Solving India's Renewable Energy Financing Challenge:
Which Federal Policies can be Most Effective?

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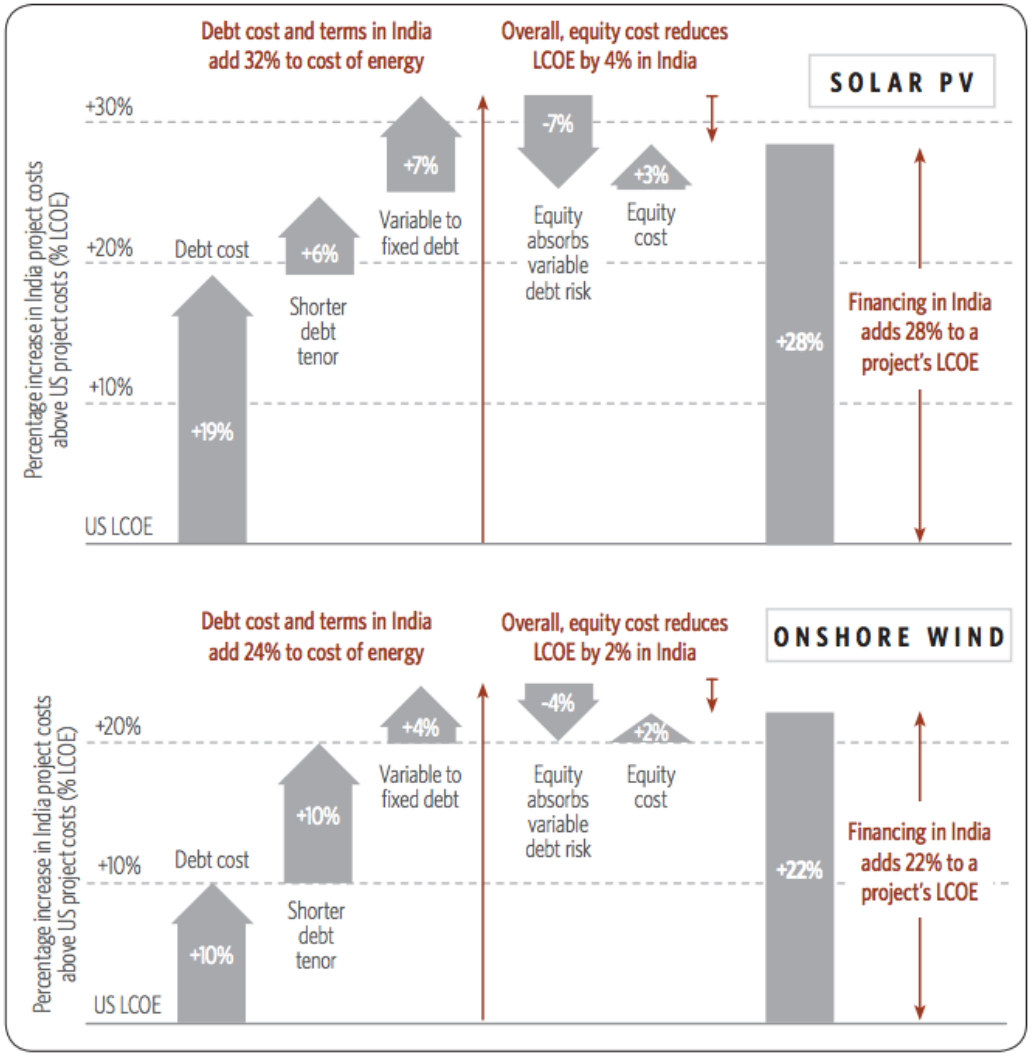
Which federal policy would be the most cost-effective?

- **India aims to double existing renewable energy** capacity by 2017.
- **Renewable energy is 52-129% more expensive** than conventional power, and requires policy support.
- Inferior debt terms – high (and variable) interest rate and short tenor – **24-32%** to the cost of renewable energy.
- Are existing policies ensuring a **cost-effective** solution?

Impact of debt and equity costs and terms in India on overall financing costs



Source: Meeting India's Renewable Energy Targets: The Financing Challenge (2012), CPI

Cost-effectiveness is only one of the key policymaker criteria

- **Cost-effectiveness** is an important driver of policy choice.
  - The provision of reduced cost, extended-tenor debt on top of current policies can reduce the total subsidy cost by over 80%.

- We also compare federal policies across the following criteria:

  1. **Viability gap coverage potential:** How much of the viability gap can be covered?

  2. **Subsidy-recovery:** How much of the budgetary allocation can be recovered?

  3. **Potential to incentivize production:** How can production be incentivized, and not just capacity installation?

  4. **One-year budget efficiency:** Given a fixed annual budgetary allocation, how much capacity could be funded?

