



Energy Transition in the Philippines – a Case Study

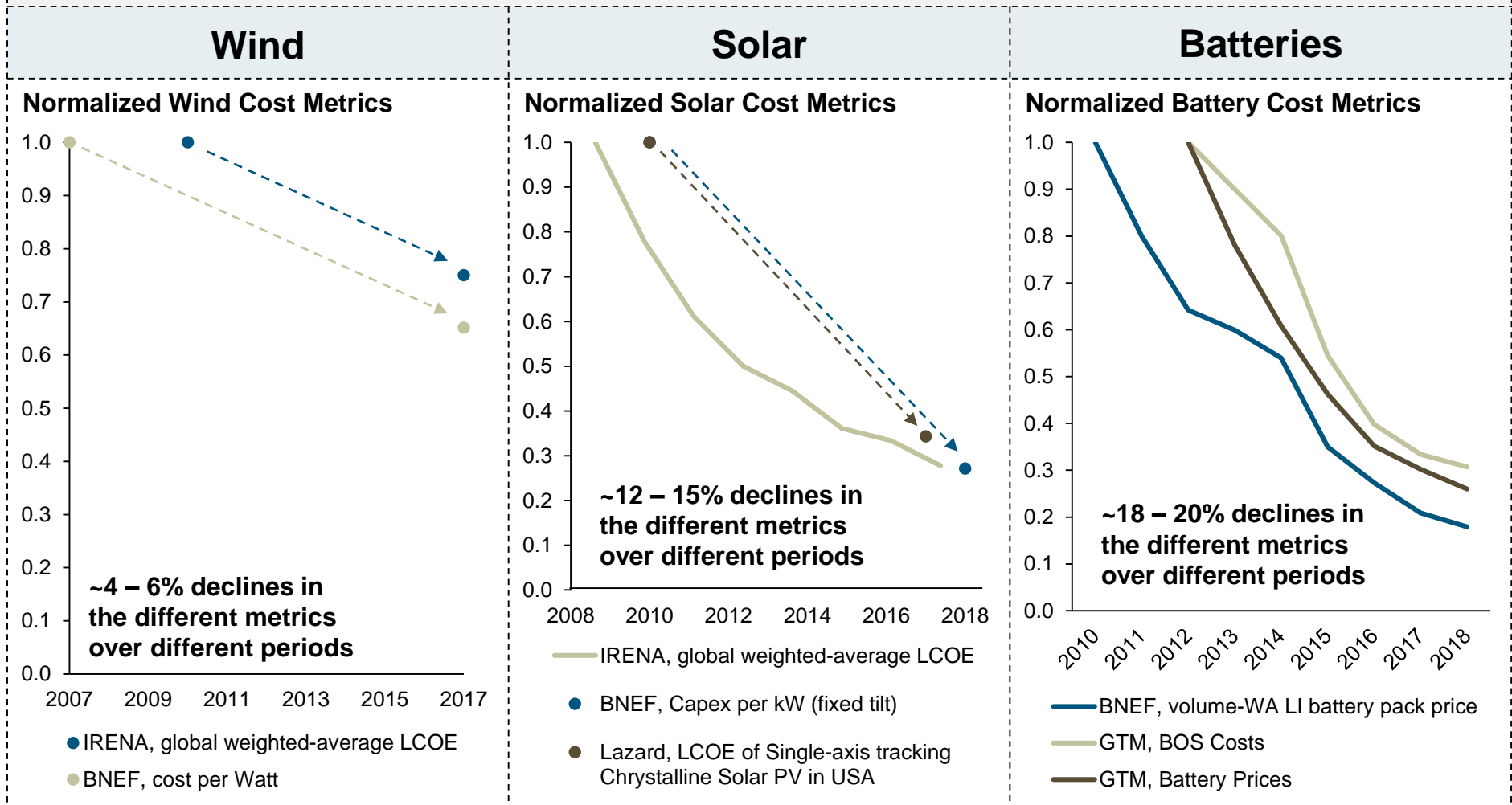
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The Energy Transition is coming, but what does that mean?

