Connect & Manage Forecast & Actuals Report July 2014

nationalgrid

Contents

1.0 Introduction

1.1 Background to Connect & Manage (C&M)

Following consultation on models for improving grid access, the Department of Energy and Climate Change (DECC) introduced the enduring C&M regime in July 2010 with an implementation date of 11 August 2010. Under this access regime, generators are offered connection dates based on the time taken to complete a project's 'enabling works', i.e. ahead of the completion of any wider transmission system reinforcements required under the security standards. Connecting generators ahead of the completion of wider works may result in additional constraints on the National Electricity Transmission System. Under the C&M regime any costs arising from the management of these constraints are socialised.

The C&M regime supersedes the previous Interim Connect & Manage (ICM) regime, which was introduced in May 2009 pending the development of the enduring regime. All projects which were offered an ICM agreement have been transitioned to the C&M regime.

Further information relating to the regime and the previous Quarterly Reports on the Connect and Manage Regime can be found by using the following links;

Government response to the technical consultation on the model for improving grid access - July 2010

National Grid's Connect and Manage Guidance Document – March 2013

C&M Derogation reports for projects with a signed C&M Agreement

Recent Connect and Manage reports

1.2 About this Report

This report is designed to provide information relating to the operation of the C&M regime for signed agreements from 1 April 2013 to 30 March 2014 and an assessment of forecast C&M costs for the following ten years. It provides an assessment of the potential ongoing overall benefits and the impact of allowing generation to connect ahead of the completion of wider works.

On the operation of the regime, information is provided in the following sections:

- **Section 2** reports on the performance of plant currently connected under the Connect & Manage regime with regard to the last quarter of Financial Year 2013/14 and the whole year in summary.

- **Section 3** provides an assessment of the anticipated additional costs which might be incurred as a result of the derogations against requirements contained within the NETS SQSS as a consequence of the connection of generation in advance of Wider Transmission Reinforcement Works being completed ("Connect & Manage"). This is the first C&M forecast with 2013 Future Energy Scenarios and associated boundary limits.

We would appreciate any feedback you have on this report. If you have any questions or feedback then please do not hesitate to contact us via the following email address;

transmissionconnections@uk.ngrid.com

2.0 Connect & Manage Outturn Reporting

This section reports on the performance of plant currently connected under the Connect & Manage regime with regard to the last quarter of Financial Year 2013/14 and the whole year in summary.

For greater clarity, the format gathers aggregated outturn data in a single tabulation (Please refer to Table 1 on Page 5).

In addition to reporting on constraint costs and carbon dioxide saved, as per previous published reports, the tabulation now includes various figures on energy output and energy constrained as they provide context as to the drivers of cost and carbon benefit. A narrative is also provided to assist the reader in understanding the context further.

Since previous reports a number of category naming conventions have changed. Please find below an explanation of the categories which are contained within Table 1 (page 5):

1. Output of the C&M units (GWh): i.e. as per operational metering
2. Carbon Abatement (Thousand Tonnes): an estimation of the amount of CO2 emissions saved due to running the C&M renewable plant in place of the conventional plant that would have otherwise run.
3. C&M Output Contributing to System Constraints (GWh) [Constraint attributable volume]: That part of the Output (see 1.) of the C&M units which caused or exacerbated a transmission system constraint and therefore had to be managed through actions to pull back other plant behind that constraint boundary, or by other actions to enhance flow.
4. Constraint Costs Attributable to C&M Units (£k): the costs of actions to manage the constrained volume specific to the C&M output (see 1.). This covers costs of actions through the Balancing Mechanism and through Trades. Costs for arming Cheviot intertrips to raise transmission limits are included as appropriate although these are treated as zero-volume actions in (3) above.
5. TNUoS Generation Zone: Summated values for the C&M connected generators as distributed geographically according to the National Grid TNUoS Generation Zones[1].

[1] http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/Transmission-Network-Use-of-System-Charges/Tools-and-Data/

2.1 Connected C&M Generation

The table below shows generation projects which have been connected under C&M terms since 2010. The rows which are shaded represent those projects connected during the April - March 13/14 year, with Tullo II having newly connected in the last quarter. This brings the overall total to 22 generation units with an aggregate contracted capacity of 1.215 GW.

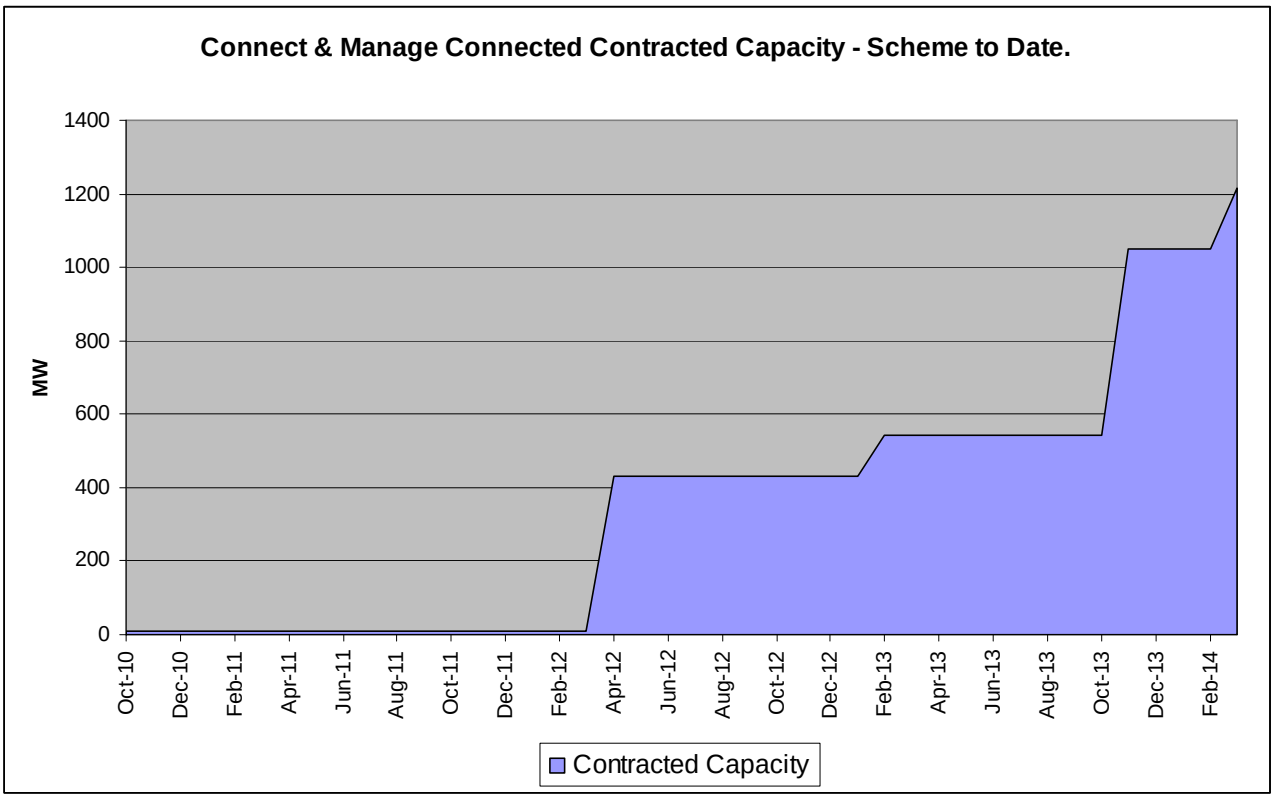
Project	Fuel Type	Contracted Capacity (MW)	ETYS Zone	TNUoS Generation Zone	Connection Month
Fasnakyle G4	Hydro	8	1	3	Oct 2010
Novar 2 Wind Farm Alness	Onshore Wind	32	1	1	Oct 2011
Hill of Towie (Drummuir)	Onshore Wind	48	1	1	Oct 2011
Whitelee Extension	Onshore Wind	238	6	7	Dec 2011
Beinn an Tuirc 2	Onshore Wind	6	3	5	Dec 2011
Glendoe	Hydro	100	1	3	Apr 2012
Baillie Wind Farm Stage 1	Onshore Wind	25	1	1	Dec 2012
Rosehall	Onshore Wind	25	1	5	Dec 2012
Kildrummy Wind Farm	Onshore Wind	18	2	4	Dec 2012
Cairn Uish (Phase 2)	Onshore Wind	41	1	1	Feb 2013
Baillie Wind Farm Stage 2	Onshore Wind	28	1	1	May 2013
Calderwater	Onshore Wind	32	6	7	May 2013
Camster	Onshore Wind	50	1	1	May 2013
Pentland Road Stage 1	Onshore Wind	14	1	3	Jun 2013
Harestanes Stage 1	Onshore Wind	111	6	7	Sep 2013
West of Duddon Sands Stage 1	Offshore Wind	206	6	9	Oct 2013
Berry Burn	Onshore Wind	67	1	1	Nov 2013
Gordonsttown Hill	Onshore Wind	13	2	1	Nov 2013
Markinch Biomass CHP Plant	Biomass	3	5	6	Nov 2013
Lchluichart Windfarm Stage 1	Onshore Wind	51	1	1	Nov 2013
Mid Hill Wind	Onshore Wind	75	2	1	Dec 2013
Tullo II	Onshore Wind	25	1	1	Mar 2014
Total Contracted Capacity (MW)		1,215			

Erratum; This table in Oct/Dec 2013 Interim Report incorrectly listed ETYS Zones as TNUoS zones. Both are tabulated above for completeness. Other outturn calculations and reporting by TNUoS zones are unaffected.

