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Enabling Renewables at Scale: *Key Needs and Opportunities for Grid-Connected Solar & Wind in Asia*

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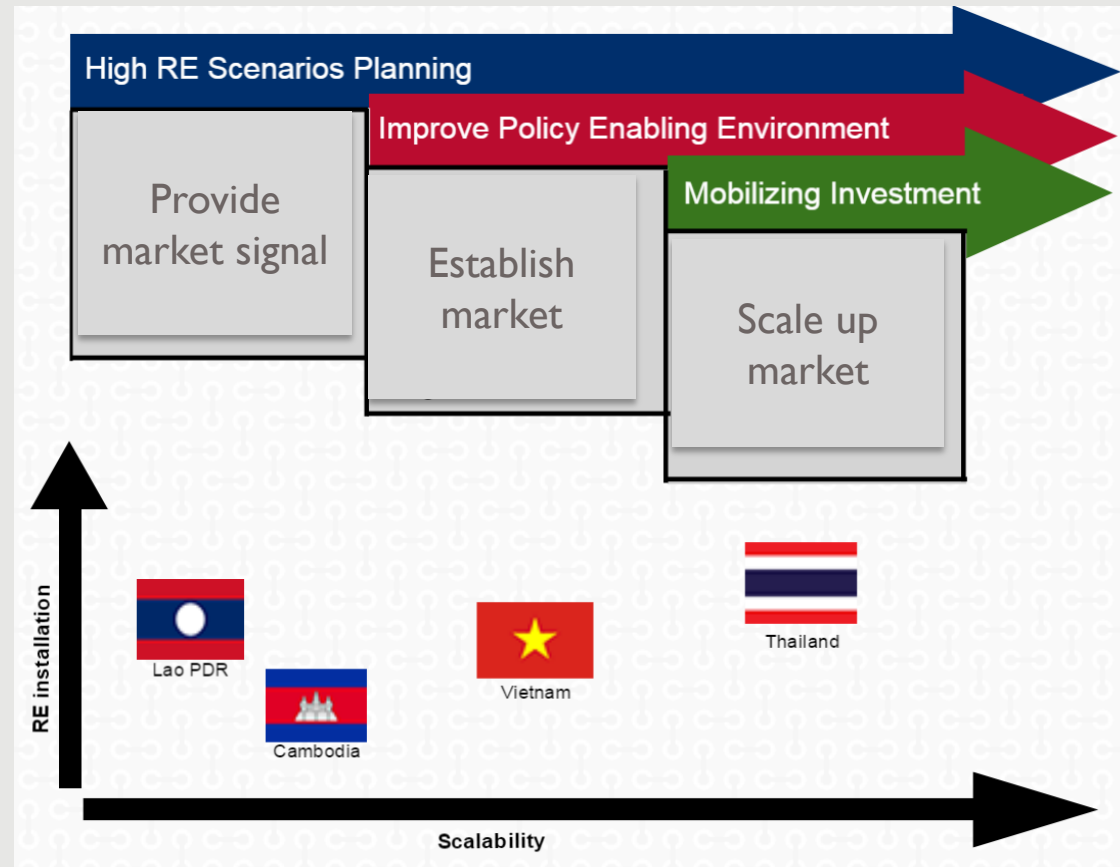
USAID CLEAN POWER ASIA

Enabling Renewables at Scale: *Key Needs and Opportunities for Grid-Connected Solar & Wind in Asia*

- Overview & Opportunities
- Constraints, Barriers, and Risks
- Enabling Private Capital Investment at a Larger Scale

USAID Clean Power Asia aims to increase deployment in 'grid-connected' renewable energy in Asia

- ❑ 5 years: June 2016 – June 2021
- ❑ Regional clean energy program
- ❑ Focus on Cambodia, Lao PDR, Thailand, and Vietnam
- ❑ Goals:
 - ❑ 15 laws/policies/regulations
 - ❑ \$750 M USD investment mobilization
 - ❑ 500 MW of installed RE
 - ❑ 3.5 M tCO2e reduction
- ❑ Implemented by Abt Associates and partners
- ❑ Funded by USAID (United States Agency for International Development)



Solar PV & wind markets can be divided in 3 phases

(I) Limited market

Regulatory:
No regulatory framework allowing private sector to invest and build solar PV & wind power projects

