



Emissions Regulation – A Utility Perspective

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Contents

- Introduction to Uniper
- UK Generation Scene
- Regulatory Landscape
- Industrial Emissions Directive & BAT in the UK
- Medium Combustion Plant Directive
- Summary

Acronyms and Abbreviations

AAQ – Ambient Air Quality

AEL – Associated Emission Level

BAT – Best Available Techniques

BEIS – Department for Business, Energy and Industrial Strategy

BREF – BAT Reference

CEMS – Continuous Emissions Monitoring System

CfD – Contract for Difference

CO – Carbon Monoxide

D1 – Draft 1

DECC – Department of Energy & Climate Change

DLN – Dry Low NOx

EIPPCB – European Integrated Pollution Prevention & Control Bureau “The Bureau”

ELV – Emission Limit Value

E-NGO – Environmental Non-Governmental Organisation

GGH – Gas-Gas Heater

IED – Industrial Emissions Directive

LCP – Large Combustion Plant

LNB – Low NOx Burners

M&B - Malfunction & Breakdown

MCPD – Medium Combustion Plant Directive

MSUL - Minimum Start-Up Load

NECD – National Emissions Ceiling Directive

NERP - National Emissions Reduction Plan

NOx – Nitrogen Oxide

NG – Natural Gas

O/CCGT – Open/Combined Cycle Gas Turbine

SUSD – Start-up/Shut Down

TNP – Transitional National Plan

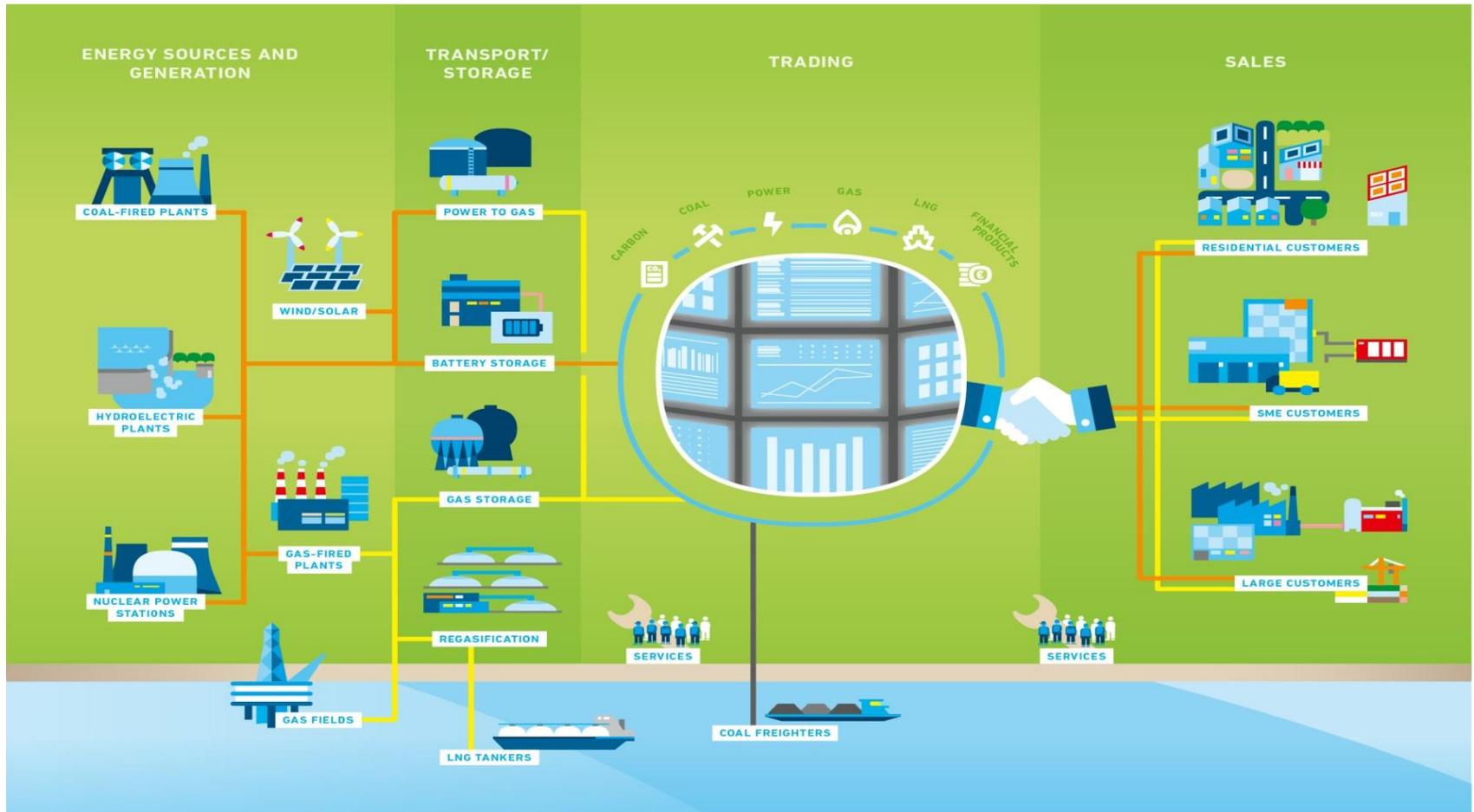
TSO – Transmission System Operator

TWG – Technical Working Group

Uniper – a new name for energy

Energy has a
new name

From gasfields and power stations to customers: Uniper helps keep energy reliable



Power Generation

- With approximately 40 gigawatts of installed generating capacity, we rank among the large international power producers.