We examine two classes of federal policies: Existing and (proposed) debt-related

At present, in addition to state support through feed-in tariffs, federal policy support is provided in the form of:

Accelerated Depreciation

Reduces tax liability in initial years.

Viability Gap Funding

Capital – i.e., one time – grant.

Generation Based Incentive

Subsidy provided per unit of power.

We also examine a new class of proposed debt-related federal policies:

Interest Subsidy

Government would subsidize the interest (only) on commercial loans.

Extended Tenor Debt

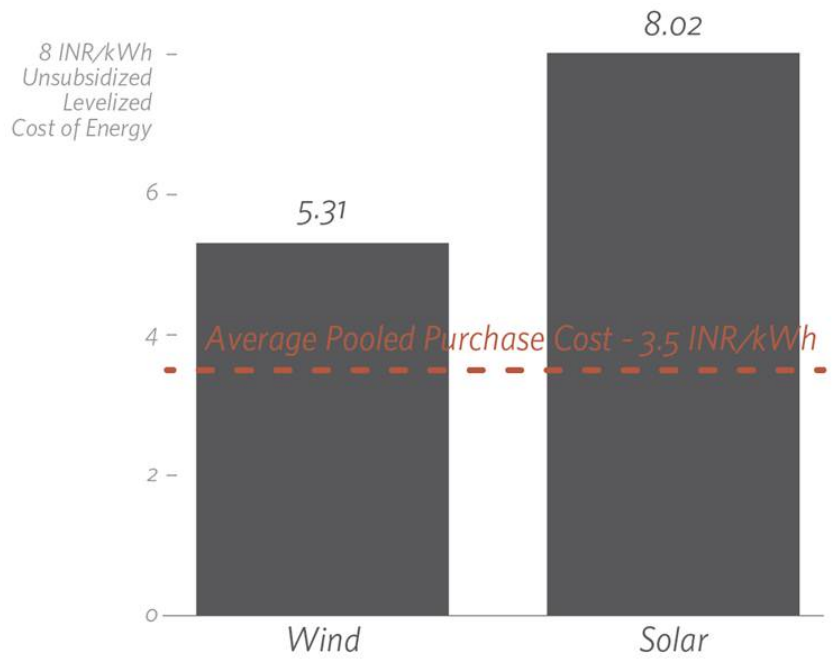
Government debt at longer-than-commercial tenor.

Reduced Cost Loan

Government debt below commercial rate of interest.

We use detailed project-level cash-flow models

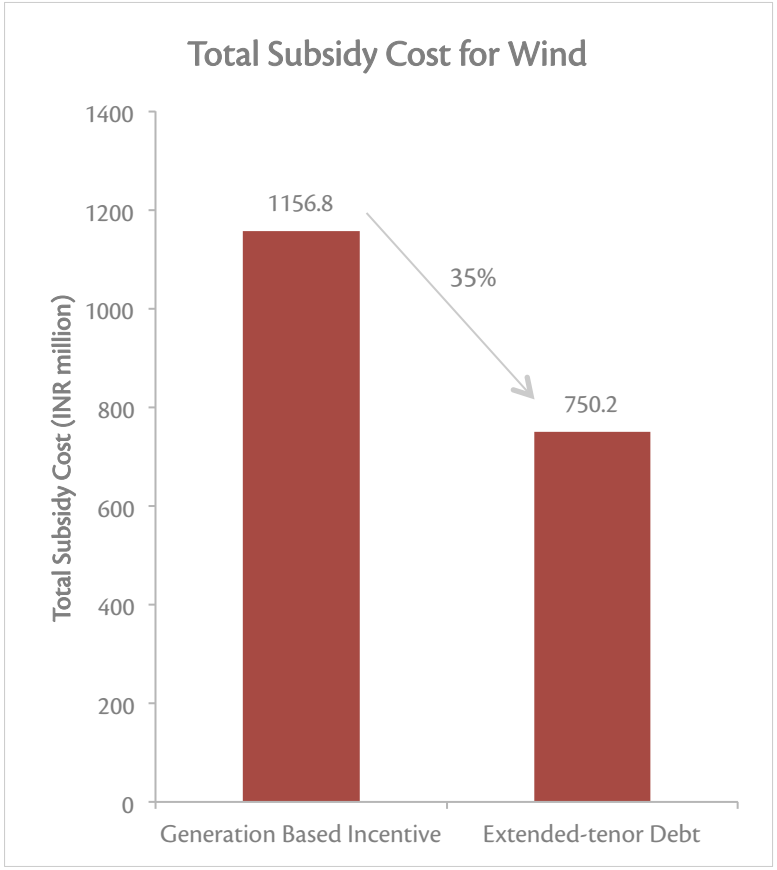
Levelized Cost of Electricity with no Federal Policy Support

