



# Indonesia Energy Transition Outlook 2022

Aiming for Net-Zero Emissions by 2050

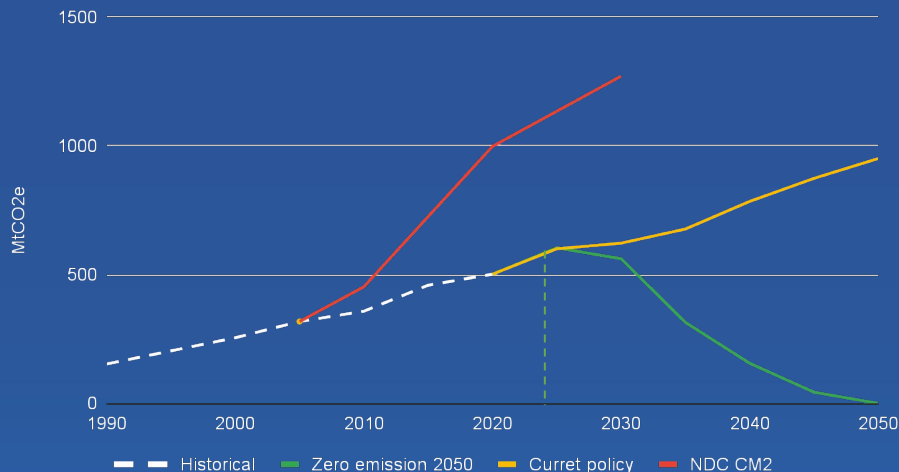
Launching event of IETO 2022  
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# Pathway to zero emissions energy system by 2050

- Indonesia's NDC is insufficient to keep temperature increase below 1.5°C
- To comply with Paris Agreement's 1.5°C limit, energy sector's emissions need to peak by 2025 and reach zero by 2050.
- By 2030 Indonesia should have:
  - RE mix in power generation reach 47%
  - 140 GW renewable energy (inc. 108 GW solar PV)
  - No new CFPPs and retire CFPPs > 15 y.o
  - 110 million e-motorcycles, 3 million e-cars, 2.4 million e-buses
  - Biofuel use ~30 million kl
  - 8 TWh of BESS and 4 TWh of PHES installed

Energy sector GHG emissions





**How far have we  
progressed in 2021?**

# Shift of commitment marked 2021 energy policy scene

- New policy and regulations supporting decarbonization

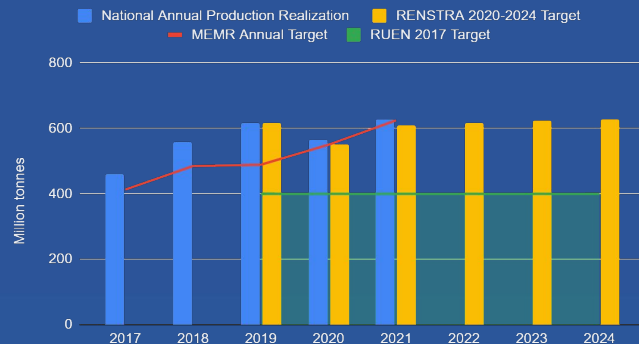
LTS-LCCR	"Green" RUPTL	CFPP phase-out	Carbon pricing	Rooftop solar PV	MEPS for appliances
Net-zero by 2060 or sooner  Rely on fossil + carbon capture	21 GW renewables (4.7 GW solar PV)  RE share 25% in 2030	No new CFPP beyond 2028  Retirement of CFPP >30 y.o Early retire 9.2 GW	Carbon tax at min. USD 2.1/tCO <sub>2</sub> e  ETS scheme trialed with CFPP	Net-metering 1:1 Credit accumulate to 6 months Possible carbon trading	Standards follows international best practices  Applies to AC, fans, refrigerators, rice cookers

- Few crucial long-awaited policies/regulations are yet to be enacted: renewable energy bill, renewable energy tariff regulation, and energy conservation regulation

