USAID
FROM THE AMERICAN PEOPLE

USAID CLEAN POWER ASIA

Training workshop on cash flow analysis, risk assessment, and financial modeling for wind power projects in Vietnam

Photo Credit: https://pxhere.com/en/photo/829635

Prepared for workshop on accelerating wind project financing in Vietnam on June 11, 2019

Introduction and Agenda

Objectives

Develop practical understanding and build capabilities to understand, analyze, and participate in project finance preparation, analysis, and modeling for wind power projects.

Presenters

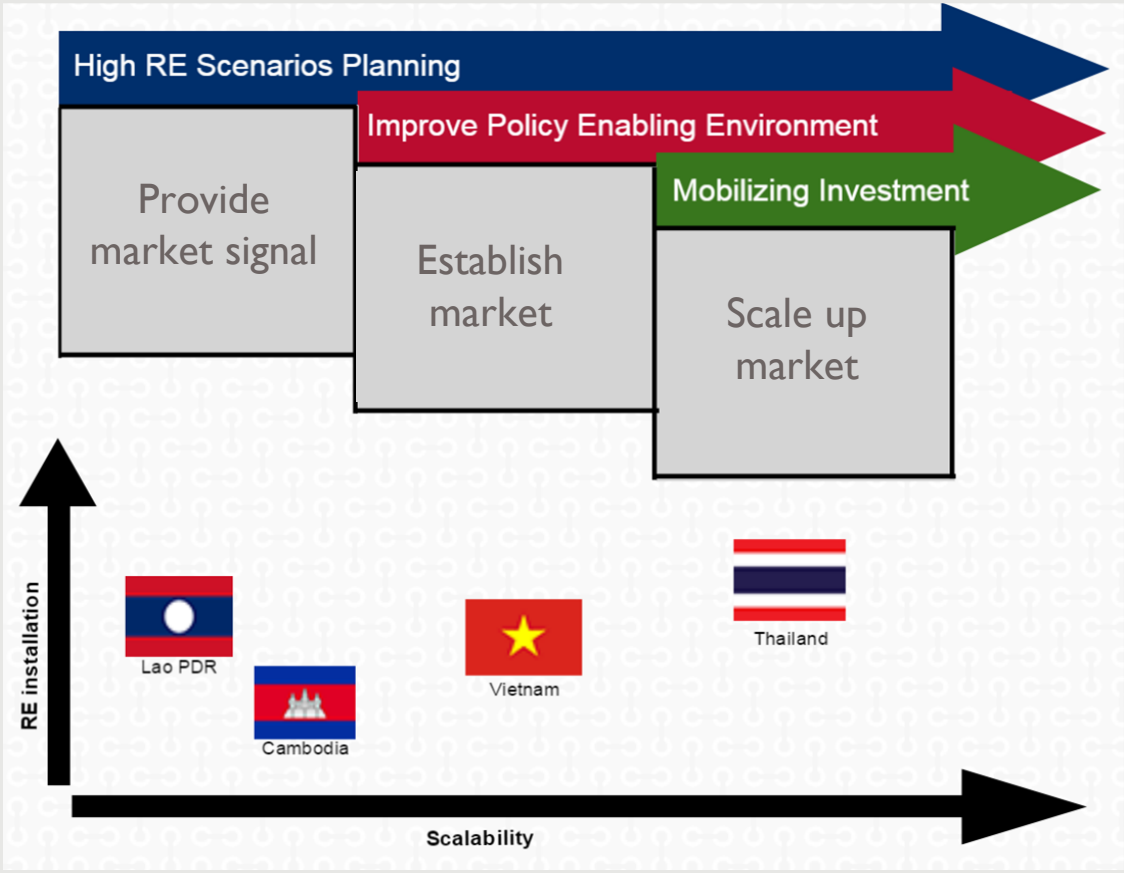
- Joost Siteur
  Investment Mobilization Lead
- Patana Surawatanapongs
  Renewable Energy Investment Advisor
- Suchai Buranavalahok
  Renewable Energy Financial Advisor

Agenda

Project finance and cash flow analysis for wind projects	**14:00-15:00**
· Characteristics of project finance · Key risks and mitigation strategies · Critical success factors in lending to wind projects · Financial modeling and cash flow analysis	
Case Study on financial modeling and risk assessment	**15:00-16:15**
· Introduction to the case study and materials handout · Group exercise on financial modeling, cash flow analysis and risk assessment	
Group reporting and wrap up	**16:15-16:30**

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 tCO_2e reduction
- Implemented by Abt Associates and partners
- Funded by USAID (United States Agency for International Development)

