



*Empowered lives.
Resilient nations.*

DREI - Derisking Renewable Energy Investment

**DREI methodology and importance (global view)
DREI Lebanon**

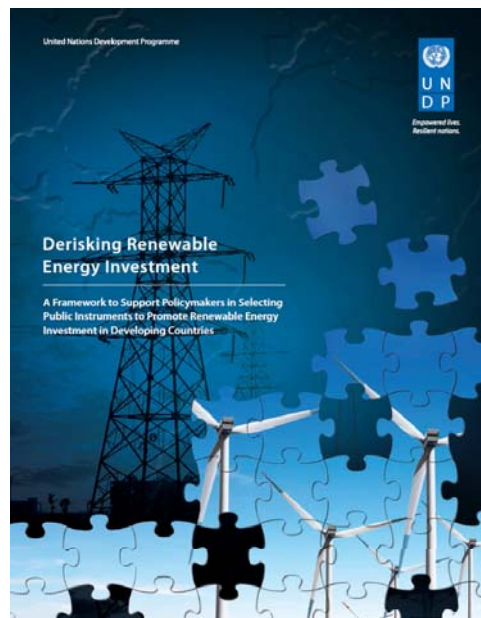
**Mischa Repmann, PhD - First Climate & UNDP
Wednesday 20 September 2017
Beirut Energy Forum**



Derisking Renewable Energy Investment History



“A framework to select cost-efficient public instruments to promote private investment in renewable energy”



- developed in 2013 (together with ETH Zurich)
- drawn from UNPD's 20y+ experience in renewable energy for low-carbon development
- becoming more «quantitative» and focusing on **risk-return** and the issue of **financing costs**
- initial **methodology for utility-scale RE** investments
- DREI is being applied and further developed as we speak:
 - Tunisia, Nigeria, **Lebanon**, Kazakhstan, Belarus, Cambodia
 - small-scale RE, energy efficiency



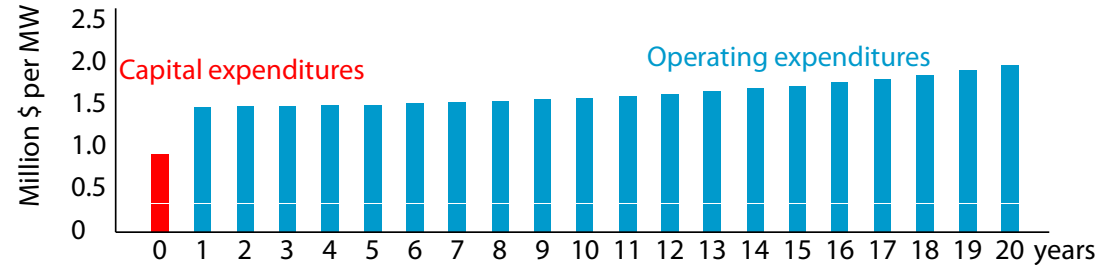
Derisking Renewable Energy Investment

The issue with RE investments

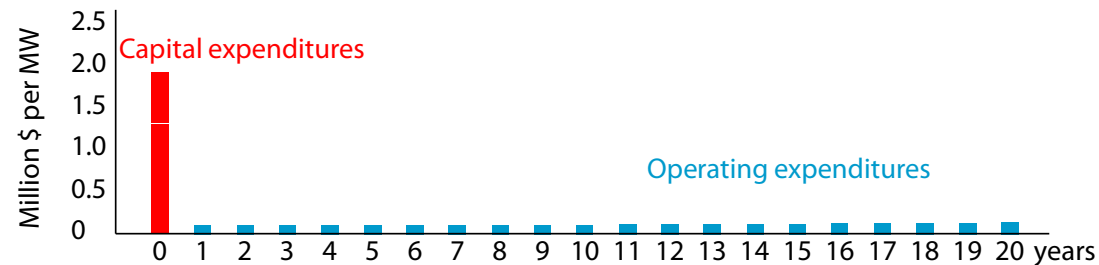


- The **objective**: to make RE investment cost competitive with the business-as-usual investment, typically fossil-fuel based energy
- RE investments have a different cost structure than fossil-fuel investments:

