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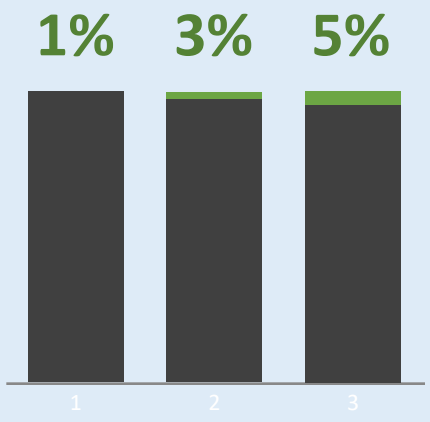
Indonesia's Biomass Cofiring Bet

A major part of the plan to pursue the 23% renewable energy target. *Low-cost* cofiring aim with no major Coal Fired Power Plant (CFPP) modifications



cofiring :

(v) Utilization of biomass from plants or waste products to replace coal in coal-fired power plants. Planned at ratio of 1-10% in Indonesia

Let's unpack the plan

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A recent IEEFA study examined the subject in greater detail to promote a greater understanding of the subject. Indonesia possesses substantial potential, but with specific challenges which needs to be acknowledged through credible planning - as *cofiring is not a magic silver bullet*

Indonesia Biomass Cofiring Bet : Beware of the implementation risks

Cofiring in brief

A mature 1990s technology with challenges that has largely been consistent in the past 20 years

Biomass Supply

- **Price** of high quality biomass
- **Supply stability**
- **Distribution of resource vs demand centers**
  - Java-Madura-Bali region (79% PLN CFPP) would likely be constrained for RDF application with limited wood biomass resource
  - Low quality biomass with low energy density and low bulk density are largely non-transportable

Power Plant

- **Technical challenges for PLN power plants**
  - Low calorific value and high moisture content potentially reducing efficiency and increasing operations complexity
  - Slagging & Fouling – increased ash deposition in the boiler
  - Accelerated boiler corrosion potential
  - Negative impact escalates with lower quality biomass and greater mixture
  - Tighter constraints for PC boilers fuel properties

Biomass Industry

- **Existing biomass industry is largely built for export** market at premium price
- **Bankability challenge** to achieve viable commercial RDF & biomass supply model
- **Investment security** cofiring fuel flexibility likely require long-term commitment from GoI & PLN to assure large scale investments

What's the plan?

Utilizing a variety of biomass and waste-based products to replace (a portion) of coal in CFPP. Current plans demand a stable supply of 4 to 8 million tonnes of cofiring fuel annually

Wood Biomass

Sawdusts

Chips

Palm Kernel Shell

Pellets

Drying ▶ **Milling** ▶ **Densification** ▶

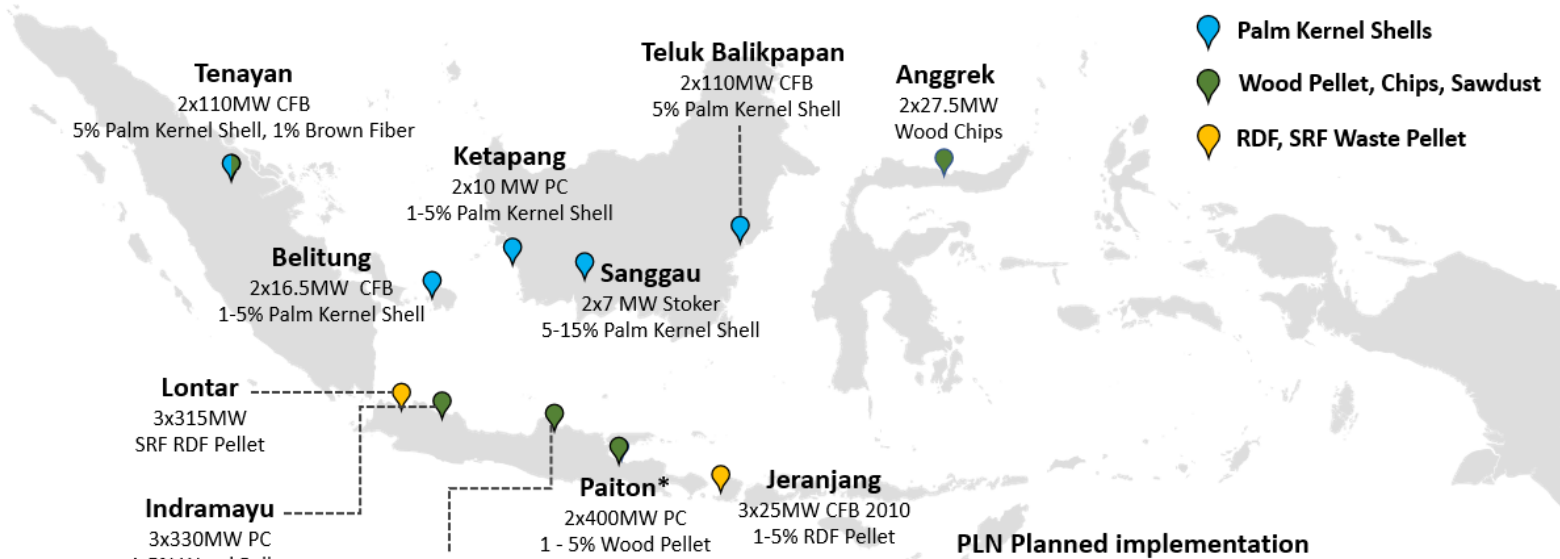
Refuse Derived Fuel (RDF)

