

POFRE (Practical on farm renewable energy)
Greenmont - October 2015

What is the future for small scale renewables in Northern Ireland?

Chris Osborne
UFU Senior Policy Officer
October 2015



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Is there an alternative to Traditional Grid Connection?

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Sector already under pressure

- ETI Committee Hearings
 - October 2010
 - September 2014
- Previous UFU POFRE Presentations
- UFU Press Articles



Barriers to the uptake of small scale renewables

- Planning Permission
- Grid Connection
- Nature of support
- Third Party Pressure
- Finance



European Commissioner for Climate Action and Energy Arias Canete

- 'Energy markets and grids have to be fit for renewables, not vice versa' – Arias Canete March 2015

Five main areas which will need to be addressed in meeting the key renewable and climate change targets;

1. Decarbonising our economy with renewables
2. Investing in renewable research and innovation
3. Designing an internal energy market that works for renewables
4. Making energy efficiency and renewables work together
5. A secure supply of renewable energy.



Energy Policy

- UK government has abandoned its leadership on renewables
- Renewable subsidies withdrawn and fossil fuel industry enhanced;
- IMF data for 2014/15
 - Fossil Fuel Subsidies v Renewables Subsidies
 - UK's fossil fuel sector - £26 billion in subsidies
 - over £400 per citizen, (1.4% of UK GDP) UK defence spending is 2.1% of GDP.
 - UK's Renewables sector - £3.5 billion in subsidies



'good intentions count for nothing if we don't get the policies right' - Arias Canete



2015 – a year for bad policy decisions

- Rating Policy
- DETI Consultation - Early Closure of NIRO
- DECC Consultation - Consultation on a Review of the Feed-in Tariff Scheme



UFU Rural Enterprise Committee

- UFU letter to DARD Minister
 - REAP launched 2007
 - ASFRE (Agriculture Stakeholder Forum on Renewable Energy) 2009
 - Research-based commercialisation of Renewable Energy
 - Need for joined up government
 - Policy development should be aligned to that developed in Northern Ireland, GB and EU



UFU Rural Enterprise Committee

- REAP updated in 2010
- Renewable Energy External Stakeholder Group (REESG) was tasked with co-ordinating its delivery
 - DARD to engage proactively with all other government departments to ensure the interests of the land based sector are properly reflected in current and future energy policy
 - DARD to be aware of and help to resolve possible issues associated with access to grid, grid connection costs, achieving a grid connection
 - DARD to embed itself as a key renewable energy policy/decision maker



DARD Response to UFU Letter

- UFU disappointed
 - NIRO
 - Jonathan Bell statement
 - Rates Revaluation
 - No consultation by LPS
 - REAP
 - Training and Guidance



Lobby update

- Rating
 - Finance Minister
 - Meetings with Land and Property Service
 - Meetings with GB counterparts
 - Renewable Energy Generation Rates Relief (REGRR)



Lobby update

- Early Closure of the NIRO
 - Meeting with DETI Permanent Secretary
 - MPs Briefing
 - Consultation Response
 - UFU Response – what did we call for?
 - Member Response
- House of Lords Vote



Lobby update

- Review of the Feed-in Tariff Scheme
 - Consultation Response
 - Previous DETI statements
 - Project 40
 - Cost?
 - State Aid?
 - Energy Policy



Renewables development at a crossroads

Thursday 19th November • Titanic Belfast



What does this mean for small scale renewables in NI?

- What is the point of further work on Managed Connections?



Need for an urgent change of thinking

- More flexible access to the Grid
- Licence Considerations
- Storage solution urgently needed



AES Energy Storage

- Kilroot, Carrickfergus
- 10MW (to extend to 100MW by 2017)
- Lithium Ion Batteries
- Largest Battery-Based Energy Storage Array in United Kingdom
- Integrate local wind energy and support the grid
- Scheduled to commence end of 2015
- Balance supply and demand and support the all island transmission grid via SONI



AES Energy Storage – local success

- Balance of Plant contract - Belfast-based Scotts Electrical Services (using a variety of subcontractors from across Northern Ireland).
- Technical drawings, project management and health, safety and environmental oversight will come from Project Design Engineers Ltd from Antrim.
- Switchboard manufacturing will be undertaken by R&R Electrical Engineering from Newtownards.
- Civil Construction WC Anthony will provide all civil construction services. From Carrickfergus
- Heating, ventilation and air conditioning has been procured from AirCon in Belfast.



AES Energy Storage



Storage – The key to success

- Storage
 - Rapid Response
 - Absorbs excess generated power
 - Flexible location
 - Quick construction time
 - Match power and energy to requirement



On-farm Energy Storage

- Need to intergrate small scale renewables to the farm business
- The potential of on-farm energy storage
- Contribution it would make to load management
- Allow power delivery at specified peak times



Potential for on-farm energy storage

- Falling price of lithium ion batteries
- Use storage as an enabling technology in the absence of financial support
- Off grid or bolster weaker interconnections
 - Peak shaving



News

On-Farm Renewable Energy Storage – the future?

Management Success Factors

By its very nature, small scale renewable generation in the countryside and rural PV produces energy intermittently. While it might be possible to store energy in the form of electricity, this would be expensive and not very environmentally friendly. However, storing energy in the form of heat or gas might be a more viable option. This is the focus of the research project, which aims to explore the potential of small scale renewable energy storage in rural areas.

With its potential for the production of small scale energy storage, the research project aims to explore the potential of small scale renewable energy storage in rural areas. The project is funded by the Department of Agriculture, Food and the Marine, the Department of Enterprise, Trade and Employment, and the Department of the Environment, Heritage and Local Government.

The research project is led by the Ulster Farmers' Union and is part of a larger programme of research into rural energy storage. The project is expected to complete its work in 2018.

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LOCAL SUPPLY: OPTIONS FOR SELLING YOUR ENERGY LOCALLY

STEPHENS SCOWN AND HEDEN SW

regensw

ULSTER FARMERS' UNION

Microgrid

ULSTER FARMERS' UNION NEWS RELEASE

Date: 30 September 2014 Cycle No: 118/2014

LFU provides evidence to NI Assembly's ETI Committee on a Micro-grid

The Ulster Farmers' Union have recently presented evidence to the Northern Ireland Assembly's Enterprise, Trade and Investment (ETI) Committee on the many and varied benefits of micro-grids and their prospective role in Northern Ireland.