- With a high proportion of hydro and gas-fired capacity, our generation fleet is particularly climate friendly. Our highly flexible capacity can be fine-tuned at all times to deliver the right amount of electricity.
- More than a century of real-world experience in power generation
- Extensive experience managing large, complex portfolios of generation assets and continually optimizing these assets
- Passion for innovation and continuous efficiency improvement
- Systematic knowledge management



UK Generation Scene

Coal Plant – Traditional Mainstay, diminishing in numbers. 17GWe.

CC/GT Plant – Relatively large installed base, some early units near end of life, but also new large units. >30GWe

Biomass – Small dedicated units and large conversions

Renewables – Increasing capacity, especially offshore. 31GWe inc biomass

Nuclear – Aging fleet due for replacement. 9GWe.

Comment – a traditionally balanced portfolio is shifting with less large central generation, more intermittency and planned lower carbon intensity.

Figure 5.1: Transitioning away from unabated fossil fuel generation

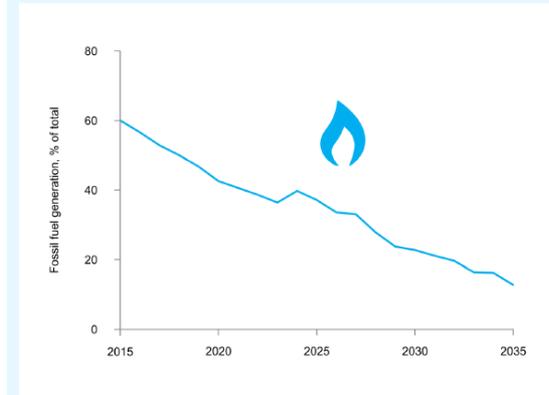


Figure 5.1 shows how the percentage of electricity generated from unabated fossil fuel sources declines steadily over the projection period.

Figure 5.2: Decarbonising electricity generation

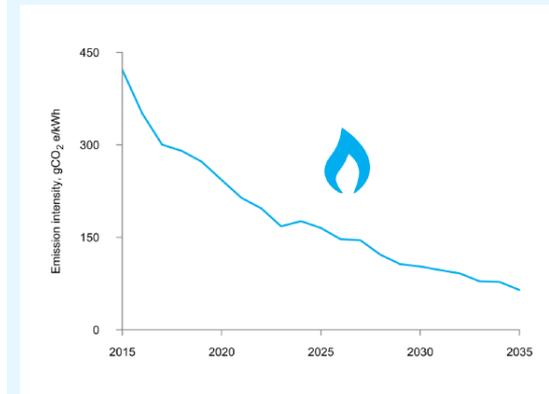


Figure 5.2 shows how the decreasing proportion of electricity generated from unabated fossil fuels (Figure 5.1) translates into changes in the emission intensity of generation. The curved decline above is due to the fact that those plants with the highest emissions intensity close before the mid-2020s leading to slower declines later.