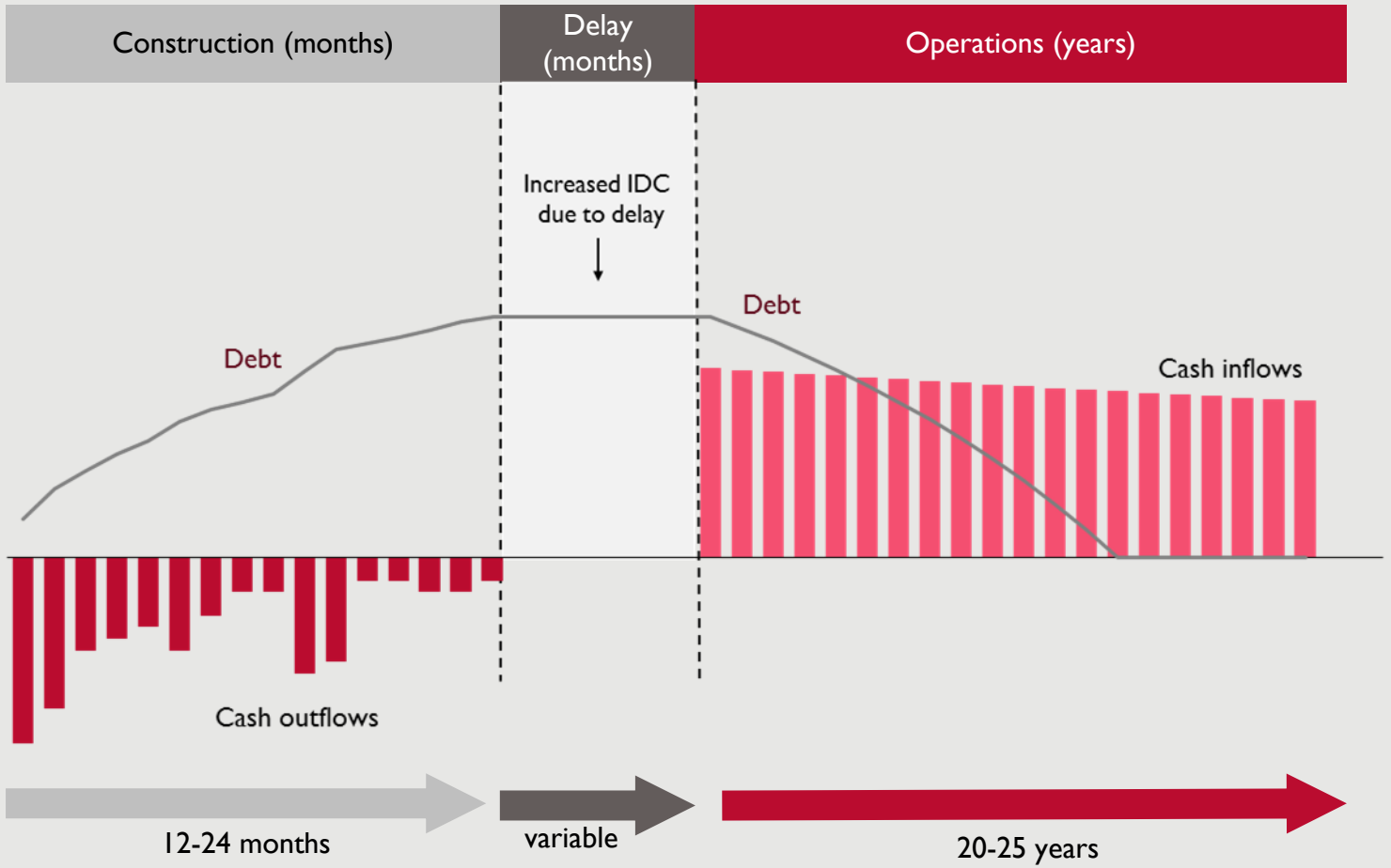


Project finance is not the same as ‘financing projects’

Project finance is a method of raising long-term debt financing for capital intensive projects:

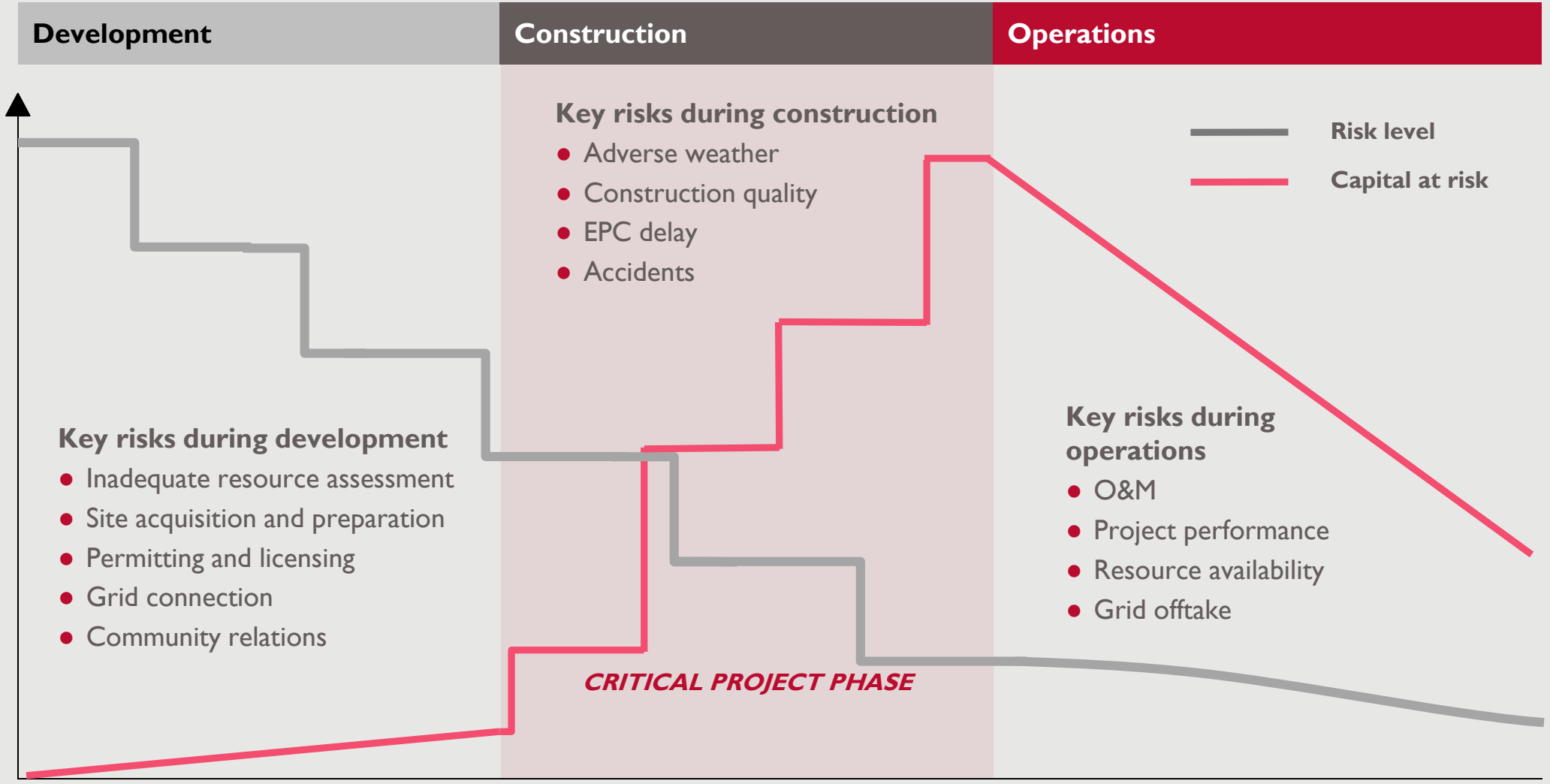
- Non-recourse or limited recourse
- Lending solely against Cash Flows generated by the project
- Requires deep understanding of a project’s construction, operating and revenue risks
- Aims to mitigate risks through restrictions on cash to project owners, contracts with warranties and penalties, and insurance
- Allocates Cash Flow in prioritized order across investors, lenders, and other parties through contractual and other arrangements

Lenders provide capital solely based on future cash flows



IDC: Interest During Construction

Risks diminish as the project achieves certain milestones



Cash flow analysis crucial to assess risks and ability to repay debt

Summary Results

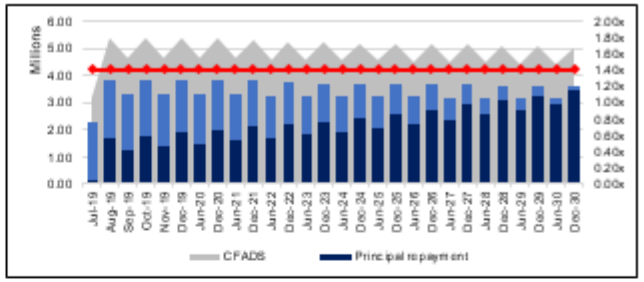
Calculate

Integrity check	**Model Ok**
Debt ratios	
Average DSCR	1.40x
Total debt	60,793,990
Last debt repayment date	31/Dec/33
Returns	
Project IRR	8.2%
Equity IRR	9.8%
Project costs	
CAPEX	89,750,000
Financing cost	3,779,215
Total project costs (USD)	93,529,215
Total project costs (USD/Wp)	*1.87*
- Debt portion	60,793,990
- Equity portion	32,735,225
1st year generation (MWh)	131,250
Capacity factor	40%