Example:
Costs Diesel Power
(undiscounted)



Example:
Costs Wind Power
(undiscounted)



based on:
Prof. T. Schmidt, Energy Politics Group,
ETH Zurich

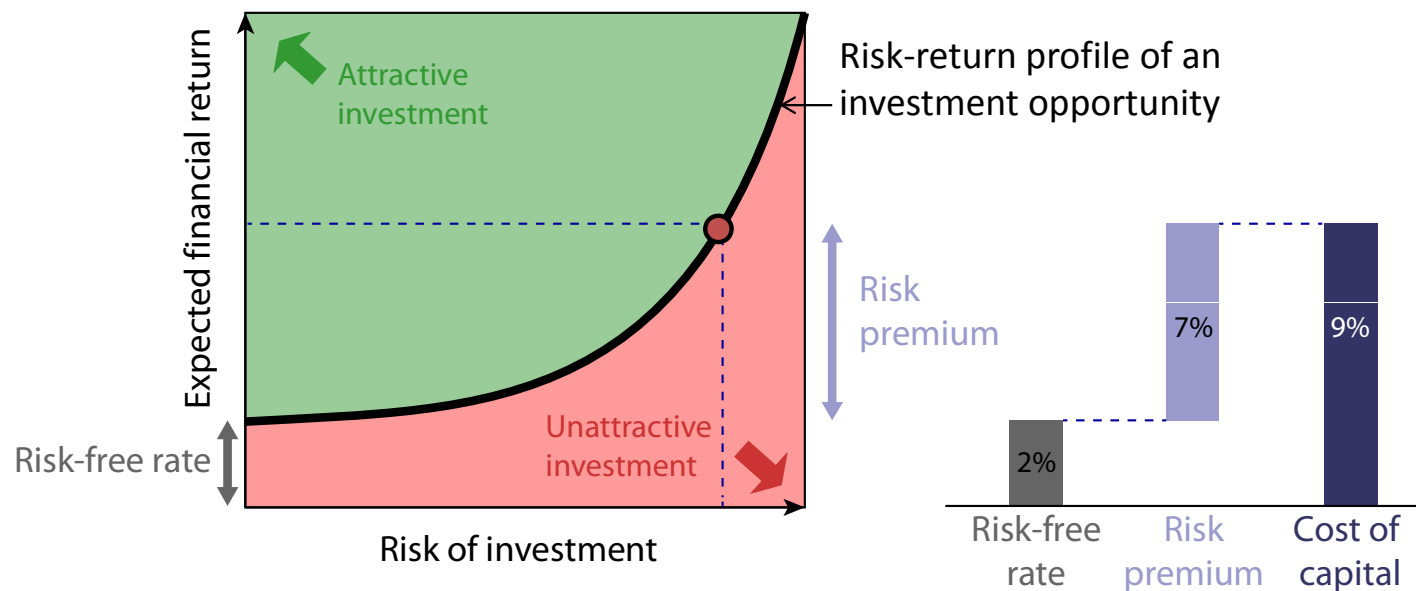
- For RE investments: **More up-front finance** is needed (less cash-flow finance)
- **Risks** and the associated **costs of finance** matter much more

Derisking Renewable Energy Investment

The issue with RE investments (cont.)



