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Project TransmiT Stakeholder event

Modelling update

CLIENT: Ofgem
DATE: 06/05/2014

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Agenda

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- Scope of our updated analysis
- Recap of modelling framework
- Developments made to the modelling since August 2013
  - Capacity Market modelling
  - CfD modelling
- Original and Alternative Cases
- Summary of results

Scope of analysis

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- We were commissioned by Ofgem to update the CMP213 Impact Assessment modelling to:
  - Address comments received through the consultation phase
  - Take into account the latest policy positions on Electricity Market Reform (EMR)
- We did not update assumptions (except those specifically related to modelling changes), in order to maintain consistency with previous modelling

Issue raised	Treatment in updated analysis
The impact of the higher level of renewable generation in Status Quo compared to WACM2	Total capacity of each renewable generation type equalised between Status Quo and WACM2
The impact of volatile capacity margins on wholesale prices	Implementation of new Capacity Market modelling approach
Possible distortions to dispatch from the ALF element of WACM2	Additional analysis which demonstrates that this is a small effect and would be outweighed by savings in constraint costs and transmission losses
The impact of the low carbon generation mix	Two cases modelled, with different low carbon generation mixes in 2030
The need for additional sensitivity analysis, which is stressed in both reports	• High RES-E share • Lower Gas Price • Low Carbon Price • 7% Target De-rated Capacity Margin

Recap on modelling framework

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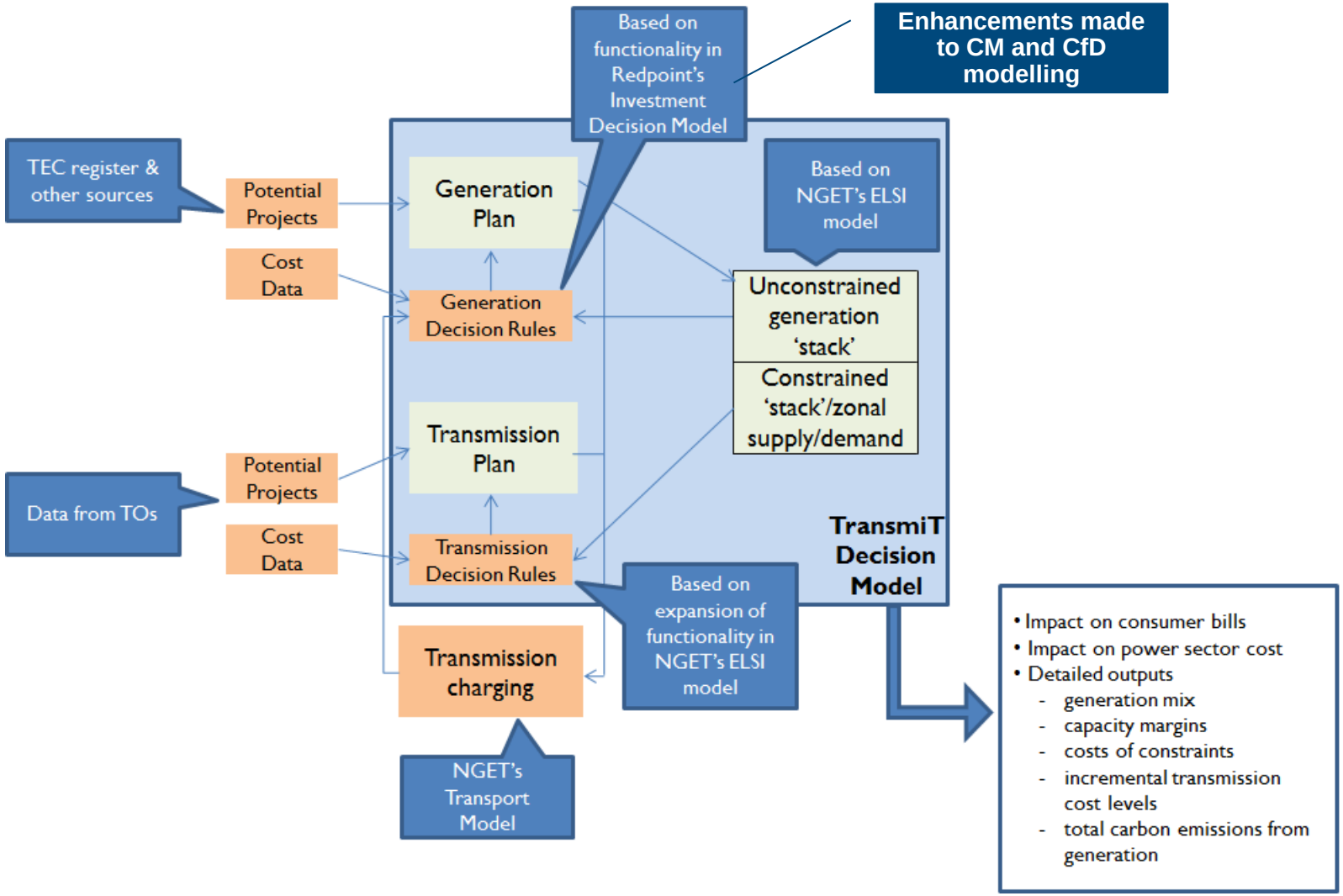

