

**Can alternative connection
arrangements with Distribution
Network Operators increase the
installation of hydro
generation?**



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Presentation will cover:

- ◆ Background to alternative connections
- ◆ Types of Alternative Connections Available
- ◆ Barriers to Alternative Connections
- ◆ Future of Alternative Connections



Why are there constraints on the network?

“A constraint arises when power cannot be transmitted to where it is needed, usually due to congestion at one or more points on the transmission network”

(National Grid, 2017)



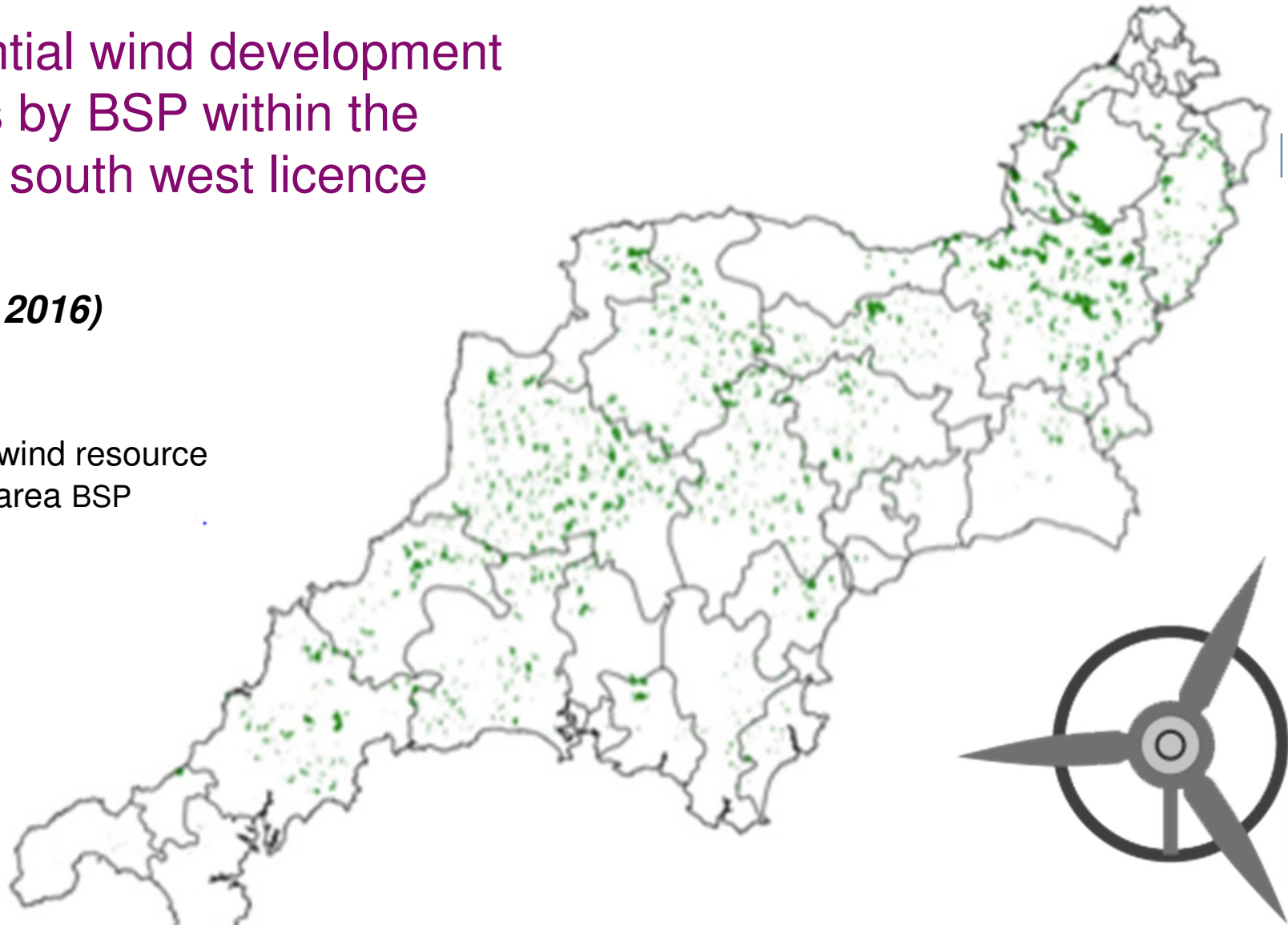
Do we need more renewable energy?

