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# Solar PV Investment and Financing

By:



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# Agenda

- Bavet City Project
  - Overview
  - Investment Costs
  - Lessons Learned
  - Benefits
  - Recommendations
- Factors of Investment
- PPA Bankability Factors

# Cambodia's First Utility Scale Solar Farm

## Attractiveness of Cambodia

- High irradiation and vast land area
- Fast growing electricity demand and day time load demand
- Good quality offtaker
- RGC's goals for increased energy independence and renewable energy
- Limited FX risk
- Ideal size of pilot project
- Potential future deployment of additional solar projects
- Availability of multilateral bank financing

# Cambodia's First Utility Scale Solar Farm

## Project Overview

- Capacity: 10.56MWp
- Location: Bavet City
- Estimated COD: July 2017
- Connection point: Chrak Mtes substation
- Transmission line: 5.5km
- Land: 15 hectares
- Annual Production: 16,006 MWh\*
- 20 year PPA with EDC
  - USD 9.1 cents / kWh, no escalation
  - No sovereign guarantee



\*P50 estimation by MottMcDonald

# Financing – a Unique Case

## Bavet City Financing

- LTV:
  - Debt: 75%
  - Equity: 25%
- Tenor: 15+ years
- Limited recourse
- Lender:
  - Asian Development Bank

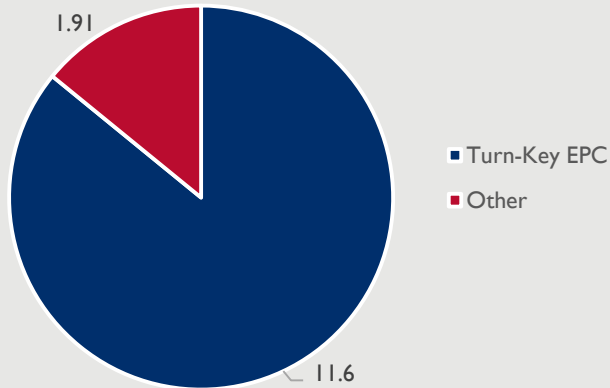


## Common Project Finance

- LTV:
  - Debt: 60-70%
  - Equity: 30-40%
- Tenor: 10-14 years
- Limited recourse
- Increased Sponsor security package
- Lender:
  - Multiple commercial banks
- Additional financing costs

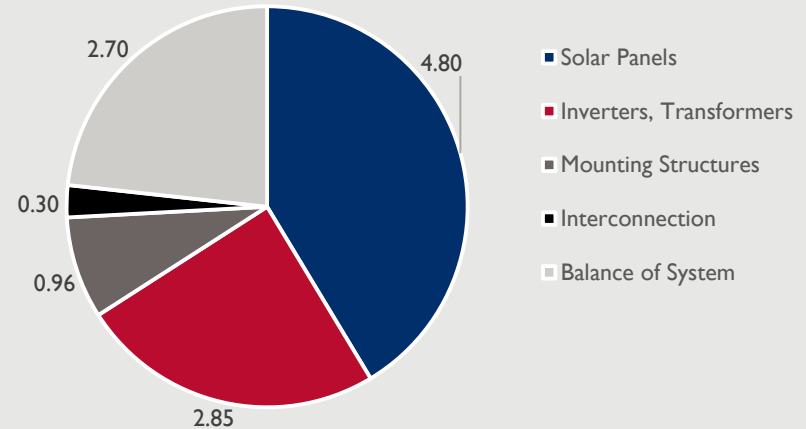
# Investment Costs

## Project Costs



- USD 1.28/W<sub>p</sub>
- 15% of Project Costs are non-EPC related
- Other costs relate to Financing and Land
- Excludes bid bonds, performance bonds, L/Cs

## EPC Cost



- USD 1.1/W<sub>p</sub>
- Tier I equipment
- Interconnection costs dependent on distance to substation
- Costs may increase if additional flooding risk mitigation is necessary

# Lessons Learned

## Project Implementation

- Flooding risk
- Interconnection limitations
- Logistics route
- Project implementation delays
- Cost of land
- Compensation of land owners

## Financing and PPA

- No standard PPA for international project finance
- No sovereign guarantee for PPA
- FX risk
- Limited availability of debt financing
- Significant additional debt funding related costs

## Benefits

- Grid parity, no subsidy necessary
- Generates electricity during peak demand
- Reduces electricity import
- Fast implementation
- Helps improve local infrastructure
- Job creation
- Complementary to hydro power
- No negative environmental impact
- No investment for required from RGC



# Recommendations

- Scale up utility scale grid parity solar PV projects
- Implement standardized PPA framework
- Consider limited RGC guarantees to incentivize commercial bank funding
- Designate specific geographical areas for project implementation

# Q&A

## Factors of Investment

- Electricity sale / saving
- CO2 certificates sales

- Development cost
- EPC cost
- Land lease cost
- Financing cost
- O&M cost
- Insurance cost