Speaking after the meeting, LFU Deputy President Barney Bell said: "Our evidence on micro-grids was favourably received and the ETI committee were receptive to the possibility that this could be a viable alternative for those unable to connect small scale renewable generators to the electricity grid. Micro-grids are smart geographically located networks capable of aggregating and optimising diverse small-scale renewable resources and the energy generated can then be distributed to selected customers. Working in conjunction with a local storage solution, it would allow a greater efficient use of energy and improve power quality in many instances."

Barney continued: "We acknowledge that NIE are making significant progress on Project 40 which would allow future managed interventions to the grid for a number of small scale renewable generators. However, where the need of upgrade is significant, grid connection will not be possible for many and this is where consideration should be given to a micro-grid. This concept was also put to the ETI Committee."

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Microgrid in Northern Ireland

NI: Arrivona can power...

- Tractors
- Fishing boats
- Ferries
- Strategic airports upland etc...
- Peak topping generators
- 250kW wind turbines
- Solar PV
- Agri-solar Domestic
- 2nd line tri-axial battery charging
- Ammonia production
- 300 houses + EVs oil a car to a customer base
- "So-gon" 1st test site
- Arriving to be self-sufficient in electricity
- Arriving to be a net exporter of electricity
- More than 70 + rural 33kV substations in EU

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Self Supply

Bristol Energy

- Advantages
 - Full control of purchasing and retail of electricity
 - Beneficial for larger generation projects
- Disadvantages
 - High set up costs
 - High level of risk



Private Wire

Greener for Life Energy Ltd

- Advantages
 - Avoid transmission and generation costs
 - Direct control with no intermediary supplier
- Disadvantages
 - Significant capital investment
 - Demand guarantee



Can I sell electricity to a neighbour?

- DARD Response to UFU Letter
 - “the facilitation of selling energy is for each group to consider” DARD Minister July 2015
- Permit for a Private Wire agreement
- Role for the Ulster Farmers Union



What next?

- House of Lords Vote
- UFU to meet DETI Minister
- UFU to meet DECC
- DETI reply to NIRO Consultation
- UFU to work on storage solution
- UFU to press on alternative grid arrangements



POPE (Produce on farm renewable energy)
 Envisioned February 2015

Is there an alternative to Traditional Grid Connection?

Chris Osborne
 UFU Senior Policy Officer



NI Electricity Market

- Generation (local power stations)
- Transmission (SONI)
- Distribution (NIE) } Owned by NIE
- Supply (Power NI/Airtricity, Budget Energy etc)



Congestion at 33kV

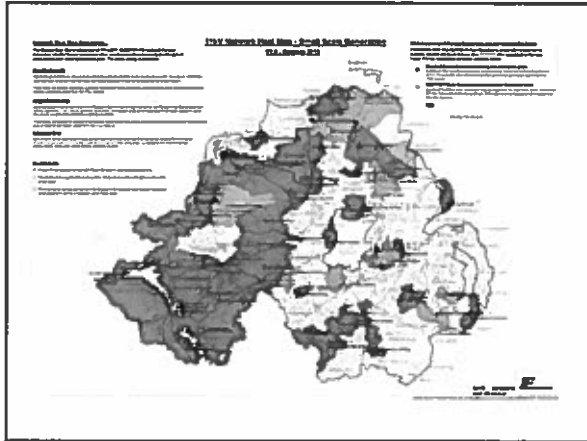
- Aggregated Volume of Applicants
- Conventional Power Flow
 - High to Low (single direction)
- Embedded Generation
 - Alters Distribution Network
 - Passive to Active Network (Reverse Power Flow)



Grid Connection – Nature of the Problem


- Saturation of the Distribution Network
 - Congestion at 11kV
 - Additional reinforcement
 - Directly chargeable to developer
 - Massive Grid Connection Costs
 - Congestion at 33kV
 - Capacity Limits Reached
 - Costs picked up by the wider consumers
 - Conditional Offers






Conditional Offers

- October 2013 – discrete lower level investment for 40 sub stations
 - Conditionality removed from 80 offers
- Backed-up applications
- Uncertainty



Utility Regulator Determination

- August 2014
 - RP5 Price Control
 - Not in public interest
- NIE had to withdraw all Conditional Offers
 - NIE communication to developers





Wider Capacity Problem

- EU Emission Directive 2016
 - Withdrawl of 510MW Ballylumford
 - Generation limits at Kilroot
- Moyle Interconnector
- Deficit of supply from 2021

Supply margin reduced from 600MW to 200MW


- Risk of power cuts

Additional capacity needed




NIE Project 40

- Initiative aimed at supporting the connection of renewables in NI in line with 2020 targets
- consult with industry
- address technical challenges
- agree and establish rules and approaches in the connection of small scale and micro-generation to the NIE network
- engage with UK DNO(S) to assess UK best practice
- alternative methods of connection



NIE Project 40

- Managed non-firm connection
- Reduced grid connection charges (no need for costly reinforcement)
- Pilot Project
- Review Statement of Charges
 - Current shallow connection charge policy
- Consultation
- Implementaion




UFUWatch News, views and analysis from the Ulster Farmers' Union

Managed Grid Connections for Small Scale Renewables

The article discusses the challenges of connecting small-scale renewables to the grid, particularly in Northern Ireland. It highlights the need for a managed non-firm connection approach to reduce costs and avoid expensive grid reinforcement. The text mentions that current connection charges are too high, leading to a significant barrier for small-scale renewable energy producers. It also notes that a pilot project is being implemented to test a new connection model, which would allow for a more flexible and cost-effective way of connecting these smaller generators to the network. The article concludes by emphasizing the importance of this initiative for meeting the 2020 renewable energy targets and supporting the growth of the renewable energy sector in Northern Ireland.

Project 40 - Current Situation

- First of its kind in UK
- Pilot
- Consultation Process
- 18/24 months away



What are Micro-Grids?

- Smart networks capable of aggregating and optimising diverse renewable energy resources.
- Operate in "island-mode" or connected to the grid (the Macro Grid).
- Combination of interconnected loads and co-located power generation sources
- Use Microgrids every day – tablets, smart phones etc



What does a Micro-Grid include?