Potential wind development areas by BSP within the WPD south west licence area

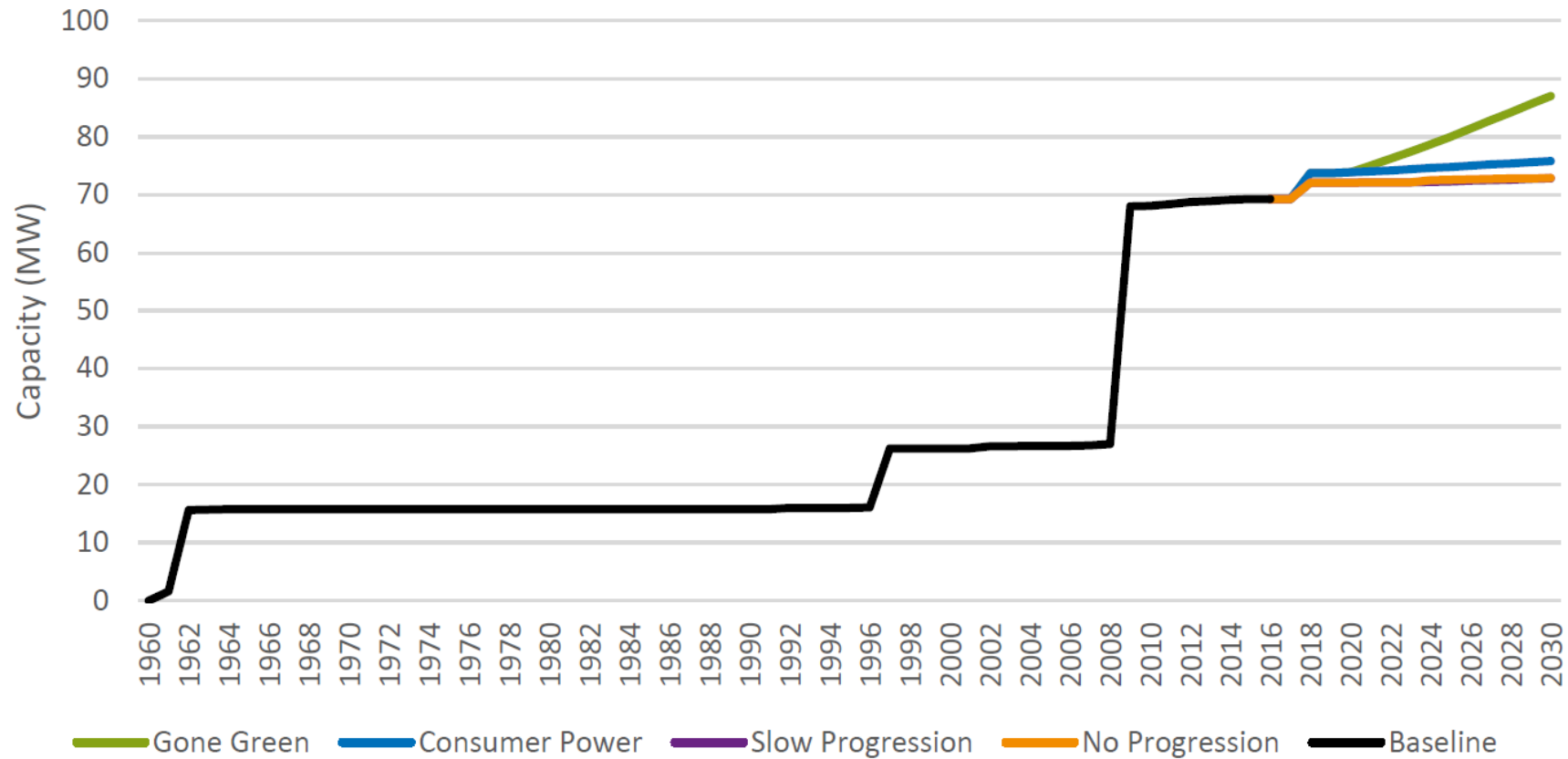
(WPD, 2016)

