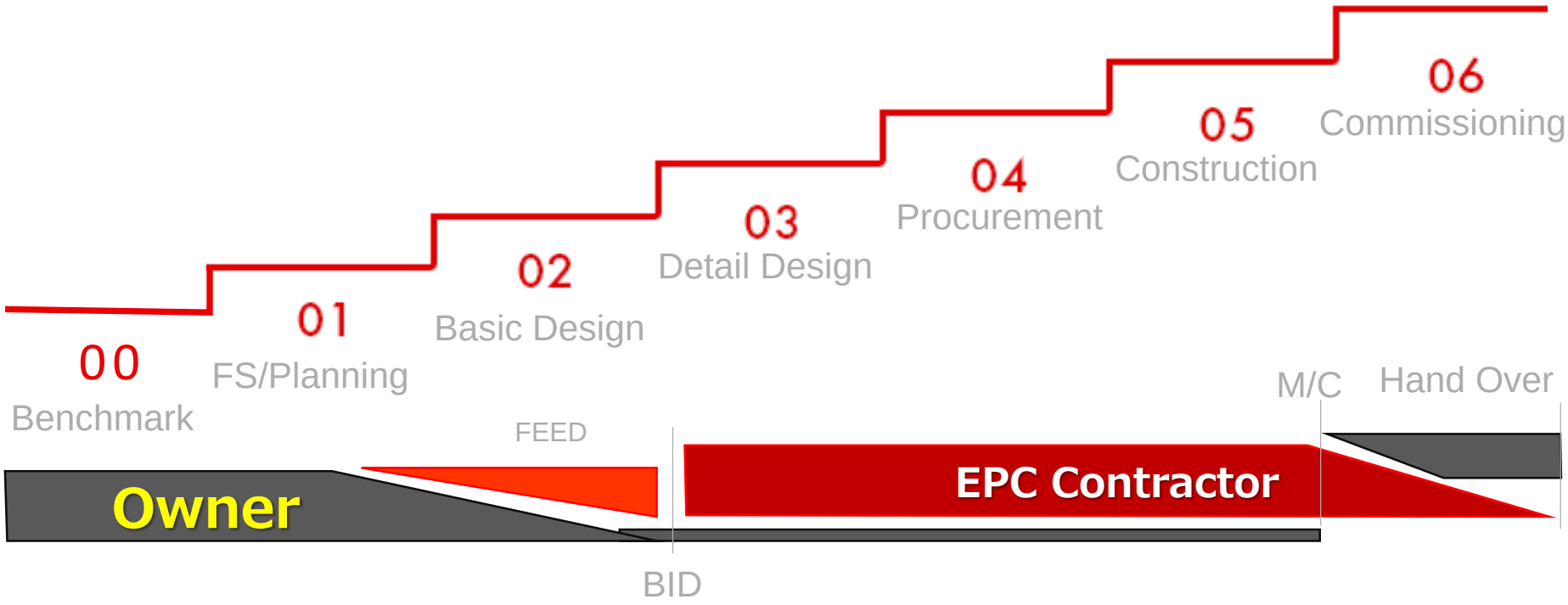
Panel Discussion

Retrofit PJ Procedure



Typical Procedure of Retrofit

① Recognition

② Targeting

STEP 1 (BENCHIMARKING)