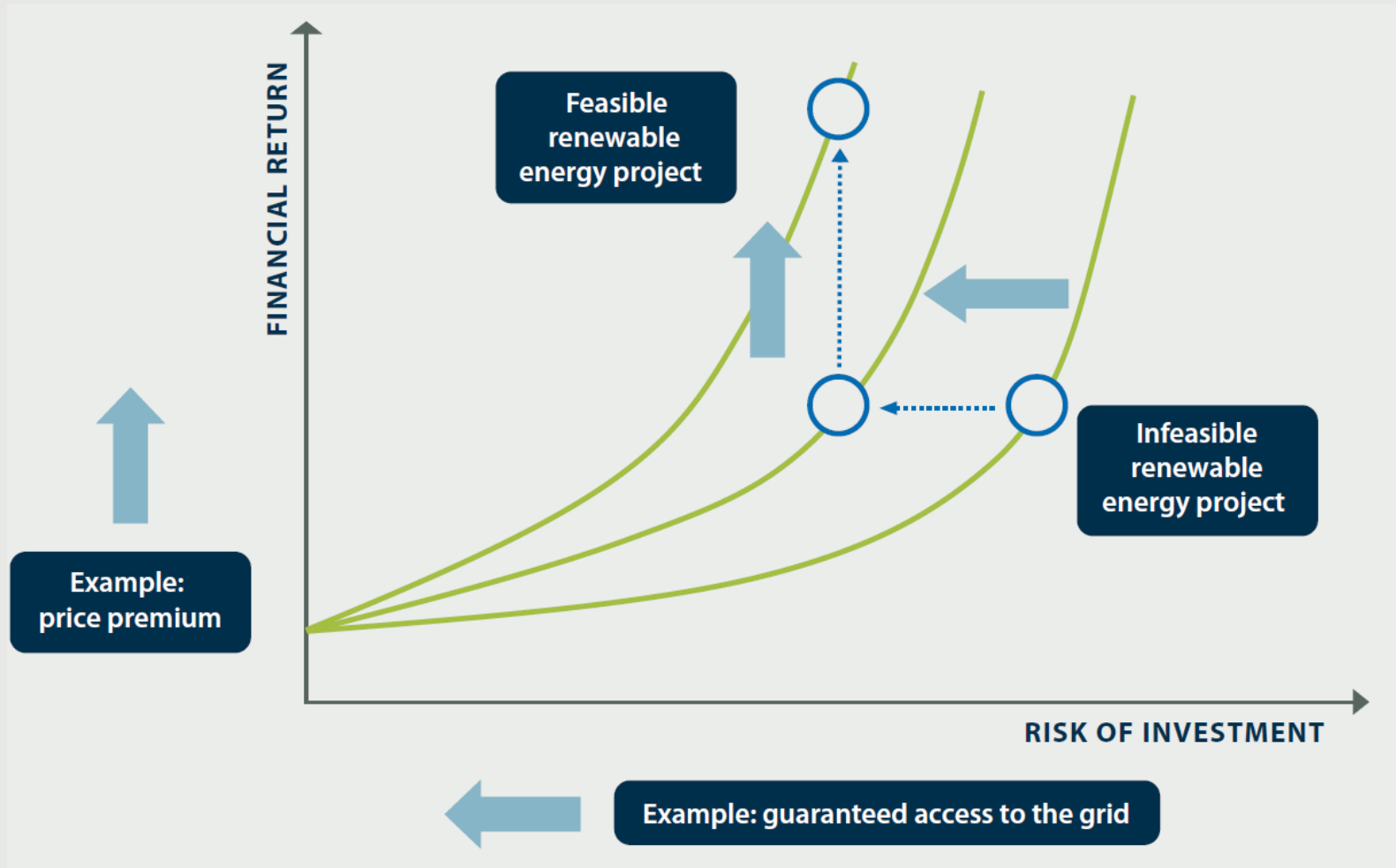
**Risk Reward Profile**



**Revenue - Cost**

**Risks**

# Factors of Investment



# Factors of Investment

## Risks

- Country related
  - Macroeconomic
  - Political
- Project feasibility
  - Economic
  - Technical
  - Political

# Factors of Investment

## Country related risks

- Macroeconomic
  - FX conversion and availability
  - Inflation
  - Taxes
- Political
  - Dispute settlement
  - Sovereign guarantee
  - Change in Law
  - Expropriation

# Factors of Investment

## Project related risks

- Economic
  - Bankability of PPA (curtailment, payment)
  - Sustainability of tariff
  - Counterparty payment risk
  - FX conversion and availability
  - Financing
    - Availability of Project finance
    - Interest rate fluctuation
    - FX hedging
    - Tenor
  - Unforeseen additional project costs

# Factors of Investment

## Project related risks (continued)

- Technical
  - Solar resource
  - Interconnection
  - Land acquisition
  - Flooding
  - Construction delay
  - Quality of EPC and Equipment
  - Environmental and social



# Factors of Investment

## Project related risks (continued)

- Political
  - Demand driven policy implementation
  - Permitting delay and complexity
  - Government support
  - Contract enforceability

# Q&A

# PPA Bankability Factors

- Take-or-pay provision
- Term meets or exceeds the term of debt repayment
- Conditions to commencement agreed with off-taker
- Financing, grid connection, EPC and O&M contracts aligned with PPA
- Curtailment is addressed
- Assignment and step-in rights established
- Defines limits of liabilities, early termination events, and methods to calculate termination payments
- Obligations for grid code compliance included
- Metering arrangements in place that align with national code
- Dispute resolution is clear

# Q&A

**Thank You.**