

Power Generation: Current Regulatory Requirements

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Workshop: Power generation (coal, gas, and biomass) under increasingly
stringent emissions regulations

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Environmental Permitting

- ➔ Where we have come from – LCPD & IED
- ➔ Sector emission to air
- ➔ What is next – Combustion Bref
- ➔ New build – other permitting requirements

Coal Plant in 2010

Opt Out

Didcot
Ferrybridge 1 & 2
Kingsnorth
Ironbridge
Cockenzie
Tilbury

Opt In

— Some via the NERP

Uskmouth
Cottam
West Burton
Ferrybridge 3 & 4
Ratcliffe
Aberthaw
Longannet
Drax
Eggborough
Rugeley
Lynemouth
Fiddler's Ferry

Closed

Ferrybridge 3 & 4
Longannet
Rugeley

LLD

Eggborough

TNP

Cottam
West Burton
Uskmouth
Aberthaw
Ratcliffe
Drax
Lynemouth
Fiddler's Ferry

IED

IED Compliant

End 2015

Close

Limited
Hours
Derogation

IED
Compliant

2020

Close

2023

LCPD &
IED
Chapter III
decision
tree for
existing UK
coal fired
power
stations

IED Chapter iii, Annex V ELVs, Art.30

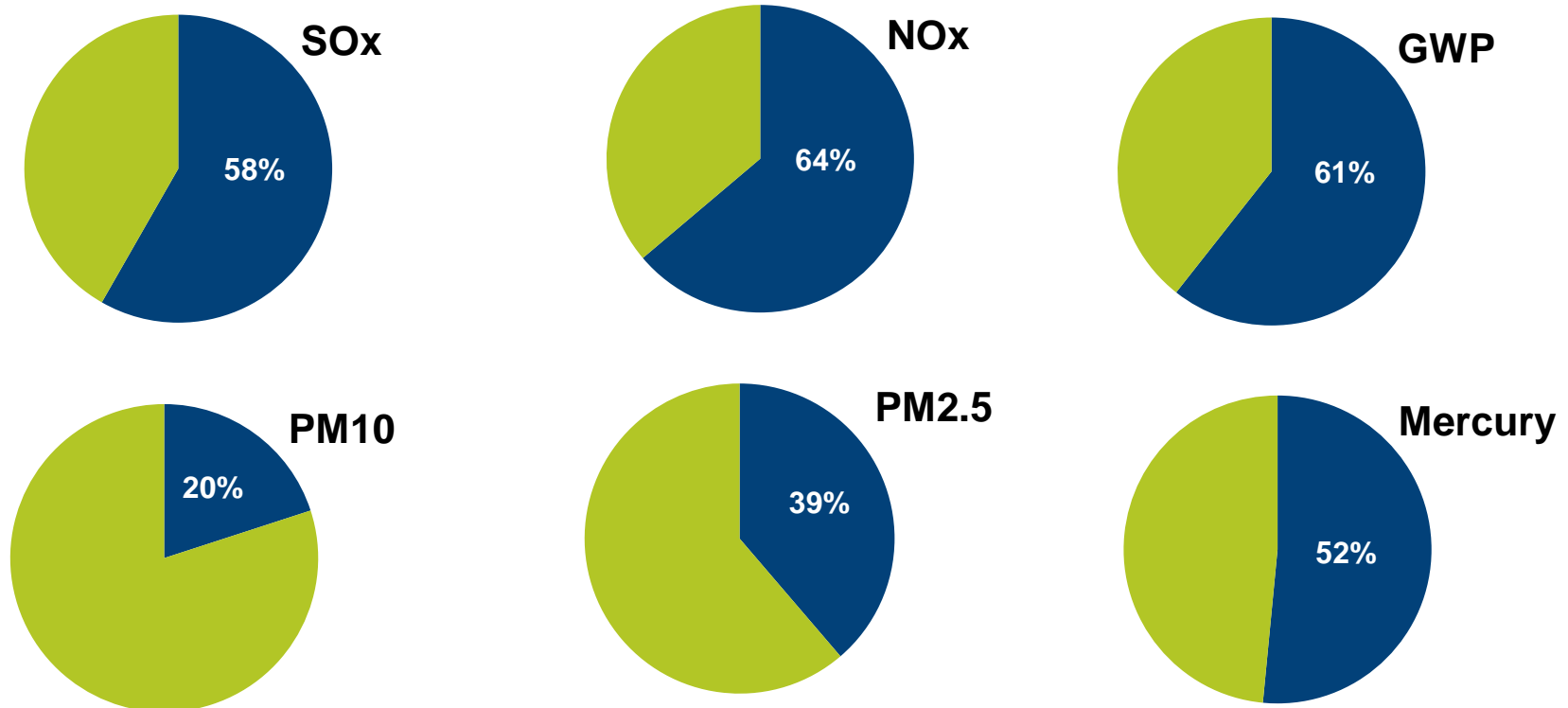
	Coal & biomass			Gas turbines & engines	
	SO ₂	NO _x	Dust PM10	NO _x	CO
LCPD existing, 2008	400	500	50	NA	NA
IED existing, 2016, Art30(2)	200	200	20	50	100
IED new, 2016, Art.30(3)	150	150	10 coal, 20 biomass	50	100

