

WESTERN POWER 
DISTRIBUTION

Serving the Midlands, South West and Wales

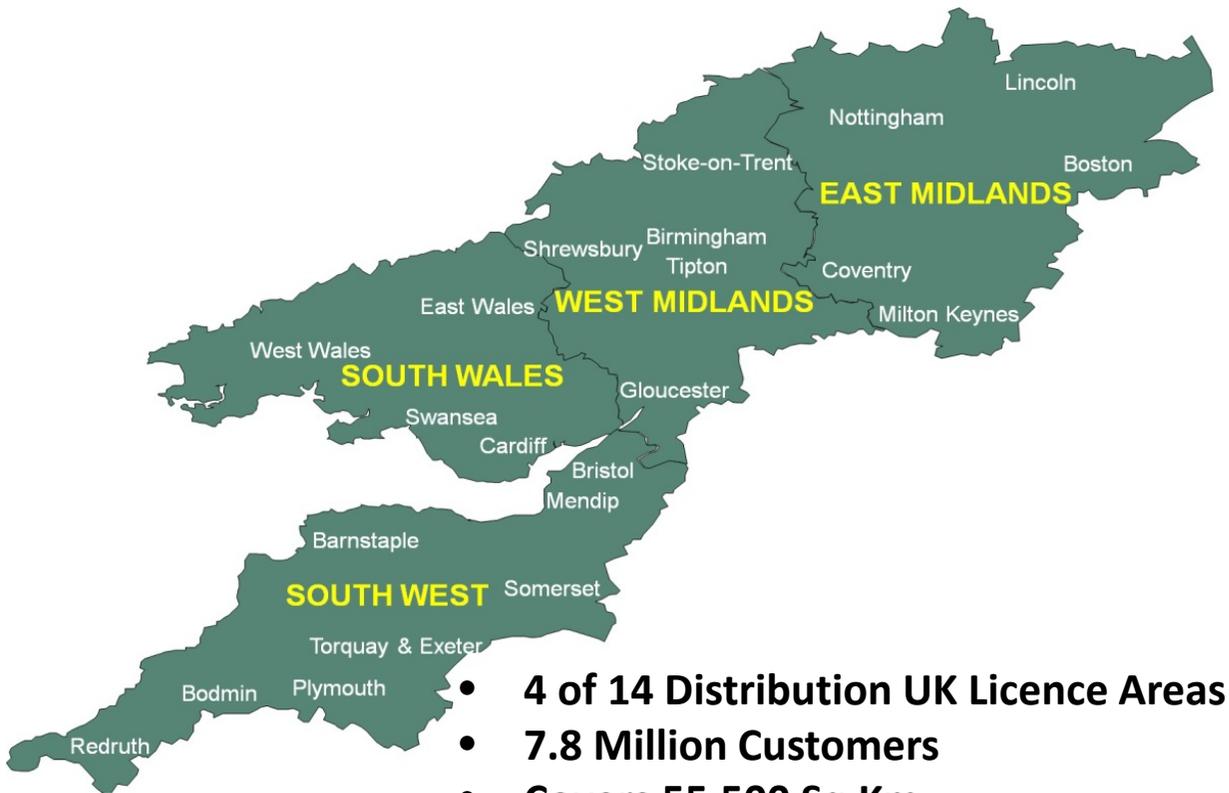
**Strategic Investment Options for
Further Growth of DG in the
South West**

15th September 2015

Agenda

- Welcome and Introduction
- Project Overview and Timetable
- National Background Assumptions
- Demand/Generation WPD South West Scenarios
- Feedback/Discussion
- Next Steps
- Lunch

WPD – Our Area



- 4 of 14 Distribution UK Licence Areas
- 7.8 Million Customers
- Covers 55,500 Sq Km
- 220,000km of Network
- 185,000 Substations



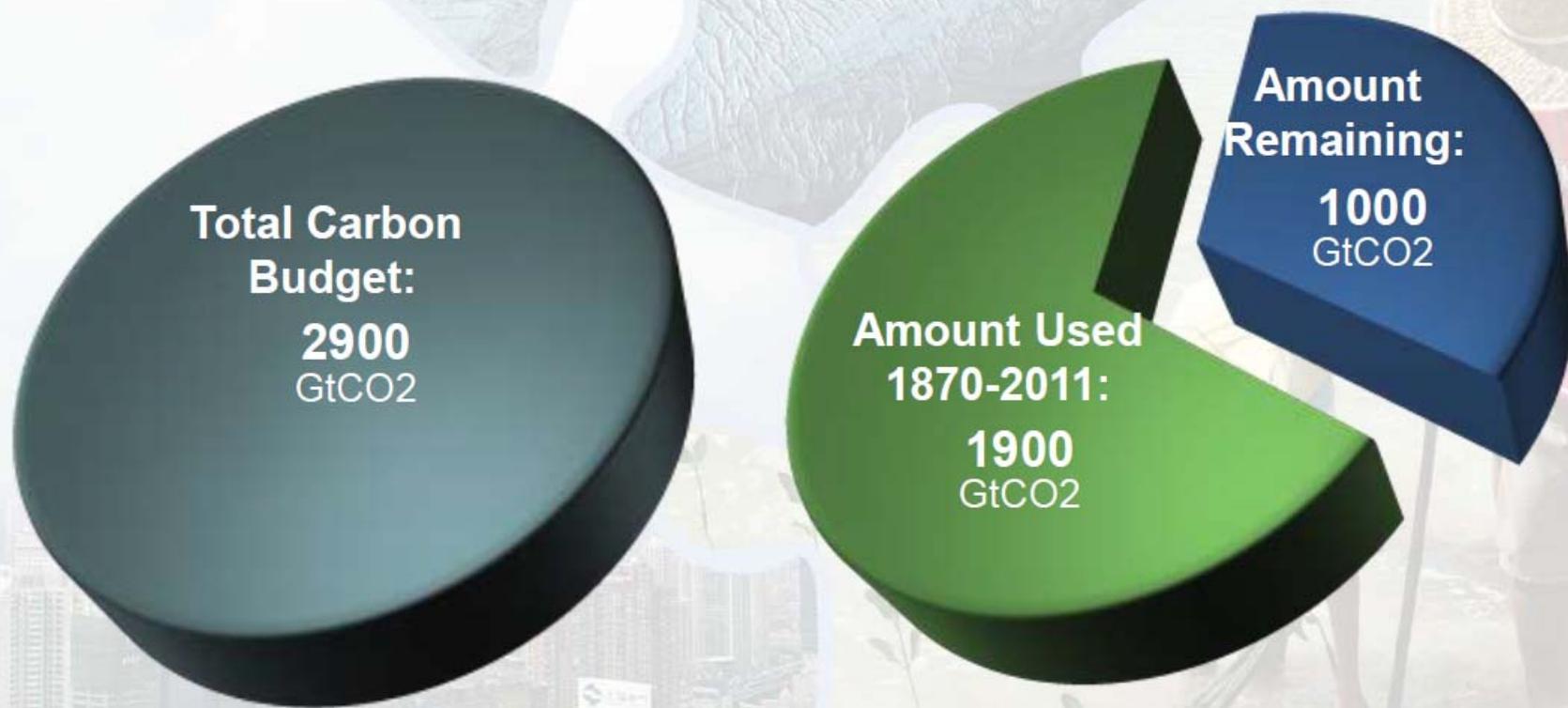
Drivers of the need for this project

- Significant and rapid growth in distributed generation leading to long delays and high costs for further connections
- Uncertainty in future path of both the growth in DG and demand usage
- Ofgem consultation on 'quicker and more efficient connections' raises questions on the role of strategic reinforcement funded by the wider customer base
- Need to understand whether there are 'no/low regret' investment options
- Given the last IPCC report and rapidly approach Paris Conference where the objective is a new climate change agreement, there is an element of when rather than if there will be further growth in renewable DG