- Generation (SCRs)
- Distribution System
- Consumption (farms and local businesses)
- Storage (crucial)
- Inverters (allow Microgrid to deliver and retrieve)



Types of Micro-grids

- Campus Institutional Micro-grids
 - i.e Princeton and Harvard (4MW to 40MW)
- Isolated Microgrids
 - Island-mode only ie Nome, Alaska (holiday homes)
- Development Microgrids
 - Developing countries (Bangladesh example)
- Military Base Microgrids
 - Physical and cyber security
- Industrial Microgrids
 - District Energy



USA – Enthusiasm for Microgrids

- Threat of cyber-terrorism
55,000 sub stations in US (only take 9 to be targeted to collapse grid)
- Extreme weather – Microgrid allows electricity distribution to be “islanded” (Hurricane Sandy)
- 4000MW installed by 2020
- SPIDERS programme
– Joint Base Pearl Harbour



Micro-Grid and Renewables

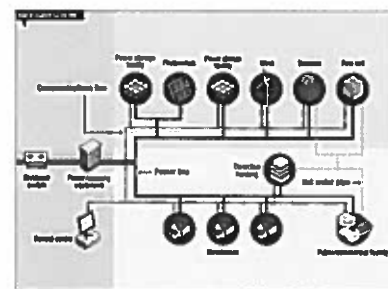
- Small scale wind
- Small scale AD
- Solar PV
- Hydro



Integration of SCRs

- Connect to Macrogrid at a single point
- Islanding will apply during an outage (back-up)
- Microgrid will facilitate integration of SCR and localise energy production

Micro-grid



Microgrids and Macrogrid interaction

Microgrids with Macrogrid interconnection;

- Improve system economics
- Improve operation
- Improve availability

Tools, strategies and techniques for an effective integration of a microgrid into the macrogrid:

- Net metering – bi-directional power flow.
- Peak shaving technology
- Advanced communications and controls
- Demand Response technology



Storage – The key to success

- Storage
 - Rapid Response
 - Absorbs excess generated power
 - Flexible location
 - Quick construction time
 - Match power and energy to requirement



Funding

- Rural Development
 - €8 billion underspent for 2014
 - Economic, Social and Territorial (Sub-Heading 1B)
 - Sustainable Growth and Natural Resources (Heading 2)
- INTEREG (funded through ERDF)
 - innovation and the knowledge economy, environment and risk prevention



Security of Supply

- Security of supply
 - Smart Switches
 - Intelligence
 - Automation
 - Local Generation
 - Ability to “Island”



Security

- Circuit Breaker Protection is crucial
- Security (as opposed to security of supply)
- Physical Security – protect circuit breakers and controls
- Cyber Security – controls designed into the system
- Classic Security – access management etc included in the Microgrid Security Programme.
- Independent security management is crucial



Advantages of Micro-Grids

- Operate as a single collective load within the existing power system
- Incorporate renewable energy/heat
- Reduce grid congestion
- Community owned/community solution
- Allow load prioritisations (better energy management)
- Customise energy needs of local communities



Advantages of Micro-Grids

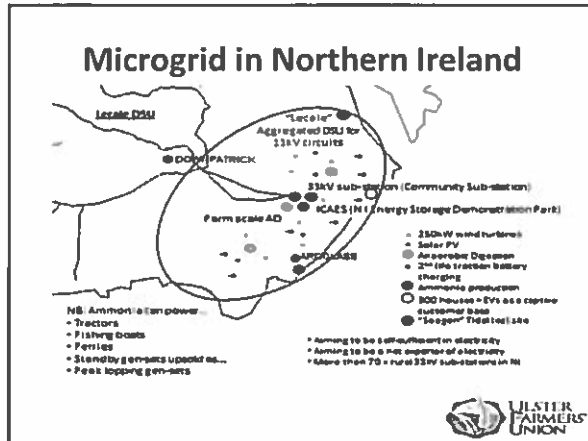
- Create revenue by selling excess energy (wholesale market access) – when not “Islanded”
- Avoid peak energy costs (peak load reduction)
- Carbon emission reduction
- Future proof (reduce reliance upon traditional centralised fossil power stations)
- Job creation
- AVOIDED COSTS
 - No costly sub-station upgrade (transformer changes/33kv upgrade)



Challenges

- Infancy of Micro-grids
 - Technology challenges (limits to near-time Economies of Scale)
- Move away from centralised conventional generation to local power
- Regulator/DNO barriers
- Change thinking to allow design and construction of local power systems which meet exact needs to consumers (Zero-Net Energy)
 - Move from a supply-side infrastructure to “the other side of the metre” (Bottom up approach)





ULSTER FARMERS' UNION NEWS RELEASE

Date: 30 September 2014

Cycle No: 1182914

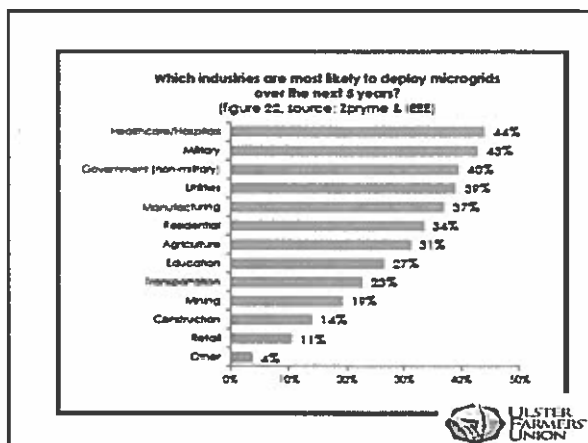
UFU provides evidence to NI Assembly's ETI Committee on Micro-grid

The Ulster Farmers' Union have recently presented evidence to the Northern Ireland Assembly's Enterprise, Trade and Investment (ETI) Committee on the theory and merits behind micro-grids and their prospective role in Northern Ireland.

