities to have a say in the generation of their own energy is undoubtedly a step in the right direction. However, current UK government policy acts strongly against the preferred direction of the public. It is strongly pro-fracking and pro-nuclear – neither of which can be implemented or strongly engaged with by the local communities - and anti-renewable energy, in direct contravention of the preference of the general public[18]. This dissonance is unhelpful in maintaining a collaborative, engaged dialogue with citizens, communities and businesses, and Welsh Government has the opportunity to counter this with strong policy and political statements supporting renewable energy and new 'smart' ways of engaging with all forms of energy.

[14] See "Designers create the 'impossible' zero-carbon house"
[15] See "Health effects of home energy efficiency interventions in England: a modelling study"
[16] Assumes value of QALY of £25,000; number of increased households by 2036 as 190,000; population increase of 438,900; 2241 QALYs per 10,000 persons over a 50-year follow-up
[17] Assuming average energy use for a three-bedroom semi-detached house using 2013 building regulations
[18] "Plummeting support for fracking and nuclear", RenewableUK Cymru website, 4th August 2015

Cynulliad Cenedlaethol Cymru Pwyllgor Amgylchedd a Chynaliadwyedd	National Assembly for Wales Environment and Sustainability Committee
Dyfodol Ynni Craffach i Gymru?	Smarter energy future for Wales?
Ymateb gan Y Cymoedd Gwyrdd (Cymru) CIC (Saesneg yn unig)	Response from The Green Valleys (Wales) CIC
SEFW 17	SEFW 17

A SMARTER ENERGY FUTURE FOR WALES: Response of The Green Valleys CIC 3rd September 2015
Prepared by Chris Blake, founding director and willing to give evidence in person.

1. Before answering some of the questions raised by the committee I am going to make a few observations about the current position by way of *background*.
   - In 2013[i], despite having abundant natural resources, Wales was producing just 10.1% of its electricity from renewable sources, less than the UK average and way behind Germany at 23.4%.
   - The vast majority of those renewable generators are owned by large corporations – the majority of them foreign owned and foreign financed.
   - Consequently, the income from renewable generation is not staying in Wales. There are very few community or socially owned renewable projects in Wales. Westminster policy has supported foreign developers to use the landscape of Wales to profit from the levy on consumers' fuel bills.
   - As you are aware the Westminster Government is rapidly closing the support under the Levy Control Framework (RO, FIT, CfD) on the basis that the budget (and cap) for 2020 will shortly be fully committed. There have been over 5 years of missed opportunity – a new commitment from Wales is needed - but at a time of great uncertainty and acknowledging that Wales currently controls neither the economic incentives nor the regulatory framework that drive renewable investment.

2. *A question of priorities* Any answer to the questions that are being asked will vary depending upon your strategic priorities. I recommend that the committee give urgent attention to its priorities and goals for renewable energy generation, as this will dictate policy choices. For example, priorities ***could be***:
   a. *Maximize energy output (MWh)* - this will lead to a focus on very large scale, high efficiency projects, typically onshore wind and PV, and experience shows that these will be delivered most quickly by commercial developers.
   b. *Security of supply* – this will encourage a diversity of distributed resources and encourage farm and community scale developments close to the point of consumption.
   c. *Maximize economic benefit for Wales* – here ownership will be crucial: mutual, social and community ownership will hold profits within the country and will also give scope for using electricity generated to address fuel poverty (one of the failures of the current generation programme).

3. Whatever the intention, the outcome of the last decade of (mainly Westminster) policy has been maximizing energy output (priority *a*, above) as evidenced by the large on and offshore wind farms. Value for money (kWh/£) will always be important so further development of large generators is vital to meeting energy needs and carbon targets. There has been some progress towards secure and distributed supply especially through deployment of FIT for domestic PV and farm and community scale renewables (priority *b*, above) supported by the small scale FIT. However, delivery has been slow (apart from <4kW PV) and is now hampered by FIT degression and grid constraint in rural areas. The goal of maximizing economic benefit for Wales has not been delivered. An insignificant fraction of Wales' renewable resources are in social ownership. Apart from land rental and relatively small community benefit funds there has been very little economic benefit to Wales from renewable generation.

4. Wales needs to deliver RE at scale as well as maintaining a variety of smaller, distributed projects. I believe Wales can deliver these priorities by focusing on two priorities for its renewable energy policy for the next 10 years:
   a. Deliver large scale, socially owned schemes
   b. Continue to support a variety of farm and community scale projects across Wales.

   The responses and evidence given below reflect these priorities.

The energy mix

How can we decarbonise our energy system at a sufficient pace to achieve the necessary reductions in emissions?