③ Feasibility Study

④ Basic Planning

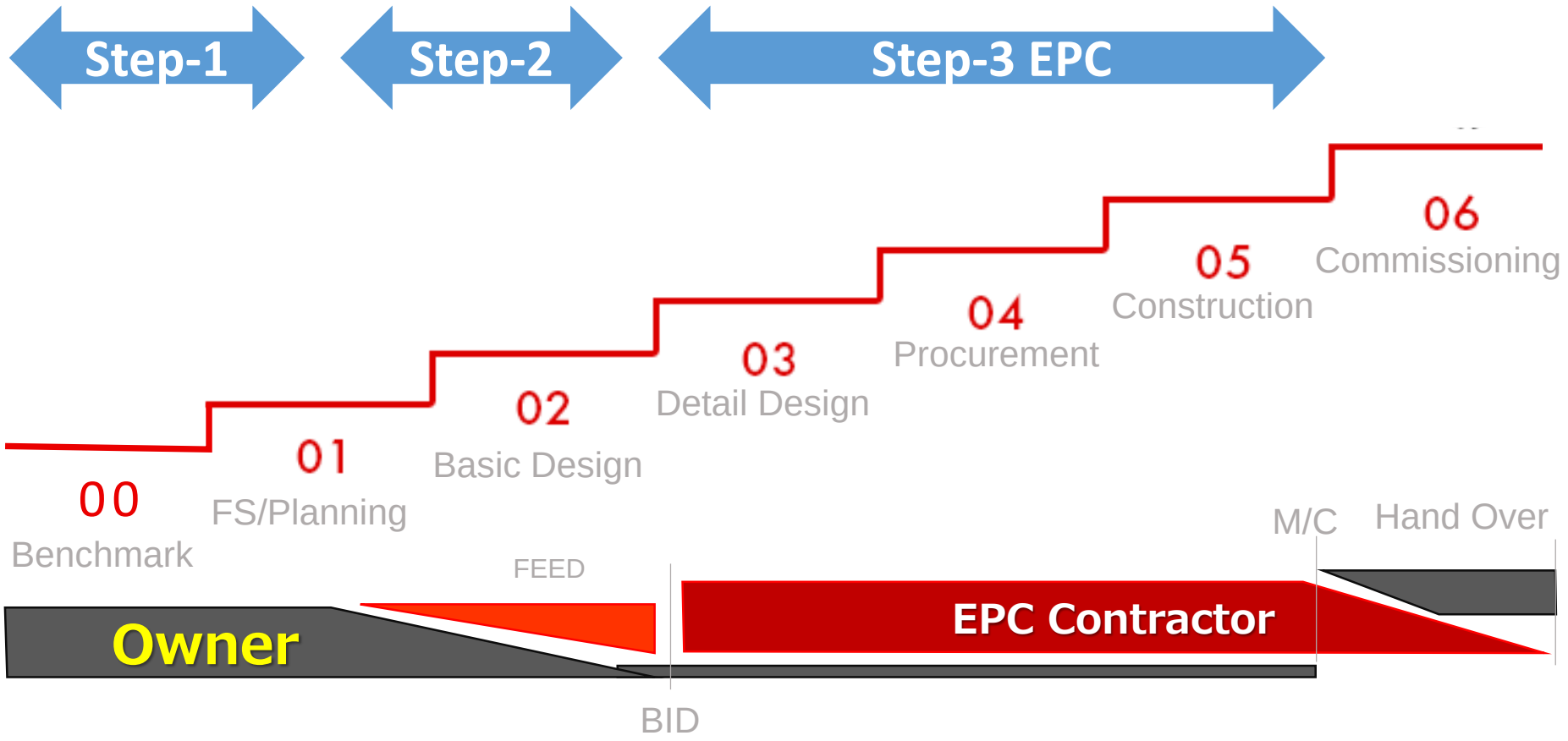
STEP 2 (PLANNING)

⑤ FEED/EPC
- Installing New Equip.
- Retrofit(=Process Modification)
- Subsidy

STEP 3 (DOING)

What Kind of Supports ?