Model developments

- Changes to the generation investment decision modelling were made to align better the modelling functionality with DECC's current proposals for the design of the CM and allocation of CfDs

Functionality	Updated analysis	Explanation
Capacity Market	Build and retirement decisions of non-CfD plants are based entirely on the outcome of capacity auctions. Capacity that does not receive an agreement in the first auctions of 2014 (for 2018/2019 delivery) will retire in or before 2018.	More explicit recognition of the proposed CM rules. Capacity auction explicitly achieves minimum 10% margin (demand curve for capacity auction is not used)
CfD Allocation (renewables)	CfDs are modelled to replace ROs as the incentive regime from 2015 (rather than 2018). Constrained competitive allocation framework means same capacities of each technology deployed under Status Quo and WACM2.	Better reflection of latest DECC policy under which CfDs will be the main mechanism for supporting new low carbon generation from the date of the first CfD allocation.
CfD Allocation (nuclear & CCS)	Nuclear and CCS build fixed exogenously	Projects are most likely to be built on an individual basis under discrete funding decisions, irrespective of the transmission charging policy.

Original and Alternative Case

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- The Original Case uses the assumptions from the August 2013 IA modelling
- The Alternative Case was designed to explore the impacts of WACM2 in a system with an alternative commodity price trajectory and different assumptions on some aspects of EMR

Assumption	Original Case	Alternative Case
Gas and coal prices	**DECC UEP 2012 assumptions**	**Lower gas price** to reduce CCGT generation costs below that of coal (gas prices are 20% lower than Original in 2015 & 2016, 15% from 2017 to 2020, and 10% after 2020. Coal price increased by 20% in 2015 and 2016)
Approach to meeting approximately 100g/kWh carbon intensity in 2030	Nuclear: 15.2 GW CCS: 9.2 GW Onshore wind: 11.9 GW Offshore wind: 10.9 GW	Nuclear: 12.0 GW CCS: 7.0 GW Onshore wind: 14.1 GW Offshore wind: 18.7 GW
Interconnector contribution to de-rated margin	**0%** (i.e. interconnectors do not contribute to required capacity in Capacity Market)	**75%** (this represents a case in which the majority of interconnector capacity can be relied upon at times of system stress reducing the capacity requirement accordingly)