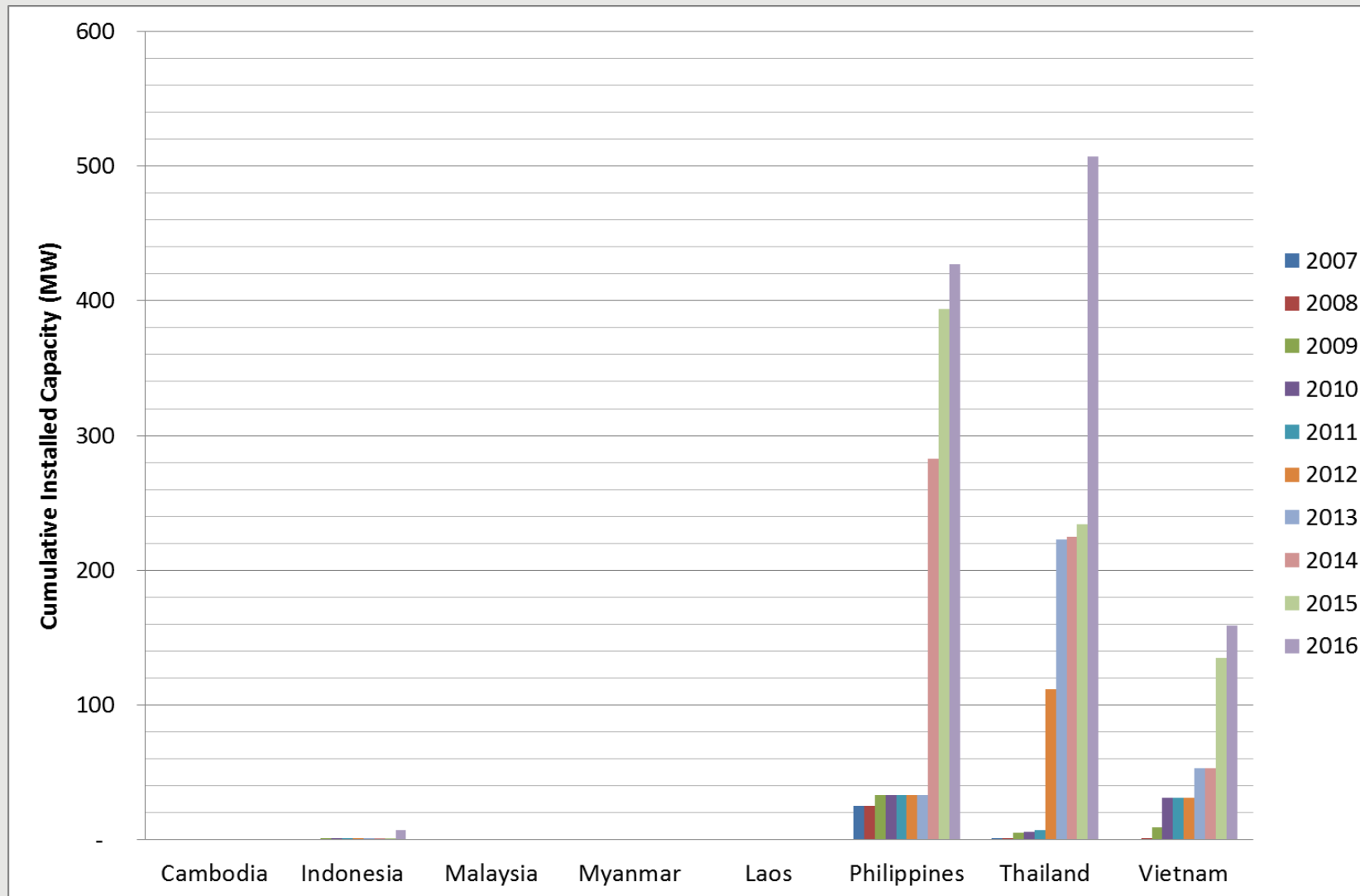
(II) Quota-based market

- **Regulatory:** Limited MW of solar PV and wind power is allowed to connect to the grid
- **Commercial:** Bankability of project
- **Financing:** access-to-finance

