



# NDC sektor energi dalam RPJMN 2020- 2024

Deon Arinaldo  
Researcher  
Institute for Essential Services Reform (IESR)

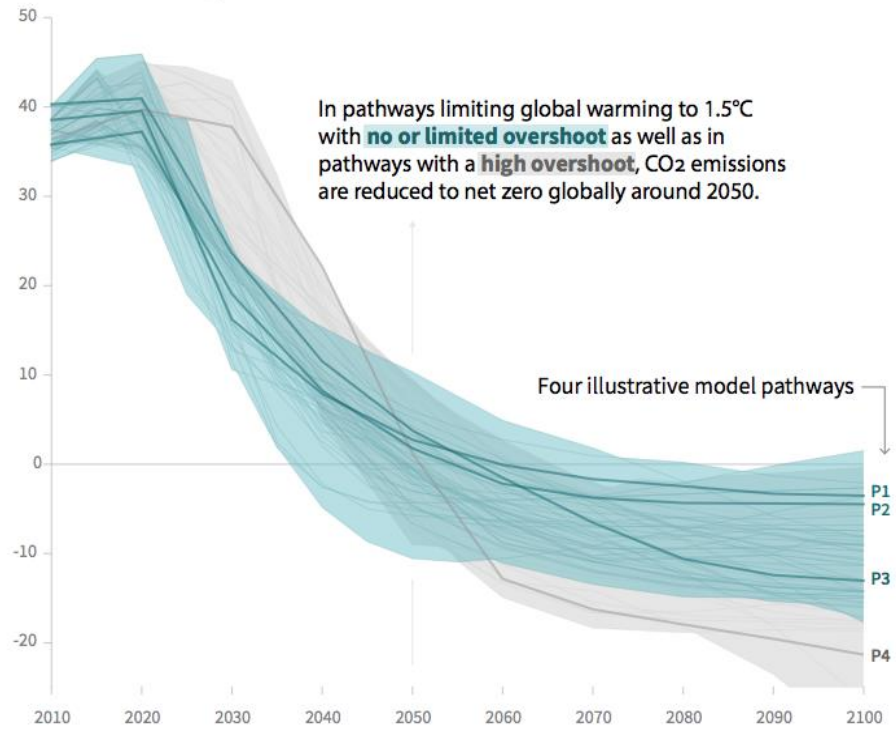
Jakarta, 17 October 2019

# Meeting Paris Agreement requires sharp decline in global emission



## Global total net CO<sub>2</sub> emissions

Billion tonnes of CO<sub>2</sub>/yr



In pathways limiting global warming to 1.5°C with **no or limited overshoot** as well as in pathways with a **high overshoot**, CO<sub>2</sub> emissions are reduced to net zero globally around 2050.

Four illustrative model pathways

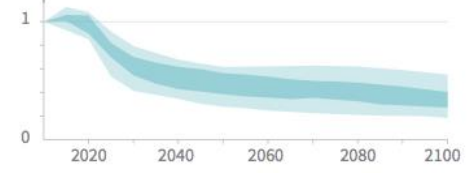
**Timing of net zero CO<sub>2</sub>**  
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios



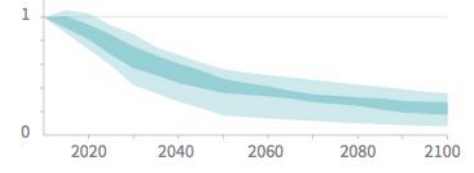
## Non-CO<sub>2</sub> emissions relative to 2010

Emissions of non-CO<sub>2</sub> forcers are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

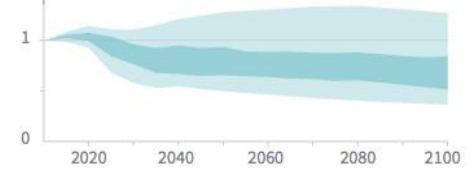
### Methane emissions



### Black carbon emissions

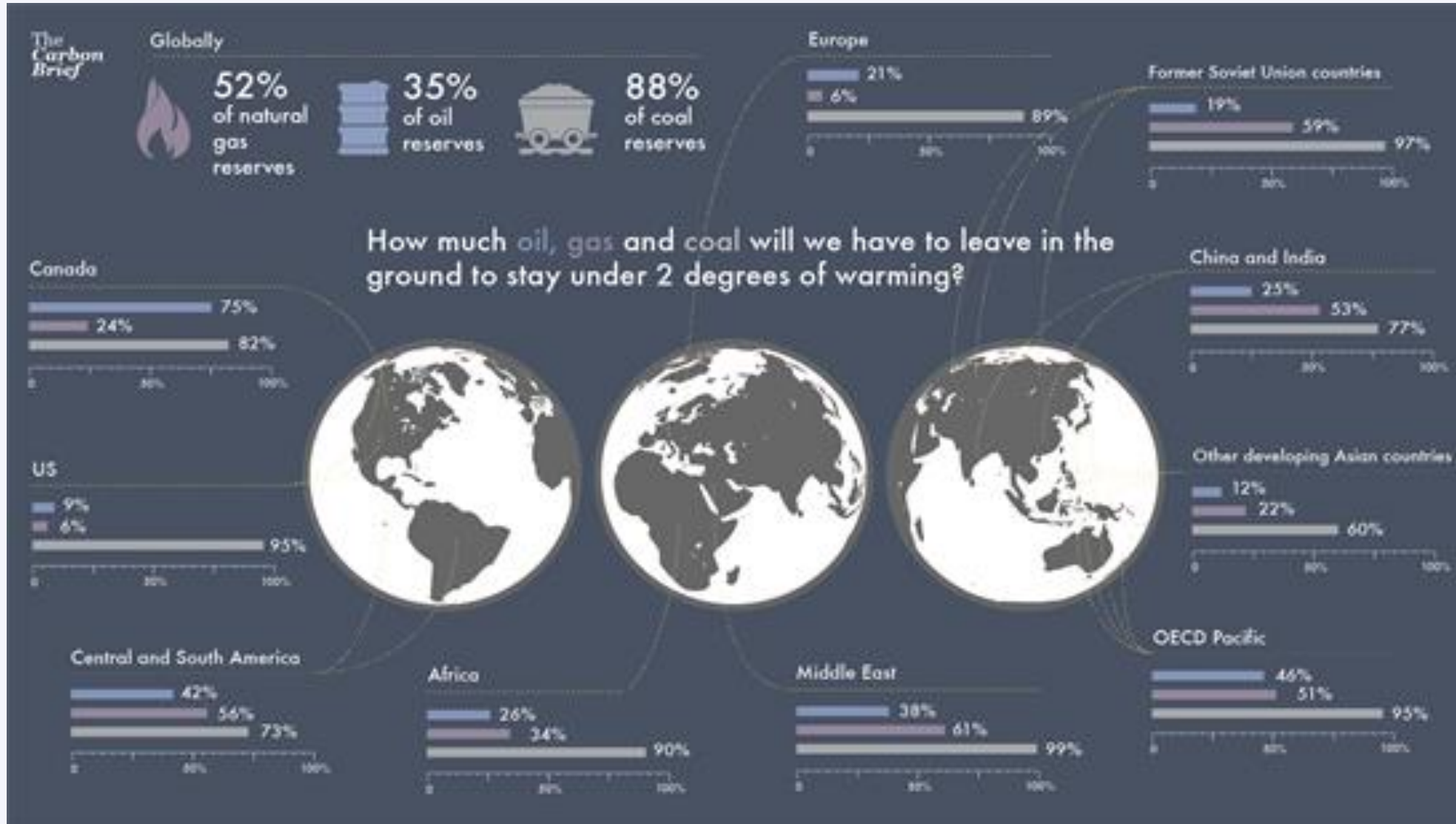


### Nitrous oxide emissions



- To meet Paris Agreement global emission must peak very soon (before 2030), and start to decline rapidly till 2050.
- To reach 2°C target, emission must be reduced by 20% at 2030, and for 1.5°C target, required 45% cut.
- There is a different peaking time for developing and developed countries, but research suggested that emission of developed countries must decline before 2030.
- Electricity generation contributes 42% of total global CO<sub>2</sub>.