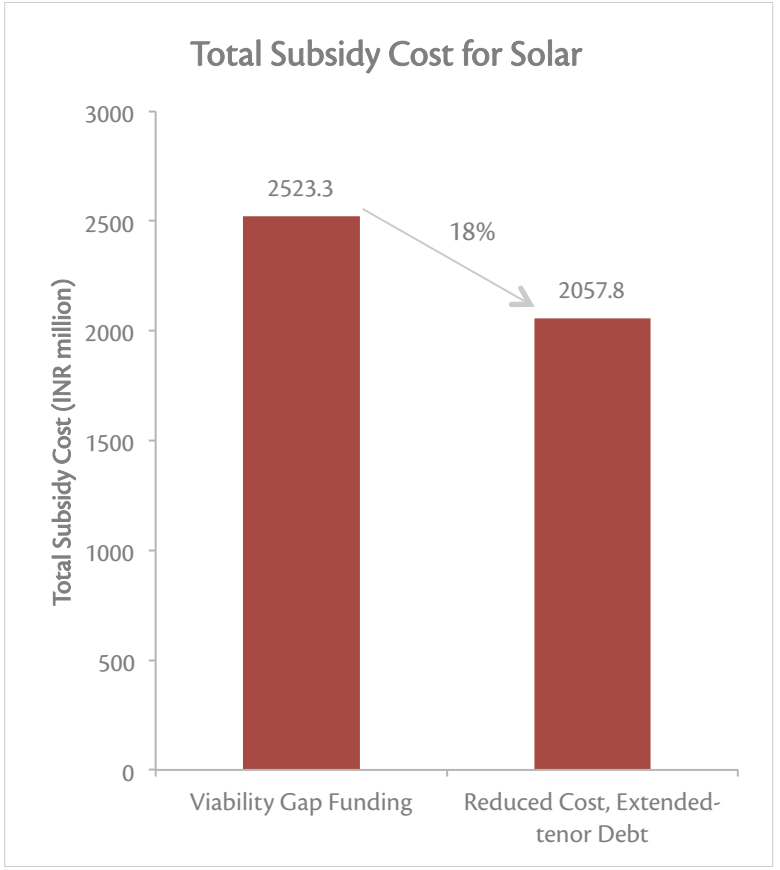


Source: CPI Analysis

- **Baseline:** No federal policy support – i.e., all support via state-level feed-in tariff
- For each federal policy, we computed the subsidies corresponding to different levels of feed-in tariffs.
- **Three analyses:**
  1. Existing policies at current support levels
  2. Fixed feed-in tariffs: To ensure fixed baseline
  3. Optimal performance for cost-effectiveness
- **Assumption:** Debt-leverage optimized to minimize cost of capital.

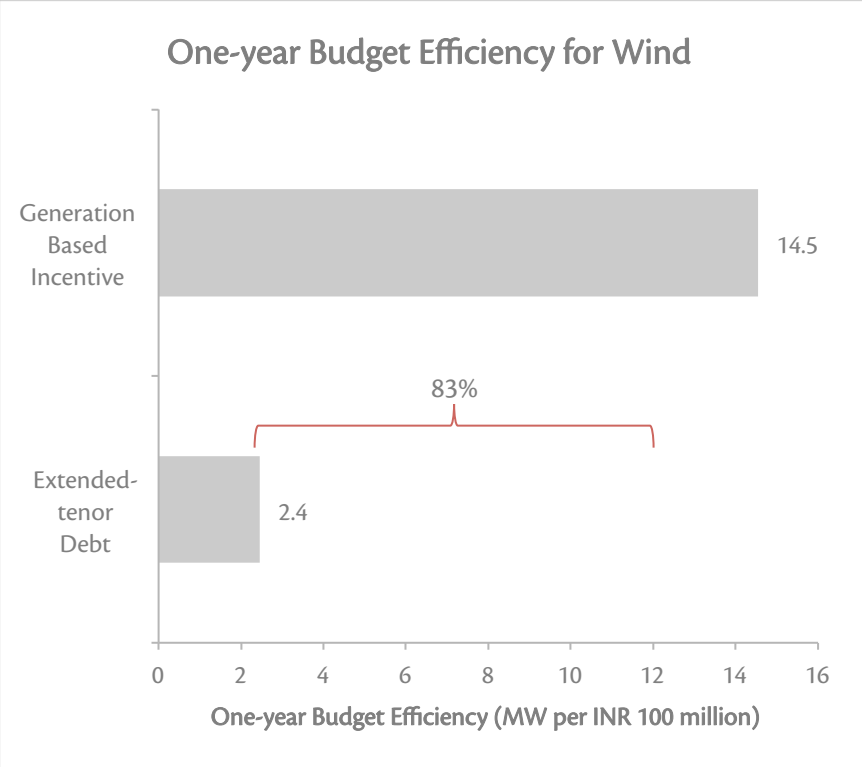
Reduced cost, extended-tenor debt is 18-35% more cost-effective than current policies …