Shredding
Screening

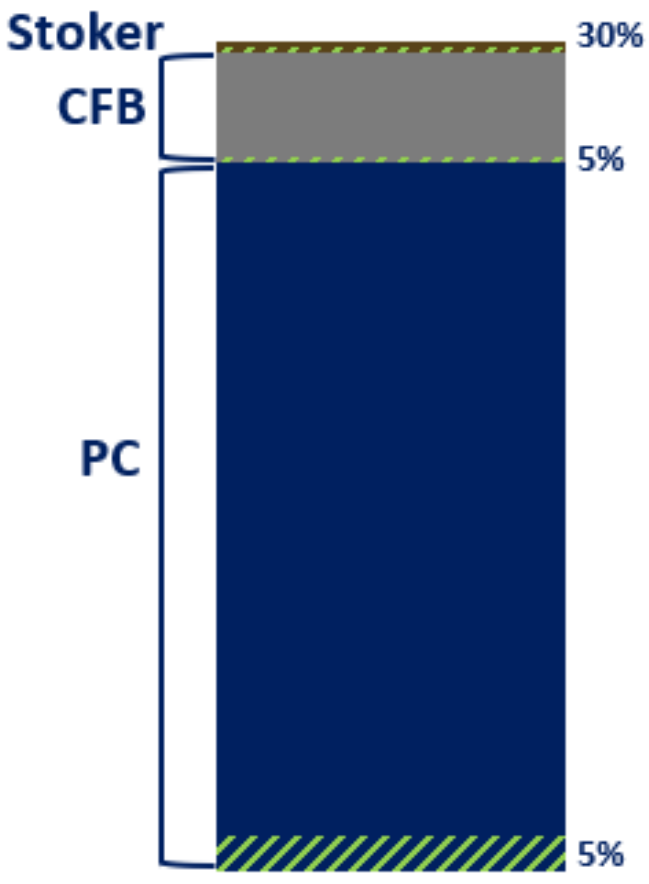
Simplified for Clarity

114 PLN coal power plants

Across Indonesia, independent power producers are currently excluded from the plan. Most of the PLN large power plants are Pulverized Coal (PC) boilers which are more constrained in fuel properties



Power Plant Boilers



Trial runs by August 2020 with further trials planned

*) Paiton 1 & 2 has performed continuous cofiring since June 2020
Consuming 3,800 tonne in 103 days (avg 37 t/day)