# What does 2°C means for our energy sources?





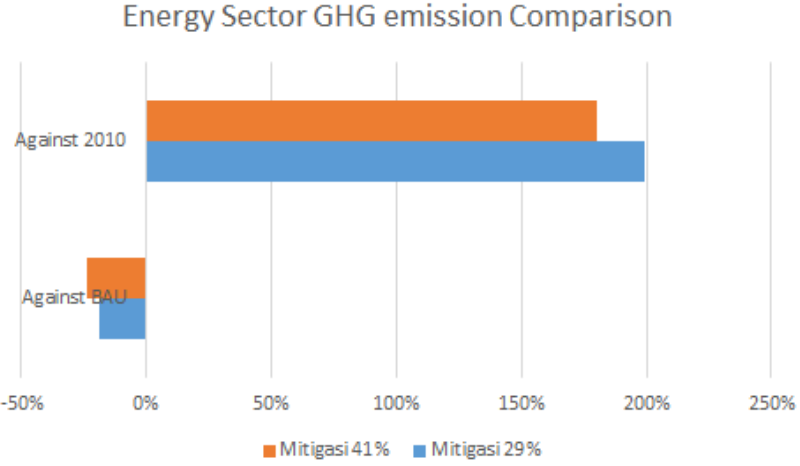
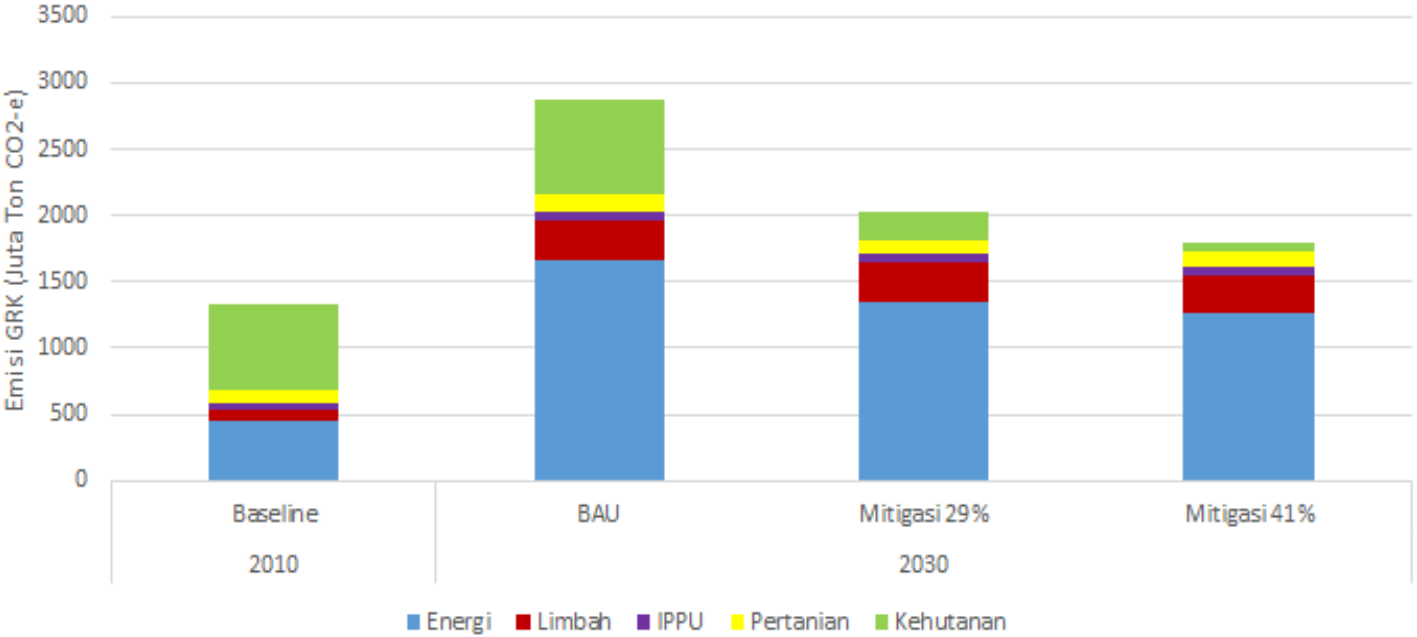


# Indonesia Commitment toward Paris Agreement

- NDC Indonesia
- NDC Evaluation
- Energy Sector Contribution



# NDC Indonesia



Source: NDC Indonesia

- Indonesian NDC targeted a GHG emission reduction against BAU scenario. As a developing country, under BAU scenario, GHG emission has grown to more than double the 2010 emission
- Aside from LULUCF, Energy sector plays a key role in NDC achievement.
- Energy sector is the largest contributor to GHG emission in 2030. Under current NDC, although energy sector has reduced its emission by 19% and 24% against BAU, it is still a threefold increase against 2010 GHG emission level.

