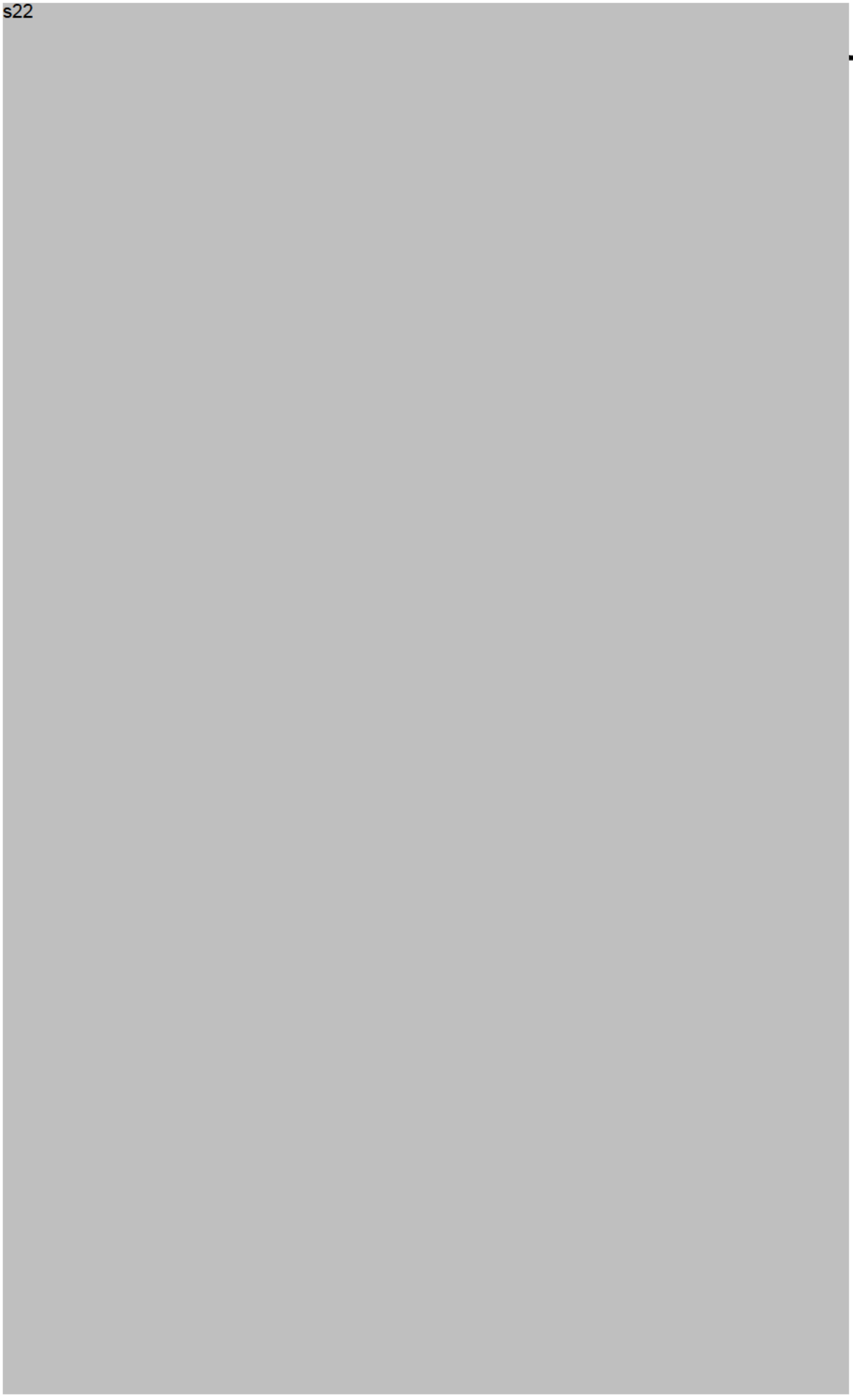

s22

Section 22

Section 22

s22

-----Original Message-----
From: s22
Sent: Tuesday, 4 October 2016 11:48 AM
To: Moriarty, Greg
Cc: Clarke, Drew
Subject: FW: Some notes for our 4 October meeting [~~DLM=Sensitive~~]

~~Sensitive~~

I met with John Short this morning.

Section 22 [redacted]

Section 22 [redacted] He sees an opportunity for that to become three way in time with the Japanese who he says are very keen to market the ultra-super critical generation tech to India, including offering concessional loans to India for ultra-super critical plant. He says that he understands that the Japanese finance is in additional to that already on offer through the green Finance initiatives.

Section 22 [redacted]

s22 [redacted]

-----Original Message-----
From: Short, John [mailto:John.Short@s22 [redacted]
Sent: Sunday, 25 September 2016 2:17 PM
To: s22 [redacted]
Cc: Clarke, Drew
Subject: Some notes for our 4 October meeting

s22 [redacted]

Thank you for agreeing to meet with me on Tuesday, 4 October.

As I advised Drew, I understand that Indian Prime Minister Modi raised the issue of "clean coal technology" with Prime Minister Turnbull on the sidelines of G20 earlier this month Section 22 [redacted]

Section 22 [redacted]

s22 [redacted]

Section 22 [redacted]

In the coal industry, references to "clean coal technology" are taken to mean what is called HELE: High Efficiency Low Emissions Technology. It is also often described as Ultra Super Critical technology.

Importantly a coal-fired HELE technology plant, especially when used with high quality thermal coal, can reduce carbon emissions by 40-50% when compared to existing old power plants in countries such as India.

The IEA Clean Coal Centre has the following important statistic: If all new coal-fired power plants (under construction or planned) were Ultra Super Critical plants - rather than the currently planned lower level of technology, the estimated consequential annual reduction in CO2 emissions would be 2 billion tonnes - equivalent to India's current annual CO2 emissions.

Thus the MOU could be a valuable vehicle for moving India up what I call "the technology curve" - and as it moves up that technology curve (to Ultra Super Critical plants versus the current Indian Government policy that all new power plants from 2017 onwards must be (the inferior) Super Critical technology), there is greater incentive for India to import high quality thermal coal (from Australia) as using high quality thermal coal leads to a lower CO2 emissions outcome versus the use of low quality thermal coal in USC plants. Section 22 [redacted]

[redacted]

(b) Japan has the most advanced HELE technology and is looking to "market" it in Asia and beyond.
(3) Japan has surplus capital - and, therefore, could supply low interest funding for Ultra Super Critical power plans to help bring down their cost. I will forward you a separate email on this cost issue.

Section 22 [redacted]

Section 22 [redacted]

Best regards,

John Short

Section 22 [redacted]

Section 22 [redacted]

Section 22 [redacted]

Section 22

From: Section 22
Sent: Friday, 27 January 2017 10:40 AM
To: Pearce, Kelly; s22
Cc: Yeaman, Luke; Gruen, David
Subject: RE: HELE Brief ~~[SEC=PROTECTED, DLM=Sensitive:Cabinet]~~
Attachments: Note for PMC - Preliminary analysis of HELE brief.docx

~~PROTECTED Sensitive: Cabinet~~

Hi s22

s47C

Sectio

Section 22
Section 22 | Environment, Energy and Climate Branch
Industry, Infrastructure and Environment Division | Department of the Prime Minister and Cabinet
p. Section 22 | e. Section 22
PO Box 6500 CANBERRA ACT 2600

s34(3)

s34(3)

From: Pearce, Kelly
Sent: Wednesday, 18 January 2017 4:56 PM
To: s22
Cc: Section 22 ; Yeaman, Luke; Gruen, David
Subject: RE: HELE Brief ~~[DLM=For-Official-Use-Only]~~

~~For Official Use Only~~

Hi s22

s47C

From: s22
Sent: Wednesday, 18 January 2017 4:34 PM
To: Pearce, Kelly
Cc: Section 22 Yeaman, Luke; Gruen, David
Subject: RE: HELE Brief ~~[DLM=For Official Use Only]~~

~~For Official Use Only~~

Thanks Kelly

s34(3)

s22

From: Pearce, Kelly
Sent: Wednesday, 18 January 2017 1:42 PM
To: s22
Cc: Section 22 Yeaman, Luke <Luke.Yeaman@pmc.gov.au>; Gruen, David <David.Gruen@pmc.gov.au>
Subject: FW: HELE Brief ~~[DLM=For Official Use Only]~~

~~For Official Use Only~~

Hi s22

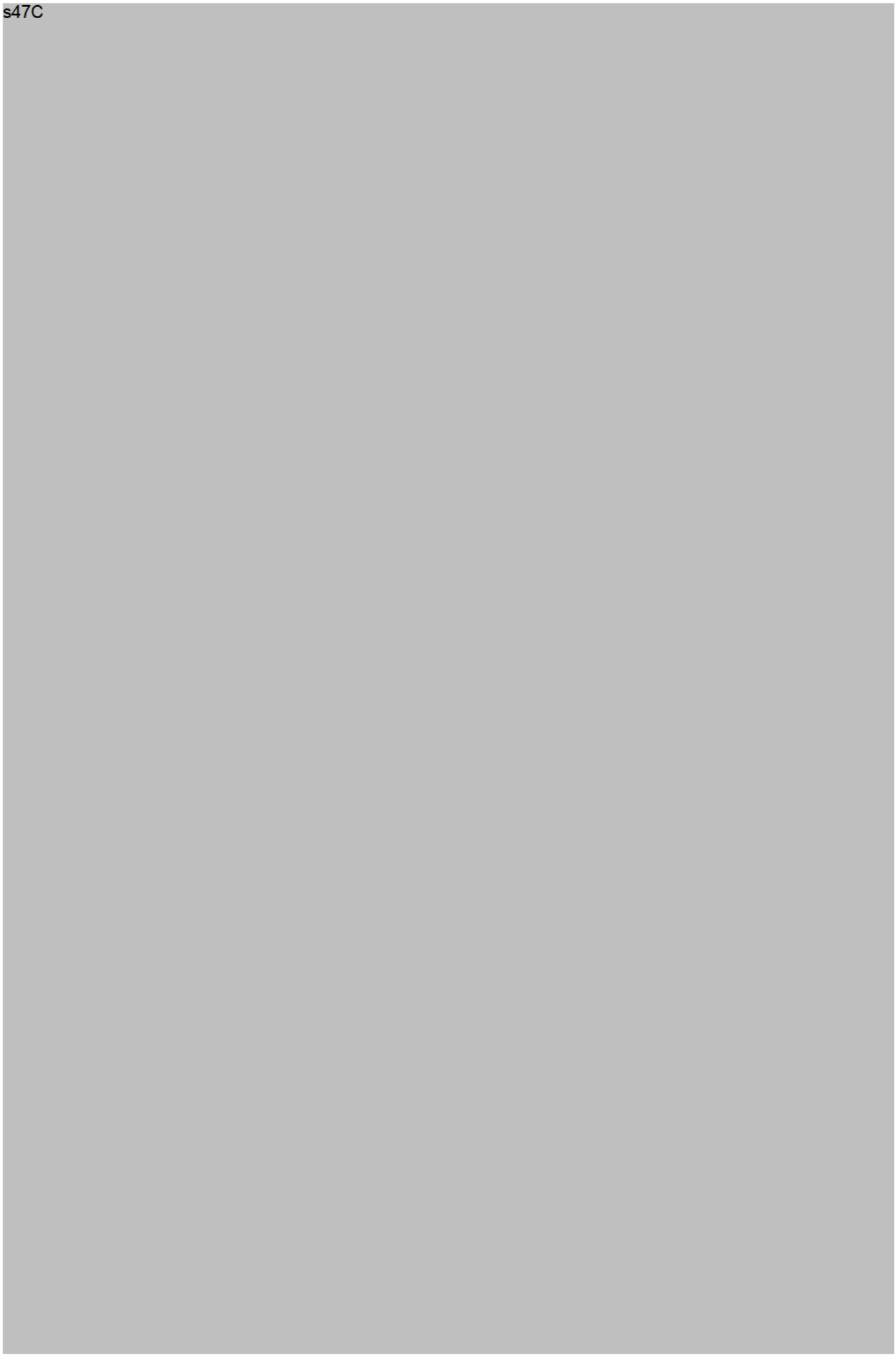
Attached the information that Minister Canavan was quoted on in yesterday's press.

The Department has indicated there was never 'commissioned research' as reported in the Australia – this appears to be a misinterpretation by the media. The 'commissioned research' was standard Ministerial briefing for information.

Regards
Kelly

Kelly Pearce | Assistant Secretary
Environment, Energy and Climate
Industry, Infrastructure & Environment Division | Department of the Prime Minister and Cabinet
p. s22 | m. s22 |
e. kelly.pearce@pmc.gov.au / unfccctaskforce@pmc.gov.au | www.dpmc.gov.au
PO Box 6500 CANBERRA ACT 4001

s47C



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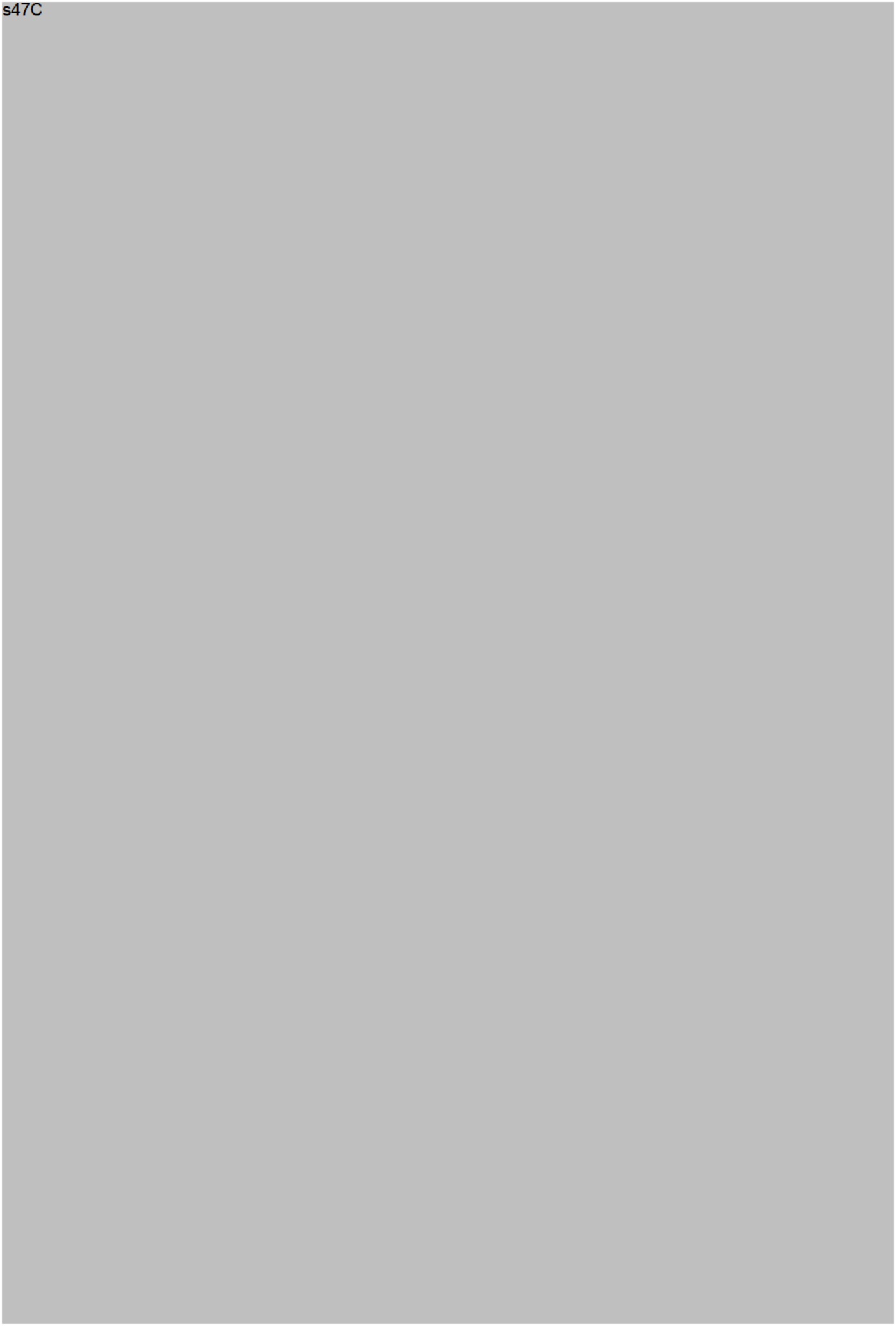

