POL-EFFECT is EFFECT redesigned to financially model and simulate impact of policy scenarios on investors’ decisions
Guiding Questions at different stages of low carbon development

What to do?
- Support For Targets
- Upstream AAA
- Sectoral economic analysis
- Analyze alternative targets
- Assess impact of targets
- Analyze co-benefits

How to do it?
- Implementation Support
- Midstream AAA/TA
- Investor/resource financial analysis
- Design enabling policy/fiscal framework to change consumer and investor behavior
- Design specific policies
- Quantify impact of policies
67 generating technologies managed in 14 investors’ cohorts

- Hydro-Large
- Hydro-Small
- Solar-Utility
- Solar-Distributed
- Wind-Onshore
- Wind-Offshore
- Biomass
- Nuclear
- Gas-National
- Coal-National
- Gas-Imported
- Coal-Imported
- Fossil-Other
- Renewable-Other
Cohort granularity
2 Investor classes with up to 5 levels of resource/investor quality

Independents
different levels of resource quality and/or developer credit worthiness

Incumbents
different levels of resource quality and/or developer credit worthiness

Often, independent private project developers face much worse and risky market conditions for doing business than incumbent, state-related companies
POL-EFFECT adds parameters (1)

- **Project related transaction costs**
  - Additional costs, hurdles, time, special charges, bribes spent by different producers' cohorts on project development

- **Policy related transaction costs**
  - Extra costs, charges and delays needed to comply with specific policies, e.g. to obtain grants or carbon price revenues (activated only in certain policy scenarios)

- **CAPEX grants**
  - Any grants or other incentives that reduce upfront capital investments to certain producers cohorts
POL-EFFECT adds parameters (2)

**Equity (risks)**
- Minimum required rates of return or the maximum acceptable payback time determines hurdle rates on equity available to different producers' cohorts

**Debt (risks, costs, and access to finance)**
- Interest rates, maturities, grace periods and maximum share of debt in financing package available to different producers' cohorts

**Taxes and tax expenditures**
- All taxes not included in consumer or producer prices
- Income tax and tax waivers, tax deductions, arrears and tax evasion
POL-EFFECT adds parameters (3)

- **Financial Energy Prices**
  - Prices actually paid after implicit and explicit taxes and subsidies
  - Cohort-specific prices and forecasts

- **Feed-in tariffs / Regulated off-take prices**
  - FIT for specific cohorts of producers
  - Other regulated tariffs, or tariff premiums/deductions

- **Carbon Prices**
  - Carbon taxes or ETS prices paid by thermal generators
  - Emission reduction credits, for low-carbon generators
**Pol-EFFECT adds models and modalities for each investor cohort/technology/resource bundle**

<table>
<thead>
<tr>
<th>Investor Choice Model</th>
<th>project-level model with barriers &amp; incentives</th>
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</thead>
<tbody>
<tr>
<td>1. Choose the baseline technology with the best financial returns</td>
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<td>2. Compare lower carbon technologies to the baseline</td>
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<tr>
<td>3. Evaluate for each investor/technology/resource bundle, what could be achieved by reducing barriers and increasing incentives</td>
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<tr>
<td>4. Evaluate feed-in tariffs, tax incentives and carbon pricing</td>
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<tr>
<td>5. Evaluate impact across investor risk / resource quality groups</td>
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<table>
<thead>
<tr>
<th>Sectoral Scenario-based Model</th>
<th>financial and economic analysis</th>
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<tr>
<td>6. Define technically available resources in modeling timeframe</td>
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<tr>
<td>7. Build into the sectoral scenario only those investor/resource bundles that have a negative MAC and are profitable (LCoE less than off-take price)</td>
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<tr>
<td>8. Evaluate financial/economic and fiscal implications</td>
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Pol-EFFECT
new modeling modality

This approach generates Marginal Abatement Cost (MAC) curves across *all technically available resources*

- Identifies MAC and LCoE for each investor/technology/resource bundle
- Incorporates into the sectoral scenarios only those investor/resource bundles that have a negative MAC and are profitable (LCoE less than off-take price)
Status Quo policy mix gives few low-carbon generation options that are attractive to investors