# NDC assumption in energy sector



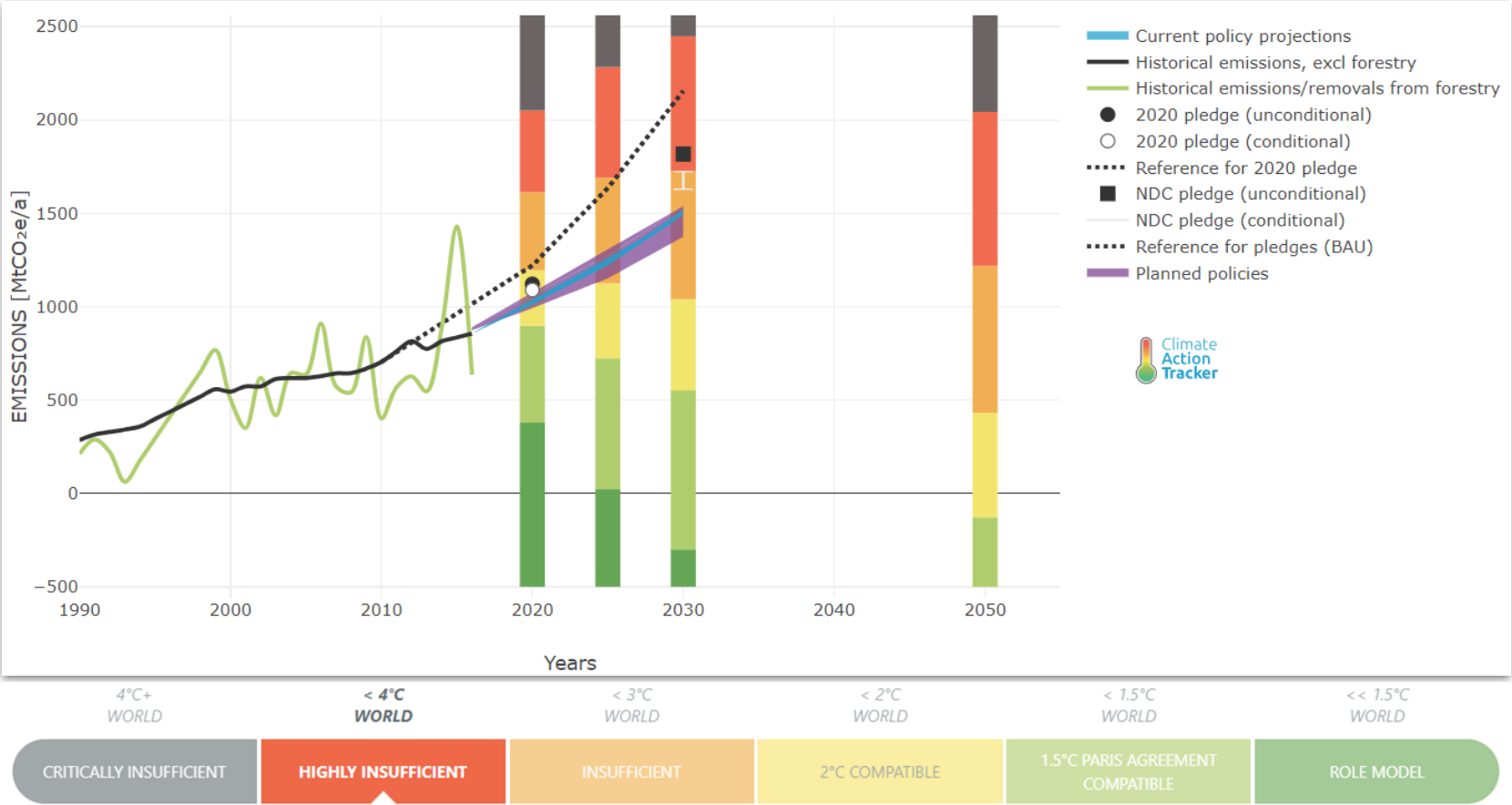
SEKTOR: ENERGI			
	BAU	Skenario Mitigasi 1 (CM 1)	Skenario Mitigasi 2 (CM 2)
1. Efisiensi konsumsi energi final	Konsumsi energi final tidak efisien		
2. Penerapan teknologi CCT ( <i>clean coal technology</i> ) di pembangkit listrik	0%	75%	100%
3. Penggunaan energi baru terbarukan pada pembangkit listrik	Pembangkit Listrik menggunakan batubara	19.6% ( <i>Committed 7,4 GW</i> berdasarkan RUPTL)*	Produksi Listrik 132,74 TWh*
4. Penggunaan bahan bakar nabati-BBN ( <i>Mandatory B30</i> ) di sektor transportasi	0%	90%	100%
5. Penambahan jaringan gas (Jargas)	0%	100%	100%
6. Penambahan Stasiun pengisian Bahan Bakar Gas (SPBG)	0%	100%	100%

\* 132,74 TWh adalah setara dengan 21,65 GW

Source:Strategi NDC Indonesia 2017



# Indonesia NDC Assessment

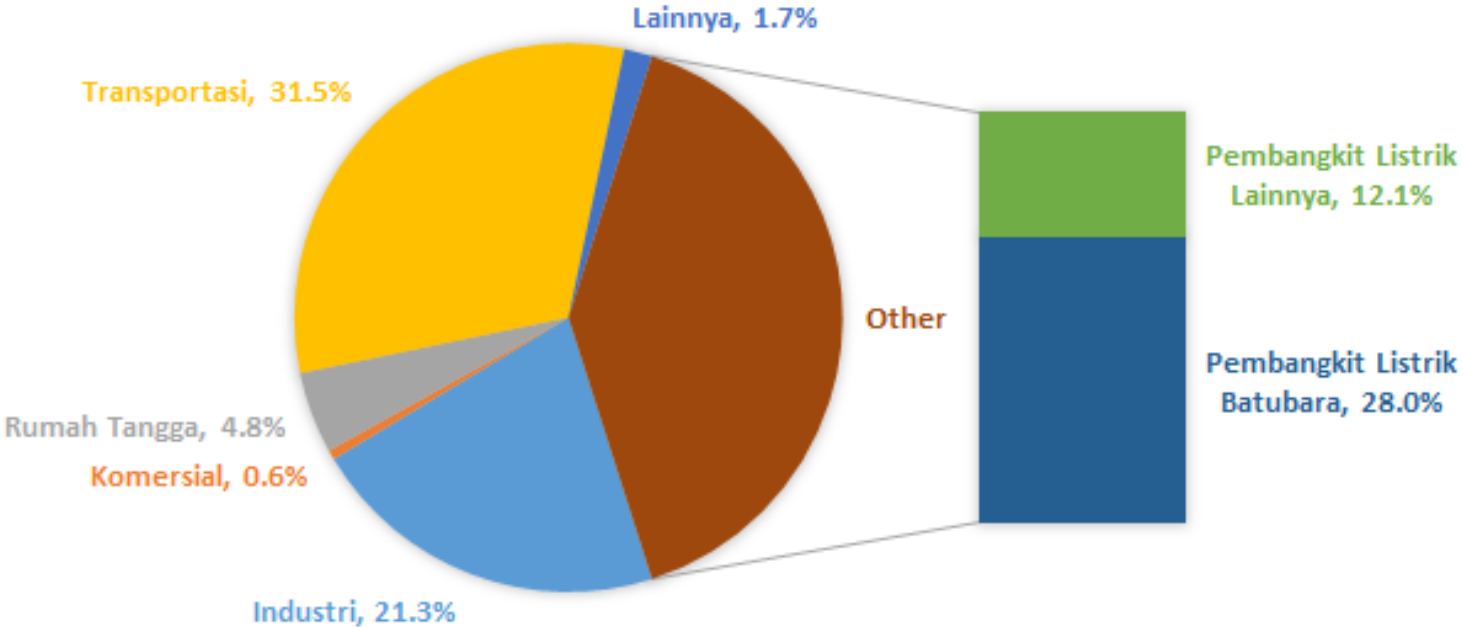


- Climate Action Tracker (CAT), an independent climate analytic organisations, categorized Indonesia NDC unconditional target as highly insufficient and the conditional target as insufficient.
- Indonesia will need to do more from current NDC target in order to fulfill its commitment on limiting global warming below 2<sup>o</sup> C, evenmore for 1.5<sup>o</sup> C.