- This Energy Transition will accelerate in the coming years in a non-linear fashion as various ‘tipping points’ are reached, and will continue to build up speed over the coming decades
- The interaction of policy and regulation with commercial realities remains a significant uncertainty, and will be an important factor in how this transition unfolds in various jurisdictions
- Because the Philippines is a merchant market with substantial private sector ownership, we expect it to be particularly active in the coming years, making it a useful case study

Recent reductions in the costs of new technologies have been stark, ushering in new economic realities that open up the door for an 'Energy Transition'

Recent Cost Declines in New Technologies



These trends are expected to continue, reaching important tipping points that will result in accelerated adoption rates; we model three cases in this analysis

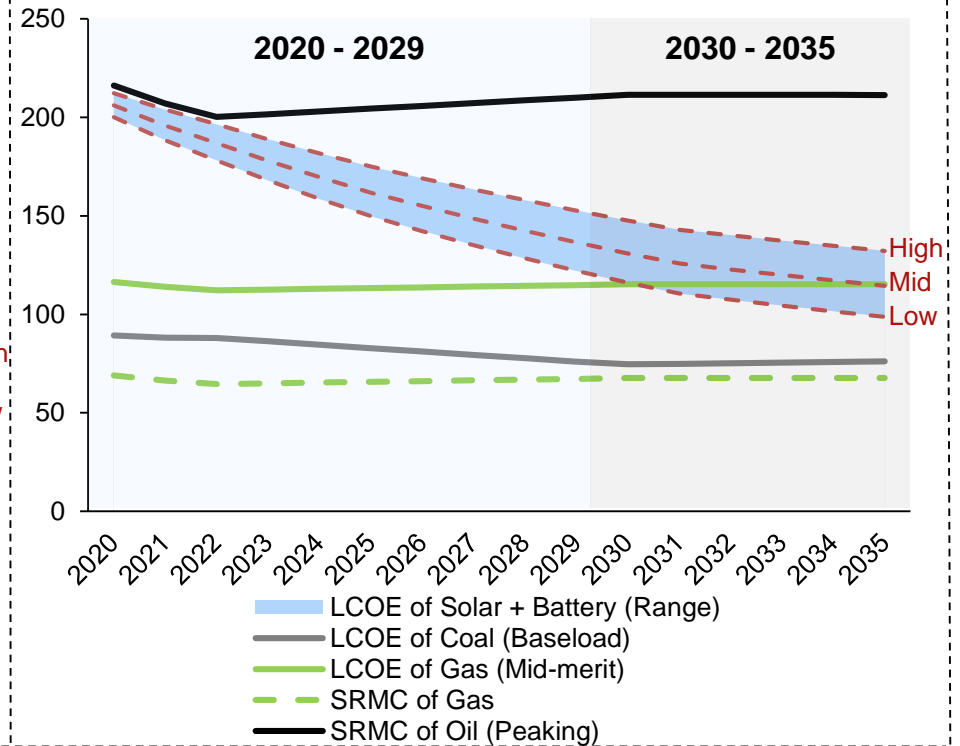
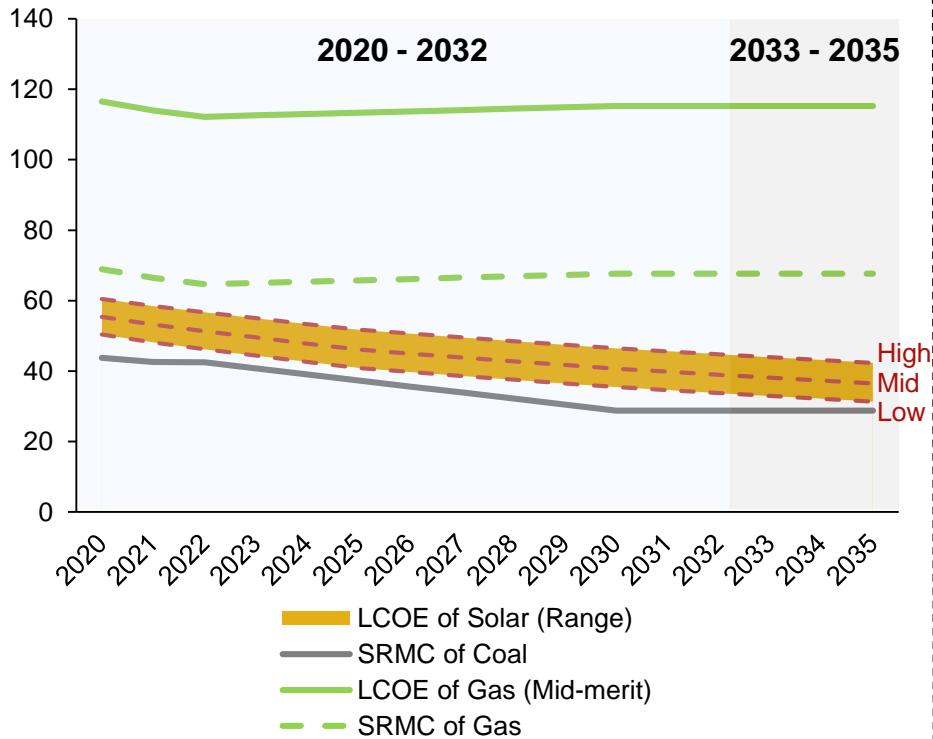
Comparison of Levelised Technology Costs over Time (Luzon, Philippines)