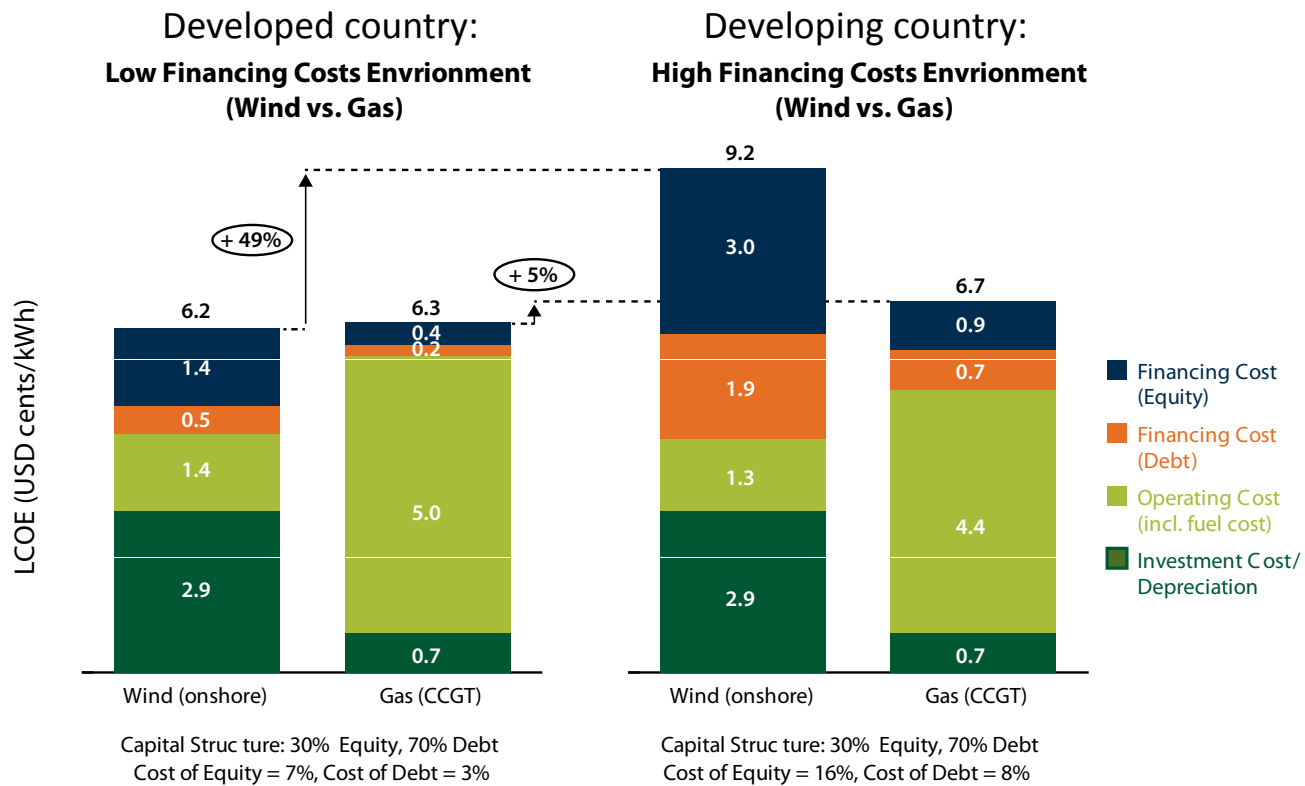
- The **objective**: to make RE investment cost competitive with the business-as-usual investment, typically fossil-fuel based energy
- The **challenge**: the high financing cost (cost of capital) in developing countries
- A project's specific risks drive the cost of capital:



based on: Prof. T. Schmidt, Energy Politics Group, ETH Zurich

Derisking Renewable Energy Investment

The issue with RE investments (cont.)



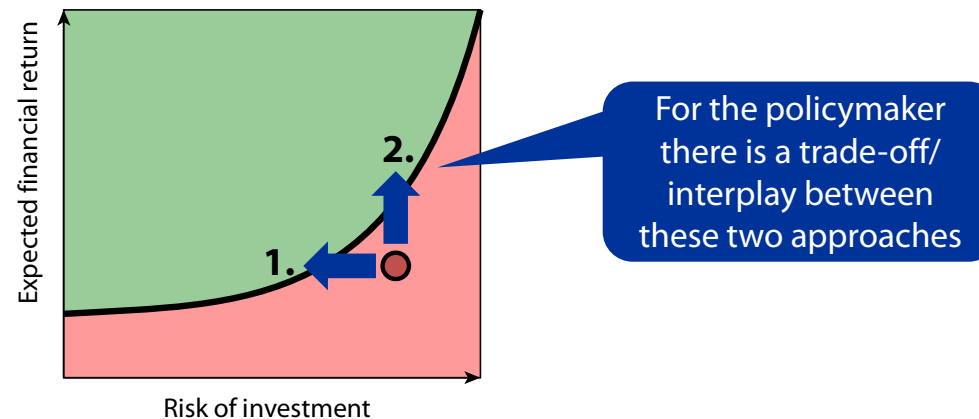
Source: Source: Derisking Renewable Energy Investment (UNDP, 2013), subsequently updated as of 2017.
 All assumptions (technology costs, capital structure etc.) except for financing costs are kept constant between the developed and developing country.