Source: Climate Action Tracker



# Energy Sector GHG emission



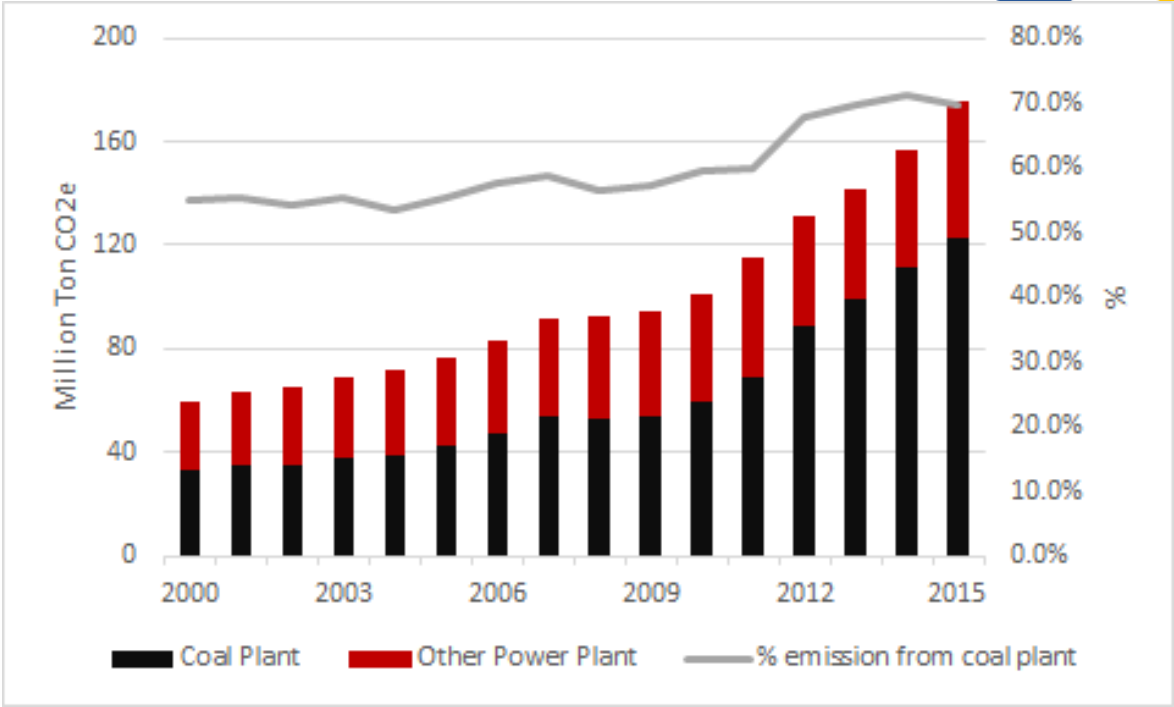
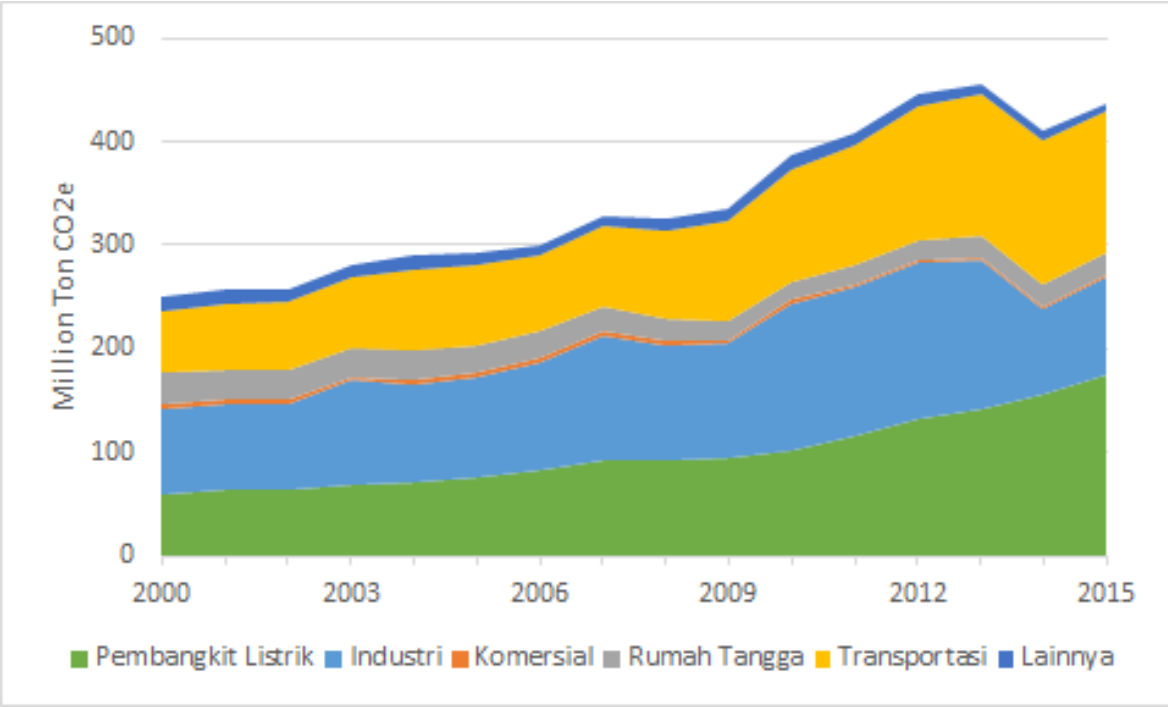
- In 2015, power sector shares the highest GHG emission (~40%), much higher than transport (31.5%)
- Coal power plant contributed ~70% of emission from power sector
- Under current RUPTL 2019-2028, coal plant fleet will be doubled in the next decade (additional 27 GW on top of currently operational ~28 GW) , locking up the power sector as one of the main source of GHG emission

