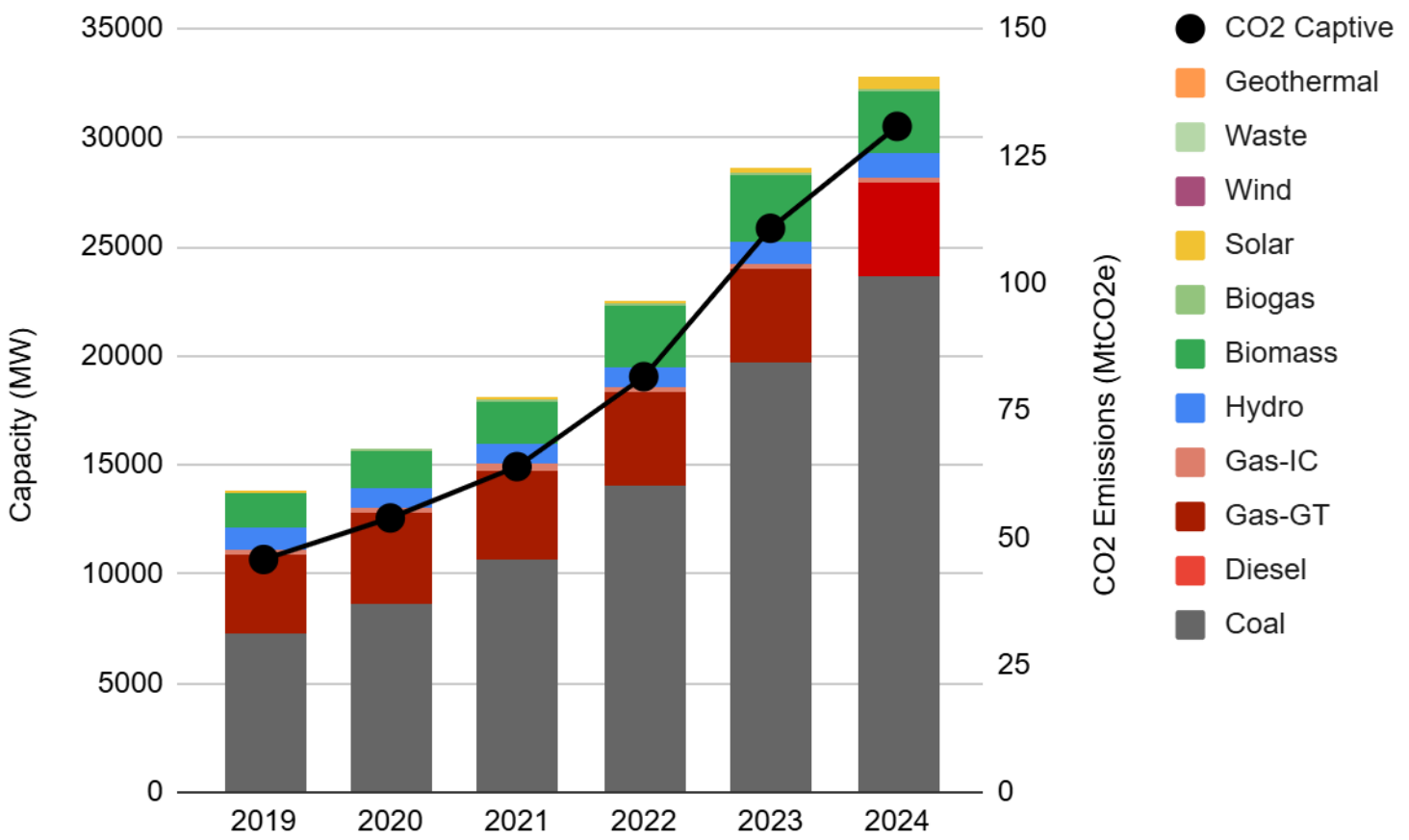
IESR
Institute for Essential Services Reform

Lessons Learned and Key Recommendations to Decarbonize Captive Power Plant in Industry