Monthly Emission Limit Values (mg/Nm³) for combustion plant > 300 MW_{th}

Combustion (Power)

Sector objective: reduce emissions to air from combustion (power) plants

- ➔ The sector accounts for the majority of SO_x, NO_x and GWP emissions to air from sites we regulate in England, and is a substantial contributor to PM₁₀ & 2.5 levels.
- ➔ As a **percentage of all 2015 emissions from sites we regulate**, the combustion sector contributed:



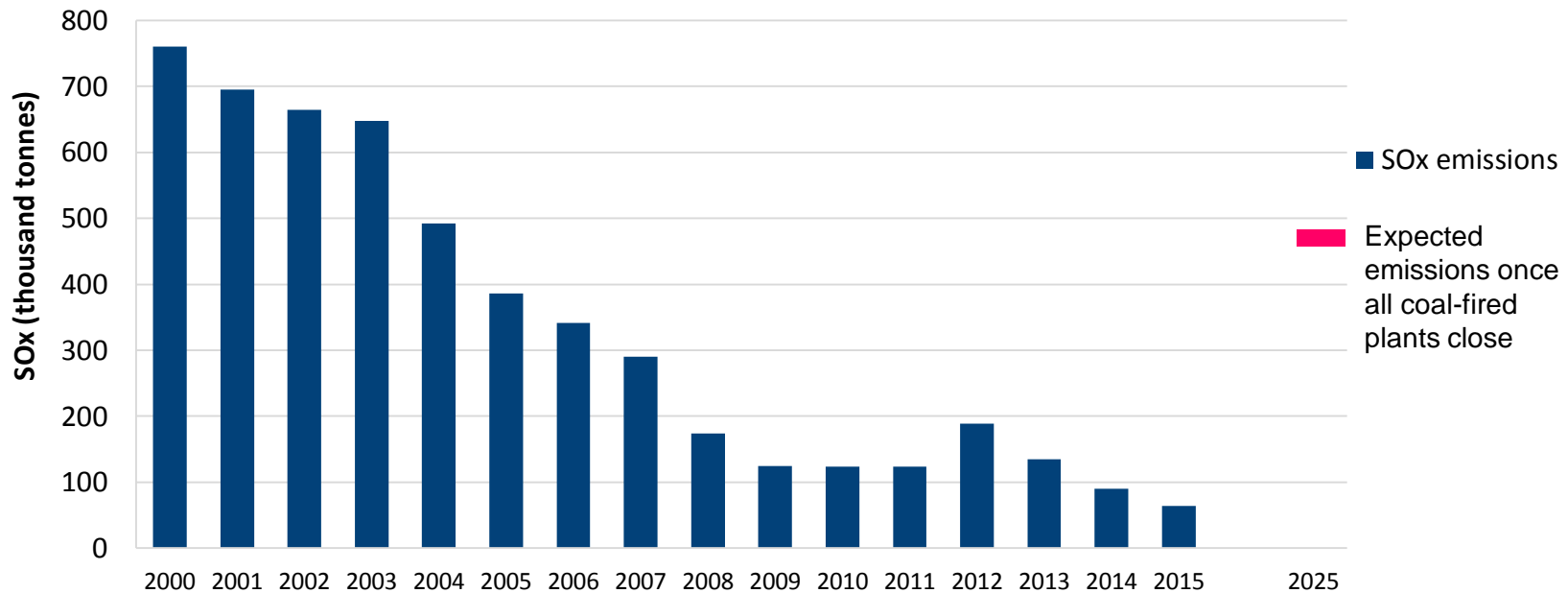
■ Contribution from combustion (power) sector
■ Contribution from all other sectors we regulate