Derisking Renewable Energy Investment

DREI's theory of change for promoting RE



- The **objective**: to make RE investment cost competitive with fossil fuel investment
- The **challenge**: the high financing cost (cost of capital) in developing countries
- From the policymakers perspective, there are two ways to address this challenge:
 1. **Derisk** RE by targeting investor risks that result in high financing costs
 2. **Compensate** for risks via incentive mechanisms



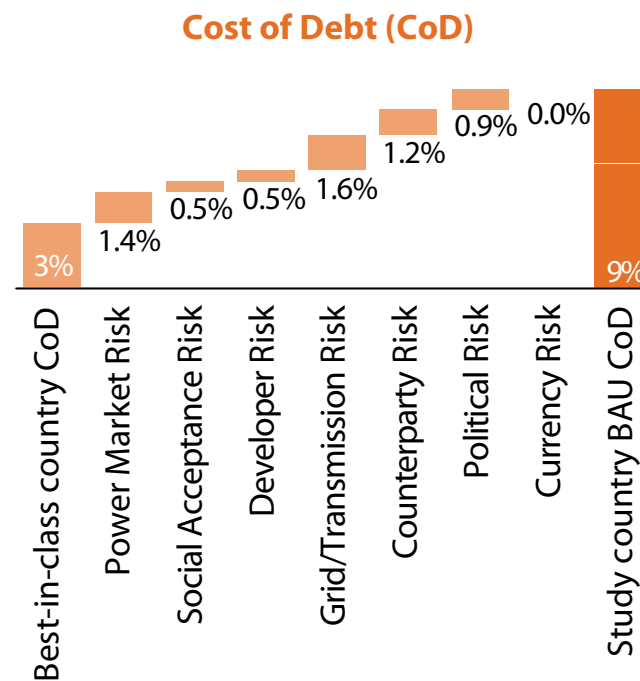
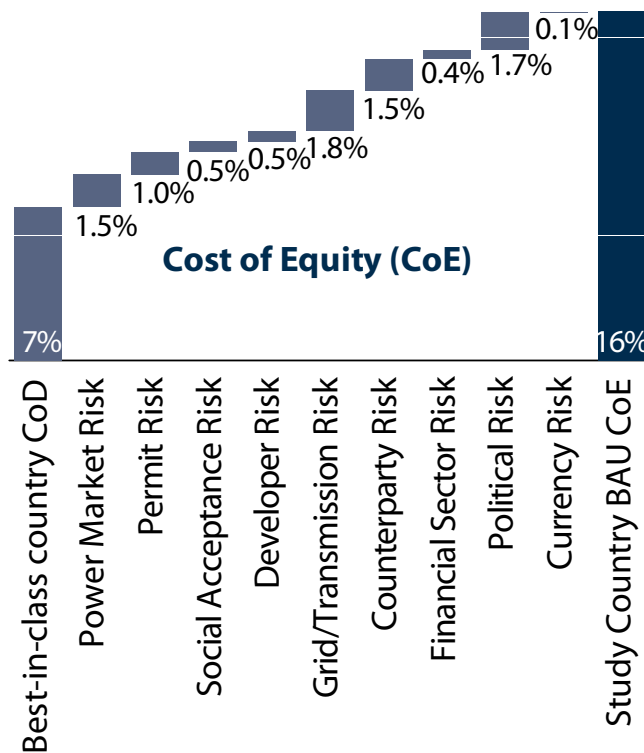
- DREI's **Theory of Change**: policymakers to derisk as much as possible, before paying for the remaining incremental costs via incentive mechanisms