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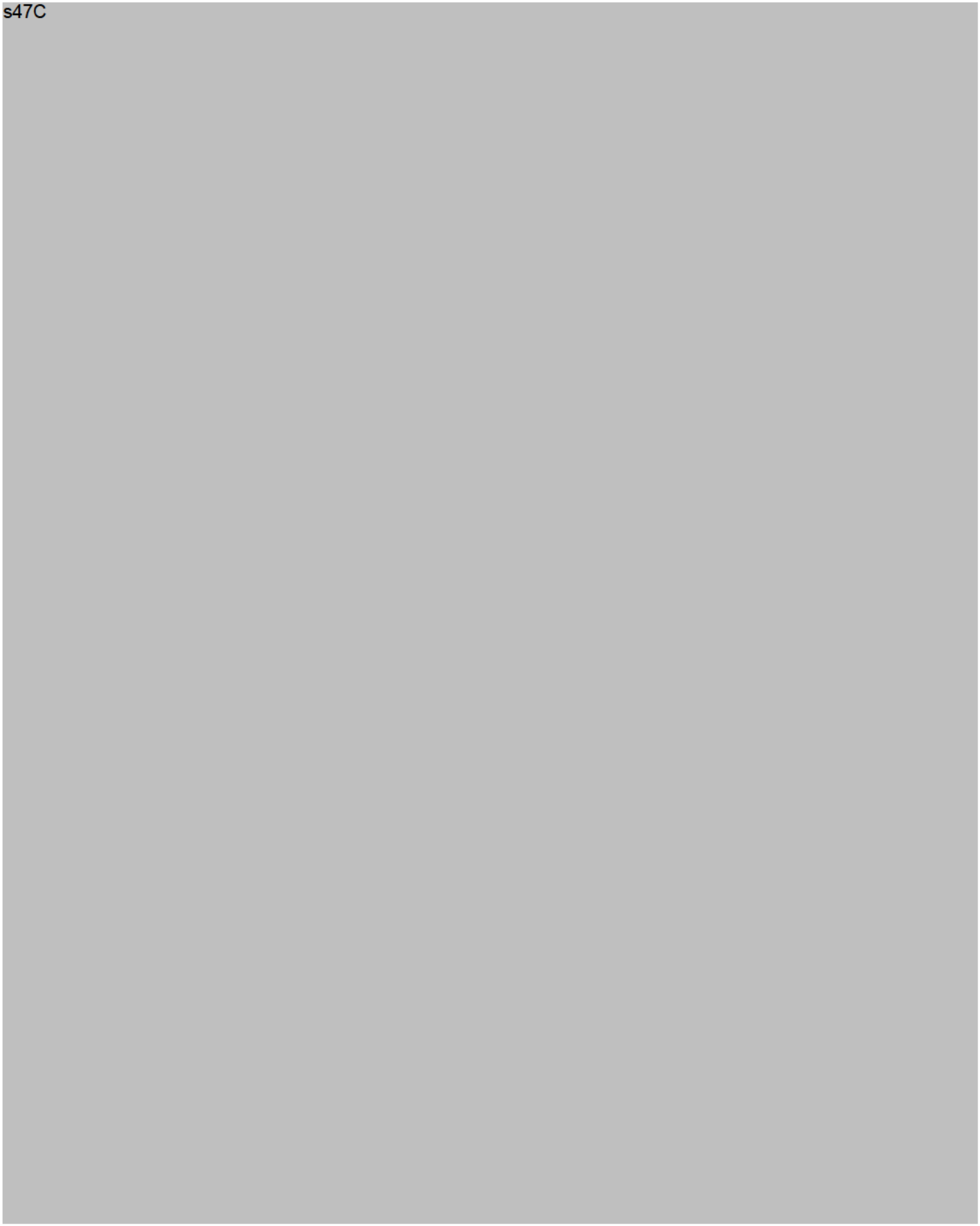


Section 22

From: Pearce, Kelly
Sent: Tuesday, 31 January 2017 4:34 PM
To: s22
Subject: RE: HELE % ~~[DLM=For-Official-Use-Only]~~
Attachments: s34(1)(c) BSporton presentation to MCA roundtable.pdf

~~For Official Use Only~~

s47C

Table 4. Potential emission savings by upgrading to USC technology today

		Lower Limit	Upper Limit
Actual	Mt	160.05	
USC	Mt	126.96	117.44
Difference	Mt	-33	-43
Difference	%	-21%	-27%

Assumptions:

1. Actual data is based on the emissions from plants listed in Attachment B for 2015–16.
2. Emissions from the four coal-fired plants in Western Australia in 2015–16 were estimated using an emissions intensity figure for 2014–15 from the Clean Energy Regulator.
3. Emissions from USC and AUSC were calculated using 2015–16 generation figures and CO2 intensity factors from the IEA as presented in Attachment A.
4. The phase-out/replacement profile is based on existing capacity being replaced by USC/AUSC in the year of retirement.

From: s22
Sent: Tuesday, 31 January 2017 4:25 PM
To: Pearce, Kelly
Subject: HELE % ~~[DLM=For-Official-Use-Only]~~

~~For Official Use Only~~

s47C

Estimated Operating Emissions for New Power Stations [72]

(From Appendix D of the Finkel Preliminary Report 14 December 2016)

Generation type	**Estimated operating emissions as generated[73] (kg CO_2-e/ MWh)**
Subcritical brown coal	1,140
Supercritical brown coal	960
Subcritical black coal	940
Supercritical black coal	860
Ultra-supercritical brown coal	845
Ultra-supercritical black coal	700
Open cycle gas turbine (OCGT)	620
Combined cycle gas turbine (CCGT)	370
Wind	0
Hydro	0
Solar PV	0
NEM electricity grid emissions intensity	820[74]

72 page 6, A Cleaner Future for Power Station – Interdepartmental Task Group Discussion Paper (Cmwth): http://industry.gov.au/Energy/Documents/sustainability-and-climate-change/DiscussionPaperCleanerFuturePowerStation.pdf

73 For simplicity, where a generation technology has a range of emissions intensities associated with it, the average has been used.

74 page 18, *National Greenhouse Accounts Factors – Australian National Greenhouse Accounts*, Department of the Environment and Energy, 2016.

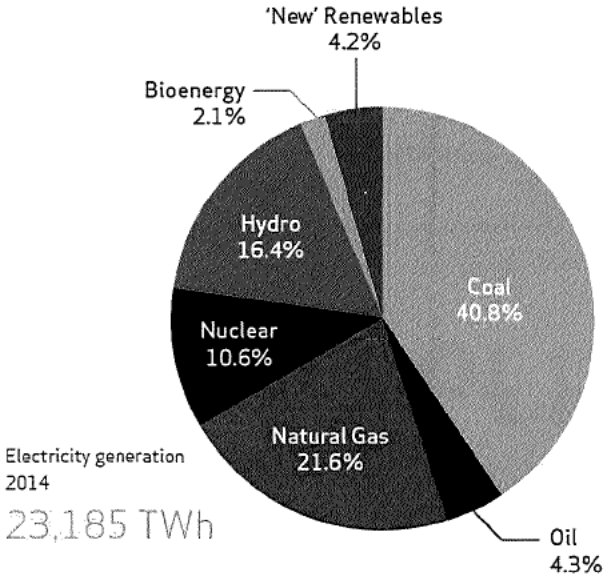
The power of high efficiency coal

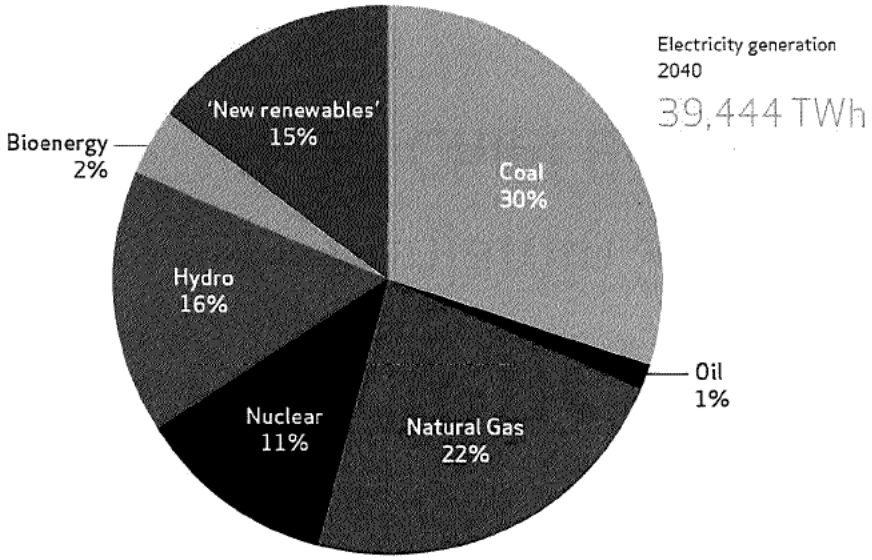
Benjamin Sporton
Chief Executive

WORLD COAL ASSOCIATION

Coal continues to grow, even as share declines

Global electricity mix





Source: IEA WEO2015 New Policies Scenario and 2016 Key Electricity Trends

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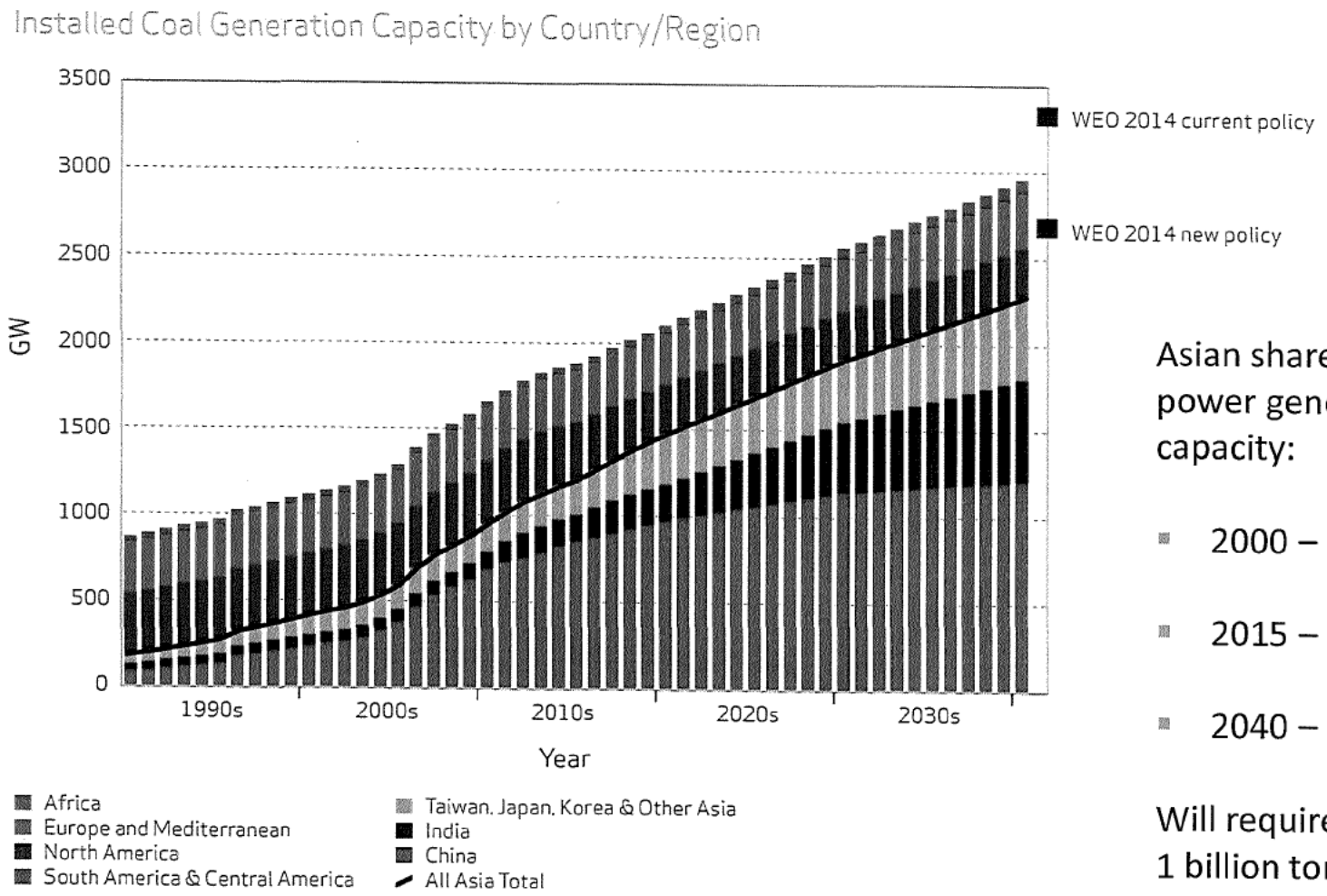
Asia will drive new coal generation capacity



Source: World Coal Association analysis

Asian share of global coal power generation capacity:

- 2000 – 38%
- 2015 – 69%
- 2040 – 77%

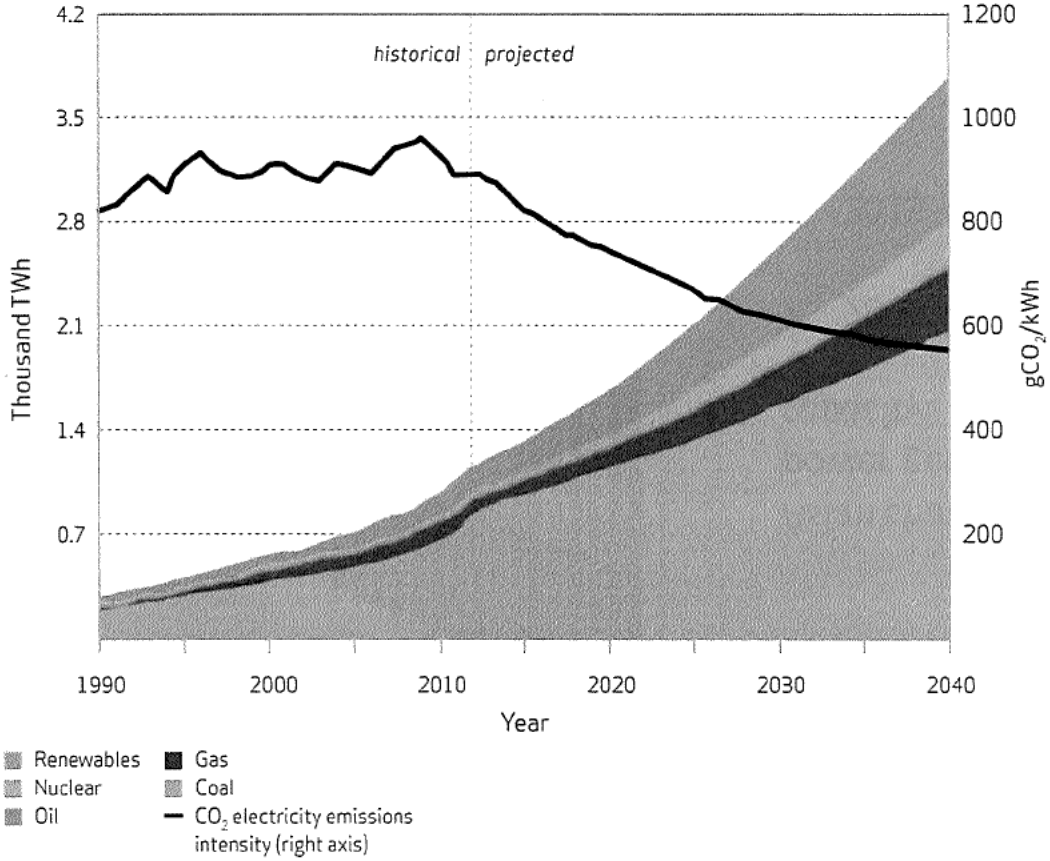
Will require an additional 1 billion tonnes per annum of coal