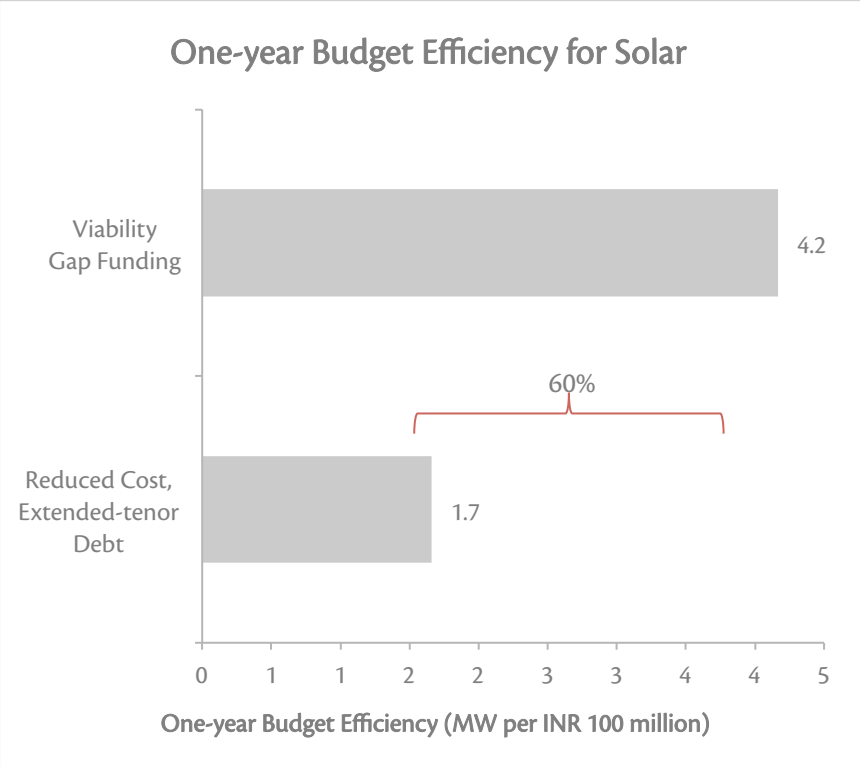




Source: CPI Analysis

… however, reduced cost, extended-tenor debt would support 60-83% less deployment in the short-term

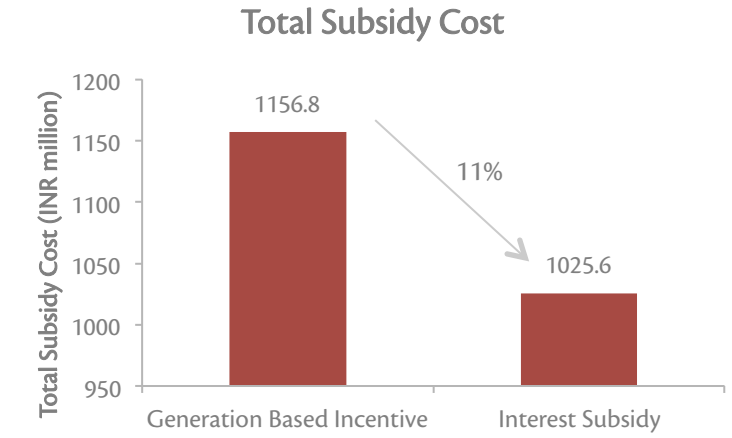


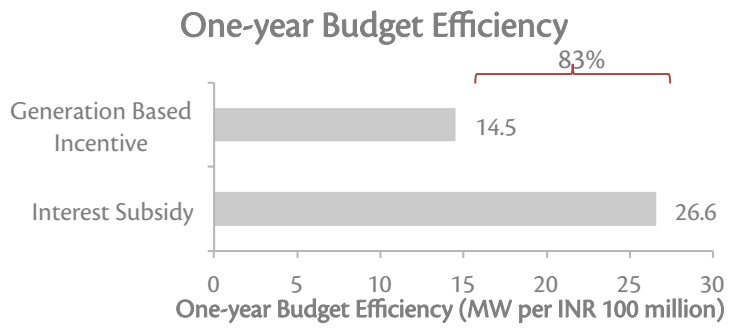


Source: CPI Analysis

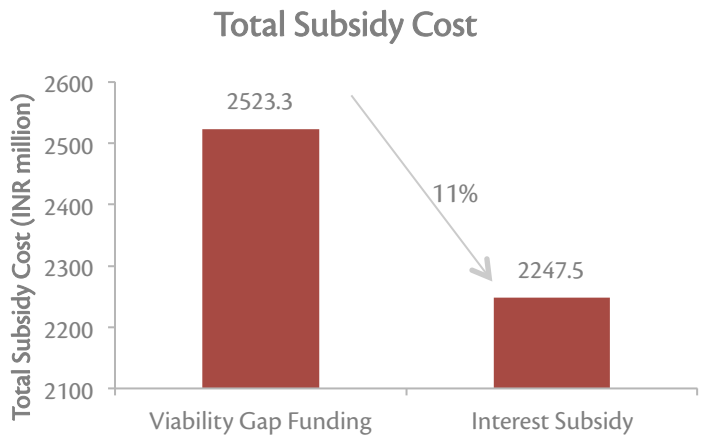
In the short-term, interest subsidy is an attractive alternative to current policies

