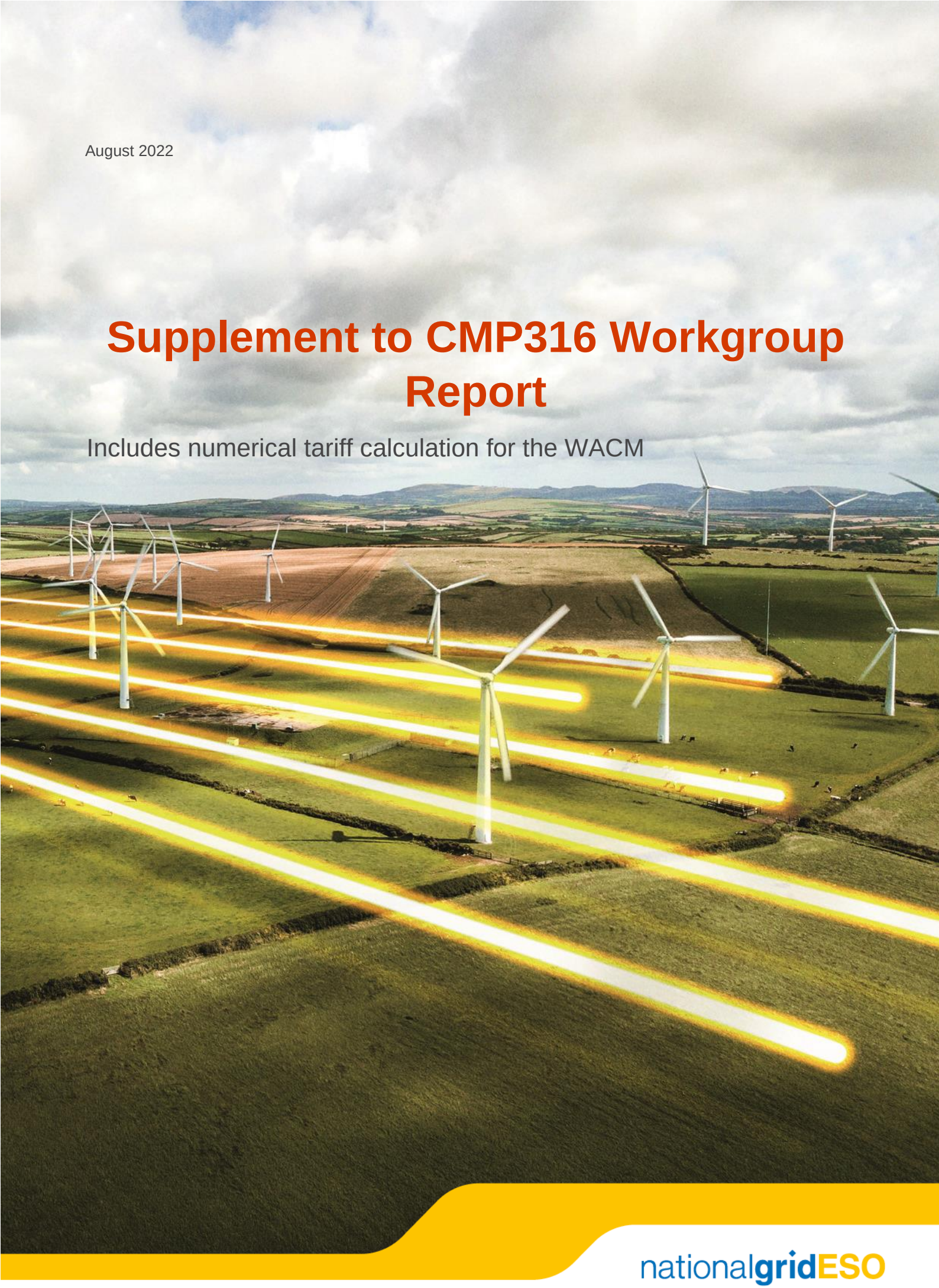
August 2022

Supplement to CMP316 Workgroup Report

Includes numerical tariff calculation for the WACM



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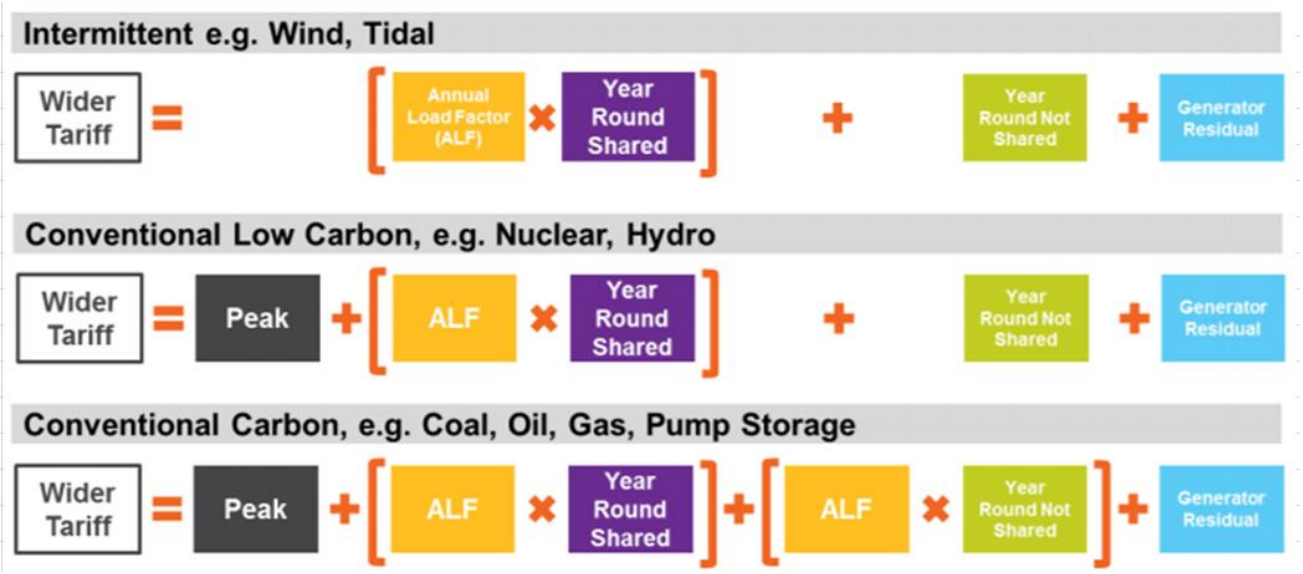
Supporting calculations to note

(As CUSC 14.15.7) Scaling factors for different generation plant types are applied on their aggregated capacity for both Peak Security and Year-Round backgrounds. The scaling is either Fixed or Variable (depending on the total demand level) in line with the factors used in the Security Standard

Generation Plant Type	Peak Security Background	Year Round Background
Intermittent	Fixed (0%)	Fixed (70%)
Nuclear & CCS	Variable	Fixed (85%)
Interconnectors	Fixed (0%)	Fixed (100%)
Hydro	Variable	Variable
Pumped Storage	Variable	Fixed (50%)
Peaking	Variable	Fixed (0%)
Other (Conventional)	Variable	Variable

Wider tariffs by generation category:



Co-located generation site examples

Power station A has TEC of 60MW, and it consists of three BMUs/technology types. The capacity and the annual outputs (MWh) are listed below

	Maximum Capacity (MW)	Fuel type	Annual exporting (MWh)
BMU1	50	Wind	135,000
BMU2	40	CHP	250,000
BMU3	15	Battery	35,000

Given the wider generation tariffs (note these are not current tariffs provided for illustration only)

Wider Tariffs (£/kW)			
Peak Security	**Shared Year Round**	**Not Shared Year-Round**	**Adjustment**
5	15	12	0

1. Baseline

As the predominant technology is wind, the power station is treated as wind.

Generation Plant Type	Peak Security Background	Year Round Background
Intermittent	Fixed (0%)	Fixed (70%)

Therefore, the scaled generation (peak security) is 0, and the scaled generation (year-round) is 60X0.7 = 71.4MW