WORLD COAL ASSOCIATION

Large-scale power generation will be a critical enabler of growth in India

- Electricity demand in India is expected to average 4.4% pa over the next 25 years
- While coal generation capacity more than doubles, renewables are required to increase exponentially (non-hydro renewables over 10 times) to meet demand
- IEA indicates that maintaining an adequate electricity supply represents a significant investment challenge requiring $2 trillion (in 2013 dollars)

India's electricity generation by source and CO_2 intensity in the New Policies Scenario



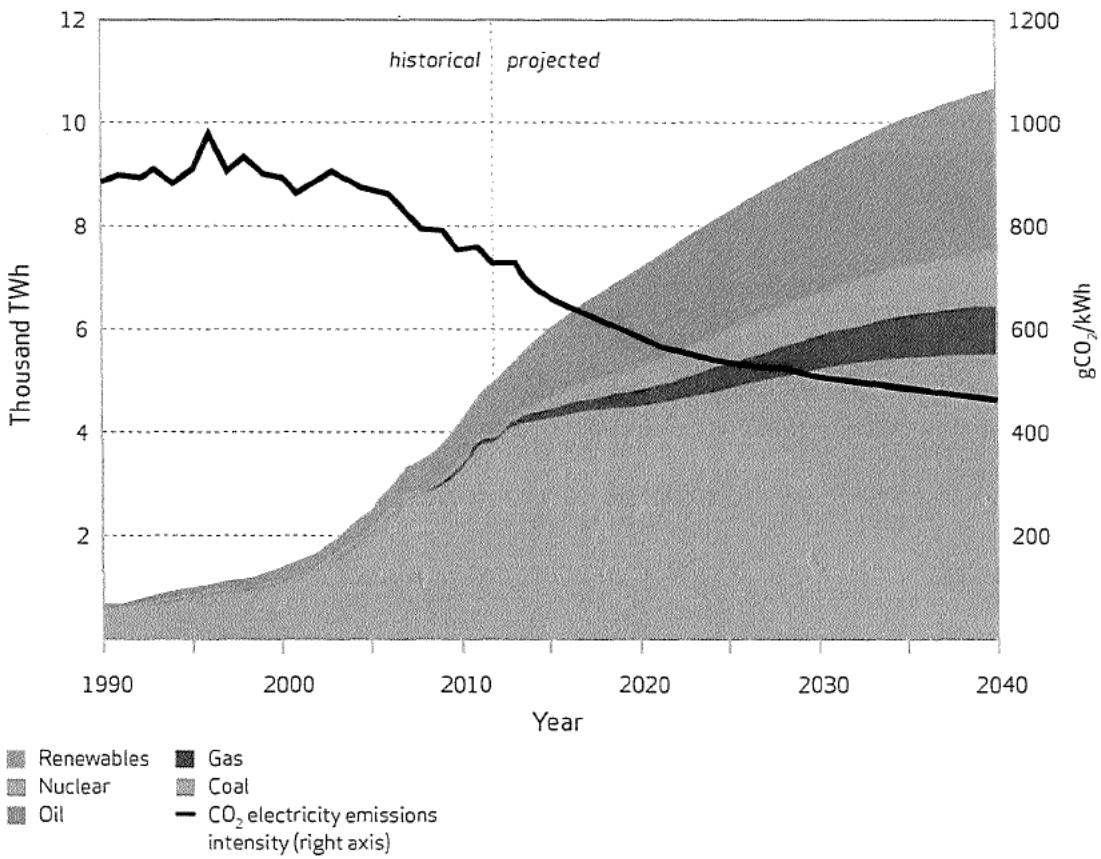
Source: IEA, WEO 2014

WORLD COAL ASSOCIATION

Coal will continue to play a big role in China

- China's electricity demand growth will be around 4.8% to 2020, then decline to around 2% through to 2040
- Electricity generation from coal will be 27% higher in 2040, despite its share of generation reducing from 75% to 49%
- Non-hydro renewables are expected to increase 1200% over the same period (25% of world generation)

China electricity generation by source and CO_2 intensity in the New Policies Scenario



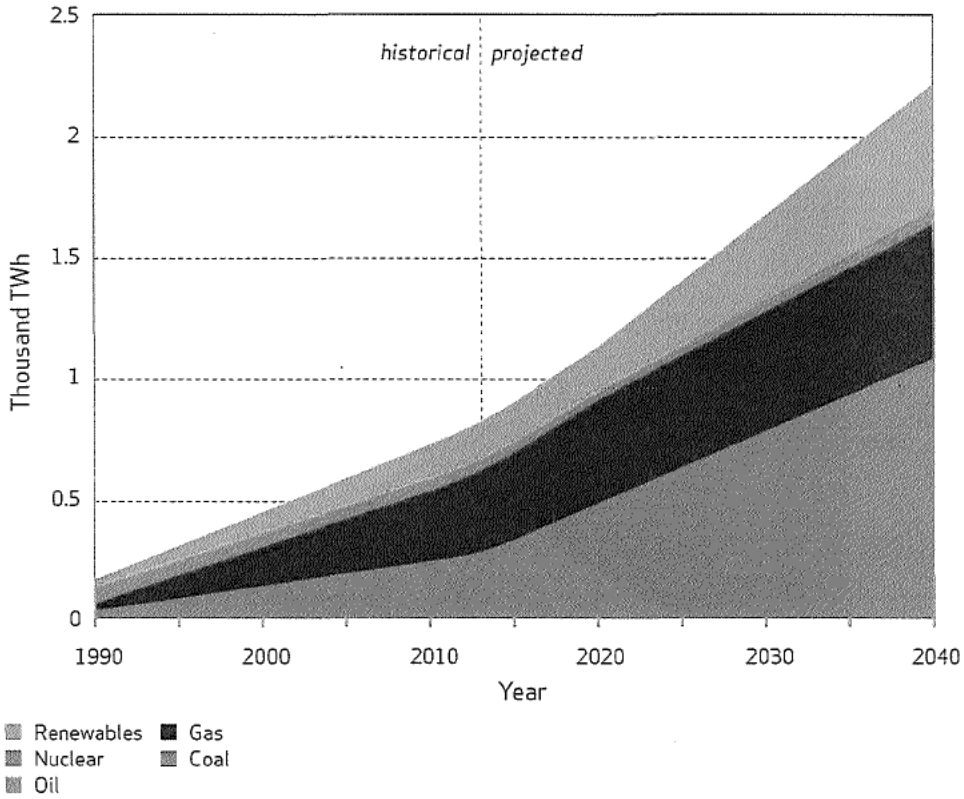
Source: IEA, WEO 2014

WORLD COAL ASSOCIATION

Coal will drive Southeast Asian energy

- Electricity demand almost triples over the period, to around 2 000 TWh in 2040, an increase bigger than current demand in India.
- The share of coal in power generation rises from 32% to 50%
- Renewables-based electricity generation increases three and half times from today to 2040 (481 TWh)
- IEA – requires $2.4 trillion investment over the period to 2040. This represents around 5% of the global total, or one-third of China's investment
- Southeast Asia will move from 46% to 60% urbanised by 2040, vs OECD 85%

Southeast Asia electricity generation by source in the New Policies Scenario



Source: Adapted from IEA WEO 2015

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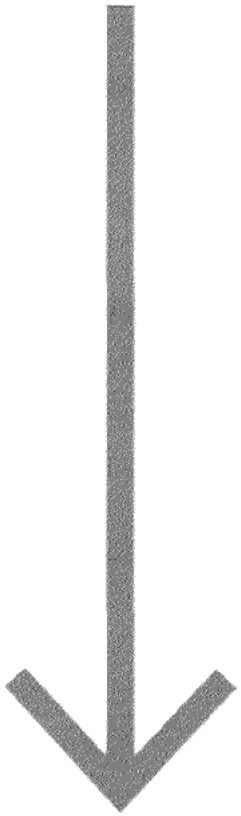
Higher efficiency reduces CO_2

For every

1%

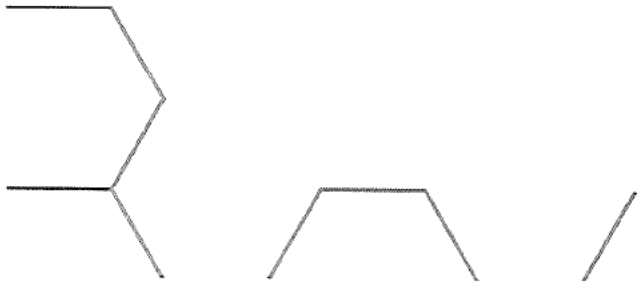
efficiency improvement



we get

2-3%

reduction in CO_2 emissions



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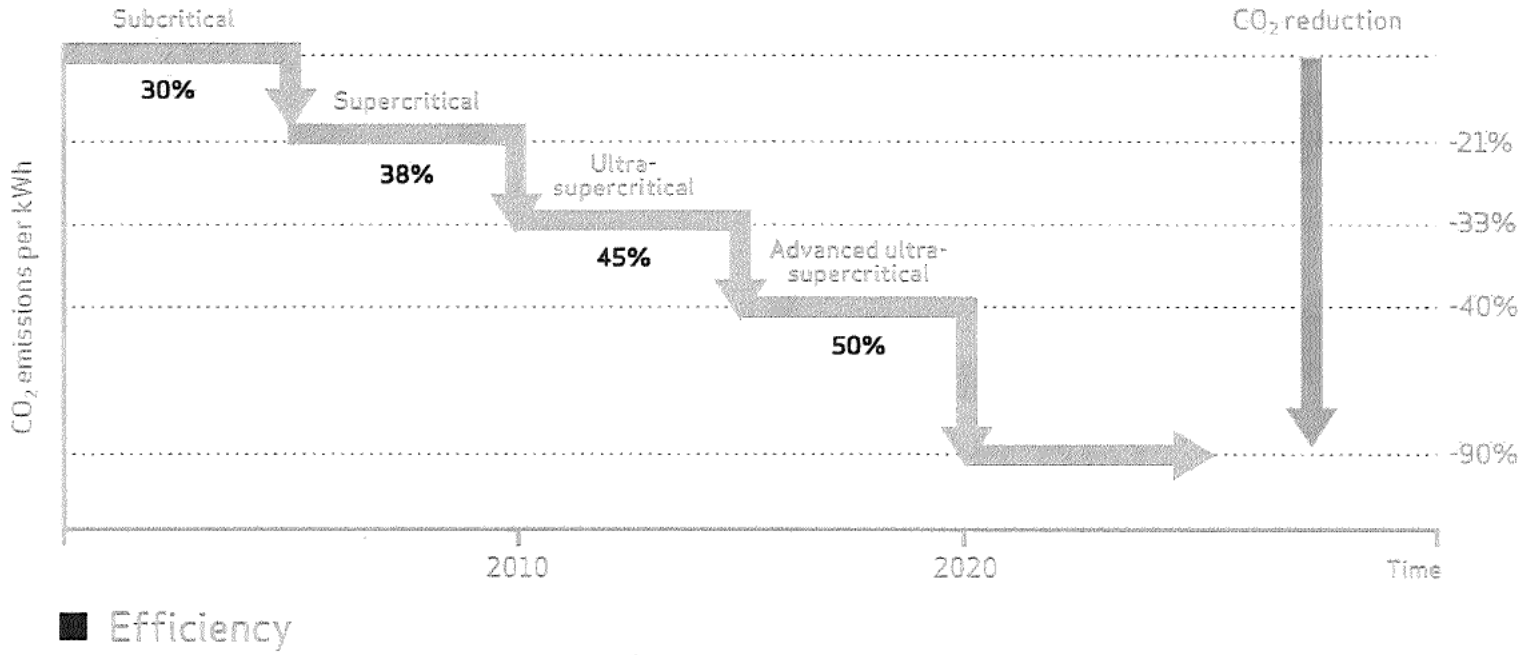
HELE technologies continue to develop

CO_2 reduction potential of coal-fired power plants by increased efficiency



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What is high efficiency low emissions coal?

Which are HELE technologies?

	Efficiency rate*	CO_2 intensity	Coal consumption	Steam temperature
Advanced ultra-supercritical	45-50%	670-740g CO_2/kWh	290-320g/kWh	700°C+
Ultra-supercritical	Up to 45%	740-800g CO_2/kWh	320-340g/kWh	600°C+
Supercritical	Up to 42%	800-880g CO_2/kWh	340-380g/kWh	Approx. 550°C-600°C
Subcritical	Up to 38%	≥880g CO_2/kWh	≥380g/kWh	<550°C

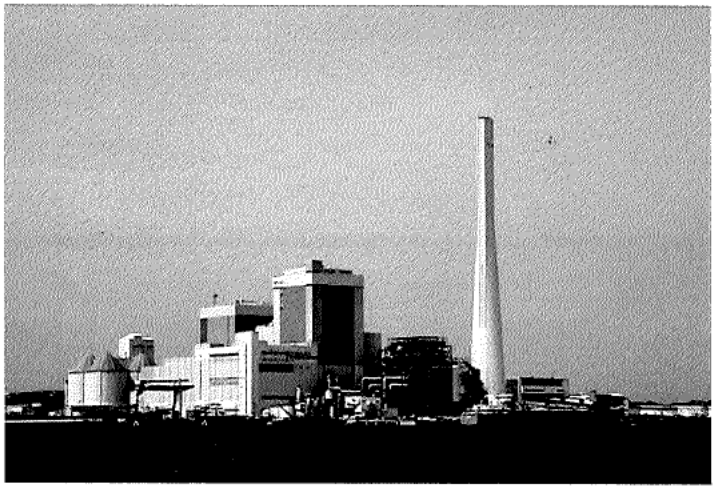
*Lower heating value

Source: Adapted from IEA, Technology Roadmaps. High-efficiency low-emissions coal-fired power generation, *2012*

WORLD COAL ASSOCIATION

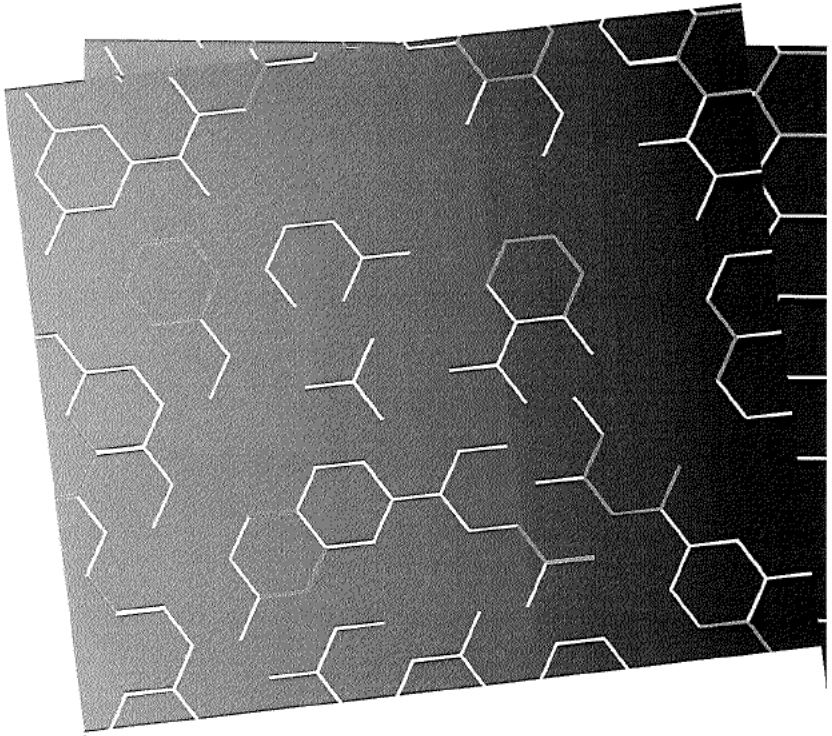
HELE can become the global standard for coal

- Japan and China have been the most active in building USC plants
- J-Power upgraded their 1967 sub-critical Isogo 38% efficient coal-fired power plant to an USC 43% efficiency plant with SOx, NOx, PM reduced to less than 1/3 of previous levels
- China's Ninghai plant has a capacity of 4,400MW and China is relying on these larger, advanced units for dispatch to displace higher emission from older, less efficient power stations
- The units have integrated advanced air quality control systems, yielding non-carbon air emissions well below China's latest more stringent standards, and also below comparable standards in North America and Europe