December 3rd 2025

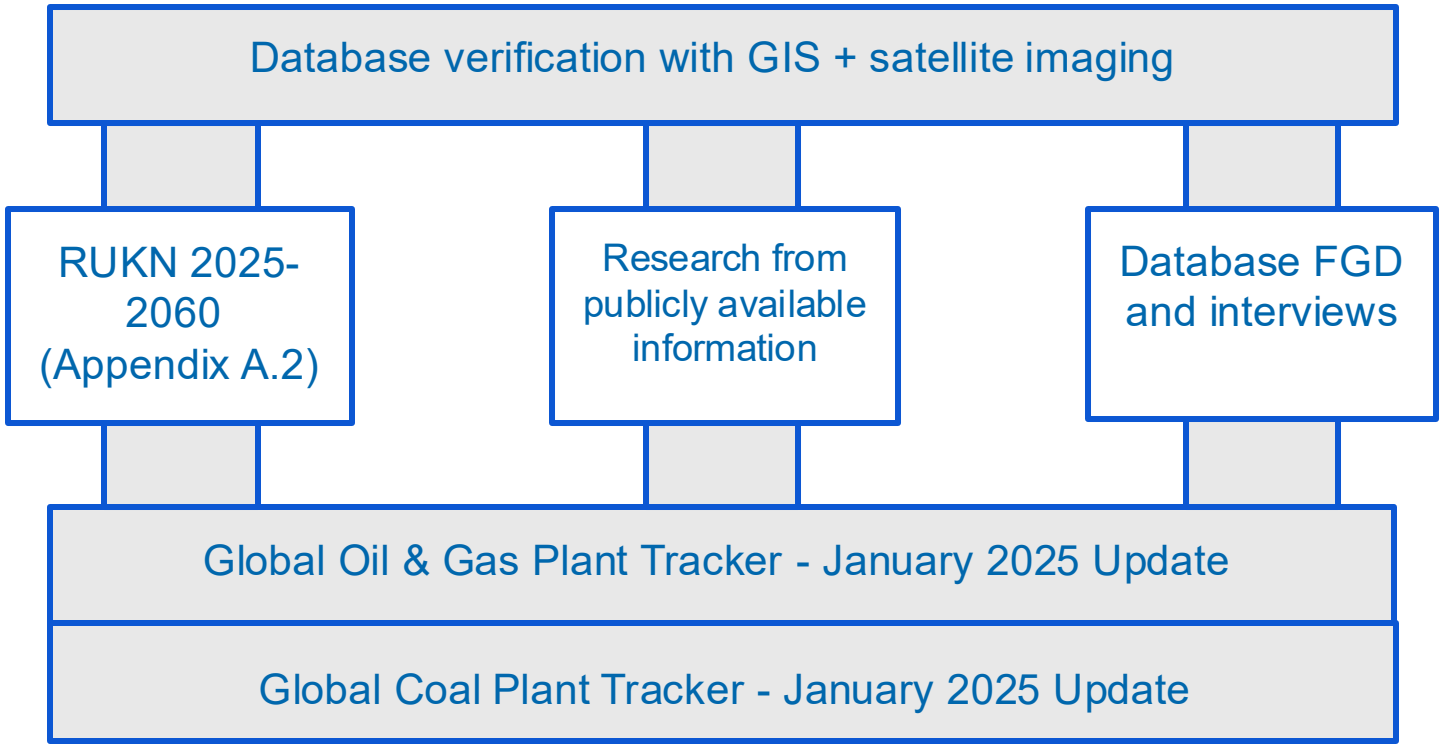
Captive power plant capacity and emission growth in Indonesia



- The most of captive power plant capacity comes from CFPPs followed by gas power plants.
- **Emissions from captive power plants by 2024 reach approximately 131 MtCO2 and contribute up to 37% of total power sector emissions**. A significant increase from just 20% five years ago.
- Beyond 2024, already **17.4 GW of captive CFPPs and gas power plants in the pipeline**, with 5 GW of CFPPs and 2.5 GW of gas power plants already in the construction phase.

The study of decarbonization measures for fossil-fuel-based captive power plants

Begin with compiling the captive power plant database...