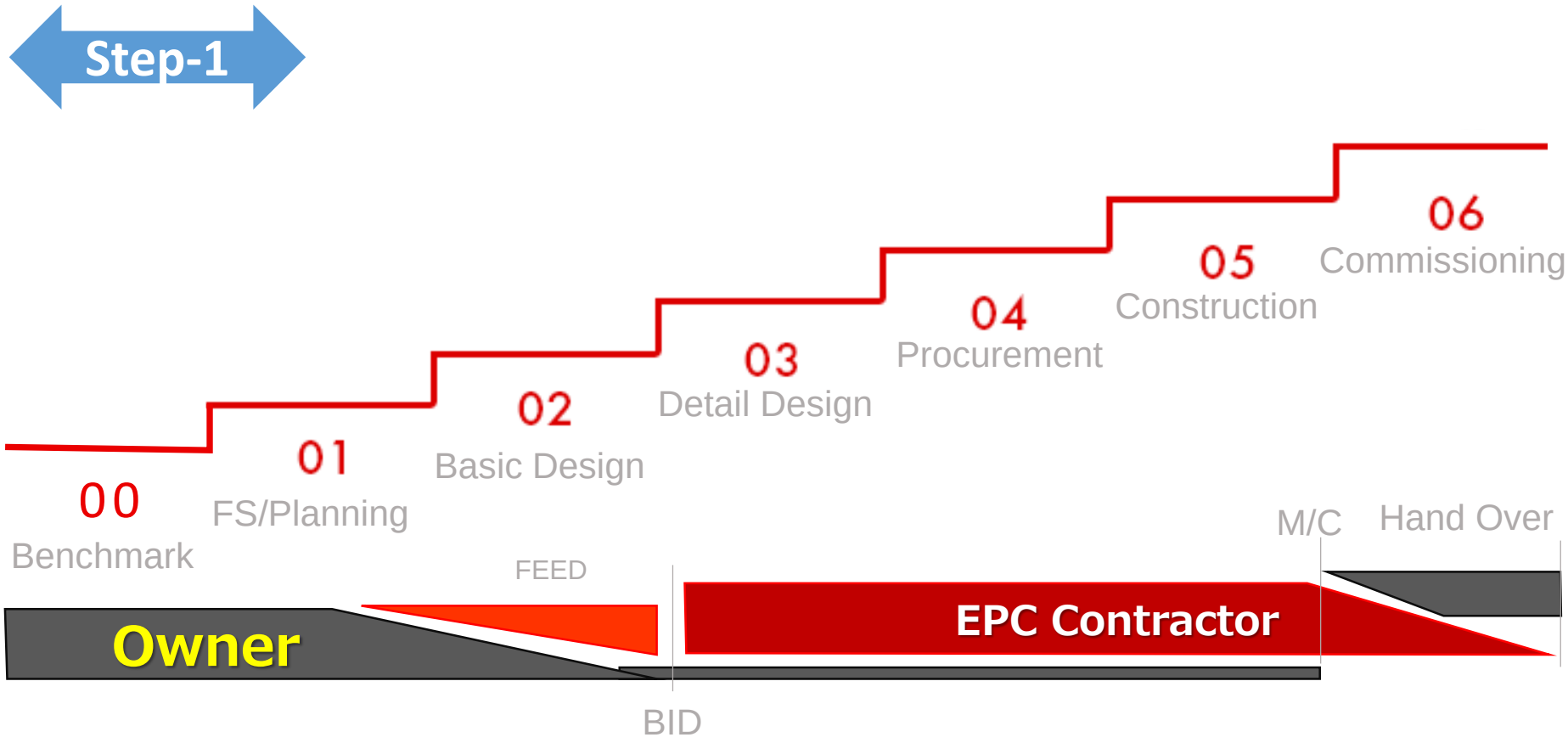
Retrofit Procedure



Singapore Specific Regulatory Challenge

Proposed requirement	Details	
Enhanced energy management practices for existing facilities	**The most energy-intensive facilities** **Consumption ≥ 500TJ/yr** • Structured EnMS by 2021 • EE opportunities assessments (EEOA) ✓ 1st EEOAs by 2021 and every 6 yrs thereafter ✓ Cover at least 80% of energy consumption	**Next tier energy-intensive facilities** **Consumption 54 – 500TJ/yr** • Structured EnMS by 2022 • EE opportunities assessments (EEOA) ✓ 1st EEOAs by 2021 ✓ review every 3 yrs the need for subsequent EEOAs ✓ Cover at least 80% of energy consumption
Energy performance measurement requirements for new facilities & major expansions	**All new energy-intensive facilities & major expansions i.e. ≥ 54TJ/yr (from 2018)** • Design and construction phase ✓ Plan for and install instruments and meters at system level • Operations phase ✓ Report energy use and energy performance indicators based on measured data ➢ Cover energy-consuming systems that account for at least 80% of total consumption	
Energy efficient design of new facilities & major expansions	**All new energy-intensive facilities & major expansions i.e. ≥ 54TJ/yr (from 2018)** • Design phase ✓ Review facility design, develop economically feasible energy/carbon efficiency measures for incorporation into the new facility and report findings	
MEPS for common industrial equipment & systems	• MEPS to be set at premium efficiency level for single speed 3-phase induction motors (from 2018) • MEPS to be extended to other common industrial equipment and systems over time	

Retrofit Procedure



STEP 1
- BENCHIMARKING -

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Monitoring / Visualization / Detection / Targeting / Recognition / Measuring / Awareness