It should be noted that although all sites are connected to the NETS not all are fully operational. In particular wind farms can often take a period of time (of >1 year duration) to ramp up to full generation output.

Overall Trends

Since the C&M regime began there has been an increase in energy output from the C&M plant due both to the number of generators connected, and also a growth reflecting increases in operational plant of windfarm arrays already connected. More than half of the total C&M capacity has been connected in the last reporting year, see chart below.



At the present time most C&M generators are located in Scotland and their outputs are subject to transmission constraints within the Scottish network and at the Cheviot boundary while works are underway to reinforce those networks. Consequently it is not always possible to accept the output of a particular C&M unit were it to cause a constraint limit to be exceeded. In effect the C&M unit output competes for transmission capacity with other generation behind that constraint: The constraint is managed by either restricting generation in that constraint group ("*Pulling Back*" by BM, trades or contracts) or by enabling a higher constraint limit (i.e. by intertrip), in most economic order.

Drivers behind the figures for 2013/4 Q4 January – March reflect a combination of the following:

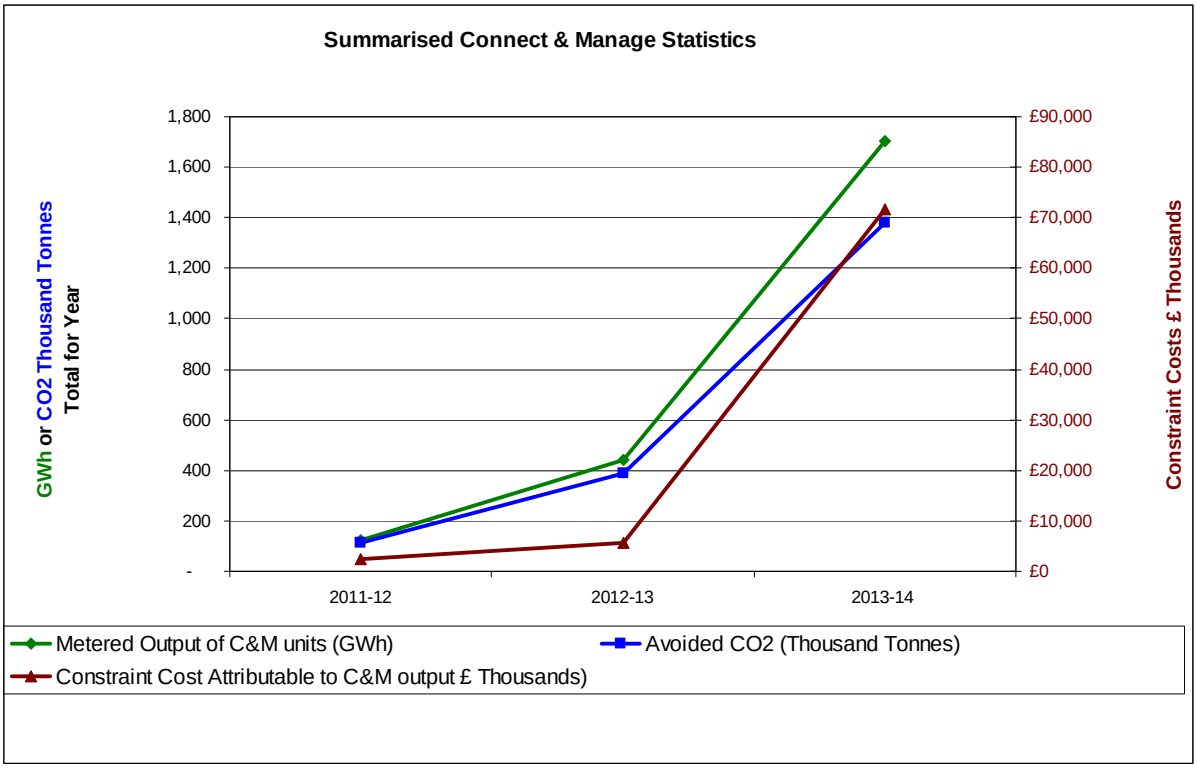
- Increased operational capacity of C&M units
- Increased operational capacity of non-C&M other generation in the locality of the C&M units (i.e.. windpower).
- Winter generation levels, with seasonal high windpower output across much of the quarter.

Metrics relating to the outturn of connected units are tabulated below (Table 1) and discussed in the following paragraphs.

Table 1: Connect & Manage Outturn Data Summary[2]

Connect & Manage Outturn Summary	Financial Year (Apr-Mar)	National	By TNoS Generation Zones 1	2	3	4	5	6	7	8	9	Other
Output of C&M (GWh)	2011-12	126	7	-	116	-	3	-	-			-
	2012-13	443	120	-	108	1	26	-	188			-
	2013-14 Q1	*232*	*70*	-	*44*	*11*	*12*	-	*95*	-	-	-
	2013-14 Q2	*178*	*88*	-	*22*	*10*	*10*	-	*48*	-	-	-
	2013-14 Q3	*581*	*242*	-	*120*	*20*	*20*	-	*179*	-	-	-
	2013-14 Q4	*711*	*267*	-	*131*	*13*	*28*	*6*	*233*	-	*33*	-
	2013-14	1,702	667	-	317	54	70	6	555	-	33	-
	Total to date	2,271	794	-	541	55	99	6	743	-	33	-
Carbon Abatement due to running of C&M units (Avoided CO2) (Thousand Tonnes)	2011-12	115	7	-	105	-	3	-	-	-	-	-
	2012-13	388	151	-	85	10	16	-	126	-	-	-
	2013-14 Q1	*228*	*59*	-	*80*	*8*	*8*	-	*73*	-	-	-
	2013-14 Q2	*149*	*72*	-	*14*	*7*	*7*	-	*49*	-	-	-
	2013-14 Q3	*447*	*178*	-	*102*	*13*	*14*	-	*140*	-	-	-
	2013-14 Q4	*553*	*187*	-	*139*	*9*	*20*	*24*	*174*	-	-	-
	2013-14	*1,377*	*496*	-	*335*	*37*	*49*	*24*	*436*	-	-	-
	Total to date	1,880	654	-	525	47	68	24	562	-	-	-
C&M Output Contributing to System Constraints (GWh)	2011-12	71	2	-	67	-	2	-	-	-	-	-
	2012-13	97	26	-	9	2	7	-	53	-	-	-
	2013-14 Q1	*160*	*44*	-	*34*	*8*	*9*	-	*65*	-	-	-
	2013-14 Q2	*80*	*45*	-	*3*	*5*	*6*	-	*21*	-	-	-
	2013-14 Q3	*431*	*178*	-	*77*	*15*	*16*	-	*145*	-	-	-
	2013-14 Q4	*553*	*221*	-	*135*	*11*	*22*	*4*	*157*	-	*3*	-
	2013-14	*1,224*	*488*	-	*249*	*39*	*53*	*4*	*388*	-	*3*	-
	Total to date	1,392	516	-	325	41	62	4	441	-	3	-
Constraint Costs Attributable to C&M units (£ Thousands)	2011-12	£ 2,432	£ 72	-	£ 2,236	-	£ 124	-	-	-	-	-
	2012-13	£ 5,646	£ 1,664	-	£ 785	£ 58	£ 294	-	£ 2,845	-	-	-
	2013-14 Q1	*£ 11,598*	*£ 3,219*	-	*£ 2,556*	*£ 199*	*£ 939*	-	*£ 4,685*	-	-	-
	2013-14 Q2	*£ 5,224*	*£ 3,200*	-	*£ 183*	*£ 177*	*£ 481*	-	*£ 1,183*	-	-	-
	2013-14 Q3	*£ 23,703*	*£ 10,151*	-	*£ 3,891*	*£ 807*	*£ 904*	-	*£ 7,950*	-	-	-
	2013-14 Q4	*£ 31,232*	*£ 12,405*	-	*£ 10,317*	*£ 478*	*£ 1,293*	*£ 89*	*£ 6,547*	-	*£ 103*	-
	2013-14	£ 71,757	£ 28,975	-	£ 16,947	£ 1,661	£ 3,617	£ 89	£ 20,365	-	£ 103	-
	Total to date	£ 79,835	£ 30,711	-	£ 19,968	£ 1,719	£ 4,035	£ 89	£ 23,210	-	£ 103	-

The Key indicators of metered output, Avoided CO2 emissions and Constraint Costs Attributable are charted below.