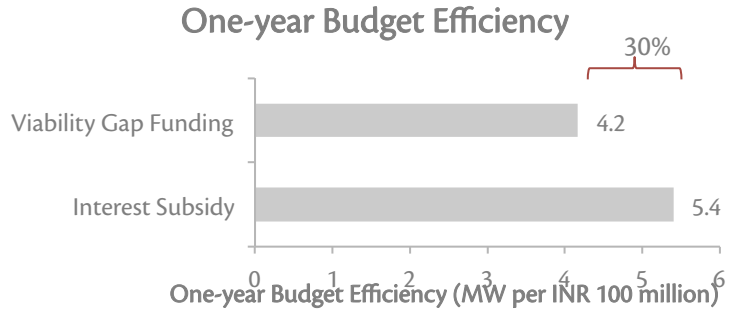
Wind Energy





Solar Energy





Source: CPI Analysis

An interest subsidy is 11% more cost effective and supports 30-83% more deployment in short-term than existing policies at current support levels

For fixed state-level support, similar results hold for wind energy …

Debt-related policies are more cost-effective and interest subsidy is an attractive short-term alternative

Impact of federal policies at a state level Feed in Tariff for Wind at INR 5/kWh

POLICY TYPE	POLICY	COST-EFFECTIVENESS POTENTIAL (% REDUCTION IN SUBSIDY COST)	SUBSIDY-RECOVERY POTENTIAL	ONE-YEAR BUDGET EFFICIENCY (MW PER INR 100 MILLION)
EXISTING	Accelerated Depreciation	18%	42%	35.7
	Viability Gap Funding	9%	0%	28.6
	Generation Based Incentive	3%	0%	19.7
DEBT	Extended Tenor Debt	30%	110%	2.5
	Reduced Cost Debt	20%	98%	2.6
	Interest Subsidy	12%	0%	36.9
BASELINE	Zero Federal Support	0%	0%	2.6

Source: CPI Analysis

Accelerated depreciation is an attractive short-term alternative to generation based incentive, except that it does not support production

… the results for solar energy are similar to those for wind

But cost-effectiveness is lower due to higher capital cost

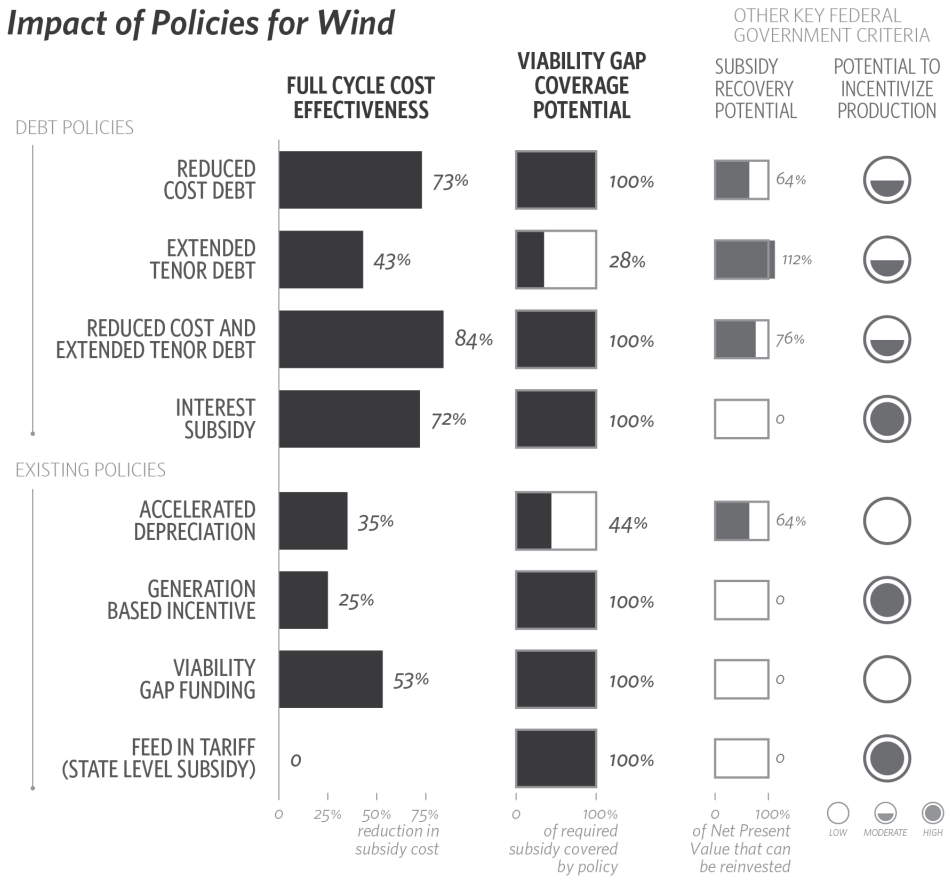
Impact of federal policies at a state level Feed in Tariff for Solar at INR 7.5/kWh