Source: UK Department of Energy & Climate Change

Driving Forces for Operators

Environment – IED, Carbon Price Support, CfD for new plant, coal consultation, NECD, Mercury, BREXIT?

Security of Supply – Capacity auction, proliferation of reciprocating engines (2GWe in two years), TSO using a range of means to ensure supply. Age and reliability of infrastructure...

Biomass – large conversions awarded or awaiting contracts. Drax 4GWe coal plant, now 3 units biomass and 3 of coal

Renewables – Increasing capacity & swings on the system, north to south imbalance, decreasing capex, frequency impacts.

Nuclear – Hinkley Point C (3.2GWe), questions over Horizon (5.4GWe) & NuGen (3.8GWe)

Comment – Many driving forces influence the decisions of Operators, not all environmental, but also around security.

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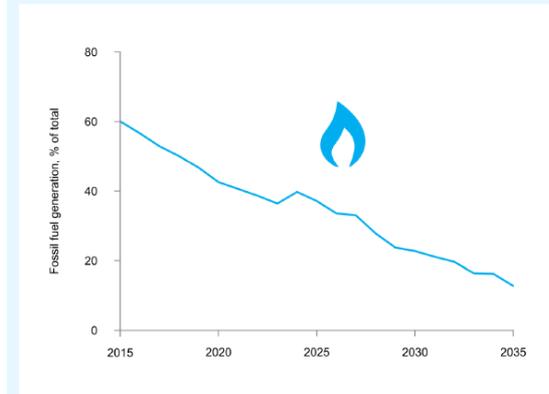