Derisking Renewable Energy Investment

DREI's approach: 1) Quantify the risk environment

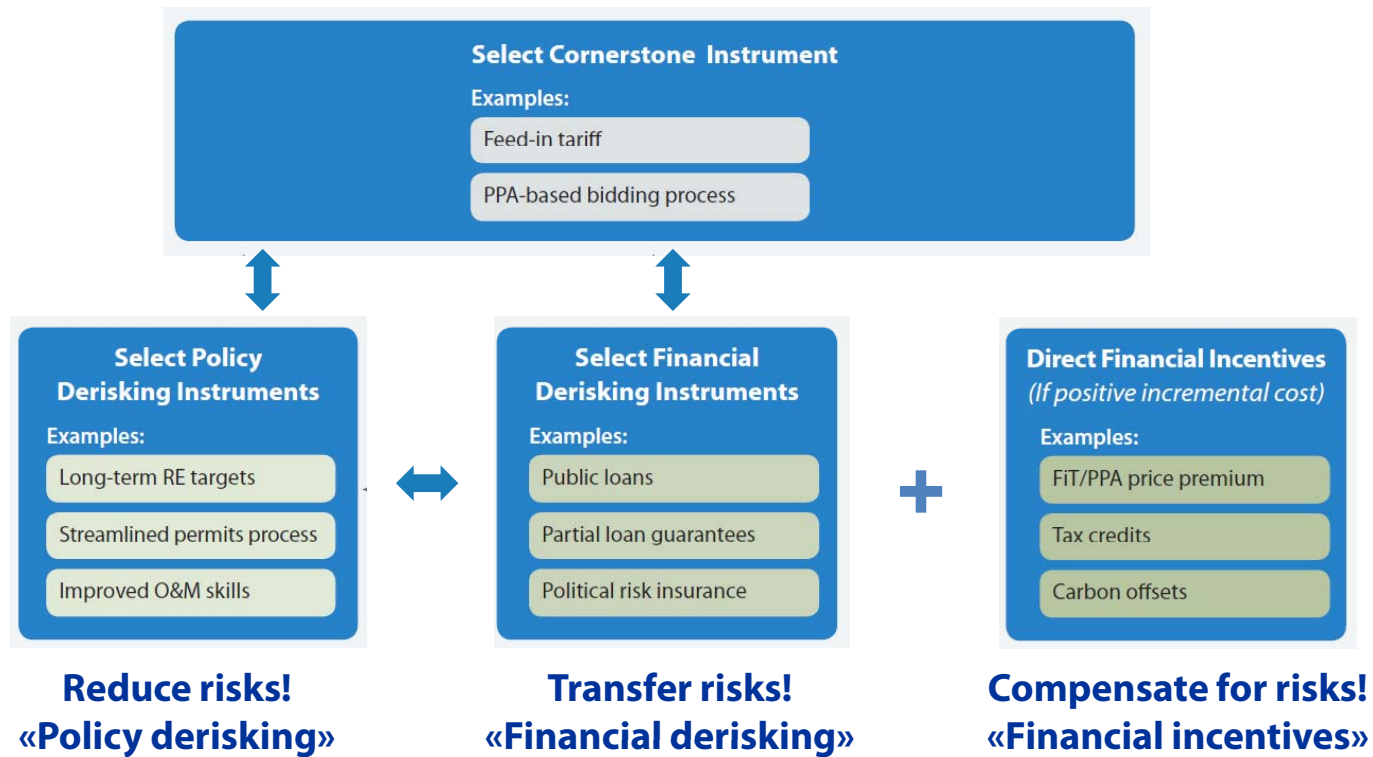


- Reach out to investors active in the target country and perform **structured interviews**
- Aggregate the perceived risk environment into **Financing Cost Waterfalls**