POLICY TYPE	POLICY	COST-EFFECTIVENESS POTENTIAL (% REDUCTION IN SUBSIDY COST)	SUBSIDY-RECOVERY POTENTIAL	ONE-YEAR BUDGET EFFICIENCY (MW PER INR 100 MILLION)
EXISTING	Accelerated Depreciation	13%	45%	25.2
	Viability Gap Funding	5%	0%	19.2
	Generation Based Incentive	2%	0%	14.1
DEBT	Extended Tenor Debt	17%	111%	1.9
	Reduced Cost Debt	11%	97%	2
	Interest Subsidy	7%	0%	25
BASELINE	Zero Federal Support	0%	0%	1.1

Source: CPI Analysis

Accelerated depreciation is an attractive short-term alternative to viability gap funding

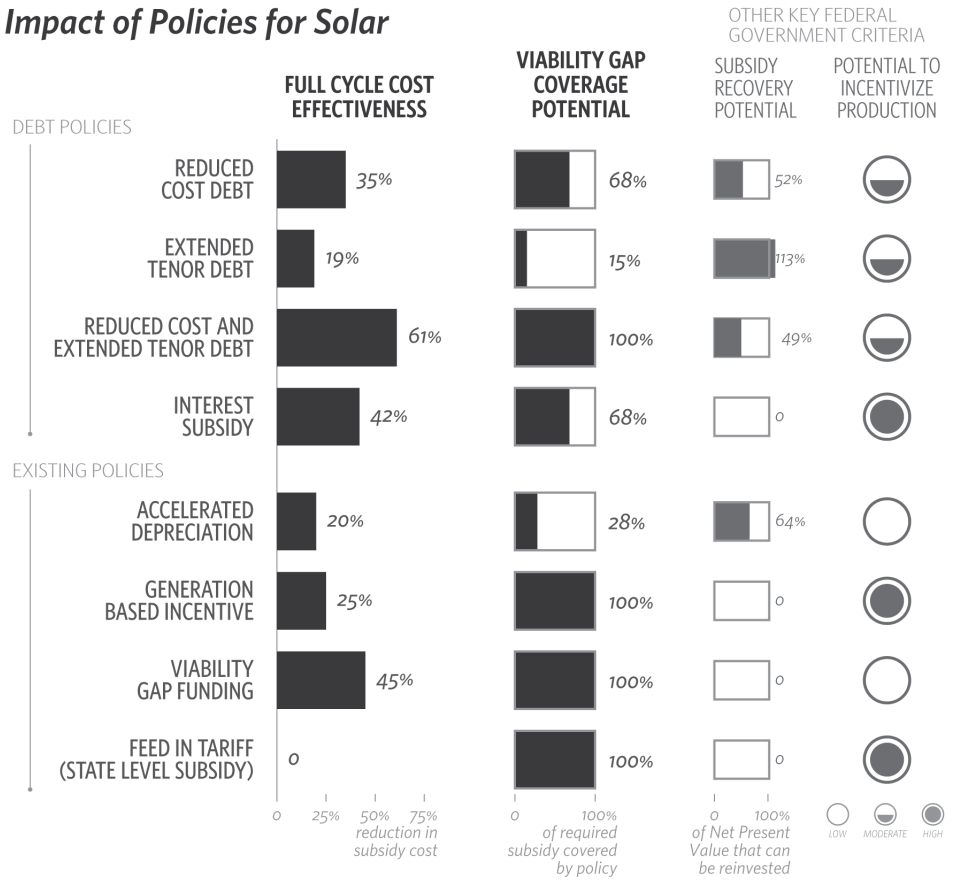
In long-term, based on optimal performance, reduced-cost, extended-tenor debt is an attractive policy for wind energy …



Source: CPI Analysis

Compared to generation based incentive, reduced-cost extended-tenor debt is 78% more cost effective and provides 76% higher subsidy recovery

… the results for solar energy are similar to those for wind



Source: CPI Analysis

Compared to viability gap funding, reduced-cost extended-tenor debt is 28% more cost effective and provides 49% higher subsidy recovery

No single policy outperforms others across all criteria

The policy decision would depend on the relative importance of each criterion; however, attractive alternatives exist

