

LEVELISED COST OF ELECTRICITY (LCOE) and POLICY IMPACT ANALYSIS

(Results from LCOE on Selected RE Technologies in ASEAN)

RE INCENTIVES WORKSHOP
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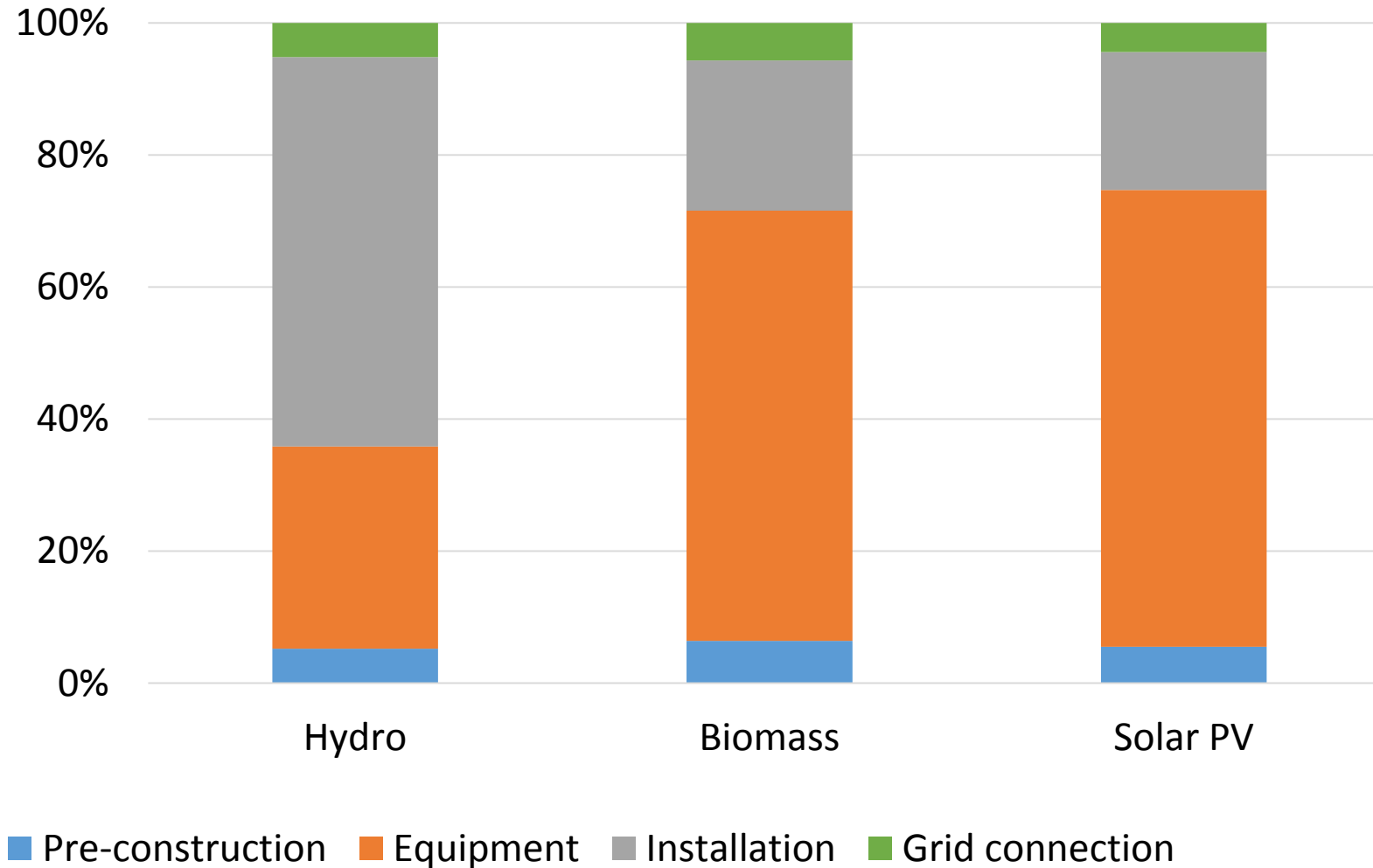
BACKGROUND AND RATIONALE