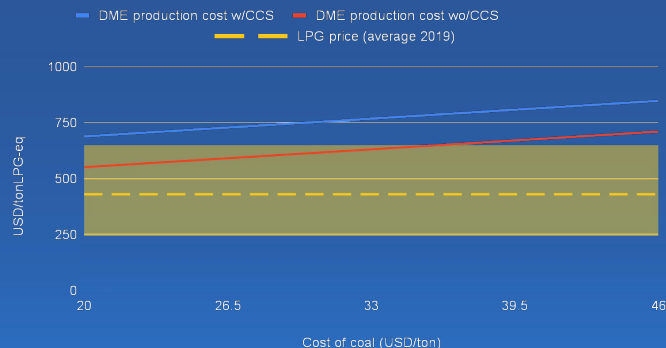
# Indonesia still reluctant to move away from coal

- 40 countries, including Indonesia declaring to move away from unabated coal in 2040s
- Global demand for coal is expected to decline if countries follow current pledges
- Domestic demand from power sector will decline after 2030 when CFPPs start to be retired
- Fossil fuel companies start diversifying their portfolio
- Government insisted on coal downstream projects despite economically unfeasible

Indonesia Annual Coal Production



DME production cost at different scenarios



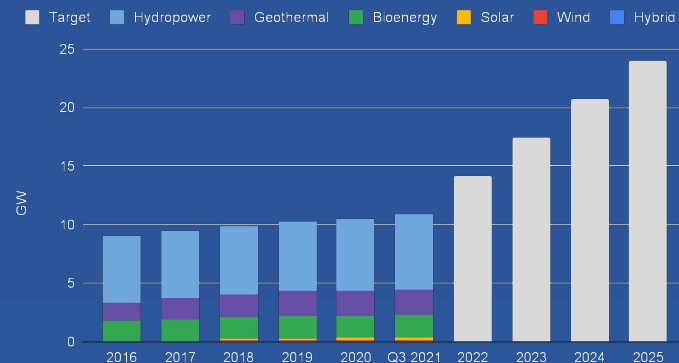
# Coal still dominated power sector as renewables growth sluggish

- Only <400 MW of RE was added, total capacity reached only 10.9 GW
- 300 MW of CFPP started operation, another 4 GW will follow early 2022
- Coal share in power generation mix 65%
- RE Investment remained under USD 2 billion

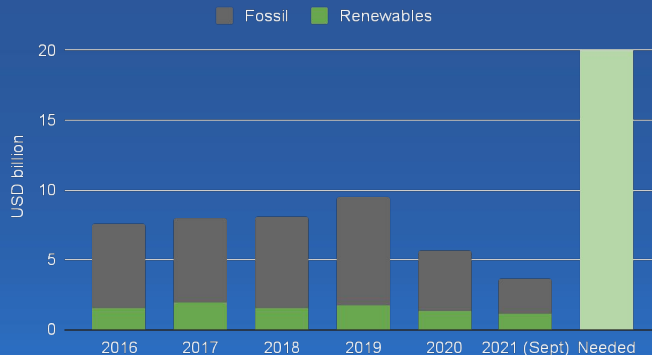
## WHY?

- Unattractive investment climate: time-consuming permitting process, high interest rates
- Poor bankability: low RE tariff, unattractive PPA terms
- Delays of crucial regulations: RE bill, Perpres on RE tariff