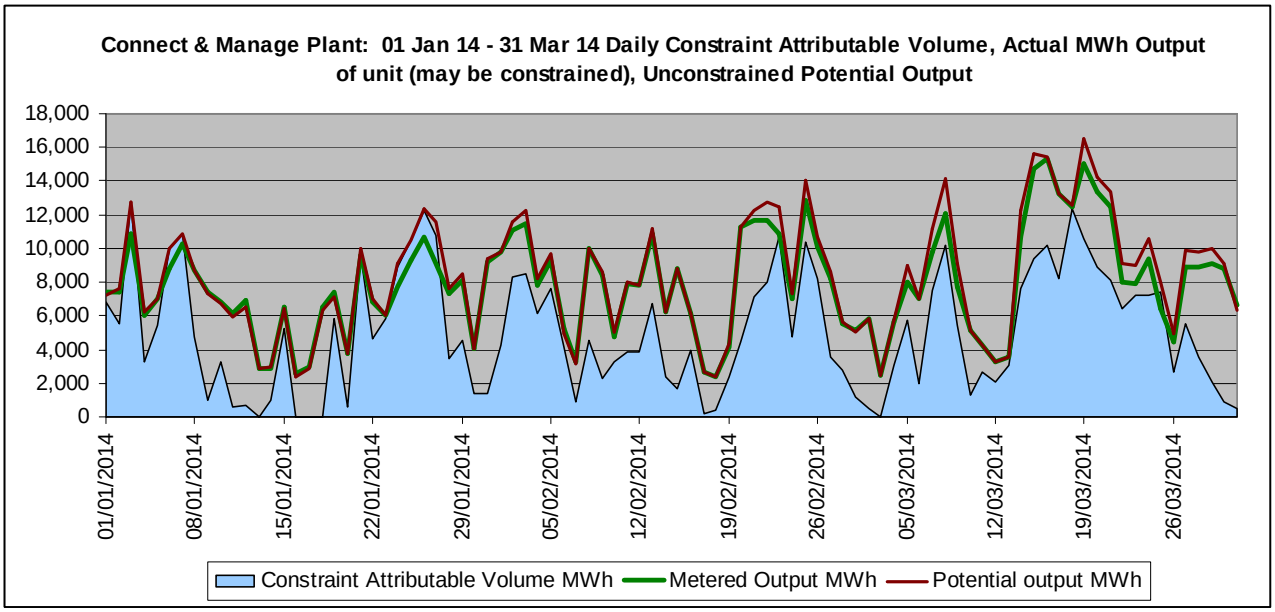
[2] Note: Revision to FY 2011-12 Zone 4. Previously published figures of Carbon 48,387 tonnes, Constraint Cost £1,725,634 are withdrawn as these related to a windfarm which is not subject to C&M terms.

2.2 2013 – 2014 Current Year and Last Quarter

Metered Output

In line with the installed capacity growth, the metered output of the C&M units has risen, with the total for year 2013/14 reaching 1,702 GWh as compared to 443 GWh in 2012/3. However, as output of the C&M units increases, they compete for transmission capacity against other generation in their vicinity, often with other windfarms, as mentioned above. As a consequence, on a windy day it can be necessary to restrict the output of the C&M unit, which leads to a difference between the potential unrestricted output of the C&M unit as compared to its actual metered output.

The chart below shows the metered output of the C&M units together with the potential unrestricted output that they could have achieved had no actions been required on these machines. The chart shape is primarily driven by windpower output in the region. The estimated total potential output of the C&M units in the quarter is 749 GWh, against the total 711 GWh metered. This chart is further discussed in the following section.



Constraint Costs

In line with the above growth, constraint costs attributable to the output of C&M units have risen from £2.4m as reported in 2011-12, to £71.8m for the full 2013-14, with the total cost attributable to C&M since the start of the regime being £79.8m, it being clear that the last two quarters are the chief contributors. The heightening costs reflect tightening competition for transmission as generation levels increase around the localities of the C&M units, often needing more expensive actions to resolve. In the above chart the 'Constraint Attributable Volume' is a volume of constraint actions directly attributable to the activity of the C&M unit. On occasions it is seen to exceed the actual metered output of the C&M unit, reflecting that in order to manage constraints at that time it was first necessary to pull back the C&M unit itself, and then to take further constraint management actions on other plant in the group so that the metered output could be transported over the transmission network.

Carbon Abatement

The carbon benefit (avoided CO2) goes hand in hand with the output of renewable C&M generation. Calculations are based on our estimate of the conventional fuel (coal, gas) that is displaced by the C&M units.

Table 1 (see Page 4) shows that the estimated CO2 saved by output from the C&M units, as opposed to other generation which would otherwise have run, now totals 1.88 million tonnes since the beginning of the scheme.

3.0 Assessment of anticipated additional costs and benefits as a result of C&M

3.1 Introduction

The following section provides an assessment of the anticipated additional costs which are as a result of the derogations against requirements contained within the NETS SQSS as a consequence of the connection of generation in advance of Wider Transmission Reinforcement Works being completed ("Connect & Manage"). This is the first C&M forecast with 2013 Future Energy Scenarios and associated boundary limits.

The enduring Connect and Manage (C&M) regime was introduced by DECC to help meet climate change targets and ensure security of supply. However, it is also important to ensure that the additional cost of the regime is not excessive and National Grid can still demonstrate that it is meeting its obligation to run the system economically and efficiently.

C&M costs are complex to forecast due to the increasing level of uncertainty associated with how the market will meet future demand, as a result of the future closure of much plant which is the result of end of technical life and restriction on running (e.g. Large Combustion Plant Directive).

The forecasts of C&M costs have been steadily improved since the introduction of the regime. The following provides a high level description of the process for forecasting the additional costs as a result of C&M. This report provides more detail than previous reports to help understand the forecast impact of the regime in terms of costs and CO2 impact, and how much the transmission system may restrict the output of C&M plant and other associated impacts.

National Grid has adapted its approach to the C&M forecast of longer term C&M connectees to take account the interaction of the Network Development Policy (NDP). While shorter term C&M connectees would likely result in a cost uplift, in longer term timescales costs are still controlled by the NDP i.e. a decision to bring forward investment would be taken. To reflect this interaction with NDP, the forecast costs of C&M have been set to zero from 2019/20 for England & Wales and 2020/21 for Scotland.

3.2 Forecasting Process

The C&M constraint costs associated with the Future Energy Scenario "Gone Green 2013" are calculated assuming the connection dates of Connect & Manage units differ in two situations.

(a) Enabling works completed
(b) Wider works completed.

The first part of the process is to calculate the additional constraint costs arising as a result of the additional C&M generation connected in the Gone Green 2013 scenario at the completion of all associated wider works.

Generation is categorised as Connect and Manage between its enabling date and the wider works completion date. Once the wider works are complete, the generation is not considered as C&M capacity, beyond that point. Our cost forecasts are based on the difference in costs between the Enabling Dates scenario and the Wider Works scenario. This means that generation categorised as "C&M" is coming in and out of the assessment throughout the ten year forecast period. Scottish C&M capacity increases year on year due to the high volume of additional wind connecting in the Gone Green scenario in the later years in comparison to the completion of wider works for earlier connections.

National Forecast peak demand based on the Future Energy Scenarios presented in the Electricity Ten Year Statement (http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/Electricity-ten-year-statement/) is profiled across the country using historical profiles. Hourly demands are produced based on a historic profile as a percentage of the peak demand. An unconstrained merit order which does not meet the transmission boundary capabilities is produced. This is done by scheduling plant to meet demand based on the most to least economic Short Run Marginal Costs. Short Run marginal costs are widely based on assumed heat rates (fuel to energy efficiency factors) and future fuel prices. Interconnectors and wind are treated separately;

- Interconnectors flows are modelled using a simplified merit order and forecasted European market prices based on the same underlying fuel prices as for the GB market.
- Wind flow is based on localised wind factors which are based on historical wind data.

To determine the constraint cost impact; a transmission network is added, with associated transmission boundary limits. The flow of power across the boundaries must comply with the boundary limits. This will result in the "pull back" of generation where there is an export constraint and "push through" of more generation where there is an import constraint. There will be equal and opposite balancing actions outside the constrained areas to ensure National demand is met.

The cost of varying these outputs is then calculated based on the typical corresponding bid and offer prices for varying the output of this generation within the Balancing Mechanism.