- **Energy demand in ASEAN is significantly increasing**
 - (CAGR of 4.7% from 2013 – 2035) → how to provide clean and sustainable energy access
- **Perception of high cost RE technology**
 - Cost figures are often not based on fact → vary by projects, scale, country, and over time
- **The cost of renewables has declined rapidly in the past few years and the capacity has been doubling since the last 8 years**
- **LCOE study in ASEAN is still very limited and often not based on actual data**
 - This study is based on actual projects, with total of 64 projects in 6 AMS
- **ACE to provide policy recommendation to AMS to support greater RE deployment**
 - Since economics/cost are significant decision factor and decision making is often based on inaccurate/outdated numbers

INSTALLATION COST BREAKDOWN



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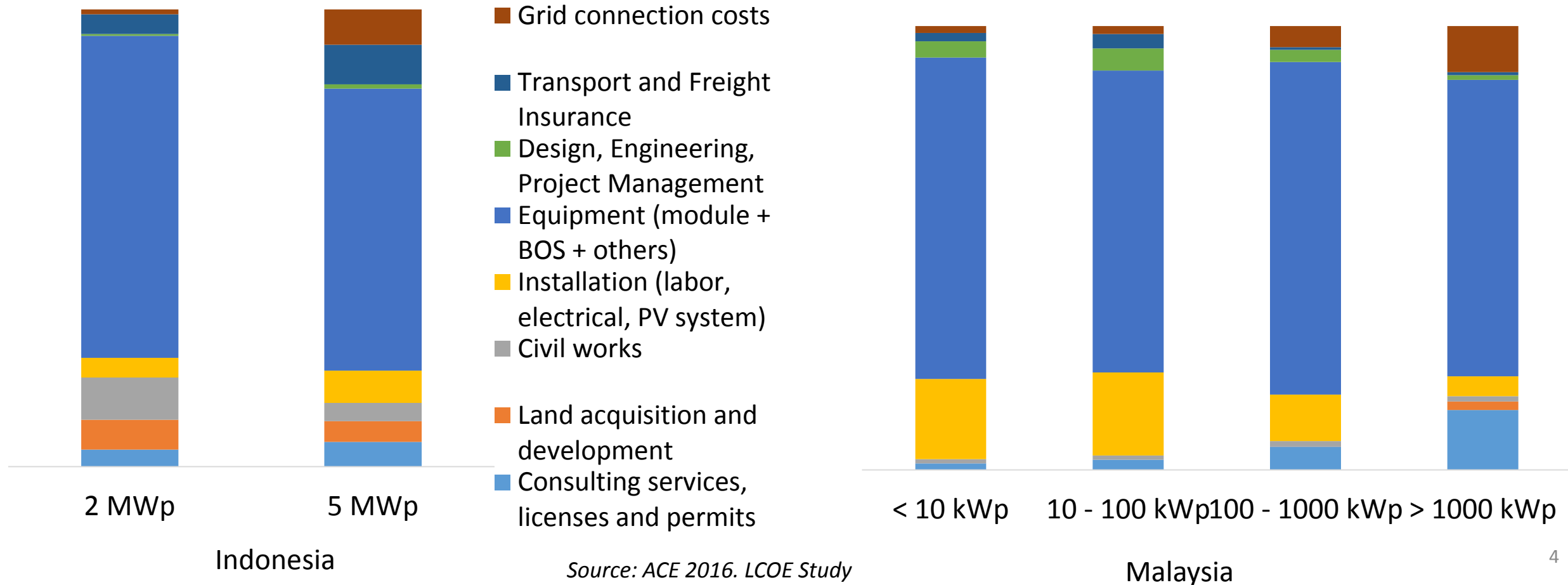


SOLAR PV - INSTALLATION COST BREAKDOWN



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60% - 70% of the cost goes to equipment (module + Balance of System (BOS))