Solar

Li-Ion Battery Storage (charged with new solar)

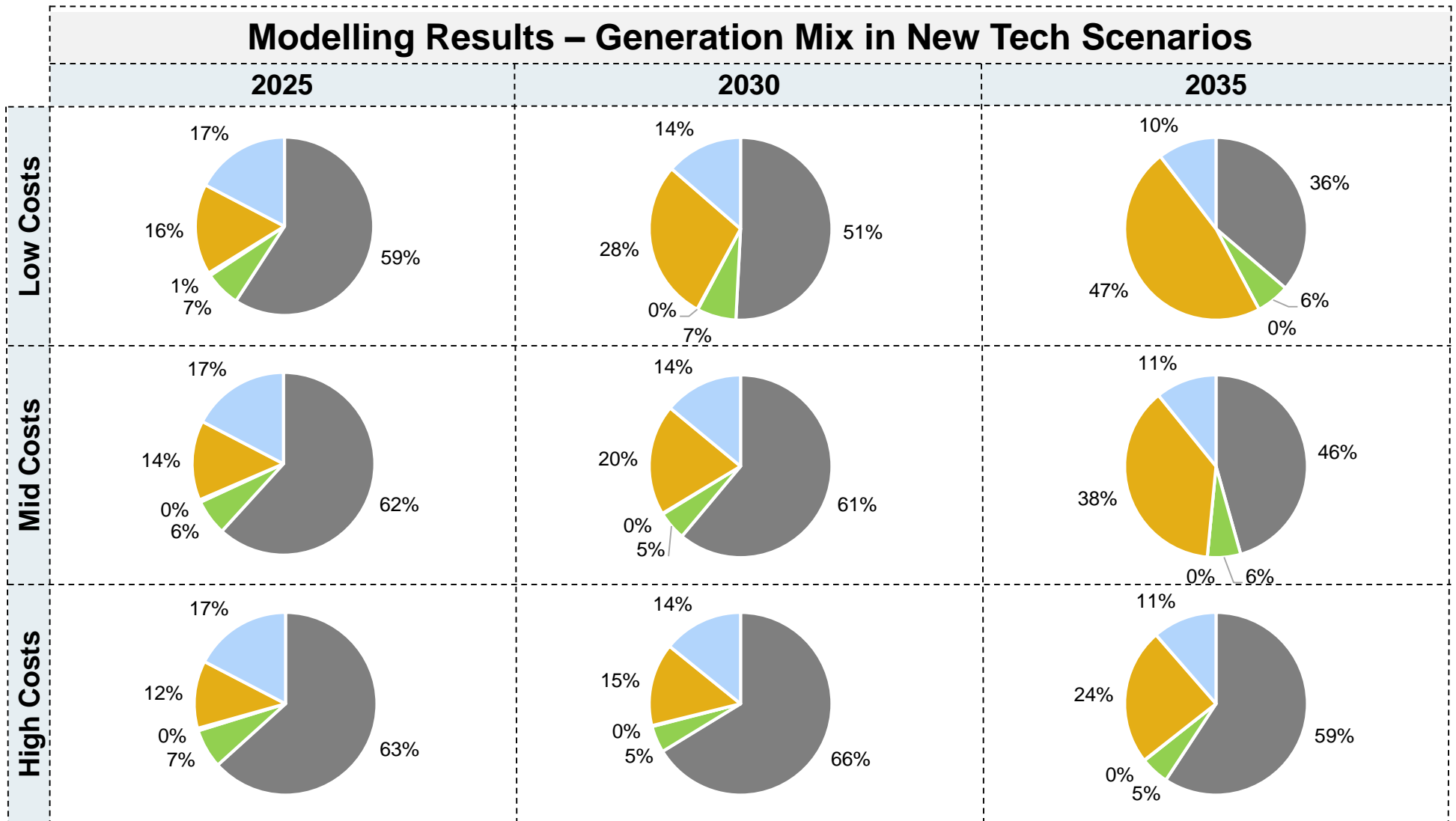
USD/MWh (2018 Real terms)