- **137 companies** with captive power licenses
- **175 units** of captive power plants with **11 types of technologies**
- **31.1 GW of total capacity** (announced, permit, construction, operation)

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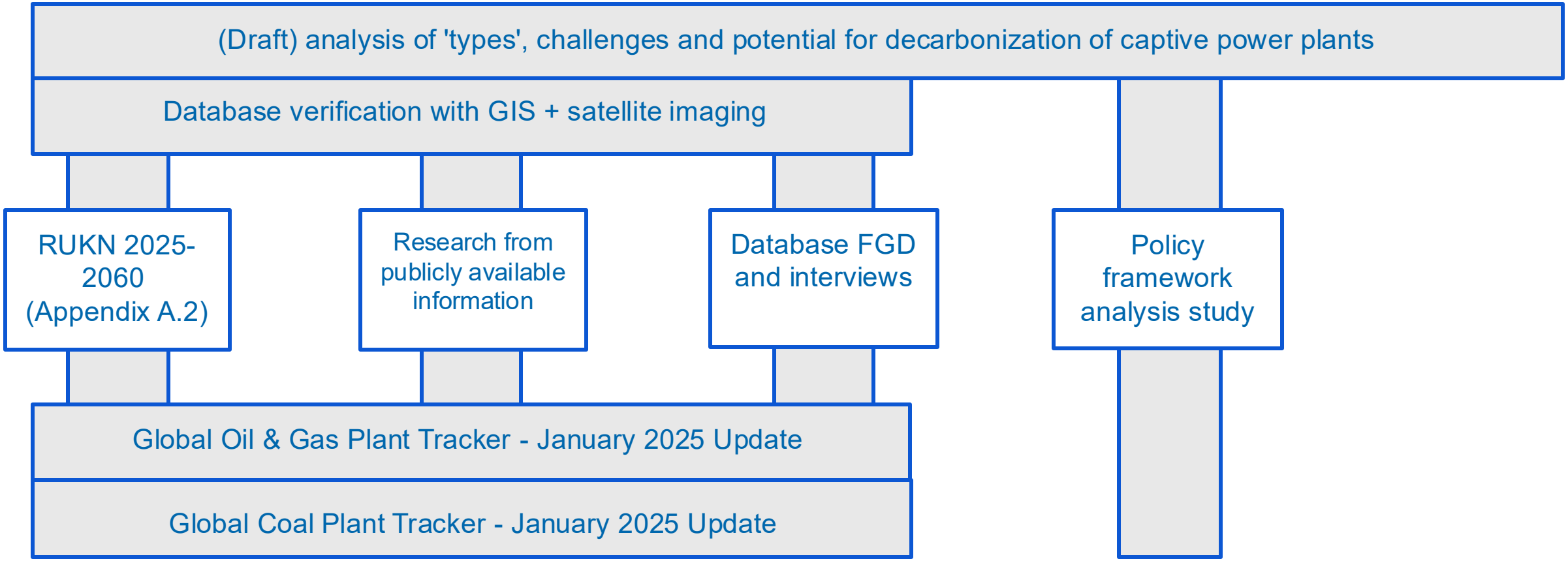
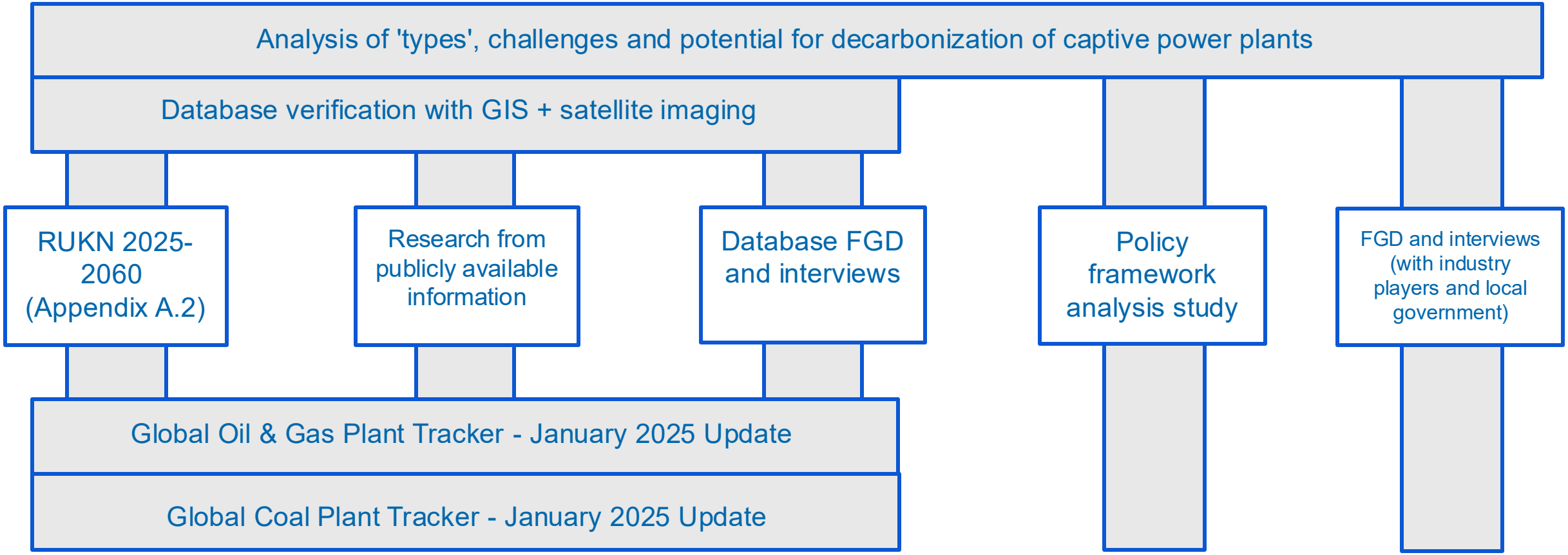
At the same time, we are conducting a study of the legal aspects these power plants...