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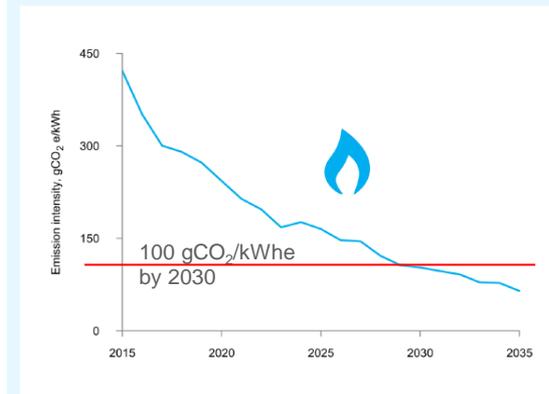
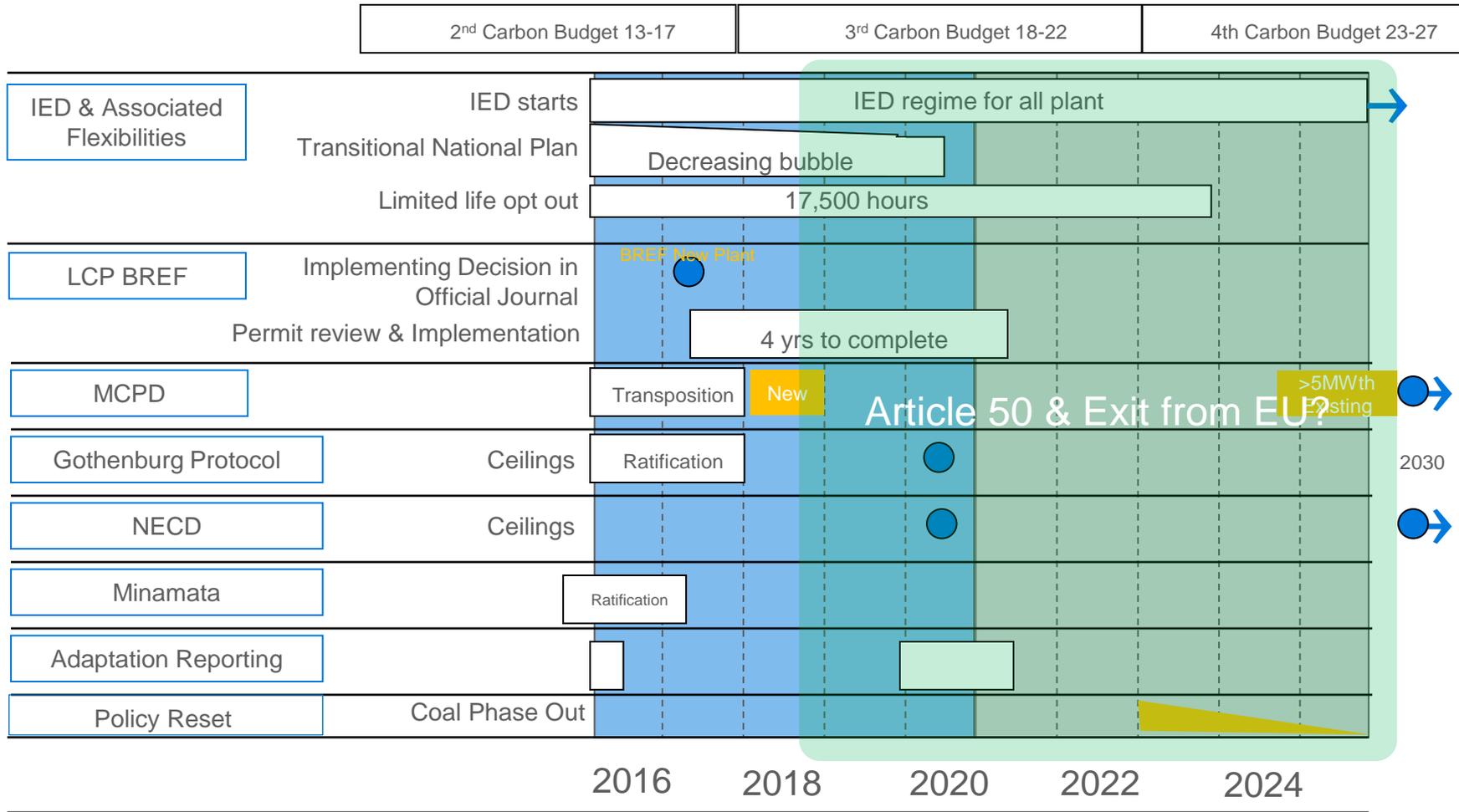


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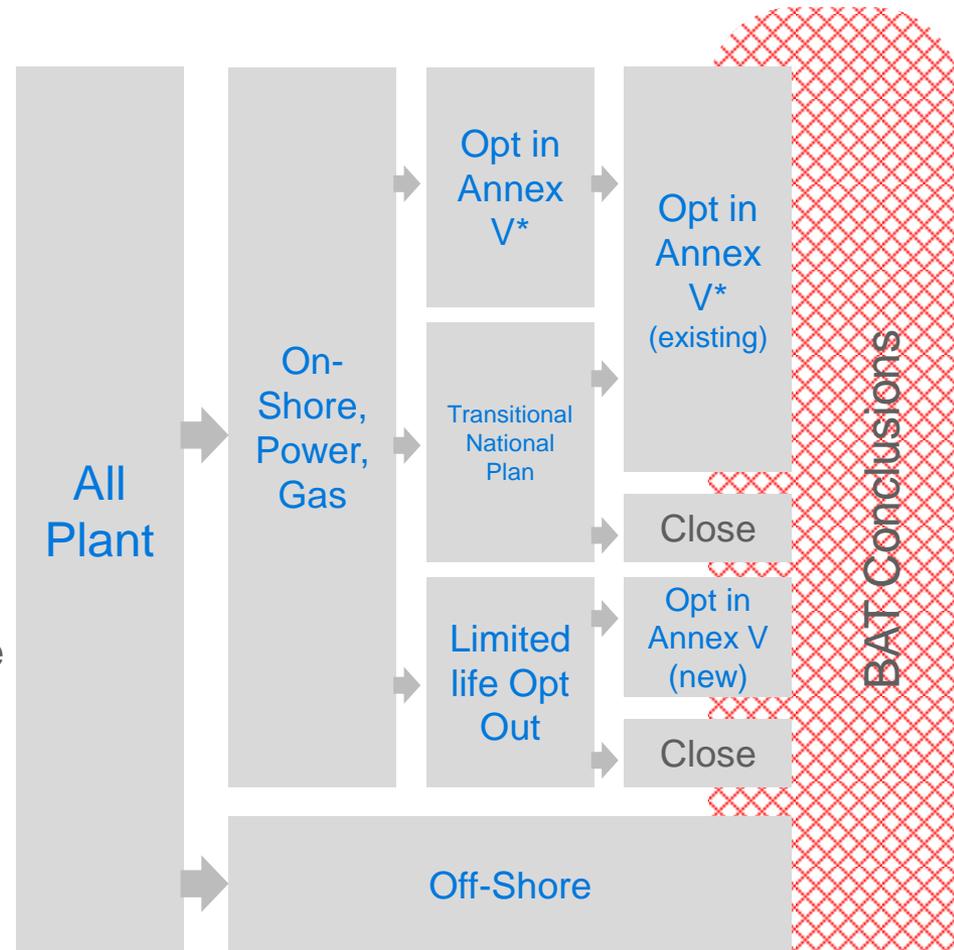
Regulatory Landscape