Source: Inventori GRK ESDM





# Power Sector Emission

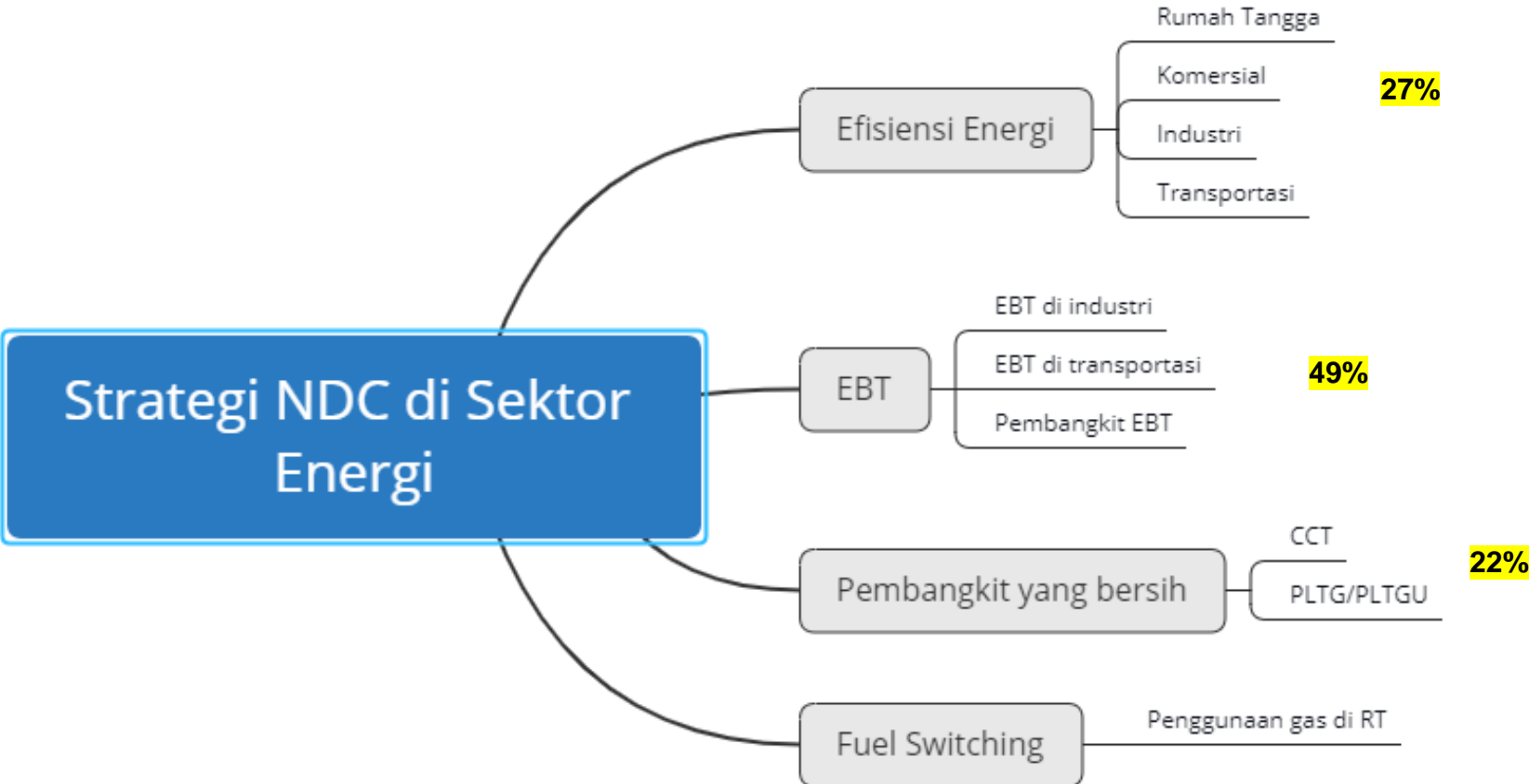


- Historically, power sector emission dominate the energy sector total emission. Coal plant contribution in power sector emission is increasing over the years
- Government need to increase ambition on climate change. Accelerating mitigation action in power sector, especially toward coal, is inevitable

Source: Inventori GRK ESDM



# NDC Mitigation action in Energy Sector



Source: KLHK

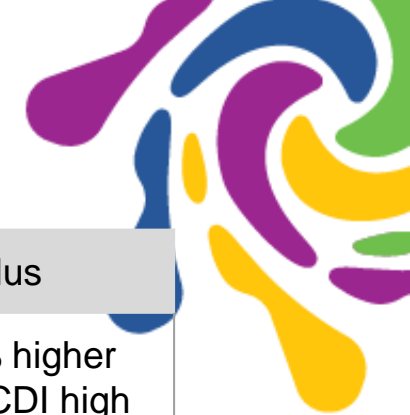
An aerial photograph showing a large concrete dam with multiple spillways. The river flows from the top left, through a dense green forest, and then curves to the right, passing the dam. The water is a vibrant turquoise color. In the foreground, the calm water of a reservoir is visible. A blue semi-transparent box is overlaid on the left side of the image, containing text.

# RPJMN 2020-2024

- Energy Sector Target and Indicator in RPJMN
- NDC & RPJMN 2020-2024



# Low Carbon Development Indonesia



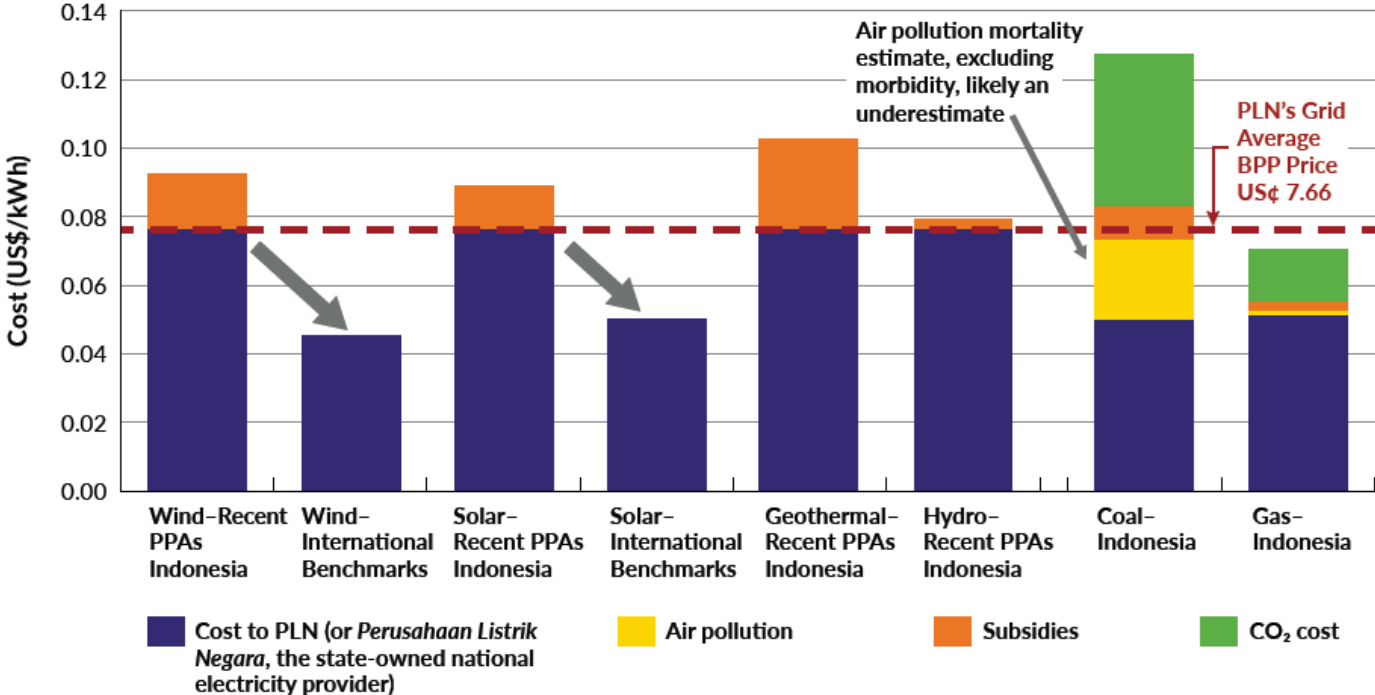
Category	Base Case	LCDI Moderate	LCDI high	LCDI Plus
Economic Growth	5% to 2024 4.3% by 2045		5.6% to 2024 6% through 2045	0.25% higher than LCDI high (2019-2045)
GHG Emission	2.88 GtCO <sub>2</sub> e by 2030	1.77 GtCO <sub>2</sub> e or 29% less GHG emission by 2030	1.47 GtCO <sub>2</sub> e or 43% less emission by 2030	75% reduction from base case by 2045
Required investment	Historical Trend	14.8 billion USD (2020- 2024) 40.9 billion USD (2025- 2045)	22 billion USD (2020- 2024) 70.3 billion USD (2025- 2045)	
Renewable Energy			23% by 2025 30% by 2030	RE in energy mix 60% by 2045, and 70% by 2050
Energy Efficiency		Energy consumption per capita reduction 2.75% by 2030 3.5% by 2045 against 2018 level	Energy consumption per capita reduction 3.5% by 2030 4.5% by 2045 against 2018 level	Double the LCDI high reduction





