Finance Mechanisms for Lowering the Cost of Renewable Energy in Rapidly Developing Countries

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Gireesh Shrimali
Why are financing costs and debt so significant to the cost of renewable energy in rapidly developing countries?

What financing mechanisms can be used to reduce the cost of renewable energy in those countries?

- Using debt sourced from the developed world
- Using domestic debt to support renewable energy programs and policy
Initial investment costs are more significant for renewable energy than conventional alternative.
Which makes the higher cost of finance in developing countries particularly important for renewable energy.

**Range of required returns on equity and debt for renewable energy**

*India versus US and Europe*

<table>
<thead>
<tr>
<th>Equity Required Return (ROE)</th>
<th>Debt Interest rate</th>
</tr>
</thead>
</table>

**Legend**
- India
- US
- Europe

<table>
<thead>
<tr>
<th>Technology</th>
<th>Solar PV</th>
<th>Onshore Wind</th>
<th>Solar Thermal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td><strong>Debt</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

**Finance Mechanisms for Emerging Economies**
Higher financing costs can offset other natural advantages that developing world countries may have.

**A comparison of sample US and India Renewable Energy Costs**

**Solar PV**

US LCOE* – 0.19 USD/kWh

<table>
<thead>
<tr>
<th>US Energy Cost</th>
<th>Capital cost</th>
<th>Performance</th>
<th>Finance</th>
<th>India Energy Cost</th>
<th>Capital cost</th>
<th>Performance</th>
<th>Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>25</td>
<td>23</td>
<td>28</td>
<td>126</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Onshore Wind**

US LCOE* – 0.9 USD/kWh

<table>
<thead>
<tr>
<th>US Energy Cost</th>
<th>Capital cost</th>
<th>Performance</th>
<th>Finance</th>
<th>India Energy Cost</th>
<th>Capital cost</th>
<th>Performance</th>
<th>Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>29</td>
<td>5</td>
<td>22</td>
<td>88</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* LCOE – Levelized Cost of Electricity

*Impact on energy costs of differences in...*
Debt cost and terms are the main driver of higher finance costs

**Comparison of US and Indian Financing costs for renewables**

**Solar PV**
- US: Debt Cost $19$, Shorter debt tenor $6$, Variable to fixed debt $7$.
- India: Debt Cost $7$, Shorter debt tenor $7$, Variable to fixed debt $3$.

**Onshore Wind**
- US: Debt Cost $10$, Shorter debt tenor $10$, Variable to fixed debt $4$.
- India: Debt Cost $4$, Shorter debt tenor $4$, Variable to fixed debt $2$.

In both cases, equity absorbs variable debt risk. The debt cost and terms add $32\%$ to cost in the US, making equity cheaper by $4\%$. In India, the debt cost and terms add $24\%$ to cost, making equity cheaper by $2\%$.

Impact on energy costs of differences in...
And the high cost of debt overwhelms other policy mechanisms.

<table>
<thead>
<tr>
<th>Policy Levers</th>
<th>Impact on lowering financing costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of Revenue Support</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>Revenue Certainty</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>Risk Perception</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>Completion Certainty</td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td>Cost Certainty</td>
<td><img src="image" alt="Graph" /></td>
</tr>
</tbody>
</table>

- Debt cost reduction
- Tenor increase

- **India Wind**
- **India PV**
- **India CSP**
Two financing mechanisms could provide solutions that lower the cost of renewable energy.

Index renewable energy tariffs to foreign currency, so doing eliminate currency hedging costs that are responsible for most of the difference between developed world and developing world debt costs.

Deliver subsidies through concessional debt, which our research shows could provide attractive equity returns to renewable energy developers at a lower cost to government and consumers.
Why are financing costs and debt so significant to the cost of renewable energy in rapidly developing countries?

What financing mechanisms can be used to reduce the cost of renewable energy in those countries?

• Using debt sourced from the developed world

• Using domestic debt to support renewable energy programs and policy
Currency hedging costs can eliminate all of the advantage of using foreign sourced debt.

Relative cost of using Rupee versus Dollar denominated loans for Indian Renewables (2012)
Many countries are in a similar situation

Currency Hedge Cost versus yield differential between local currency and dollar debt and for 10 year debt (Dec 2013)
Indexing tariffs to a foreign currency could eliminate the currency hedging cost and reduce energy cost by 30%.