High level message from IPCC report

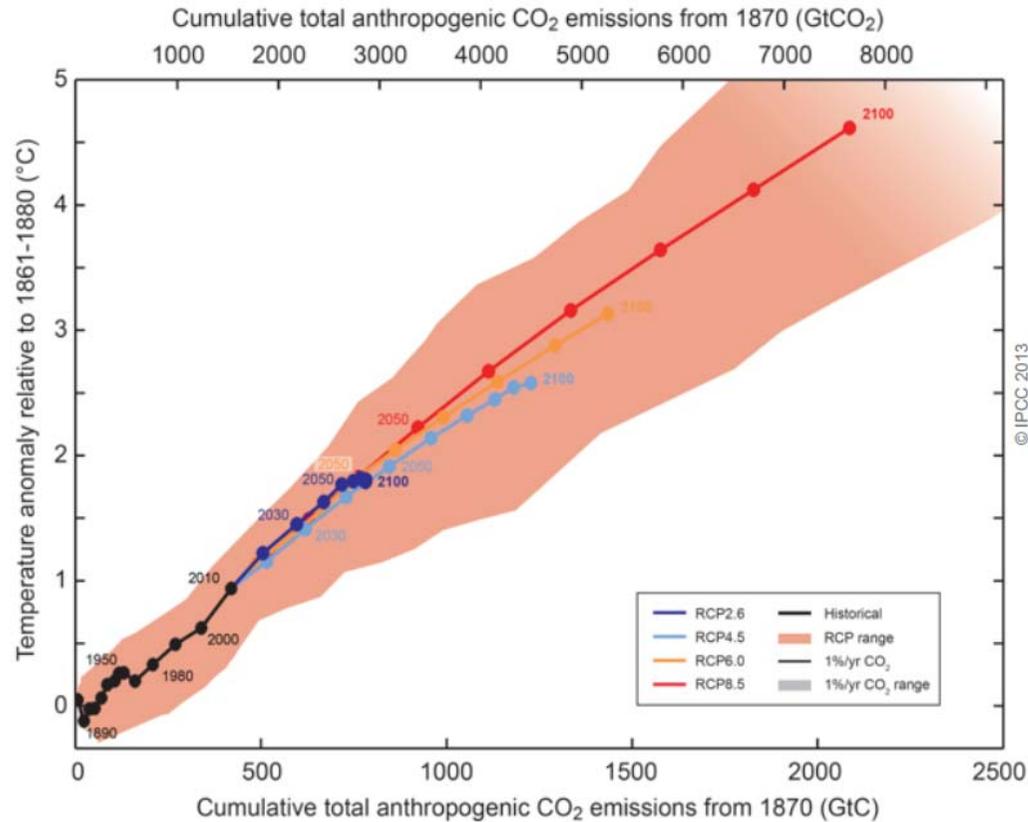
The window for action is rapidly closing

65% of our carbon budget compatible with a 2° C goal already used



AR5 WGI SPM

High level message from IPCC report



Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.

IPCC AR5 Working Group I
Climate Change 2013: The Physical Science Basis

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WHO
UNEP

- RPC – Representative Concentration Pathways
- ‘baseline scenarios’ (i.e. without additional efforts to constrain emissions) lead to pathways between RPC6.0 and RPC8.5
- RPC2.6 is representative of a scenario that aims to keep global warming likely below 2°C above pre-industrial levels

Significant uncertainty of future growth in renewable DG and electricity demand

- As part of the run up to the Paris Conference, nation states are due to publish Intended Nationally Determined Contributions (INDCs)
- The EU and its Member States have submitted an INDC:

*'The EU and its Member States are committed to a **binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990***

- UK emissions for 2012 were 22% below 1990 levels (Kyoto Protocol basis)
- 33% of UK greenhouse gas emissions were from the Electricity Supply sector and 21% from Transport

Significant uncertainty of future growth in renewable DG and electricity demand

- Recent UK Government announcements include:
 - 24/7 Amber Rudd - ‘We are committed to taking action on climate change and are clear that our long-term economic plan goes hand in hand with a long-term plan for climate action’
 - 23/7 – DECC announce ‘green deal finance company funding to end’
 - 18/6 – DECC announce ‘intention to close the Renewables Obligation to new onshore wind from 1 April 2016’
 - 22/7 – DECC consultation on closing RO to below 5MW PV
 - 27/8 – DECC consultation launched on review of FIT tariffs

- Various groups are analysing the INDCs submitted so far with all indicating that they fall short of achieving the 2 degree goal