There are a number of environmental regulations or regulatory goals influencing operator behaviour in the coming years.

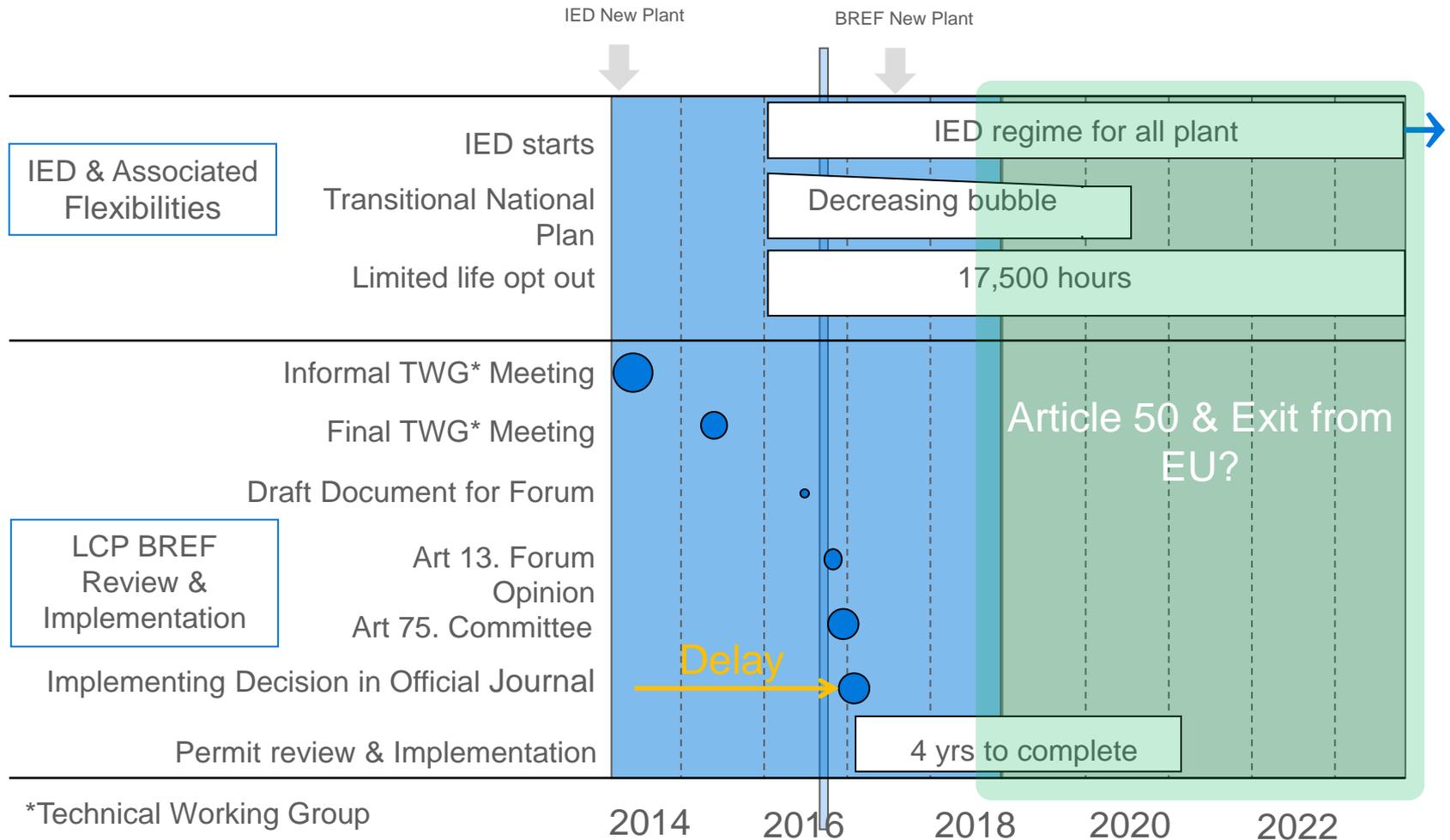
Introduction - Industrial Emissions Directive