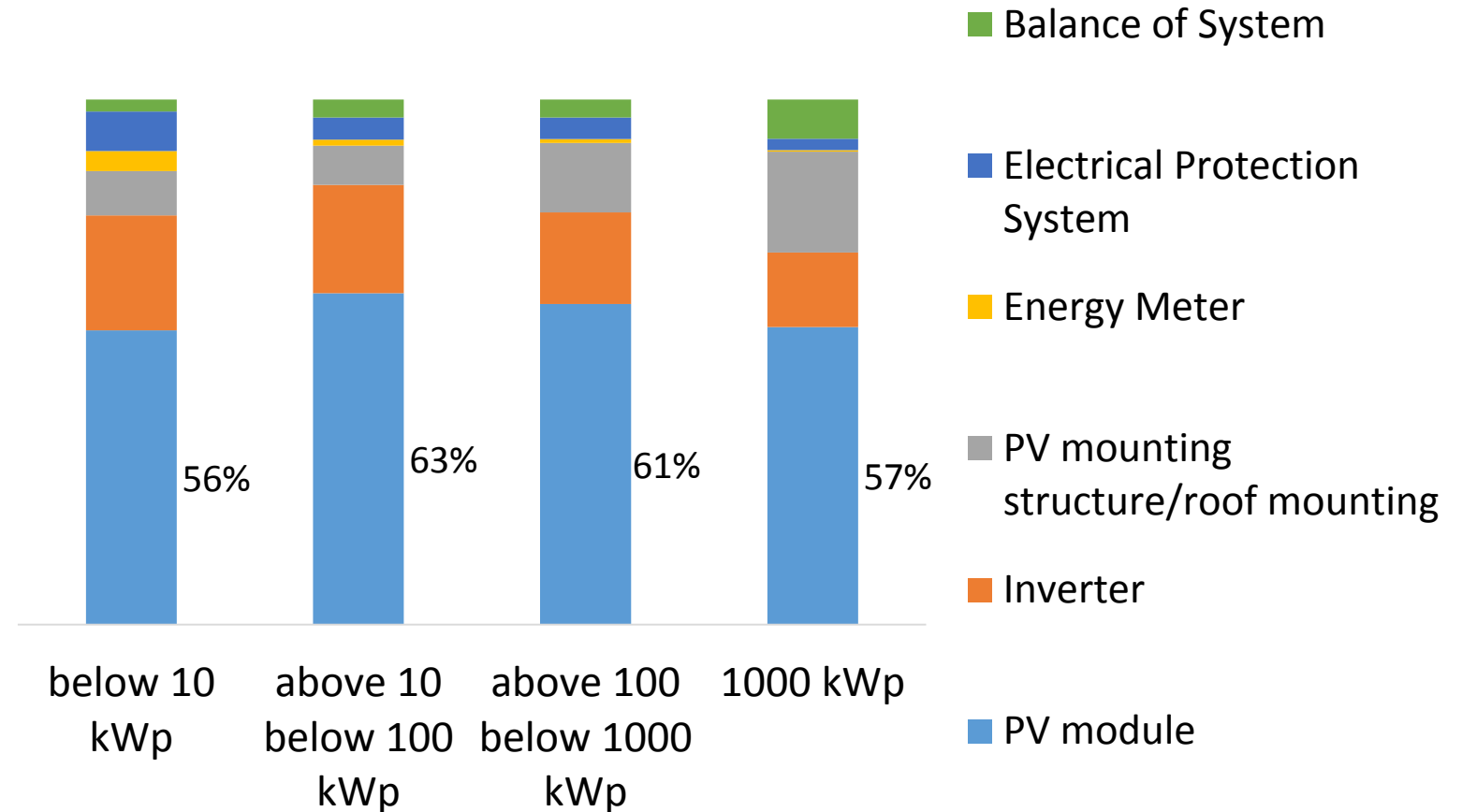
Source: ACE 2016. LCOE Study

BREAKDOWN OF SOLAR PV EQUIPMENT COST IN MALAYSIA



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- PV modules account for the biggest share ranging from 55% to 65%.
- In overall/total cost, the PV modules accounted for around 30-40%. Therefore, significant price decreasing of solar PV modules not necessarily could reduce the total cost significantly.