Status quo 2030

Investment-grade abatement: 20.5 MTCO2/yr

GHG abatement potential m tCO2e

$/tCO2e

Gas CCGT
Biomass steam Incumbent Best resource quality
Biomass steam Incumbent Better resource quality
Hydro-Run of river
Mini Hydro
Biomass steam Incumbent good resource quality
Biomass steam Independent best resource quality
Biomass steam Independent better resource quality
Wind onshore Incumbent Best resource quality
Solar PV Incumbent Best resource quality
Hydro - Storage
Coal - Supercritical Imported
Solar PV Incumbent Better resource quality
Wind onshore Incumbent Better resource quality
Biomass steam Independent good resource quality
LNG CCGT
Solar PV Incumbent good resource quality
Wind onshore Incumbent
Hydro - Pumped
Wind onshore Independent best resource quality
Solar PV Independent best resource quality
Solar PV Independent good resource quality
Wind offshore Independent
Wind onshore Independent better resource quality
Coal - Supercritical with CCS Imported
Solar PV Independent better resource quality
Solar PV Independent good resource quality
Adequate policy mix for renewable energy investments can unlock additional investment grade abatement (around 30.4 MTCO2/yr)
## Technologies attractive to investors in different scenarios

<table>
<thead>
<tr>
<th>Technologies with negative MAC ($/tCO2e)</th>
<th>Status quo</th>
<th>Barrier Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas CCGT</td>
<td><img src="#" alt="Check" /></td>
<td><img src="#" alt="Check" /></td>
</tr>
<tr>
<td>LNG CCGT</td>
<td><img src="#" alt="X" /></td>
<td><img src="#" alt="X" /></td>
</tr>
<tr>
<td>Geothermal dual flash</td>
<td><img src="#" alt="Check" /></td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Geothermal binary</td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Mini Hydro</td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Hydro – Run of River</td>
<td><img src="#" alt="Check" /></td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Hydro – Storage</td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Biomass steam Best resource quality</td>
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<td><img src="#" alt="X" /></td>
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<td>Biomass steam Good resource quality</td>
<td><img src="#" alt="X" /></td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Solar PV utility Best resource quality</td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>Solar PV utility Good resource quality</td>
<td><img src="#" alt="X" /></td>
<td><img src="#" alt="Check" /></td>
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<tr>
<td>All wind resources</td>
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POL-EFFECT Outputs

By plant type/ technology

Economic
Capex
Opex

Financial
Debt
Fuel

Equity
Carbon

Fiscal and Investor Cash Flows
### Installed capacity under different policy scenarios compared to PDP-7 targets

#### 2030 (MW)

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Status Quo (SQ)</th>
<th>Barrier Removal (BR)</th>
<th>PDP-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Hydro</td>
<td>20,317</td>
<td>20,617</td>
<td><strong>24,817</strong></td>
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<tr>
<td>Coal</td>
<td>76,284</td>
<td>71,584</td>
<td><strong>68,784</strong></td>
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<tr>
<td>Gas</td>
<td>29,942</td>
<td>27,992</td>
<td><strong>22,842</strong></td>
</tr>
<tr>
<td>Oil</td>
<td>706</td>
<td>706</td>
<td><strong>706</strong></td>
</tr>
<tr>
<td>Diesel</td>
<td>568</td>
<td>568</td>
<td><strong>568</strong></td>
</tr>
<tr>
<td>Nuclear</td>
<td>0</td>
<td>0</td>
<td><strong>4,800</strong></td>
</tr>
<tr>
<td>Renewables</td>
<td>8,824</td>
<td>27,679</td>
<td><strong>22,039</strong></td>
</tr>
<tr>
<td>Wind</td>
<td>718</td>
<td>718</td>
<td><strong>6,018</strong></td>
</tr>
<tr>
<td>Solar</td>
<td>3,900</td>
<td>17,900</td>
<td><strong>12,000</strong></td>
</tr>
<tr>
<td>Biomass</td>
<td>779</td>
<td>4,959</td>
<td><strong>659</strong></td>
</tr>
<tr>
<td>Small Hydro</td>
<td>3,037</td>
<td>3,712</td>
<td><strong>2,962</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>136,641</strong></td>
<td><strong>149,146</strong></td>
<td><strong>147,056</strong></td>
</tr>
</tbody>
</table>
Total capex brought by investors in the Barrier Removal scenario is larger than under Status Quo, but lower than PDP-7 targets.

- **Total investments** brought about by investor ranges from VND 2.8 quadrillion under Status Quo VND to 3.3 quadrillion VND under barrier removal scenario, but are still lower than 3.6 quadrillion VND expected in PDP-7.
Packages of measures allow NDC targets to be met.
Thank You

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