Projects with tariffs indexed to dollars could eliminate need for a hedge

For a foreign investment:
If project cash flows are in dollars or euros, currency risk would be reduced, the need for a hedge eliminated and debt costs to developers would fall.

For developers and policy makers:
Lower debt cost could reduce average lifetime energy cost by up to 30%.

Developing countries need only index that portion of the tariff related to the foreign sourced debt.

Fossil fuels are typically traded on world markets and priced in dollars and thus already benefit from access to lower cost foreign capital.
But a country that indexes tariffs to the dollar or Euro takes on a set of currency related risks.

**Risks associated with indexing tariffs to foreign currency**

- **Inflation differential**
- **Relative currency valuation**
- **Macroeconomic Policy**
- **Risk of currency fluctuation**

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**Tradeoff between lower debt costs and the cost of currency devaluation**

- Levelized cost higher than with local debt
- Currency appreciates
- Currency depreciates
- Impact on average local currency LCOE
- Average annual currency devaluation versus U.S. dollar

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CLIMATE POLICY INITIATIVE
Why are financing costs and debt so significant to the cost of renewable energy in rapidly developing countries?

What financing mechanisms can be used to reduce the cost of renewable energy in those countries?

- Using debt sourced from the developed world
- Using domestic debt to support renewable energy programs and policy
For high debt cost countries, concessional debt may be a more cost effective way to make renewable energy projects attractive to developers.

Two reasons why concessional debt is more cost effective than direct subsidies:

1. Low cost debt may reduce the total project support required to make a project viable

2. Governments have advantages that may enable them to provide dollar-equivalent debt subsidies more cheaply than price supports
Low cost debt may reduce the total project support required to make a project viable

Factors reducing subsidy required when using debt

1. Lower cost, long term debt allows greater financial engineering that will reduce costs

2. If the low-cost loan support mechanism offers project validation or risk guarantee, projects may secure additional low cost debt from commercial lenders

3. Low cost debt will improve the effectiveness of existing renewable energy policies

<table>
<thead>
<tr>
<th>INTEREST RATE CONCESSION</th>
<th>REDUCTION IN TOTAL SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WIND</td>
</tr>
<tr>
<td>3%</td>
<td>-16%</td>
</tr>
<tr>
<td>5%</td>
<td>-27%</td>
</tr>
<tr>
<td>7%</td>
<td>-39%</td>
</tr>
</tbody>
</table>
Governments have advantages that may enable them to provide dollar-equivalent debt subsidies more cheaply than price supports

Factors reducing the cost of providing debt subsidies

1. A national government can usually raise money at a lower cost than developers
2. A national government can provide a currency swap at a lower cost than developers
3. A country may not need (or want) to hedge all of its foreign currency borrowings
4. Lower long term interest rates better reflect the value of infrastructure investments

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>PERCENT OF ELECTRICITY GENERATED FROM AN IMPORTED FUEL SOURCE (2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>58%</td>
</tr>
<tr>
<td>Chile</td>
<td>40%</td>
</tr>
<tr>
<td>Hungary</td>
<td>32%</td>
</tr>
<tr>
<td>Mexico</td>
<td>18%</td>
</tr>
<tr>
<td>India</td>
<td>11%</td>
</tr>
<tr>
<td>Romania</td>
<td>9%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>2%</td>
</tr>
<tr>
<td>South Africa</td>
<td>1%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1%</td>
</tr>
<tr>
<td>Colombia</td>
<td>0%</td>
</tr>
</tbody>
</table>
There is no universally right way to design a concessional debt program

Considerations for designing a concessional debt program

- Magnitude of loan discount relative to short-term rates
- Administering entity
- Program duration
- Two-tier system
- Loan application process management
- Interface with existing renewable energy policy
- Credit/project evaluation
- Funding the interest subsidy
- Project selection mechanism and criteria
- Availability of loans for refinancing
- Treatment of domestic and imported material
Summary

The high cost of debt can significantly increase the cost of renewable energy in rapidly developing countries.

Two solutions can reduce these costs:

- Improve access to foreign debt at lower cost by indexing renewable energy tariffs to foreign currency.
- Deliver support through subsidized debt rather than through direct subsidies or higher tariffs.

Appropriate program design should allocate risks and costs to the stakeholders most suited to manage them.
Next Steps

Work with governments and/or multilateral organizations in implementing these solutions

Estimate budgetary requirements for providing subsidized debt

Further research on the design of subsidized debt instruments
Questions?

The chat history has been cleared
Thank you

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