WORLD COAL ASSOCIATION

WCA wants to see more action on HELE

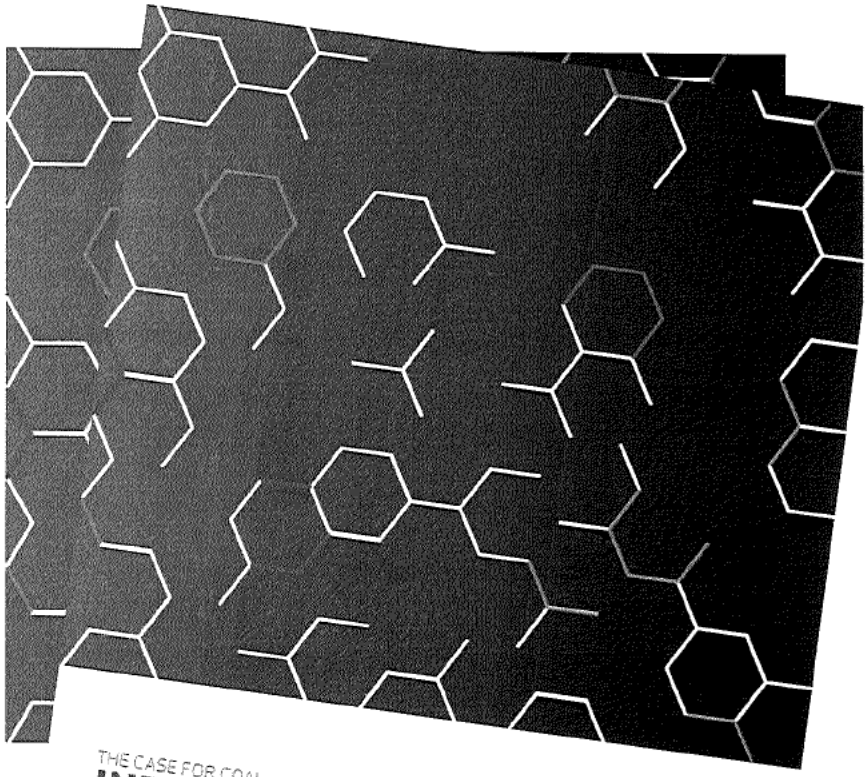


THE CASE FOR COAL

THE POWER OF HIGH EFFICIENCY COAL

REDUCING EMISSIONS WHILE DELIVERING ECONOMIC DEVELOPMENT AND RELIABLE ENERGY

WORLD COAL ASSOCIATION



THE CASE FOR COAL

INDIA'S ENERGY TRILEMMA

WORLD COAL ASSOCIATION

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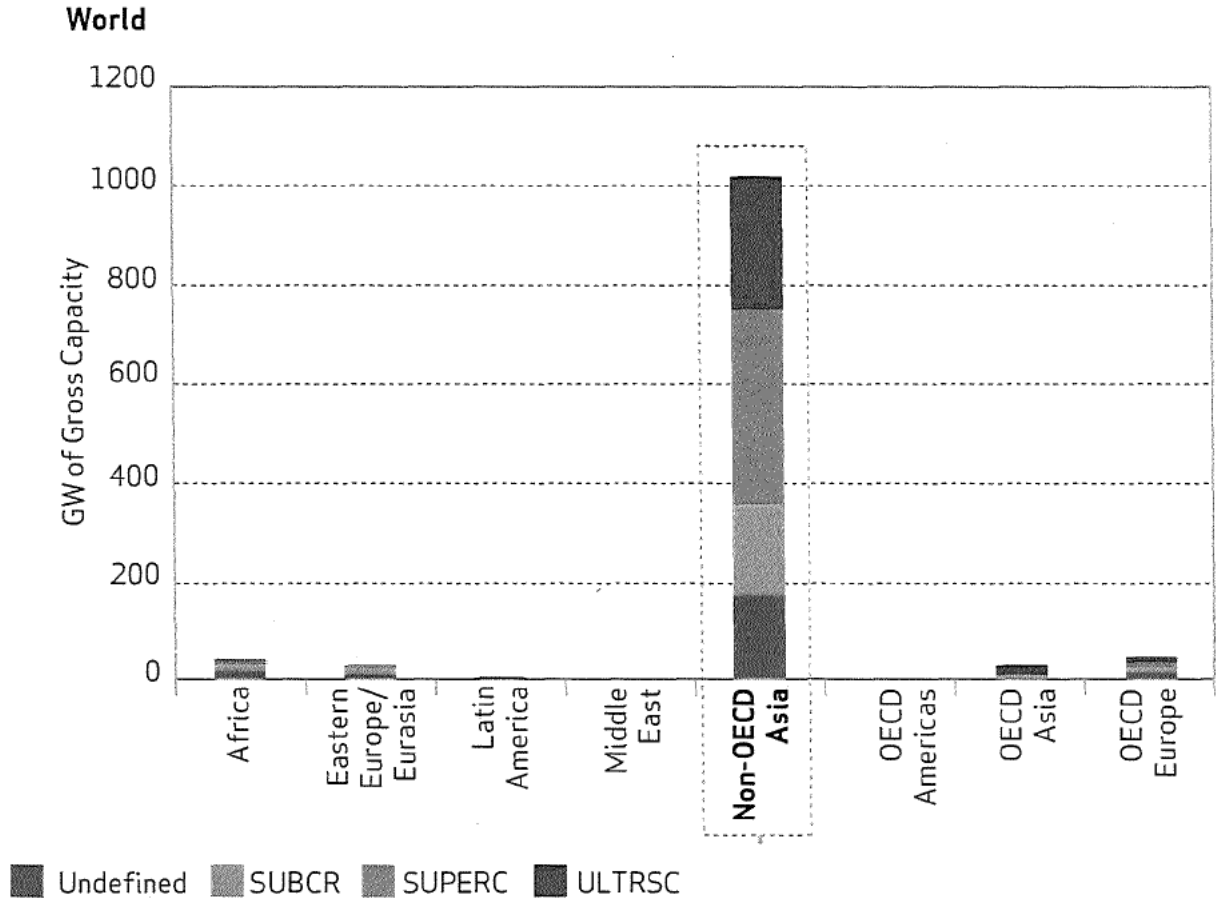
HELE is part of the Paris Agreement

WORLD COAL ASSOCIATION

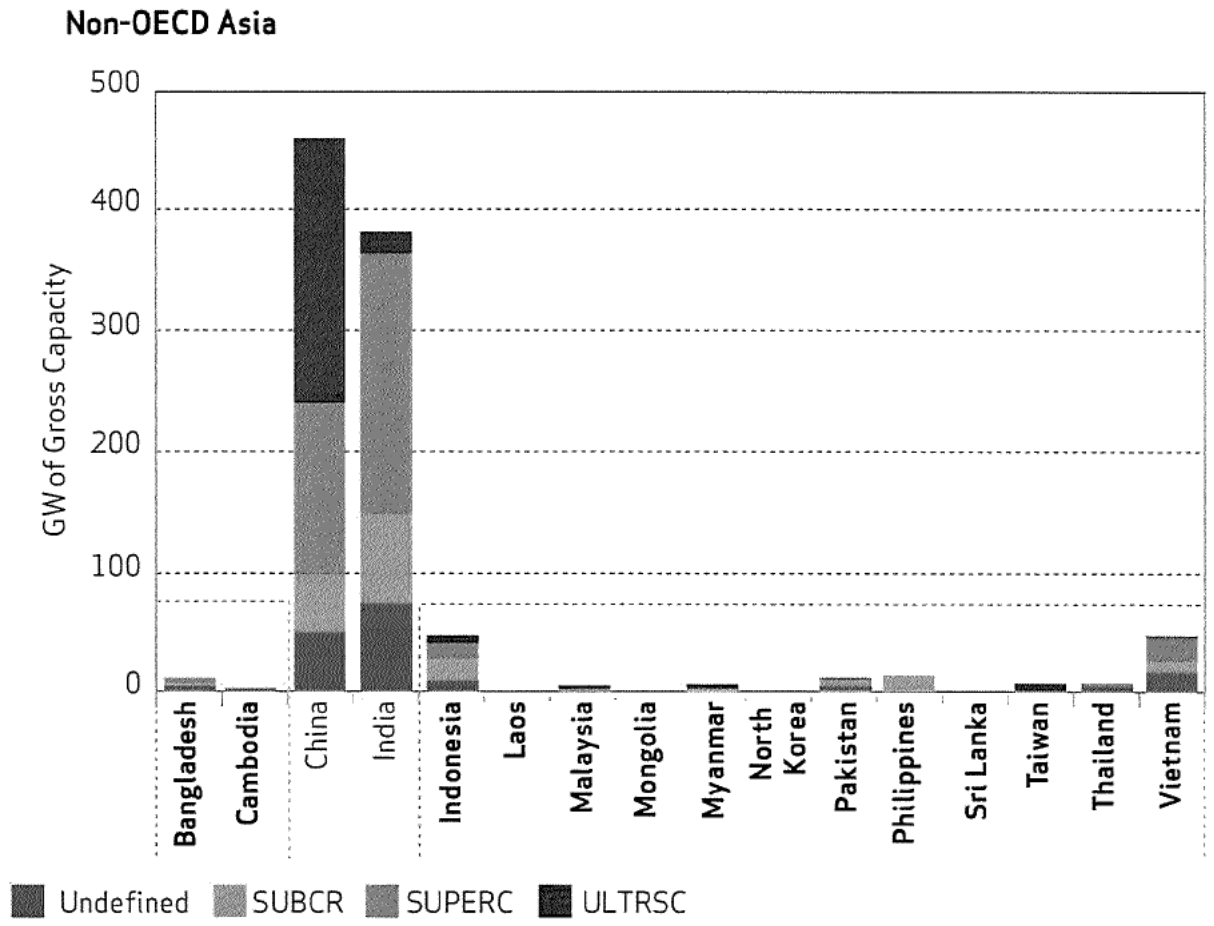
Coal plant development mix of HELE and not



Source: World Coal Association analysis, 2015

WORLD COAL ASSOCIATION

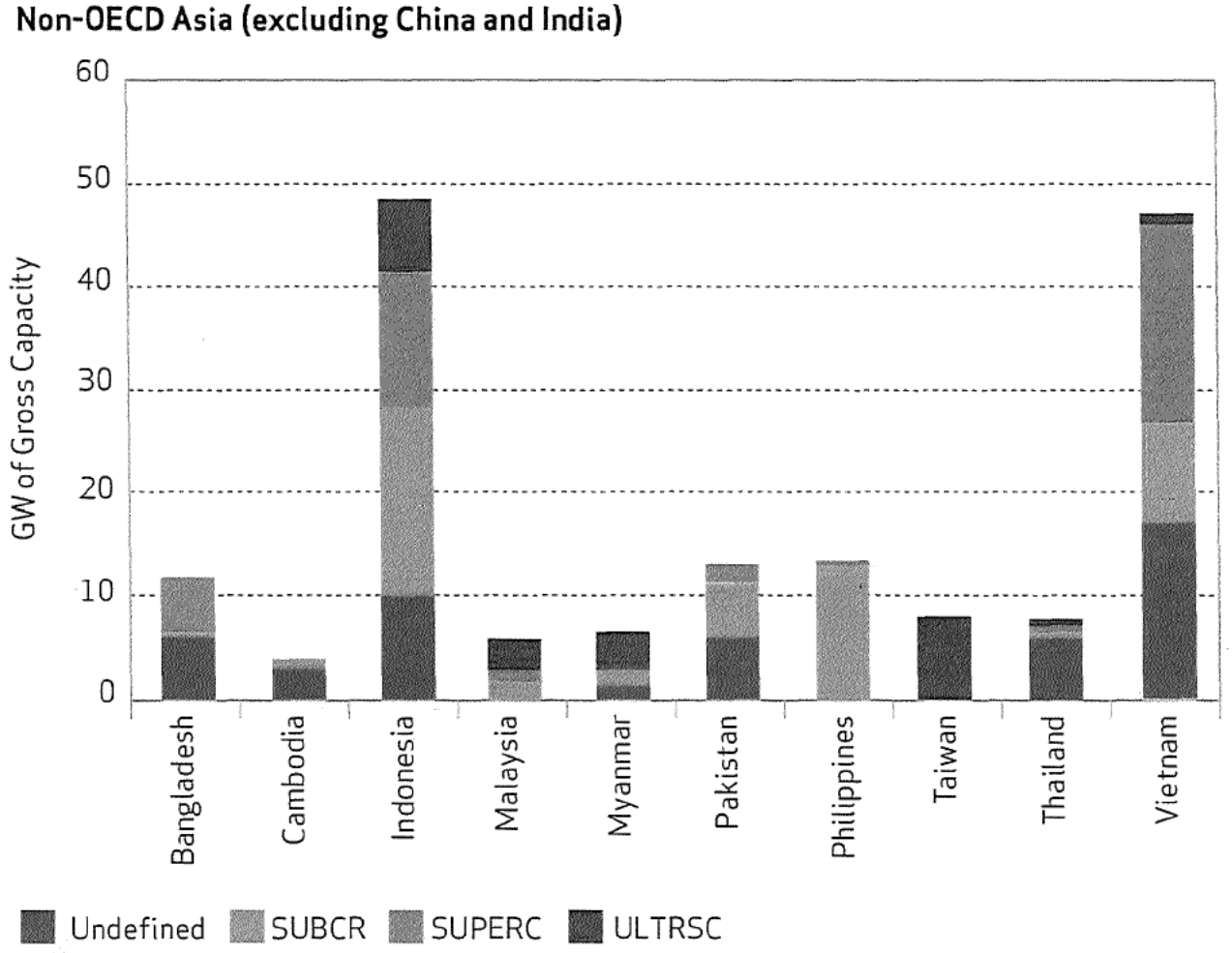
China committed to HELE, others less so



Source: World Coal Association analysis, 2015

WORLD COAL ASSOCIATION

Non-OECD Asia needs to make HELE switch



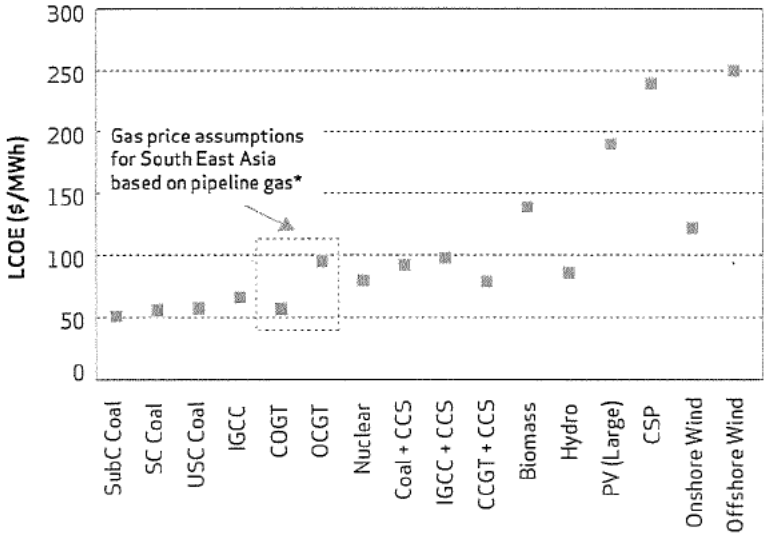
Source: World Coal Association analysis, 2015

WORLD COAL ASSOCIATION

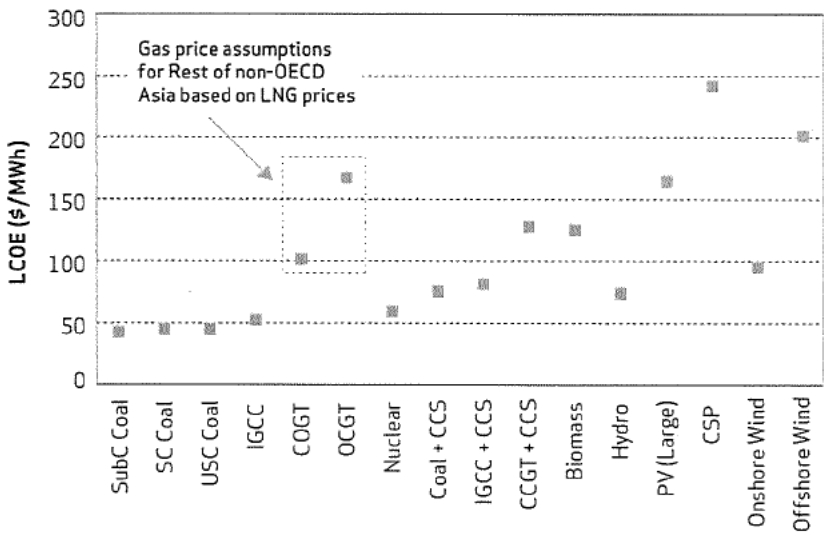
HELE is cost competitive today...