(III) Free market

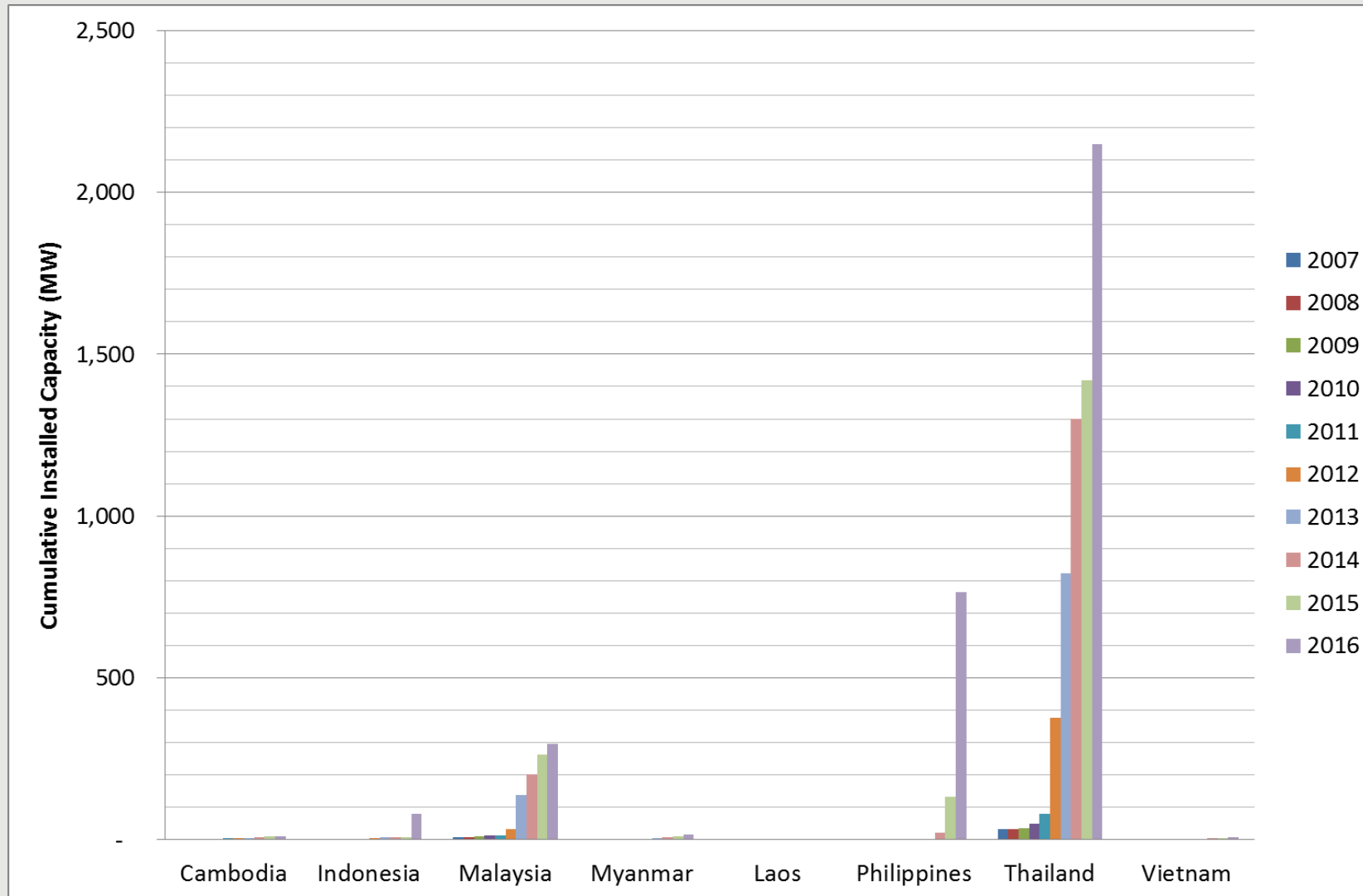
- **Commercial:** Bankability of project
- **Financing:** access-to-finance

ASEAN wind power installed capacity (2007-2016)



Source: Renewable energy statistic 2017 (IRENA)

ASEAN solar PV installed capacity statistic (2007-2016)



Source: Renewable energy statistic 2017 (IRENA)

Enabling private capital investment in RE projects

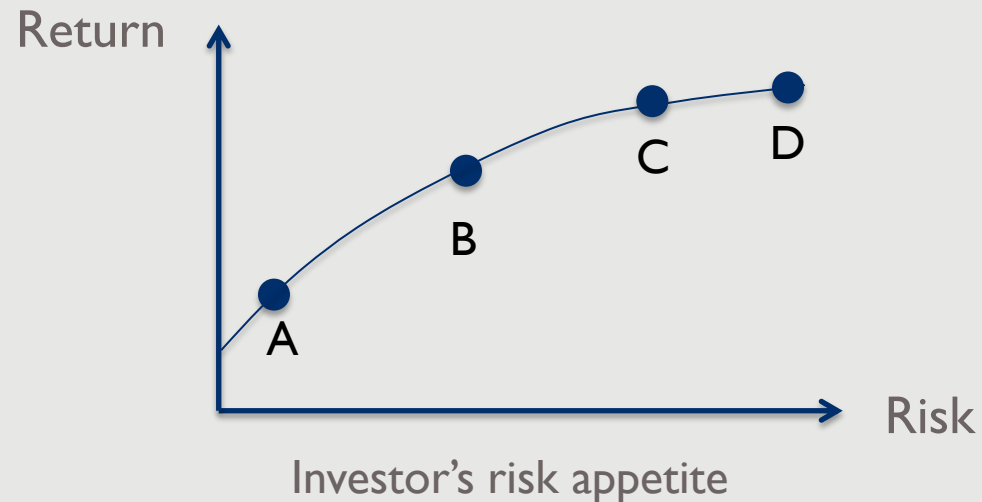
Two rules:

1. To attract private investors, risk-reward profile of project must be attractive
2. Different investors have different risk appetite