The study of decarbonization measures for fossil-fuel-based captive power plants

We discussed the results of our initial analysis with stakeholders in several regions...



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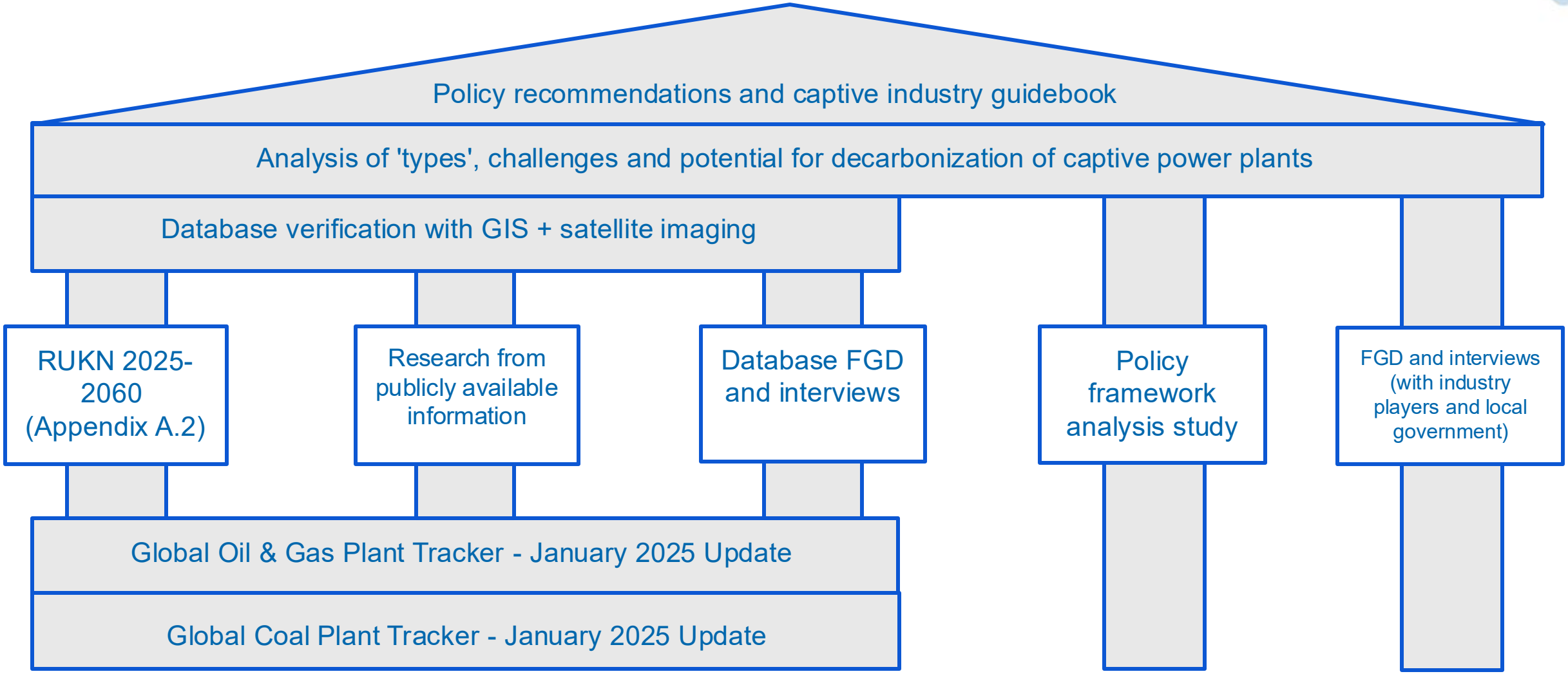