Combustion (Power)

Sector objective: reduce emissions to air from combustion (power) plants

SOx emissions to air from regulated combustion (power) sites, England

Sulphur oxides



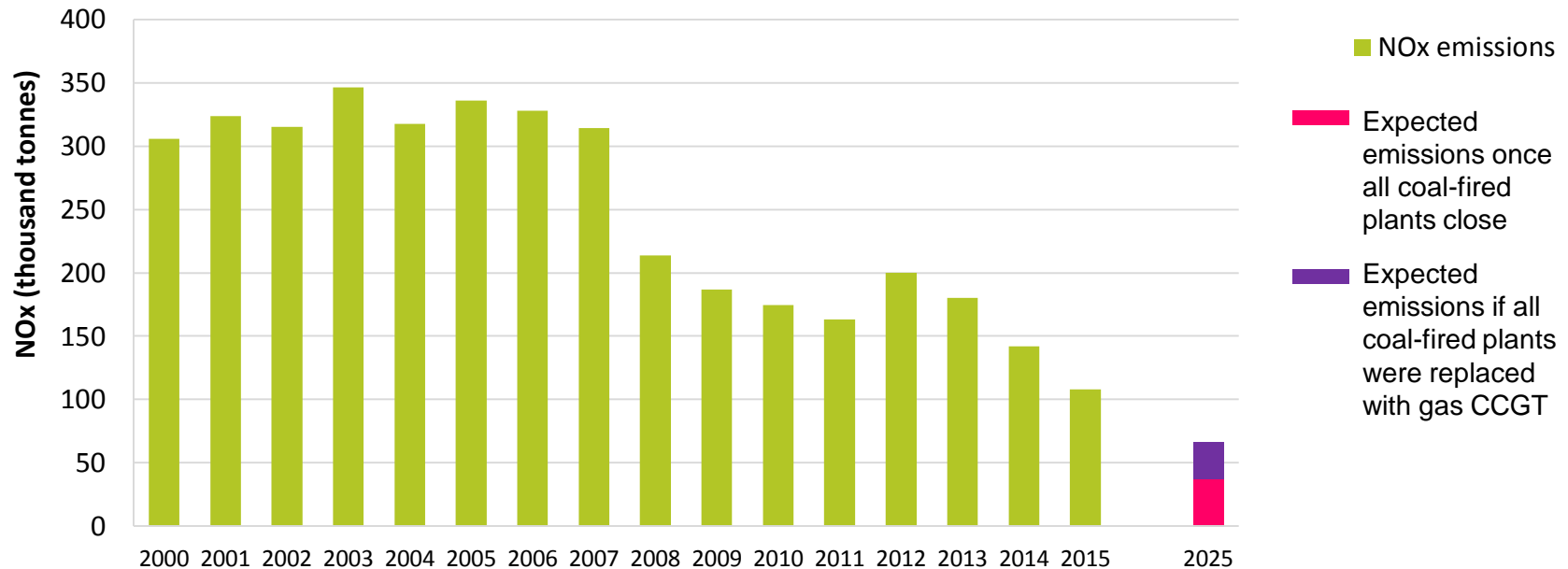
- 29% decrease in SOx emissions between 2014 and 2015, 92% decrease since 2000
- SOx emissions in 2015 were 64kt, which is less than the sector (England & Wales) Habitats target of 70kt by 2020
- If all coal plant close in 2025 emissions of SOx from the sector will fall significantly

Combustion (Power)