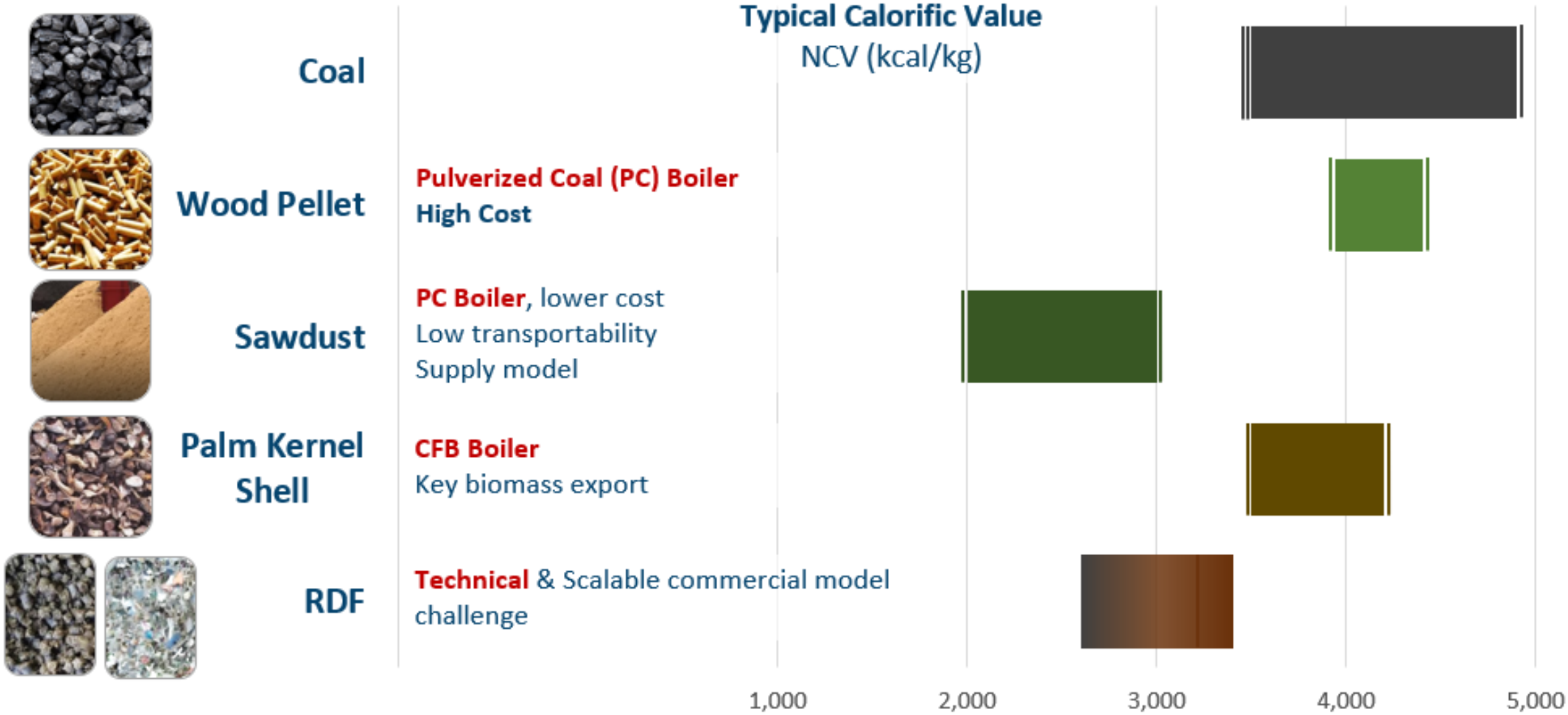
PLN Planned implementation

Power Plant Type	Number of Units	Installed Capacity (MW)	Target mix & Biomass consumption
Pulverized Coal	45	15,490	5% biomass, 10,375 t/day
Circulating Fluidized Bed (CFB)	39	2,435	5% biomass, 2,175 t/day
Stoker	30	229	30% biomass, 1,684 t/day
	114	**18,154**	