5. Renewable generation still requires some financial support (something that all other technologies receive – from tax incentives to oil exploration to nuclear decommissioning from Public spending).

This review is taking place when there is considerable doubt about the future of the financial support for the renewables sector in the UK. Future support from Westminster is unknown although it is likely that until 2020 the Government will argue that since the LCF support has been allocated earlier than expected, no additional spending is required until after 2020. Against this policy assumption there are some rational responses to inform Wales' future energy policy:

a. *Go Large*. Focus on the lager schemes where economies of scale get closer to grid parity.
b. *Local supply*. Actively develop models that allow direct resale of generated electricity (local supply). If generators were able to sell directly to consumers at a price above the minimum export price but below retail pricing then the impact of the declining FIT could be mitigated. Active support and piloting of direct sale initiatives is vital to the funding of future renewable generation. It also promises a potential challenge to fuel poverty – the socially owned wind farm that sells to the housing association tenants at a reduced tariff?

    [We have a bizarre situation, regulated by OFGEM, requiring all generators to sell big ESCOs at the wholesale rate (around 5p per unit) who then resell that power at 5p per unit. Imagine that OFGEM regulated the production and distribution of carrots –all growers would be forced to sell to the big 4 supermarkets at wholesale prices –making farmers markets are illegal!]
c. Support distributed generation where electricity can be used on site (saving 15p per unit on purchase) – this would mean supporting farm and domestic schemes where electricity is used on site and encouraging on-site consumption to replace fossil fuel.

This focus on large scale, local supply, and generating at point of use is independent of any particular technology and aligns with the priorities set out in paragraph 3 above.

What mixture of distributed generation resources best meets Wales' renewable energy needs in respect to the supply of a) electricity, b) gas, and c) heat?

6.
    a. For electricity the answer is largely given above – larger, renewables schemes with the ability to local supply, and smaller renewables alongside local demand.
    b. For gas, large scale AD from domestic waste is one of the technologies that have been overlooked – in part because of LA waste management contracts.
    c. For properties that are off the gas grid there needs to be continuing support for biomass heating and electric heat pumps which can be an ideal partner for renewables that have a strong winter generating capacity (wind and hydro). TGV have installed a 30kW microhydro scheme in mid-Wales as a partner to ground source heat pump that is heating efficiently a large multi-room property. Support is needed to encourage integrated solutions.

The grid

How does the grid distribution network in Wales enable or restrict the development of a new smarter energy system?

7. Grid capacity is a major constraint on renewable generation in many parts of the UK. Once again this is an area where community renewable generation projects are at a material disadvantage when compared to commercial projects. We have had direct experience with rural grid constraint (£5.7m reinforcement cost of an 18kW community microhydro project). Commercial developers have the experience and the balance sheets to be able to employ grid consultants to ensure that they design schemes that reserve all of the available capacity on our constrained, legacy network. There is clear evidence of market failure under the current "market" regime of regulated by OFGEM . One absurd consequence is the insistence that the existing grid is used optimally ("value of money argument") even when to achieve this generators (supported under the LCF) are being given constrained connection offers or having generation curtailed. In other word the determination to avoid under-used assets in the distribution network are requiring under-utilisation of generation assets. Common sense requires some redundancy in the distribution network and full utilisation of generating assets – the opposite of the current situation.

8. For some DNOs (WPD in mid-Wales is an example where I have direct experience) the heralded solution is Active Network Management (ANM). From 2017 all connection offers in that region will be ANM offers – requiring the developer to pay for an inter-trip (a switch) and secure communication to the network management system maintained centrally by the DNO. Under certain network conditions generators will be remotely switched off to maintain the network within safe operating parameters. As noted above, this prioritises grid resource efficiency over generation asset resource efficiency. It also acts as a further barrier to community and smaller distributed generation since the cost (met by the developer) of ANM connections will typically be another £40k. Not a problem for a 30MW wind farm but critical for a smaller community or farm-scale project.

What changes might be needed in terms of ownership, regulation, operation and investment?

9. The DNOs have neither the remit nor the appetite for distribution grid investment. Developers are utilising the legacy grid rather than invest in large-scale reinforcement themselves and planned cooperation between developers has not materialised (research by REGENSW has highlighted the barriers to a market driven investment).

10. This can probably be achieved by any one of two options, (a) public ownership of the grid in Wales, (b) modifingy existing regulation to allow a funded social enterprise to make strategic grid investments and to recoup a proportion of the investment from the existing "second comer" rules where subsequent beneficiaries of the investment pay a proportion.

Storage

How can energy storage mechanisms be used to overcome barriers to increasing the use of renewable energy.