Onshore wind resource potential area BSP

BSPs



Cumulative growth of hydropower in the South Wales licence area



Technology	Key growth drivers	Basis of forecasted ESA distribution
Hydro	<ul style="list-style-type: none"> • Environmental constraints • Grid availability • Subsidy availability • Ease of permitting • Availability of investment capital 	<ul style="list-style-type: none"> • Historic trends • Hydropower resource assessment - an analysis of all obstacles on a river, including available head and flow rate from Environment Agency resource data

Of the measures taken by the DNO's to mitigate the issues in the current grid network:

- ◆ Queue management/capacity recovery
- ◆ Alternative connection agreements – timed and soft-intertrip
- ◆ Active Network Management
- ◆ Consortia/grid collaboration agreement
- ◆ Smart solutions, such as demand side response (sunshine tariff)
e.g. WREN Sunshine Tariff project
- ◆ Energy storage solutions – pilot projects e.g. SoLA Bristol
- ◆ Strategic grid investment options



Types of alternative connection:

- ◆ Active Network Management
- ◆ Intertrip
- ◆ Export Limitation
- ◆ Timed Connections
- ◆ Consortium Agreements

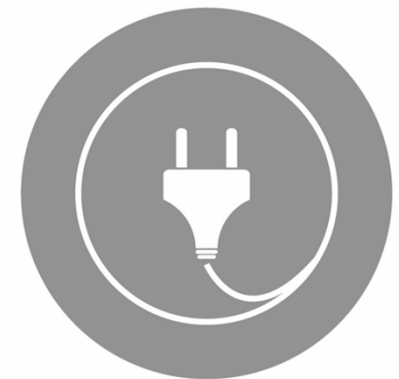
How does this tie in with DSR and Flexibility Services?



Take up of alternative connections:

7 responses from BHA members seeking connections:

- ◆ 2 export limitation
- ◆ 2 timed constraint
- ◆ 1 ANM
- ◆ 2 not proceeding due to constraint



The area where alternative connections are being utilised **52 MW of generation is connected under ANM** and **30 MW of generation is still to be connected** with the predominant technology being wind

- A total of **165MW** of generation (over 1MW) is included in UK Power Networks assessment, of which 30MW expected to be connected shortly;
- This includes **82MW** of constrained generation as part of the initial FDG-A process which has already been accepted.