Main Inputs

Legend

Formulas / Not to be edited	Text
Input cells	Text
Input cells (drop-down list)	Text
Level 1 heading	Text
Level 2 heading	Text
Condition check (true)	TRUE
Condition check (false)	FALSE



Timing

Construction start date	1/Jan/19	dd/mm/yy
Construction duration	12	month(s)
Length of Operations	20	year(s)

Project costs

Turbines	1,530,000	USD/MWp
Foundations	130,000	USD/MWp
Electric Installations	32,000	USD/MWp
Grid Connection	30,000	USD/MWp
Land	25,000	USD/MWp
Road	18,000	USD/MWp
Others	30,000	USD/MWp
Total	1,795,000	USD/MWp

Operations

O&M costs	15,000	USD/MW/year
Insurance	0.40%	of CAPEX
Major overhaul	10	years
Overhaul costs	5.0%	% of Turbines cost
Grid curtailment	0%	%

Project specifics

No. of turbines	20	Turbine(s)
Capacity per turbine	2.5	MW
Tariff	0.085	USD/kWh
Installed Capacity	50	MW
Generation profile	P90	
Annual Energy Yield	175	GWh/year
Capacity factor	40%	%

Finance

Funding basis	Back-ended	
Debt share	65%	%
Tenor	15	years
Interest rate	7.00%	% p.a.
Commitment Fee	0.50%	%
Front end fee	0.75%	%

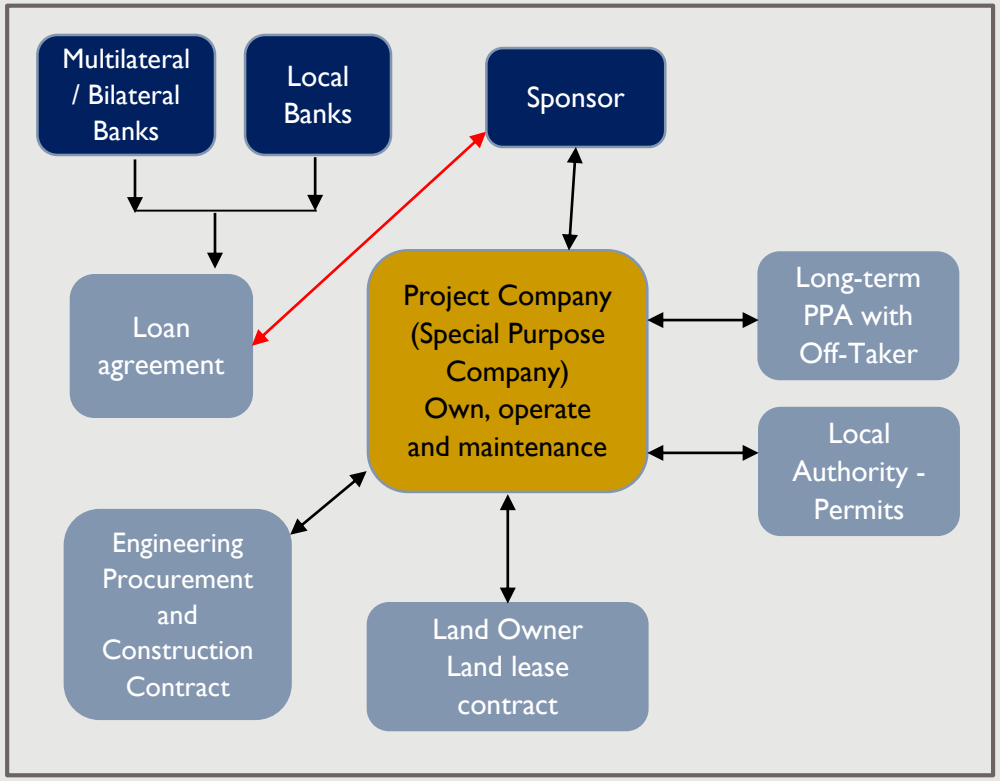
Reserve Accounts

DSRA	1	Period(s)
DSCR threshold for default	1.10x	time(s)
DSCR threshold for dividends	1.20x	time(s)
Inflation	3.0%	% p.a.

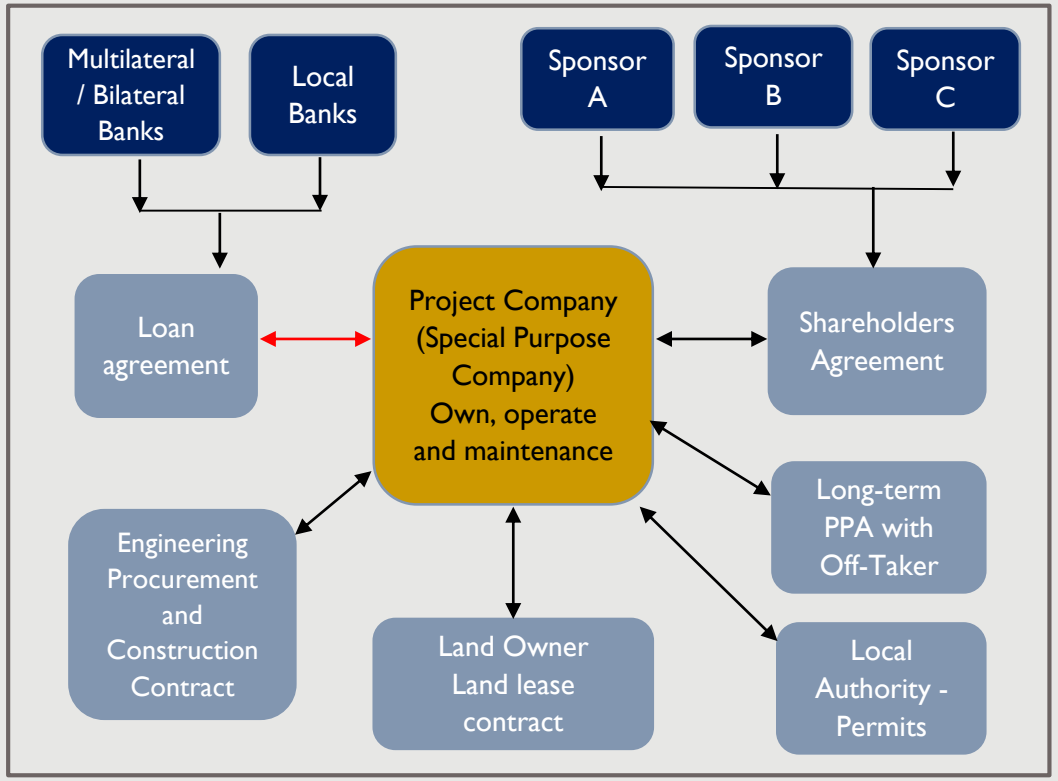
Why do project financing?