Lifetime Cost of Electricity per MWh across Generation Technologies in 2015

South-East Asia 2015



Rest of non-OECD Asia 2015



Source: World Coal Association analysis, 2015

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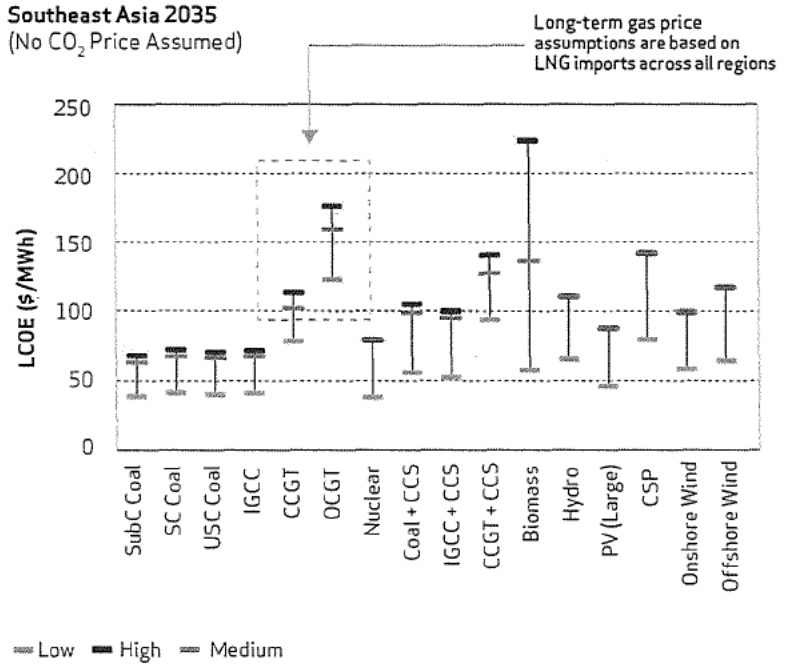
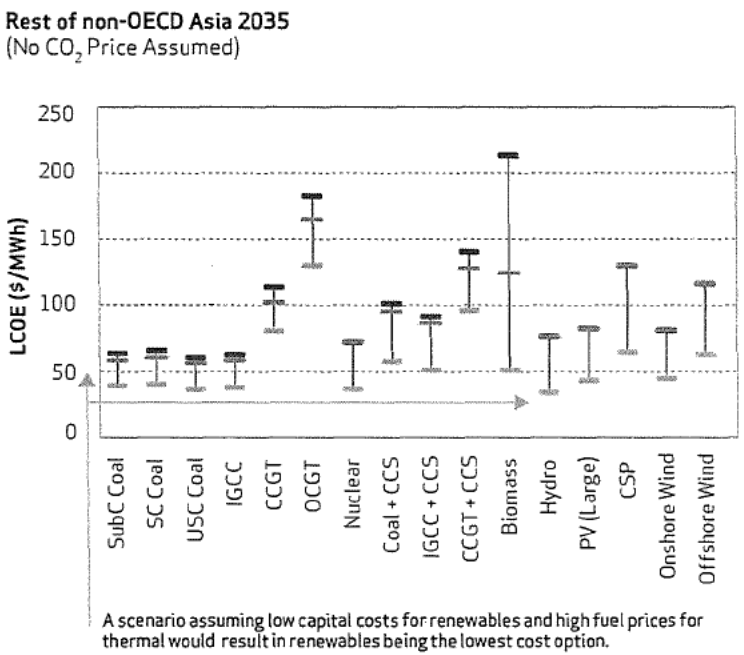
… and in the future (and so is coal+CCS)

Lifetime Cost of Electricity per MWh across Generation Technologies in 2035





Source: World Coal Association analysis, 2015

WORLD COAL ASSOCIATION

Per $ of investment HELE more powerful

Compared to renewables, HELE technologies can reduce more emissions for the same upfront investment

Investment Option	Generation Mix for 10,000 TWh (%)		Required Capacity (GW)		Total CAPEX[1] ($Billion)	% Increase in CAPEX to Baseline	Annual Emission (Bn. tCO_2)
	Coal	Renewable	Coal	Renewable			
Sub-Critical Coal Only	**100**	**0**	**1,343**	**0**	**699**	**Baseline**	**9.5**
Ultra Super-critical Coal Only	100	0	1,343	0	932	33	7.0
Sub-critical Coal and Onshore Wind	95	5	1,269	241	932	33	9.0
Sub-critical Coal and Solar PV	96	4	1,284	264	932	33	9.1
Onshore Wind Only	0	100	0	4,391	4,944	607	0
Solar PV Only	0	100	0	6,008	6,002	759	0

$233 Billion of additional funding required

For the same additional financing, ultra super-critical coal technology generates the least amountof emissions

Low load factor renewable technologies means significantly higher required capacity - and therefore higher CAPEX - to generate the same TWh of electricity

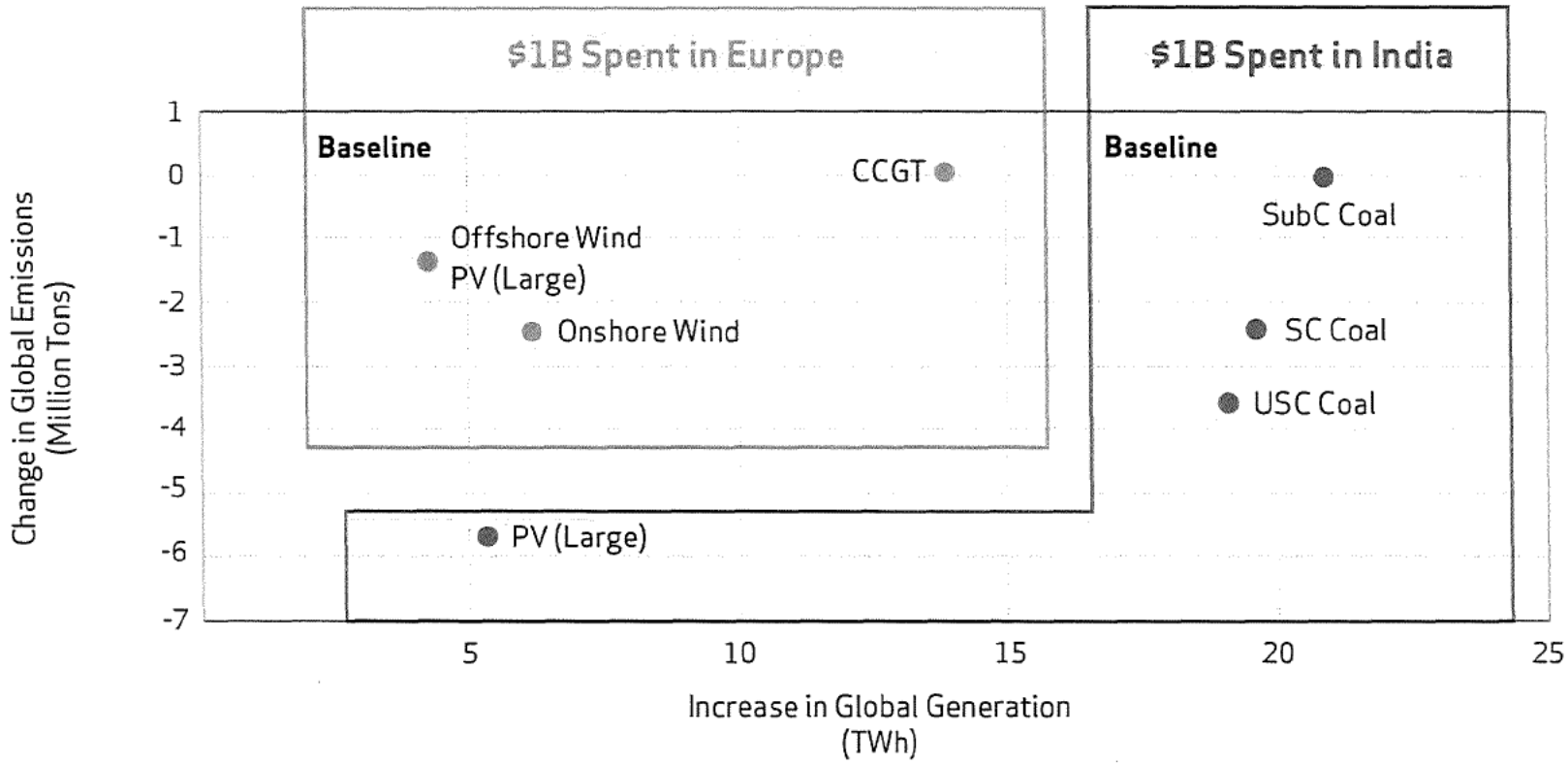
Notes:
1) Based on IEA's WEO 2014 New Policy Scenarios capital cost estimates for China in 2035 with construction costs spread equally over the construction period

Source: World Coal Association analysis, 2015

WORLD COAL ASSOCIATION

HELE in India – meeting twin objectives

Deploying cleaner coal technology promotes energy access, while managing emissions of carbon dioxide



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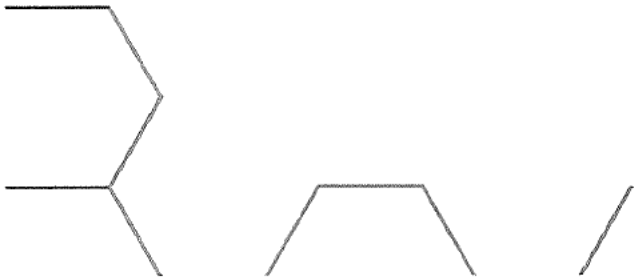
HELE in India – examining the impact

The environmental benefits of deploying cleaner coal technology in India

Scenario	Capacity mix	CO_2 emissions (tCO_2) (over 40 years)	CO_2 abated equivalent to		
			Subcritical plant closure	Number of new wind turbines	Cars removed from the road
Mix per development pipeline	USC 6, SC 167, SubC 118	84 Billion			
Shift to Supercritical	USC 6, SC 286, SubC 0	80 Billion	28	26,000	200 million
Shift to Ultra Supercritical	USC 292, SC 0, SubC 0	73 Billion	69	65,000	500 million



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WCA supports coordinated international action

- International platform to help drive deployment of HELE technologies in developing and emerging economies
- Public private partnership to overcome financial, technical and regulatory barriers
- Currently seeking partners to help build an initial alliance

WORLD COAL ASSOCIATION

WCA PACE workshop with Indonesia

Ministry of Environment and Forestry of Indonesia

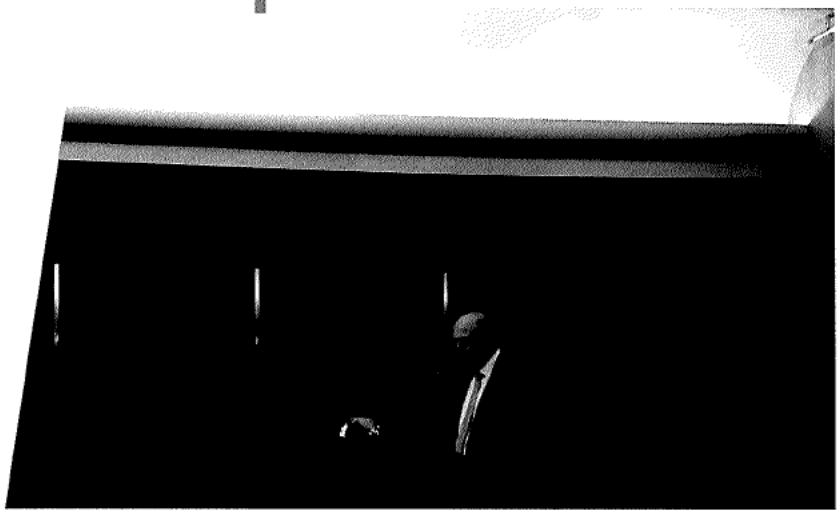
WORLD COAL ASSOCIATION

Ministry of Energy and Natural Resources of Indonesia

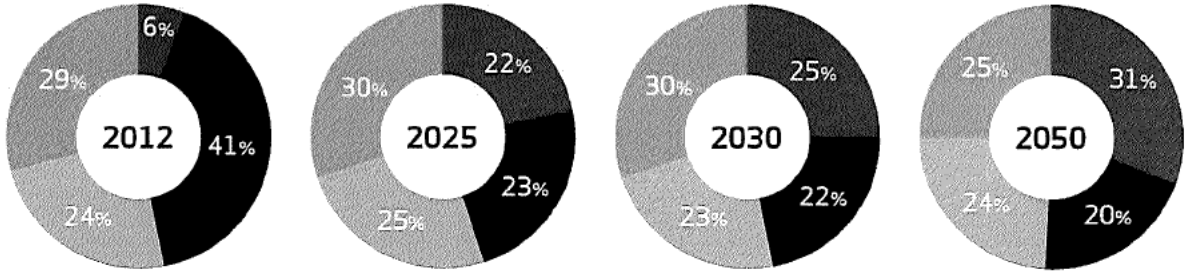
BUILDING PATHWAYS FOR HIGH EFFICIENCY LOW EMISSIONS COAL TECHNOLOGY IN INDONESIA

WORKSHOP

JAKARTA – INDONESIA
6 SEPTEMBER 2016



Indonesia's national energy mix plans to 2050



TOTAL 159 Mtoe; 0.7 Mtoe/capita

TOTAL 400 Mtoe; 1.4 Mtoe/capita

TOTAL 480 Mtoe; 1.7 Mtoe/capita

TOTAL 1,000 Mtoe; 3.2 Mtoe/capita

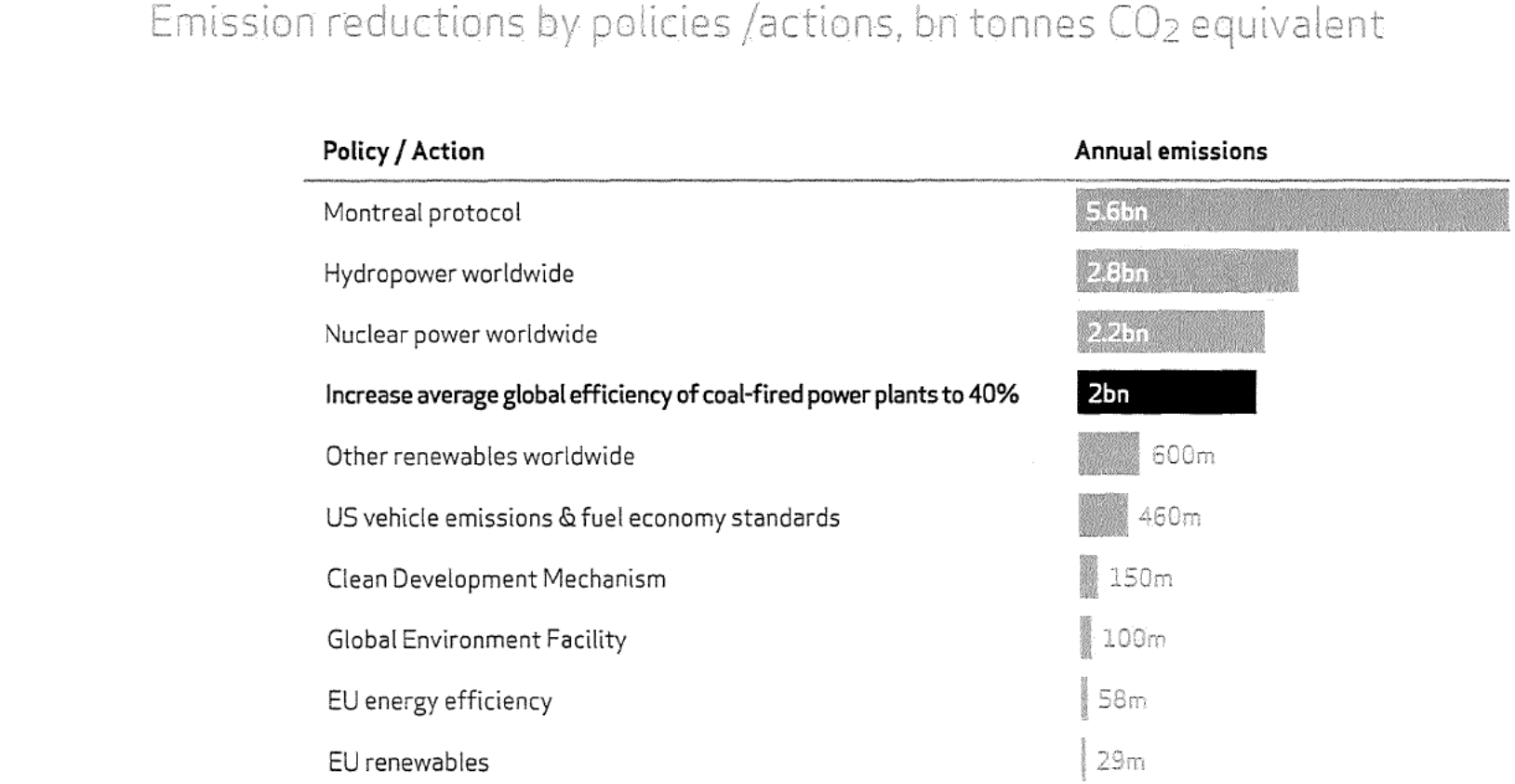
Coal · New and renewable energy · Oil · Gas