- **In the long-term, debt-related policies are attractive**
  - Reduced-cost extended-tenor debt is 28-78% more cost-effective and provides 49-76% higher subsidy recovery
  - Even in short-term, reduced-cost extended-tenor debt is 18-35% more cost-effective; however it supports 60-83% less deployment

- **In the short-term,**
  - **Interest-subsidy is an attractive alternative**: It is 11% more cost-effective and provides 30-83% more deployment
  - **Accelerated depreciation is also attractive**: It is 10-17% more cost-effective and provides 44-87% more deployment

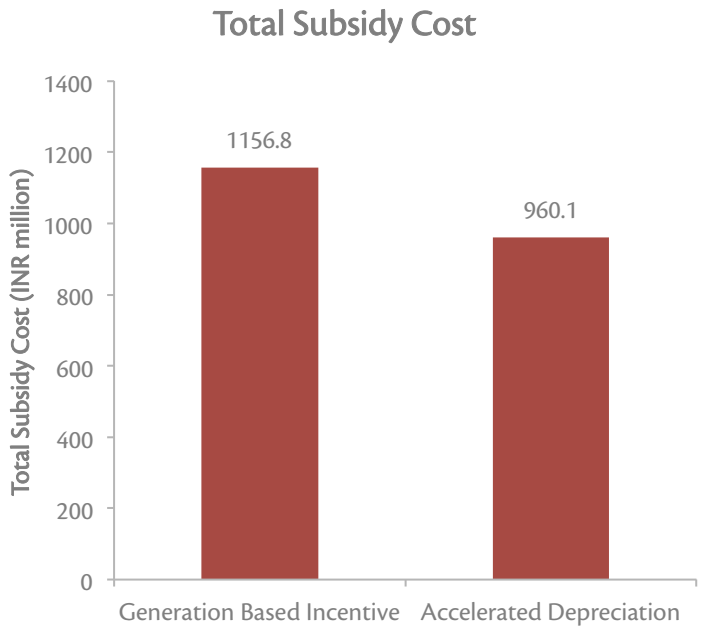
Backup

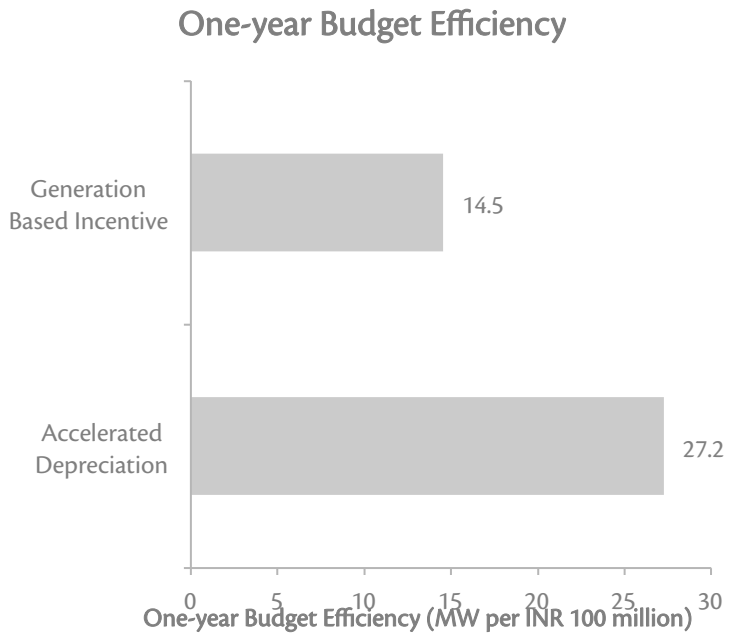
Project-level Assumptions

ASSUMPTIONS	WIND	SOLAR
POWER GENERATION		
Installed capacity	50 MW	50 MW
Capacity Utilizations (P50 PLF)	24.7%	20.5%
Useful Life	20 yrs	25 yrs
CAPITAL COST		
Capital Cost[i] (in INR million/MW)	61.6	80.0
Total Capital Cost (in INR million)	3080	4000
FINANCIAL ASSUMPTIONS		
Debt (for fixed leverage)	60%	60%
Minimum Debt Service Coverage Ratio[ii]	1.3	1.3
P90 PLF (Debt condition)[iii]	22.7%	18.5%
DEBT		
Repayment Period	10 yrs	11 yrs
Interest Rate	12.3%	12.3%
EQUITY		
Expected Return on Equity	17.9%	17.3%

Source: CPI Analysis based on Bloomberg New Energy Finance database, Central Electricity Regulatory Commission benchmarks and interviews with project developers

For wind energy, compared to current generation based incentive, accelerated depreciation is an attractive alternative