Example: Climate Action Tracker Briefing note

01/09/15

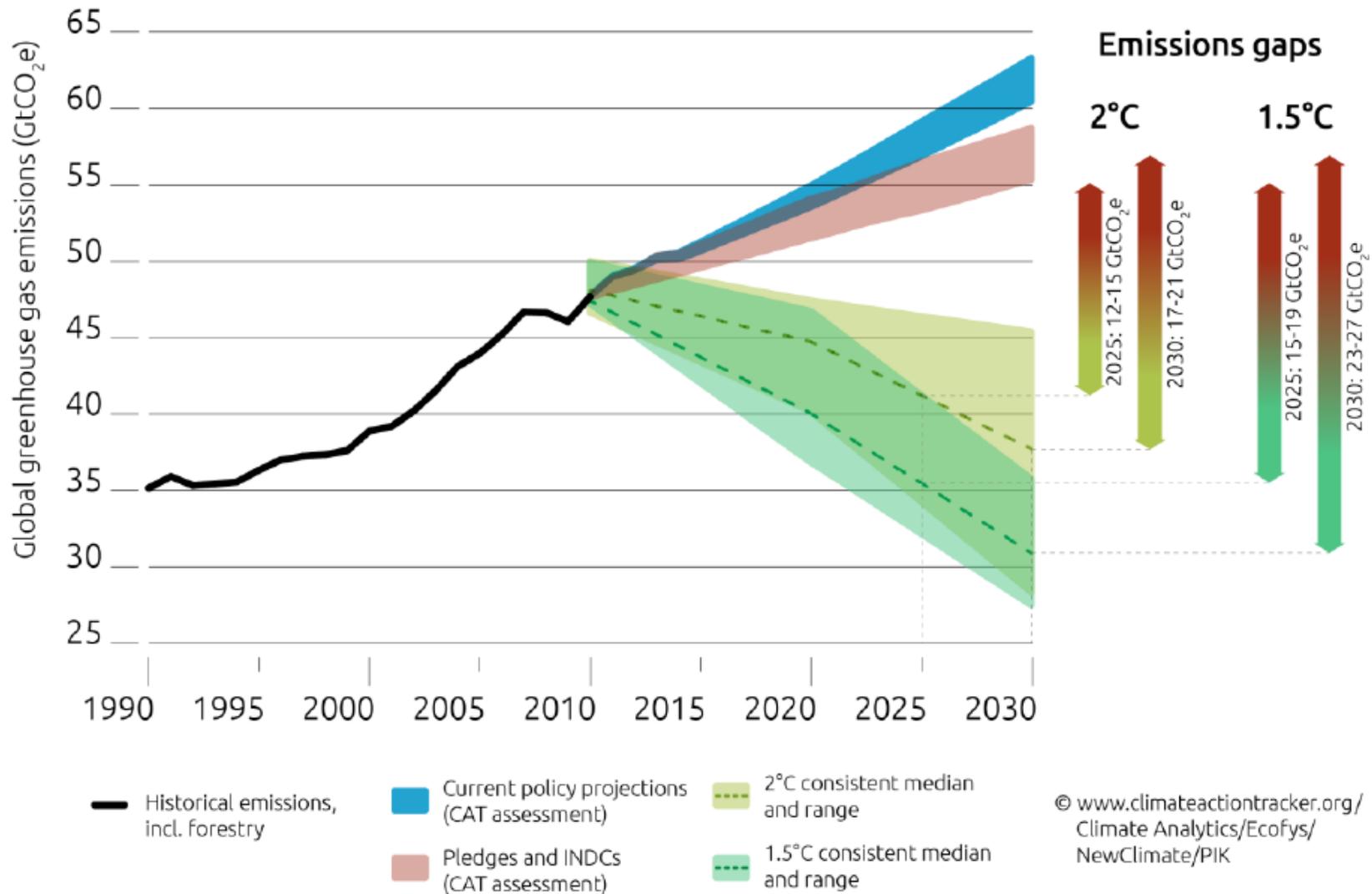


Figure 1: Emissions levels until 2030 under current policy projections and submitted INDCs compared with least-cost 1.5° and 2°C consistent pathways. The emissions gap ranges only reflect the uncertainty in the pledges and INDCs scenario. 2°C consistent median and range: Greater than 66% chance of staying within 2°C in 2100. 1.5°C consistent median and range: Greater than or equal to 50% chance of being below 1.5°C in 2100. Both temperature paths show the median and 10th to 90th percentile range. Pathway ranges exclude delayed action scenarios and any that deviate more than 5% from historic emissions in 2010.

Questions?

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Project Overview and Timetable

Current DG data for South West

Generation Type	Western Power Distribution - South West Generator Connections (MVA)			Total (MVA)
	Connected	Committed	Offered	
Photovoltaic	1,018.0	1,009.2	511.5	2,538.7
Wind	200.6	241.9	45.8	488.2
Landfill Gas, Sewage Gas, Biogas, Waste Incineration	55.1	113.6	33.0	201.7
CHP	20.9	1.8	0.9	23.6
Biomass & Energy Crops	0.2	2.2	1.3	3.6
Hydro, Tidal & Wave Power	2.5	3.0	-	5.5
Other Generation	468.9	245.1	422.8	1,136.8
Total	1,766.1	1,616.7	1,015.2	4,398.1

Winter Maximum Demand (MW)	2,530
Summer Minimum Demand (MW)	980

Current WPD Network Constraints in S West

K route

Two 94km 132kV circuits
Constrains North Cornwall
and Devon from St Tudy to
Barnstaple

J route

10km 132kV circuit
Constrains North Devon

Fraddon BSP

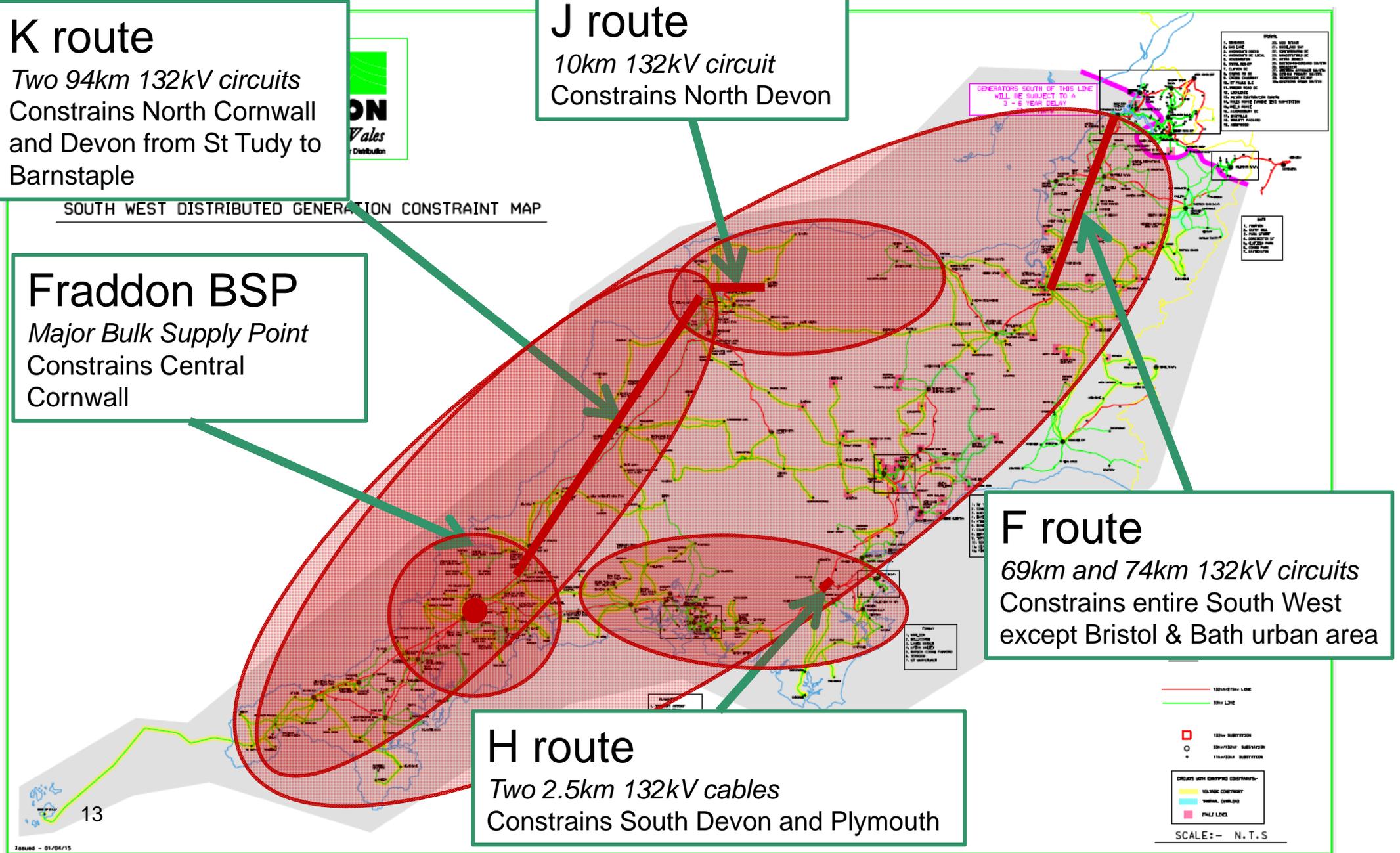
Major Bulk Supply Point
Constrains Central
Cornwall

F route

69km and 74km 132kV circuits
Constrains entire South West
except Bristol & Bath urban area

H route

Two 2.5km 132kV cables
Constrains South Devon and Plymouth



Resulting Restrictions

- All customers in the WPD South West plc region seeking the connection of new generation which contribute to flows on the F-route will presently have the following restrictions included in their connection offers:
 - A delay of 3 - 6 years, subject to planning approval and the completion of National Grid's 400kV works
 - The restrictions will apply to all generator connections requiring works at HV (i.e. 6.6kV or 11kV) or above
- In addition, there are likely to be other reinforcement works included in the connection offers (for more localised issues), plus a requirement to obtain a Statement of Works from National Grid indicating works required on the transmission system
- These other works add further costs and delay to generator connections