Typical financing structures

Corporate finance



Project finance

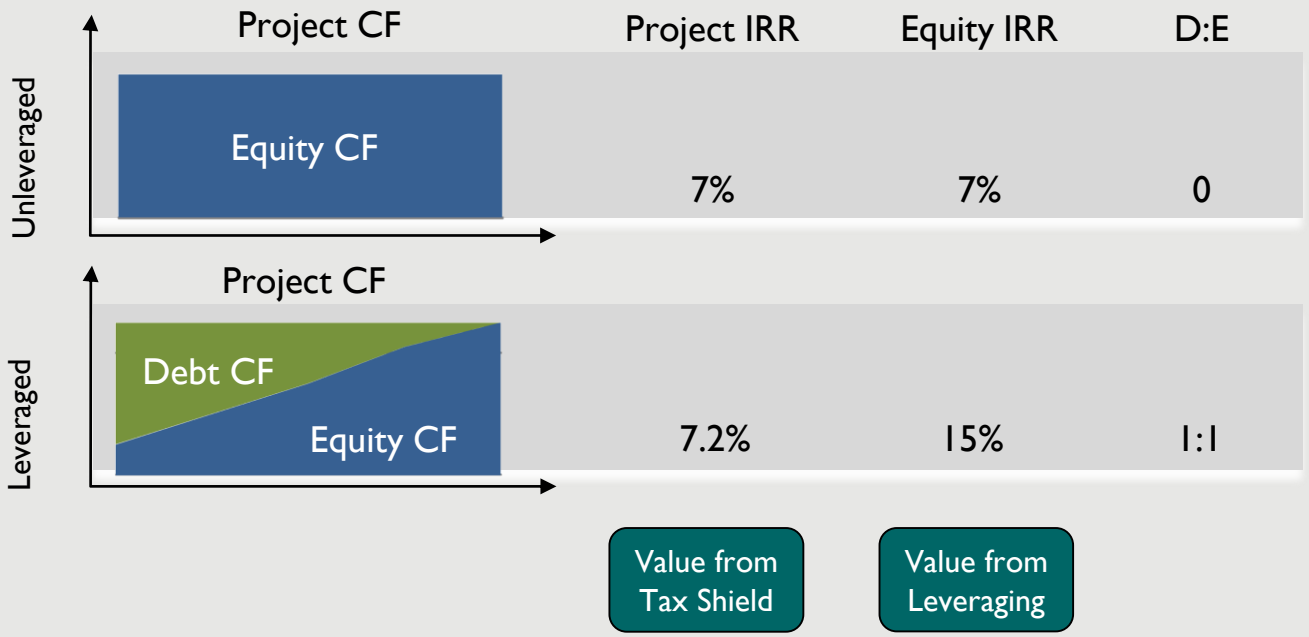


Project finance vs. corporate finance

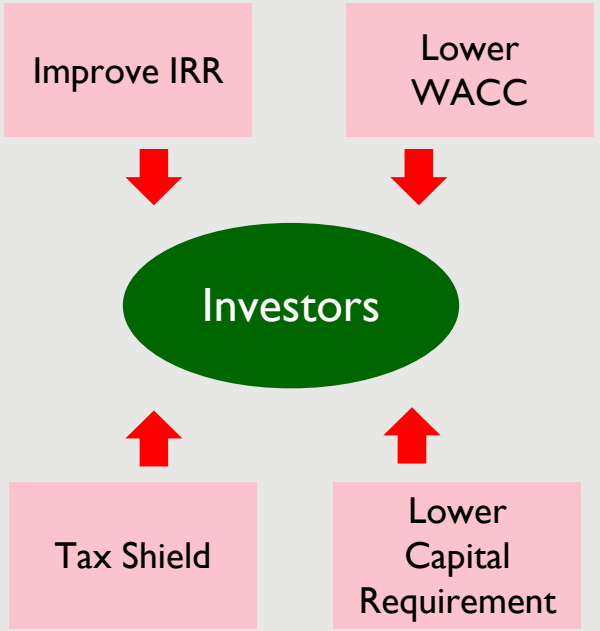
Characteristics	Project Finance	Corporate Finance
Project	Usually green field	Usually brown field
Credit Profile	Cash flow projections based on the contractual structure	Historical financial performance with key underlying assumptions from diversified cash flow of the company
Sponsor / Shareholder Support	Limited-recourse or non-recourse basis	Commercial negotiation, depending on requirement
Loan Tenor	Medium to long-term tenor	Short to medium tenor
Funding Requirement	Medium to high debt funding portion, relative to project size	Commercial negotiation, depending on requirement
Parties Involvement	Many parties to perform due diligence	A few parties to perform due diligence
Asset Classes	Businesses under concession e.g. energy, railway, telecommunication	Any businesses