# Renewable energy should be the future of Indonesian energy system

Cost Comparison for Electricity Production Sources in Indonesia, 2018



“ It is clear, therefore, that it is perceptions—and not the renewable energy technologies or costs—that must catch up to Indonesia’s energy reality” LCDI report - Bappenas

# Energy Sector in RPJMN 2020-2024



Agenda	Sasaran	Indikator	Status 2017	Target 2020	Target 2024
1. Memperkuat ketahanan ekonomi untuk pertumbuhan yang berkualitas	Pemenuhan kebutuhan energi dengan mengutamakan peningkatan energi baru terbarukan (EBT)	<ul style="list-style-type: none"> <li>A. Porsi EBT dalam bauran energi nasional</li> <li>B. Intensitas energi primer</li> <li>C. Intensitas energi final</li> <li>D. Kapasitas terpasang EBT</li> <li>E. DMO batubara</li> </ul>	<p>6.24%</p> <p>434 SBM/Rp. miliar</p> <p>7.32 GW (Ongrid)</p> <p>21%</p>	<p>13.4%</p> <p>421 SBM/Rp. miliar</p> <p>225 SBM/Rp. miliar</p> <p>14.5 GW</p> <p>44.9%</p>	<p>20%</p> <p>404 SBM/Rp. miliar</p> <p>213 SBM/Rp. miliar</p> <p>37.3 GW</p> <p>50.8%</p>
5. Memperkuat Infrastruktur untuk mendukung pengembangan ekonomi dan pelayanan dasar	Meningkatnya pasokan energi ramah lingkungan untuk perkotaan	Jumlah tambahan pasokan listrik ramah lingkungan di perkotaan			
	Meningkatnya akses dan pasokan energi dan listrik yang bersih dan efisien	<ul style="list-style-type: none"> <li>A. Rasio elektrifikasi</li> <li>B. Konsumsi listrik per kapita</li> <li>C. Emisi CO2</li> <li>D. Intensitas energi final</li> </ul>	<p>A. 94.91%</p> <p>B. 1012 kWh/kapita</p>		<p>B. 1500 kWh/kapita</p>
6. Membangun LH, meningkatkan ketahanan bencana dan perubahan iklim	Meningkatnya keberhasilan mitigasi perubahan iklim melalui implementasi Pembangunan Rendah Karbon	<ul style="list-style-type: none"> <li>A. Penurunan emisi GRK</li> <li>B. Penurunan intensitas emisi GRK</li> </ul>			<p>27.3%</p> <p>24%</p>

# NDC Target and RPJMN 2020-2024



Item	NDC	RPJMN
GHG Emission Reduction	29% by 2030 (CM1) 41% by 2030 (CM2)	27.3% by 2024
Energy Efficiency	Targeted by sectors. Actions included: -SKEM -ESCO -Mass Transport	Primary Energy Intensity 404 TOE/bil IDR Final Energy Intensity 213 TOE/bil IDR
Renewable Energy	RE for electricity (21.65 GW) RE for transport & industry (90-100% B30)	20% energy mix by 2024 & 37.3 GW by 2024 -
Clean Power Plants (CCT/HELE)	75-100% implementation	Mentioned in policy directives but not listed in indicators
Fuel Switching	Jaringan gas 100% (?)	Jaringan gas kota (4 million)

A photograph of a power plant at dusk. The sky is a mix of blue and orange. Several tall smokestacks are visible, some with smoke rising from them. A large cooling tower is on the left. The plant's lights are on, and their reflection is visible in a body of water in the foreground. A semi-transparent blue box is overlaid on the left side of the image, containing the text.

# Mitigation Options in Power Sector



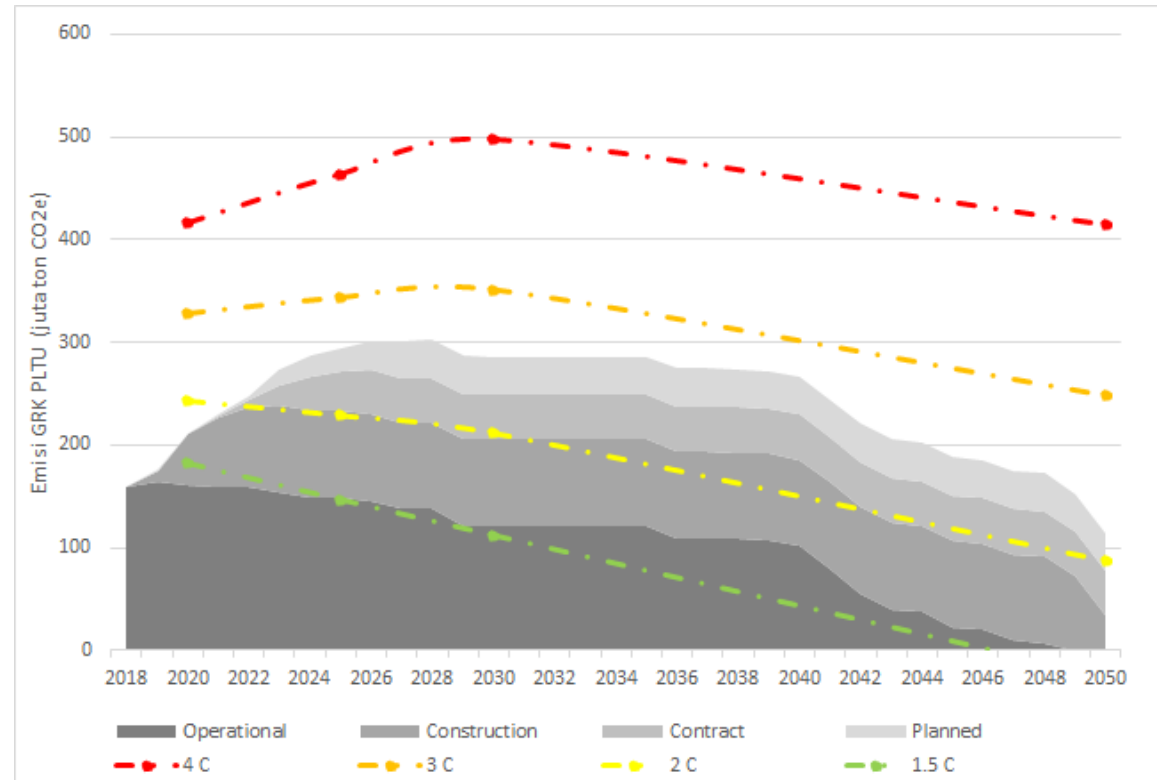
# Mitigation Options for Coal Power Plant



- **Advanced conversion technologies**
  - Advanced pulverized coal combustion (Supercritical, Ultra-Supercritical)
  - Integrated gasification combined cycle
  - Cogeneration
  - Co-firing with biomass
  
- **Switching to lower carbon fossil fuels and renewable energy**
  - Replacement with gas (~50% emission reduction)
  - Replacement with renewables (~99% emission reduction)
  
- **Power Station Rehabilitation**
  - Improving current efficiency
  - CCS (~90% emission reduction/capture but efficiency decrease up to 9. Therefore more emission to be decreased)