Source : PLN, MEMR

Cofiring fuels not created equal

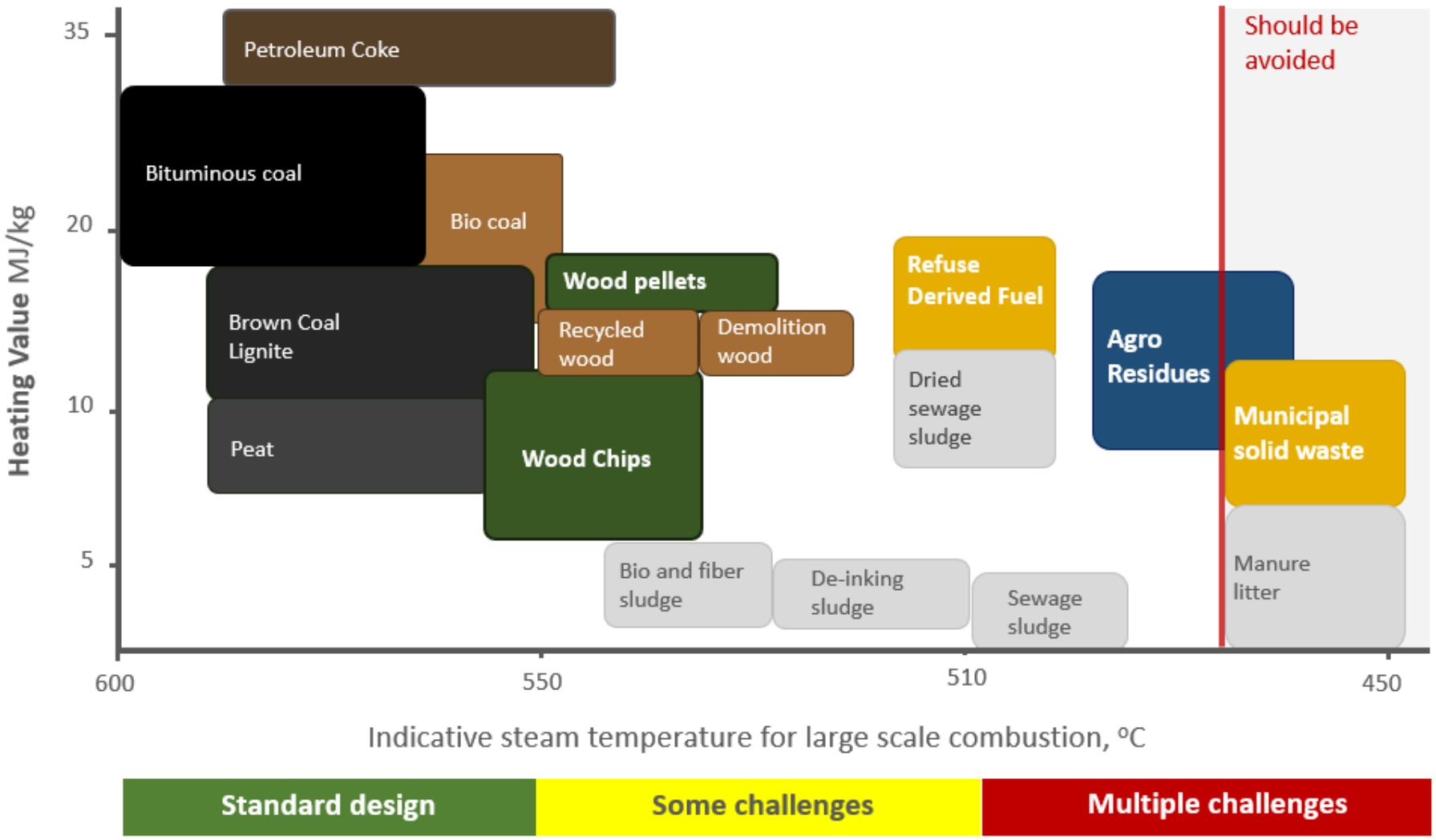
Energy content, specific technical challenges, types of boilers required, supply models at the scale demanded has yet to be proven.



Calorific Value provides indication of energy content for each unit mass (kg) of fuel material
Source : Market evaluation, refer to report for details

The different challenges

Utilizing biomass in power plants designed for specific fuel (i.e. coal) is possible, but with specific potential challenges.



- **Low calorific value** and high moisture content potentially reducing efficiency and increasing operations complexity
- **Slagging & fouling** – increased ash deposition in the boiler
- **Accelerated boiler corrosion** potential
- Negative impact escalates with lower quality biomass and greater mixture
- Tighter constraints for PC boilers fuel properties

Source : van Niekerk, 2017

What about other countries?

Cofiring is *technically feasible* but could be economically challenging, hence the need for policy (funding) supports.

Japan is doing it, but..

- Biomass **policy support**. Feed-in-Tariffs since 2012
- Predominance of fuel-tolerant **CFB boiler** for cofiring
- Importer of PKS and WP

Prudent steps by other biomass-rich countries

China very small cofiring

- **Massive biomass resource,** focus on dedicated biomass
- Policy support - financial challenges in cofiring projects
- China govt **excluded cofiring** from supplementary renewable subsidies in 2018