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Next Steps

- Work on Project 40 will continue
- Engage with NIE/Utility Regulator
- FIT for small scale renewables
- Pilot scheme
- LECALE and DDFRE
- Funding
- Cost of failure – c.£20m

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POFHE

Enmsa:11en - february 2014

Northern Ireland Small Scale Renewables


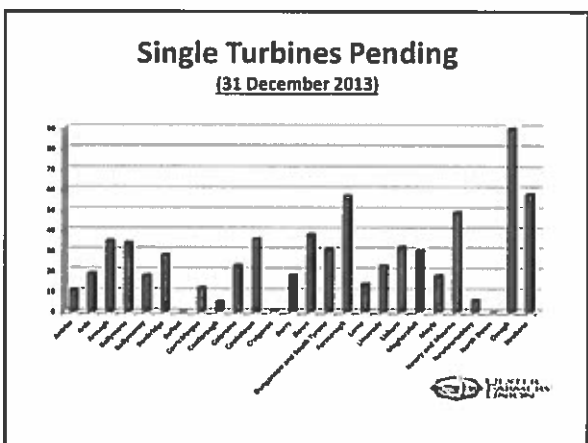
Barriers and Opportunities

"time to think outside the box"




Barriers

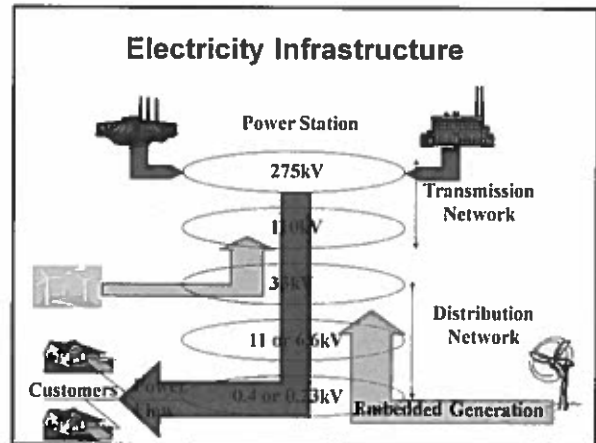
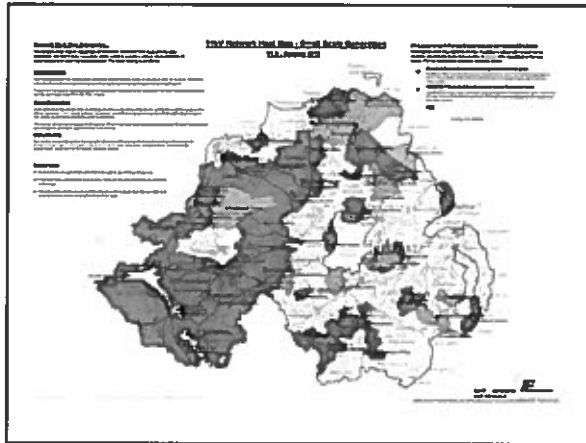
- Planning
- Future of NIROCs
- Grid Connection

Future of NIROCs


- 1 April 2015 – Review of small scale banding levels
- 31 March 2017 – NIROCs close for small scale renewables
- FIT for Small Scale Generation






Grid Connection – Nature of the Problem

- Congestion at 11kV
- Balance demand and supply (generated capacity = load)
- Insufficient Peak Capacity and Reserve Capacity Needed
- Congestion at 33kV




Congestion at 33kV

- Aggregated Volume of Applicants
- Conventional Power Flow
 - High to Low (single direction)
- Embedded Generation
 - Alters Distribution Network
 - Passive to Active Network (Reverse Power Flow)



Grid – nature of problem

- Generated capacity to match the load
- Small Scale - equilibrium met through the control of loads as well as a generation
- Connecting embedded generation to the distribution network means that voltage cannot rise above specified levels.
 - capacity is soon reached
 - expensive upgrade of lines is only way to manage this accommodate new generation and keep to safe levels



Grid Connection


Parts of 11kV/33kV full to capacity

Conditional offers

- Utility Regulator
- Non-chargable network reinforcement

Update


- £2.3m for investment October 2013
- Covers 40 primary sub stations
- 30+ others – Competition Commission



Grid - 5 Solutions


5 possible solutions

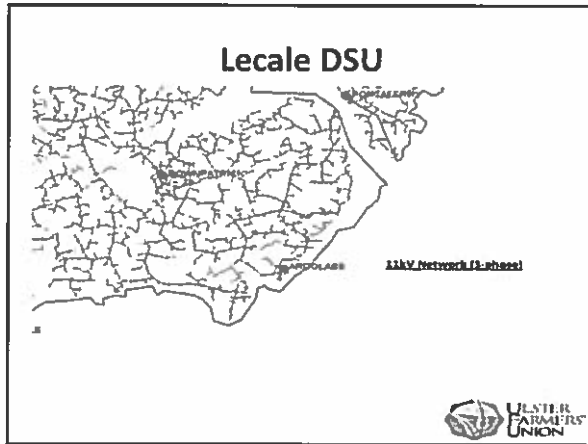
1. Investment in upgrading grid (RP5/RP6)
2. Procurement of additional short term capacity
3. Active Network Management - Curtailment
4. Reassess Grid Connection Policy
5. Microgrid Solution




Time to think outside of the box - Microgrid and Storage Solution in SE Down

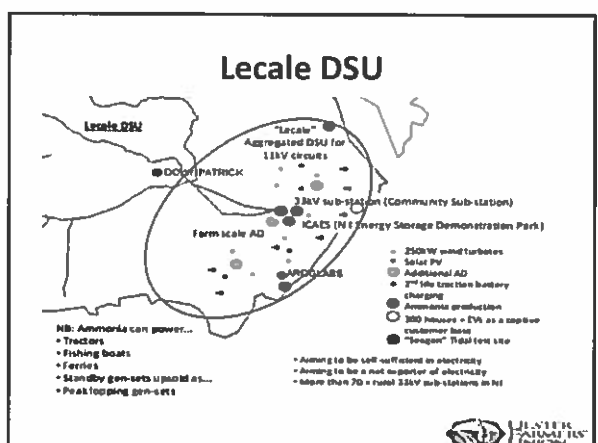
The headline of the newspaper clipping is "Time to think outside of the box - Microgrid and Storage Solution in SE Down". The article discusses the challenges of the electricity grid and proposes microgrids and storage as solutions. It mentions that the grid is becoming more congested and that traditional methods of managing it are no longer sufficient. The article highlights the potential of microgrids to provide local power and storage, reducing the strain on the main grid. It also mentions that this solution is particularly relevant in the Southeast of Down (SE Down) region.