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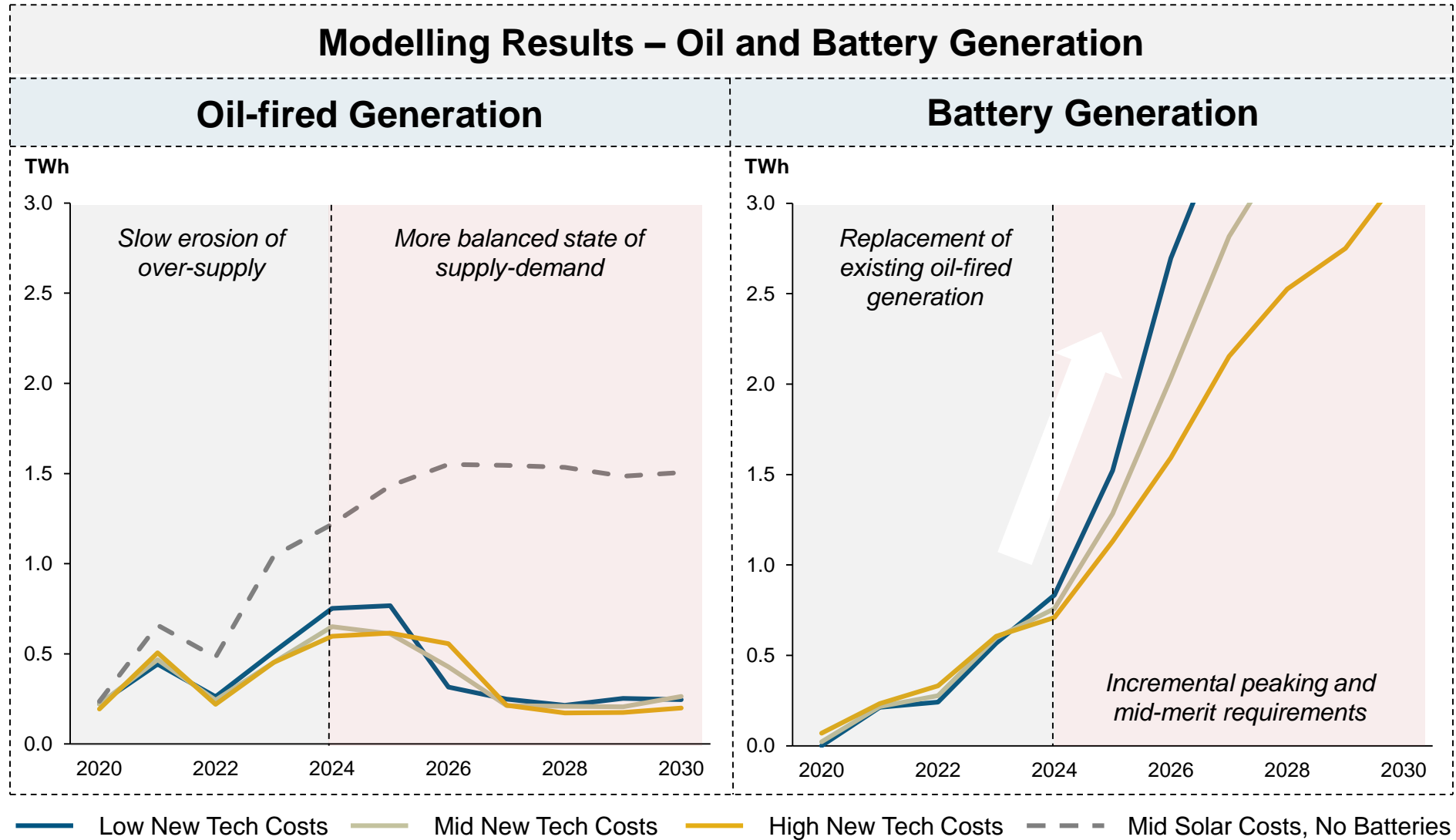
Notes: assumptions include capacity factor of 80% for coal; a capacity factor of 45% for CCGTs; battery autonomy of four hours, cycling once per day with maximum of 80% DoD and 4% p.a. capacity degradation; real FOB coal prices converge on 60 USD/MT; real Brent prices converge on 70 USD/bbl; regasification fee of 1.5 USD/mmbtu; LNG prices based on oil-linked contract with slope of .12 and constant of 0.5