Source: NEC (National Energy Council) (2014), National Energy Policy 2014-2025, NEC, Jakarta

WORLD COAL ASSOCIATION

A global initiative on HELE would have impact

Emission reductions by policies /actions, bn tonnes CO_2 equivalent



Source: Adapted from The Economist and the IEA 2014

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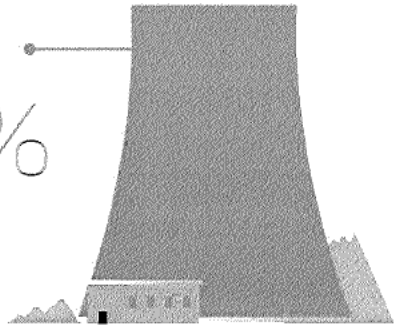
Deploying HELE also has other benefits

Air quality

↓ 90-99.9%

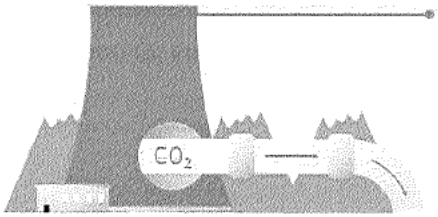
Reduction of pollutants from coal combustion as a result of using cleaner coal technologies.



CCS

THE ROLE OF CARBON CAPTURE AND STORAGE (CCS)

CCS is an integrated suite of technologies that can capture up to 90% of the CO_2 emissions produced from the use of fossil fuels in electricity generation and industrial processes, preventing the CO_2 from entering the atmosphere. The technology is also effective in capturing other emissions.



90%

Amount of CO_2 emissions that could be captured through CCS technologies.

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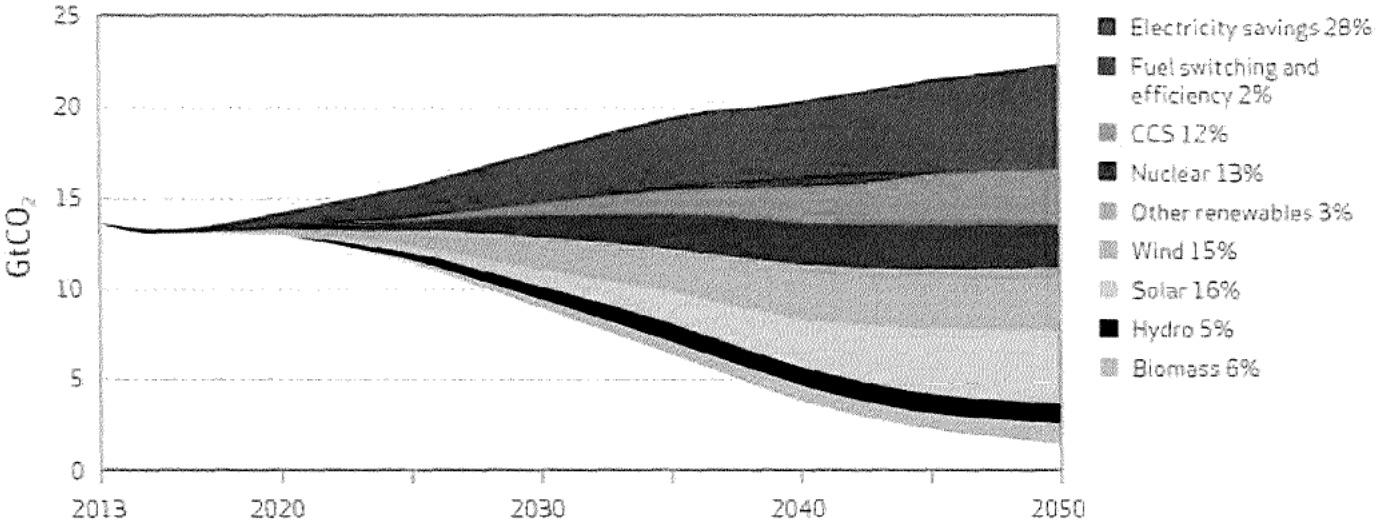
CCS is critical to global climate objectives

Contribution of different technologies to cumulative annual emissions reductions



Source: IEA, Energy Technology perspectives 2016

- CCS is expected to deliver 12% of cumulative GHG emissions cuts through to 2050. It is therefore a key low-carbon technology
- The world's first large scale integrated CCS project capturing CO2 from a coal-fired power plant – SaskPower's Boundary Dam – has just started full scale operation at the end of September 2014

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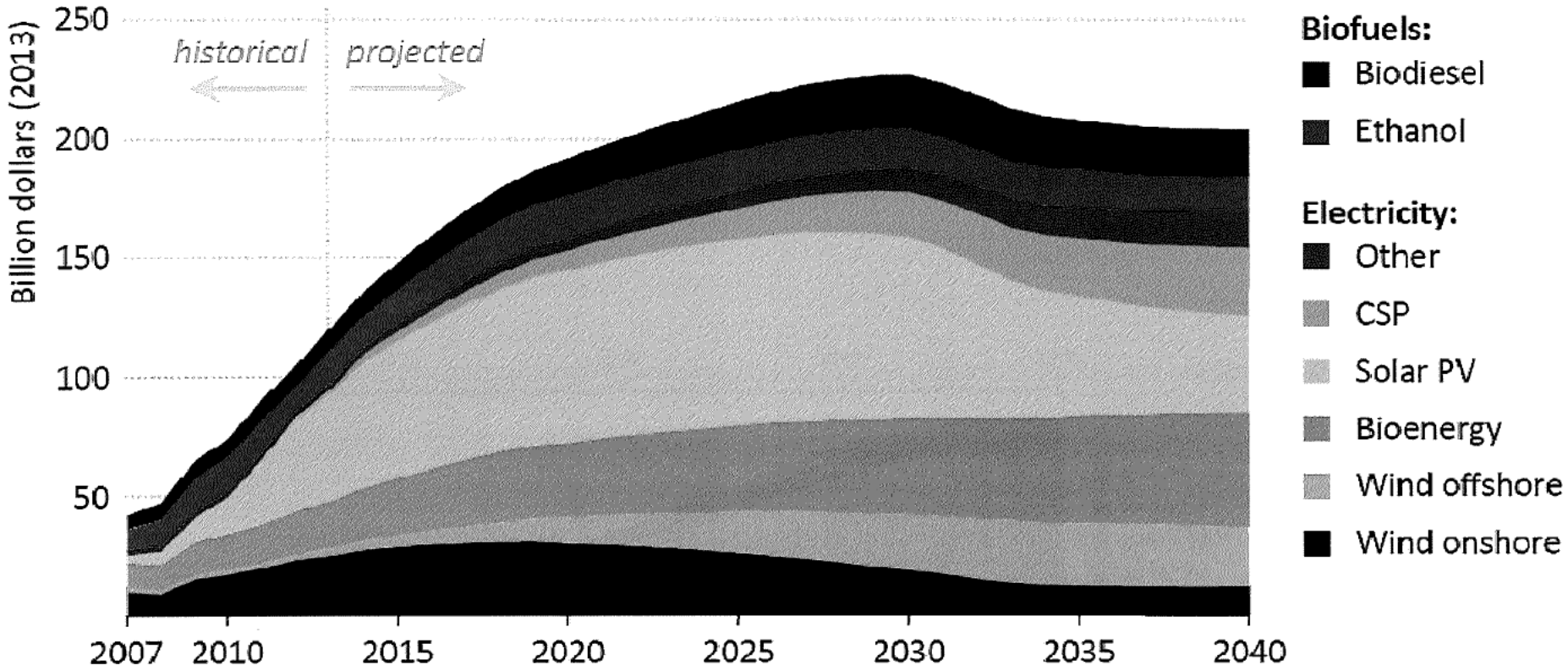
CCS needs policy parity with renewables



- In the period 2007 to 2016, value of global policy support for renewable energy deployment was around US$800B.

- Total value of policy support for deployment of CCS over all time is around $20B

Data source: IEA, World Energy Outlook 2014, Global CCS Institute

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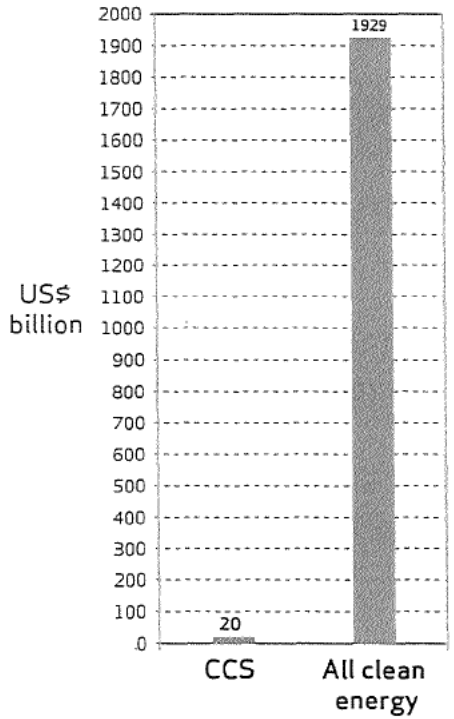
Why CCS has been slow to progress

Clean energy investment* between 2004 – 2013 (billion US$)

CCS:
$20
billion

All clean energy:
$1929
billion



1%

*includes technology development, projects, M&A
Source: IEA

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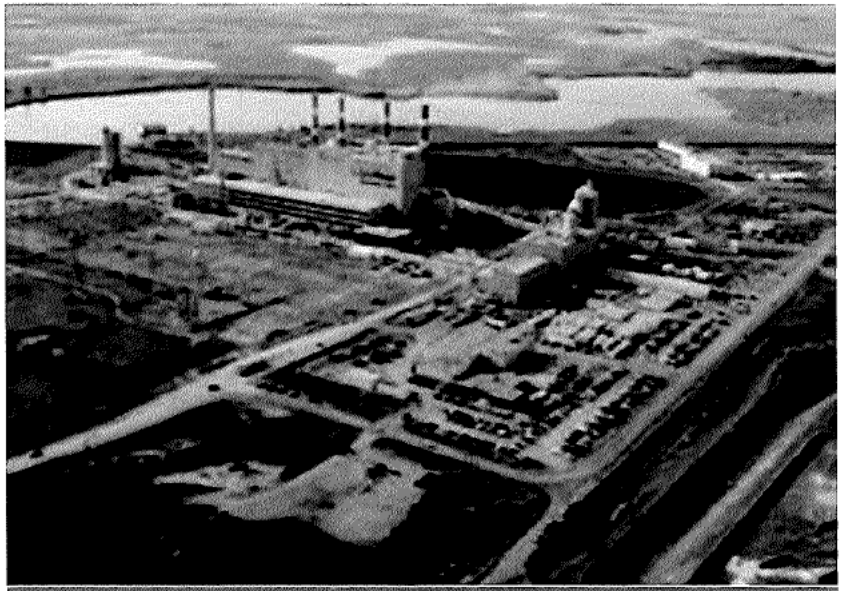
CCS is real, and happening now

- The world's first application of CCS at large scale in the power sector became operational in October 2014, at the Boundary Dam power station in Canada (1 Mtpa CO_2 capture)
- An upgrade of a 1960's coal unit chosen by Saskpower over gas and renewables
- Two more large scale applications of CCS in power will come on line in 2016 in the US
    - Kemper County Energy Facility (3 Mtpa, Mississippi)
    - Petra Nova Carbon Capture Project (1.4 Mtpa, Texas)
- Large-scale application of CCS will become a reality in iron and steel in 2016 at the Abu Dhabi CCS Project (0.8 Mtpa)
- A further 14 projects are in advanced planning (FEED)



- Boundary Dam, Saskatchewan, Canada
- Coal-fired 110MW CCS 1Mtpa plant operational October 2014
- $1.4Bn Government and Saskatchewan Power Co partnership

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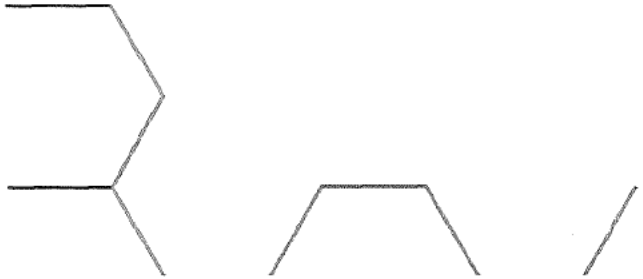
In summary – the WCA view

- We must recognise that coal is an important driver of affordable, reliable energy to support economic development and competitiveness
- Coal plays a major role in industrialising and urbanising economies
- In any scenario coal is still going to play a major role in the world's energy mix – especially across Asia
- We can significantly reduce emissions from coal with commercially available technology today – we should encourage and support deployment of HELE technologies in preference of less efficient technologies
- More public support is needed to facilitate increased commercial demonstration of CCS to drive costs down so that we can begin a transition toward near-zero emission fossil fuels