Derisking Renewable Energy Investment

DREI's approach: 2.1) Select public instrument package

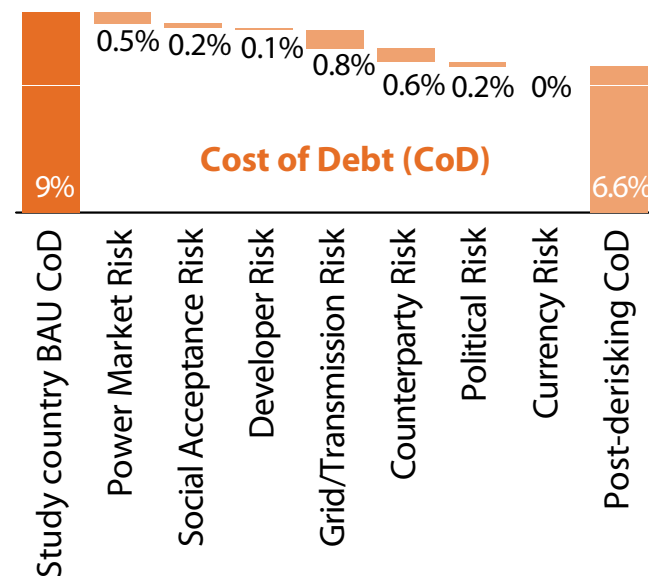
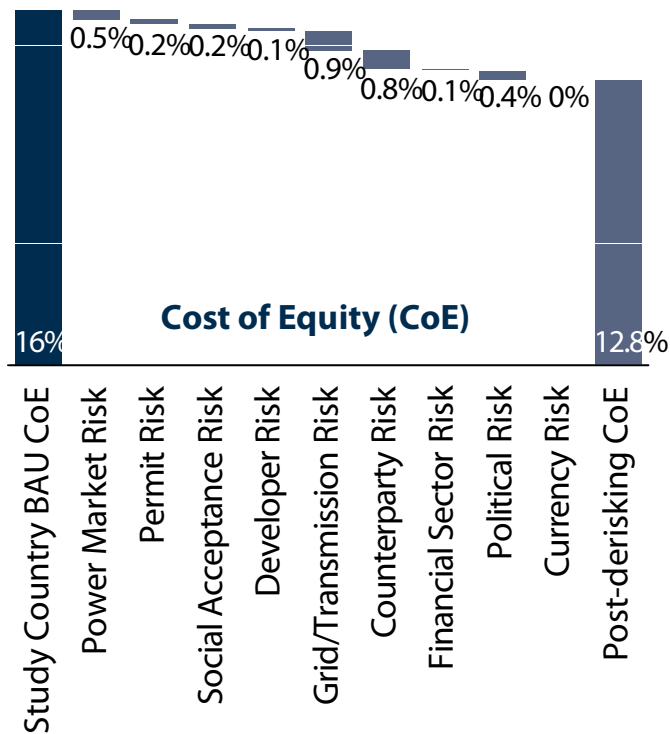


Source: UNDP, *Derisking Renewable Energy Investment* (2013).

Derisking Renewable Energy Investment

DREI's approach: 2.2) Quantify instruments' effectiveness

- (Reach out to investors active in the target country and perform **structured interviews**)
- Aggregate the perceived effectiveness of the instrument package into **Post-Derisking Waterfalls**