Current National Grid Constraints affecting S West

- Latest National Grid response to a Statement of Work Request highlights the following issues:
 - Need for generators to have reactive capability between 0.95 Power Factor Lead to 0.95 power Factor Lag at Rated MW Output for voltage regulation control on the National Grid
 - Emergency conditions disconnection facility upon instruction from GB System Operator (National Grid)
 - thermal capacity issues at 2 GSPs (Alverdiscott and Indian Queens) and fault level issues at 2 further GSPs
 - 400kV circuit issue with Hinckley Point to Melksham circuit requiring a Modification Application to National Grid
 - Active Management/Intertrips from National Grid are likely to be required
 - Whilst not there yet, the system is approaching dynamic voltage stability limits which will require a considerable increase in data from DG to assess with longer timescales than the Statement of Works process

Aim of Study

- Assessing the potential growth in DG by type, general location and year against potential demand changes
- Identifying thermal, voltage and fault level constraints that result
- Assessing options for reinforcement
- Providing recommendations for 'low regret' investment and identifying the cost and timescale of these
- Use this to understand the economic potential for demand side response and/or generation constraint to avoid reinforcement

Approach

- Background Energy Scenarios
- Resulting Generation and Demand Scenarios
- Identification of potential solutions (included those on National Grid)
- Estimation of capacity provided by those solutions
- Cost/timescales of those solutions
- Potential for demand or generation response given the cost of network solutions

Timetable

- Initial stakeholder workshop to get stakeholder input to approach and scenarios to be considered – September 2015
- Develop detailed demand and generation scenarios – October/November 2015
- Undertake network studies and identify solutions with costs - November 2015 to January 2016
- Sensitivity work – i.e. how much ‘headroom’ do the potential solutions give – February 2016
- Assess potential for demand response/generation constraint – March 2016
- Complete and publish report – April 2016
- Dissemination event – late April 2016

Questions?

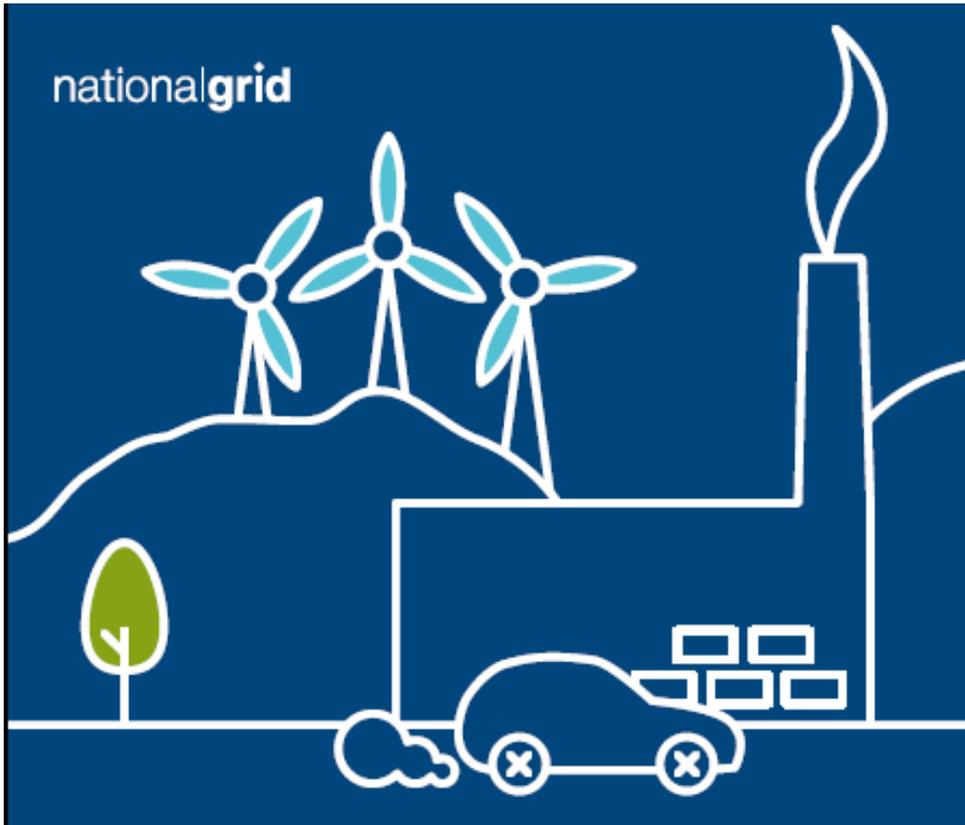
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National Background Assumptions

- National Grid Future Energy Scenarios
- WPD View for the South West area
- Feedback on:
 - Scenarios to consider
 - Your views on South West development

National Grid – Future Energy Scenarios



- Annual Publication
FES 2015
- Considers GB Wide Future
Energy Landscape
- Four future scenarios
- From now to 2050
- Electricity Demand & Generation
- Gas Demand and Supply

National Grid – Future Energy Scenarios

nationalgrid

FES 2015



Consumer Power

Economic – moderate economic growth

Political – government policies focus on indigenous security of supply and carbon reduction

Technological – high innovation focused on market and consumer needs. High levels of local generation and a mixture of generation types at national level

Social – consumerism and quality of life drives behaviour and desire for 'going green', not a conscious decision

Environmental – Long-term UK carbon and renewable ambition becomes more relaxed

Gone Green

Economic – moderate economic growth

Political – European harmonisation and long-term environmental energy policy certainty

Technological – renewable and low carbon generation is high. Increased focus on green innovation

Social – society actively engaged in 'going green'

Environmental – new policy intervention ensuring all carbon and renewable targets are achieved

No Progression

Economic – slower economic growth

Political – inconsistent political statements and a lack of focus on environmental energy policies

Technological – little innovation occurs in the energy sector with gas as the preferred choice for generation over low carbon

Social – society is cost conscious and focused on the here and now

Environmental – reduced low carbon policy support and limited new interventions

Slow Progression

Economic – slower economic growth

Political – European harmonisation, focus on low cost environmental energy policies

Technological – medium levels of innovation lead to a focus on a mixture of renewable and low carbon technologies