Six identified archetypes and potential solutions

No	Archetypes	Profile Description	Key Characteristics	Representative
1	**The Pragmatic Switcher**	Heavy industries with legacy captive fossil plants located near the PLN grid.	**License: IUPTLS** Prioritizes OPEX reduction by migrating to a cheaper, more reliable grid.	Cement company in West Java

Core issues :
They face rising maintenance and fuel costs, increasing compliance requirements, and growing pressure to decarbonize

Potential solution :
The most effective step is to connect directly to the PLN grid, which provides cleaner electricity than older captive plants and improves reliability. Operators can also reduce stranded asset risks by leasing their thermal plants to PLN as reserve support through an excess power arrangement.

5	**The Remote Microgrid Pioneer**	Companies in extremely isolated areas, with no access to the PLN grid.	**License: IUPTLS** 100% diesel dependent. Decarbonization must come from captive, isolated systems.	Coal mining company in South Kalimantan
6	**The Bio-resource Integrator**	Industries that generate significant organic wastes as a byproduct, to be converted into thermal and electrical energy.	**License: IUPTLS** Internal circular economy. The waste stream is the fuel source, minimizing external fuel purchase and waste disposal costs (increased cost effectiveness).	Pulp and paper or CPO company in Riau

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Core issues :
These tenants operate in large industrial zones, where electricity demand reaches hundreds of megawatts. They have limited influence over the estate's coal-heavy grid mix and face costly, complex land acquisition challenges if seeking external renewable development.

Potential solution :
A virtual PPA model may enable tenants to procure renewable energy without relocating operations. The tenant partners with an IPP to build renewable capacity (e.g., ground-mounted solar PV), injects the electricity into the estate substation and accounts for it virtually. This model requires a tripartite agreement between the tenant, the IPP and the estate owner, as well as investment in a dedicated transmission line.

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3	**The Utility Company**	Entities that own and manage the power utility for an industrial estate.	**License: IUPLTU** Grid-balancer. Must manage frequency/stability against tenant-owned solar projects.	Utility and industrial estate companies

Core issues :
They operate captive power plants to supply tenants in industrial estates. They must decarbonize without compromising reliability. For example, uncoordinated adoption of rooftop solar by tenants can create midday load drops that destabilize grid operations.
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Potential solution :
A coordinated Net Zero Cluster allows the utility to aggregate demand, manage renewable deployment centrally and prevent destabilizing load fluctuations. **Incorporating Battery Energy Storage Systems (BESS)** stabilizes solar output and keeps turbines within safe operating ranges. Utilities can also offer waste to energy services by converting tenant waste such as RDF into steam or power, providing a source of baseload energy..

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4	**The Asset Transformer**	Industries with large land assets (quarries, depleted mines) that can be repurposed.	**License: IUPTLU/IUPTLS** Land-rich. Turns reclamation/environmental liabilities into productive energy assets.	Cement and mining companies

Core issues :
Asset Transformers such as in mining or cement operations must rehabilitate large quarries or mine voids while decarbonizing their energy systems. There is regulatory ambiguity regarding whether post-mining land can be used for energy development..
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Potential solution :
Post mining solar, or rehabilitating ex-mining land for ground-mounted solar, enables companies to meet reclamation obligations while generating renewable electricity. This energy can also support production of green commodities such as green nickel or cement, which are increasingly valued in global markets and may improve competitiveness...