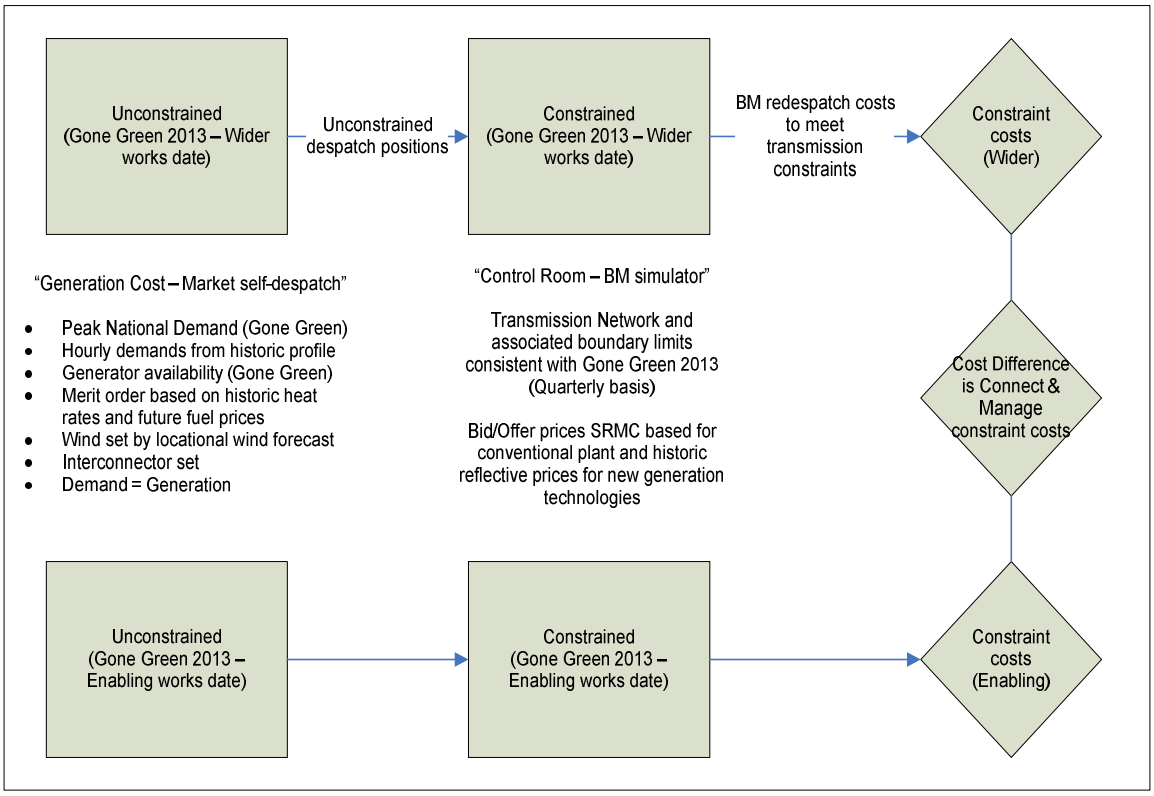
The difference in cost of the unconstrained and constrained models gives the constraint cost of "Gone Green 2013 – C&M connection at the date of completion of wider works" [1].

The same generation backgrounds are taken, modifying the connection dates of C&M generation, advanced to the completion of enabling works. **The impact on the behaviour of the market of the additional C&M generation made available; and consequent suppression of energy/fuel price and the subsequent effect on plant availability are not modelled.**

The assumed amount of available generation as a result of "enabling works" dates is greater and as a result, marginal plant will be displaced from the merit order to meet demand.
The unconstrained and constrained models are then produced for the "enabling works" scenario and the difference in costs between these two runs is the constraint cost of "Gone Green 2013 – C&M connect at completion of enabling works" [2].

The difference in constraint costs of [2] and [1] gives the constraint costs of C&M.

The following is a high level diagram showing this process.



The modelling approach does not consider the overall changes in market capacity and the associated impact on market behaviour and prices. It focuses primarily on the volume of C&M plant available in the future scenarios and the additional cost of resolving constraints during the periods that this C&M plant has connected to the transmission system but the wider reinforcement works required for compliant connections have not yet been completed.

In our approach, where lifetime derogation boundary costs exceed a specific limit, reinforcement works are advanced consistent with the general programme of work to provide a higher boundary limit earlier in the scenario timescale to achieve overall costs within an assumed cost limit. This approach reflects the situation that should occur in practice, where TSO's invest efficiently in their networks partly in response to higher constraint costs. Planned transmission investment should ensure that C&M costs decrease. In addition, a significantly higher volume of C&M in future years should lead to downward pressure on prices, which may cause other C&M projects to defer their connection to later years.

As the C&M generation connects, they will then be fully incorporated in all future scenarios and the system impact of these additional generation will evaluated in the application of National Grid's Network Development Policy (NDP), as discussed in section 3.3.2 below.

3.3 Impact of Connect & Manage Gone Green Scenario

3.3.1 Total Constraints Cost & Volumes: GB Market

The following charts show the forecasted costs and volumes of C&M constraints for 2014/15 through to 2023/24. To provide a consistent basis for forecast the boundary capabilities are calculated on a quarterly (seasonal) basis and do not take account of the impact of specific and individual maintenance outages, which would provide a greater resolution of boundary limits, for instance, on a weekly basis. Individual outages and their impact on boundary limits are only known for 2014/15 and not for 2015/16 onwards. A more detailed and comprehensive view of the forecast costs is provided under our SO incentives for 2014/15.

The reason for taking this approach was to provide an indicative view of the costs of Connect & Manage.

Points of note:

An approach adopted in previous years was the use of pre-agreed costs limits for individual constraint boundaries and the system as a whole. We have applied these cost limits to the C&M modelling to ensure that excessive costs are not incorporated into the output. We consider this a sensible approach to adopt given National Grid's licence obligation to plan and operate the system economically and efficiently, and this is also consistent with the Network Development Policy. If the lifetime derogation cost of a specific constraint boundary was forecasted to be in excess of the cost of the next incremental boundary reinforcement, then these reinforcement works will be advanced to provide a higher boundary limit earlier then presently presented in our Electricity Ten Year Statement (ETYS).. The costs shown reflect these adjusted limits for certain boundaries consistent with respecting lifetime derogation cost limits. These adjustments have only been made in the later years of the scenario to reflect the lead times associated with building new infrastructure.

3.3.2 Impact of Network Development Policy

In addition to the above approach, the impact of National Grid's Network Development Policy has also been taken into account in the cost assessment.

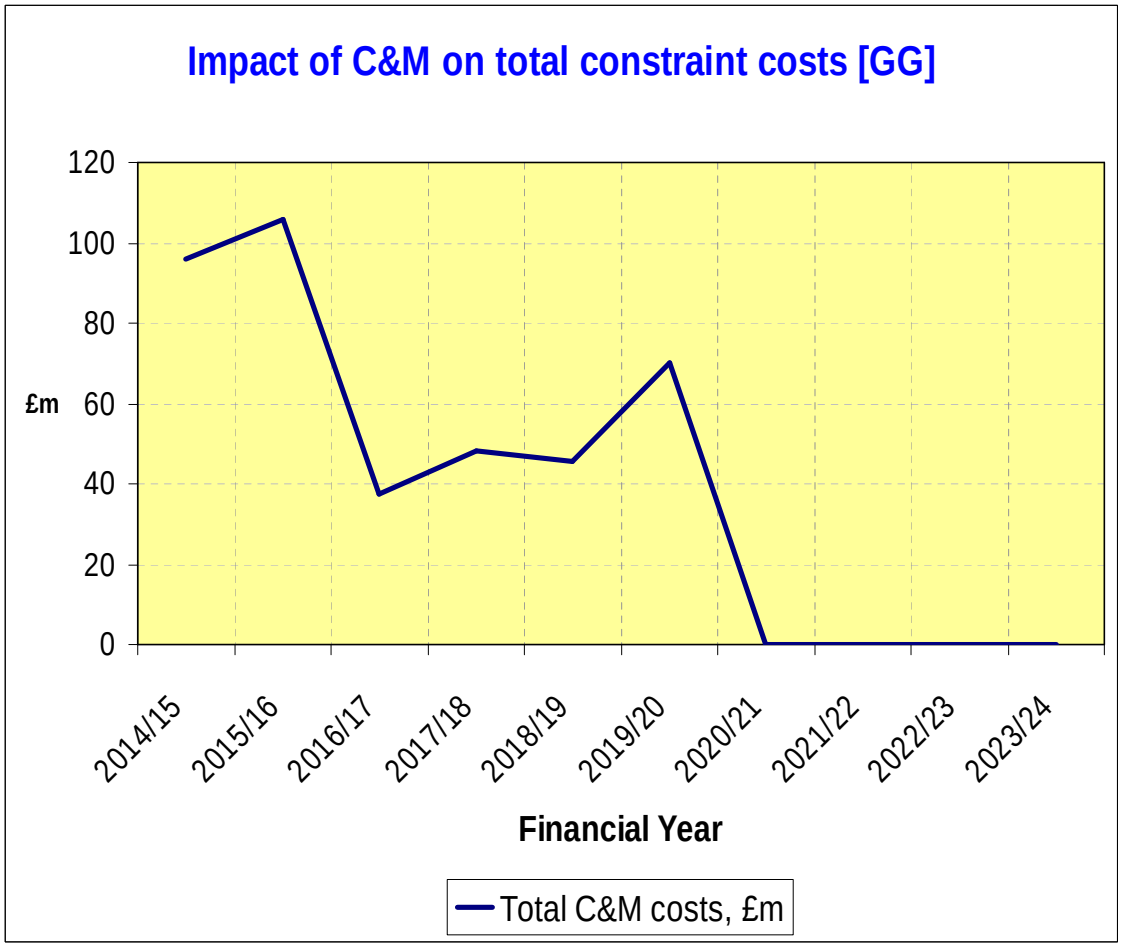
The RIIO price control introduced the Network Development Policy (NDP) for England and Wales where National Grid is the transmission owner. The NDP identifies the requirements for further transmission investment and considers the balance between the risks of investing too early in wider transmission reinforcements and the risks of investing too late, which include incurring inefficient congestion costs. The key output of the NDP is the identification of the appropriate action to take in the current year. This is selected through minimising the investment regrets against the credible range of future energy scenarios and sensitivities. The NDP provides a transparent process for the selection of transmission solutions and is presented in Chapter 4 of our Ten Year Statement. This will enable stakeholders to understand why decisions to build, and not to build, have been taken. The range of system requirements and NDP outcomes presented in this year's Electricity Ten Year Statement (ETYS) reflect the current slower market conditions and therefore some major projects are now being delivered in later years.