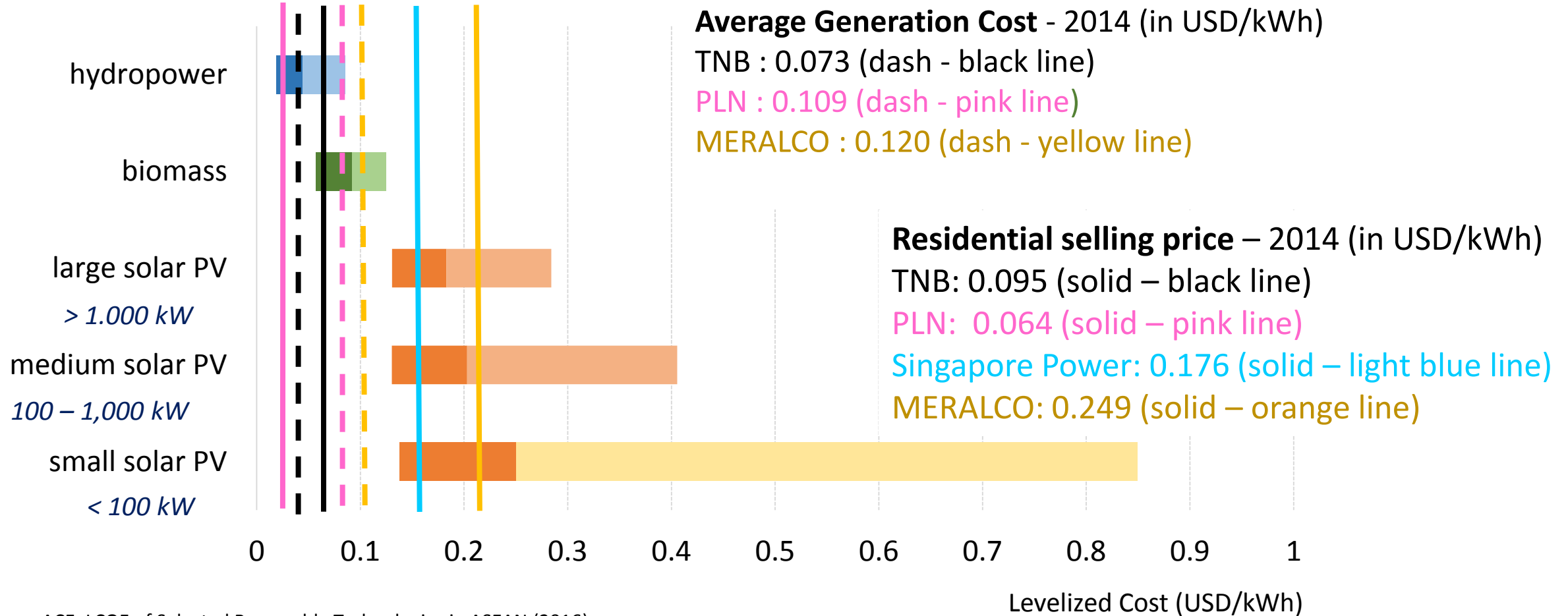


LCOE RESULTS VS ELECTRICITY PRICE



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The subsidy to electricity price could cause the non-competitiveness of RE