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Core issues :
Remote Microgrid Pioneers operate far from PLN's network and rely heavily on diesel gensets, resulting in high fuel transport costs and significant emissions. Integrating renewable energy in remote and rugged environments is technically challenging.
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Potential solution :
Hybrid systems that combine solar PV with BESS offer the most cost-effective and impactful pathway. Solar reduces daytime diesel use while storage manages variability and enables gensets to be shut down during periods of excess renewable supply.

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Core issues : Bio-resource Integrators in palm oil, pulp or paper industries must manage large organic waste streams such as POME, palm fiber or sludge. Unmanaged waste produces methane emissions and compliance risks. To increase the bioenergy mix, waste products may not sufficient, requiring additional procurement from outside the industrial area. . Potential solution : **Developing an internal circular energy system** by converting waste into baseload power and thermal steam. This reduces fossil fuel consumption, resolves waste disposal issues and provides opportunities for issuing carbon credits. Solar PV can complement the system by supplying administrative loads..				
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General challenges in captive power decarbonization

Economic pragmatism favoring coal over renewables

Many companies recognize the imperative and long-term benefits of moving away from fossil-fueled captive power; however, they currently see no strong financial justification for making the transition

Regulatory confusion and barriers discouraging renewable capacity expansion

Companies reported difficulties from their experiences in building ground-mounted and rooftop solar PV, such as unclear permit timelines, volatile regulations, and disharmonized rules across ministries, all of which result in longer construction periods and deter investment.

Lack of regulatory mandate for captive CFPP phase-out

Companies indicated that while economic benefit is "the carrot," a strong regulatory mandate is "the stick" that would push them to transition, yet currently, neither exists. The legal and regulatory framework offers no mandatory push away from coal for captive power generation, impacting both existing and planned facilities.

Land acquisition and social issues

Renewables like wind and solar PV inherently requires significantly more land than fossil power plants, making land availability a primary obstacle for initiating projects. To address the limitations of on-site capacity, some companies are exploring the renewable potential located further away from their existing facilities. However, this introduces significant financial and regulatory hurdles.

Policy Recommendations

❑ Formalizing Power Wheeling Framework

Establish a clear regulatory mechanism that permits industrial players to access and use PLN's existing transmission and distribution network to transmit power from their self-owned RE generators. This service must be provided in exchange for a reasonable, regulated "Toll Fee" paid to PLN.

❑ Revision of "Parallel Fees" (*Biaya Operasi Paralel*)

Waive or significantly reduce parallel or standby fees for industrial users that pair their solar plants with BESS. This reduces volatility and improves grid stability while removing the financial penalty for generating renewable energy.

❑ Streamlined “Green Brownfield” Permit

Create a dedicated, fast-track permit (e.g., for "Renewable Energy on Ex-Mining/Quarry Land") that simplifies the conversion of legally required rehabilitation areas into productive RE assets, turning an environmental obligation into an energy opportunity.

❑ Fiscal Incentives for Decentralized Green Microgrids

Introduce targeted fiscal incentives (e.g., tax holidays, subsidized finance, or loan guarantees) specifically for certified hybrid microgrid projects that demonstrably displace diesel consumption in non-PLN-service areas, accelerating decarbonization in the most emissions-intensive locations.

❑ Leverage KIBL (*Kawasan Industri Berbasis Lingkungan*) Guidelines to Incentivize Tenant RE Use

Integrate mandatory decarbonization milestones into KIBL certification and offer specific tax/rental incentives or subsidies to tenants who verifiably source a high percentage of power from the estate's RE or low-carbon grid mix.

❑ Develop Blended Finance Mechanisms for Green Captive Power

Establish a dedicated, government-backed Blended Finance Facility for industrial decarbonization. This facility should: **i) Provide low-interest loans and ii) Offer risk guarantees to commercial lenders** for projects in non-PLN service areas (especially in remote areas), reducing bank risk perception.

❑ Introduce Regulatory Signals for Captive Coal Phase-out

i) Develop a structured, explicit roadmap for the gradual phase-out of captive CFPPs, including early retirement guidelines, compensation mechanisms, and loan restructuring pathways,
ii) Require all new captive power projects to follow strict eligibility criteria that exclude coal-based technologies unless justified by formal and transparent national strategic classification, and
iii) Introduce compliance monitoring for developers that commit to emissions reduction targets under Presidential Regulation 112/2022.