Sector objective: reduce emissions to air from combustion (power) plants

NOx emissions to air from regulated combustion (power) sites, England

Nitrogen oxides



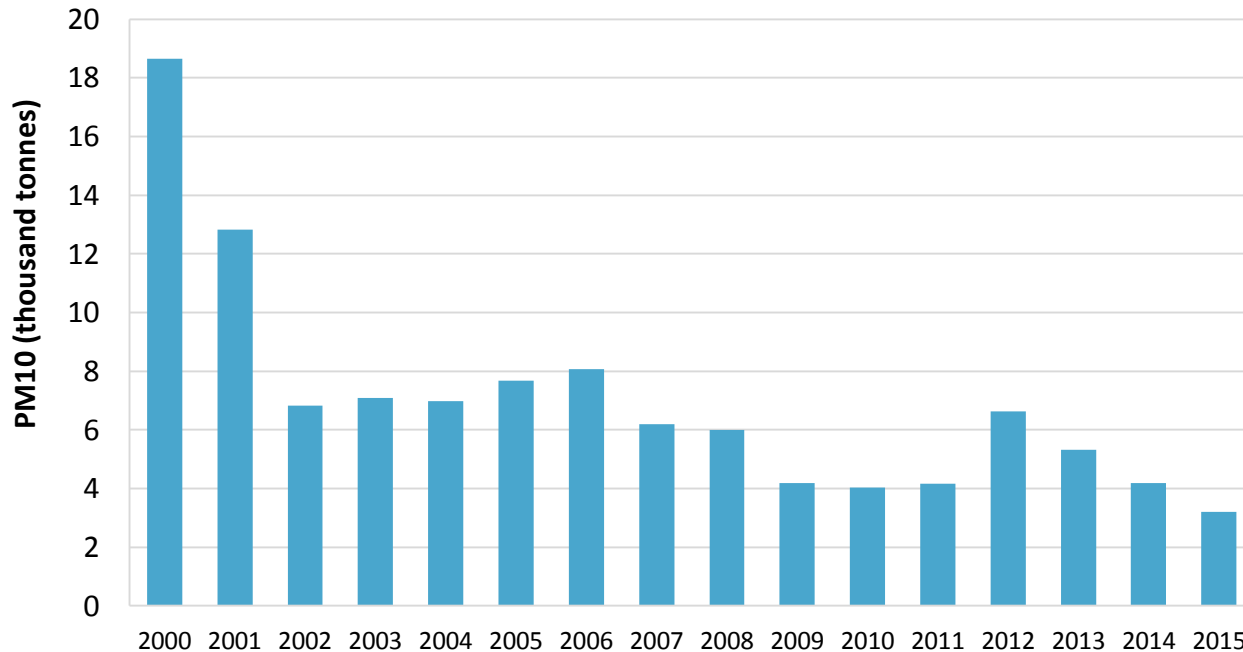
- 24% decrease in NOx emissions between 2014 and 2015, 65% decrease since 2000
- NOx emissions from non coal power stations in 2015 are 37kt
- If coal-fired plants closed in 2025 and were replaced with 10 GWe new gas CCGTs sector emissions would be about 66kt

Combustion (Power)