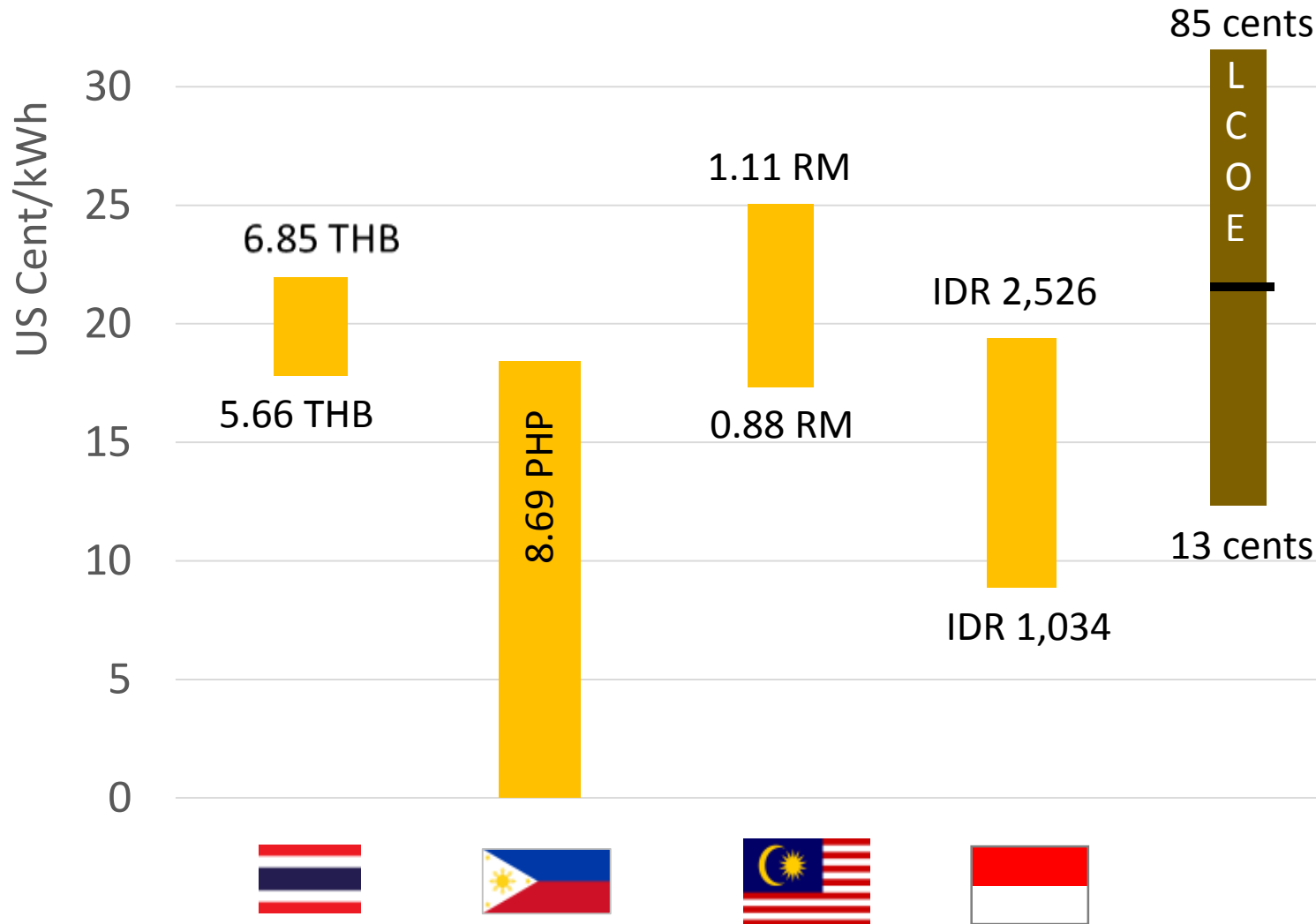
FOSSIL FUEL SUBSIDIES

Impacts of fossil fuel subsidies:

- Lower the price of electricity generated from fossil fuels, paid by energy consumers, to below levels that cover the full cost of supply
- Major fiscal imbalances due to the difference between market and subsidized energy prices
- Distorted production and consumption pattern for critical resources, stalled the growth of cleaner fuels and technologies
- Discourage energy efficiency and conservation measures and undermine incentives to invest in R&D efforts on renewables.

ASEAN Member States have been undertaking several policy actions to gradually remove the subsidies

FEED-IN-TARIFF FOR SOLAR PV AND RE INCENTIVES IN ASEAN



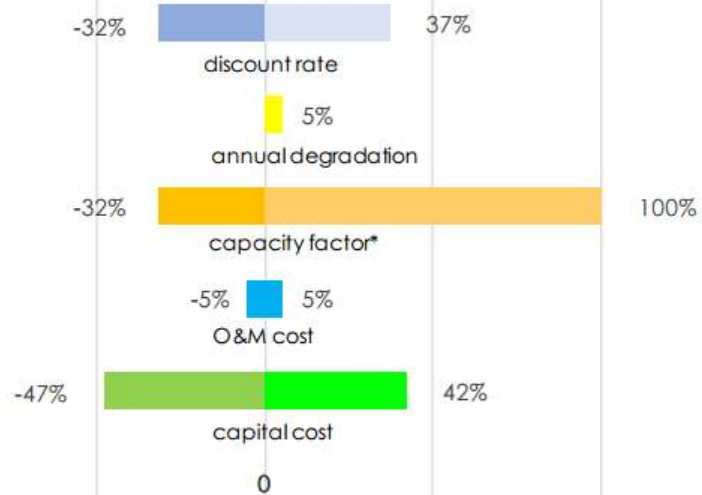
Other incentives for RE Projects

- Income tax holiday
- Duty free importation on RE machinery, equipment and materials
- Zero % VAT rate
- Accelerated depreciation
- Etc.