Benefits of project financing

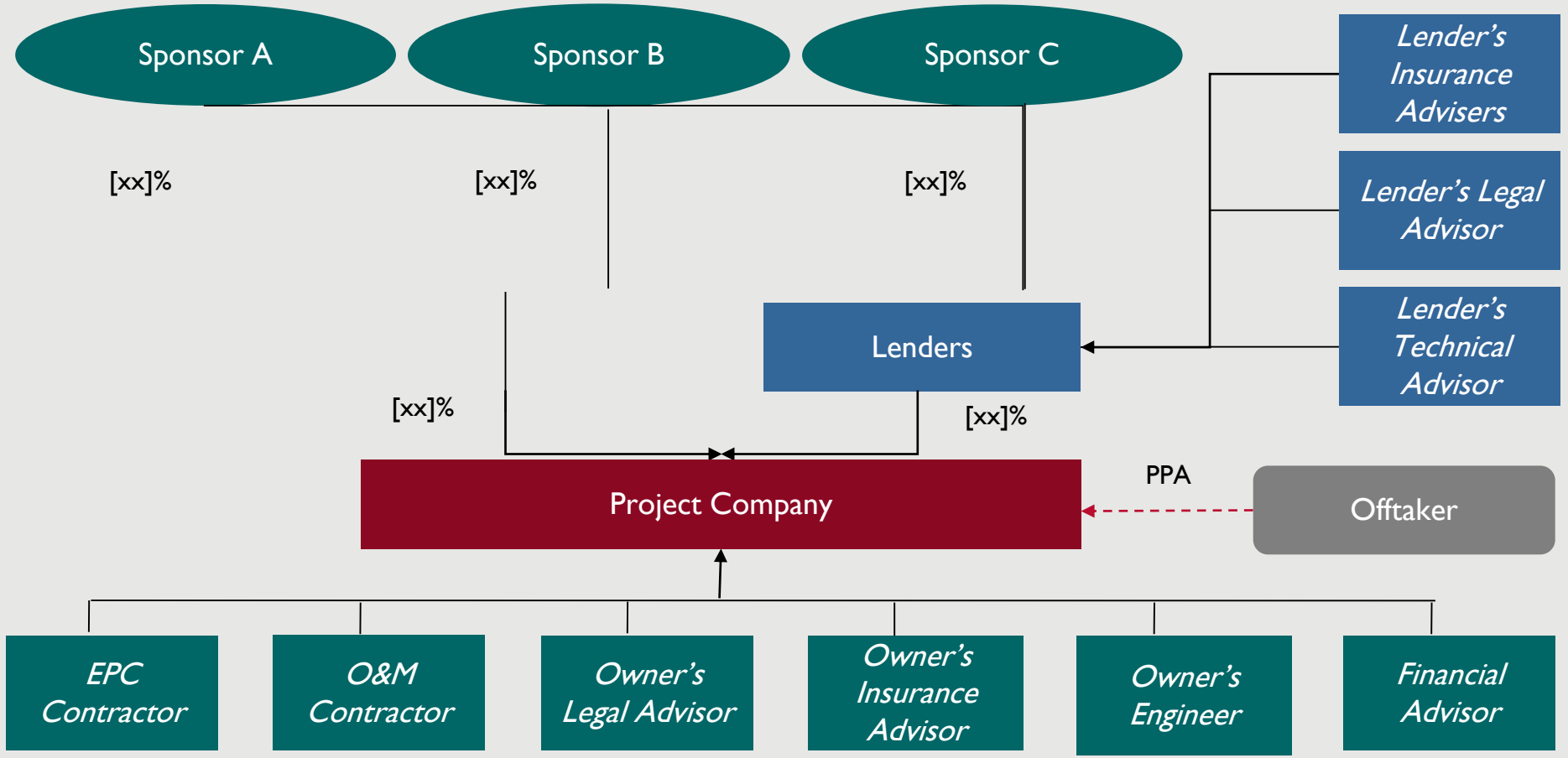
Project Cash Flow vs. IRR



Value to investors from Leveraging



Key parties in project finance



How to do a project cash flow projection

Predictable cash flow

Preferred cash flow characteristics for project financing scheme are:

- Resilience to economic downturns
- Low volatility of operating cash flow
- Long operational life
- Cash flow generated from long duration of assets with minimal technology risk
- Low maintenance capital expenditures

Wind financial model

Technical / Financial / Economic Assumptions

Wind speed, capacity factor, energy loss factors, cost of fund, interest rate, term loan, corporate income tax, inflation rate

CAPEX

- Turbine
- Foundation
- Electricity installations
- Grid connection
- Land
- Met mast
- Other development costs

OPEX

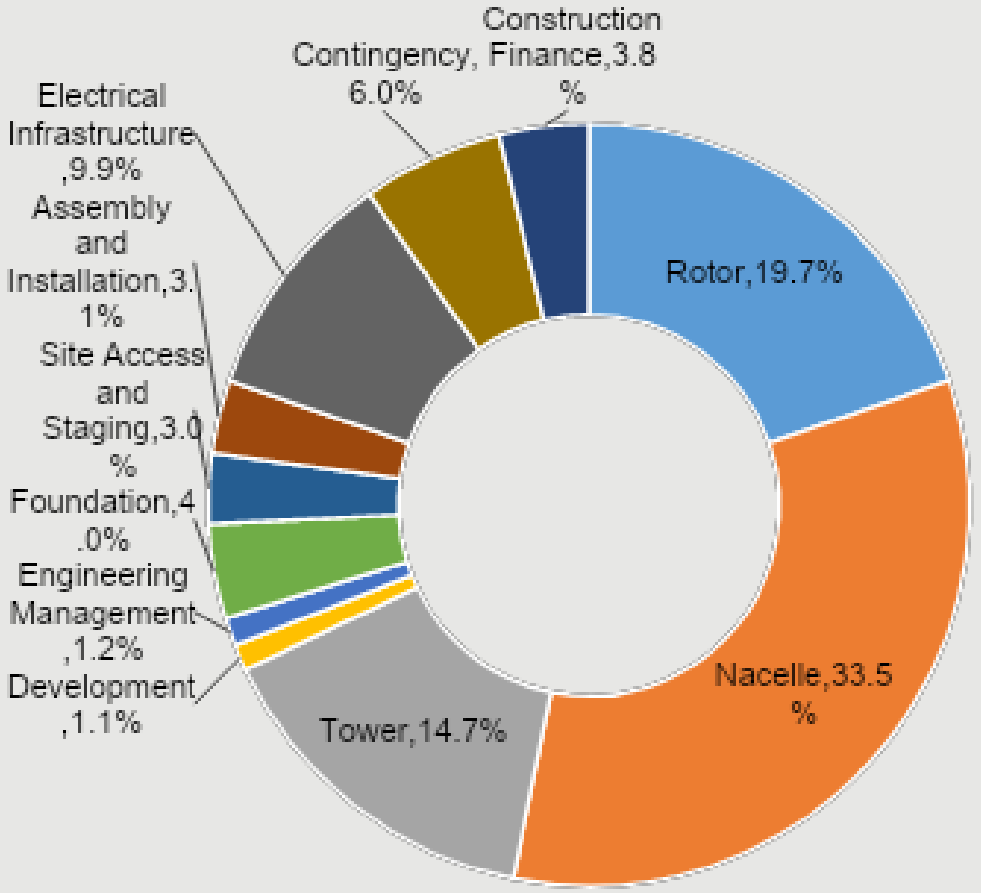
- Operation and maintenance expense
- Insurance expense

Revenue/Saving/ Incentives

- Tariff pricing
- Tax incentive

Cash Flow Projection

Cost breakdown of a onshore wind project example



Source: NREL 2017

Key assumptions of wind farm projects

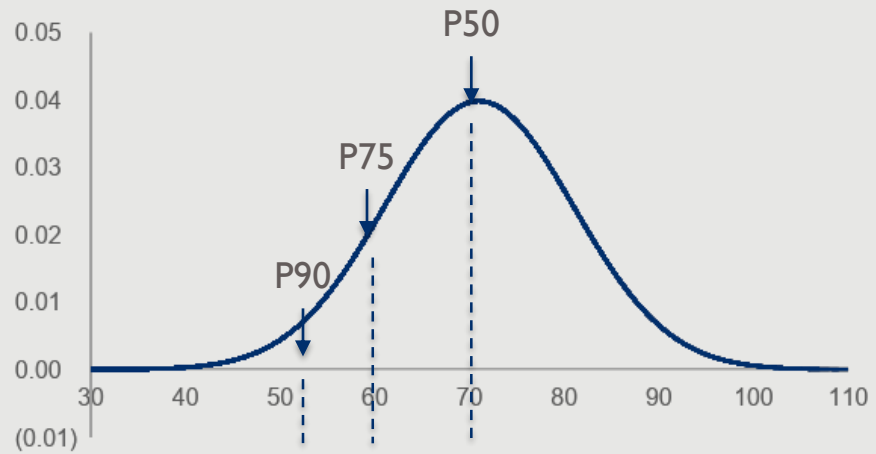
Technical Assumption		Source/Reference
Installed capacity	kW or MW	Project design
Wind speed	m/s	Public data/Site specific data/Technical advisor
Capacity factor	Approx 35-40 %	Technical specification
Annual yield	MWh or GWh	Feasibility study/Technical Advisor
Financial Assumption		**Source/Reference**
Total investment	USD/kW	Project design / Technical advisor
Selling price of electricity	USD/kWh	Policymaker / utility
% escalation of electricity‘s selling price	X% per year	Utility / inflation rate / historical electricity price
Operating and maintenance cost	USD/kW	Contract/Technical advisor
Insurance cost	% of total investment	Insurance advisor
Major overhaul at	11th	Year (New Capex)
Maintenance CAPEX	USD/kW	Warranty/Technical advisor
Expense escalation	X % per year	Inflation rate
PPA term	20 or 25 year	Policymaker / utility
Share of debt in total use of funds	60-70%	Based on financial indicators
Share of equity in total use of funds	30-40%	Based on financial indicators
Loan interest rate	4% - 8%	LIBOR + spread
Loan term (years)	7 – 15 years	Based on financial indicators

Annual energy yield

- Probability scenarios predict potential energy yield based on long-term wind speed data
- By using statistical methods to predict the errors the probability distribution can be established and the range of generation can be predicted
- Probability analysis usually includes seasonal variation as it typically uses annual data

Example of probability scenarios

Probability	Av. Annual Generation (GWh)
P50	71,175,000
P75	60,498,750
P90	53,381,250



Scenarios analysis

Scenario analysis is critical to assess the impact of variations in the assumptions on a project's profitability and bankability.