Generation charge

Given the wider generation tariffs (note these are not current tariffs provided for illustration only)

Wider Tariffs (£/kW)			
Peak Security	**Shared Year Round**	**Not Shared Year-Round**	**Adjustment**
5	15	12	0

14.15.102 For a given **Financial Year** "t" the Power Station ALF will be based on information from the previous five **Financial Years**, calculated for each **Financial Year** as set out below.

$$ALF = \frac{\sum_{p=1}^{17520} GMWh_p}{\sum_{p=1}^{17520} TECp \times 0.5}$$

ALF=(135000+250000+35000)/(60*8760)=80%

Then for the intermittent generation, its wider tariff is (15X80%+12+0=)£24/kW, and its wider charge is (24X60=) **£1,440k**

2. CMP316 Original solution

The TEC of the power station is apportioned to each technology according to the Maximum Capacity (as defined within the Grid Code) of the relevant BMUs

As CUSC 14.18.7

For a Multi Technology **Power Station** the **Power Station**'s TEC is allocated across the different technology types, specifically:

$$MTPSTEC_{is} = \frac{CAP_i}{\sum_{i=1}^{n} CAP_i} \times TEC_s$$

Where:
$MTPSTEC_{is}$ = Multi Technology **Power Station**'s TEC for technology i at station s
$CAPi$= Maximum Capacity for technology i
TEC_s = TEC of **Power Station** as defined in the Connection Agreement
n = number of different technologies on site

For Multi Technology **Power Station**'s wider liability, the Chargeable Capacities associated with each technology type is the $MTPSTEC_{is}$. The charge for a Multi Technology **Power Station** will be calculated as the summation of all individual technology liabilities as calculated using $MTPSTEC_{is}$.