The impact of NDP on the Connect and Manage cost assessment is that from 2019/20 onwards, England and Wales boundaries will all be considered as "controlled" boundaries. This means that any constraint costs associated with additional connections or other changes will be fully managed within the NDP process. To be specific, as a result of the current C&M generation included in the Gone Green and Slow Progression 2013 scenarios, there are no expected C&M related constraint costs from 2019/20 onwards for England and Wales (E/W) boundaries. For Scotland, boundaries are controlled from 2020/21.

We assume this because if we made a decision to invest in 2013/14 on any of these projects associated with Network Development Policy in England and Wales we could deliver any project for 2019/20. However, for many of our major projects we have made these decisions not to carry on with the investment because we do not believe that the generation based on the balance of all of the scenarios will require the investment in these timescales, such as Bramford-Twinstead etc. When looking at Gone Green only there may have been constraints associated with these investments not being progressed to the timescales that only manifested itself in Gone Green. Therefore is appropriate to assume there would have been zero constraint costs in this scenario because, if we were making a single scenario decision, and not utilising Real time decision making of NDP looking at many scenarios, we would have been able to deliver the investment and therefore the constraint cost associated with wider works not being completed would be zero in Gone Green.

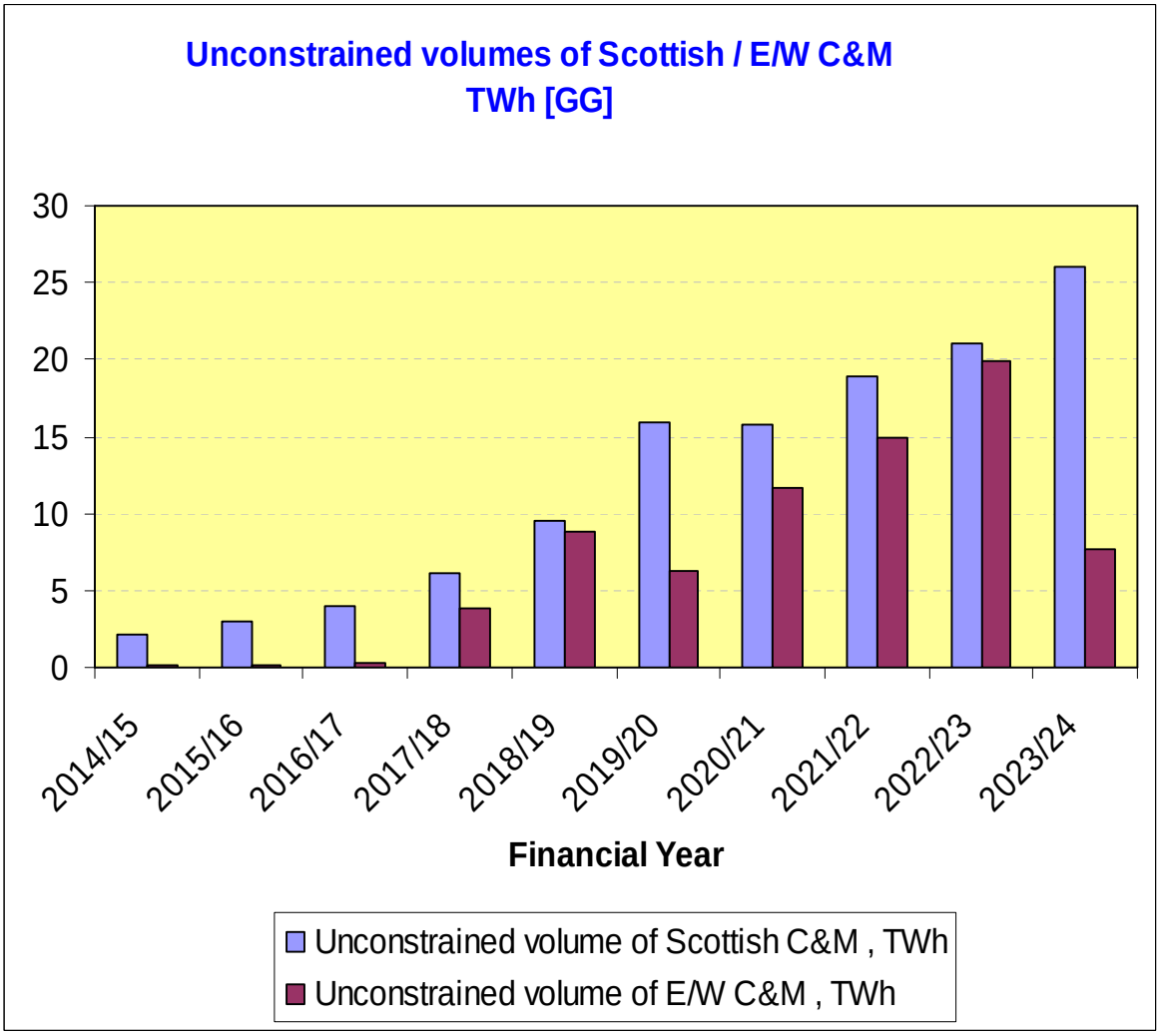
Assessing the balance of constraint costs vs investment:

When assessing whether to make an investment vs an efficient level of constraint we are using both the SQSS to identify where there may be pinch points on the network and then a cost benefit analysis looking at the cost of the investment compared to the expected constraint costs. A decision on whether to invest, in one scenario only, would be based on the investment providing sufficient benefit to the transmission system such that the cost of the investment over its life time is cheaper than the cost of the constraints expected without the investment. We make a decision on the optimal year of the investment such that the ratio of cost of investment-cost of constraints is maximised.