Scenarios are developed by varying base case assumptions for variables such as:

- Wind resource
- Losses (e.g., wake effect, availability)
- Change in capital expenditure (CAPEX)
- Duration of construction
- Change in economic factors (e.g. interest rate, exchange rate)

Repayment profile

Debt sizing and tenor may be based on debt service capability of the project

DSCR (Debt Service Coverage Ratio)

- Measures how many times the project can repay debt service in each period
- Calculated by CFADS/Debt Service in a certain period
- Principal and interest included in debt service
- A ratio of 2.00x means that there is twice as much cash available to repay principal and interest in the period

Debt to Equity Ratio (D/E)

- Measures the leveraged ratio of the project
- Calculated by the Total liabilities/Total shareholder's equity

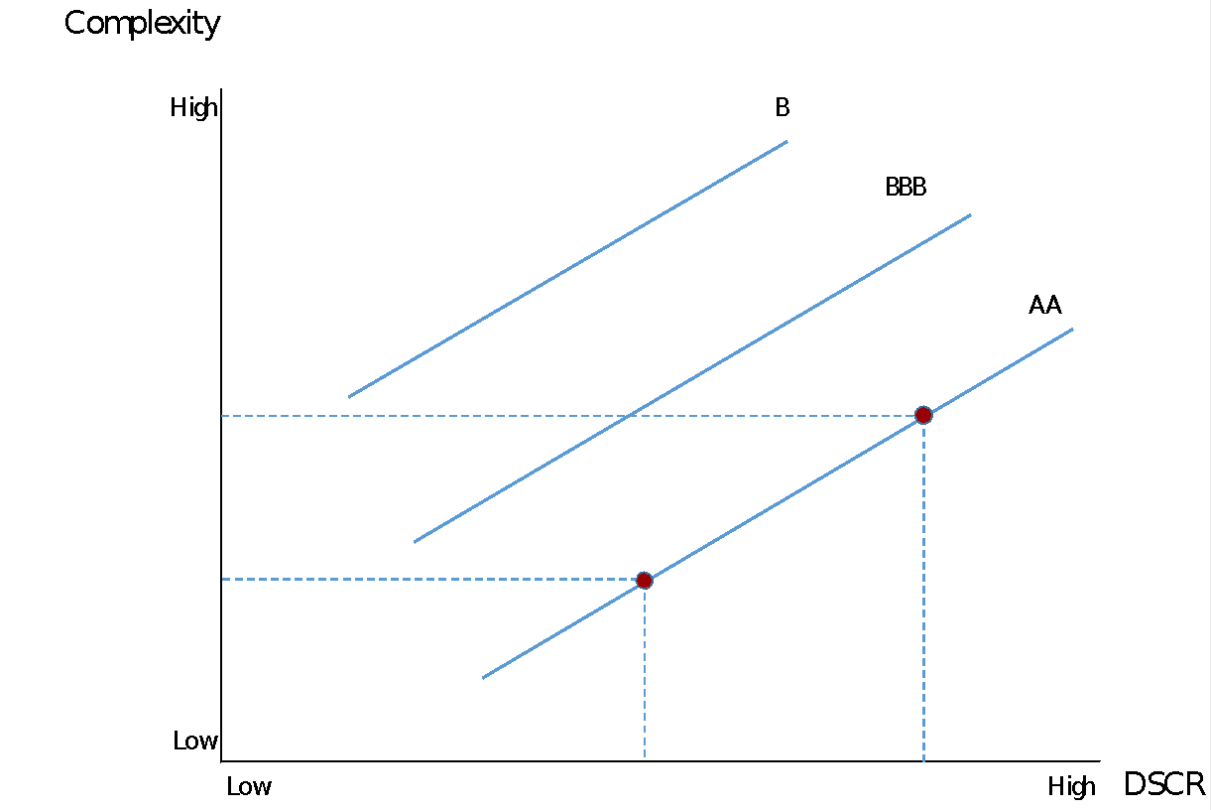
EBITDA / EBIT / Net Operating Margin / Net Debt to EBITDA

- These parameters could be assessed in conjunction with the parameters above in order to determine the proper repayment profile and gearing ratio

Debt Service Coverage Ratio (DSCR)

One of the key factors used to assess financial risk is the forecasted debt service coverage ratio or DSCR. The higher the risk, the higher DSCR should be for more cushion on the downside risk.

Minimum DSCR could be defined in the Bank's risk policy or according to the project finance rating methodology by S&P, Moody's and Fitch. For wind farms, a DSCR of more than 1.4x at P90 will usually be considered as an investment grade.

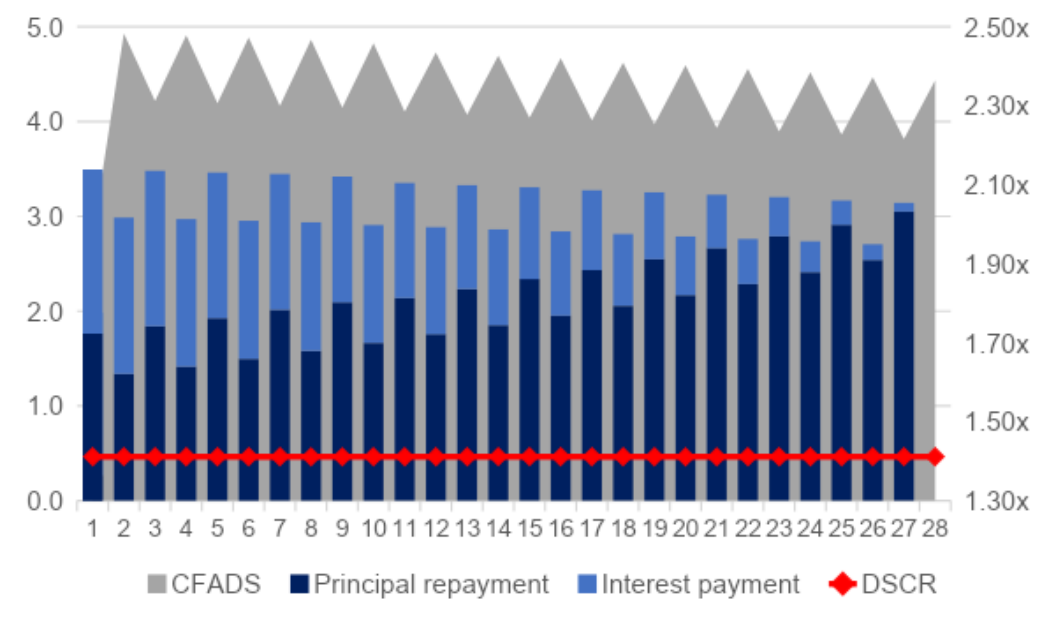


Note: This is for illustrative purposes, many risk factors must be considered in conjunction in order to define project rating.

