



# Minutes

## The Grid in Wales

**Presentations by Dave Roberts, EA Technology**

**Jeremy Smith, innogy Renewables UK**

**Wednesday 14 February 2018 @ 12.00pm**

**Media Briefing Room, Senedd**

# Attendees

## Assembly Members

Jenny Rathbone, AM  
John Griffiths, AM  
Llyr Gruffydd AM

Mike Hedges, AM  
Nick Ramsay, AM

## Industry Members

Angharad Davies, Cadno  
Communications  
Ben Lewis, Barton Wilmore  
Carolyn Pugsley, Freshwater  
Chris Jackson, RES  
Corbin Saunders, Liberty Renewables  
Craig Salter, Associated British Ports  
Daniel Bryant, National Assembly for  
Wales  
Daniel Patterson, ERM  
David Brown, ARUP  
David Clubb, RenewableUK

David Roberts, EA Technology  
Erin Gill, ARUP  
Fflur Lawton, Smart Energy GB  
Gareth Tucker, Seren Energy  
Gerallt Hughes, ARUP  
Gillian Pennack, ARUP  
Gwenllian Elias, Savills  
Ioan Llyr Smallwood, Tegni Ltd  
Jack Sellers, National Assembly for  
Wales  
Jennifer Pride, Welsh Government  
Jeremy Smith, innogy Renewables UK



Jonny Hewitt, Vattenfall  
Lia Murphy, Ofgem  
Lowri Kenny, Smart Energy GB  
Mabon Apgwyn, Cadno Communications  
Margaret Minhinnick, Sustainable Wales  
Mari Arthur, Cynnal Cymru  
Mark Summers, Acuity Legal Limited  
Natalie Queffurus, ARUP  
Nick Speed, Centrica  
Olivia Powis, Ofgem  
Paul Morris, EA Technology

Robert Proctor, Renew Wales/Adfywio  
Cymru  
Rosemary Grogan, RES  
Sara Powell-Davies, RenewableUK  
Sian Caiach, Llanelli Rural Council  
Simon Morgan, REG Power Management  
Steve Knowles, Cardiff Council  
Stuart Becharas, Acuity Legal Limited  
Tony Cooke, Cardiff Community Energy  
Yasmin Akbari, Freshwater

### Welcome: Llyr Gruffydd

- There's been a change in venue from the Pierhead to the Senedd to encourage more AMs to attend – extended a welcome to those in attendance and their staff members attending on their behalf.
- The theme of this meeting is the lack of grid capacity in Wales
- Presentations from Dave Roberts from EA Technology and Jeremy Smith from innogy Renewables UK

### Presentation: Dave Roberts, director of Smart Interventions, EA Technology

- EA Technology works with global power networks to improve resilience
- Dave Roberts has 17 years' experience in the industry; Cardiff University graduate who joined EA Technology seven years ago.
- Presentation outlines why things are as they are – and what some of the solutions could be, but not speaking on behalf of networking operators

### Electricity infrastructure in Wales

#### Structure

- Two distribution networks across Wales: in the north is SP Energy Networks (SP-Manweb), and in the south is Western Power Distribution.
- Grid is made up of one transmission owner (National Grid) and one regulator (Ofgem).

#### Grid Capacity

- There is network infrastructure along the north coast and the south coast, but nothing in between in mid Wales.
- The network is congested, there isn't much overlap between the two networks and this causes a challenge.
- Big topological differences between the two networks based on history, policy and practice rather than just geography.



## Generation and electricity distribution: why network operators worry about distributed generation (DG)

- UK networks are built to take power from big power stations and cascade it down to our homes.
- When generation is added in to the network, there are two main considerations: thermal and voltage

### Thermal:

- Thermal constraint is when more power is being pushed through the network and causes constraint in some areas.
- The load can affect networks away from where generation is connected, e.g. higher voltage networks
- The current has heating effects and causes overhead line networks to sag. Overhead lines are built around its safety clearances – the hotter the network the more it sags and infringes on safety clearances. Network operators will often talk about ‘thermal ratings’, which is how ‘saggy’ a network can get before it starts to infringe on safety.

### Voltage:

- Statutory limits to voltage so consumers receive voltage within certain levels. Different for different network voltages, and therefore sizes of customers (residential, commercial, industrial).
- Lots of generation into a network causes the volts to rise. A reasonable rise can be accommodated but ultimately try to manage within an envelope.

## Network resilience standards and challenges posed to the network

- One of the dominant drivers for investing is engineering recommendation known as P2/6 and that is basically the planning standard.
- The P2/6 is how much load you can potentially lose and pick back up if the power goes off.
- Drives reinforcement and investment at a higher voltage level.
- Ethos of the standard was built in 1970s but was recently adapted in approximately 2005, and another review is currently in consultation.