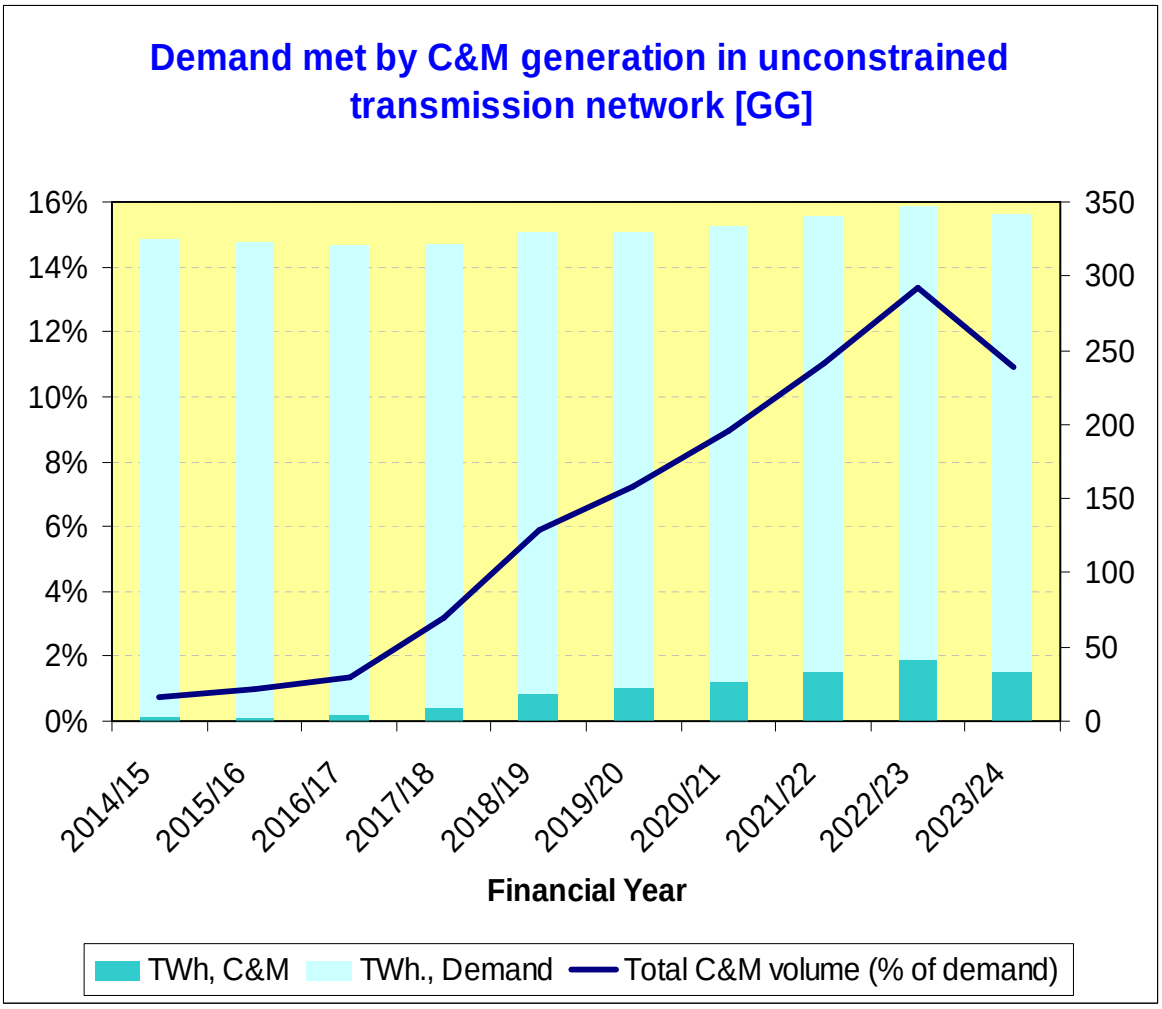
Outturn C&M costs for 2013/14 are £71.8m; these costs are forecast to continue to rise as additional C&M generation appears in Scotland and costs are incurred as a result of constraints within Scotland and the north of England (B7a Upper North - see Appendix A System Boundary Map). In 2014/15 there is an increase in B6 (Cheviot) limits as a result of additional series and shunt compensation in Scotland. This results in costs for B6 collapsing and costs being attributable to B7a. Following infrastructure reinforcements in 2016/17, these costs are reduced. Costs continue to build until network reinforcements via the NDP process are delivered across both Scotland and E/W boundaries.

In later years, England and Wales C&M generation becomes more prominent and costs for later years are more attributable to E&W constraints as the E&W C&M generation offsets Scotland to England flows. This can be shown in the following graph which shows the relative influence of Scotland and England and Wales C&M generation for the unconstrained network, i.e. assuming no transmission constraints.


Unconstrained volumes of Scottish / E/W C&M
TWh [GG]
30
25
20
15
10
5
0
2014/15
2015/16
2016/17
2017/18
2018/19
2019/20
2020/21
2021/22
2022/23
2023/24
Financial Year
Unconstrained volume of Scottish C&M , TWh
Unconstrained volume of E/W C&M , TWh

3.4 Demand met by C&M generation in unconstrained transmission network

The following graph gives a view of how successful C&M is forecast to be in meeting total National demand assuming no restrictions in output due to constraints. The decrease in 2023/24 is associated with the completion of a major component of wider works, which reduces the volume of generation categorised as C&M in that year.



Note: the figures shown above relate specifically to Connect and Manage generation (wind and other fuel types), not to all renewable generation, e.g. other generation which does not have advanced enabling dates ahead of wider works completion.

3.5 Comparison to Gone Green 2012 & Gone Green 2013

The Gone Green scenario has been designed to meet the environmental targets; 15% of all energy from renewable sources by 2020, greenhouse gas emissions meeting the carbon budgets out to 2027, and an 80% reduction in greenhouse gas emissions by 2050.

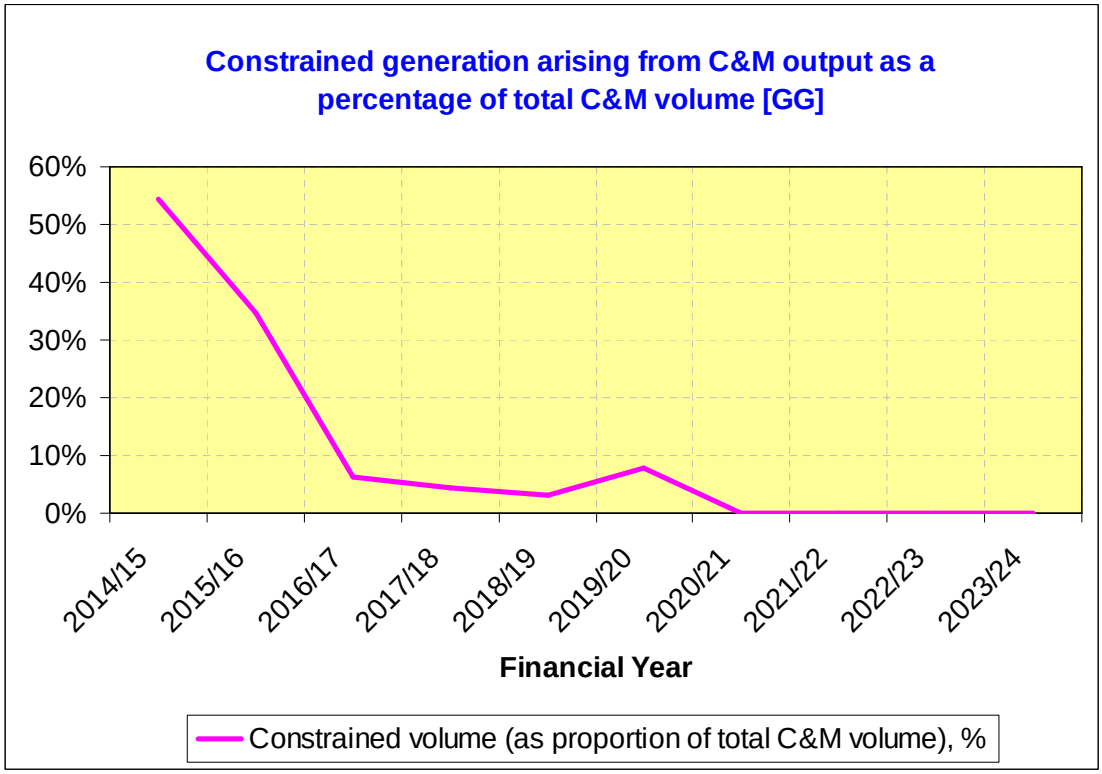
Electricity demand projections are lower in both scenarios than in our 2012 scenarios as a result of a number of improvements to our analysis methodology and a lower outturn demand in 2012. Future plant build (both renewable and thermal generation) is subject to considerable uncertainty, and Electricity Market Reform (EMR) will play an important role in delivering new build for renewable, nuclear and gas, through anticipated mechanisms such as Contracts for Difference (CfDs) and capacity payments. Lower electricity demand projections offset the impact of plant closures. Margins can be

maintained in the medium term at around 5% (on a de-rated basis) but this is dependent on new generation build and in both scenarios they dip below this level in the next few years. Gas generation capacity increases and the role of gas generation becomes more prominent as a back-up for intermittent generation.