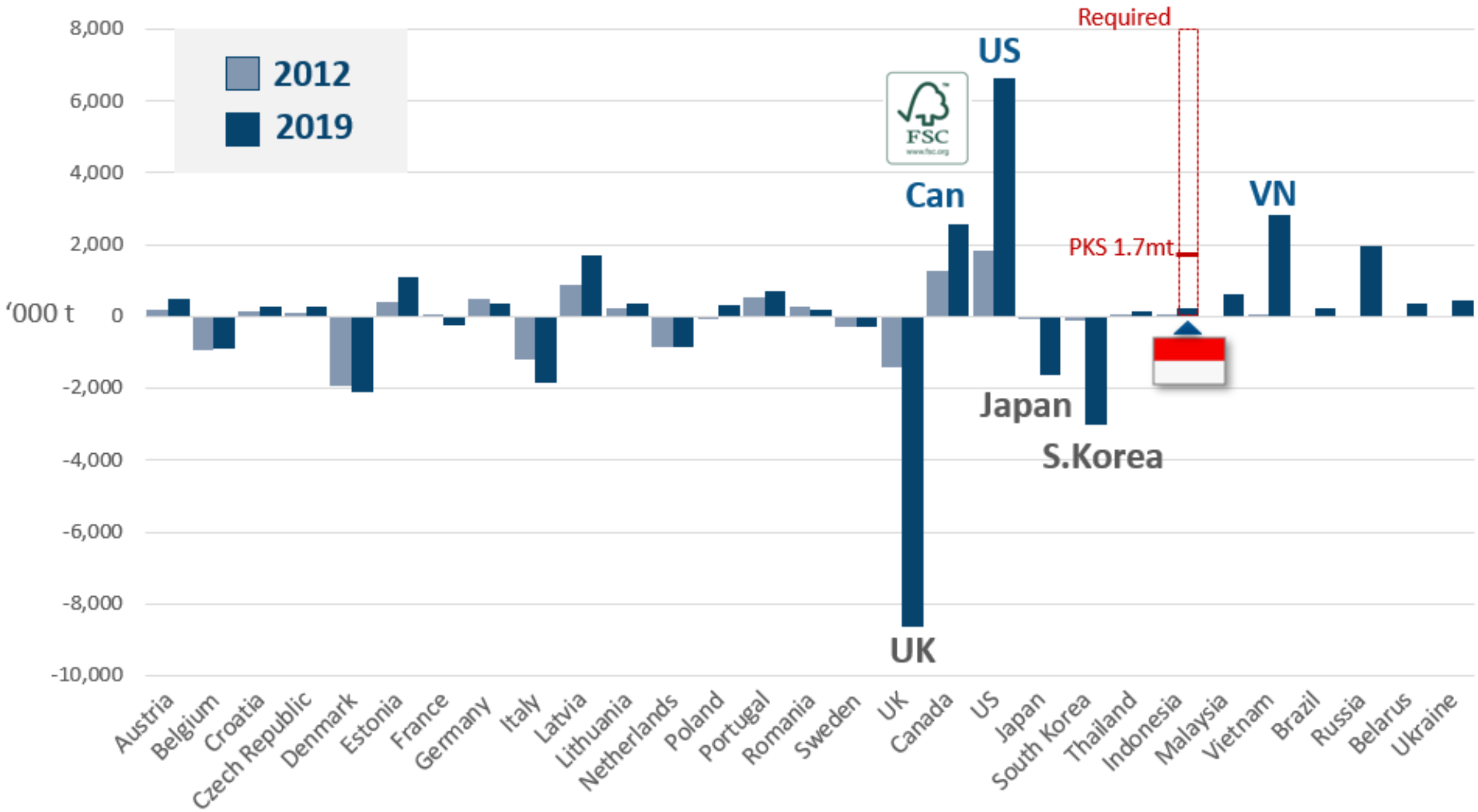
US very small cofiring

- **Massive biomass resource: world's largest** wood pellet exporter
- 23% coal in power mix

Be mindful that these countries are **strong technological powerhouses for power plants**

Global wood pellet trade

One (among many) indicator of existing wood biomass potential. Current cofiring plan requires a very large development of a biomass industry.

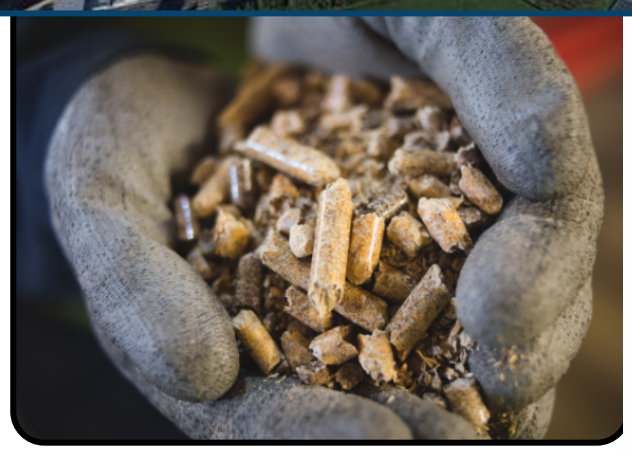


Indonesia's recent rise in biomass products has largely been driven by export markets with premium prices

The UK comparison

Cofiring in the UK has been policy-reliant. UK cofiring peaked in 2011, with declining policy support. Technically feasible, but major policy support is needed.