11. Wales needs to be cautious about the use of "technological fixes" to solve structural grid constraint caused by lack of investment. Westminster and the DNOs are offering magic solutions of mass storage and active network management (see para 7 above). Battery storage will become important but we need to keep some perspective on the current state of the technology. The much-heralded TESLA battery is effectively a £2,000 wallet which holds £1 worth of electricity. The experimental vanadium ion battery on the island of Ghia cost £3m and holds about £60 worth. Batteries will have a place and although unit costs are falling the technology is not economic and still at the experimental stage. This is best left to DNOs, academic and corporate research budgets for now. But we should cooperate with externally funded trials but this is not an immediate solution.
    Energy storage *does* makes perfect sense when the energy is stored for direct use and not for later release into the grid. For example, electric vehicle batteries or electric heating of hot water in buffer tanks for domestic heating. These require intelligent energy management systems and should be supported.

Ownership

To investigate the desirability and feasibility of greater public and community ownership of generation, transmission and distribution infrastructure and the implications of such a change.

12. In conversations with DECC officials they freely acknowledge that there are market failures in the energy generation and distribution markets. The system of regulation is favouring the big 6 ESCOs and neither consumers nor the Welsh economy. The case for social ownership or state supported strategic investment in the grid has been made in para 10 above. Some large scale renewable generation also needs to be in social / mutual ownership. In para 3 above I highlight that the vast majority of money paid by consumers to support renewables has gone to foreign owned developers and their overseas investors. We have collectively failed to retain the benefits within the Welsh economy.

13. The reasons for this failure inform the proposed solution. Community projects have been too slow-footed to compete with the professional, well-financed developers who have secured the

best sites. Many of the sites for RE in Wales are on publically owned land (LA, NRW, Crown Estate) but taking the risk of site development (where the big returns are made) requires both expertise and an appetite for commercial risk that the public sector does not have.

14. I believe there is urgent need to establish a municipal / social RE development body with the aim of developing large scale projects on the public estate in Wales. This needs to be done nationally – not at the local authority level with a professional assessment of the best sites. Of course it should have been done 5 years ago when LCF support was plentiful and the best sites were available. However the scope for renewable energy in Wales is still considerable and much of the public estate is still undeveloped. There will be (even if we have to wait until 2020) a new support framework for RE and work needs to start now on securing sites and gaining permissions. Through this agency the economic benefits of development can be retained within Wales. As a municipal generator it would also have scope (if effective local supply regime was established) to offer supported tariffs for those in fuel poverty – something that the market will never provide.

Energy efficiency and demand reduction Not answered – not an area of direct experience.

Communities - making the case for change

How can communities, businesses and industry contribute to transforming the way that Wales thinks about energy?"

15. All we can say with certainty is that the present system is not working for consumers, the economic health of Wales, those in fuel poverty, or delivering on energy efficiency. But is working very well for the shareholders of the ESCOs and DNOs. I have argued that large scale RE is needed in Wales and that at least some of future development should be municipally owned. There is also a role for smaller community owned distributed generation. In particular the ESCOs have failed in delivering energy efficiency measures to the domestic market (lack of trust and conflict of interest the two main contributors). Communities have a key role to play in engaging with and delivering changes in behaviour and installation of energy saving measures. One option would be to link further support to community energy projects to commitments to deliver community based energy efficiency measures. Taking FIT out of the income equation would allow community generation projects to receive European grant funding for construction (something State Aid rule prohibit with FIT) and could come with requirements for substantive change at the householder level.

Does the answer to this challenge lie in enabling communities to take greater responsibility for meeting their future energy needs?

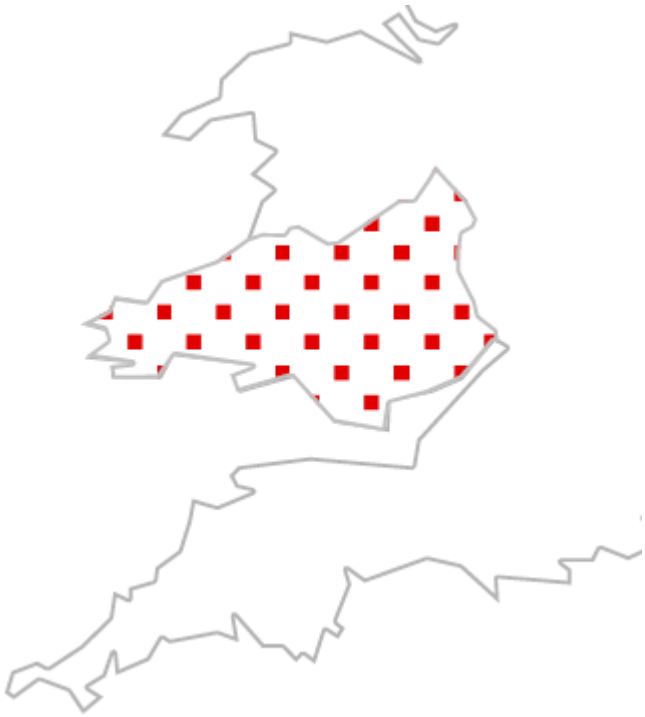
Experience with Ynni'r fro suggests that communities can't deliver the big energy projects consistently. But to meet our carbon reduction obligations and the follow the spirit of the Future Generations Bill, Wales needs to continue to develop large scale RE projects. I believe (at least some of) these projects should be socially owned (a partnership between municipal landowners, LAs and local communities) to harness the full economic benefit for Wales and potentially start to address fuel poverty through local supply. Communities do have a key role to play – developing small and medium scale projects and in particular to delivering the energy efficiency agenda.