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Results

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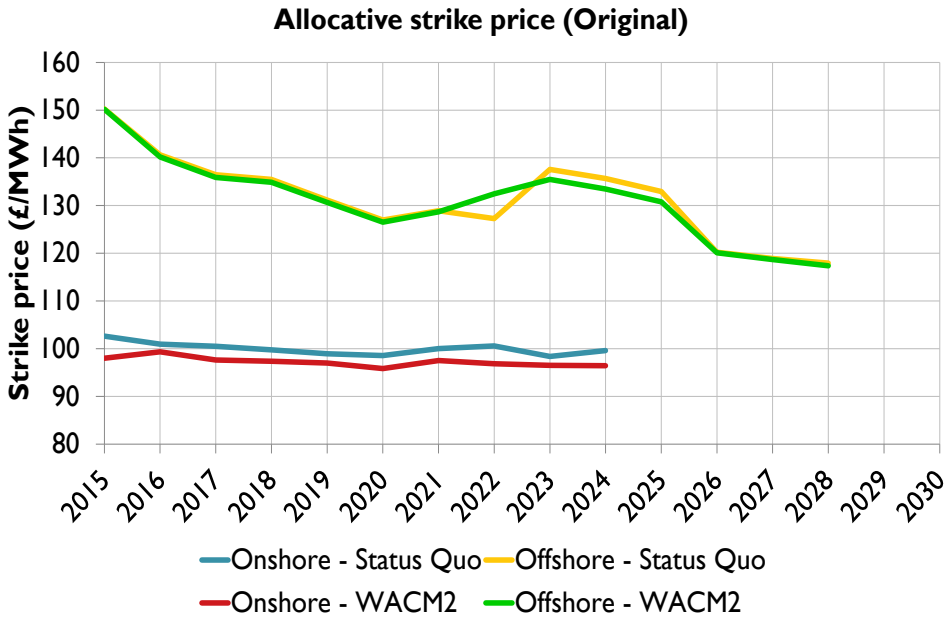
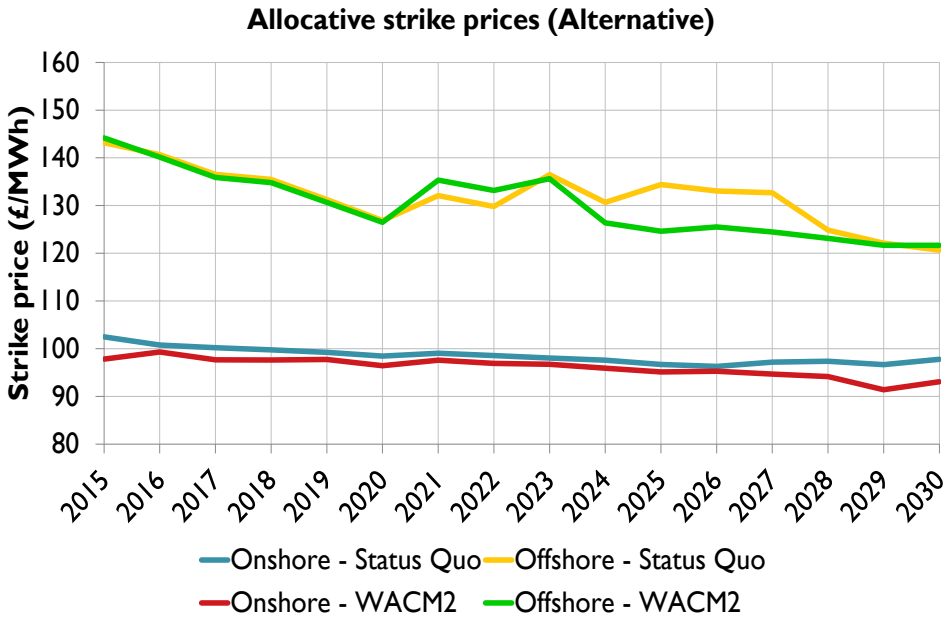
Low carbon generation

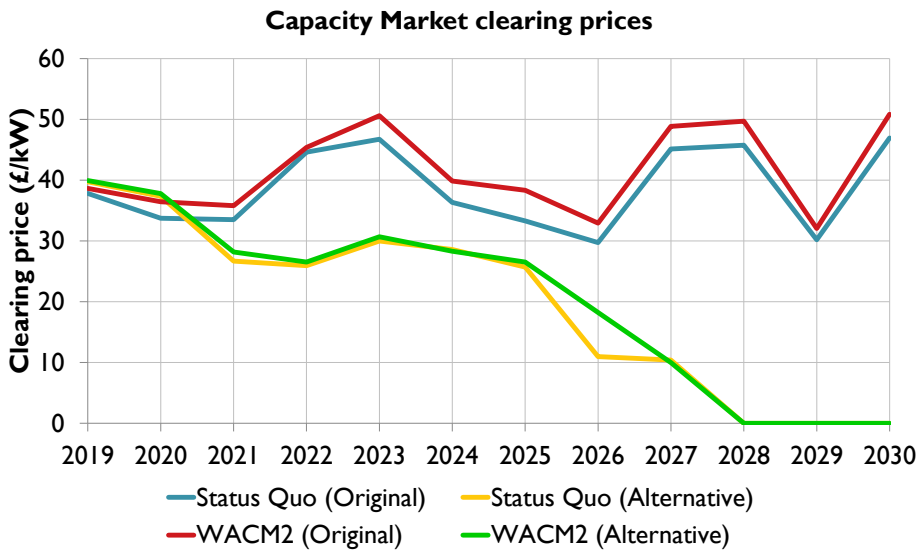
- Identical volumes of onshore and offshore wind deployed under Status Quo and WACM2
- Under WACM2, marginal onshore wind generation built in more northerly location
- Clearing prices are lower under WACM2 due to lower TNUoS for marginal wind
- Effect also occurs for offshore wind, to a smaller extent