STEP 2
- PLANNING -

Energy performance measurement requirements for new facilities & major expansions	**<u>All new energy-intensive facilities & major expansions i.e. ≥ 54TJ/yr (from 2018)</u>** • Design and construction phase ✓ Plan for and install instruments and meters at system level • Operations phase ✓ Report energy use and energy performance indicators based on measured data ➢ Cover energy-consuming systems that account for at least 80% of total consumption
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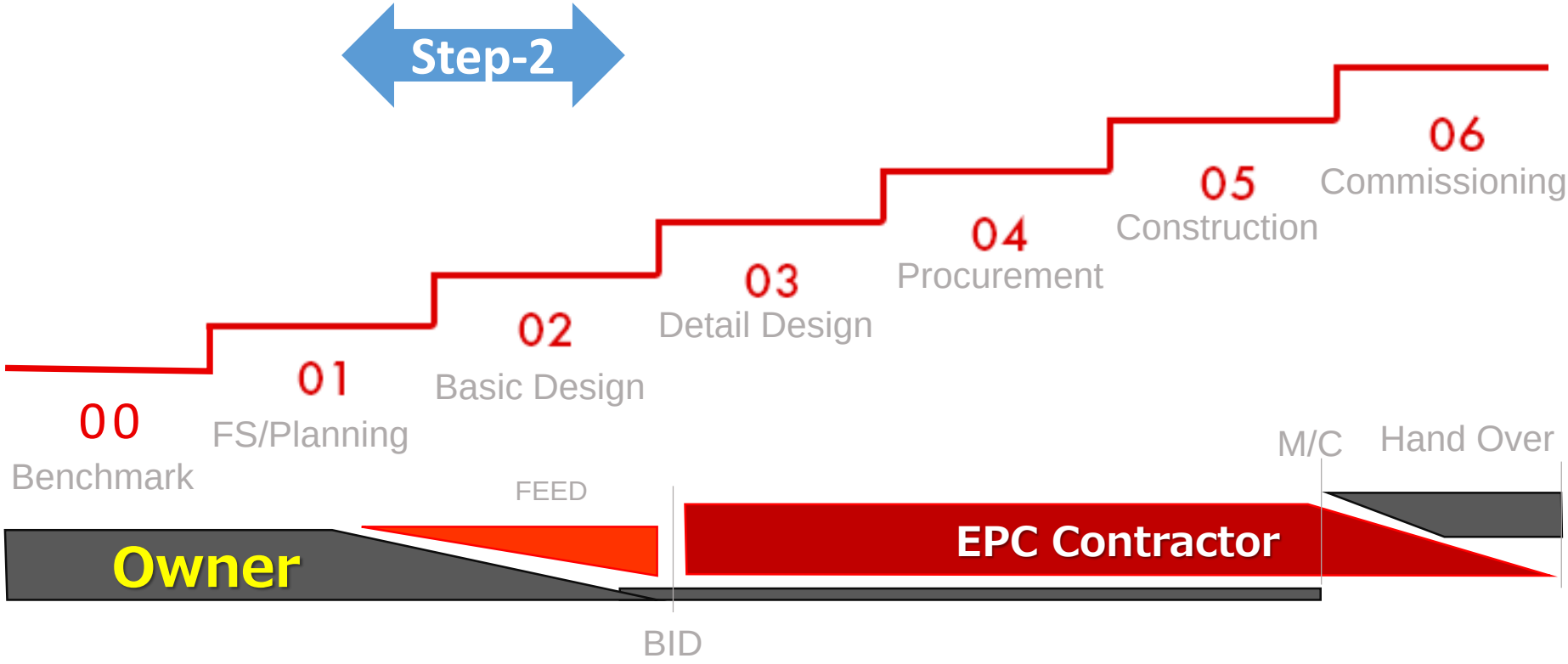
STEP 3
- DOING -