	MTPSTEC (MW)	**Scaled generation (peak security)**	**Scaled generation (year-round)**
Technology 1 (Wind)	28.6	0	20
Technology 2 (CHP)	22.9	variable	variable
Technology 3 (Battery)	8.6	variable	4.3

Generation charge

Given the wider generation tariffs

Wider Tariffs (£/kW)			
Peak Security	**Shared Year Round**	**Not Shared Year-Round**	**Adjustment**
5	15	12	0

As CUSC 14.15.102

Single Technology **Power Station** (as 14.15.7) will use the formula above to calculate the **Power Station** ALF. For a Multi Technology **Power Station** (as

14.15.7) where appropriate metering arrangements are in place, an ALF will be calculated for each technology type. Note that the sum of GMWh for a Multi Technology **Power Station** across all technology types will equal the total GMWh for the **Power Station**.

$$ALF_A = \frac{\sum_{p=1}^{17520} GMWh_{Ap}}{\sum_{p=1}^{17520} TEC_p \times 0.5} \ldots.$$

Where:
A denotes each technology type within a **Power Station**
$GMWh_{Ap}$ is the maximum of FPN or actual metered output in a Settlement Period related to the **BM Unit** associated with $MTPSTEC_A$

ALF1=135000/(60*8760)=26%

ALF2= 250000/(60*8760)=48%

ALF3=35000/(60*8760)=7%

(Note there is some rounding in the illustration above. The sum of the technology ALFs does sum exactly to the Power Station ALF with additional decimal places)

Wider tariffs for each technology are

Wind: (15X26%+12+0=)£15.9/kW

CHP: (5+15X48%+12X48%+0=)£17.8/kW

Battery: (5+15X7%+12X7%+0=)£6.8/kW

And the wider charge for this power station is (15.9X28.6+17.8X22.9+6.8X8.6=) **£919k**

3. CMP316 WACM Solution

The TEC of the power station is apportioned to each technology according to the maximum capacity of the relevant BMUs –

The solution does not change the calculation of the tariffs. The tariff calculation is as the Original proposal. The charges differ by use of MTPSTECPK and the ALF calculation.

As CUSC 14.8.7 (note MTPSTECPK – used for the could be lower than TEC)

MTPSTECPK is introduced for the purpose of calculating generation charge, and is calculated by allocating TEC in the following way:
$MTPSTECPK_{A...}$ is sum of Maximum Capacity (MC) for each technology type as long as the associated technology attracts a peak tariff component. (Where the associated technology does not attract a peak tariff component then the formula will consider that MC will be zero)
Note $MTPSTECPK_{A...}$ is capped at the MTPSTEC or technology MC, whichever is lower.

For each wider component (Peak Security; Year Round Not-Shared; Year Round), if Maximum Capacity for each technology does not attract peak security tariff then it will be removed from the denominator of calculation. This will be capped at the Maximum Capacity for each technology, whichever is lower, and therefore MTPSTEC could be lower than TEC. This applies for Generation Charges (14.18) procedures.

$$MTPSTECPK_{is} = \min\left(\frac{CAP_i}{\sum_{i=1}^{m} CAP_i} \times TEC_s, CAP_i\right)$$

Where CAP_i = Maximum Capacity for technology i to which peak security tariff applies
m = the number of technologies that attract peak security tariff

For Multi Technology **Power Station**s, 'Chargeable Capacity' is based on $MTPSTEC_{is}$ for year round wider tariff components and adjustment component, and based on $MTPSTECPK_{is}$ for peak security component. The charge for a Multi Technology **Power Station** will be calculated as the summation of all individual technology liabilities as calculated using $MTPSTEC_{is}$ and $MTPSTECPK_{is}$

	MTPSTEC (MW)	Scaled generation (peak security)	Scaled generation (year-round)	Peak Capacity (MW) MTPSTECPK
Technology 1 (Wind)	28.6	0	20	0
Technology 2 (CHP)	22.9	variable	variable	40
Technology 3 (Battery)	8.6	variable	4.3	15

Generation charge

Given the wider generation tariffs

Wider Tariffs (£/kW)			
Peak Security	**Shared Year Round**	**Not Shared Year-Round**	**Adjustment**
5	15	12	0

As CUSC 14.15.102

$$ALF_A = \frac{\sum_{p=1}^{17520} GMWhAp}{8760\ X\ MTPSTEC_A}$$

Where:
A denotes each technology type within a **Power Station**
$GMWh_{Ap}$ is the maximum of FPN or actual metered output in a Settlement Period related to the **BM Unit** associated with $MTPSTEC_A$

ALF1=135000/(28.6*8760)=54%

ALF2= 250000/(22.9*8760)=125%

ALF3=35000/(8.6*8760)=47%
(note that an ALF at technology level, for the WACM, can exceed 100% but not at TEC level)

Wider tariffs for each technology are

Wind: (15X54%+12+0=)£20.1/kW

CHP: (5X40/22.9+15X125%+12X125%+0=)£42.5/kW

Battery: (5X15/8.6+15X47%+12X47%+0=)£21.3/kW

And the wider charge for this power station is (20.1X28.6+42.5X22.9+21.3X8.6=) **£1727k**