- The IED Represents a bundling of a number of former directives, most notably the LCP and IPPC Directives.
- Applies some form of regulation regarding emissions to most LCPs.
- LCPs are defined as single units >50MWth, or of aggregated units >15MWth totalling >50MWth.
- “Simplified” depiction of coverage is given here for LCPs (not firing waste).
- There are a number of categories, some time bounded, others restricted to certain plant types placing performance restrictions on assets.
- The IED sets “back-stop” emissions.



*Less onerous ELVs are provided for plant operating <1500 hpa on a rolling average basis, compared to plant with potential to operate base load.
Some <500hpa plant are not set ELVs, but must report operating hours.

Timeline for IED & LCP BREF Determination



There have been extensive delays during the review, and currently it appears the conclusions may be published late 2016 or early 2017.

Large Combustion Plant – basis of compliance

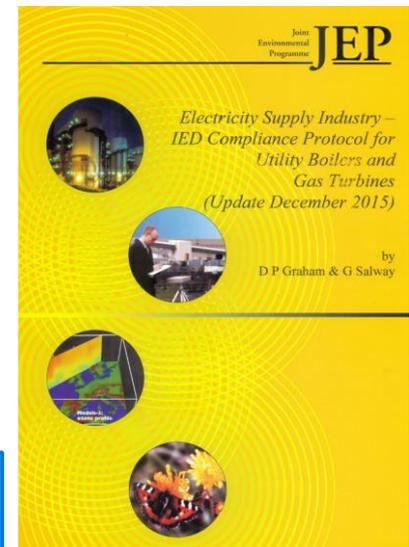
- IED enshrined in UK law
- Compliance basis (not ELVs) the same for new and existing plant.
- ELV Compliance
 - No **monthly** validated averages are higher than the ELV
 - No **daily** validated averages are higher than 110% ELV
 - 95 % of the validated **hourly** average values over the year do not exceed 200% of the ELV
- TNP Compliance
 - Mass emission = stack flow * concentration
 - Stack flow calculated from fuel consumption
 - Flow must be verified by stack testing
 - Back-up ELVs still apply. May be as monthly ELV and 95th percentile of daily averages.
- Both exclude SU-SD, as per EU Implementing Decision.
- Total mass emission is reported for total inventory calculation.



Compliance Protocols- developed collaboratively by the Industry and the Competent Authorities.

Regulators- there are four Competent Authorities in the UK:

- Environment Agency (EA)
- Scottish Environment Protection Agency (SEPA)
- Natural Resources Wales
- Department of Environment Northern Ireland



Transitional National Plan (TNP)

- Similar to National Emissions Reduction Plan (NERP) under the LCPD – UK one of a minority of nations employing this option.
- Compliance based on mass emissions allowances for NO_x, SO₂, Dust (NO_x only for CCGT) rather than IED Annex V ELVs but...
- Subject to compliance with ELVs specified on 31/12/2015
- Mass allowances based on LCPD ELVs in 2016 with linear decrease to IED ELVs in mid 2020.
- Allows greater flexibility since:
 - i) allowances based on operation in 2001-2010 (generally higher than 2016-2020);
 - ii) allowances are based on ELVs not actual performance;
 - iii) surplus allowances can be transferred with other plant (some limited trading of 600te NO_x has already occurred, purchased by AES Kilroot);
 - iv) compliance can be achieved by limiting running rather than limiting emission concentration (so long as permit ELVs are still met).