## Connecting generation

- The Distribution Network Operator (DNO) has three options when there is insufficient capacity for new generation.
  1. Reinforce the network:
    - Pros*
      - Releases large capacity increases
      - Future proofed
    - Cons*
      - Time consuming



- Difficulties for DNOs to justify large, strategic reinforcements
  - Developer commitment
  - Charging rules
  - Regulatory cost recovery
  - Uncertainty
  - Risk of stranded assets
  - ANOB increases cost of reinforcement
2. Constrain the generation:
- Pros*
- A cost effective alternative to reinforcement in small quantities
  - No impact on network costs to end consumers
- Cons*
- No financial recompense for generators
  - High impact on generator owners when constraints are made upon a 'Precautionary basis' or when simplistic assumptions re background generation and demand are made
3. Actively network management: this is becoming more common and is managing the network within local generation to use its capacity the most effectively.
- Pros*
- More efficient constraint
  - Smaller investment
  - Defers risk of stranded assets
  - Would automatically account for EV
  - Could dispatch storage
- Cons*
- Lack of transparency in who gets the capacity (LIFO vs Pro Rata)
  - Actual curtailment gets worse as more generation comes along
  - Comms can be a problem
  - Why would incumbent generation join in?

### How does storage fit?

- Cost of storage is dramatically reducing – down from \$1000 per kilowatt-hour in 2010 for batteries down towards \$200 per kilowatt-hour today.
- This changes the dynamics of how storage can be used and applied to the networks.
- Still many unanswered questions about the logistics e.g operation, generation and storage itself.
- Believed to become a more prevalent technology and solution.
- Echoes the previous point that if you want to get power from one place to another, you need infrastructure in place to move it as wirelessly doesn't exist yet.

### Electric vehicles



- We all know why there is a need for electric vehicles – especially with regards to the carbon targets and helping to reduce constraints - and we're starting to see real change in this direction.
- Electrification of transport and vehicle to grid technology will have more of a place in 2030.
- Debates surrounding using electric vehicles as storage mediums, as they can be moved from one place to another.
- There are fantastic opportunities but we have to be realistic around time frames.
- Vehicle to grid will have more of a place but not until at least 2030.

### Food for thought – technically feasible so why isn't it happening?

- *Barrier One: Commercial frameworks.* It isn't 'off the peg' yet – it isn't clear or consistent between network operators or generators and geography doesn't help.
- *Barrier Two: Transparency between actors.* All risks need to be understood by every stakeholder.
- *Barrier Three: Timing.* Need for a short term solution that can knit into longer term plans
- *Barrier Four: The need for enabling technology, processes and systems* Enabling technology is particularly relevant in rural mid Wales because of communications. To get systems to work you need communications systems in place to show the whole picture and all needed information.

### Presentation: Jeremy Smith, head of development strategy, innogy Renewables UK

#### Introduction

- Was asked to present on behalf of a developer's perspective.
- Purposefully kept at quite high level as DR has gone through details.
- Will cover innogy in Wales, why is grid important to developers, a developer's perspective on the Welsh grid, and the future.

#### innogy in Wales

- Four offices in Wales.
- 133 staff members.
- Currently operates more than 700 megawatts of offshore wind (three farms) and 44 megawatts of hydra power (six hydroelectric power stations) - all in north Wales.
- Currently building almost 200 megawatts of onshore – two projects in south Wales, Swansea and Carmarthenshire, starting a project in Clocaenog very soon.
- In 2016, £1million was spent on community investing funding in Wales, £7 million on Welsh supply chain.



## Why is grid important?

- *Levelised cost of energy (LCOE)* - This relates to the cost of building and operating a project over its lifetime, and you can use it to compare technologies, ie tidal lagoon, wind farm, nuclear, etc. A lower LCOE will be cheaper for UK PLC to have that technology as part of its energy mix – very important. Why is grid important in LCOE? It is a major capital cost owing to its ongoing operational maintenance costs: you pay to use the system and pay to connect.
- *Risk* - currently there are two different consenting bodies – one for planning and one for grid connection. There needs to be one decision point and not two – and also for the decision to be taken at the same time; not separated by years.
- *Access to additional revenues*: Combinations with storage could allow you to compete in those revenue streams but would need legislative change. Could compete on an in advance basis in a capacity market and provide frequency responses that could potentially give revenue streams to offset need of subsidies.
- *Timetable issues*: Part of the risk issue – don't want to consent your grid after you've consented for your windfarm.
- *Constraints* – constraints on the grid; constraints on the size of development; constraint on the generation itself. Constraining your ability to make revenue from the project.
- *WG Targets* – need grid system to help meet WG targets
- *Bills* - If LCOE is too high it affects bill payers.