Retrofit Procedure



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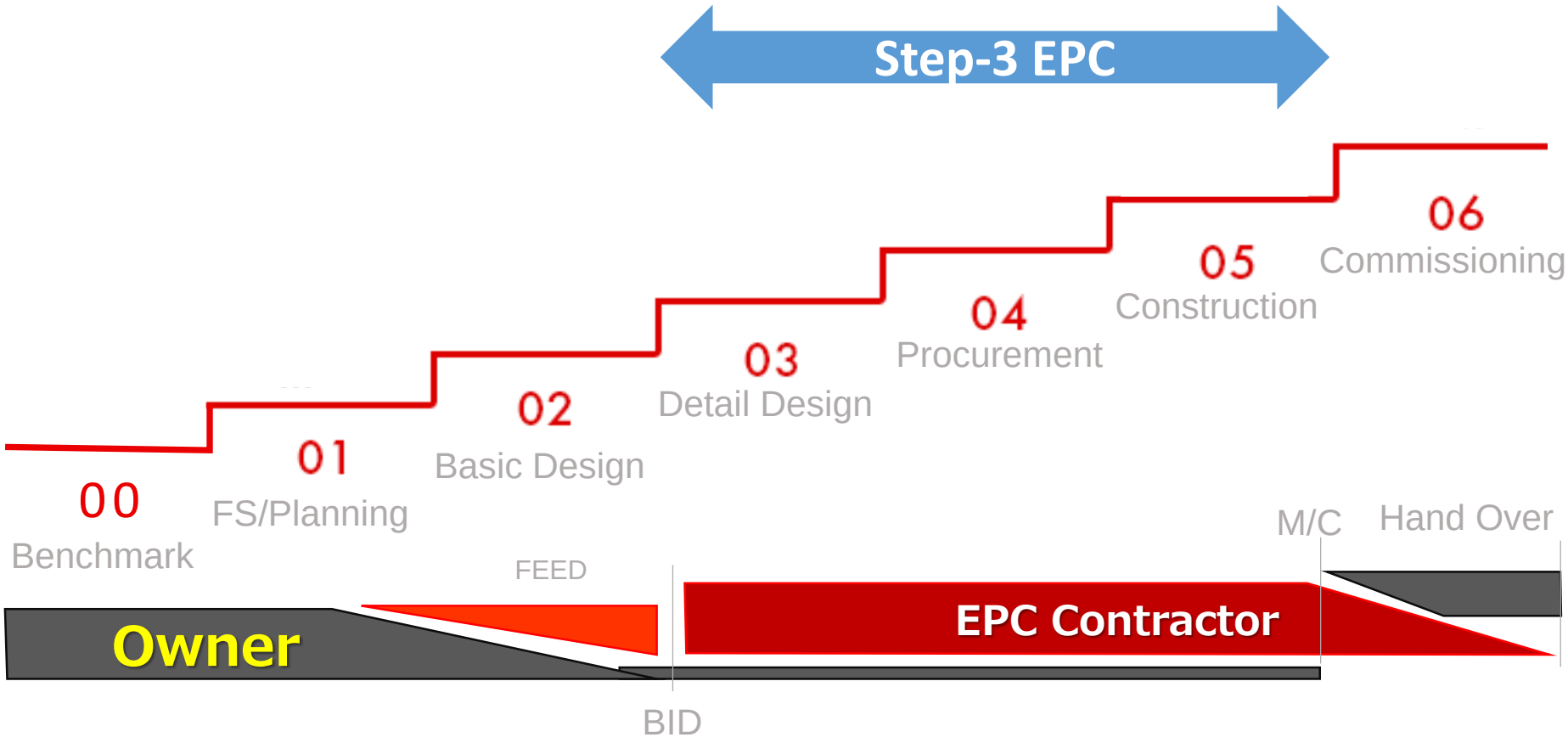
Subsidy

Retrofit Procedure



Subsidy Overview

Association Name	RING (Research Association of Refinery Integration for Group-operation)	SII (Sustainable open Innovation Initiative)
Relevant Government Office	METI (Petroleum Refining and Reserve Division)	METI (Energy Efficiency Division)
Purpose	• Strengthen competitiveness of refineries and industrial complexes	• Promotion of energy saving • Optimization of energy supply and demand
Target Company	Multiple operators including Refiners	All domestic businesses
Target Expenses	① Design cost ② Equipment cost ③ Construction cost	① Design cost ② Equipment cost ③ Construction cost
Subsidy Ratio	1／2	1／4～1／3
Maximum Amount	1 billion ¥ / year (Rules for 2018)	1 .5 billion ¥ / year

Subsidy Overview

Association Name	RING (Research Association of Refinery Integration for Group-operation)	SII (Sustainable open Innovation Initiative)
Application Requirements	① Optimization of processed crude oil (Heavy, high acid value) ② Bottom-less measures (Heavy oil production reduction) ③ High value added petroleum products ④ Shift to chemicals ⑤ Strengthening export capacity ⑥ Operational reliability	① Energy saving rate 1% or more ② Energy saving amount is over 1,000 KL(in a crude oil equivalent) ③ Cost effectiveness More than 200KL(in a crude oil equivalent) / 10 million yen ④ Energy unit improvement rate 1% or more