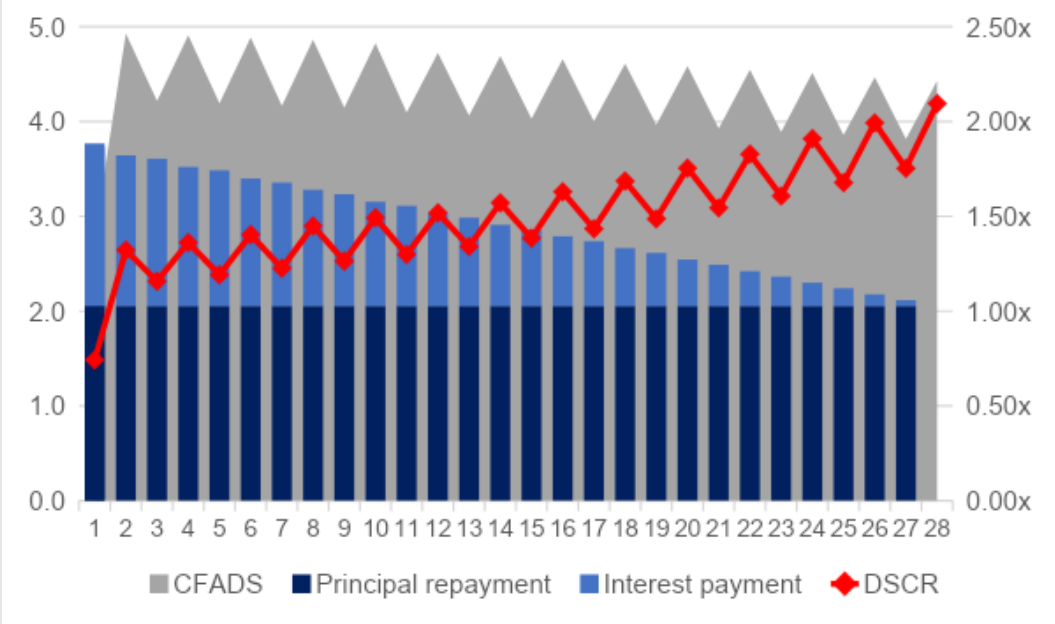
Debt sculpting

- In case of irregular, but predictable cash flows, loan repayments may be structured on an irregular schedule, e.g. to account for seasonal variations
- Debt sculpting aligns debt service with cash flow patterns, basing the principal repayment in each period on a constant DSCR

Constant DSCR



Fixed principal repayments



How to succeed in project finance lending

Due diligence

Risk type	Issues	Mitigation
Operation risk	- Effect on projected revenue and O&M costs	- Accurate revenue estimation by experienced technical advisor - Experienced operator with long-term O&M contract
Financing risk	- Ability of the project to secure sufficient funding until it reaches the COD	- Strong sponsor - Sufficient contingency - Solid off-taker contract (PPA)
Legal and regulatory risk	- Change in law - Disputes	- Identify all potential legal issues upfront - Engage a legal advisor with experience in project finance

Due diligence (cont'd)

Risk type	Issues	Mitigation
Off-taker risk	- Validity and continuity of the PPA - Payment risk - Enforceability	- Legal due diligence of program, legislation, and approval process - Credible off-taker with a strong financial status
Permits and licenses risk	- Availability of the necessary permits and licenses at the time of financing	- Identify all the required licenses, permits and approvals upfront
Construction risk	- Delays - Cost overrun - Underperformance	- Proper contract management (fixed price, wrapped EPC/construction contract, adequate liquidated damage) - Using experienced contractor

Documentation

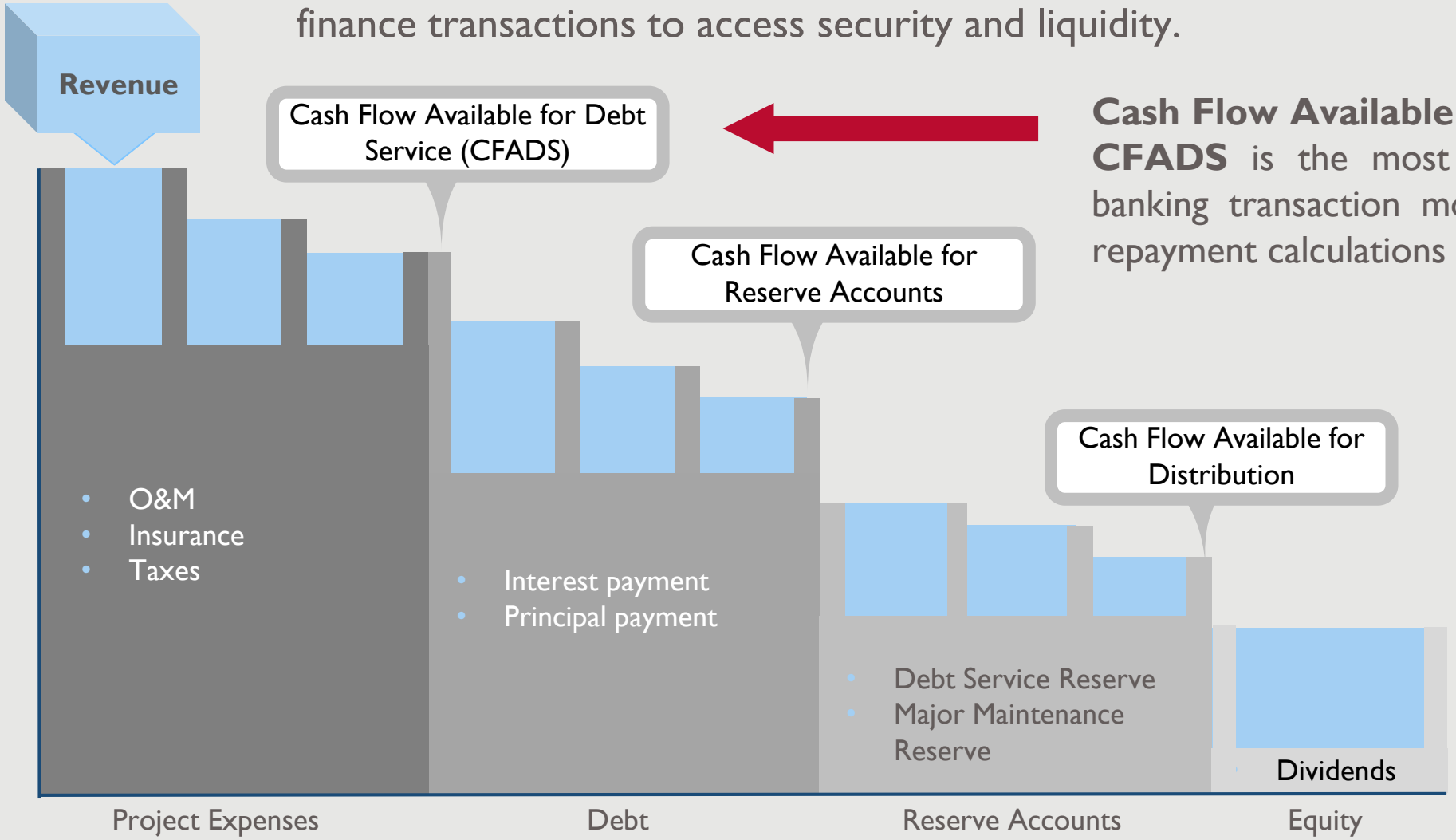
Type	Documents	Purpose
Financing Document	Credit Facility Agreement, Hedging Agreement	Loan condition
Project Documents	Concession agreement, PPA, EPC contract, permits, licenses	Risk allocation and viability of the project
Supporting Documents	Feasibility study, Financial model, Financial statement of the Sponsors/Off taker, Project Information Memorandum	Cash flow and risk analysis
Security Documents	Pledge, Mortgage, Assignment, Guarantee, Undertaking	Credit enhancement
Advisor Documents	Legal opinion, Issuance report, Technical report	3rd party opinion, validation of assumptions