UK's largest biomass power producer started with cofiring, moved to **full biomass**, and required more than **£700** million in public funding support in 2019 [1]



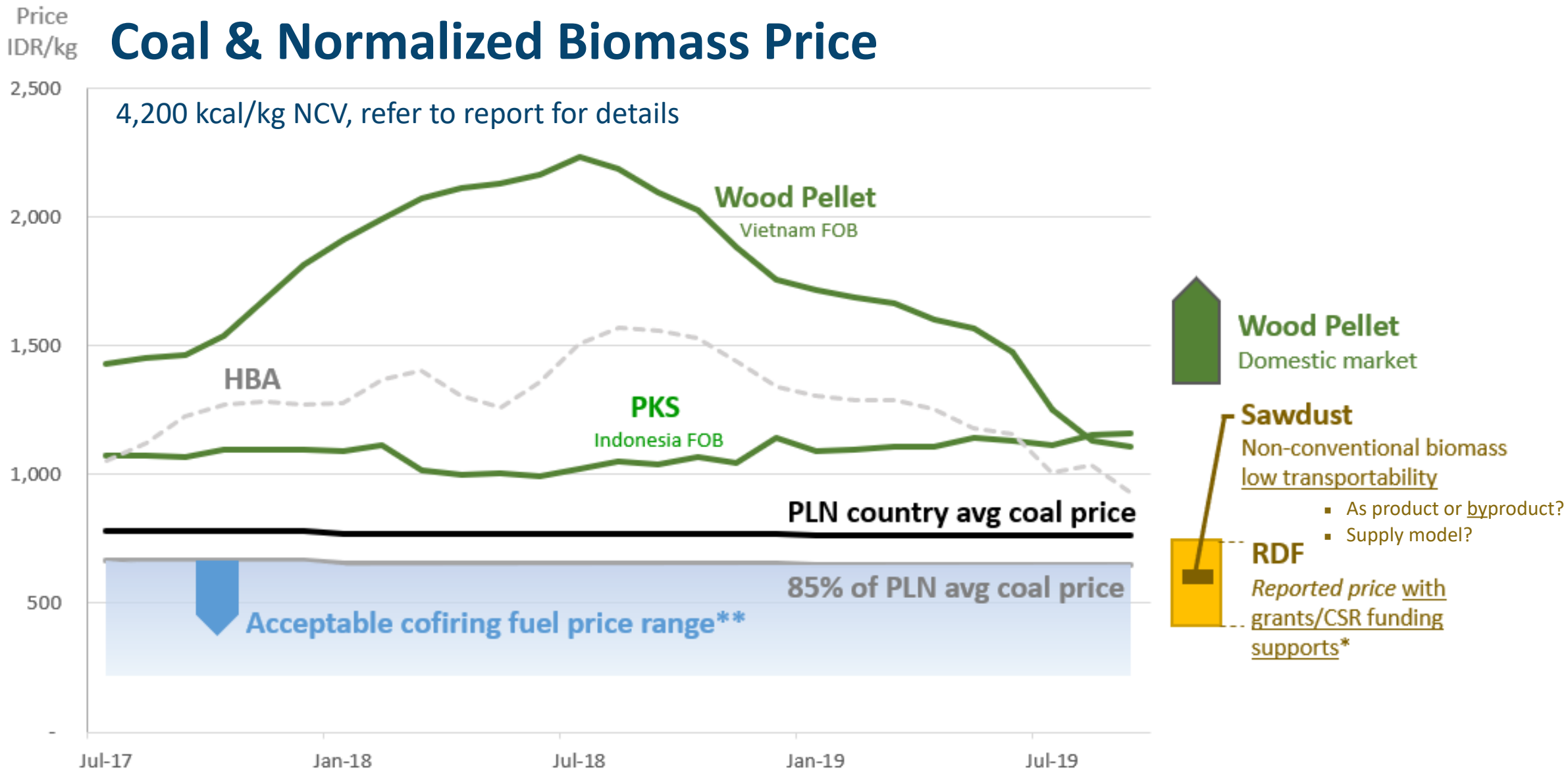
UK Cofiring

[1] Earned ROC and CfD income, Drax 2019 AR. 13.4 TWh, 2.6 GW biomass capacity
Note that UK base electricity price is substantially higher than Indonesia
Source : UK BEIS, IEA CCC, Drax

The price of quality biomass

PLN aims to procure biomass at a price largely ‘lower than coal’. The current biomass market may prove to be challenging to respond to the scale that is needed

“ Are there any policy supports planned?”



Source : PLN, Argus index, IEEFA market evaluation

** Refer to report for details

What is the scale needed?