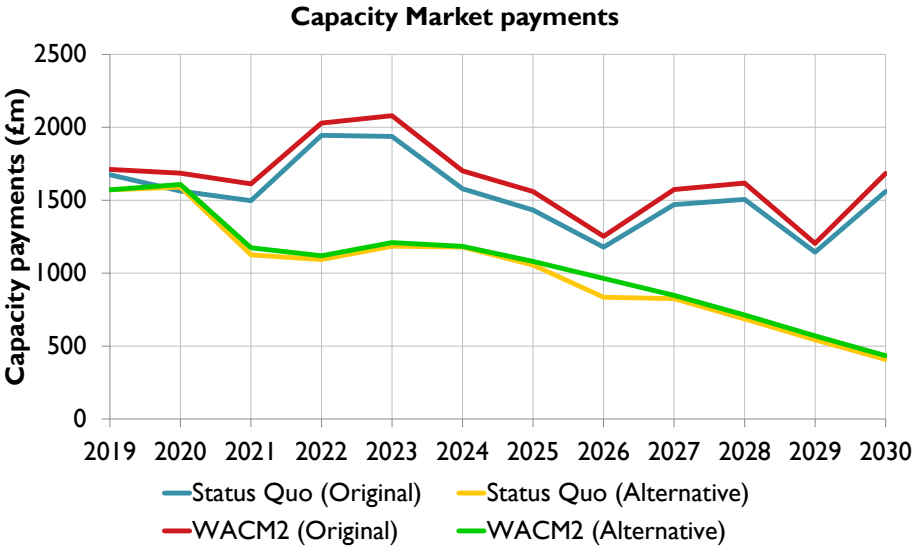




Capacity Market

- The marginal plant in the CM auctions is typically located in a region of higher TNUoS under WACM2, driving the increase in capacity payments.
- Capacity payments are less differentiated in the Alternative Case because of the smaller requirement for thermal capacity (due to the assumed contribution from interconnectors)
  - Capacity prices are zero from 2028 onwards as no new capacity is required and all existing capacity is on long term CM agreements





Power sector costs

- Generation costs decrease under WACM2. The difference is larger under the Original Case where Status Quo develops more new CCGT capacity and retires more existing plant than under WACM2.
- Transmission costs (including transmission losses) and constraint costs increase due to additional reinforcement of the onshore network
- The small benefit in carbon costs is a result of slightly higher average load factors of deployed onshore wind under WACM2
- Across the entire period, power sector costs reduce under WACM2 in both the Original and Alternative Cases

WACM2 benefit relative to Status Quo NPV (£m)		Original Case		Alternative Case	
		2011-20	2021-30	2011-20	2021-30
Power sector costs	Generation costs	18	607	19	102
	Transmission costs	-38	-169	0	-86
	Constraint costs	-99	-339	-55	69
	Carbon costs	4	85	5	14
	Decrease in power sector costs	**-115**	**184**	**-31**	**99**

Consumer bills

- Under WACM2, the levelised cost of the marginal (CfD strike price setting) onshore wind and offshore wind plant reduces, creating a saving for consumers.
- Higher TNUoS for marginal thermal capacity in the Capacity Market increase costs for consumers.
- Under the Original Case assumptions, the Capacity Market effect outweighs the CfD effect (due mainly to a larger volume of capacity receiving CM payments than CfD payments).
- After 2020 in the Alternative Case, savings in low carbon support outweigh CM costs

WACM2 benefit relative to Status Quo NPV (£m)		Original Case		Alternative Case	
		2011-20	2021-30	2011-20	2021-30
Consumer bills	Wholesale costs	-51	-308	-212	-65
	Capacity payments	-114	-630	-13	-213
	BSUoS	-50	-169	-27	34
	Transmission losses	-38	-131	-41	-31
	Demand TNUoS charges	0	-28	30	-40
	Low carbon support	106	382	97	417
	Decrease in consumer bills	**-147**	**-884**	**-167**	**102**

Conclusions

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Power sector costs

- Transmission costs are likely to increase, but generation costs reduce under WACM2. In the longer run, the analysis suggests in the core cases a small reduction in overall power sector costs
- By eliminating differences in total volumes and type of renewables build, and differences in capacity margins, the updated analysis suggests that the **differences relating purely to changing transmission charging are much smaller** than previously assumed.