In conclusion there are four main priorities: 1) establish a municipally owned development company for RE large-scale projects to harness wealth and start to tackle fuel poverty through direct supply; 2) continue to support distributed farm and community scale projects where electricity is used on site (and support integrated projects such as heat pumps with wind or hydro schemes); 3) Use financial support for community projects to drive community-led action on energy efficiency; 4) Ensure there is strategic investment in the distribution grid.

[i] *Energiewende Wales?*, Karen Whitfield, National Assembly for Wales Research Service

Eitem 5

Western Power Distribution holds the licence for the distribution network in South Wales. The geographic area covered is shown below:



Our response to the questions raised prior to the Environment and Sustainability Committee hearing: A Smarter Energy Future for Wales? Are below.

1. Where are the current constraints on the grid transmission and distribution network in Wales?

Distribution network issues

A map of S Wales showing the strategic circuits and which have issues associated with them is separately attached. This is also available from our website at:

https://www.westernpower.co.uk/Connections/Generation/Generation-Capacity-Map/Distributed-generation-EHV-constraint-maps.aspx

Key Limitations on WPD's South Wales networks:

- Mid Wales 66kV ring – solution either 3rd 66kV circuit or better solution new 132kV circuit into Brecon area plus network reorganisation work.
- Pembrokeshire 132kV circuits & 33kV circuits.
- Swansea North 132kV circuits (Rhos – Lampeter, Carmarthen –Llanelli, Swansea North – Ammanford – Travellers Rest – Hirwaun)
- 132kV & 33kV circuit reinforcement in Cardiff East – Aberthaw area.
- Maesteg and Llynfi valley new 66kV circuit.

- Upper Boat 33kV switchgear restrictions.

Most existing 33kV circuits across South Wales are already at a level where further generation is not possible without major reinforcement, or an alternative connection method e.g. new 33kV circuit back to a major substation.

These constraints are after taking into account both the already connected generation and also those that have accepted a connection offer but have yet to progress to connection (generally referred to as committed generation). The volume of committed generation is significant as shown in the following table:

Generation Type	Western Power Distribution - South Wales Generator Connections (MVA)			Total (MVA)
	Connected	Committed	Offered	
Photovoltaic	384.0	1,306.5	615.7	2,306.1
Wind	153.1	692.7	111.3	957.1
LandfillGas, Sewage Gas, Biogas, Waste Incineratior	41.1	26.3	3.2	70.5
CHP	1.9	15.5	5.6	23.0
Biomass & Energy Crops	1.5	71.9	76.0	149.3
Hydro, Tidal & Wave Power	16.4	16.4	0.5	33.2
Other Generation	635.0	461.3	372.0	1,468.3
Total	1,232.9	2,590.5	1,184.2	5,007.6

These need to be considered

There is likely to be some of this committed generation that does not proceed and hence use their allocated capacity. To help identify generation in this position we include 'milestones' in our connection offers which include a requirement to obtain planning consent, start and complete construction of the generation project within defined timescales. This allows us to free up capacity to allocate to other proceeding projects.

National Grid network issues

The interface between distribution networks and transmission networks is managed via a nationally regulated Connection and Use of System Code. This Code includes a 'Statement of Works' (SoW) process where the distributor informs National Grid of generation that is seeking connection and National Grid identifies any issues, and potential work needed on their network. Costs for these works are then established under a Modification Application process. A recent statement of work request by us to National Grid identified the following issues in S Wales:

1. *System Wide Specific Generator Requirement*

NG have requested that generation connecting has a Power Factor range capability of 0.95 lead/lag, with a specific requirement for non-Photovoltaic (PV) to operate at 0.95 lead and PV to operate at 0.98 lead. This requirement is associated with maintaining control of voltage on the 400kV and 275kV National Grid network which can otherwise rise above equipment rating levels.