All cases see accelerating adoption of solar and batteries; the timing and rate of adoption depends on when the various tipping points are reached

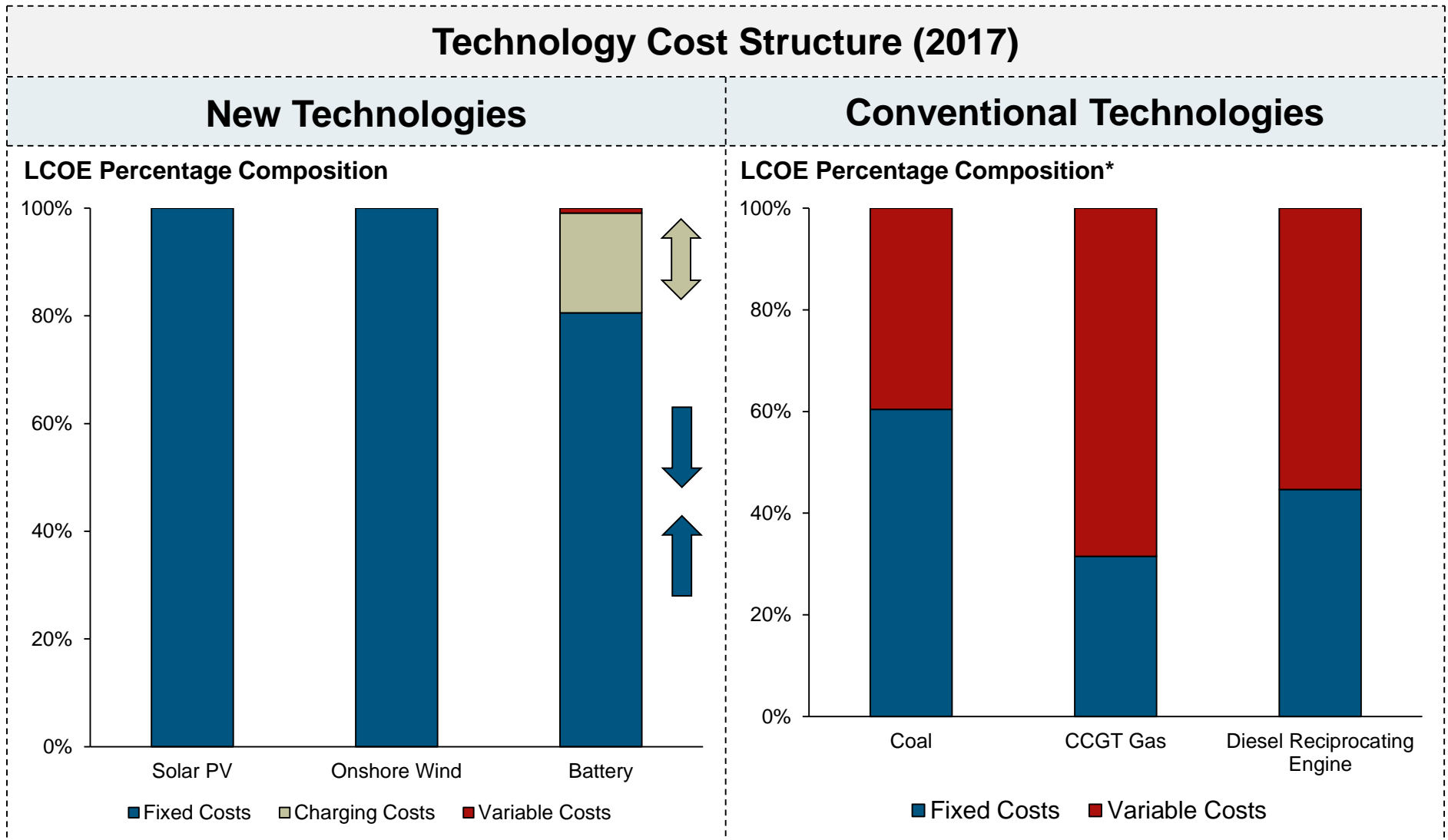


■ Gas
 ■ Coal
 ■ Solar & Batteries
 ■ Oil
 ■ Other

Early adoption of batteries is driven by the replacement of existing oil-fired generation, particularly in the Visayas and Mindanao