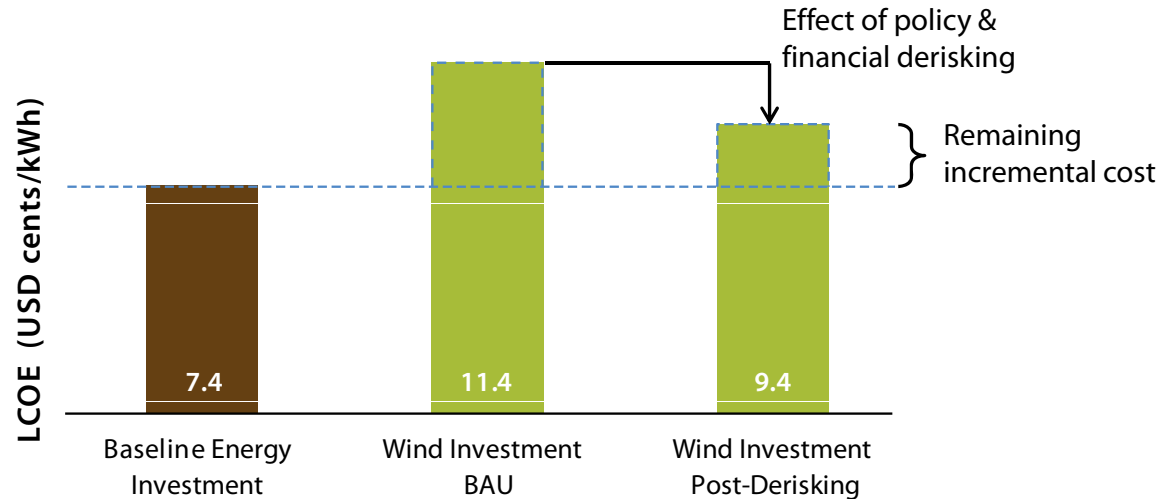


Derisking Renewable Energy Investment

DREI's approach: 3) Levelised cost



- Perform **LCOE modelling** under transparent set of assumptions, incl. about RE target, operating parameters, country specifications, etc.



Derisking Renewable Energy Investment

DREI's approach: 4) Evaluation



Use DREI's financial modelling tools to evaluate four **key performance metrics**

How does the deployment of the selected public instrument package

1. ... catalyse **private sector investment** ?

 2. ... generate **economy-wide savings**?

 3. ... increase the **affordability** of RE for end-users?

 4. ... benefit the **environment**?
- On top: Perform **sensitivity analyses** on key inputs and assumptions
 - to explore the robustness of the modelling exercise
 - to explore scenarios, e.g. alternative sets of public instruments

DREI Lebanon study

Foreshadowing key results

2030 investment target:
450 MW utility-scale wind



Use DREI's financial modelling tools to evaluate four **key performance metrics**

How does the deployment of the selected public instrument package

1. ... catalyse **private sector investment** ?

estimated at **USD 98m ...**

... of **USD 635m**

2. ... generate **economy-wide savings**?

... of **USD 221m** over 20 years

3. ... increase the **affordability** of RE for end-users?

... by lowering the LCOE from USD 11.4 cents to 9.4 cents per kWh

4. ... benefit the **environment**?

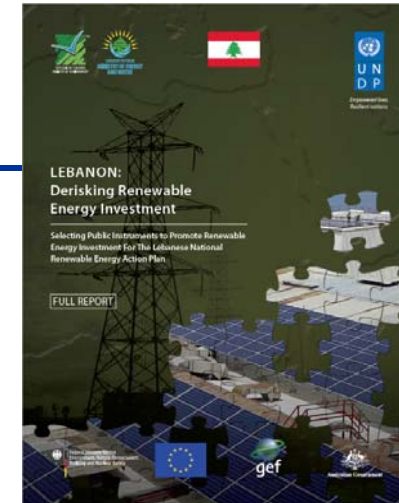
... by reducing carbon emissions by -10 million tonnes over 20 years

DREI Lebanon study

Link to download the study

Full report:
<http://climatechange.moe.gov.lb/viewfile.aspx?id=262>

Summary report:
<http://climatechange.moe.gov.lb/viewfile.aspx?id=261>



DERISKING RENEWABLE ENERGY INVESTMENT FINANCIAL TOOL

OVERVIEW

The financial tool supports the framework presented in UNDP's Derisking Renewable Energy Investment Study. The financial tool calculates the expected cost of electricity (LCOE) before and after the introduction of public instruments.

Please go to UNDP's website to download the report, view contents of the financial tool and other related documents.