2. *Specific Grid Supply Point (Grid Supply Points are the point of connection between Distributors and National Grid) - SGT Thermal Capacity*

• Pembroke - Generation included in the request results in overloads of 50MVA. There is some headroom for earlier connections but a Modification Application is now required.

• Based on the diversity of DG in this group National Grid are unlikely to invest in additional super grid capacity.

• Pyle – Generation included results in an overload of 90MVA. NG think that a replacement of 180MVA SGT1 with a 240MVA may be an economic solution. Modification Application required.

• Swansea North – More generation is seeking to connect than can be accommodated under even intact network conditions. There is some scope for some to connect but a Modification Application is now required.

• Upperboat 33kV – Generation included in the request results in overloads of 15MVA. A Modification Application is now required.

3. *Wider Network System Studies*

While there are potentially wider network issues, National Grid believe this can be managed. However, they require a Modification Application to ensure costs are managed in the most economical manner.

4. *Fault Levels*

The fault levels at all GSPs, with the exception of Uskmouth, were found to be within the rating of the relevant circuit breakers.

• Fault levels at Uskmouth 275kV are already at nominal rating pre-connection of any generation in this SoW. There is no headroom to connect any further DG in the Uskmouth GSP without management of generation infeed. National Grid will require Modification Application for this GSP in order to develop a process for management of fault levels in the area.

5. *Dynamic Voltage Stability*

Changes to the position of generation in the TEC register (a register maintained by National Grid of all Transmission connected generation) in response to legislation and economics are likely. Depending on this outcome, it is therefore possible that a detailed stability assessment of this part of the network will be required.

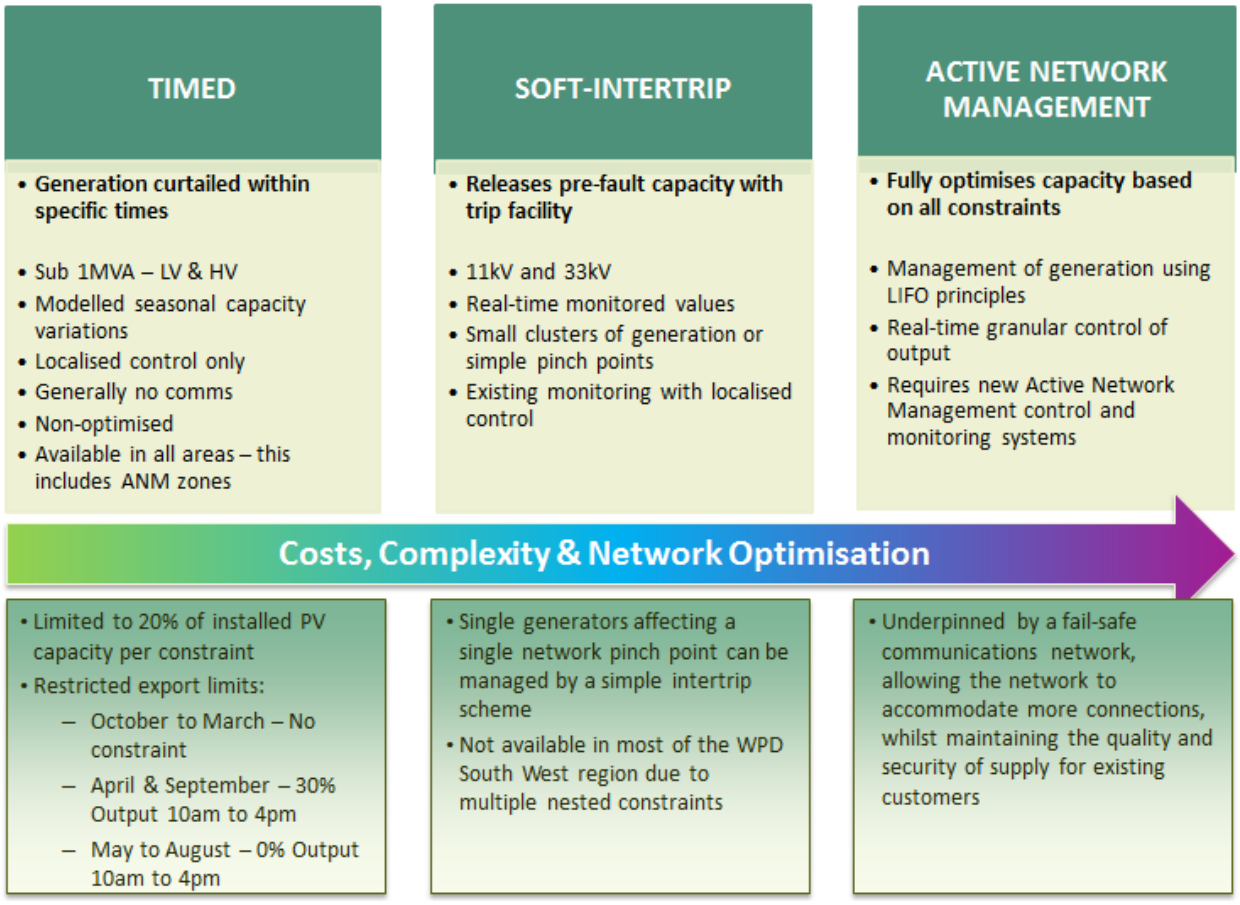
2. Where are the opportunities to exploit spare grid capacity through local generation and the development of energy parks?