These new technologies tend to have very different cost structures from 'conventional' generation resources, largely made up of upfront capital costs



Sources: Lazard Levelized Cost of Energy 2017; TLG Analysis

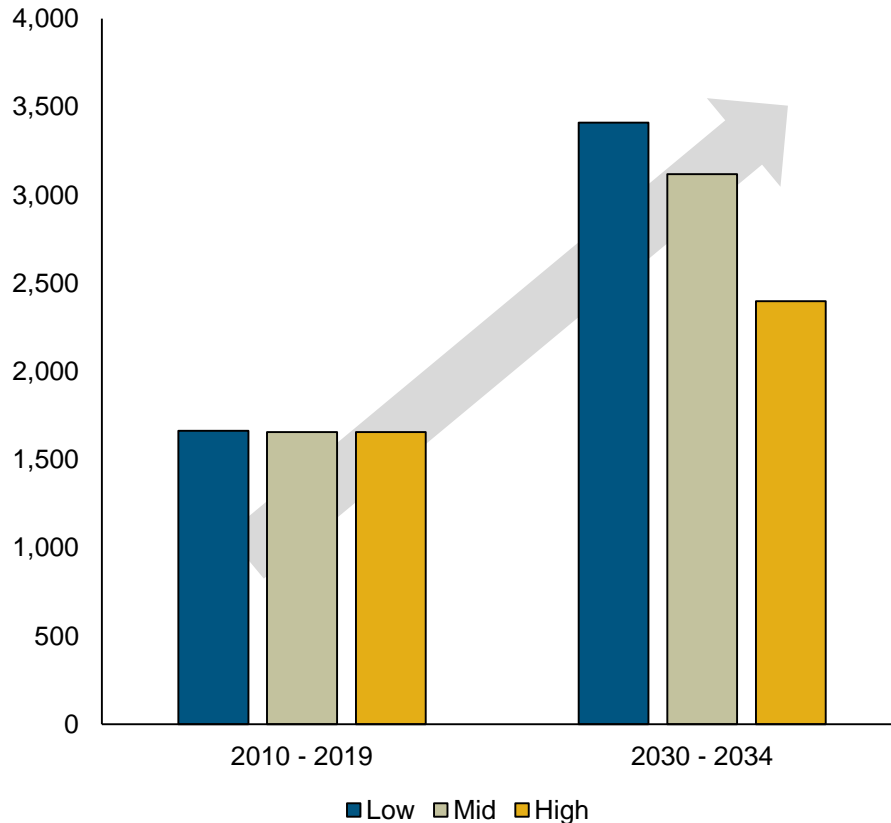
* Cost structures shown for varying Capacity Factors: Coal at 80%; Gas at 45%; Diesel at 15%

The realisation of this outcome thus requires an acceleration of investment and a forward-thinking methodology for evaluating new procurement