Consumer bills

- Whether consumers are able to benefit from potential reductions in power sector costs under WACM2 will critically depend on the impact of changing transmission charges on CfD and CM auction clearing prices.
- Although there is significant uncertainty, we would expect the overall impact on consumers of WACM2 would be small in the context of the costs of EMR.

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Additional material

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Conclusions
Uncertainties on EMR

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- Our analysis is sensitive to the final parameters of the CM and CfDs
- The de-rating factors to be applied to capacity participating in the CM auctions are yet to be confirmed
- The inclusion (or not) of interconnectors or interconnected generation capacity in CM auctions is likely to affect significantly outcomes
  - The inclusion of interconnectors displaces the need to procure capacity in the GB market. In the Alternative Case, using 75% creates a range of results and could also be a proxy for other factors such as impact of increases in Demand Side Response.
- The amount and type of capacity that is likely to be allocated CfDs beyond the end of the first Delivery Plan in 2019 is relatively uncertain and also has implications for the CM.
- Whether the CM will continue indefinitely or be a temporary measure.

Sensitivities

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High Renewable Energy Share (RES)

- A High RES Sensitivity on the Original Case was modelled using the same renewables capacity as in the Alternative Case.

Lower Gas Price

- A Lower Gas Price Sensitivity on the Original Case was modelled using the same lower gas price trajectory assumed in the Alternative Case.

Low Carbon Price

- A Low Carbon Price Sensitivity was developed to assess the impacts of a lower Carbon Price Floor (CPF) trajectory.

7% Target De-rated Capacity Margin

- A sensitivity was developed to assess the impact on the Original Case of a lower targeted de-rated capacity margin by 3 percentage points, to 7%.

Sensitivities CBA to 2020

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WACM2 benefit relative to Status Quo NPV (£m)		Original	Alternative	High RES	Lower Gas Price	Low Carbon Price	7% Target De-rated Capacity Margin
Power sector costs	Generation costs	18	19	18	-55	30	33
	Transmission costs	-38	0	-38	-14	-36	-32
	Constraint costs	-99	-55	-99	-71	-66	-99
	Carbon costs	4	5	4	23	2	4
	Decrease in power sector costs	**-115**	**-31**	**-115**	**-116**	**-70**	**-94**
Consumer bills	Wholesale costs	-51	-212	-51	-265	-363	-164
	Capacity payments	-114	-13	-114	-214	-31	-75
	BSUoS	-50	-27	-50	-35	-33	-49
	Transmission losses	-38	-41	-38	-38	-24	-38
	Demand TNUoS charges	0	30	0	17	-9	4
	Low carbon support	106	97	106	59	134	122
	Decrease in consumer bills	**-147**	**-167**	**-147**	**-476**	**-325**	**-200**

Sensitivities CBA to 2030

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WACM2 benefit relative to Status Quo NPV (£m)		Original	Alternative	High RES	Lower Gas Price	Low Carbon Price	7% Target De-rated Capacity Margin
Power sector costs	Generation costs	607	102	241	36	71	574
	Transmission costs	-169	-86	-349	-175	-195	-103
	Constraint costs	-339	69	-115	-105	-30	-120
	Carbon costs	85	14	27	27	6	62
	Decrease in power sector costs	**184**	**99**	**-196**	**-217**	**-148**	**413**
Consumer bills	Wholesale costs	-308	-65	-351	365	-296	-178
	Capacity payments	-630	-213	-197	-199	-10	-319
	BSUoS	-169	34	-57	-52	-15	-60
	Transmission losses	-131	-31	-155	-114	-89	-104
	Demand TNUoS charges	-28	-40	-142	-45	-77	1
	Low carbon support	382	417	571	176	288	244
	Decrease in consumer bills	**-884**	**102**	**-331**	**132**	**-200**	**-416**