## Welsh grid from a developer's perspective

- Need to learn from past mistakes – don't start a conservation in the middle of a general election.
- Positive opinion about renewable energy at a high level doesn't necessarily translate into a lack of opposition.
- Meeting the WG targets without mid Wales is going to be very difficult. We still have projects in mid Wales that we have yet to have a decision on. These equate to more than 200 megawatts of potential capacity.
- The grid in the north and south are good but both are constrained - and there's nothing in the middle. We need a massive upgrade in mid Wales if we are going to make projects viable and want to increase renewables over the next 10 to 15 years; the grid system is currently not well set up.

## Welsh grid – some frustrations

- Reactive and not proactive approach is frustrating. You could find a great site, apply for the grid and it is unavailable. This then has a knock on effect on additional costs that weren't expected, such as upgrading transformers, cables etc. Developers are responsible for these costs. Sometimes second-comers have an opportunity where they can connect within 10 years and maybe pay you back for their share. But this can't be planned for and the financial model has to work without taking this into account.



- Cost of connection - At Innogy, we do a lot of the work ourselves. Instead of asking Western Power to connect us, we'll look to consent, planning and construction ourselves because we can do it cheaper and have more control over the time frame. The problem comes as there are two decision points from two different bodies and often the decisions are made years apart. In an ideal world, we would have that entire process streamlined into one application, one decision and one consent, minimising risk and cost.
- Grid blocking - when grid applications are made and accepted but not progressed. There are steps in place with preplanning new grid connections but no process to remove older grid connections from the system..

## The Future

- The Wales Act brings a lot of questions about bringing grid connections into planning systems. Fair piece of work to be done here. Could there be compulsory purchase orders to do it cheaper and more effectively than the DNO? Should there be a separate application or combined? I'd like to see integration to streamline the entire process into one decision.
- Mid Wales grid – what's going to happen? It's not going anywhere at the moment – waiting for Westminster to decide. The national grid aren't doing any work on it and developers aren't working on their projects – everything will remain in limbo until those decisions are made.
- Still very unclear when there will be an active change over electric vehicles.
- In terms of future demand, unfortunately, at the moment, planning for grid is planning in an uncertain world. Energy policy is largely not devolved to Wales even though the planning side is. There are de-carbonisation and renewable energy targets for Wales but limited ability to get stuck into grid systems that prevents us from doing much. To see a change you need all partners to work together to come up with solutions - so perhaps those decisions should be devolved to Welsh Government.

## Questions and answers

- **Question:** *Mari Arthur, Cynnod Cymru:* I've been told you have to put in an application in Cardiff, but there's a limit on thermal supply until 2026, but not for renewables. If that is thermal from battery storage for solar PP, why does the restriction apply to battery storage of renewables but not to renewables direct?

**Response (JS):** My understanding of it is the restriction is on thermal generation until 2026 because of the cables running under the River Severn. The problem with battery storage would be when it is dispatching its electricity and their concern is, but I could be wrong, is that at times of peak demand you've got the conventional power generation that is topping up the grid. The risk is you have additional generation where the storage is also seeking to make revenue at peak times, probably because the price is the highest. There might not be a restriction on storage if you weren't seeking to export at peak times.



**Response (DR):** From a physics perspective, just talking about the mechanics of it, what you're looking at is how much head room you have between its demand curve and its rating. If there's already allocation given to the existing capacity that's given more priority over other things. But ultimately, it echoes Jeremy's point, that if you're trying to dispatch at the same time, because you're playing into a different market then that could cause different constraints.

- **Question:** *Jenny Rathbone, AM for Cardiff Central:* I'm hoping you could each talk a little more on what the Welsh Government could and should be doing to break the monopoly hold of the DNO and the national grid. They're both private companies and they're both monopoly holders, so I'm interested in your comments about connecting the grid yourselves. Surely what we need is what is similar to the system in Germany. We're stifling innovation and enterprise with the current system.

**Response (JS):** I'm aware that in Germany, some of the grid system is municipally owned which makes that easier and when we're developing projects in Germany; we don't have to worry about the grid-side as much we do in the UK. A simple thing what the Welsh Government can do, from my perspective, is to look at the way the planning system works with grid consent, making it as easy as possible for developers to consent and construct new grid connections as part of the development process, so they are less obliged to use the DNO to do it.