- ### Lecale DSU
- NI's first Microgrid
 - SEM Model for DSUs
 - Mixture of renewable technologies
 - Wind
 - Solar PV
 - Tidal (SEAGEN @ Portaferry)
 - On-farm AD
 - Energy Storage Park
 - Ammonia Production
-

- ### Outside the Box
- Utilisation
 - Use generated energy differently
 - Are ROCs/FITs the correct driver?
 - Utilisation of excess energy
-



Load Management

- Local Level Demand Response
 - Storage (to achieve load control)
 - Alternative to Curtailment
 - Community Based Electricity Demand Side Solution
- No one-size fits all
Improve locational efficiency



Micro-Grid Revenue Stream

- Sell output to local consumers
- Arbitrage – Buy at £20-£30/MWhr
 - Sell at £80-£250/MWhr
- Community Based Electricity Demand Side Solution



Ancillary benefits of micro grid solution

- Reactive Power Management
- Voltage Regulation

Storage - Advantages

- Rapid Response
- Absorbs excess generated power
- Flexible location
- Quick construction time
- Match power and energy to requirement



Storage - Issues

- No regulatory or licencing policy (yet)
- No government policy for deployment/storage adoption



Storage – Policy Requirements

- A Government Target ie 2GW by 2020
- Parity of support (certainty of income)

UFU Policy Review

The four tools for system balancing



Ammonia

- Excess wind will be converted to hydrogen
 - via electrolysis
 - reacted with scrubbed nitrogen
 - to produce ammonia
 - liquefied for storage
 - burnt into "gen-sets"
 - Peak-Topping service (manage load)



Uses for Ammonia

- Ammonia can power-
 - Fishing trawlers
 - Ferries
 - Tractors

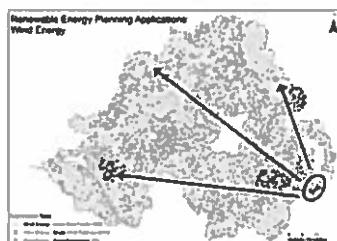
Advantages of Intelligent Energy System Solution

- Deal with predicted grid outages in 2016
- Remove the Grid Connection barrier.
- Possible community solutions – farms join together in a micro-grid arrangement
- Storage



Lecale DSU

Small wind planning applications



Wider Capacity Problem

- EU Emission Directive 2016
 - Withdrawal of 510MW Ballylumford
 - Generation limits at Kilroot
- Moyle Interconnector
- Deficit of supply from 2021
Supply margin 600MW to 200MW
- Risk of power cuts
250MW additional capacity needed



Outlook

New view required on needs of the energy market

- New generation strategies
- Innovative technologies

Needed to deliver reliable, cost-effective energy to the end consumer

- Different way to manage demand and supply of generated renewable energy
- Security of supply



Popee

9 Kennant - October 2013

Northern Ireland Small Scale Renewables

Policy challenges and opportunities

A landowner perspective



UFU Policy Review

- Targets and Policy
- RHI
- Solar PV
- Policy
- Future of NIROCs
- Wind
- Grid Connection
- Future Policy Direction

Northern Ireland Renewable Energy Targets

20% - all EU energy consumption

40% - Northern Ireland - Electricity
Consumption

10% - Northern Ireland - Heat consumption



Re-cap of RHI

- Non-Domestic Phase One - November 2012
- Renewable Heat Premium Payment (RHPP) - May 2012
- Phase Two - Consultation closed 14 October
 - Extension of non-domestic
 - Domestic RHI



Key differences between NIRHI and GB

- NIRHI started later
- No consultation on cost control
- Smaller budget
- Tariffs lower (oil cost comparison rather than gas)



Technology	Scale (kWth)	Tariff (p/kWh)
Biomethane injection	All scales	7.3 (3.1 NI)
Biogas combustion	Sub 200	7.3 (3.1 NI)
Biomass boilers	Sub 200	Tier 1 8.6
		Tier 2 2.2
NI = 6.4p / 6.1 / 1.5 different size thresholds (smaller)	200-999	Tier 1 5.3
		Tier 2 2.2
Ground source heat pumps	Sub 100	4.8 (8.7 - 4.4 NI)
	100 +	3.5 (1.3 NI)
Solar thermal	Sub 200	9.2 (8.8 NI)



NIRHI Phase Two Consultation

- Closed 14 October
- Domestic RHI to be available to farmhouses
 - Ambiguity
 - Farmhouses accredited under non-domestic will continue
 - New installation going into dwellings with Rating Classification "House Agricultural" - DOMESTIC



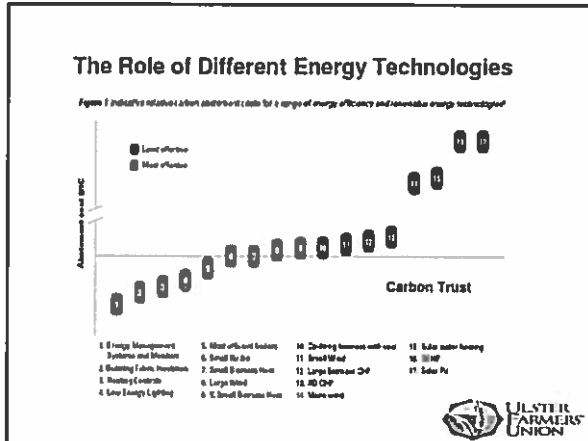
Solar PV

Questions to ask before signing a contract

- How long has the company been in business?
- Option agreement
- Grid connection (relationship with NIE)
- Site screened correctly?
- Exclusivity
- Level of capital available
- Install and maintain
- Clear and transparent framework?

Voluntary Code of Practice





Incentive or Obligation?

- Rush for 4 ROCs
- Most efficient use of renewable energy?

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Future of NIROC Support

- Green Tax Review
- Electricity Market Reform
 - NIROCs will cease 2017
 - Extend NIRO life span to 2037
 - Move to long term contracts or CfD Feed-In Tariffs for >5MW
 - Small scale FITs


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Real 2012 prices	Gas bill	Electricity bill	Energy bill
Wholesale energy cost	£383 (55%)	£215 (37%)	£597 (47%)
Network costs	£124 (18%)	£133 (23%)	£257 (20%)
Other supplier costs and margin	£119 (17%)	£121 (21%)	£240 (19%)
Energy and climate change policies	£33 (5%)	£80 (14%)	£112 (9%)
ECO ²⁰¹²	£25 (4%)	£22 (4%)	£47 (4%)
RO	-	£30 (5%)	£30 (2%)
EU ETS	-	£8 (1%)	£8 (1%)
CPF	-	£5 (1%)	£5 (0%)
Warm Home Discount	£6 (1%)	£8 (1%)	£11 (1%)
FITs	-	£7 (1%)	£7 (1%)
Smart Meters & Better Billing	£2 (0%)	£1 (0%)	£3 (0%)
VAT (5%)	£33 (5%)	£27 (5%)	£60 (5%)
Total (no Warm Home Discount rebate)	£891	£576	£1,267
Average rebate (inc VAT)	-	-£13	-£13
Total (with rebate)	£891	£563	£1,255