Sector objective: reduce emissions to air from combustion (power) plants

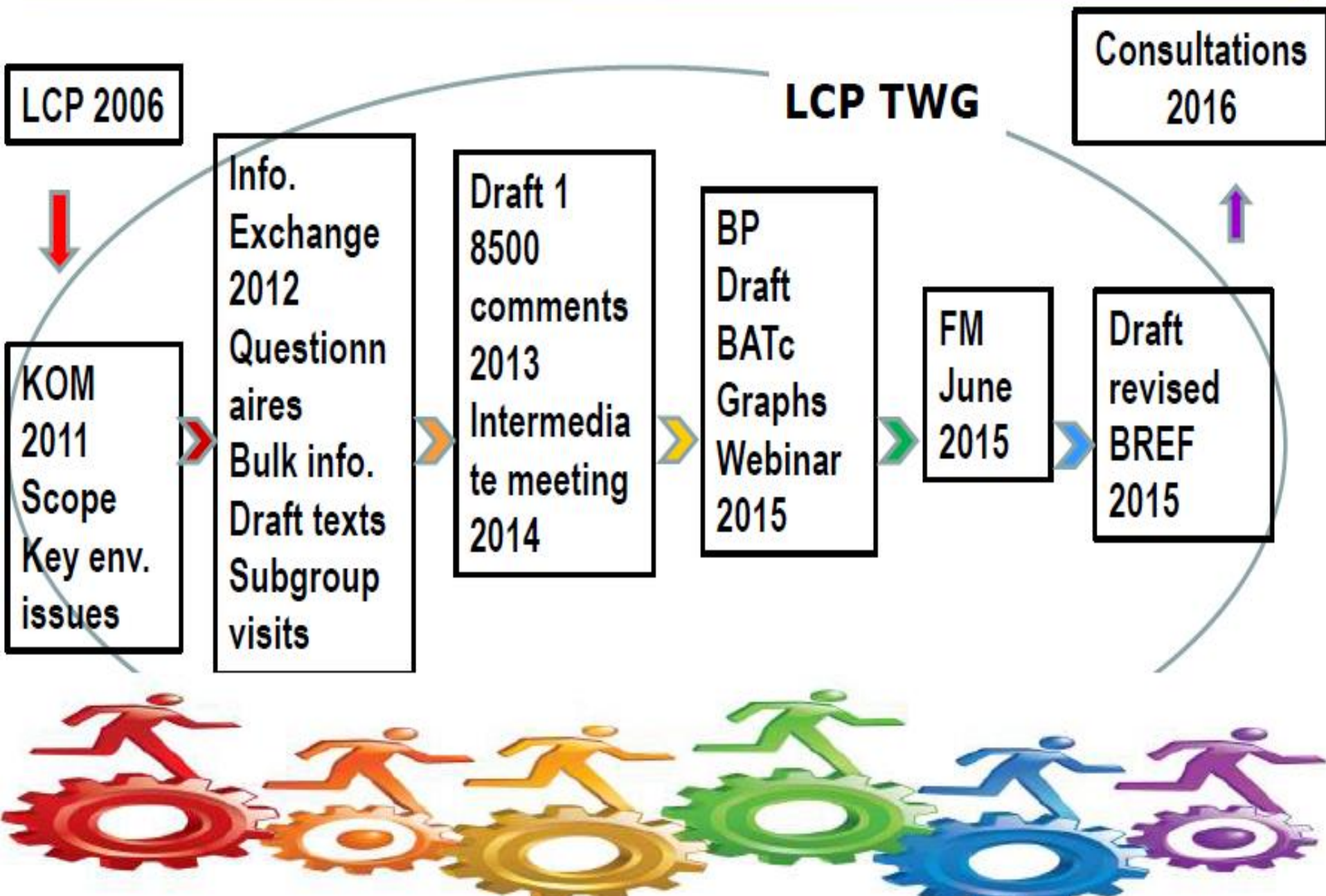
PM10 emissions to air from regulated combustion (power) sites, England

Particulate matter



- 24% decrease in PM10 emissions between 2014 and 2015, 83% decrease since 2000
- In 2015, PM10 levels were the lowest recorded since 2000 (3.2kt), dropping below the previous low in 2010 (4kt)
- PM2.5 emission in 2015 were 2.5kt

LCP BREF review process: a process



Outcomes of the LCP BREF

- ➔ 74 sets of conclusions
- ➔ 72 BAT AEELs for energy efficiency
- ➔ 15 BAT AELs for emissions to water
- ➔ 257 BAT AELs for emissions to air(including Hg)
- ➔ “Narrative” BAT conclusions
- ➔ Interaction with IED

Outcomes (continued)

- ➔ On the whole – positive, secured appropriate conclusions for 500 and 1500 hour plant, offshore, indicative CO
- ➔ Split views – consider site specific applications for Art 15(4) derogations
- ➔ Some issues, new high efficiency CCGTs
- ➔ Implementation document

Table 10.3: BAT-associated emission levels (BAT-AELs) for NO_x emissions to air from the combustion of coal and/or lignite