Example of standard covenants & requirements in financing documents

- Submission of periodic financial statements
- Submission of any litigation notice
- Notification of any dispute and default
- No merger and acquisition during the loan term
- No change in business
- No financial indebtedness
- Compliance with the law
- Validity of all permits/licenses
- Maintenance of all securities
- Comply with financial covenants e.g. D/E, DSCR thresholds for loan default and dividends
- Etc.

Cash flow waterfall

The cash flow waterfall is a representation of the cash flow statement rearranged to show the priority of each cash inflow and outflow. It is preferred by banks in project finance transactions to access security and liquidity.



Cash Flow Available for Debt Service or CFADS is the most important line for a banking transaction model as it drives debt repayment calculations by taking into account:

- Operating Cash Flow
- Funding from Sponsor(s) if any
- Operation CAPEX
- Working capital adjustment
- Tax

Key success factors of project financing

- Sponsors/Operator: Credentials / experiences / financial strength of owner/ operator plays an important role for development and operation of the project
- Project: Well-structured project enhances success of the project
- Risks and Mitigation: Appropriate mitigation mechanisms can reduce the likelihood of failure and protect the lenders
- Reputable advisors: Experienced and reputable advisors can increase the confidence of project's parties

Financial model demonstration

Case study

Case Study: Introduction

- A project developer has submitted an application for a loan to finance a 200 MW wind power project in Vietnam
- Participants will work in groups to review the project information and perform a financial analysis
- Each group will play the role of a project finance team at a bank to provide a recommendation to the bank's credit committee and produce an initial draft Term Sheet for negotiation with the project sponsors
- Groups will report on their assessment, recommendation and draft terms

Case Study uses a Project Finance model

Summary Results

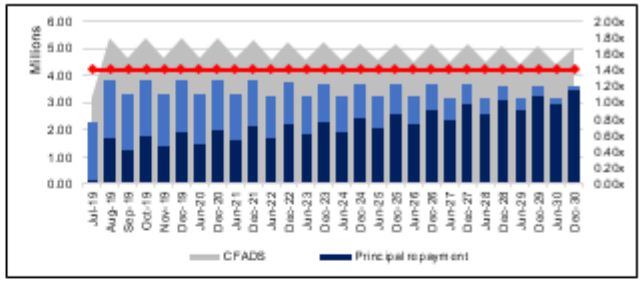
Calculate

Integrity check	**Model Ok**
Debt ratios	
Average DSCR	1.40x
Total debt	60,793,990
Last debt repayment date	31/Dec/33
Returns	
Project IRR	8.2%
Equity IRR	9.8%
Project costs	
CAPEX	89,750,000
Financing cost	3,779,215
Total project costs (USD)	93,529,215
Total project costs (USD/Watt	*1.87*
- Debt portion	60,793,990
- Equity portion	32,735,225
1st year generation (MWh)	131,250
Capacity factor	40%

Main Inputs

Legend

Formulas / Not to be edited	Text
Input cells	Text
Input cells (drop-down list)	Text
Level 1 heading	Text
Level 2 heading	Text
Condition check (true)	TRUE
Condition check (false)	FALSE



Timing

Construction start date	1/Jan/19	dd/mm/yy
Construction duration	12	month(s)
Length of Operations	20	year(s)

Project costs

Turbines	1,530,000	USD/MWp
Foundations	130,000	USD/MWp
Electric Installations	32,000	USD/MWp
Grid Connection	30,000	USD/MWp
Land	25,000	USD/MWp
Road	18,000	USD/MWp
Others	30,000	USD/MWp
Total	1,795,000	USD/MWp

Operations

O&M costs	15,000	USD/MW/year
Insurance	0.40%	of CAPEX
Major overhaul	10	years
Overhaul costs	5.0%	% of Turbines cost
Grid curtailment	0%	%

Project specifics

No. of turbines	20	Turbine(s)
Capacity per turbine	2.5	MW
Tariff	0.085	USD/kWh
Installed Capacity	50	MW
Generation profile	P90	
Annual Energy Yield	175	GWh/year
Capacity factor	40%	%

Finance

Funding basis	Back-ended	
Debt share	65%	%
Tenor	15	years
Interest rate	7.00%	% p.a.
Commitment Fee	0.50%	%
Front end fee	0.75%	%

Reserve Accounts

DSRA	1	Period(s)
DSCR threshold for default	1.10x	time(s)
DSCR threshold for dividends	1.20x	time(s)
Inflation	3.0%	% p.a.

Case Study: Key questions

1. What is the DSCR under the base case scenario? Are you comfortable with this DSCR?
2. What happens to the DSCR when you use the P90 profile? Is it still acceptable?
3. What adjustments would you make to the debt structure to achieve the desired DSCR?
4. What do you consider to be the main risks to financing the project?
5. What is your recommendation to the bank credit committee?

Mr. Sithisakdi Apichatthanapath
USAID Regional Development Mission for Asia
Athenee Tower, 25th Floor
63 Wireless Road
Patumwan, Bangkok 10330
Tel: +66 2257 3000
Email: sapichatthanapath@usaid.gov

Ms. Dana Kenney
USAID Clean Power Asia
Abdulrahim Place, Suite 501
990 Rama IV Road
Bangrak, Bangkok 10500
Tel: +66 2026 3065
Email: Dana_Kenney@abtassoc.com

PHOTO CREDIT: ISTOCK.COM

USAID
FROM THE AMERICAN PEOPLE

USAID CLEAN POWER ASIA