Source: DECC 2013. Figures may not add due to rounding

Northern Ireland Renewable Energy Targets


- 20% - all EU energy consumption
- 40% – Northern Ireland – Electricity Consumption
- 10% - Northern Ireland – Heat consumption



NI Capacity


Total Installed Generation 3264MW (2012)

Conventional Generation 2336MW
Interconnection (Moyle) 450MW
Total Installed Renewable Generation 478MW
(487MW is large wind and 30MW is small scale)




Large Scale Wind

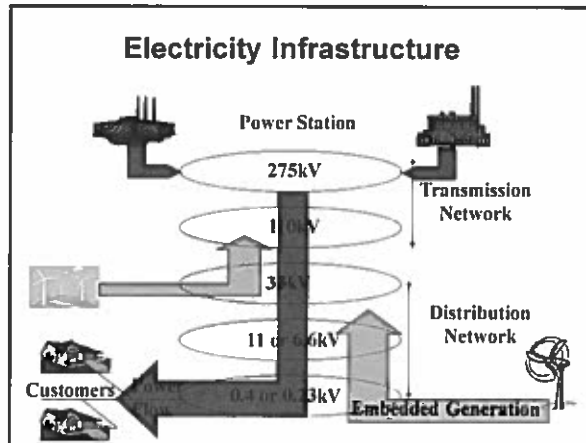
- 295 turbines operational
- 487.34MW project capacity
- 221 turbines consented
- 559.05MW project capacity
- TOTAL = 1,147.04MW



Small Scale Wind

- 2013 – 25MW
- 2014 – 55MW
- 2020 – 116MW?
- (SONI/EirGrid All Island Generation Capacity Statement 2013-2022)





Capacity Issues

- 60% of UK electricity due to shut
 - Closure of Ballylumford B (possible derogation on emissions - unlikely)
- OR (scoping study end of 2013 on investment in boiler units)
- IED restrictions on Kilroot (capacity restrictions)
- New generating capacity needed to avoid black outs



Grid Connection

- Massive variations in costs
- When it becomes financially unviable
- Inaccurate information
 - Time Scale
 - Grid Connection Cost
 - NIE interaction



Grid Connection

Parts of 11kV/33kV full to capacity

- Conditional offers
 - Quote for connection
 - Non-chargable network reinforcement
 - NIAUR
- Update
 - £2.3m for investment
 - Covers 40 primary sub stations
 - Facilitate export from 11 to 33kV (reverse power flow)



Grid Connection

3 possible solutions

1. Investment in upgrading grid (RP5/RP6)
2. Procurement of additional short term capacity
3. Reassess Grid Connection Policy
4. Intelligent Energy Solution



Intelligent Energy System Solution

- Matrix Sustainable Energy Horizon Panel
- Intelligent Energy Solution
 - Distributed Generation is an alternative to Centralised generation.
 - Distributed generation will improve local security of supply.
 - Improvements in LOAD CONTROL and STORAGE means this could form part of a Intelligent Energy Solution.



Intelligent Energy System Solution

- Deal with predicted grid outages in 2016
- Remove the Grid Connection barrier.
- Possible community solutions – farms join together in a micro-grid arrangement
- Storage



Storage

- Power-to-Gas
- Lithium electricity storage
- Solar power storage
- Compressed Air Storage



Distributed Generation

- Different way to manage demand and supply of generated renewable energy
- Improve incorporation of alternative generations sources
 - ability to "switch-on" controllable site-loads ie water heating, electric vehicles which charged during windy periods



Compressed Air Storage System (CAES)

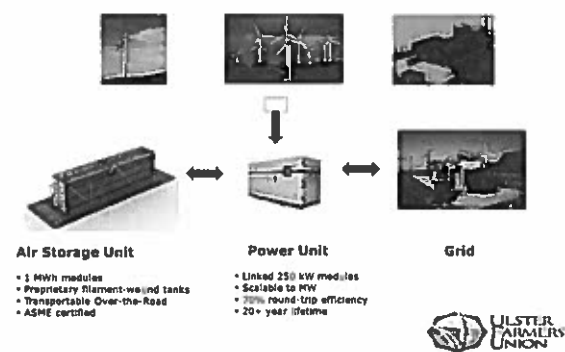
What is CAES Technology?

- store energy generated at one time for use at another.

Air storage can be adiabatic, diabatic or isothermal



Compressed Air Energy Storage (CAES)



Outlook

New view required on needs of the energy market

- New generation strategies
- Innovative technologies

Needed to deliver reliable, cost-effective energy to end consumer.

- Security of supply

Role for land-based sector.



PofRE

Greenmount October 2014

Northern Ireland Small Scale Renewables

Policy challenges and opportunities

A landowner perspective



UFU Policy Review

- Targets and Policy
- RHI
- Solar PV
- Policy
- Future of NIROCs
- Wind
- Grid Connection
- Future Policy Direction

Northern Ireland Renewable Energy Targets

20% - all EU energy consumption

40% – Northern Ireland – Electricity
Consumption

10% - Northern Ireland – Heat consumption



Re-cap of RHI

- Non-Domestic Phase One – November 2012
- Renewable Heat Premium Payment (RHPP) – May 2012
- Phase Two – Consultation closed 14 October
 - Extension of non-domestic
 - Domestic RHI



Key differences between NIRHI and GB

- NIRHI started later
- No consultation on cost control
- Smaller budget
- Tariffs lower (oil cost comparison rather than gas)



Technology	Scale (kWth)	Tariff (p/kWh)
Biomethane injection	All scales	7.3 (3.1 NI)
Biogas combustion	Sub 200	7.3 (3.1 NI)
Biomass boilers	Sub 200	Tier 1 8.6
		Tier 2 2.2
NI = 6.4p / 6.1 / 1.5 different size thresholds (smaller)	200-999	Tier 1 5.3
	1000+	Tier 2 2.2
Ground source heat pumps	Sub 100	4.8 (8.7 - 4.4 NI)
	100+	3.5 (1.3 NI)
Solar thermal	Sub 200	9.2 (8.8 NI)