TABLE OF CONTENTS

The financial tool is organized into the following eight sheets:

- I. Summary Outputs
- II. Inputs, Renewable Energy Mix
- III. Inputs, Baseline Energy Mix
- IV. LCOE, Baseline Energy Mix
- V. LCOE, Renewable Energy Mix
- VI. Additional Costs
- VII. Supplementary Information
- VIII. User Notes

REMARKS/COMMENTS

The following remarks/comments are used throughout the tool:

- Input cells: Input cells require the user to enter numerical data or to select an option from a drop-down menu. Input cells are formatted in blue font, and warnings of the format are in yellow.
- Output cells: Output cells are formatted in black font. Do NOT enter data into an output cell. If the formula is visible, it is in black font.
- Guidance comments: The tool includes a column with guidance comments. These comments provide explanatory text for the user with guidance comments is visible below the input cells. To view the comments click on the cell.
- Check: Check cells will appear when there is an invalid entry of some sort. Check cells are formatted in red.
- Other: Other cells are used to format the tool to enhance its functionality and formulas are not accidently deleted.

VERSION 1.3 OCTOBER 2016

more about the DREI Lebanon work:
Session 13B, Talk 1, 12:00-13:30, Crystal Ballroom

RENEWABLE ENERGY GENERATION

This sheet is organized into four sections:

- A. LCOE, Renewable Energy Generation Pre-derisking
- B. LCOE, Renewable Energy Generation Post-derisking
- C. Financing, Supporting Calculations
- D. Derisking, Supporting Calculations

RENEWABLE ENERGY GENERATION, PRE-DERISKING

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Energy production	8000	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02
Operating & Financial Expenses											
Availability	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Renewable Energy Generation, Pre-Derisking	8000	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02

RENEWABLE ENERGY GENERATION, POST-DERISKING

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Energy production	8000	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02
Operating & Financial Expenses											
Availability	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Renewable Energy Generation, Post-Derisking	8000	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02	8211.02

FINANCING, SUPPORTING CALCULATIONS

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Capital Expenditure	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Operating Expenses	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Depreciation	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Interest Expense	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Interest Income	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Income Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Profit Before Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Income Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Profit After Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

DERISKING, SUPPORTING CALCULATIONS

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Capital Expenditure	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Operating Expenses	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Depreciation	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Interest Expense	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Interest Income	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Income Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Profit Before Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Income Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Profit After Tax	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

MODEL INPUT DATA

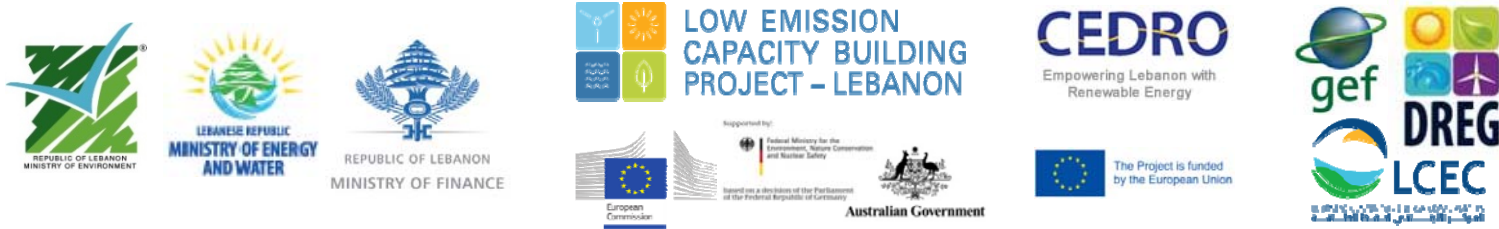
Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Renewable Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Light Fuel Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heavy Fuel Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thermal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nuclear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



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www.undp.org/DREI

For DREI Lebanon: Our gratitude to the ministries and support programs involved:



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DREI Lebanon study

Foreshadowing key results

2030 investment target:
300 MW utility-scale solar PV



Use DREI's financial modelling tools to evaluate four **key performance metrics**

How does the deployment of the selected public instrument package

1. ... catalyse **private sector investment** ?

estimated at **USD 46m ...**

... of **USD 279m**

2. ... generate **economy-wide savings**?

... of **USD 97m** over 20 years

3. ... increase the **affordability** of RE for end-users?

... by lowering the LCOE from USD 10 cents to 8.2 cents per kWh

4. ... benefit the **environment**?

... by reducing carbon emissions by -5.2 million tonnes over 20 years