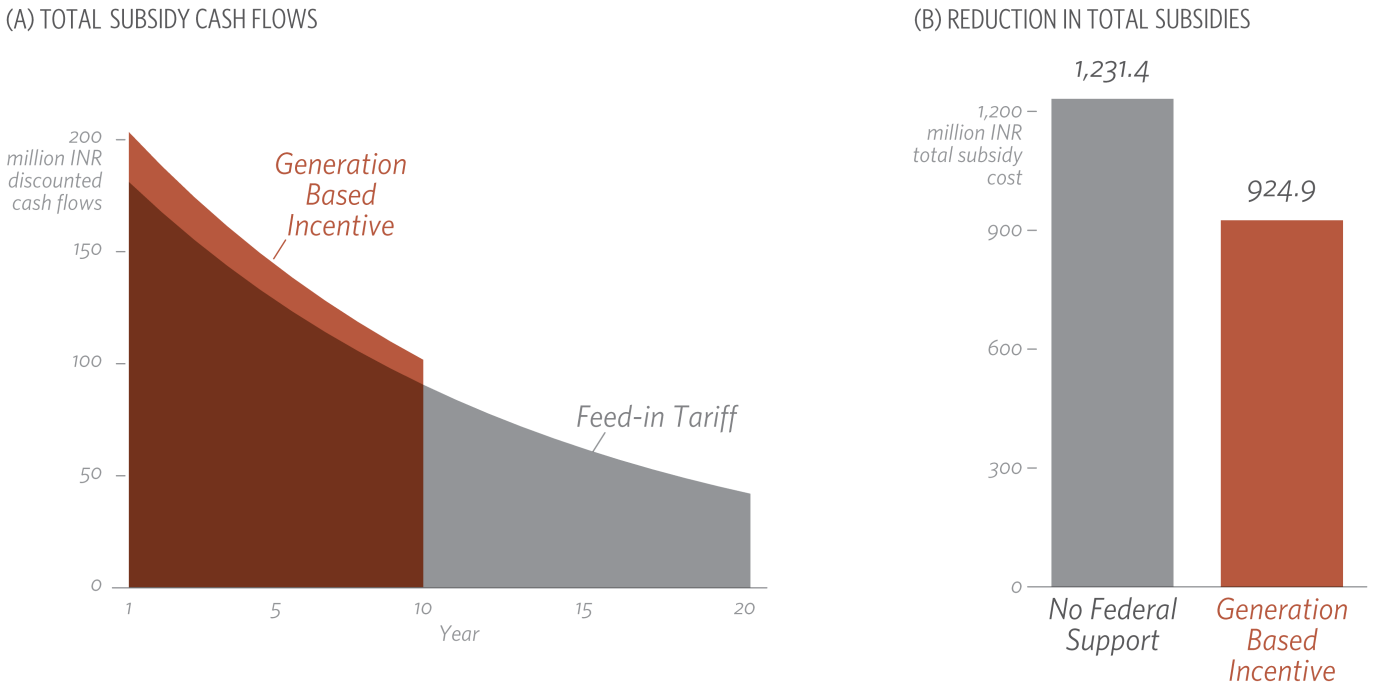


Source: CPI Analysis

Accelerated depreciation is 17% more cost-effective and supports 87% more deployment; how it may not incentivize production as well

Front-loaded subsidies lead to greater cost reduction

Comparison of Generation Based Incentive with no federal policy support (Wind energy)



Source: CPI Analysis

Compared to a no federal support – i.e., all support via feed-in tariff – the generation based incentive – a more front loaded policy – is more cost effective

Cost-effectiveness is achieved through a combination of factors

Source of cost-effectiveness of federal policies (Wind energy)

FEDERAL POLICY	COST-EFFECTIVENESS POTENTIAL (% REDUCTION IN SUBSIDY COST)	SOURCE OF COST-EFFECTIVENESS
Extended-Tenor Debt	30%	Interest-arbitrage, Subsidy-recovery, Higher-leverage
Reduced Cost Debt	20%	Subsidy-recovery and Higher-leverage
Accelerated Depreciation	18%	Front-loading and Subsidy-recovery
Interest Subsidy	12%	Higher-leverage and Front-loading
Viability Gap Funding	9%	Front-loading
Generation Based Incentive	3%	Front-loading
Zero Federal Support	0%	

Source: CPI Analysis

- Existing federal policies are more cost-effective than the baseline due to **front-loading**.
- Debt-related policies lead to **higher-leverage** due to reduced debt service requirements.
- Reduced cost debt and accelerated depreciation allow for **subsidy-recovery**.
- Extended-tenor debt is a special case of subsidy-recovery
  - **Interest-arbitrage** since the government lends at the commercial rate of interest.

Debt-related policies are cost-effective even with fixed leverage

Effect of leverage on reduced cost loans

Source: CPI Analysis

- A debt-related policy reduces cash outflows for debt-servicing, making it possible to employ a higher level of debt.
- With optimized leverage, this leads to substitution of expensive equity with low cost debt, reducing the overall cost of capital.
- With fixed leverage, debt-related policies still perform better than existing policies, but cost-effectiveness is lower due to the absence of **equity substitution**.