Reference Case Modelling Results

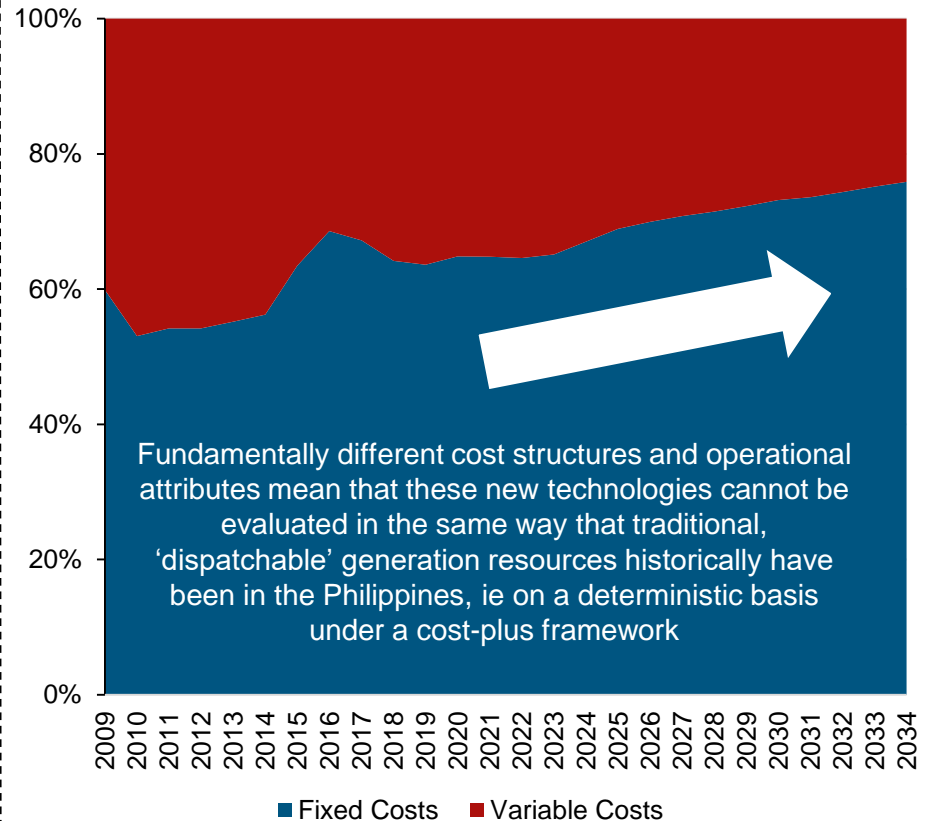
Estimated Investment Requirements

Million USD p.a. (2018 Real terms)



Estimated System Cost Make-up

Fixed and Variable Costs as % of Total System Cost (Mid Case)



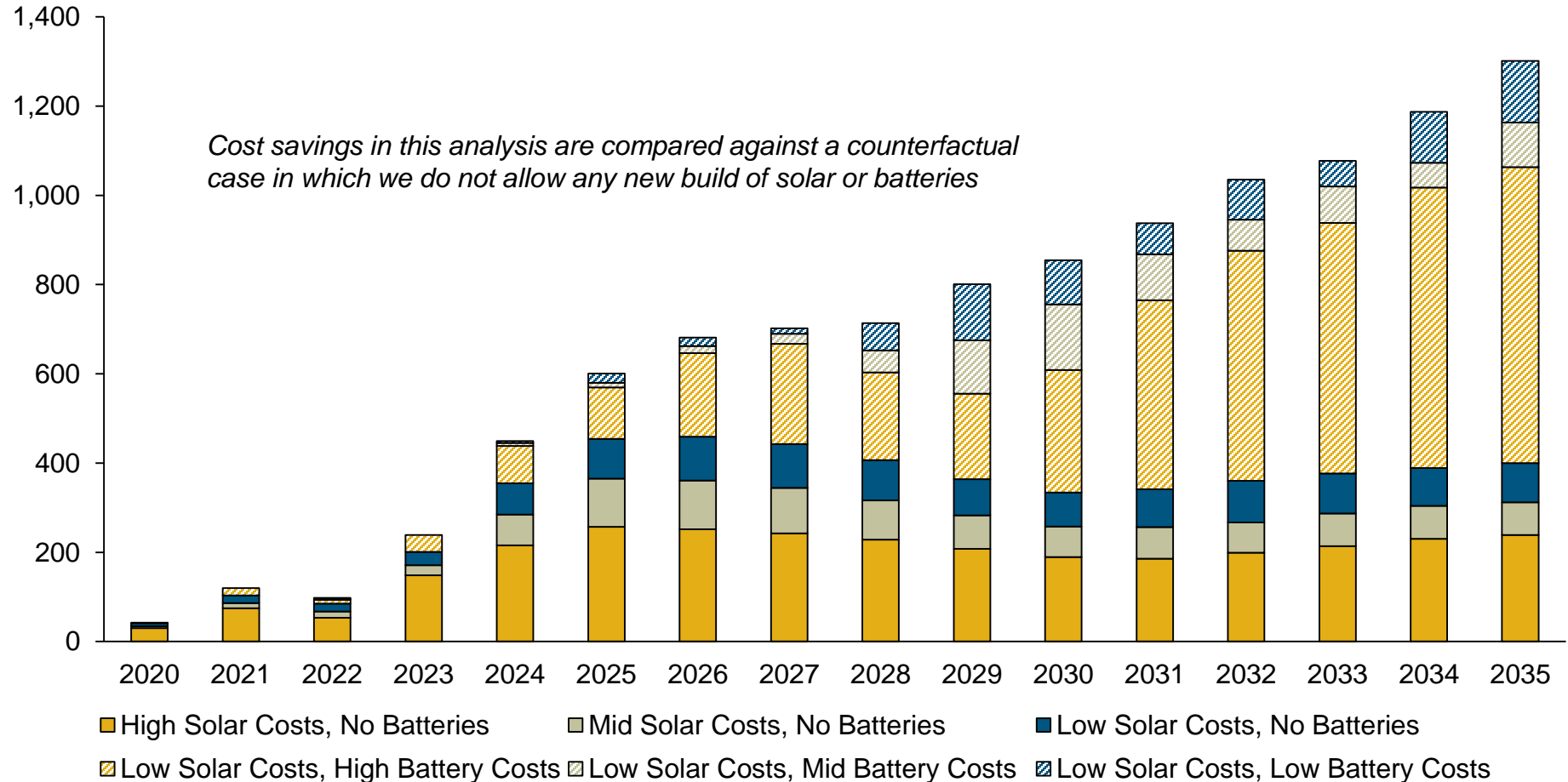
Changes in regulation and policy will be required to fully realise this transition