Renewables installed capacity and 2025 target



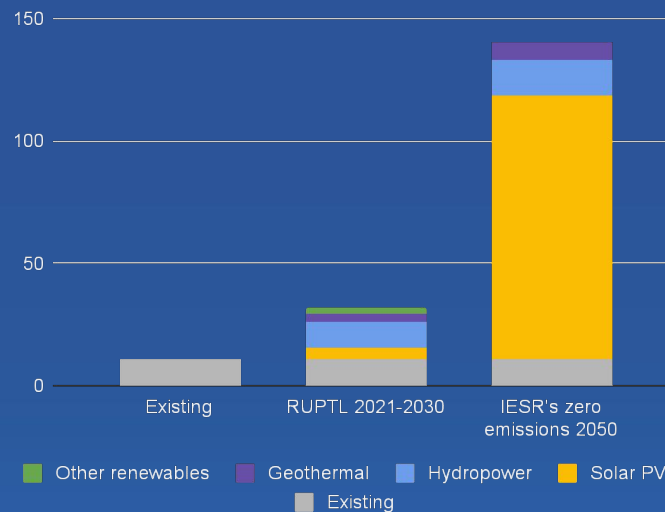
Annual power sector investment



# Big changes in power planning, but still insufficient to achieve Paris Agreement

- PLN aims to achieve carbon neutrality by 2060
- No new CFPPs after 2028 and retirement of CFPPs >30 y.o starting 2030 + early retirement of 9.2 GW
- 21 GW renewable energy planned by 2030, while 130 GW is needed
- Strategies to reduce emissions include CFPP co-firing, de-dieselization, nuclear power, and carbon capture
  - Co-firing is costly with limited impact
  - Global nuclear SMR projects faced delays and uncertainties
  - CCS far more expensive than solar + storage (~USD 80/MWh vs. ~USD 40/MWh in 2040)

Renewable capacity needed vs. planned



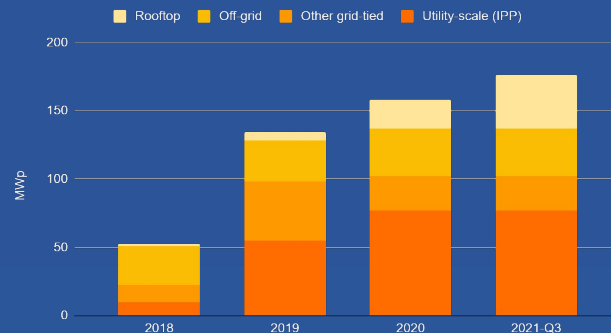
# Solar PV growth stagnated, only rooftop solar PV increased

- Solar PV growth of only 18 MW driven (almost) entirely by rooftop solar PV, total capacity reached 176 MW
- Rooftop solar PV capacity reached 39 MW
- Total residential rooftop PV reached 10.5 MW, while market potential reached 6.5 GW (Jawa-Bali)

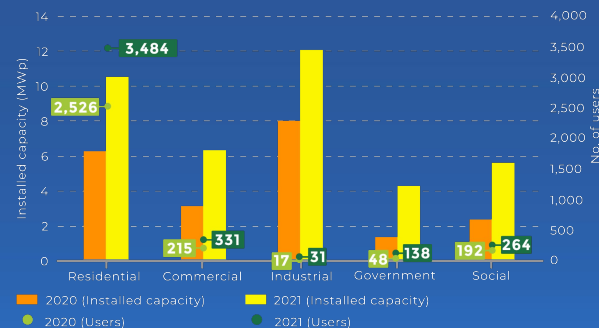
## WHY?

- Lack of regular auction schedules
- Renewables tariff
- For rooftop solar PV
- Lack of financing availability
- Expensive product perception

Installed solar PV capacity



Rooftop solar growth by segment 2021



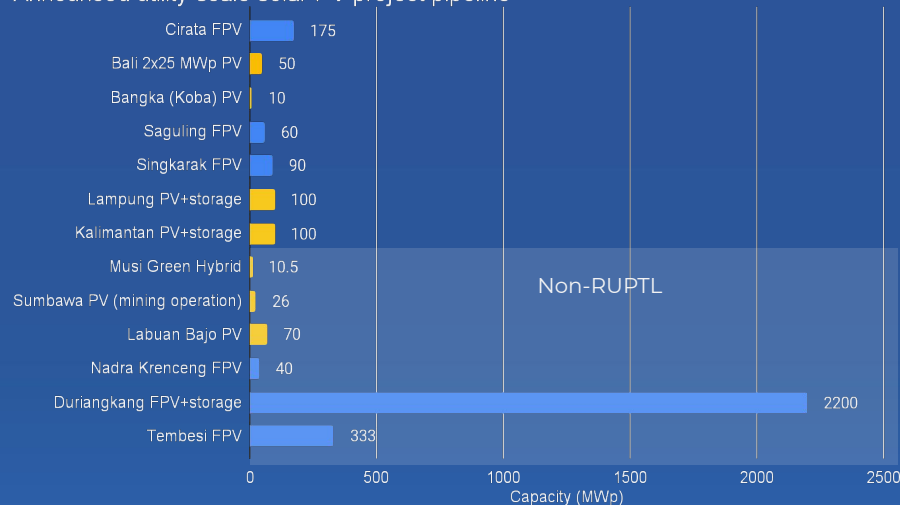
Note: Commercial refers to "Business" in PLN's consumer group  
Source: MEMR; IESR analysis.