Since we have updated our modelling, it becomes very difficult to compare and contrast forecasts. Key assumption changes between Gone Green 2012 and 2013 are:

- Updated heat rates based on historical analysis and brought in-line with SO incentive forecast assumptions.
- Updated wind BOA prices to more closely reflect actual submitted prices.
- Incorporation of new constraint boundaries

3.6 Volume of generation constrained as a proportion of total C&M generation

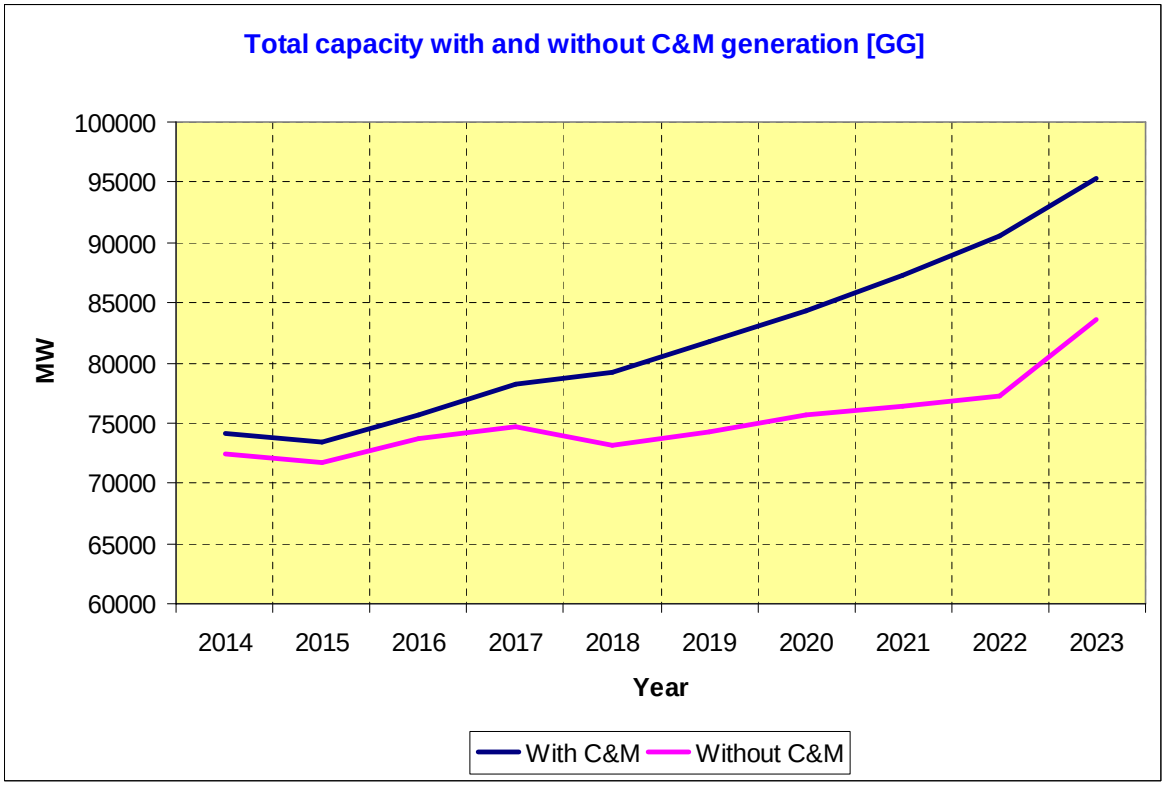


In the first two years of the scenario, forecast constrained generation volumes are a significant proportion of the total C&M volume. This is associated with:

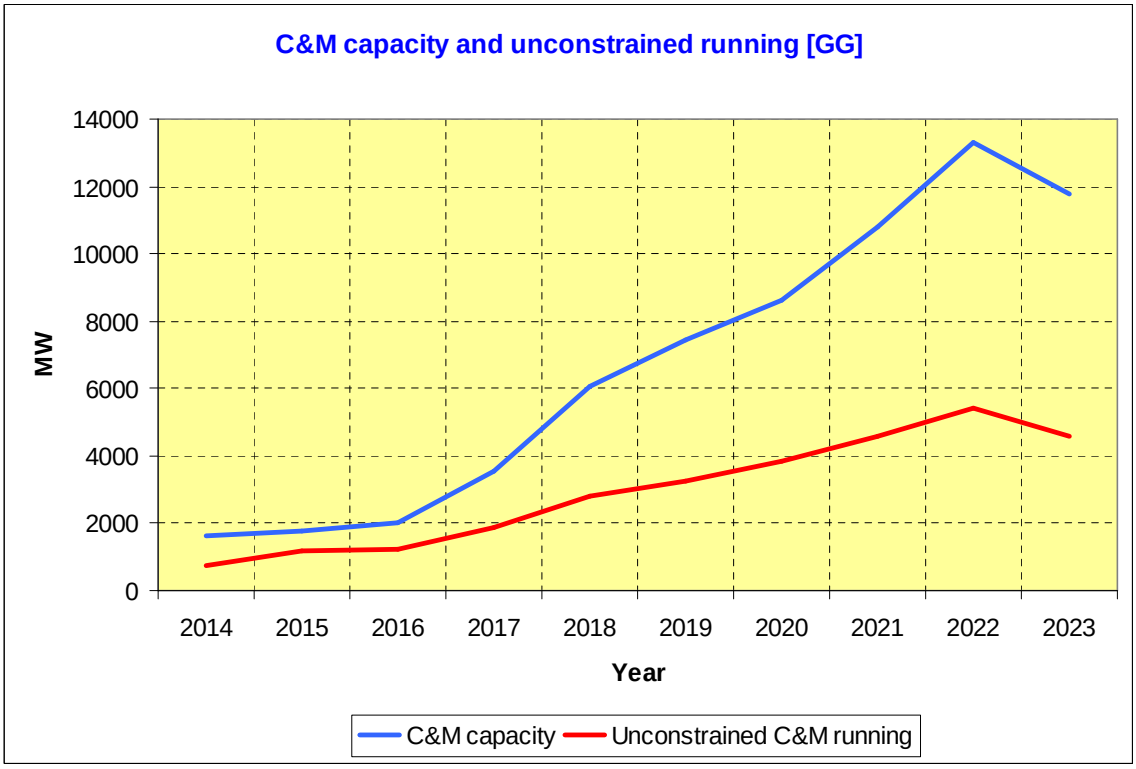
- the restriction in output attributable to the B7a – Upper North constraint prior to reinforcement works being completed.
- A relatively low volume of available C&M generation in these early years compared with overall congestion volumes.

In later years, the proportion of generation constrained as a proportion of output decreases. Due to transmission reinforcement occurring in discrete stages, there will always be increases and decreases in the proportion of C&M generation which is constrained as seen by the increase in later years.

3.7 Capacity of C&M generation within Future Energy Scenario GG2013

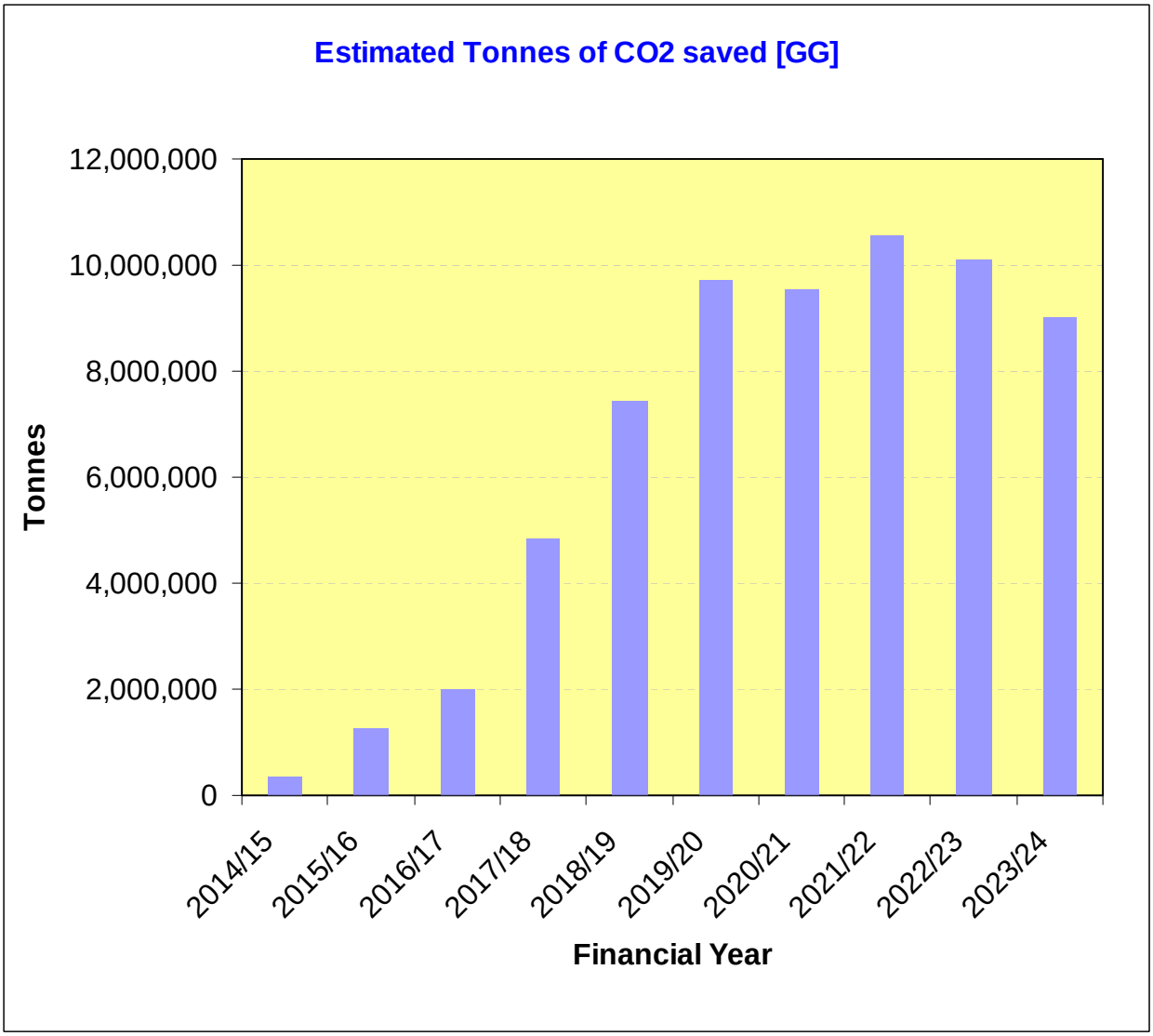


The above graph shows the forecast generation capacity in the Gone Green 2013 scenario with and without C&M generation. This aligns with earlier commentary highlighting the significant increase in C&M volumes in later years of the scenario compared with earlier years.