TNP offers flexibility in compliance approach, but also undermines some previous investment decisions of large Operators.

How the TNP Regulations Work

- Reg. 4 EA must establish and maintain an electronic Register* that contains: plant data; allowances; actual mass emissions; transfers, EOI to transfer; plant closures; plant change of status; national bubble.
- Reg. 5 Duties of regulators: issue permits that contain TNP provisions; prevent exceedances; ensure notification of closure change of status.
- Reg. 6 Reporting. Quarterly reporting of mass emission. Other regulators to inform EA within 1 month. Other regulators to inform EA of annual totals by 28/2 . Regulator to make adjustments if 'appropriate'.
- **Reg. 7 Transfers. Allowed in-year and in the following quarter. Operators taking part in a transfer to inform EA within 5 days of transfer date. EA must enter into Register within 10 days of notification. Cannot carry allowances forward. A transfer of allowances can't result in a balance ≤ 0 – CANNOT SHORT IN THE MARKET.**
- Reg. 8 Plant closure or plant variation. The regulator must determine reduction of annual allowance, inform the EA (if applicable) within 10 days; vary the permit. The EA must update the Register within 10 days of notification.

Selected TNP Allocations

	NOx	SO ₂	PM
Coal or Coal & Biomass			
Drax Power Ltd	16605	33035	4129
Aberthaw	27843	9444	1180
Ratcliffe	7145	14208	1776
West Burton	3221/3171	6336/6240	792/780
CCGT			
Connah's Quay	978/1010/1010/1025	0/0/0/0	0/0/0/0
King's Lynn	513	0	0
Peterhead	2602	0	0
Biomass			
Lynemouth	2165	4319	539

LCP BREF – What Changes?

- New AELs, and points of interpretation, along with monitoring requirements will need to be captured in revised permits.
- This will require a further revision to the compliance protocol.
- Tighter limits on NO_x, SO₂ and PM for coal plant, and additional HCl, HF and Hg control. FGD wastewater AELs also set.

MWth category for Large Plant	Annual mg/Nm ³	Daily mg/Nm ³	Comment
NO _x Tighter	65-150	<85-165 Up to 220 for Peak and Emergency plant 340 pre 1987 <1500hpa, 200 pre 7/1/2014	CO indicative level, <5-100 or 140 for plant with restrictions on design...
SO ₂ Tighter	10-130	25-165 Up to 220 for <1500hpa plant if permitted before 7/1/14. Otherwise 205 for pre 7/1/14 plant.	Indigenous fuel flexibility (97% removal)
HCl New	1-5		7 if GGH fitted, or 20 if average coal chlorine is ≥ 1000 mg/kg (dry)
HF New	<1-3		7 if GGH fitted
Dust Tighter	<2-8	3-11 Up to 14 for units if put into operation before 7/1/14.	
Hg New	1-4 µg/Nm ³		

- Some tightening of regime for CCGT plant, but is there a risk that new CCGTs are priced out of the market by 30mg/Nm³ NO_x requirements?

Chosen Technologies – NOx Focus

Coal Plant – Interim BAT decision does not mandate SCR, TNP and overall uncertainty in the market incentivises low capex techniques. Therefore great movement towards advanced LNB technologies, with some potentially seeking to achieve IED compliance/lower tonnage release using SNCR as well. In longer term LCP BREF may force hand of Operators to either opt for <1500hpa, or request for 15(4) derogations. **Only 1 UK coal plant with SCR, whilst SNCR proven on several others**

CC/GT Plant – Newer CCGT plant are not eligible for TNP. Many plant have upgraded their DLN systems to meet Annex V limits (as these are often already in permits) and to offer better part load CO performance. Many plant have tighter permit conditions than in IED, with some having tighter daily averages in particular.