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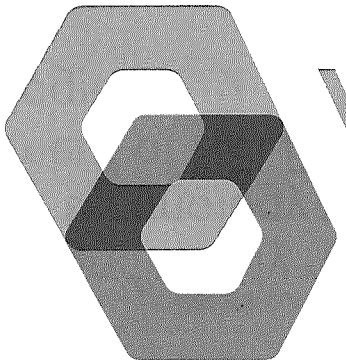
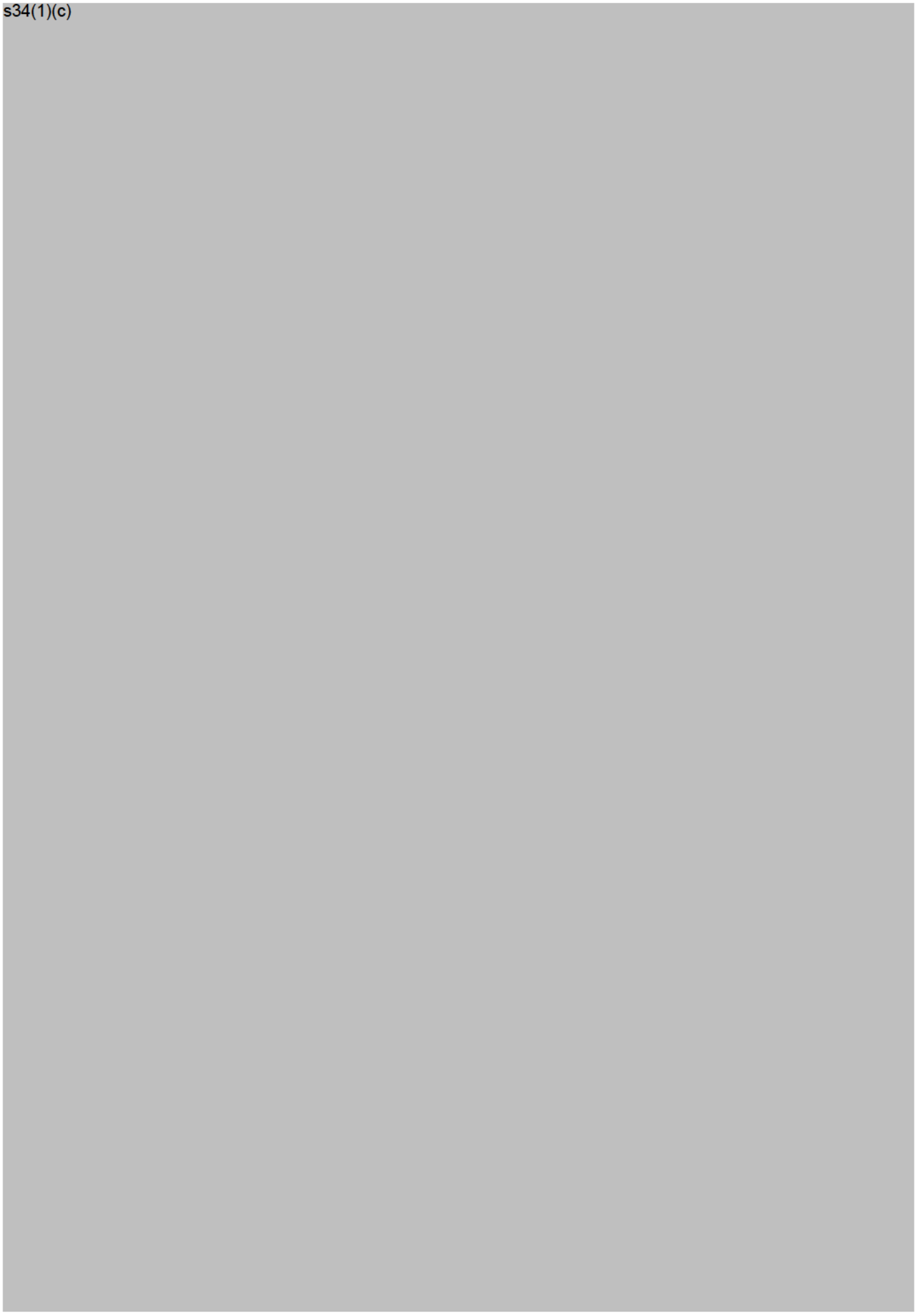


WORLD COAL ASSOCIATION

www.worldcoal.org

info@worldcoal.org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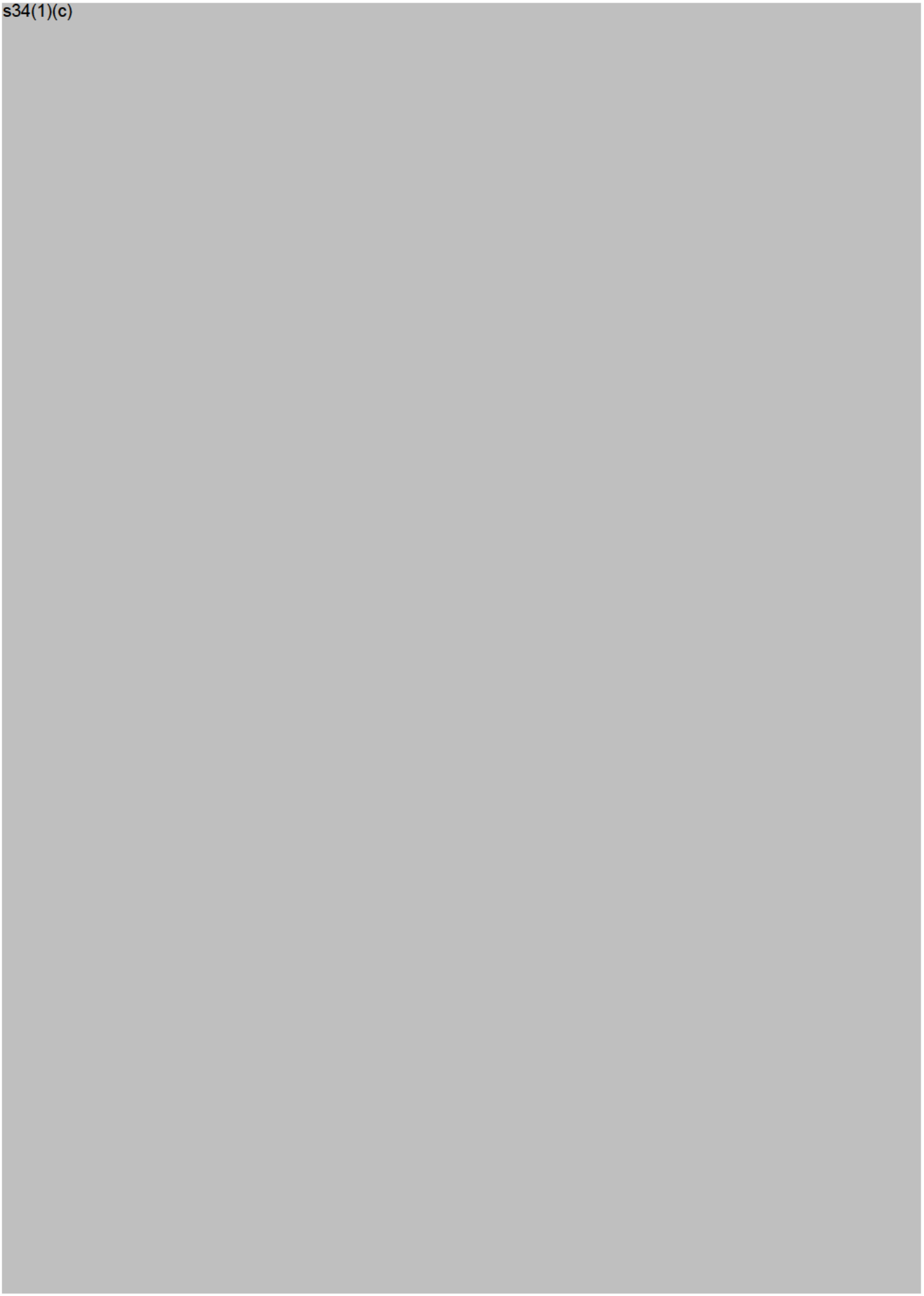
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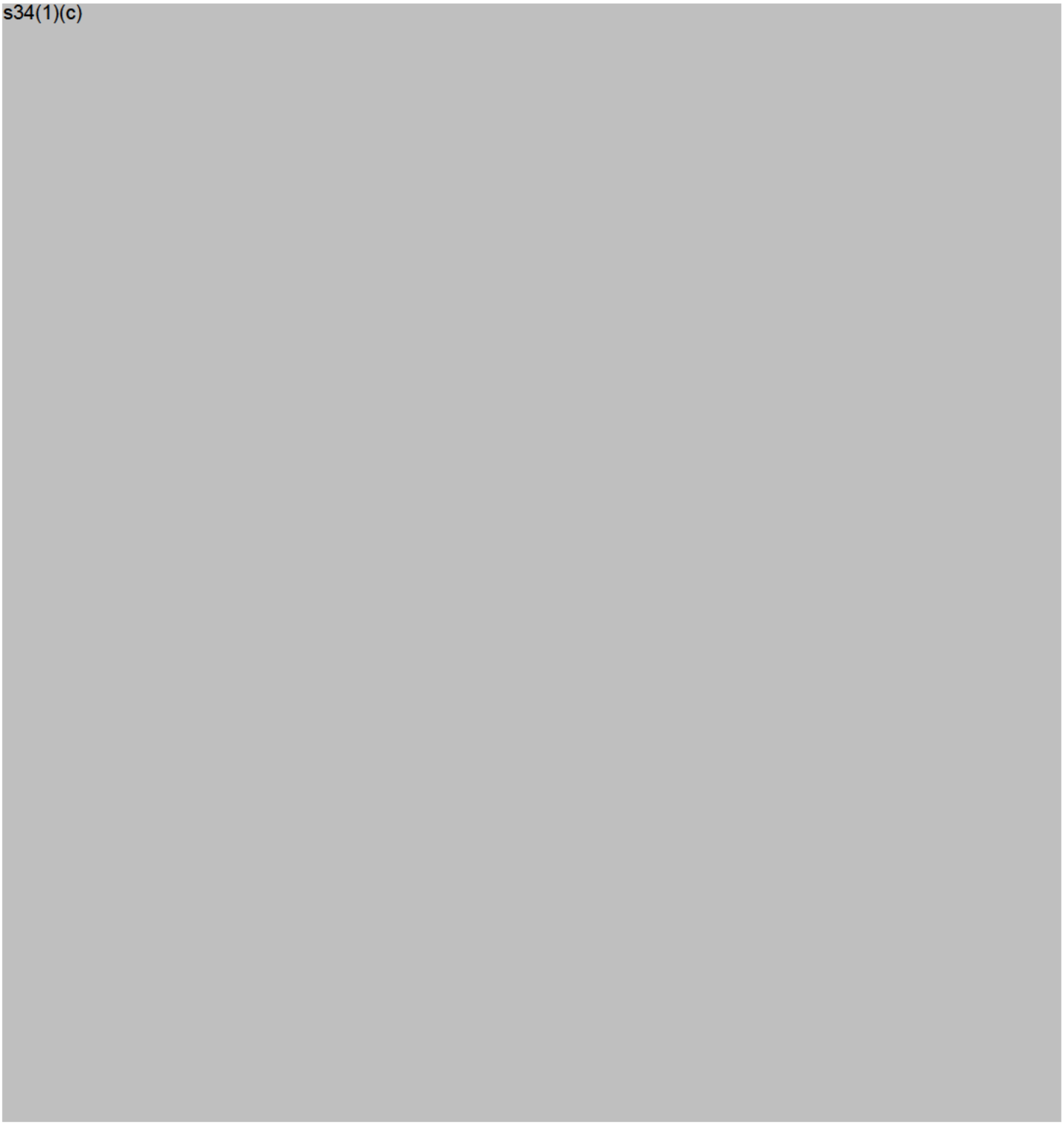
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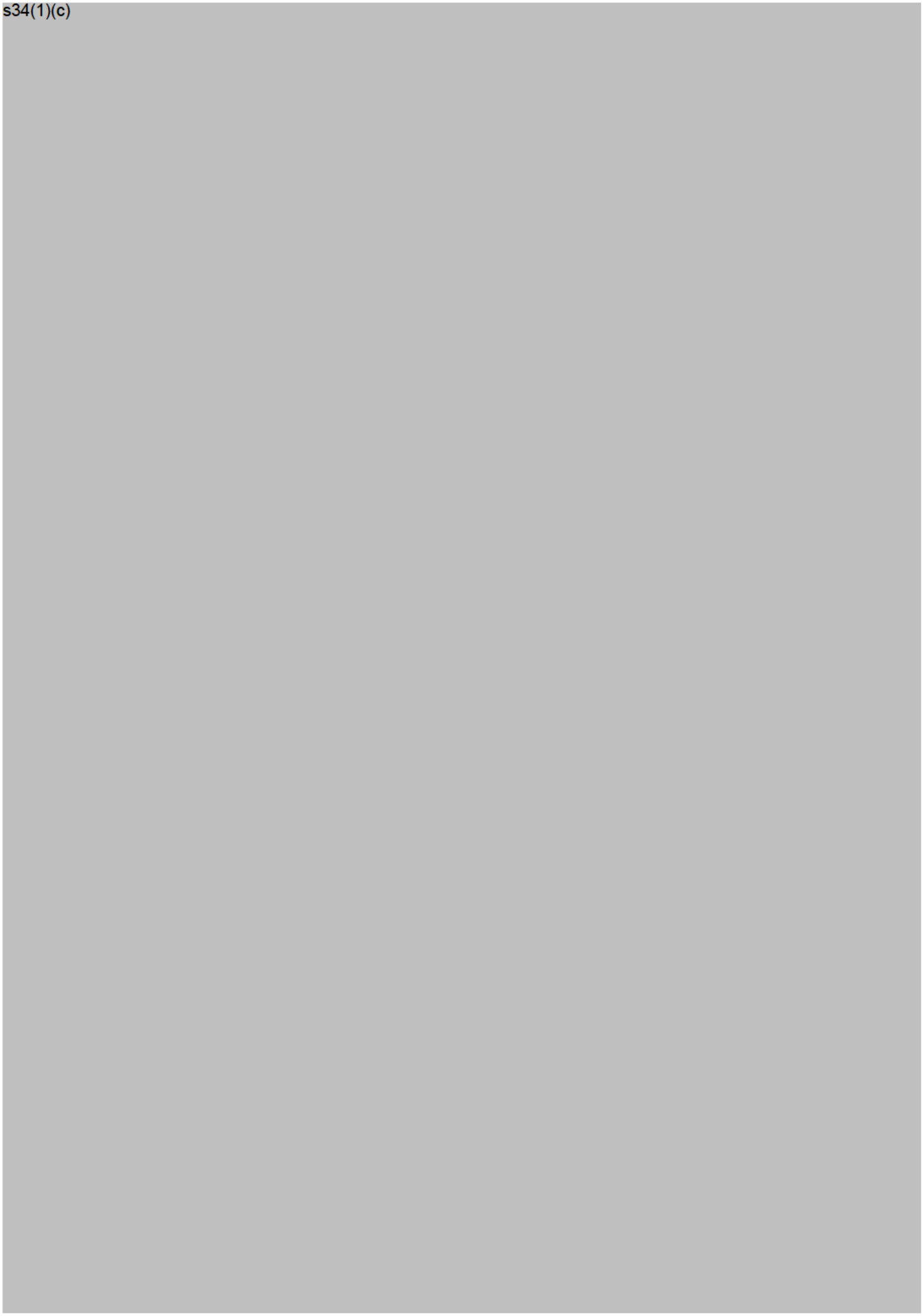
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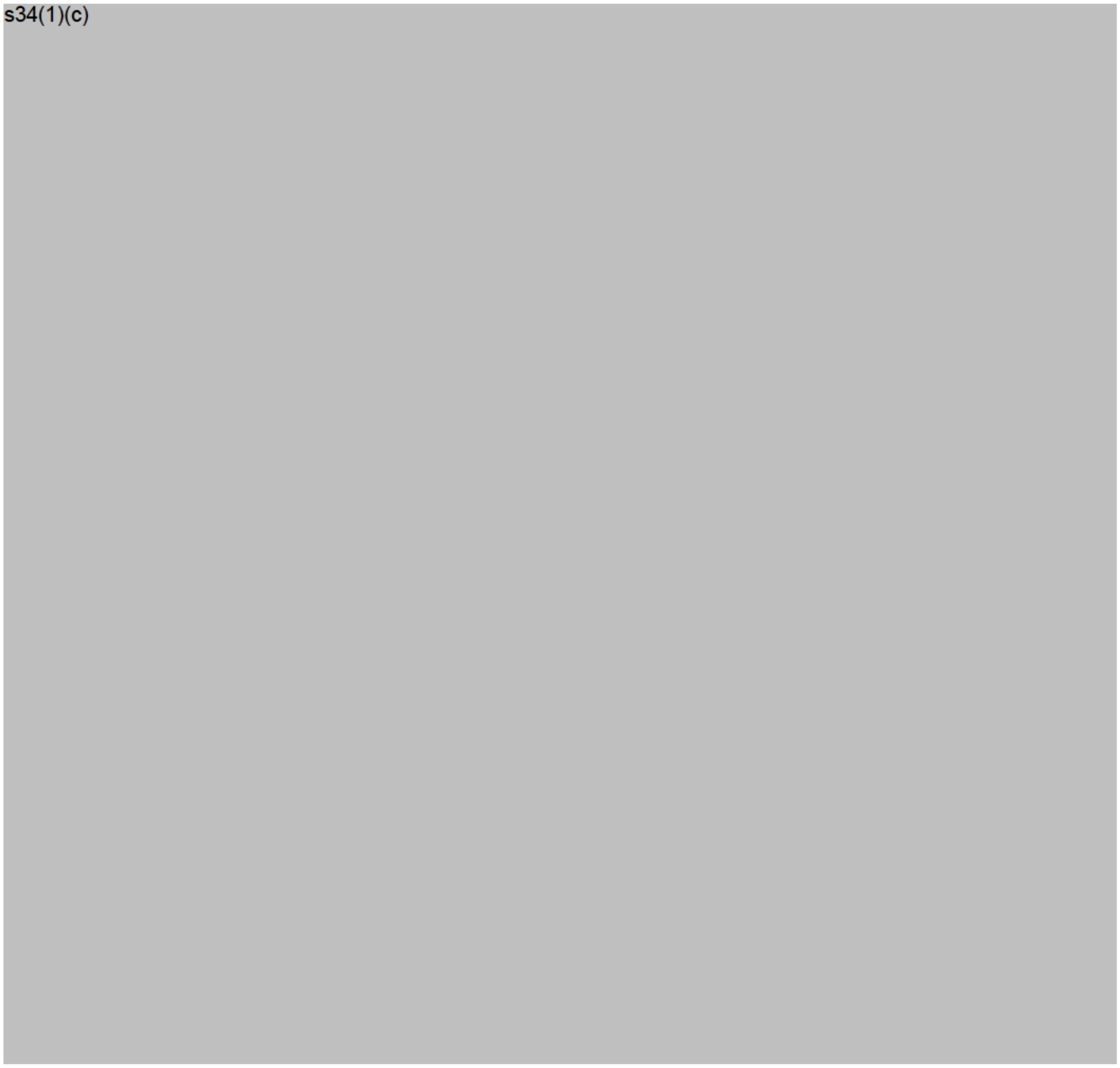
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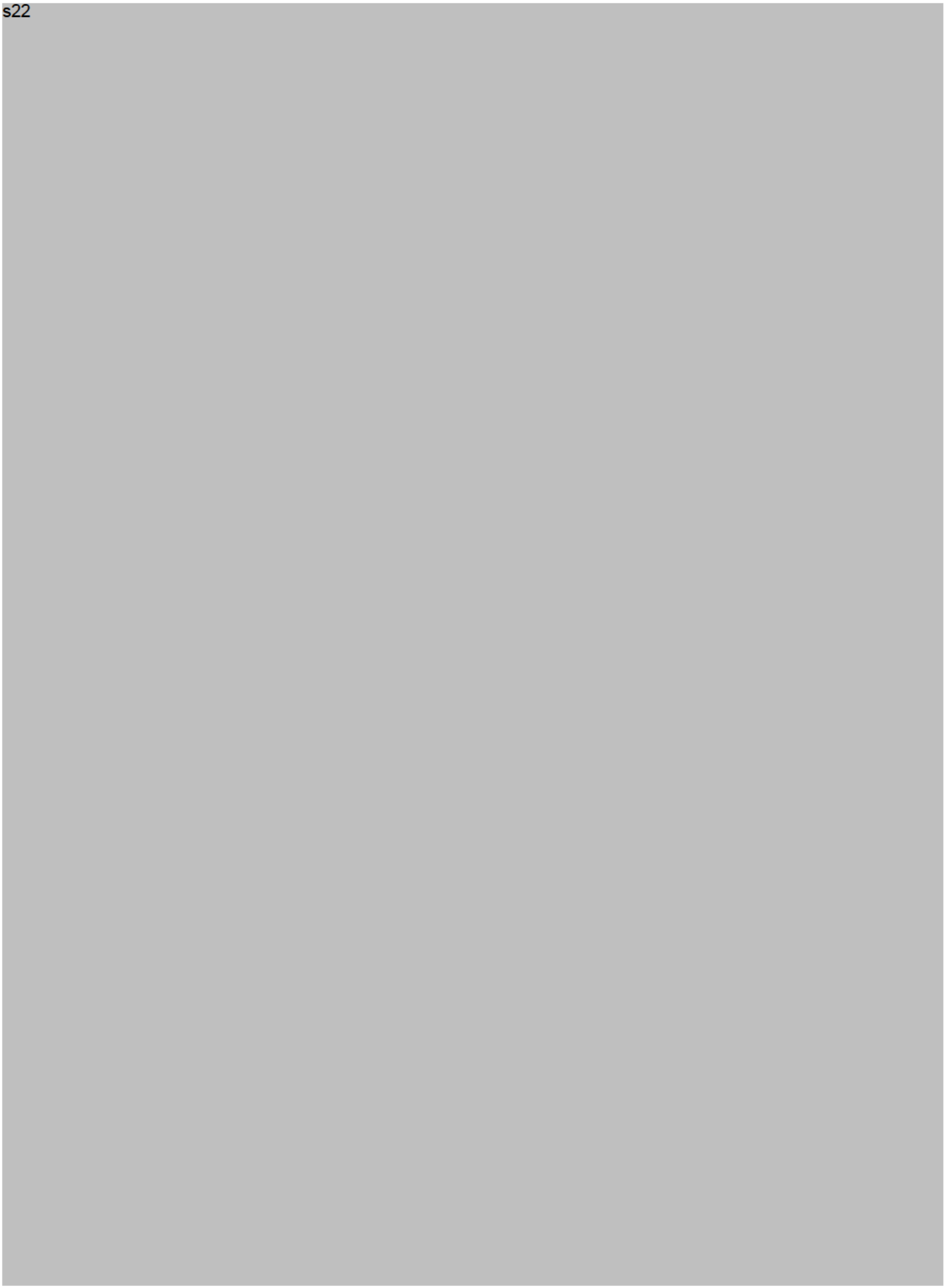
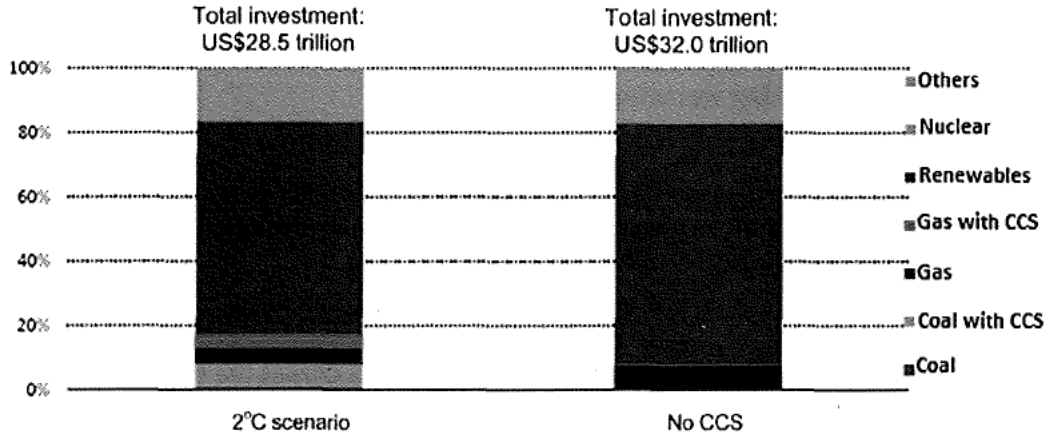
Carbon Capture Use and Storage