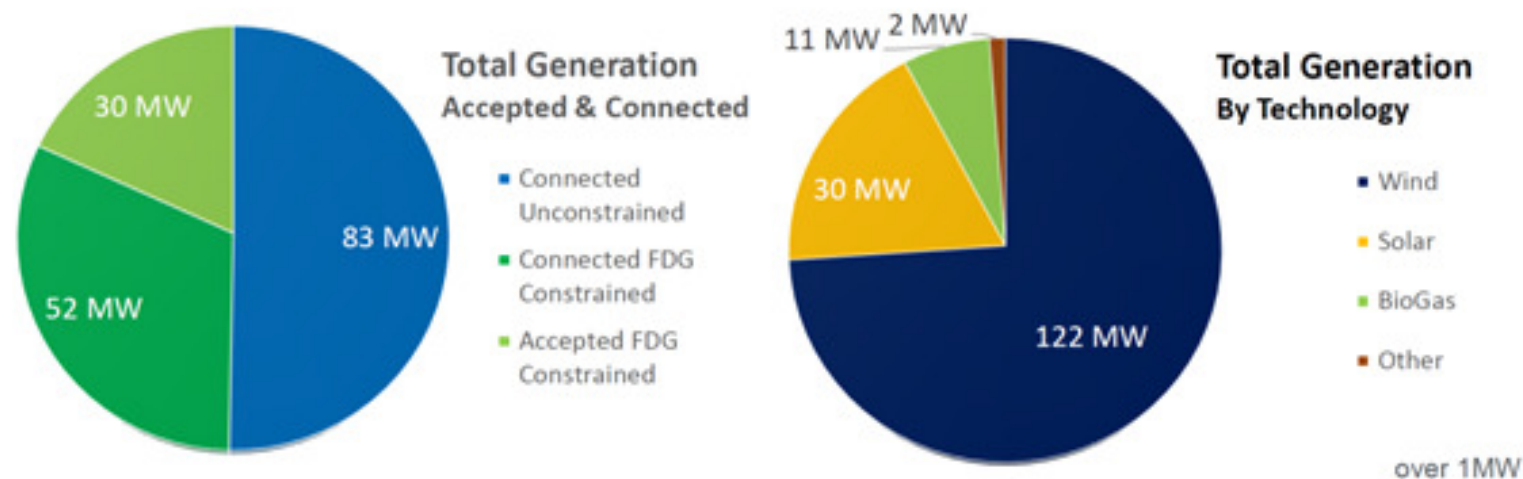


Figure 29 Total Generation accepted/connected by technology (UKPN, 2016)

Barriers

- ◆ Subsidy
- ◆ Planning
- ◆ Financial modeling

“...operating a wind or solar installation can expect to see a reduction in overall utilisation by about 0.5% when compared with the utilisation level of an unconstrained connection offer (e.g. from 23% to 22.5%).”

Northern Powergrid, (2018)

Strategy	Present Value in £m (2014)				CAPEX (£m)		
	Lost revenue from DG curtailment	Smart investment	Traditional investment	Total cost	Smart investment	Traditional investment	Total cost
1 Traditional network solution	-	-	1.54	1.54	-	5.10	5.10
2 Connect and Manage	9.58	0.15	-	9.73	0.50	-	0.50
3 Smart grid with firm DG access	-	0.55	-	0.55	1.83	-	1.83
4 Smart grid with smart commercial arrangement	0.00	0.53	-	0.54	1.75	-	1.75
5 Combination of smart grid, network, and smart commercial arrangement	0.00	0.53	-	0.54	1.75	-	1.75

Figure 19 Cost comparison of different solutions (imperial College London & UKPN, 2014)

Conclusions:

DNO	SUMMARY
	ANM is the most common type of alternative connection applied for across all areas
	Export Limitation is the least popular of alternative connection method, likely due to the fact that the amount of export to be limited may not be fully understood at the time of connection
	2.9% of all applications for grid connection are for alternative grid connection are for alternative grid connections across all WPD network areas
	The Costs of fitting additional software and export limiting devices required in an export limit connection may exceed the cost benefit of not having a standard connection
	A significant proportion of renewable energy generation has been installed using alternative connections which would not otherwise have been installed
	Low levels of alternative connections in Wales this may be due to less renewable energy projects applying for grid connections or less constraints?!

Conclusions:

CASE STUDIES	
	<p>Performance and financial modelling are key to being able to proceed with an alternative connection. There is no bankable method of modelling curtailment at present which precludes investment in many areas of alternative connection.</p>
	<p>Out of the case studies reviewed export limiting was the most popular type of alternative connection</p>
	<p>In most cases the constraint under an alternative connection was not as severe as modelling in the connection agreement</p>
	<p>Constraint can occur over and above that modelled for the alternative connection due to an alternative connection being a non-firm connection agreement</p>
	<p>Lack of subsidy inhibits alternative connections as the financial model no longer works without a strong power purchase agreement, the data for current alternative connections is therefore low as very little new generation is in planning</p>

The Future:

- ◆ Transition to DSO
- ◆ Flexibility
- ◆ Storage
- ◆ ANM Business as usual

Generation Support – “Curtailment” and “variable price” models

Pilot projects to support grid compliance

Curtailment Mitigation

Capacity optimisation supports price parity

New market & pricing models

Cheap storage plus ICT tools exploits variable price models

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