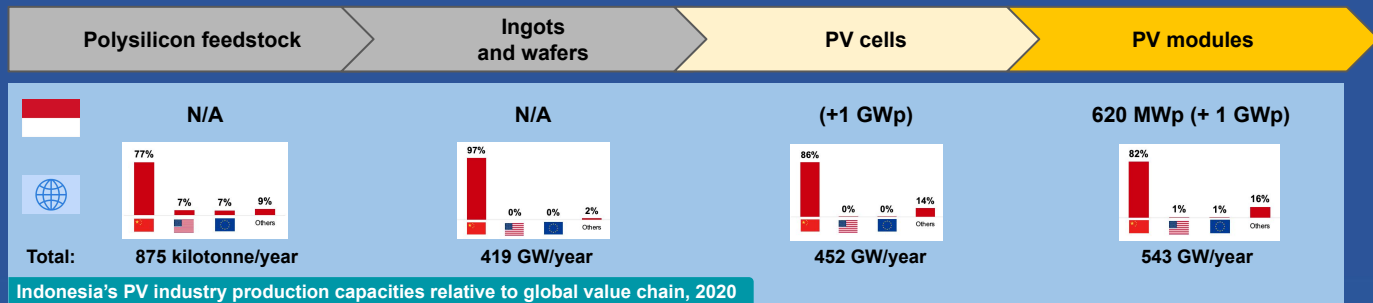
# Promising future of solar PV with GWs of projects announced

- Project planned:
  - 4.7 GW utility-scale by 2030 under RUPTL (585 MWp already in pipeline)
  - 2.7 GWp utility-scale non-RUPTL already in pipeline (inc. for export)
  - 9.7 GWp utility-scale announced for export
  - 3.6 GWp rooftop by 2025 under PSN (~500 MW already in pipeline)
- Floating PV gains popularity with 700 MW projects listed in RUPTL
- Ex-mining site provides alternative location for utility solar PV, 430 MW projects proposed to the next RUPTL

Announced utility-scale solar PV project pipeline



# PV modules manufacturing industry is not ready to cater the need for gigawatts of solar PV per year

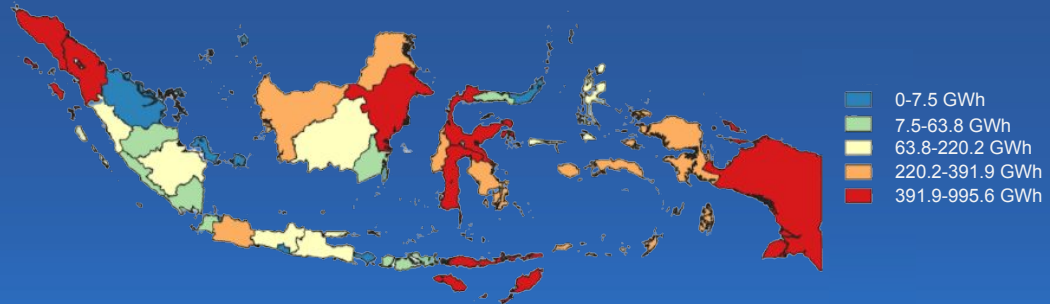


Source: Ministry of Industry, APMSI, BloombergNEF, IESR analysis. Note: Production capacities include plants that have been commissioned, are under construction, or have been announced.

- 620 MWp PV modules production capacity, only 10% utilization rate
- Higher cost compared to imported modules
- Subpar quality/efficiency due to older technologies
- No manufacturer currently comply with LCR regulation



# Storage use is still limited in existing power system

- Current battery storage (BESS) application is limited to off-grid system
  - Small battery (upto 1 kWh) for electrifying households in rural villages
  - 1.8 GWh BESS planned for de-dieselization program
  - Solar power export will use BESS ~12 GWh
- PHES as flexible generation
  - Lower cost and higher energy delivery compared to BESS
  - 4.2 GW planned in RUPTL, 1 GW expected to start operation 2025
  - 7.3 TWh PHES potential