NIRHI Phase Two Consultation

- Closed 14 October
- Domestic RHI to be available to farmhouses
 - Ambiguity
 - Farmhouses accredited under non-domestic will continue
 - New installation going into dwellings with Rating Classification "House Agricultural" - DOMESTIC



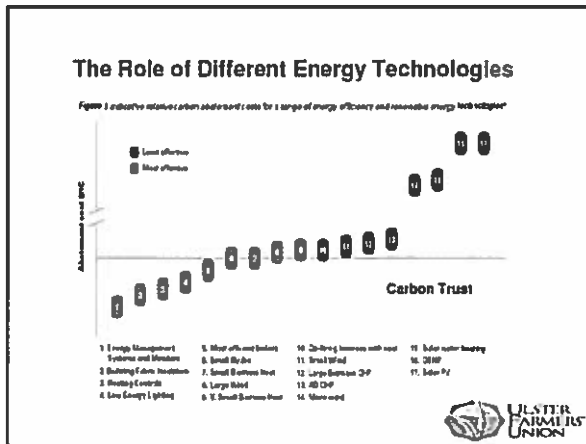
Solar PV

Questions to ask before signing a contract

- How long has the company been in business?
- Option agreement
- Grid connection (relationship with NIE)
- Site screened correctly?
- Exclusivity
- Level of capital available
- Install and maintain
- Clear and transparent framework?

Voluntary Code of Practice





Incentive or Obligation?

- Rush for 4 ROCs
- Most efficient use of renewable energy?

ULSTER FARMERS UNION

Future of NIROC Support

- Green Tax Review
- Electricity Market Reform
 - NIROCs will cease 2017
 - Extend NIRO life span to 2037
 - Move to long term contracts or CfD Feed-In Tariffs for >5MW
 - Small scale FITs

ULSTER FARMERS UNION

Real 2012 prices	Gas bill	Electricity bill	Energy bill
Wholesale energy cost	£383 (55%)	£215 (37%)	£597 (47%)
Network costs	£124 (18%)	£133 (23%)	£257 (20%)
Other supplier costs and margin	£119 (17%)	£121 (21%)	£240 (19%)
Energy and climate change policies	£33 (5%)	£80 (14%)	£112 (9%)
ECO ¹¹¹	£25 (4%)	£22 (4%)	£47 (4%)
RO	-	£30 (5%)	£30 (2%)
EU ETS	-	£8 (1%)	£8 (1%)
CPF	-	£5 (1%)	£5 (0%)
Warm Home Discount	£8 (1%)	£8 (1%)	£11 (1%)
FITs	-	£7 (1%)	£7 (1%)
Smart Meters & Better Billing	£2 (0%)	£1 (0%)	£3 (0%)
VAT (5%)	£33 (5%)	£27 (5%)	£60 (5%)
Total (no Warm Home Discount rebate)	£691	£576	£1,267
Average rebate (inc VAT)	-	-£13	-£13
Total (with rebate)	£691	£563	£1,255

Source: DECC 2013. Figures may not add due to rounding

Northern Ireland Renewable Energy Targets

- 20% - all EU energy consumption
- 40% – Northern Ireland – Electricity Consumption
- 10% - Northern Ireland – Heat consumption



NI Capacity

Total Installed Generation 3264MW (2012)

- Conventional Generation 2336MW
- Interconnection (Moyle) 450MW
- Total Installed Renewable Generation 478MW
(487MW is large wind and 30MW is small scale)



Large Scale Wind

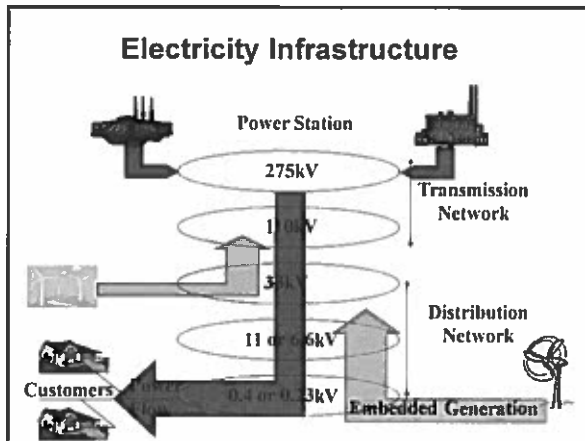
- 295 turbines operational
- 487.34MW project capacity
- 221 turbines consented
- 559.05MW project capacity
- TOTAL = 1,147.04MW



Small Scale Wind

- 2013 – 25MW
- 2014 – 55MW
- 2020 – 116MW?
(SONI/EirGrid All Island Generation Capacity Statement 2013-2022)





Capacity Issues

- 60% of UK electricity due to shut
 - Closure of Ballylumford B (possible derogation on emissions - unlikely)
- OR (scoping study end of 2013 on investment in boiler units)
 - IED restrictions on Kilroot (capacity restrictions)
- New generating capacity needed to avoid black outs



Grid Connection

- Massive variations in costs
- When it becomes financially unviable
- Inaccurate information
 - Time Scale
 - Grid Connection Cost
 - NIE interaction



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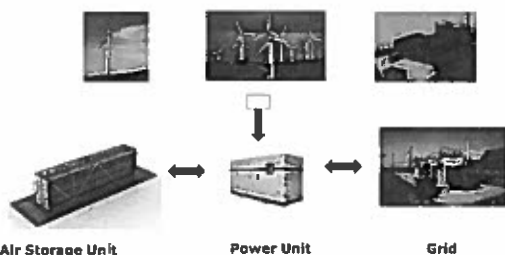
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Compressed Air Energy Storage (CAES)



- Air Storage Unit**
- 1 MWh modules
 - Proprietary filament-wound tanks
 - Transportable Over-the-Road
 - ASME certified

- Power Unit**
- Linked 250 kW modules
 - Scalable to MW
 - 70% round-trip efficiency
 - 20+ year lifetime



Outlook

New view required on needs of the energy market

- New generation strategies
- Innovative technologies

Needed to deliver reliable, cost-effective energy to end consumer.

- Security of supply

Role for land-based sector.



Is there an alternative to Traditional Grid Connection?