Community Energy projects are often seeking to co-located generation with the local community demand. The support offered to community energy projects by WPD includes:

- Website resources including constraint maps, a capacity register and further information on the connections process are available on our website
- A specific guide to Connecting Community Energy available on our website
- Series of workshops specifically tailored for community energy schemes on how get a connection. Presentations from these events are available on our website. Further events to be held in autumn 2015 and first quarter of 2016
- Quarterly surgeries are run at WPD depots to give potential connectees an opportunity to have early discussions with an engineer to discuss on a one-to-one basis their requirements and the connection process. More information is available on our website
- Community representation on the WPD Customer Connection Steering Group

Overall. the impact of generation and demand on the network is due to the net effect of the combination of both. Hence the addition of generation that supplies existing demand can lead to the need to reinforce the upstream network as it effectively removes demand which was already helping to absorb existing generation. The co-location of both new demand and generation, where the generation output matches the demand usage has little impact on the network - to date such developments have been rare as the economics of most generation lead to either near continuous operation or for its use as a 'peak' service or emergency backup. The addition of storage can add significant flexibility, however whilst costs of storage are reducing they are not yet at a level to make storage economic in the vast majority of cases.

As most renewable generation does not have a continuous output the changing pattern of demand and generation during the day can be used to provide 'smart' connections to the network. These connection arrangement (termed 'alternative connections' by us) are available to assist lower cost connections that do not require reinforcement of the network. Alternative offers available are summarised in the following table:



The roll out program for the more advanced ANM solution is shown below (also available from our website):

GSP Group	Active BSP Group	Quoting from	Building during
Bicker fen	Skegness	Active	Active
Grendon	Corby Northampton	Active April 2016	April 2015 April 2017
Bridgwater	Bridgwater Street	Active	November 2015 November 2015
West Burton	Horncastle	April 2015	April 2016
Indian Queens	Truro	November 2015	November 2016
Swansea North	Swansea Pembroke	November 2016 November 2016	November 2017 November 2017

3. On average how long do grid connections for local renewable energy projects in Wales take to complete? How do costs compare with elsewhere in the UK and further afield?

Where reinforcement works are required, the times are very specific to the reinforcement works required. In addition where third party land is involved time is required to agree consents/access. It is therefore difficult to be specific on times for connections.

However, assuming no reinforcement is required, and consents are straight forward, then from full/initial payment and confirmation to progress the connection, typical connection times would be:-

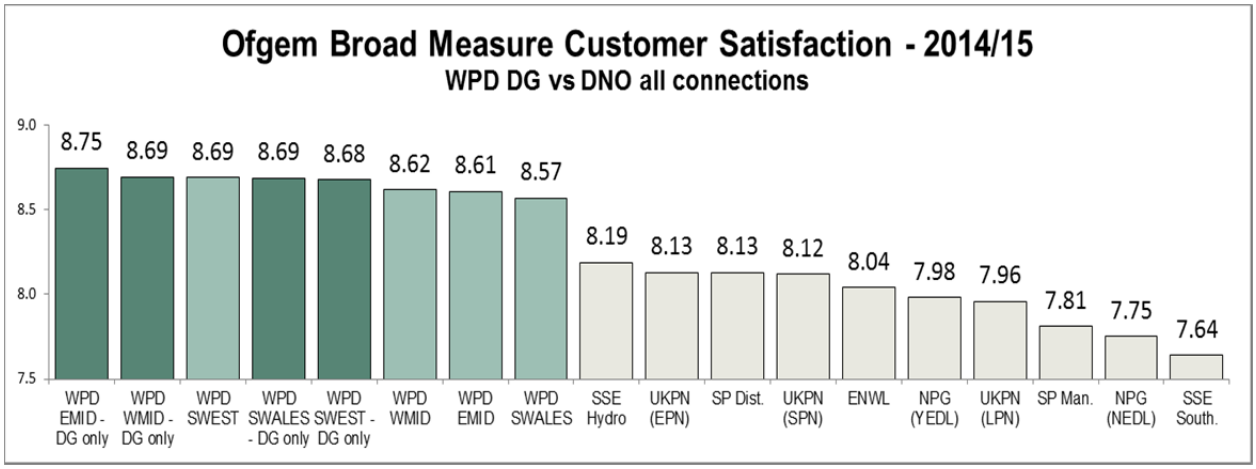
Low Voltage Connections work only - 4 to 8 weeks