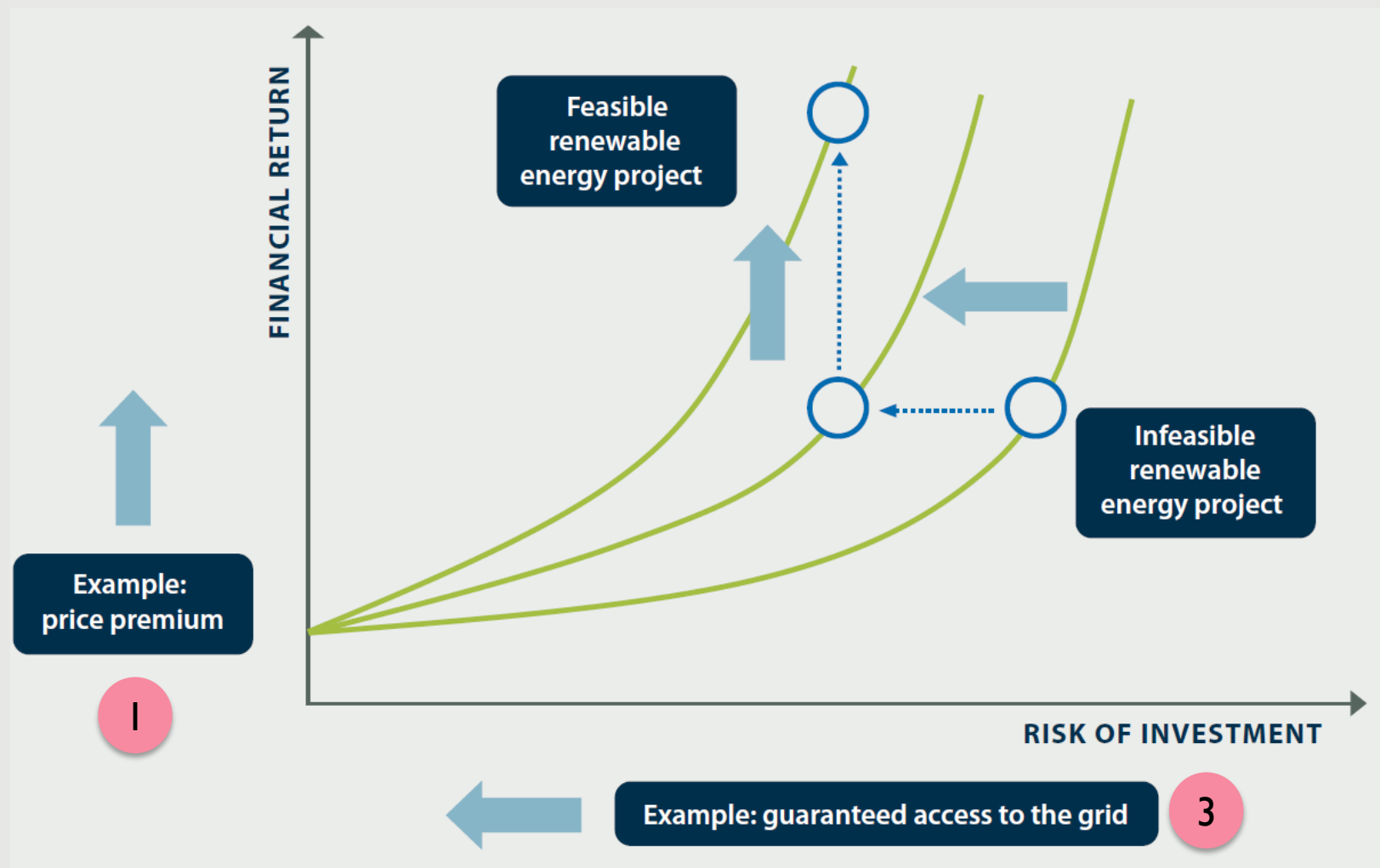
Risk-Reward Profile

Revenue – Cost

Risks



Risk/reward profile of solar & wind power projects



Public finance can be used to reduce risks and increase return to enable solar and wind projects to go to larger scale.

I Price premium policy to attract private sector investment

- To improve financial return of the project by 1%, how much the government must inject a price premium as an incentive?
 - Assumption
 - The government is launching the 1,000 MW wind power program
 - Total investment cost of wind power project is about 2 M USD / MW

– Result

- The cost to improve the project IRR by 1% is:
 - = $1\% \times 1,000 \text{ MW} \times 2 \text{ M USD/MW}$
 - = 20M USD/year or 240M USD (with PPA 20 years)

Thus, by introducing price premium tariff to increase 1% project return, the government would have to fund about 20M USD/year.