**Response (DR):** Germany has a myriad of different municipal distribution networks and the distribution ability of the integration of the organisations tends to be in towns and cities. Large cities will have multiple parties and that works when you've got local generation feeding to local people. There are also a small number of network operators that do exist in Germany, where you're trying to transfer power from one place to another. If you're looking to use all the power locally, that's a very different answer than if you're going to move that power somewhere else. If you are going to move it, you're looking at what the least-cost option is to do that. If that's the DNO, then it should be the DNO. If it's not, then you should be looking at other means to do that.

To answer another question is, how do you invest ahead of need when you don't have the infrastructure in place? I think the role of the Welsh Government would be to be able to say this is what we want and how we want to see it happen, therefore it would give us the confidence to allow whomever, whether it's networks, operators or private investors, to actually be able to build the infrastructure. There's currently a gridlock as no one is jumping first.

- **Question:** *Nick Speed, Centrica:* In discussions around whether we move to regional transmission distribution operators, what's the danger and what's the opportunity for Wales to make sure we end up with something that is better for us, locking in the potential for more renewables across Wales?

**Response (DR):** We need to be clear on what the end goal is and we're trying to achieve. We've spoken to companies about electric vehicle demand and we see this as





a challenge, but also an opportunity. In five years, we could see radical change in demand and that appears on the network because it's possible that half the people could decide they want an electric car. We think 2020 will be a tipping point where we see big changes. If we're trying to accommodate low carbon, high air quality vehicles to everyone, we'll need infrastructure support and it goes back to having to be clear about what your end game is. At the moment, we let the market decide and you end up with a very incremental solution which is never the right solution for the long-term.

**Response (LG):** The question here is that it's the UK Government's call to make.

- **Question:** *Sian Caiach, County Councillor for Llanelli in Carmarthenshire:* To us locals it seems like a bit of mess, you don't know how much you need and an accurate prediction could change at any time. We definitely have poor infrastructure in everything. It would be good to know how accurate are these predictions and are the policies right? Most of us feel it would be nice to have more control in Wales about what is happening in Wales. Is the generation of transition storage prediction going to happen and what sort of variation could you get? We have lots of sites among other things that are very important to us, especially with the weather changing, there's probably a lot of farms out there that aren't going to be used for local agriculture.

**Response (DR):** Predicting forecasts and forecasting with a high degree of accuracy is always going to be a very difficult thing to do. What you can do is sense check different scenarios and look at what's plausible and see any common themes that go with them. The pace is moving rapidly but there are a number of common things that can be done and we've been talking to network operators about that and how they can get more visibility of all the things happening in the locality so they can build a more strategic view rather than it being highly reactive as it is now.

**Response (JS):** We do have knowledge about when conventional power stations are coming off the system: we know there are nuclear and coal-fired power stations closing, roughly where they are and how much capacity they can provide. About a year ago, there was something like 132 terawatts of electricity generation that was needed so that needs to be replaced with predominantly low carbon generation due to the need to meet the carbon budget. Around 100 terawatts of that needs to be 'clean' given there is a clear policy drive for more renewables in the UK.

**Response (LG):** Visited Germany and they have a plan that is mapped out to a certain point. They're accepting of the fact they don't know what technologies will emerge but the plan gives a degree of certainty and clarity of policy direction.

**Response:** *Olivia Powis, Ofgem:* We have put extra incentives on the DNO to engage with customers, so please do tell them exactly what the plans are and what can be expected because there are incentives for them to forward plan their networks. While we don't want them to invest ahead of need, because we don't want stranded assets, they're able to do so if there is evidence and a concrete plan. So it is possible, but it would need all of the stakeholders involved to give them enough assurance that would justify the



---

investment, which is only possible if everyone works together in a co-ordinated approach to get a realistic plan with enough evidence to develop in that area.

- **Question:** *Fozia Aktar, Carmarthenshire County Council:* What is your commitment to local authorities and how much support are you going to give local authorities from your projects? We are the first link so we need accurate information so we can carry things forward and represent the community so it's a big step for us as a local authority.

**Response (JS):** Grid has always been politically difficult, especially at the local level and especially in mid-Wales. But there has also been opposition in Carmarthenshire. The fear of the unknown worries people – and rightly so. I think the challenge is on the developers and grid companies to take people through that process in a way that is not confrontational and as something that is not imposed, but something we need to work with them on to deliver. There are other benefits, such as community benefit funding, that might come with a project but only if we can do things better to make the grid more connected.

#### Close

LG thanked the presenters and AMs for attending, and invited suggestions for future topics for meetings from attendees.