# Sluggish EV adoption as barriers persisted

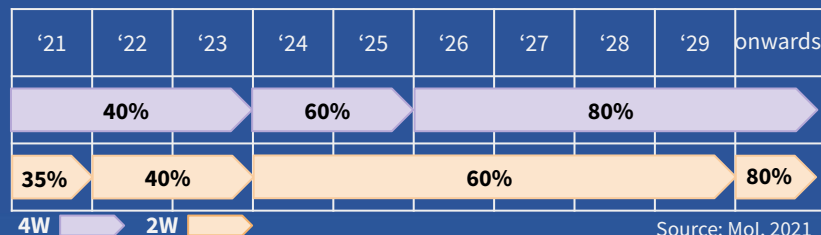
- EV sales remained marginal, less than 1% of vehicle sales
  - TCO of electric cars is higher than ICE
  - ~23% of EV (car) price comes from various taxes
  - ICE performs better than EV at comparable price (drive range, top speed, refueling duration)
  - Incentives for ICE (luxury tax discounts)
  - Slow installation of public charging and battery swap stations
- MEMR plan to ban sales of ICE motorcycles and cars by 2040 and 2050, not yet put into regulation

EV adoption	 Car	 Motorcycle
Certified vehicles (2020)	<b>229</b> units	<b>1,947</b> units
Certified vehicles (2021)	<b>2,012</b> units	<b>5,486</b> units
Targeted vehicles (2030)	<b>2 M</b> units	<b>13 M</b> units

	Electric	ICE	Electric	ICE
OTR price (IDR million)	637	533	19	17.8
Annual driving distance (km/year)	20,000	20,000	10,000	10,000
Annual fuel cost (IDR million/year)	4.7	15.3	0.6	1.3
Annual maintenance and insurance costs, and taxes (IDR million/year)	15	16.7	0.58	1.3
Salvage value (IDR million)	159	213	0.6	6.5
<b>TCO (IDR million)</b>	<b>614</b>	<b>532</b>	<b>24.8</b>	<b>26.5</b>

# Development of domestic upstream industries is needed to comply with local content requirements

Local content requirement adjustment for years ahead (%)



- EV producers start proliferating (esp. two-wheelers), but upstream industries are underdeveloped
- The LCR is increasing to 60% in 2 years, upstream industries (battery) need to be built soon
  - Battery is main component of EV (~35% LCR)
  - Current electric two-wheelers manufacturers only managed to fulfill 40-47% LCR
  - IBC's battery plant is expected to start in 2024

Existing companies in domestic battery supply chain

	Raw materials suppliers	Battery cells producers	EV producers		Recycling company
			Cars	Motorcycles	
Total company	1 (refining)	2	1	22	1
Total production capacity	240 kilo tonnes	10.25 GWh (*)	250,000 units (*)	1.04 million units	24 kilo tonnes (*)
Facility location	Maluku Utara	Jawa Barat, Jakarta	Jawa Barat	Varied	Sulawesi Tengah

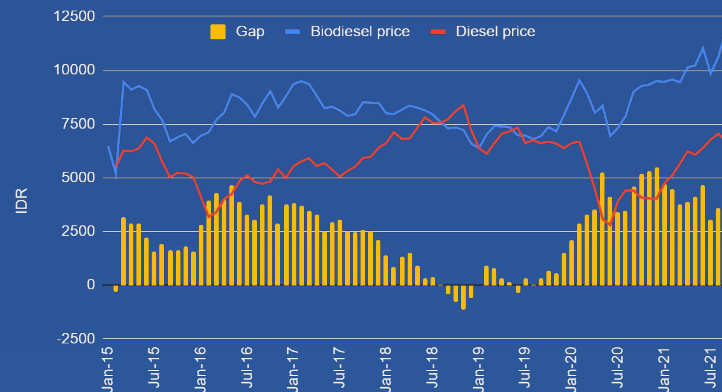
(\*) plan to start soon

Source: IESR analysis; Mol, 2021

# Clean fuels dominated by biodiesel, other alternatives lack support

- To date, biodiesel is the only clean fuel alternative for non-electricity use
- Biofuel development reached important milestone with the flight test of 2.4% bioavtur
- Further utilization of palm-oil biofuel is hampered by sustainability issues and high commodity prices
- Other clean fuel alternatives rely on private initiatives, lacking regulatory support
  - Bio-CNG in palm oil mill for own consumption
  - Green hydrogen project for own consumption in refinery
  - Green hydrogen project for electricity storage