The plan demanded a large scale biomass industry with specific challenges to be acknowledged

Biomass

4-8 mi tonne/yr required

Currently

1.7 Mt/yr PKS *exports*

0.24 Mt/yr WP *exports*

- Feasibility to compete with high export price and existing market use
- Feasibility to develop stable and sustainable low-cost biomass **at scale**

RDF

0.9 mi tonne/yr RDF required

Currently

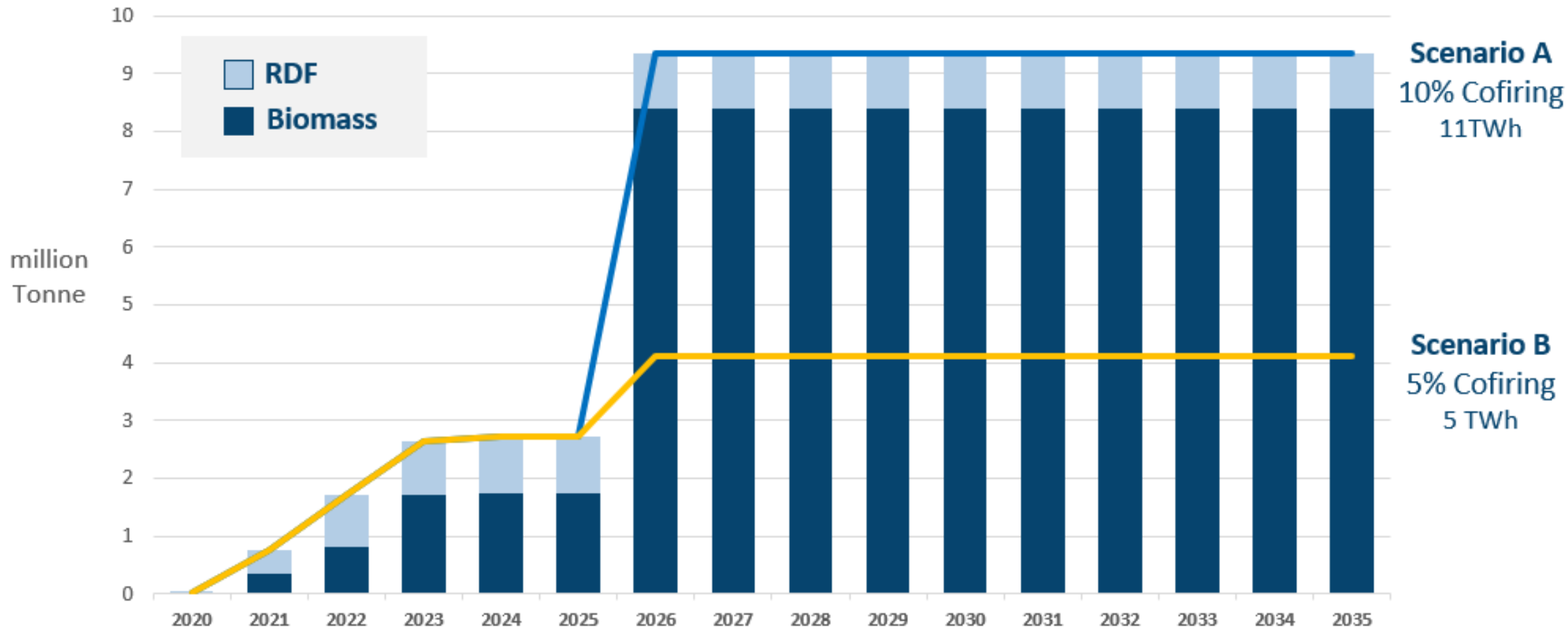
? Mt/yr RDF proven models for cofiring

- **Commendable** community involvement and waste handling
- Challenge to reach scale. Existing model in Lombok, <100 kg/**day** production vs need 1,800kg/**hour** at 3%(75 MW)
- Existing projects are largely heavily supported by CSR and Grant funding

Source : MEMR, PLN, APCASI, FutureMetrics, Mongabay

Demand projections: PLN cofiring plan

Projection of a rapid increase to 2025 across Indonesia, with consistent demand rise. *“Would a market develop to reach the scale projected, at the price demanded?”*