Regulatory Risks and Solutions	
Risks	Factors
(1) Execution Risks	<ul style="list-style-type: none"> • Coordinating development of land and grid consistently with projects • Ensuring adequate and timely procurement of ancillary services • Ensuring payment of ancillary services by the appropriate causer/beneficiary
(2) Competitive Selection Process (“CSP”) Risks	<ul style="list-style-type: none"> • How will CSP really work (operationalisation uncertainty) <ul style="list-style-type: none"> • Consistent and unbiased evaluation across fuels and technologies • Who will bear what risks, and how will these risks be quantified in the scheme
(3) Investment Risks	<ul style="list-style-type: none"> • Counterparty contracting risks <ul style="list-style-type: none"> • Rollout of Retail Competition and Open Access (“RCOA”) and treatment in contracts • What premium/penalty for RCOA clause in PSAs • Supplements to LT contracting (capacity market; removal or increase of energy market price cap; etc)

It is important that this transition is enabled, as it has the potential to substantially reduce end-user bills

Annual Savings for End-User due to Solar and Batteries

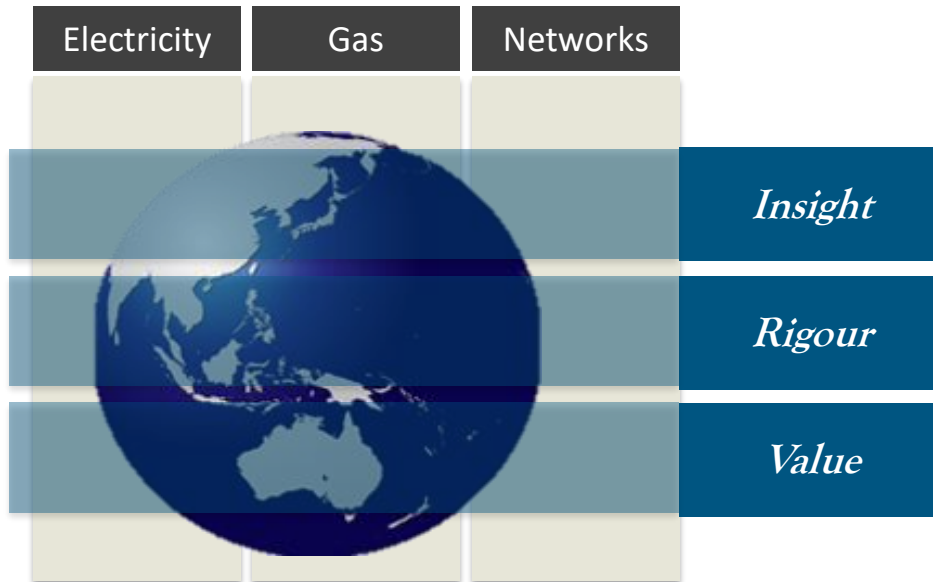
Million USD p.a. (2018 Real terms)



Concluding Remarks

- The electricity sector is poised to undergo a fundamental transition in the coming decades
- We expect this transition to accelerate in a non-linear fashion over this timeframe as different relevant tipping points are reached and substantially surpassed
- There are a number of commercial and regulatory hurdles that need to be carefully addressed, which will be important factors in determining the path of this transition in various jurisdictions
- This transition has the potential to substantially benefit the consumer in the form of lower bills, and result in lower CO2 emissions
- This transition will create huge opportunities (risks) for different stakeholders in the sector, which can only be capitalised on (mitigated) to the degree that they are understood and anticipated

Questions?



Thank you!

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This presentation can be found online at:
www.lantaugroup.com