Social – society is engaged in 'going green' but choices are limited by cost

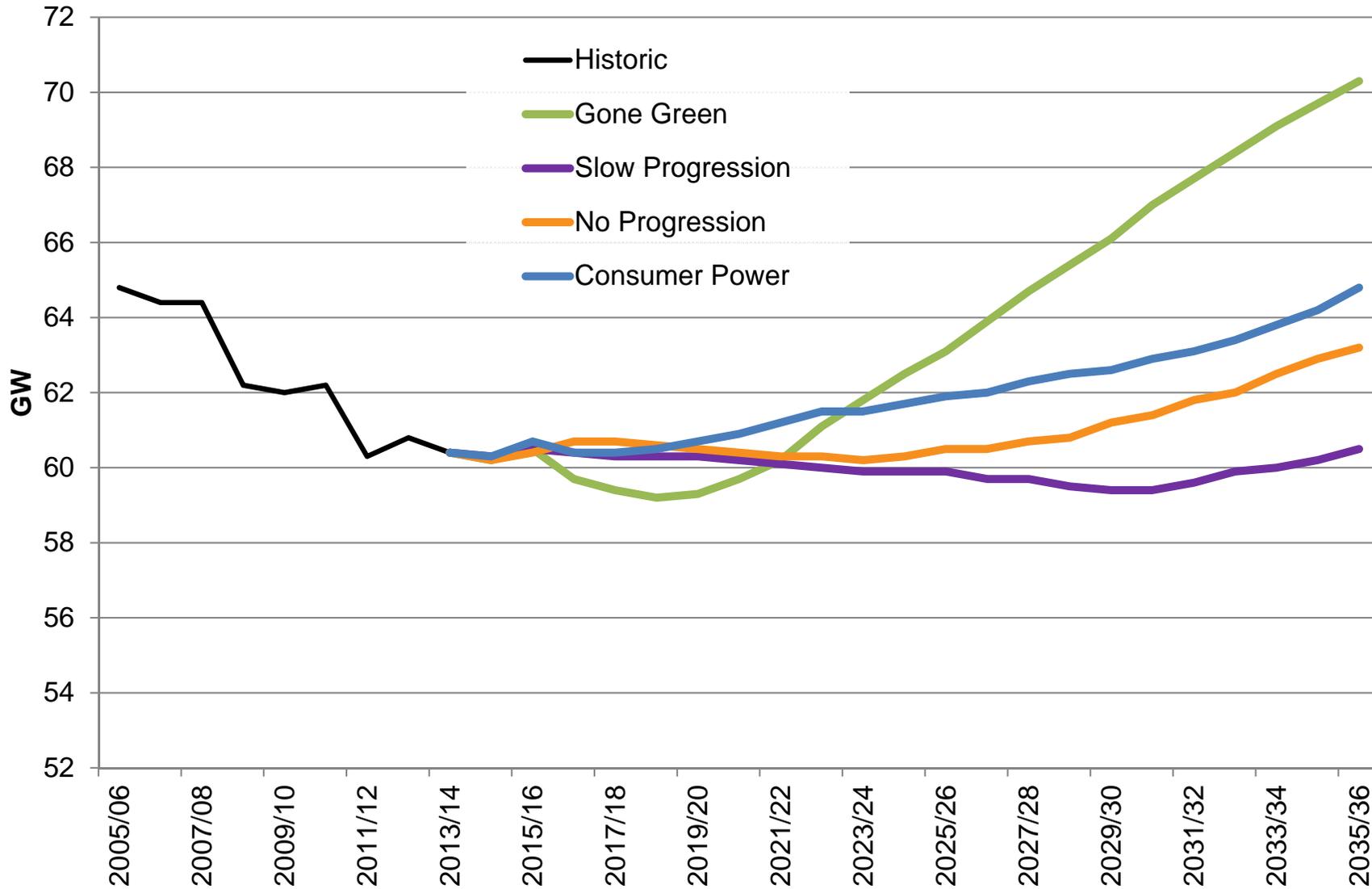
Environmental – new policy interventions are constrained by affordability



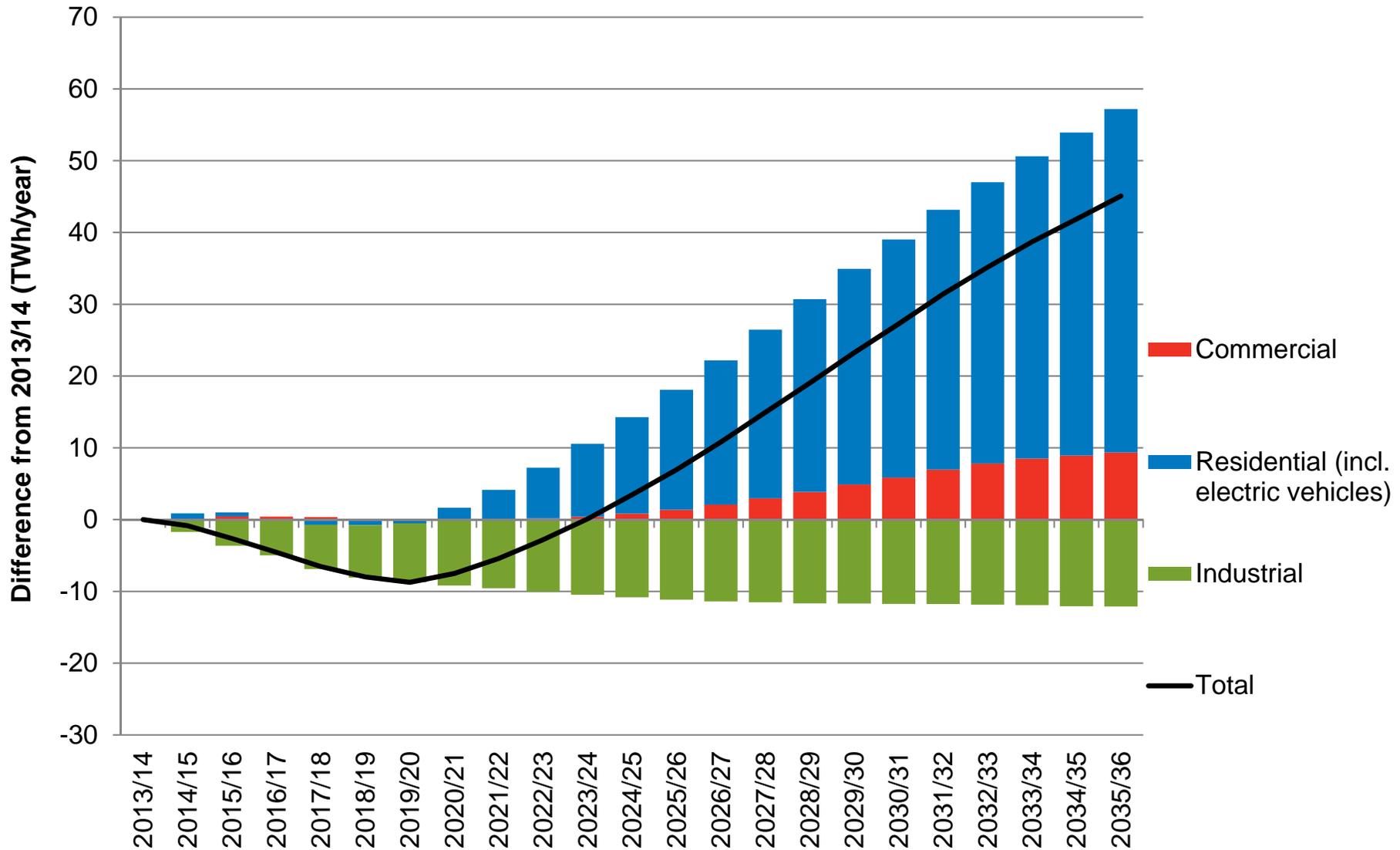
National Grid – Future Energy Scenarios

- Consumer Power
 - highest levels of small scale solar power & low summer Transmission System demand - 5GW by 2030
- Gone Green
 - Meets Renewable & Carbon targets on time - 34% electricity from renewables by 2020
 - Electrification of Transport & Heat