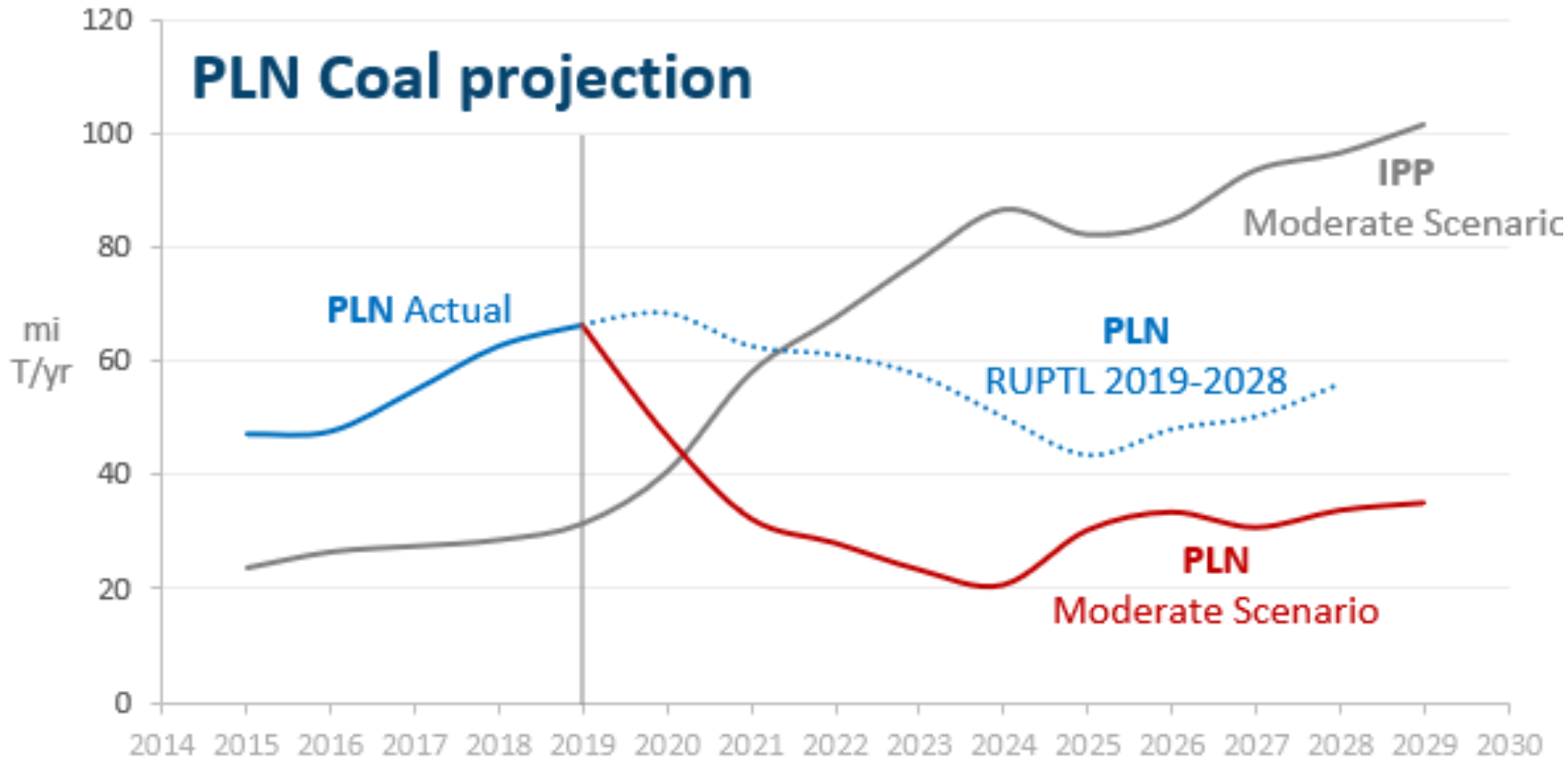


Cofiring ‘flexibility’ allows PLN to switch back to coal when stable fuel supply is not available. Such flexibility could also cast doubt for long-term investments plans

Source : PLN Cofiring Presentation, demand scenario

Clarity of projection is essential for investments

A credible, coherent and transparent plan is required, particularly with the changing outlook of power generation in the coming decade.



- **Clarity of demand forecast,** including potential procurement commitments – Noting that **lock-in has its inherent risks**
- **Acknowledgement of existing specific challenges.** Technicalities, RDF & biomass supply stability and price
- **Outlining priority target regions** to establish proven supply models

Source : PLN coal outlook

Be mindful of the challenges

Economics

Market price, scalable stable supply, demand certainty
costs/benefits of **policy support (if any)** – and at what cost?

Objective

Technical

Mature technology. Performance lessons from other countries
What differentiates Indonesia?

Environmental

Foundational reason for cofiring.
Supply sustainability risk – scale, speed, cost. How to control the risk?

” Massive targets. Would cofiring work?

- Reaching the **scale** aimed across Indonesia remains an open question
- **Credible and transparent plans** needed for investment certainty
- **A critical decision point for Indonesia –** given the significance of cofiring towards the 23% RE goal

Full report at www.ieefa.org
Contact the author at padhiguna@ieefa.org

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