This shows a comparison of the total C&M capacity and the unconstrained C&M running i.e. the typical load factor of C&M generation. This again highlights the increase in C&M volumes in later years of the scenario, with corresponding increases in the unconstrained running of C&M.

3.8 Estimated carbon savings

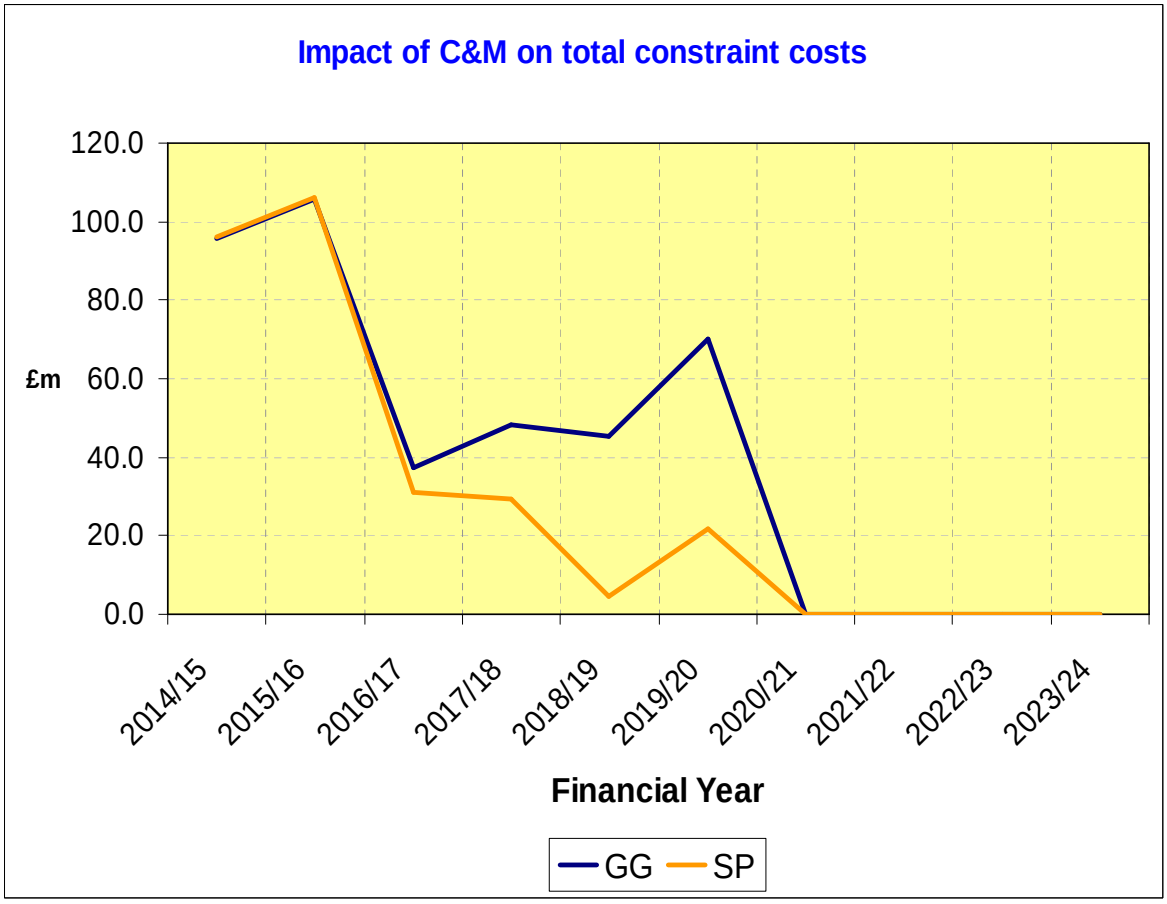


The above graph shows the forecast CO2 savings from the C&M regime over the next ten years.

In context, the CO2 savings of around 9-10 million tonnes for the last five years of the forecast period equate to the typical annual emissions from around 4 medium sized coal stations.

(Using an example of a 480MW medium sized coal plant with a load factor of 66% which runs all year round, the number of running hours is 8760 (24 hours x 365 days), this would equate to ~2.5 million tonnes of emissions of carbon dioxide (0.96 Tonnes/MWh x (66% x 480)MW x 8760 hours).
Therefore, 10 million tonnes of carbon is equivalent to the CO2 emissions from ~4 medium size coal units).

3.9 Comparison of total C&M costs for Gone Green and Slow Progression 2013 scenarios



The above graph shows the total costs for the Slow Progression scenario. The costs are significantly lower than Gone Green for most years except 2014/15 and 2015/16 where the costs remain high as a result of insufficient infrastructure in place to support the forecast flows across the B1 North West Export and B7a Upper North boundaries. As described in section 3.2 above, the impact of the Network Development Policy (NDP) is to remove any forecast constraint costs for 2020/21 onwards in the Slow Progression scenario in the same way as for the Gone Green scenario.

Summary of costs for GG and SP

Year	Total C&M costs	
	[GG], £m	[SP], £m
2014/15	95.8	95.8
2015/16	105.6	105.6
2016/17	37.4	30.8
2017/18	48.2	29.2
2018/19	45.5	4.7
2019/20	70.2	22.0
2020/21	0.0	0.0
2021/22	0.0	0.0
2022/23	0.0	0.0
2023/24	0.0	0.0

4.0 Contracted Generation and Acceleration of Connection Dates

The table below provides a summary of all projects with a signed C&M agreement split by Transmission Owner. The status denotes the following:

- "Future" relates to those projects which have entered into an agreement but are yet to connect and;
- "Connected" refers to those projects which have already connected to the network. A breakdown of each connected site can be found in Section 2.1 of this report.

TO	Status	Renewable / Non Renewable	Number of Projects	Capacity (MW)	Average Advancement (Years)
NGET	Future	Renewable	31	15,906	3
		Non Renewable	7	5,230	4
	Connected	Renewable	1	206	2
		Non Renewable	0	0	0
Total			**39**	**21,342**	**3**
SPT	Future	Renewable	52	6,833	6
		Non Renewable	0	0	0
	Connected	Renewable	4	384	10
		Non Renewable	0	0	0
Total			**56**	**7,217**	**6**
SHE	Future	Renewable	79	7,712	5
		Non Renewable	0	0	0
	Connected	Renewable	17	613	5
		Non Renewable	0	0	0
Total			**96**	**8,325**	**5**
Overall Combined TO Total			**191**	**36,884**	**5**

The "Average Advancement" describes the advancement (in years) that a customer could expect to achieve under the C&M regime, as opposed to the Invest & Connect regime. Under Invest & Connect projects would need to wait for wider reinforcement works required under the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) to be completed on the transmission system prior to connection. Whereas; under the C&M regime relevant generators only need to await the completion of "Enabling Works".

It is worth noting that the data which has been used to determine the average advancement value has been taken from customers' signed agreements which, in some cases (at the customers' preference), are later than the earliest connection date that could have been achieved.

Overall there are 191 projects which have a C&M agreement with a combined total capacity of approximately 37GW and an average advancement of 5 years.

Since the last report the number of projects which have now connected to the system has increased from 15 to 22. The number of customers entering into a contract has also increased from 148 "future" projects to 170, with a significant proportion of new customers seeking a connection in the SPT area.

Although the total number of projects has increased the total number of GW capacity has remained relatively static. This is because a small number of large capacity projects have terminated their contracts and a greater number of projects with smaller capacity have subsequently entered into an agreement.

Appendix A - Map of system boundaries studied