Combustion plant total rated thermal input (MW _{th})	BAT-AELs (mg/Nm ³)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant ⁽⁴⁾	New plant	Existing plant ⁽⁷⁾ ⁽¹¹⁾
< 100	100–150	100–270	155–200	165–330
100–300	50–100	100–180	80–130	155–210
≥ 300, FBC boiler combusting coal and/or lignite and lignite-fired PC boiler	50–85	< 85–150 ⁽⁸⁾ ⁽⁹⁾	80–125	140–165 ⁽¹⁰⁾
≥ 300, coal-fired PC boiler	65–85	65–150	80–125	< 85–165 ⁽⁶⁾
⁽⁴⁾ These BAT-AELs do not apply to plants operated < 1500 h/yr. ⁽⁶⁾ In the case of plants put into operation no later than 7 January 2014, the higher end of the range is 200 mg/Nm ³ for plants operated ≥ 1500 h/yr, and 220 mg/Nm ³ for plants operated < 1500 h/yr. ⁽⁷⁾ In the case of plants put into operation no later than 1 July 1987, which are operated < 1500 h/yr and for which SCR and/or SNCR is not applicable, the higher end of the range is 340 mg/Nm ³ . ⁽⁸⁾ The lower end of the range is considered achievable when using SCR. ⁽⁹⁾ The higher end of the range is 175 mg/Nm ³ for FBC boilers put into operation no later than 7 January 2014 and for lignite-fired PC boilers. ⁽¹⁰⁾ The higher end of the range is 220 mg/Nm ³ for FBC boilers put into operation no later than 7 January 2014 and for lignite-fired PC boilers. ⁽¹¹⁾ These levels are indicative for plants operated < 500 h/yr.				

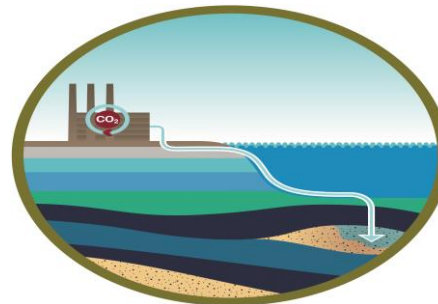
BAT 26. In order to prevent and/or reduce NO_x emissions to air while limiting CO and N₂O emissions to air from the combustion of solid biomass and/or peat, BAT is to use one or a combination of the techniques given below.

Technique		Description	Applicability
a.	Combustion optimisation	See descriptions in Section 10.8	Generally applicable
b.	Low-NO _x burners (LNB)		Generally applicable
c.	Air staging		Generally applicable
d.	Fuel staging		Generally applicable
e.	Flue-gas recirculation		Generally applicable
f.	Selective catalytic reduction (SCR)	See description in Section 10.8. The use of high-alkali fuels (e.g. straw) may require the SCR to be installed downstream of the dust abatement system	Not applicable to combustion plants operated < 500 h/yr. There may be economic restrictions for retrofitting existing combustion plants of < 300 MW _{th} . Not generally applicable to existing combustion plants of < 100 MW _{th}
g.	Selective non-catalytic reduction (SNCR)	See description in Section 10.8. Can be applied with 'slip' SCR	Not applicable to combustion plants operated < 500 h/yr with highly boiler variable loads. The applicability may be limited in the case of combustion plants operated between 500 h/yr and 1500 h/yr with highly variable boiler loads. For existing combustion plants, applicable within the constraints associated with the required temperature window and residence time for the injected reactants

Planning & Permitting – new build

Carbon Capture Ready

- ➔ CCR is both a planning & permitting requirement for new fossil fuel plant > 300 MWe (Geological Storage Dir.)
 - ➔ Suitable storage sites are available
 - ➔ Transport facilities are technically & economically feasible
 - ➔ Feasibility of technical retrofit of capture (EA in England)
 - ➔ Retain sufficient space (EA in England)
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- ➔ DECC CCR Guidance Nov 2009 & Supplementary Guide 2012.



Planning & Permitting – new build Combined Heat & Power + CHP R

- ➔ CHP assessment & CHP Ready is both a planning & permitting requirement for new fossil fuel plant > 20 MWth & operating > 1500 hrs pa.
- ➔ Permitting – both BAT & Art.14 Energy Efficiency Dir.
 1. Is CHP technically & economically viable / 10% primary energy saving
 2. No immediate CHP opportunities – must be **CHP R = Ability to supply defined amount of heat without significant modification**
 3. Periodic review – can CHP-R = CHP ?

Planning & Permitting – new build

Cooling & water

- ➔ EPR requires the maximising thermal efficiency for energy generation.
- ➔ BAT for cooling is once through – but is it possible?
- ➔ H1 process and complex modelling - thermal dispersion
- ➔ Proximity & sensitivity of the habitats
- ➔ Is the water available? Abstraction reform
- ➔ Eels Regulations & Fish Pass



Any Questions ?