Source: Inventori GRK ESDM

# Mitigation Action Impact on Coal Plant Emission (1)

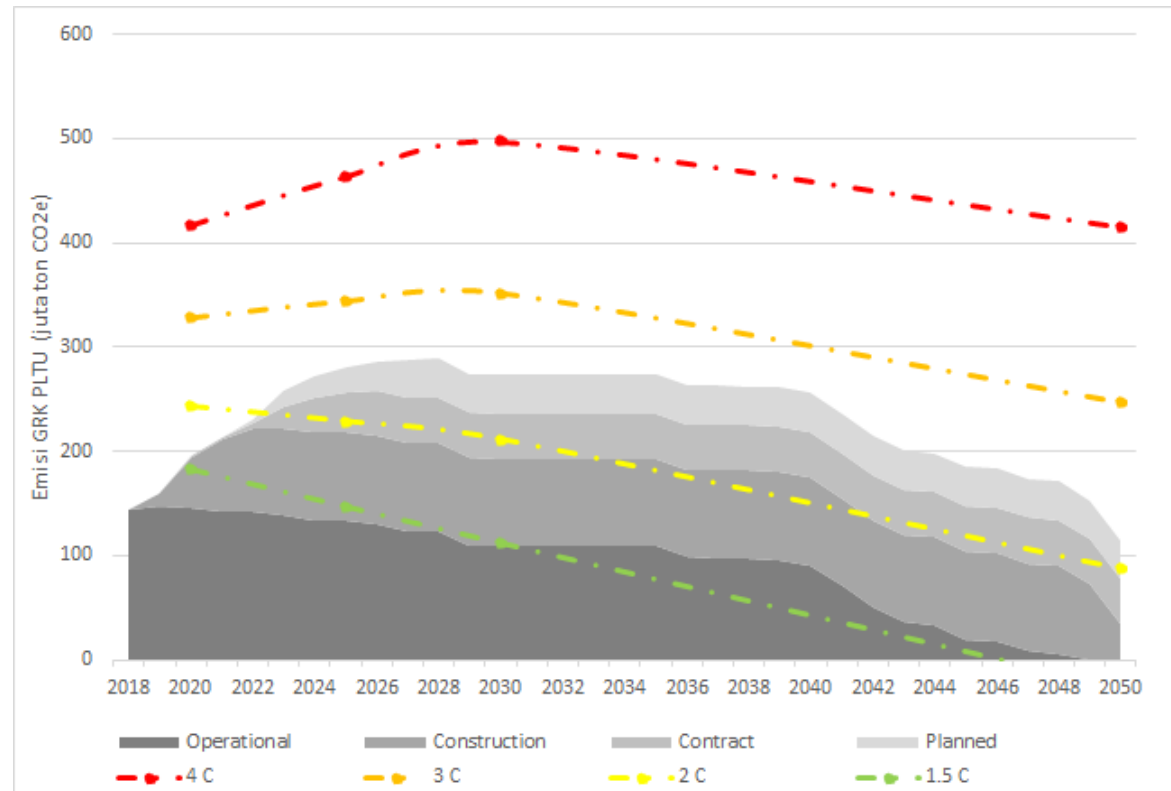


## # Capacity Retirement at 30 Years Life

- The total emission from coal plant falls into 3°C scenario
- Peak emission by 2028 with 303 million ton CO<sub>2</sub>e GHG emission and 49.9 GW installed capacity
- By 2050, GHG emission has only been reduced to 115 million ton CO<sub>2</sub>e

Source: IESR calculation

# Mitigation Action Impact on Coal Plant Emission (2)

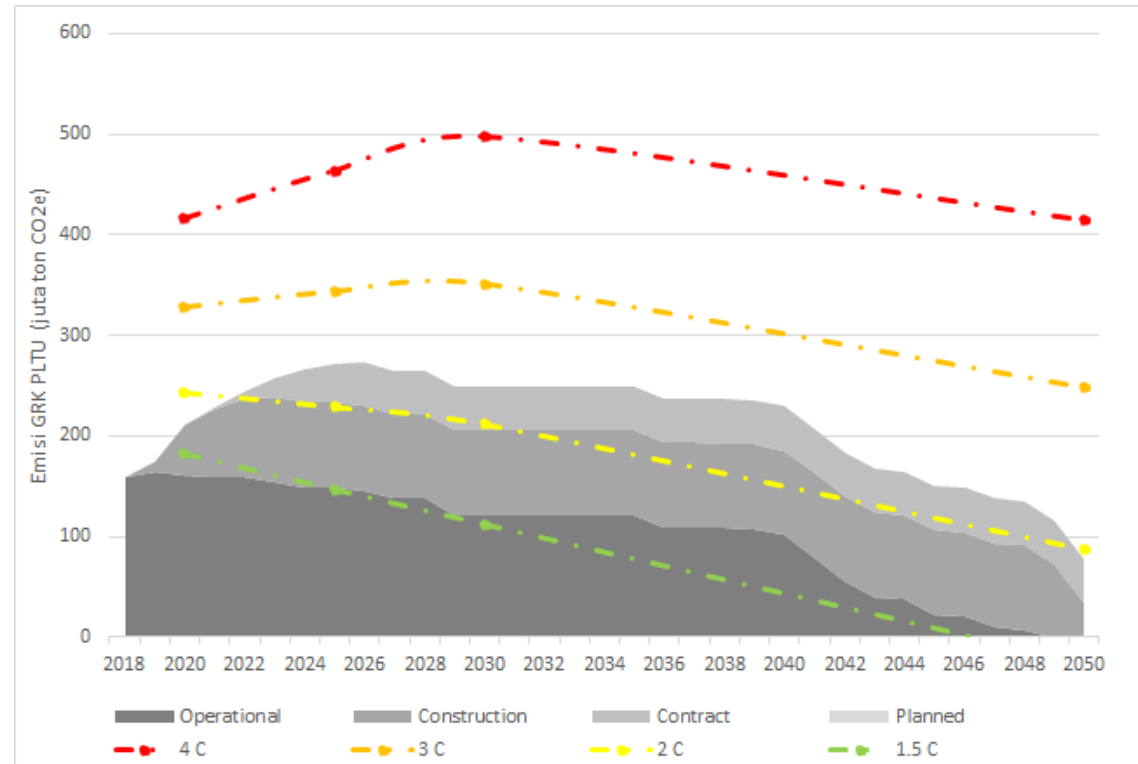


## # Capacity Retirement at 30 Years Life + Efficiency Improvement of Existing Plant

- The total emission from coal plant just falls a little below 3°C scenario
- Peak emission by 2028 with 289 million ton CO<sub>2</sub>e GHG emission and 49.9 GW installed capacity. Only a marginal decrease on emission can be gained from efficiency measures
- By 2050, GHG emission has only been reduced to 115 million ton CO<sub>2</sub>e