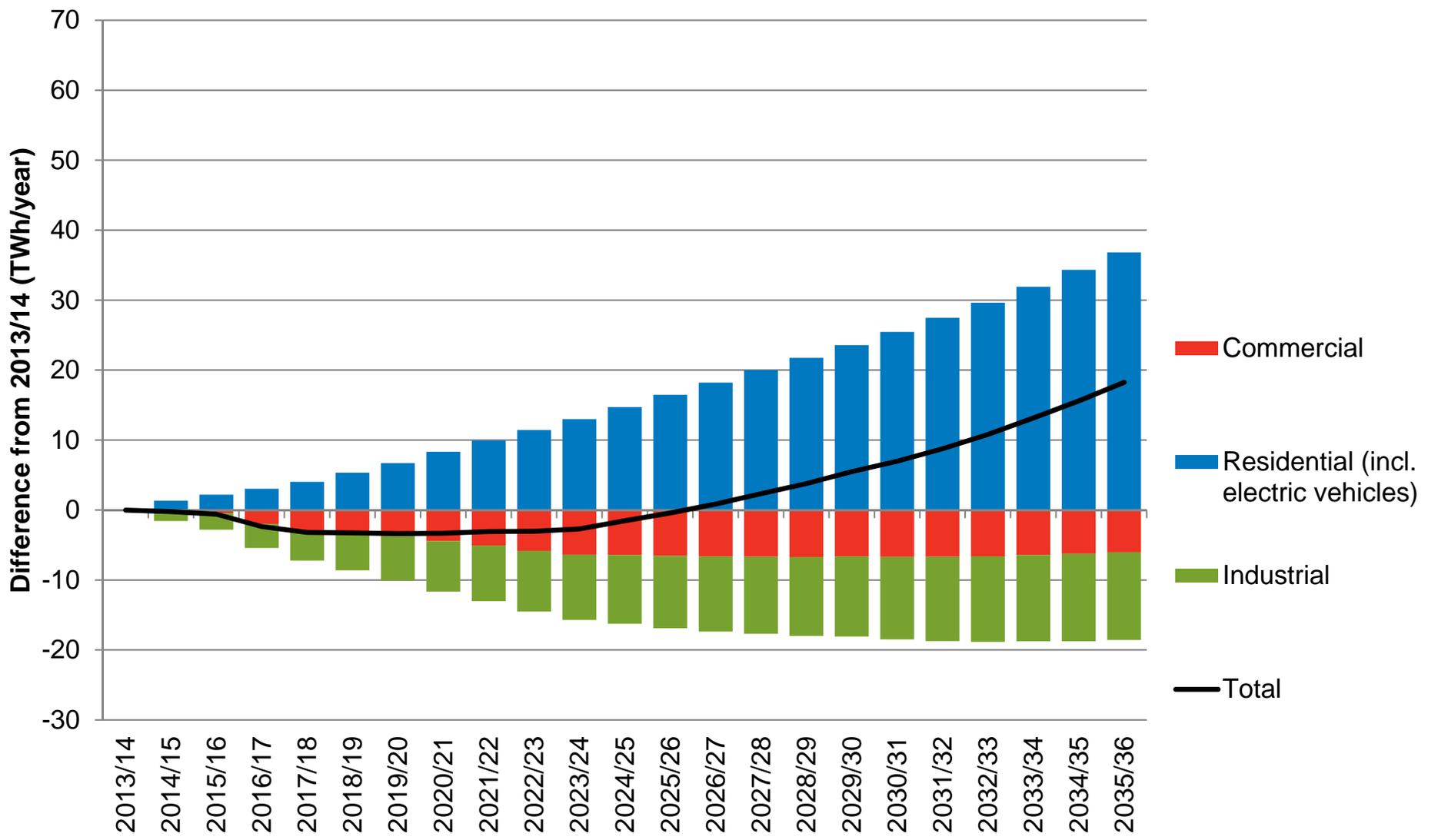
National Grid FES Peak Electricity Demand



National Grid FES Gone Green TWh/year



National Grid FES Consumer Power TWh/year



National Grid – Future Energy Scenarios

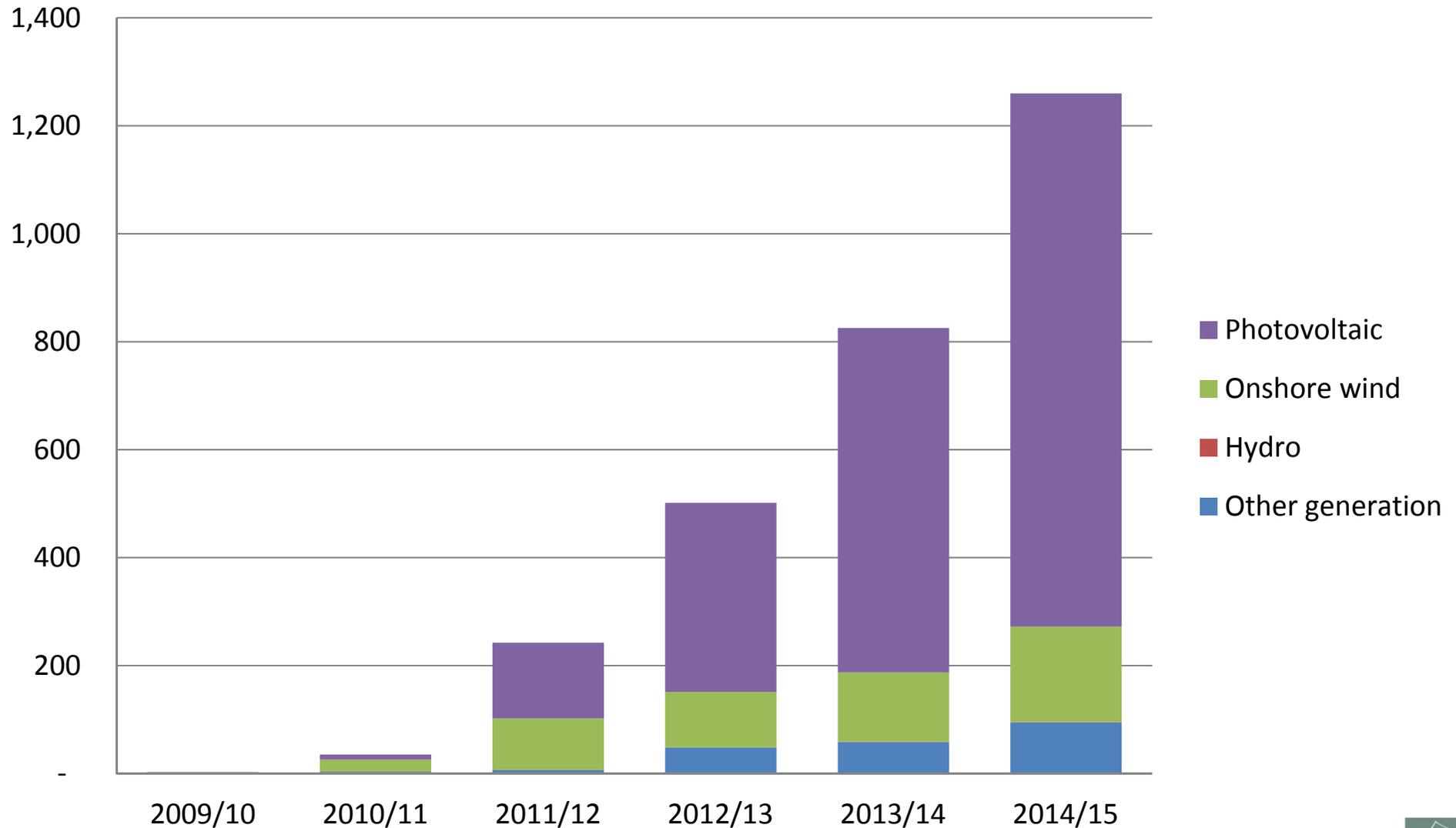
- Provides good source data
- How many scenarios to consider?
 - Gone Green – high electrification of transport & heat
 - Consumer Power – high small scale generation
- FES GB Wide – so will require a South West view
 - Generation mix – PV / Wind / Marine?
 - Electric Vehicle uptake - Early adoption?
 - Heat electrification – existing heating/house type - heat pumps?