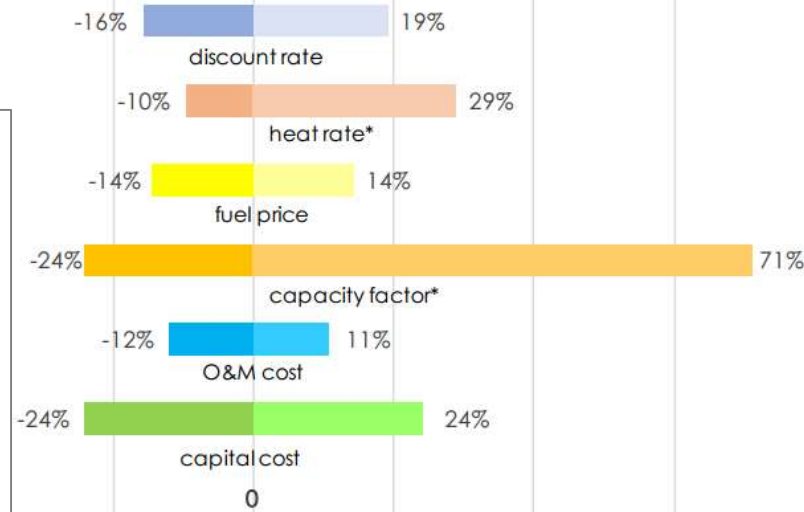
SENSITIVITY ANALYSIS

- Sensitivity analysis were conducted by changing the parameters to $\pm 50\%$
- The most impactful key parameters to be targeted for policy making : capacity factors, capital cost, and discount rate

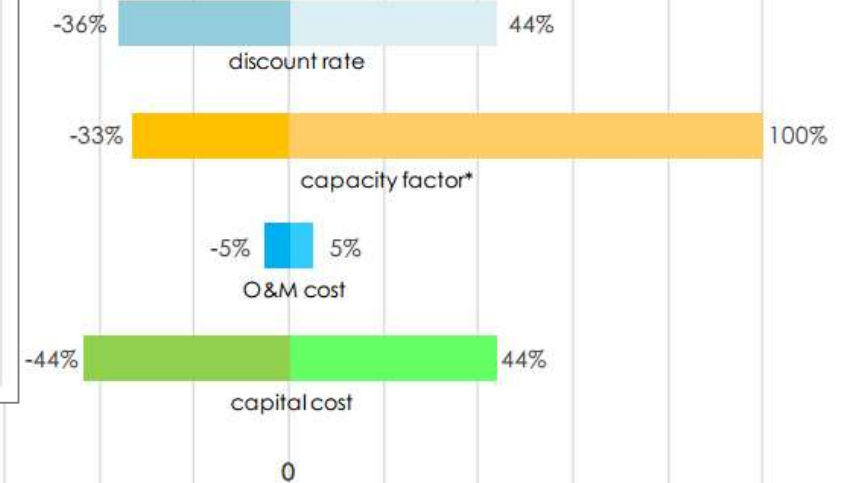
Solar PV



Biomass



Hydro



POLICY IMPACT ON SOLAR PV LCOE PRICE- CASE STUDY

A case study of 5 MW_p solar PV project was established and being used to simulate the impacts of different policy measures on LCOE and project profitability.

Cost Parameters

- Capital Cost: USD 2.236 million/MW
- Operating Cost: 1.16% of Capital Cost

Fiscal Parameters

- Corporate tax rate: 25%
- Income tax holiday: no tax holiday
- Depreciation period: 20 years

Technical Parameters

- Installed capacity: 5 MW_p
- Capacity factor: 17%
- Annual production degradation: 5%

Financing Parameters

- Debt share: 67%
- Interest rate: 7%
- Grace period: 2 years
- Loan term including grace period: 7 years
- Return on equity: 18.4%

Others

- Project useful life: 20 years
- Construction period: 1.0 years
- Feed-in tariff: USD 0.23 per kWh
- Discount rate: 9.6%