Source: IESR calculation

# Mitigation Action Impact on Coal Plant Emission (3)



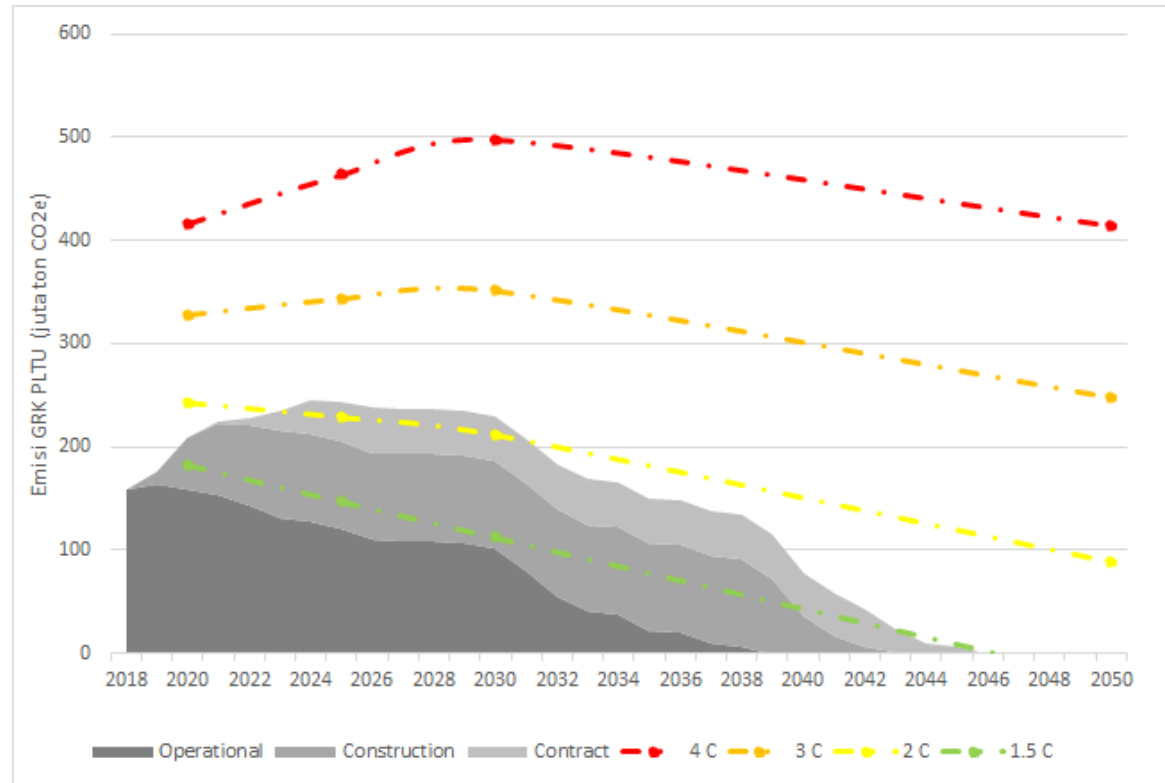
## # Capacity Retirement at 30 Years Life + No New Coal Plant by 2020 (Planned Coal Plants are cancelled)

- The total emission from coal plant just is moving toward 2°C scenario
- Peak emission by 2026 with 273 million ton CO<sub>2</sub>e GHG emission and 45.1 GW installed capacity. GHG emission reduction is from cancelled coal plant planned after 2020 (no PPA contract yet)
- By 2050, GHG emission has only been reduced to 78 million ton CO<sub>2</sub>e

Source: IESR calculation



# Mitigation Action Impact on Coal Plant Emission (4)



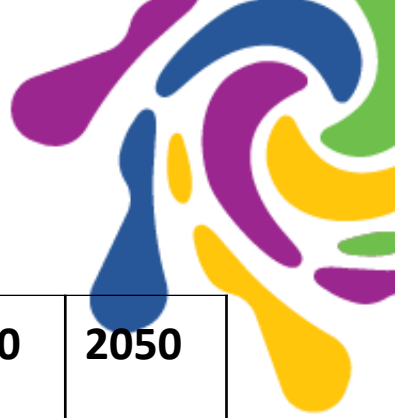
## # Capacity Retirement at 20 Years Life + No New Coal Plant by 2020 (Planned Coal Plants are cancelled)

- An overshoot of GHG emission happen before 2040. However, by 2048 all coal has been phased out. The total emission from coal plant is just moving toward 1.5°C scenario
- Peak emission by 2028 with 274 million ton CO<sub>2</sub>e GHG emission and 45 GW installed capacity.
- By 2048, GHG emission has become zero
- However there should be compensation for contracted IPP and PLN, who had to phase out the plant earlier than contract/planned



# Implication of Mitigation Action to Other Sectors

# Consequences of Climate Target on Coal Domestic Consumption



Kapasitas Terpasang PLTU (GW)	2020	2025	2030	2050
RUPTL	35.4	51.1	54.4	
Skenario 1	35.0	48.7	47.2	19.0
2 C	33.3	31.4	28.9	12.1
1.5 C	25.0	20.1	15.3	0

Konsumsi Batubara (Juta Ton)	2020	2025	2030	2050
RUPTL	109.0	126.0	153.0	
Skenario 1	107.2	149.3	144.9	58.1
2 C	102.1	96.1	88.9	36.9
1.5 C	76.7	61.7	47.1	0

- IPCC 2<sup>0</sup> C and 1.5<sup>0</sup> C target would require that there are less coal plant installed capacity in Indonesia. On both scenarios, no more coal plant would need to be built after 2020. The 1.5<sup>0</sup> C scenario would even need 2 GW less of coal plant installed capacity from current existing capacity by 2020 meaning, coal plant phase-out should happen this year
- Coal domestic consumption in power sector would peak around 153 million ton, but will reduced gradually after. In IPCC scenario, coal domestic consumption would only reach maximum of 100 ton (which is roughly equal to 2018 total coal domestic consumption from power sector and cement industry)

Source: IESR calculation



# Risks Related to Declining Coal Consumption



- Risk of Stranded Asset  
Carbon Tracker project 35 billion USD of potential stranded assets from power sector (coal plant). PLN would bear 16.1 billion USD of this risk. Depending on the government action, this risk for PLN would become burden for the government (APBN) or being pass-through to the people (Increase in TDL)
- Risk of negative growth, especially on coal province (East Kalimantan, South Kalimantan, South Sumatera and Central Kalimantan)  
Most of these provinces GDP relied on coal production, especially East Kalimantan and South Kalimantan. There are also risks of declining demand from international market as the major coal export destination of Indonesia is also undergoing a coal transition as well.
- Risk of early retirement/lay off for coal industry workers  
Less production means less workers needed. A potential lay off of thousands of coal mine workers would be a social burden for government

# In Summary



- Indonesia NDC is still viewed as lacking in terms of meeting 1.5 C or even 2 C target
- Energy sector will be the largest contributor of GHG emission by 2030
- Mitigation action in energy sector through renewable energy is crucial to achieve NDC objective or even beyond, thus should be integrated in the RPJMN with clear indicator/target (for power sector, transport and industry)
- Electricity mix from coal plant should be reduced to account for increasing renewables in the power sector
- CCT/HELE technology is insufficient to achieve emission reduction strategy. Much higher contribution toward emission reduction could come from replacing coal plant with renewable power plant
- A transformation in energy system may have social impact that would also need to be addressed





# Thank You!

## **Institute for Essential Services Reform**

is a think tank that actively advocates public policy to ensure the fulfillment of people's energy needs, equality and fairness in the use of natural resources and ecological sustainability.

---

### **INSTITUTE FOR ESSENTIAL SERVICES REFORM**

Jalan Tebet Barat Dalam VIII No. 20 B  
Jakarta Selatan 12810 | Indonesia  
T: +62 21 2232 3069 | F: +62 21 8317 073

 [www.iesr.or.id](http://www.iesr.or.id)

 [iesr@iesr.or.id](mailto:iesr@iesr.or.id)

 [IESR.id](https://www.facebook.com/IESR.id)

 [@IESR](https://twitter.com/IESR)

 [iesr.id](https://www.instagram.com/iesr.id)