WPD – South West Experience

- DG Connections
- DG Offers
- Forecasts
 - DG
 - Heat Pumps
 - EVs

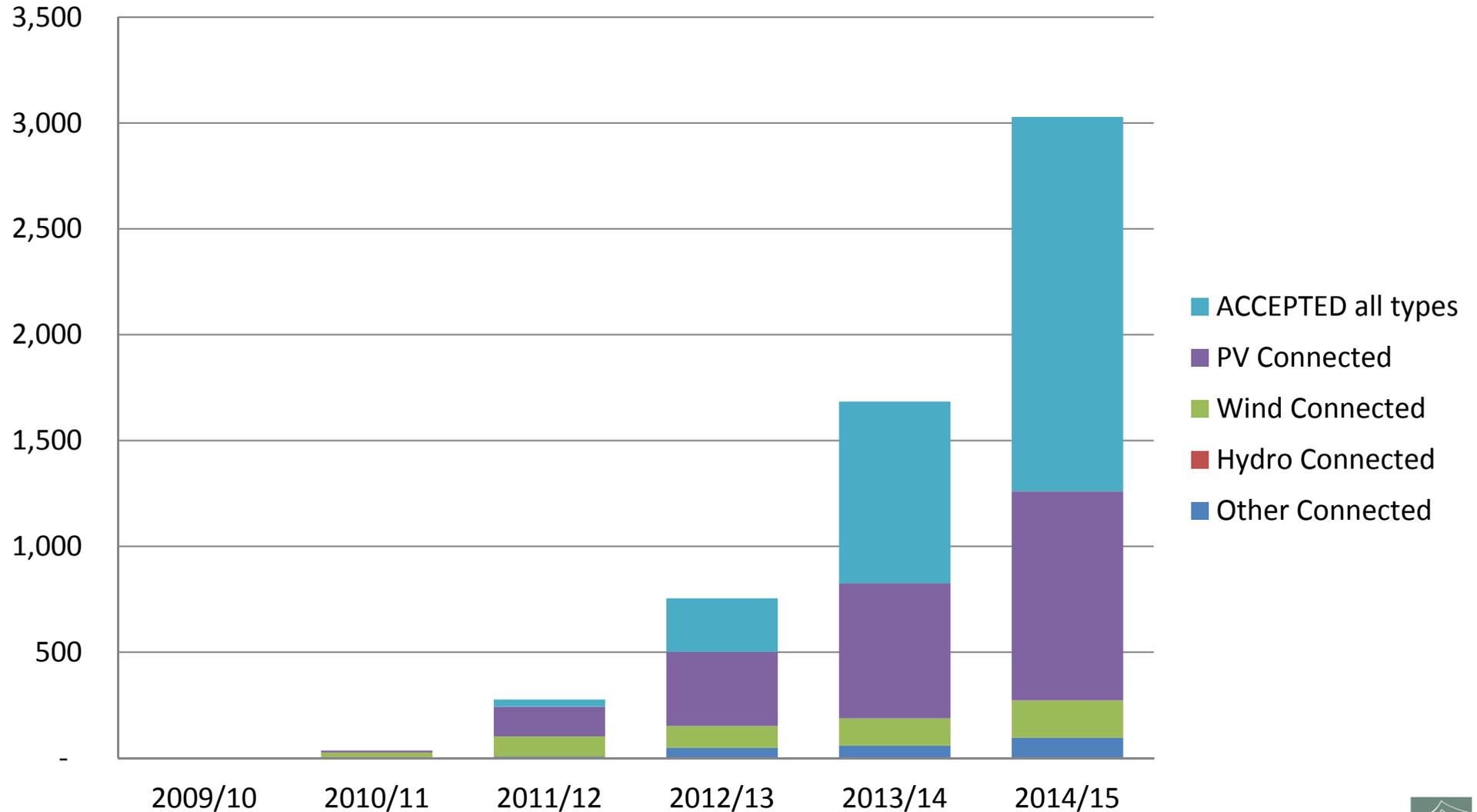
WPD – South West Experience

DG (MW) Connected South West Cumulative since 2009



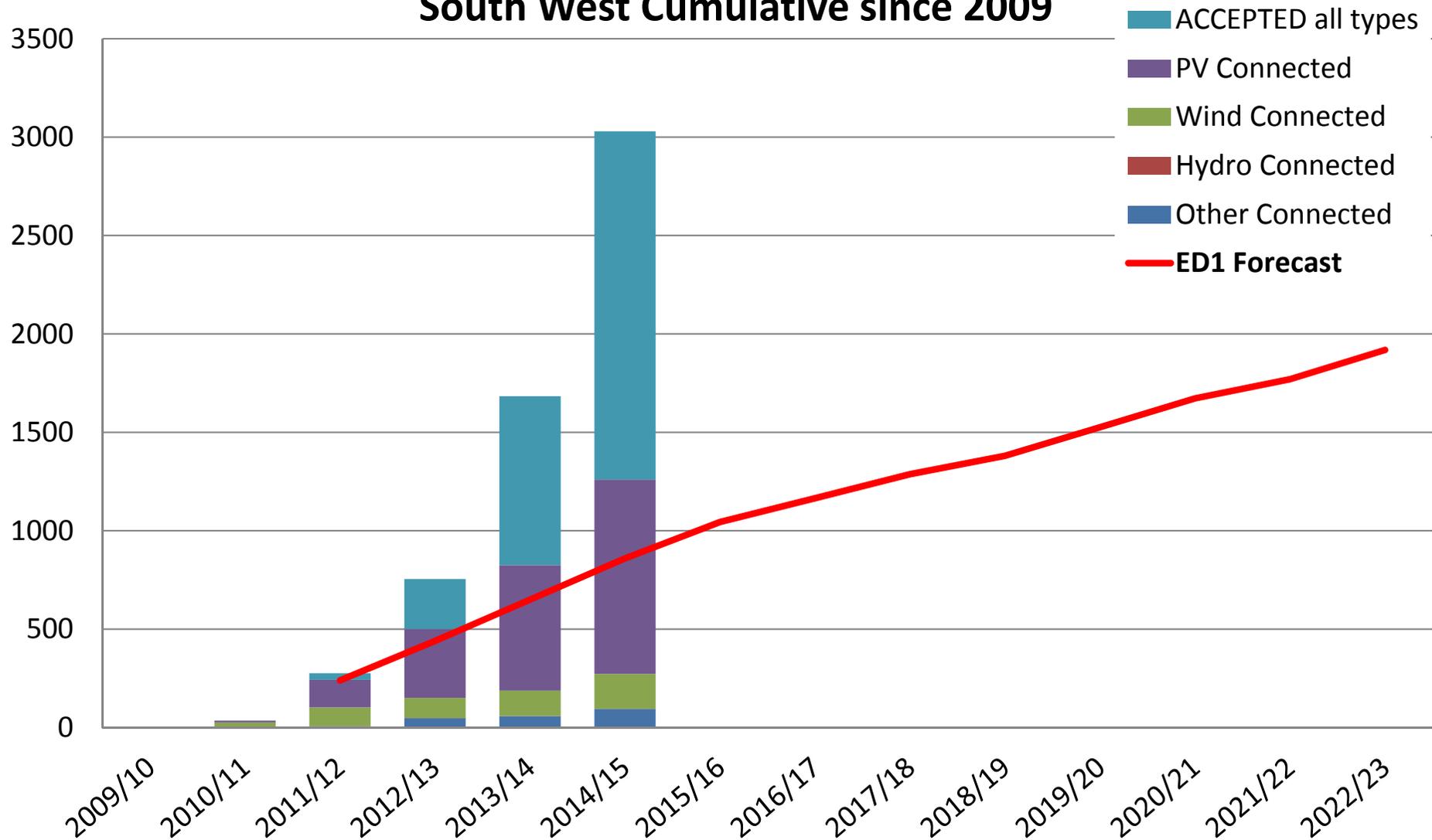
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DG (MW) Connected + Accepted South West Cumulative since 2009