2

Reducing costs of solar & wind projects

	Standardization	Aggregation	Securitization	Green bond	YieldCos
Financing cost	√	√	√	√	√
Legal cost	√				
Insurance cost	√	√	√		
Due diligence cost		√	√		
EPC cost	√	√			

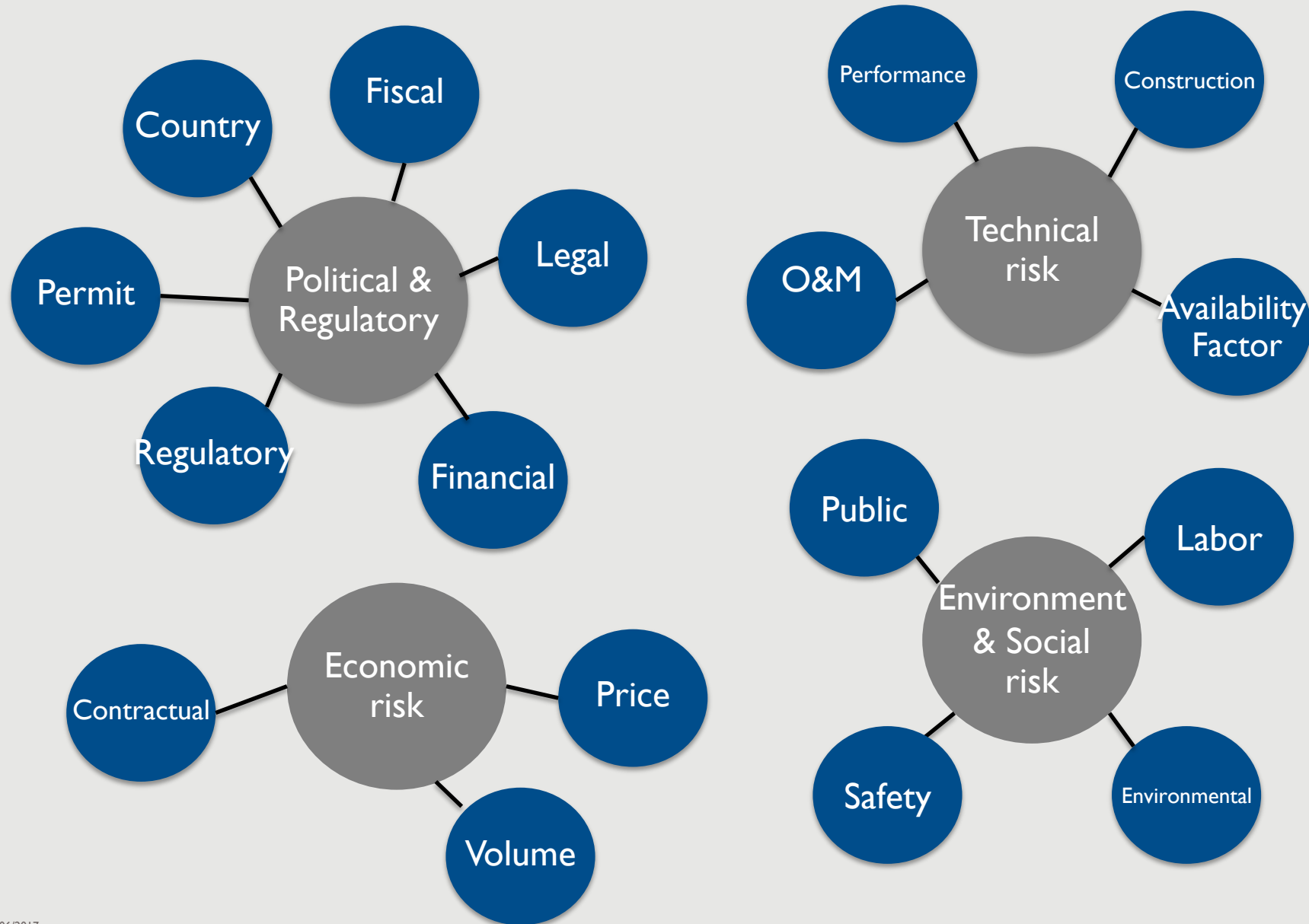
Structured finance and capital market tools can help to lower the development costs of solar PV and wind projects.