Low Voltage Connections with some High Voltage works – 8 to 12 weeks

High Voltage Connections work only – 16 to 26 weeks

Extra High Voltage Connections work – 10 to 18 months (summer system access)

In terms of comparison to elsewhere in the UK, we do not have sufficient data about other DNOs to make the comparison, however we do carry out an annual satisfaction survey for DG customers including questions on both timeliness and cost. The results of this survey for 14/15 compared to a monthly survey of customer satisfaction of all connections carried out by our Regulator is below



We do not have any international comparison data. Previous historic benchmarking has proved problematic due to the differing ownership and regulatory structures.

4. What is the scope for reducing the need for grid enhancement through the local supply and siting of energy generation (plus storage)?

See response to question 2. above.

5. Smart grids – how do we encourage their development to deal with more local renewable energy supply?

Many of the elements of a smart grid either have or are being developed as part of our future networks activities. These include active network management (described above), integration of storage into network operation, demand side response trials, enhanced system monitoring, improvements in our communications solutions, dynamic asset ratings together with commercial arrangements needed to support many of these activities.

Overall national system demand and generation needs to be kept in balance on a real time basis. At present, the 'system operator' which deals with this balancing is National Grid. The actions that they take to achieve balance includes contracting with demand and generation embedded within distribution networks as well as the management via the balancing market of generation connected to the National Grid.

Going forward there are a number of drivers for DNOs to also becoming Distribution System Operators (DSOs) that take a more active role in balancing networks at a local level. These are:

- The commercial interaction between DG connected under a ANM scheme and other connected generation
- The EU Network Codes allow the Transmission System Operator to define (subject to approval by Ofgem) the envelope of reactive power flow at the boundary between DNOs and National Grid - this can probably be best achieved by control of distributed generation.
- the contracting for Demand Side Response and use of any future storage solution can be more cost effective than reinforcement
- As the amount of National Grid connected centrally dispatched generation reduces and is replaced by distributed generation, National Grid will need DNOs to forecast and control the power flows at the boundary between the two systems

Where DG is connected via an ANM scheme, they get the benefit of a faster and lower cost connection but have to accept the risk of being constrained off when there is insufficient network capacity. Whilst the expected level of constraint can be estimated based on historic information, changes to the pattern of demand and future changes to the network present an uncapped risk in terms of the degree of constraint they may see in future. Concerns have been raised by generator representatives that there needs to be a cap on the level of constraint or compensation payments made during times of constraint.

Such an arrangement would give an economic signal for the right time to undertake system reinforcement as the level of constraint payment would show when it is more economic to make an investment in further capacity. Such an arrangement will need assistance from our regulator to establish the framework we can operate in.

6. What can be done to ensure the promotion and development of smart grids?

Distributors and Transmission companies already undertake a number of projects to develop new techniques and understand how to better integrate new generation under the Network Innovation Allowance and Network Innovation Competition introduced by Ofgem.

The progress and results of these projects are widely disseminated and developments resulting in new intellectual property rights are available for all to use. We integrate learning from these projects into our business operations when we can see benefits in doing so.

7. What executive and legislative powers over the grid operation and regulation are needed to take forward this agenda?

Our existing licence encourages innovation via the Network Innovation Allowance and Network Innovation Competition together with a 'totex' approach to regulation which encourages the adoption of lower cost options. Whilst it does not prevent us from becoming a Distribution System Operator there are benefits in a common framework being applied to all DNOs and this would be best achieved via regulation or development of a Code overseen by the Regulator.

Specific areas that would need to be covered include:

- information flows between parties (DSO, TSO, Suppliers, Aggregators, generators etc.)

- market operation in terms of priority over who has access to flexibility generation, demand or storage.
- methods of determining any constraint payments (e.g. administered, bid process etc.)

The lack of a national framework is likely to result in a more fragmented process being developed and different frameworks being developed by different DNOs that will in the longer term need to be pulled together.