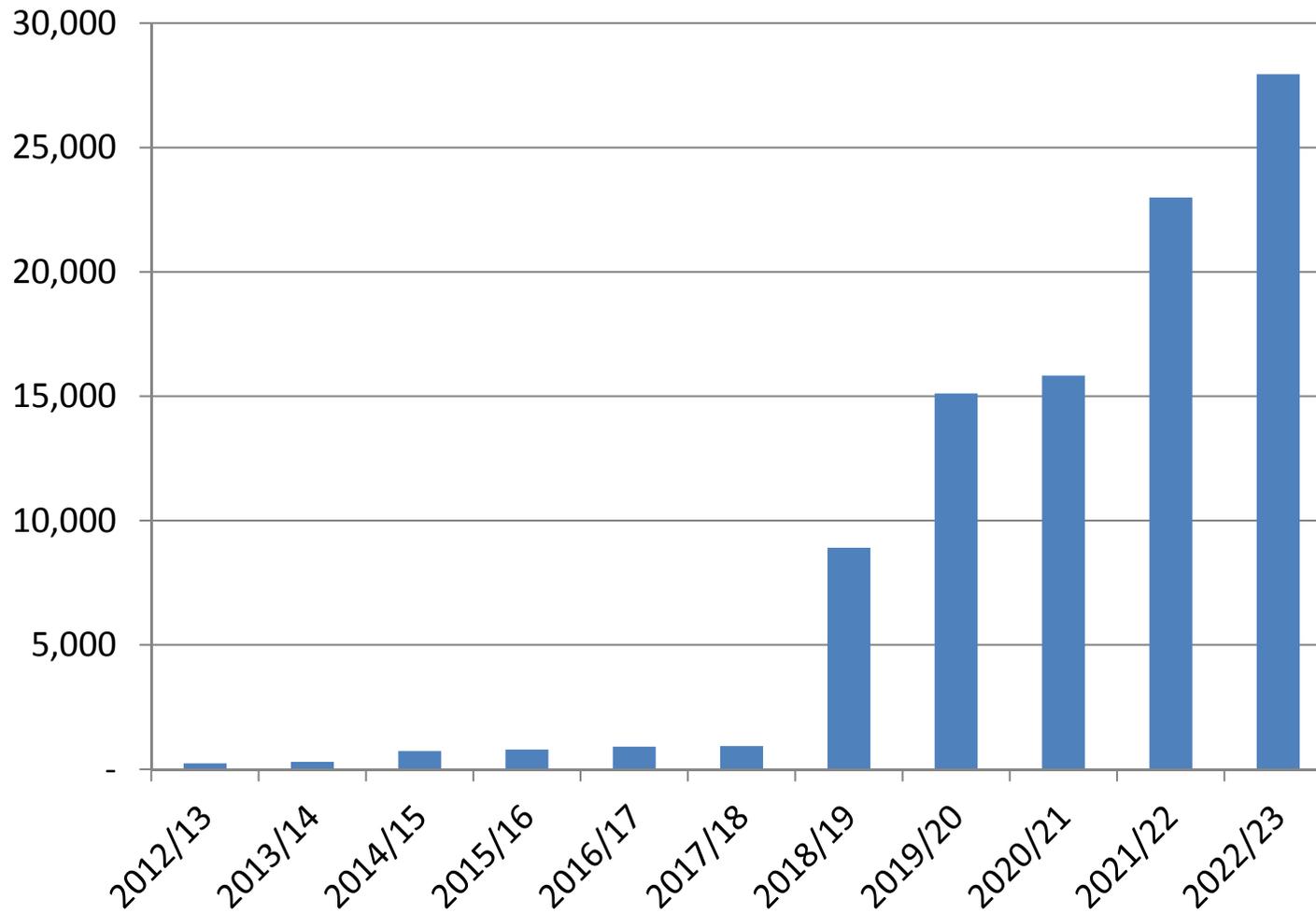
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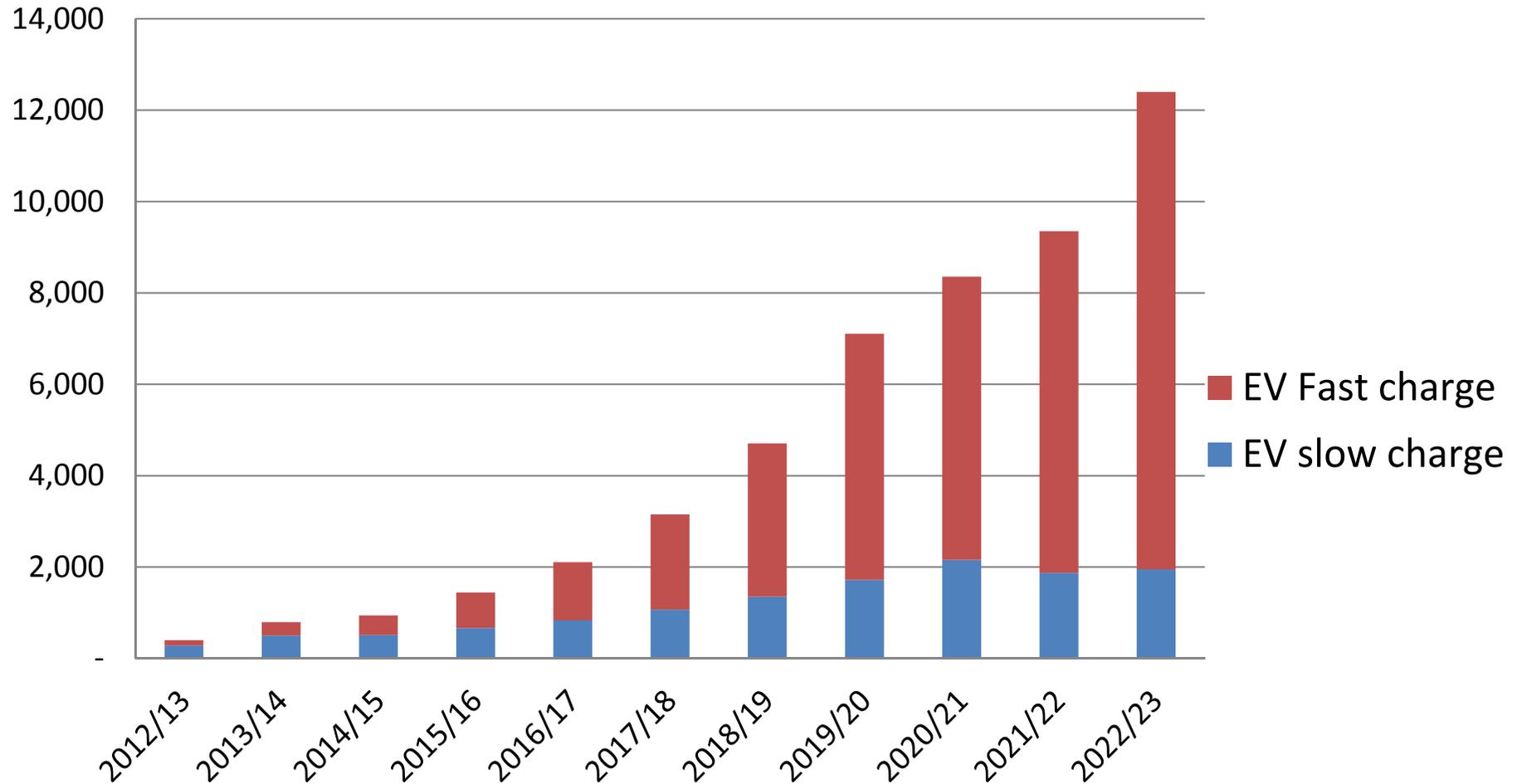
WPD – South West Experience

Heat Pump Installations per Year ED1 Plan South West



WPD – South West Experience

EV Charger Installations per Year ED1 Plan South West



Questions? Your Views?