<p>CORPORATE POWER PURCHASE AGREEMENT</p> <p>Version 1.0 as of February 6th, 2017</p> <p>This Agreement has been developed by the USAID Clean Power Asia to facilitate an investment of distributed electricity generation system from Solar PV in Thailand.</p> <p>The USAID Clean Power Asia encourages the use of this document by all interested parties. This is a standardized agreement aiming to support market players by providing neutral clauses as a starting point for a negotiation between the Seller and the Purchaser of solar power. We expect that this agreement can help to reduce soft costs and negotiating time for all interested parties.</p> <p>If any question, please contact Mr.Boonrod Yaowaprupek, Investment Mobilization Lead, USAID Clean Power Asia at Tel: + 662 026 3065 Email: boonrod_yaowaprupek@abtassoc.com</p>	<p style="text-align: center;">POWER PURCHASE AGREEMENT</p> <p>THIS POWER PURCHASE AGREEMENT (the "Agreement") is made on 10, 2017.</p> <p>BY AND BETWEEN:</p> <p>(1) [Solar Power Producer Name], a company registered and existing under the laws of Thailand, having its registered office at _____ (the "Seller"); and</p> <p>(2) [HOST Name] a company registered and existing under the laws of Thailand, having its registered office at _____ (the "Purchaser").</p> <p>The Seller and the Purchaser shall be collectively referred to as the "Parties" and individually as a "Party".</p> <p>WHEREAS:</p> <p>A. The Seller desires to develop, design, construct, own and operate the solar PV system (the "System") located on Purchaser's property.</p> <p>B. The Purchaser desires to make a portion of such property available to the Seller for the construction, operation and maintenance of a solar powered electric generating project.</p> <p>C. The Seller intends to sell to the Purchaser and the Purchaser intends to purchase from the Seller all of the power generated by the System (as defined below) pursuant to the terms and conditions of this Agreement.</p> <p>NOW, THEREFORE, the Parties agree as follows:</p>
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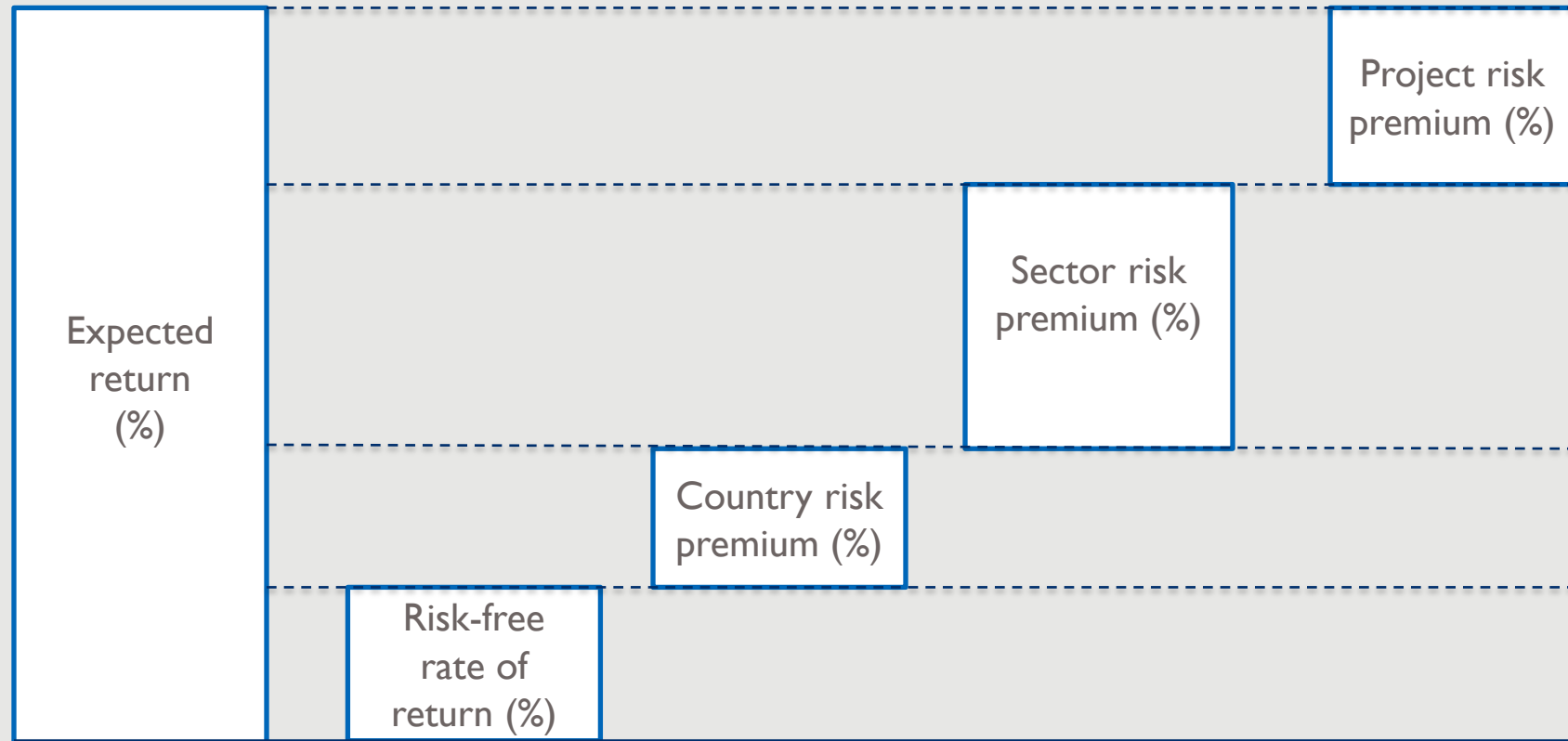
* USAID Clean Power Asia has developed a standard template for corporate power purchase agreement (PPA). Interested parties can contact us for more info and receive the template (boonrod_yaowaprupek@abtassoc.com).