Biodiesel price, Diesel price and Gap (IDR)



# Few provinces ready for energy transition

22 provinces have RUED enacted, only few have operational regulations in place

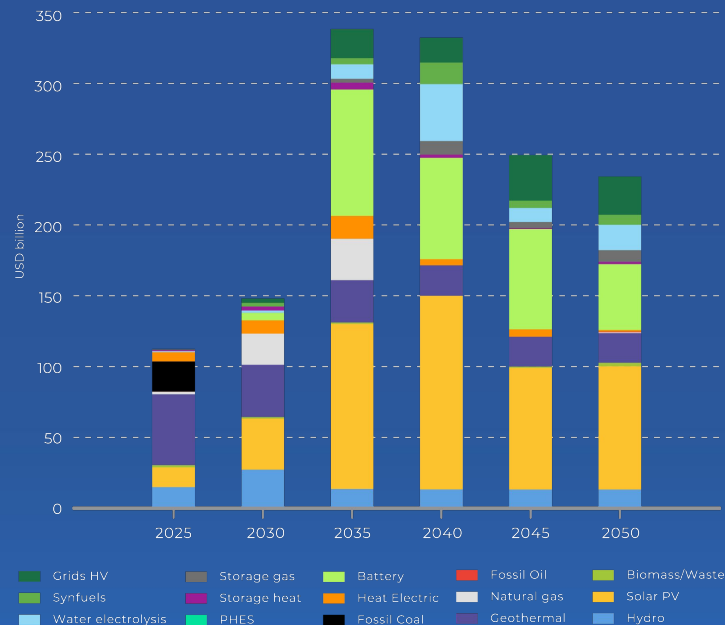
- DKI Jakarta:  
Gub. regulation targeting net-zero 2050  
APBD allocation for Rooftop solar PV on public buildings  
Green building incentives, electric buses procurement
- Central Java (Solar Province Initiative):  
APBD allocation for rooftop solar PV for economic recovery program  
Jateng Petro Energi start exploring renewable energy opportunities  
Several Lols for floating PV development (>700 MWp potential)
- Bali:  
Bali Clean Energy regulation: rooftop solar PV in government and SOE buildings  
Economic recovery roadmap targeting 53% RE in 2045
- Jambi, West Java, West Nusa Tenggara are planning to issue regulations/instructions to support rooftop solar PV adoption



## Various fund sources available to leverage investment low carbon technologies

- 20-25 billion annual investment required, financial instruments needed to attract investment
- Various potential fund sources available, but underutilized:
  - International financing
  - Non-conventional financing: green bond/sukuk, islamic finance, blended finance, municipal bonds
  - Carbon tax could provide additional fund
- Local banks could support renewables projects

Capex in 5-year Intervals



Source: IESR, Agora Energiewende & LUT University, 2021



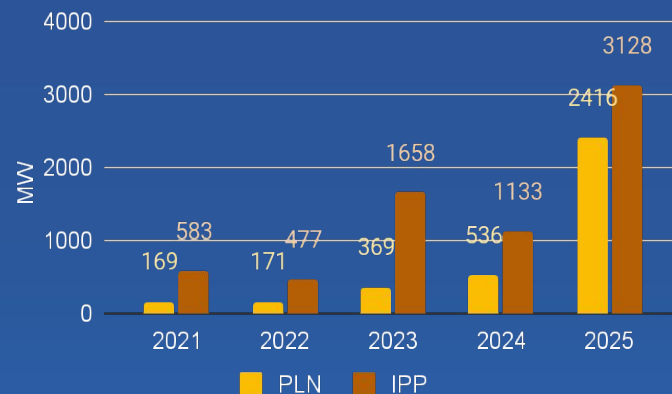


**What to expect in 2022?**

# Renewables ready to flourish once investment climate improves

- New policy directions in 2021 promise better future
- Enactment of long-awaited regulations
  - Perpres RE Tariff
  - Regulation on Energy Conservation
  - Renewable Energy Law
- Improving investment climate is the crucial first step in realizing additional 10 GW of RE by 2025
  - Regular, timely, transparent auctions
  - Streamlining of permitting process
  - Access to low interest loan
  - Improving RE projects' bankability
  - Enhance domestic industrial capacity
  - Temporary LCR waiver for PV modules