Biomass – For dedicated plant typically primary measures - some with SNCR. For those coal to biomass conversions EA view is that primary measures are BAT, SCR is not, and SNCR may have applicability restrictions. SNCR has been proven on a UK converted plant. Applicability or otherwise of techniques always requires a site specific assessment to determine BAT.

Strong driver for low capex solutions due to uncertainty around opportunity to achieve payback and extremely competitive capacity auctions. Flexibility important, but not really rewarded in the market.

Medium Combustion Plant Directive - Scope

1. Plants with a rated thermal input equal to or greater than 1 MW and less than 50 MW
2. A combination formed by new medium combustion plants, including where the total rated thermal input of such combination is equal to or more than 50 MW, unless the combination is a combustion plant covered by Chapter III of the Industrial Emissions Directive (i.e. a Large Combustion Plant)

The second point reflects that under the Industrial Emissions Directive (IED), units of less than 15MW_{th} are not included in the aggregation calculation for determining whether the thermal rating for a combination of units is above the 50MW_{th} threshold for defining a Large Combustion plant. For instance a new 45MW_{th} unit and a new 10MW_{th} unit emitting up the same stack would not be covered by IED Chapter III, but would be subject to the MCPD

Medium Combustion Plant Directive

‘Existing combustion plant’ means a combustion plant put into operation before **20 December 2018** or for which a permit was granted before **19 December 2017** pursuant to national legislation provided that the plant is put into operation no later than **20 December 2018**;

‘New combustion plant’ means a combustion plant other than an existing combustion plant;

Member States are allowed 2 years to transpose the Directive. **Final timescales** are therefore:

- Entry into force – 19 December 2015
- Transposition into Member State Law – 19 December 2017
- DEFRA currently consulting on aspects of implementation
- Existing plant will be plant put into operation before 20 December 2018
- New plant will be plant put into operation after 20 December 2018

Concerns with Final MCPD Position

Scope

- Double regulation of IED Chapter II plant is undesirable as it creates legal uncertainty. IED leads, and MCPD back-stop.
- Aggregation rules for new plant may create practical difficulties in complying with a single ELV across multiple units and setting an appropriate ELV.
- Introduction of energy efficiency and carbon monoxide into the Directive scope. Although just a review requirement, it creates regulatory uncertainty.

Impact

- The short timescale between registration and first measurement will be challenging for existing plant, as a large number of plants will require testing within the same period and test-team availability may be limited.
- Limited restriction in practice to low load factor, small, engines.
- Much work to be completed on compliance process (incl. permitting/registration and monitoring needs).
- There is no scope for further change in the Directive, so these issues are being considered at Member State level during transposition and regulatory framework discussions. Some are covered in the current consultation.

Winners and Losers

Those who don't invest, or have avoided previous investments to comply.

Small engine developers.

Low CAPEX upgrade suppliers.



Investment made to comply with expected IED/LCPD pathway.

BEIS CO₂ targets.

National emission ceilings.

Security of Supply?

Closing Points

Key Points

- There are many driving forces influencing the decisions of Operators, not all environmental, but also around security of supply.
- A traditionally balanced portfolio is shifting with less large central generation, more intermittency and planned lower carbon intensity.
- TNP offers flexibility in compliance approach but also undermines (along with BAT rules) some previous investment decisions for large Operators.
- Implementation approach based on national priorities, such as AAQ.

The Future

- BREXIT is the elephant in the room, but important to note much environmental regulation is already a UK law, a national agreement or seems likely to become a law/agreement ahead of leaving the Union.
- BAT AEL implementation may be problematic –final document and its implementation represents a risk to all Operators.
- The driver for low capex solutions is expected to continue due to uncertainty around opportunity to achieve payback and extremely competitive capacity auctions.
- Flexibility will be important, but is not really rewarded in the market.
- Large, environmentally low impact (NO_x, SO_x), plant likely to continue to be disrupted by numerous, small, higher emitters due to capacity market and MCPD.



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