Chris Osborne
UFU Senior Policy Officer



NI Electricity Market

- Generation (local power stations)
- Transmission (SONI)
- Distribution (NIE) } Owned by NIE
- Supply (Power NI/Airtricity etc)



Congestion at 33kV

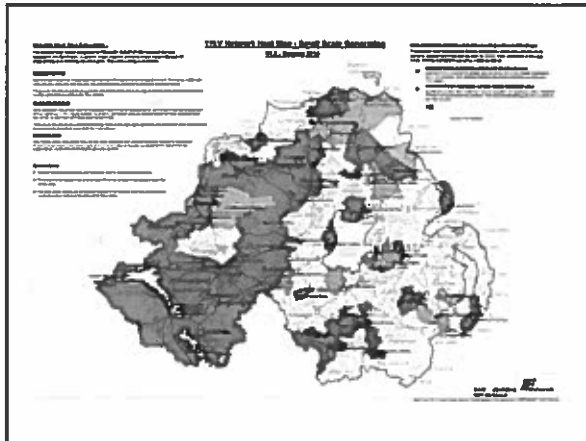
- Aggregated Volume of Applicants
- Conventional Power Flow
 - High to Low (single direction)
- Embedded Generation
 - Alters Distribution Network
 - Passive to Active Network (Reverse Power Flow)



Grid Connection – Nature of the Problem

- Saturation of the Distribution Network
- Congestion at 11kV
 - Additional reinforcement
 - Directly chargeable to developer
 - Massive Grid Connection Costs
- Congestion at 33kV
 - Capacity Limits Reached
 - Costs picked up by the wider consumers
 - Conditional Offers





Conditional Offers

- October 2013 – discrete lower level investment for 40 sub stations
 - Conditionality removed from 80 offers
- Backed-up applications
- Uncertainty



Wider Capacity Problem

- EU Emission Directive 2016
 - Withdrawal of 510MW Ballylumford
 - Generation limits at Kilroot
 - Moyle Interconnector
 - Deficit of supply from 2021
- Supply margin reduced from 600MW to 200MW
- Risk of power cuts
- Additional capacity needed



Utility Regulator Determination

- August 2014
 - RP5 Price Control
 - Not In public interest
- NIE had to withdraw all Conditional Offers
 - NIE communication to developers



NIE Project 40

- Initiative aimed at supporting the connection of renewables in NI in line with 2020 targets
- consult with industry
- address technical challenges
- agree and establish rules and approaches in the connection of small scale and micro-generation to the NIE network
- engage with UK DNO(S) to assess UK best practice
- alternative methods of connection



NIE Project 40

- Managed non-firm connection
- Reduced grid connection charges (no need for costly reinforcement)
- Review Statement of Charges
 - Current shallow connection charge policy
- Consultation
- Improved and interactive Heat Map



Current Situation

- Application withdrawn and applicant wants to keep their application live
 - NIE will retain the position of the relevant applicants in the "connection queue"
- Statement of Charges is completed, no need to re-apply for a connection offer and one will be issued automatically on the basis of the initial application



Cost of Failure

- Missed Opportunity
- EU/NI Executive Renewable Targets
- £20m in lost money



What are Micro-Grids?

- Smart networks capable of aggregating and optimising diverse renewable energy resources.
- Operate in "Island-mode" or connected to the grid.
- Combination of interconnected loads and co-located power generation sources



What does a Micro-Grid include?

- Generation
- Distribution System
- Consumption
- Storage



Types of Micro-grids

- Campus Institutional Micro-grids
 - i.e Princeton and Harvard
 - 4MW to 40MW
- Remote "Off-Grid" Micro-grids
 - Island-mode only
 - Nome, Alaska
- Military Base Microgrids
 - Physical and cyber security



USA – Enthusiasm for Microgrids

- Threat of cyber-terrorism
 - 55,000 sub stations in US (only take 9 to be targeted to collapse grid)
- Extreme weather – Microgrid allows electricity distribution to be "islanded" (Hurricane Sandy)
- 4000MW installed by 2020
- SPIDERS programme
 - Joint Base Pearl Harbour

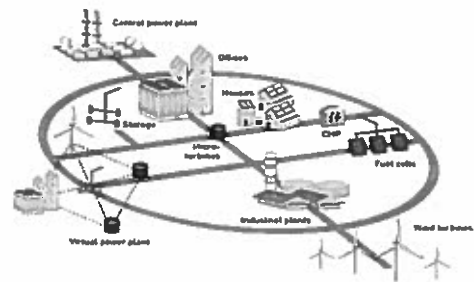


Micro-Grid and Renewables

- Small scale wind
- Small scale AD
- Solar PV
- Hydro



Micro-grid



Storage – The key to success

- Storage
 - Rapid Response
 - Absorbs excess generated power
 - Flexible location
 - Quick construction time
 - Match power and energy to requirement



Funding

- INTEREG
- Rural Development
- Private Finance



Security of Supply

- Security of supply
 - Smart Switches
 - Intelligence
 - Automation
 - Local Generation
 - Ability to “Island”



Security

- Circuit Breaker Protection is crucial
- Security (as opposed to security of supply)
- Physical Security – protect circuit breakers and controls
- Cyber Security – controls designed into the system
- Classic Security – access management etc included in the Microgrid Security Programme.
- Independent security management is crucial



Advantages of Micro-Grids

- Operate as a single collective load within the existing power system
- Incorporate renewable energy/heat
- Reduce grid congestion
- Community owned/community solution
- Allow load prioritisations (better energy management)
- Customise energy needs of local communities



Advantages of Micro-Grids

- Create revenue by selling excess energy (wholesale market access) – when not “Islanded”
- Avoid peak energy costs (peak load reduction)
- Carbon emission reduction
- Future proof (reduce reliance upon traditional centralised fossil power stations)
- Job creation
- AVOIDED COSTS
 - No costly sub-station upgrade (transformer changes/33kv upgrade)



Challenges

- Infancy of Micro-grids
 - Technology challenges (limits to near-time Economies of Scale)
- Move away from centralised conventional generation to local power
- Regulator/DNO barriers
- Change thinking to allow design and construction of local power systems which meet exact needs to consumers (Zero-Net Energy)
 - Move from a supply-side infrastructure to “the other side of the metre” (Bottom up approach)



Next Steps

- Work on Project 40 will continue
- Engage with NIE/Utility Regulator
- FIT for small scale renewables
- Pilot scheme?
- LECALE and DDFRE
- Funding