WESTERN POWER DISTRIBUTION

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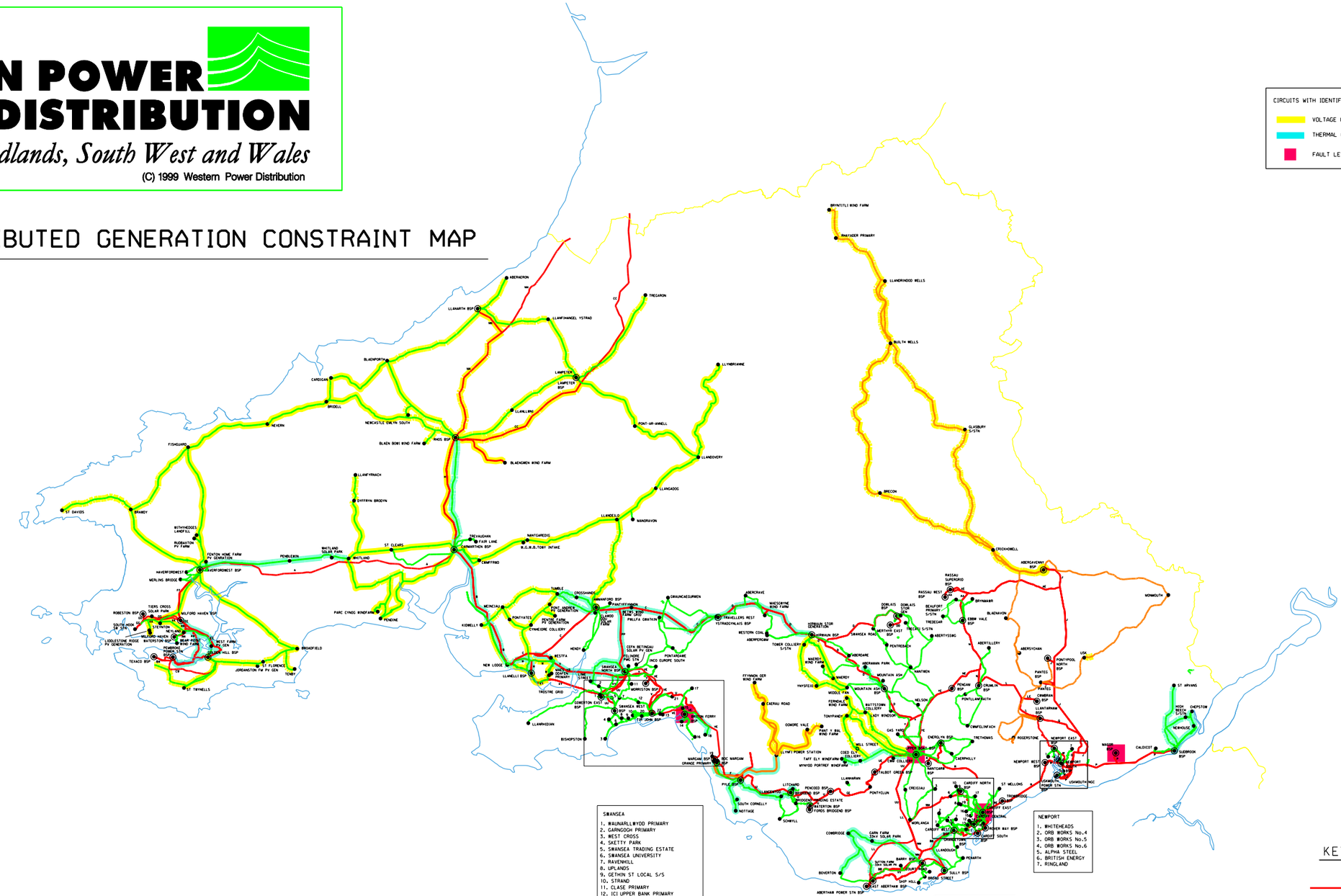
SOUTH WALES DISTRIBUTED GENERATION CONSTRAINT MAP



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Nigel Turvey

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Nigel Turvey has a BSc and Diploma in Electrical Engineering from Southampton University and is a Fellow of the Institution of Engineering and Technology. He joined SWEB (distribution part of which became WPD) on graduation, in 1985, starting as a System Development Engineer and as part of the privatisation team he worked on the development of use of system tariffs.

Following various Engineering and Commercial roles, Nigel now leads a department that develops engineering and commercial policy, designs the higher voltage networks and connections to that network, sets use of system tariffs and also maintains the overhead and underground map records. He is a member of a number of national groups developing technical, commercial and regulatory aspects of smart grids. During regulatory price reviews he has led on investment planning, innovation and smart grid strategies. He also had a major role in the acquisition and integration of both South Wales and more recently the Midlands distribution networks into WPD.

Nigel is a member of the Distribution Code Review Panel and the Power Academy Executive.