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Risks in renewable energy investment



3 Expected returns from an investor perspective



Country Risk

- political
- currency
- economic
- sovereign
- transfer

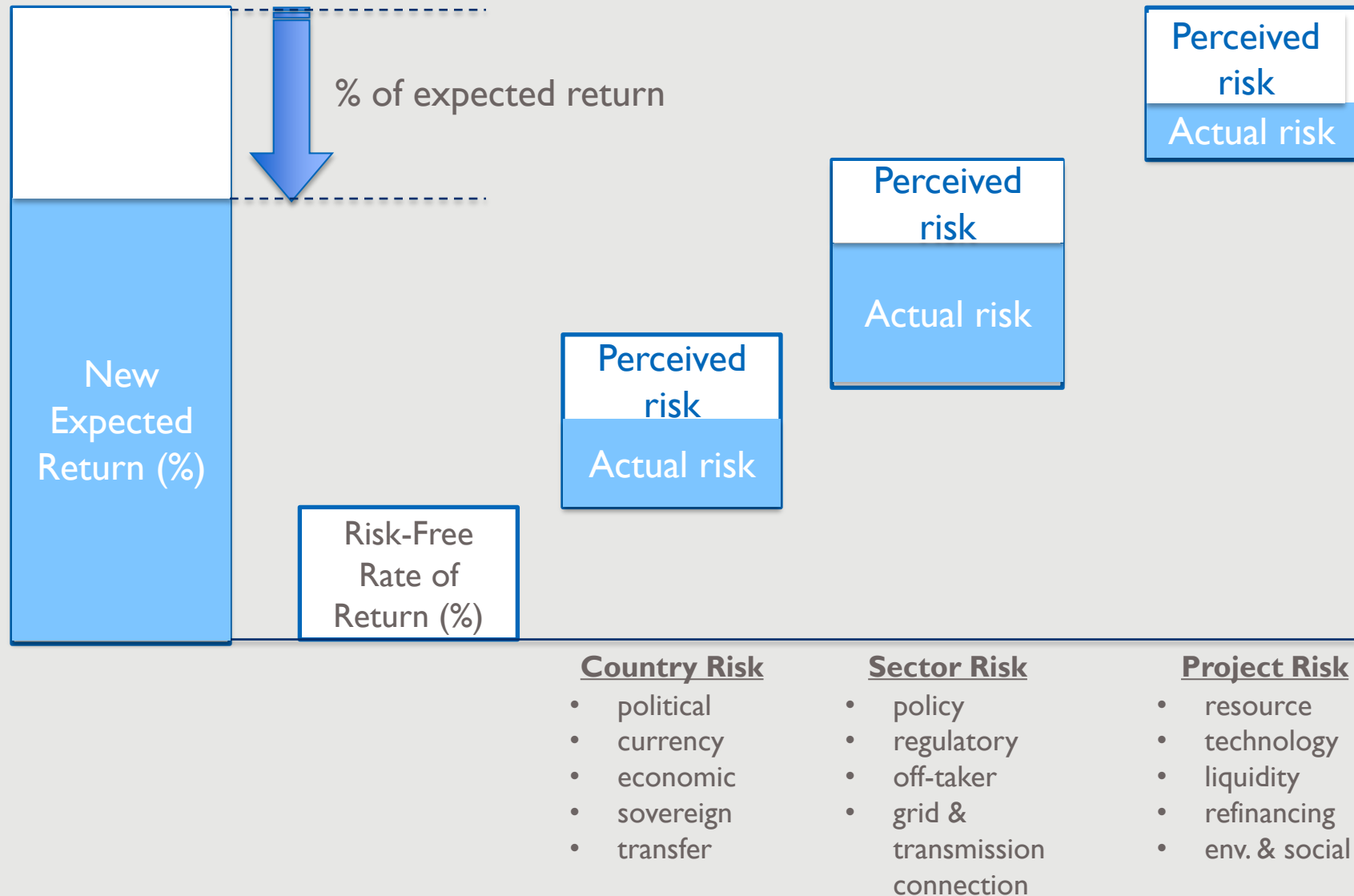
Sector Risk

- policy
- regulatory
- off-taker
- grid & transmission connection

Project Risk

- resource
- technology
- liquidity
- refinancing
- env. & social

3 Key is to remove or lower the perceived risks

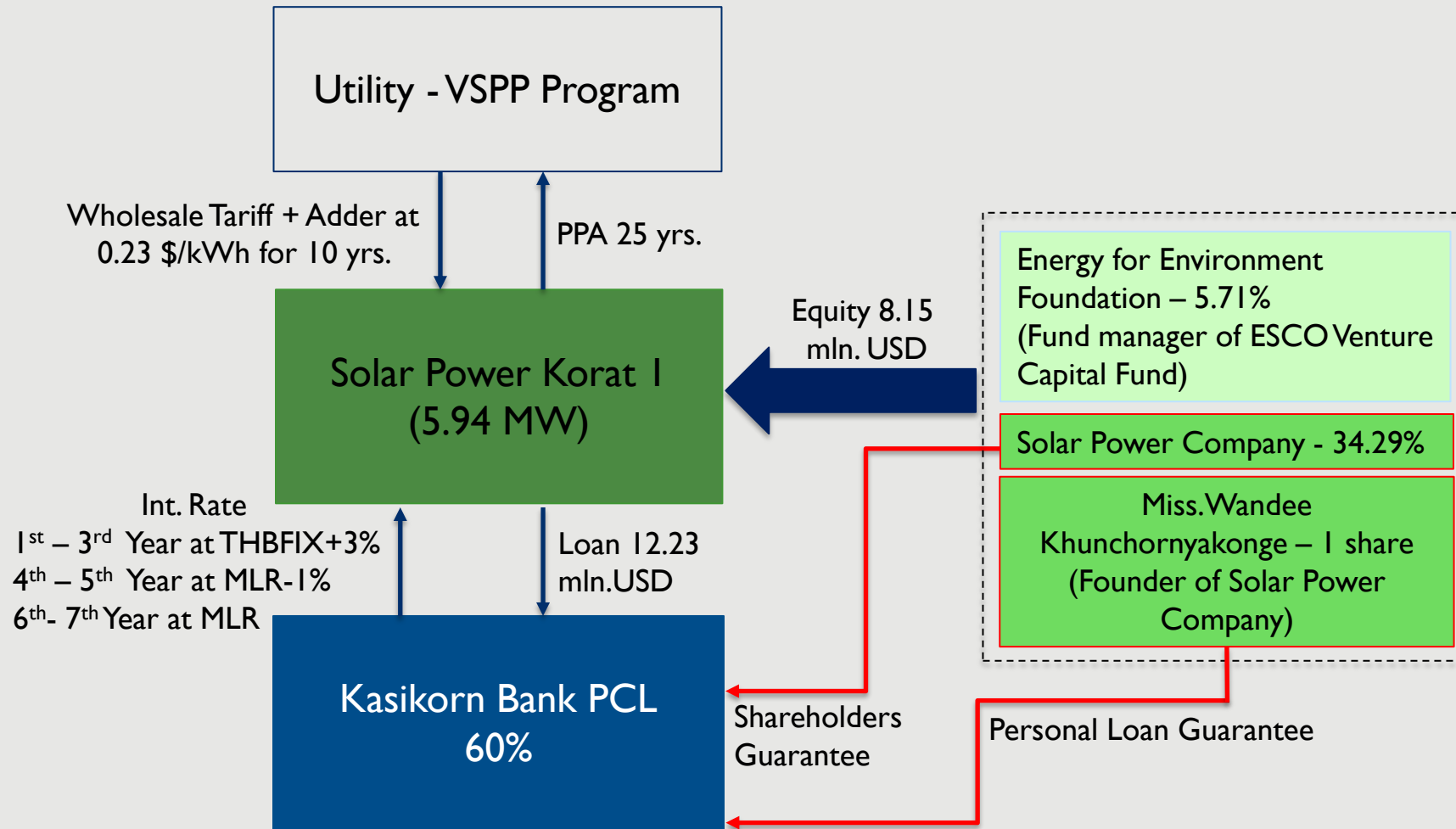


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Enabling larger scale investment with risk mitigation

	Government guarantee	Political risk insurance	Partial risk guarantee	Export credit guarantee	Liquidity facility	Currency risk hedging / guarantee fund
Political risk	√					
Policy and regulatory risk	√	√				
Off-taker risk	√	√	√			
Grid interconnection risk			√			
Technology risk			√	√		
Currency risk						√
Liquidity and refinancing risk					√	
Resource risk				√		

Case Study: Solar PV project: Solar Power Korat I



Take Away

- Although public sector plays an important role in establishing grid-connected RE markets, private sector investment is needed to fulfill capital requirements.
- In order to attract private sector investment in grid-connected RE, risk-reward profile of the projects must be well-balance providing sufficient risk-adjusted return to investors.
- There are 3 ways for public sector to improve the risk-reward profile:
 1. Increase revenue
 2. Reduce cost
 3. Reduce risks
- Public sector should consider to apply structured finance (reducing cost) and risk mitigation instruments (reducing risks) which might be cheaper than introducing price premium policy (increasing revenue).

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