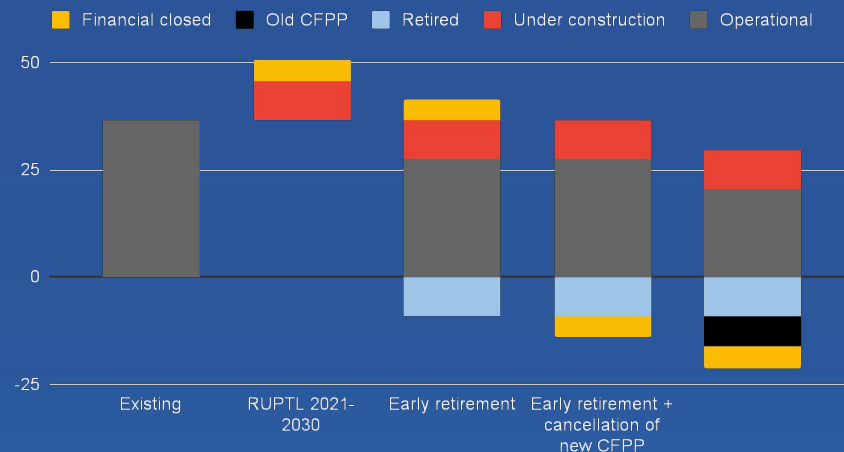
Planned new installation of renewables until 2025 (in RUPTL)



# Early coal retirement is pivotal to enable rapid energy transition

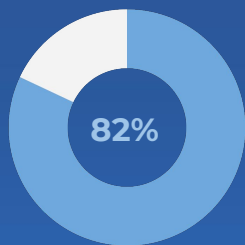
- Retirement and cancellation of CFPP will provide more space for renewables acceleration
  - 9.2 GW early-retirement through ETM
  - 5 GW project pipeline not yet started construction
  - 7 GW over 30 y.o by 2030
- 1 GW CFPP retired/cancelled could open space for 4 GW of solar PV
- 1.8 GW pilot projects for early retirement is crucial milestone
- G20 summit as opportunity to showcase commitment

CFPP capacity by 2030 under different CFPP scenario

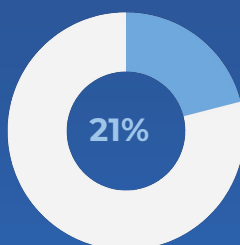


## Private and local initiatives drive renewables adoption and energy efficiency measures

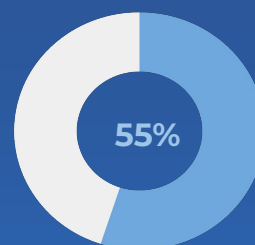
- More provincial government are going to issue circular letter (SE) and regulations to support rooftop solar PV deployment
- Household rooftop solar PV installation likely to increase following net-metering update
- More businesses (C&I) are installing rooftop solar PV, around 500 MWp are in pipeline
- Businesses start planning for emission reduction measures following carbon tax regulations: renewable energy and energy efficiency



Companies recognize the need to achieve net-zero emissions



Companies have net-zero target



Companies considering to set net-zero target

# More electric two-wheelers to be deployed

## Electric vehicles

- Electric two-wheelers adoption by ride-hailing services will exceed ~25,000 units as companies started investing in electric vehicle manufacturers.
- Electric cars adoption will still be limited by the high upfront cost unless more incentives provided
- Government plan to ban ICE and impose carbon tax on transportation sector could attract more investment

## Biofuel

- Biodiesel blending is unlikely to increase to 40% if palm oil price remains high. Otherwise, 40% FAME blend might be pursued.
- Bioethanol blending is still hindered by high production costs, although attractive proposal to blend bioethanol to higher RON gasoline might provide a solution



# Thank you