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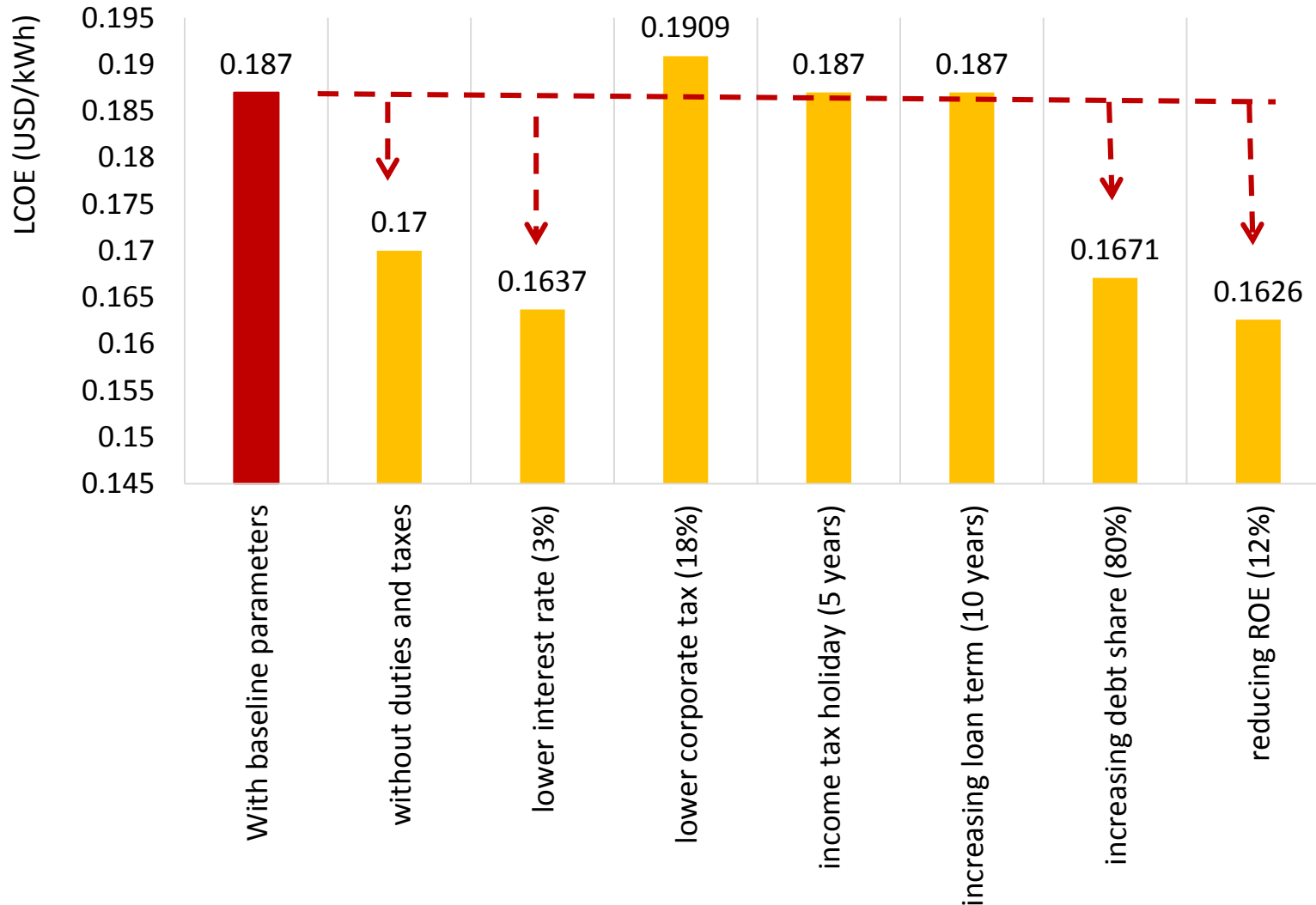
- Corporate tax rate: 25% (change to 18%)
- Income tax holiday: no tax holiday (with tax holiday of 5 years)
- Depreciation period: 20 years

Apply import duties and tax exemptions (taxes account around 10% of the capital cost)

Financing Parameters

- Debt share: 67% (change to 80%)
- Interest rate: 7% (change to 3%)
- Grace period: 2 years
- Loan term including grace period: 7 years (change to 10 years)
- Return on equity: 18.4% (change to 12%)

POLICY IMPACT ON SOLAR PV LCOE PRICE- CASE STUDY



- Any policy measure that targets the reduction of capital and operating costs
 - Duties and taxes exemption
 - Lower interest rate
 - Increasing debt share
 - Reducing ROE

CONCLUSION

- ASEAN will experience the significant increase of RE in power sector, especially for solar PV, wind and bio-energy.
- The LCOE result shows that **solar PV** has the **highest** LCOE with average of 0.22 USD/kWh; while **hydro** has the **lowest** at 0.044 USD/kWh. LCOE of biomass is 0.088 USD/kWh
- Renewable energy has reached grid parity (hydropower and biomass, taking Philippines cost as a reference). Subsidy is one of the factor that caused the non-competitiveness of RE
- Policy makers shall continue the efforts to reduce the RE cost such as simplifying permit and procedures, land acquisition process and information transparency
- The most impactful key parameters to be targeted for policy making : capacity factors, capital cost, and discount rate
- Policy that bring positive impacts to LCOE: exemptions from import duties and taxes, lowering loan interest rate, increasing debt share and reducing Return of equity

Thank you.



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