s22



Coal-fired power currently comprises 41 per cent of global electricity generation and contributes 30 per cent of the world's energy-related CO2 emissions. While coal will continue to have a place in meeting energy access challenges in Asia, the proportion of the world's electricity that will be produced by coal-fired power plants is set to decline in the coming decades. The IEA projects the coal-fired power share of global generation to fall to 28 per cent in 2040 under existing emissions reduction policies. To meet the 2°C warming commitment, coal shrinks to only 7 per cent of the generation mix by 2040, but 70 per cent of emissions from those coal-fired plants will need to be captured and stored. This coal-fired power generation would mostly be in China and the United States.

Figure 2: Electricity generation mix in 2040 to meet a 2°C target (with and without CCUS)[1]



Under the IEA's scenarios, without CCUS (right hand bar in Fig 1), coal would be entirely eliminated from the electricity generation mix by mid-century, with increased overall cost of the transition.

Shell and Bloomberg's projections are broadly consistent with the IEA, with coal's share of a plausible energy mix in a net-zero emissions world falling to 9 per cent and 8 per cent respectively. Emissions from that coal-fired electricity generation would be largely captured and stored or used.

s22

Global action

s22

Boundary Dam in Canada was the world's first demonstration of commercial-scale CCUS at a coal-fired power plant,

[1] Source: International Energy Agency *'20 Years of Carbon Capture and Storage: Accelerating Future Deployment'*, 2016

and it has attracted a lot of international interest since it opened in 2014. s22

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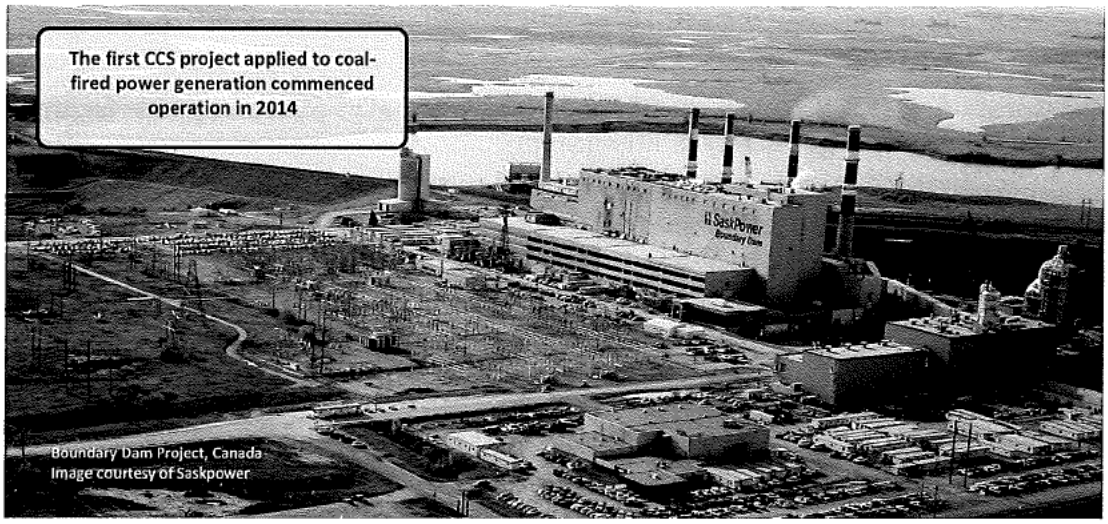

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Australian domestic CCUS initiatives

- s22
- s22
- CSIRO´s Low Emission Coal Technology R&D program
- s22
- The black coal industry's *COAL21* Fund (has committed over $300 million to R&D projects)
- Australian National Low Emissions Coal R&D fund
- Australia-China Joint Coordination Group on Clean Coal Technology

s22

Prospects for CCUS in Australia

Looking forward, Climate Change Authority modelling suggests that CCUS for coal is unlikely to be used to meet our emission reduction targets based on what we know today. However, under some scenarios CCUS-equipped gas-fired power generation is viable after 2030. Coal-fired power plant CCUS was available in the model but was not deployed in any scenario, due to its anticipated high cost.

s22

s22 [redacted]

Conclusion: the challenge ahead

Roughly 6 billion tons of coal are used globally each year, producing 18 billion tons of CO_2. s22 [redacted]

s22 [redacted]

s22 [redacted]

PDR: MB16-001414

DEPARTMENT OF THE PRIME MINISTER AND CABINET

PM&C
Secretary
Dr Gruen
Dr Kennedy
Mr McKinnon
Mr Yeaman
Ms Yu
Mr Duggan
Ms Pearce
Ms Jones

PMO
Mr Clarke
s22
Mr Moriarty
s22

CABINET
SECRETARY

To: Prime Minister

MEETING BRIEF - MR GAUTAM ADANI, CHAIRMAN AND FOUNDER OF THE ADANI GROUP

Purpose: s47C	**Timing and Venue:** s22

Section 47C

s22

s47C

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s22

Section 47C

Section 47C

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Section 47C

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Section 47C

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Section 47C

Kelly Pearce
Assistant Secretary
Environment, Energy and Climate Change
December 2016

Contact Officer: Section 22
Section 22

Consultation: Int Div, Eco Div, DIIS, DoEE, Office of Northern Australia.

NOTED:

Date:

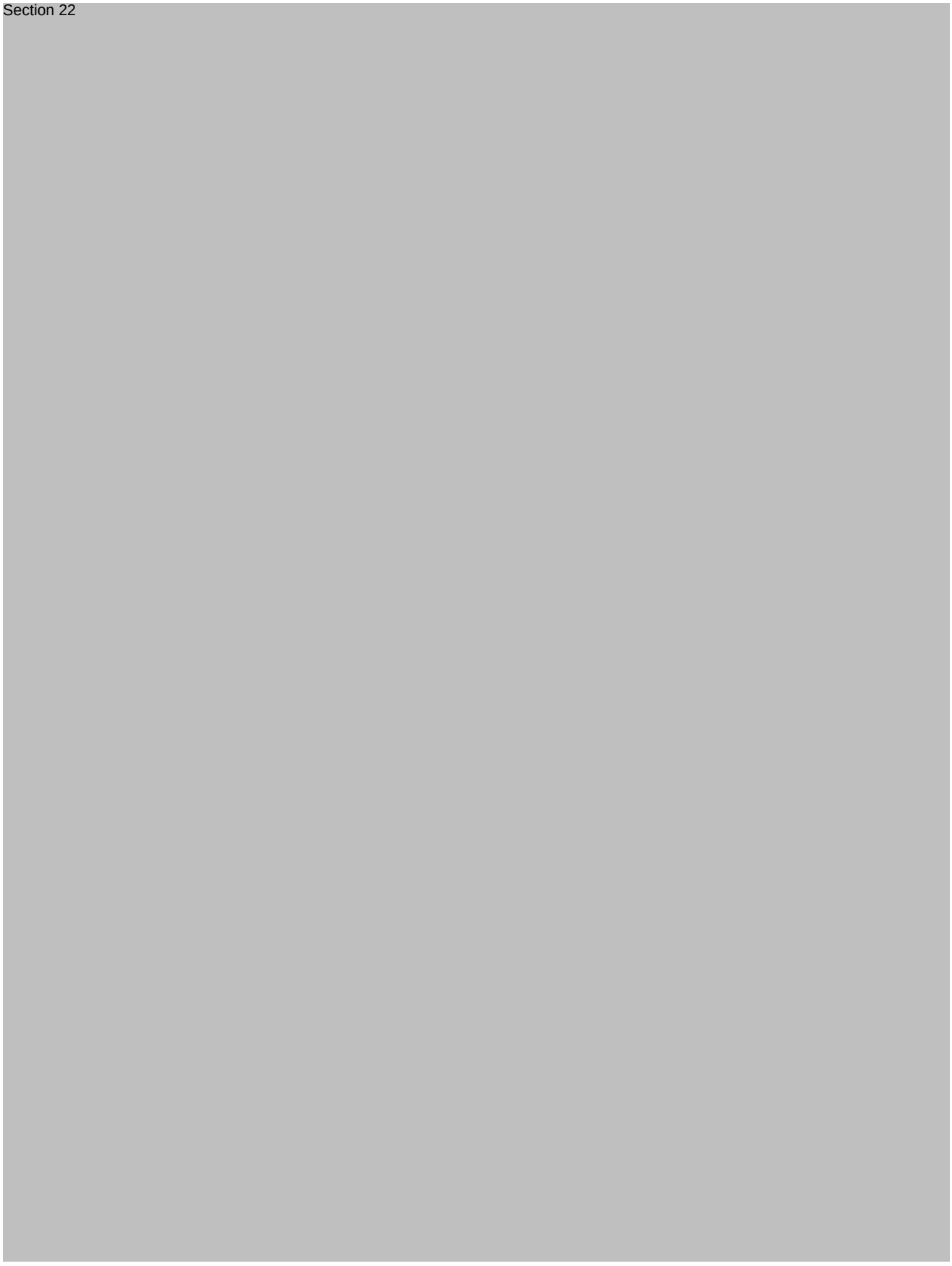
ATTACHMENT A

s22

ATTACHMENT B

TALKING POINTS

Section 22



ATTACHMENT C

BACKGROUND

s22

- **India's growing energy needs**: India will need to rely on all forms of energy, including coal. 300 million Indians currently do not have access to electricity.
  - India is making significant investments in high efficiency low emission (HELE) coal fired power plants, which can potentially reduce carbon emissions from electricity generation by up to 40 per cent.
  - HELE plants require high quality coal to operate most efficiently. As Australia has some of the highest quality coal and India's coal is generally of poor quality, there are excellent opportunities for closer cooperation.

s22

Exempt in full s34(3)