How to shape sustainable energy systems - why proactive national vRE planning matters

Experiences from Partner Countries

IRENA Innovation Week, Bonn 2016
Frank Seidel
Sector Project 'Technology Cooperation in the Energy Sector'
GIZ Energy Projects Worldwide

About 130+ energy projects worldwide

- Africa: 30%
- Asia: 27%
- Europe: 12%
- Latin America: 18%
- MENA region: 6%
- Trans-regional: 7%

Current projects

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## Characteristics of Power Systems
### OECD vs. non-OECD

<table>
<thead>
<tr>
<th>e.g. Germany</th>
<th>Majority of giz partner countries</th>
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<tbody>
<tr>
<td>Stagnating demand</td>
<td>Demand grows fast!</td>
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<tr>
<td>Highly meshed grid</td>
<td>Weak grid and transmission system infrastructure and operation</td>
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<tr>
<td>Continuity of service</td>
<td>Frequent blackouts and brownouts</td>
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<td>Power exchange</td>
<td>Different institutional set-ups</td>
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<tr>
<td>Ability to pay</td>
<td>(Energy) poverty</td>
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<tr>
<td>Connect &amp; forget</td>
<td>„Where, when and how much“ power (GIZ2013), which technology?</td>
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<tr>
<td>Mediocre RE resources</td>
<td>Excellent RE resources</td>
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</table>
Outlook - Why does vRE planning matter?

- Global framework conditions for RE have changed in recent years
vRE auction results

- **Canada** USD 64/MWh
- **Mexico** USD 40/MWh
- **Peru** USD 48/MWh, USD 38/MWh
- **Chile** USD 65/MWh
- **Morocco** USD 25/MWh
- **Egypt** USD 41/MWh
- **Jordan** USD 61/MWh
- **UAE** USD 58/MWh
- **India** USD 71/MWh
- **South Africa** USD 65/MWh, USD 51/MWh
- **Brazil** USD 84/MWh, USD 49/MWh
- **Australia** USD 67/MWh
- **Egypt** USD 41/MWh
- **Jordan** USD 61/MWh
- **Australia** USD 67/MWh
Outlook - Why does vRE planning matter?

- Global framework conditions for RE have changed in recent years
- Market transformation is disruptive and causes structural changes
- Developing & emerging economies are embarking on RE “take-off” phases
- Mainstream concepts and methods used successfully in 1st and 2nd generation RE countries (GER, ES, US) are not appropriate for next phase
- Value of RE to the system (not just cost) needs to be put at the center of the strategy
- Countries targeting high shares of vRE require a sharp focus on:
  - (i) Country-specific boundary conditions (solutions cannot be simply copied from other markets)
  - (ii) Changing international market conditions for RE (PV Capex falling fast, wacc shifting, countries compete for investors)
  - (iii) Robust cost-benefit analysis for optimal, country specific RE pathways

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The System Perspective

Don’t focus only on the **specific isolated costs and emissions** of the next technology or project per kWp or kWh, but on the **total emissions and costs of the national power system**
Key Questions to be answered by vRE National Masterplans

Why?

How to integrate and operate?

Which technologies?

At what cost?

Where?

When?

How much?

Experiences from partner countries

- Extensive regional outreach and collaboration with GIZ partners (Ministries, Regulators, Utilities and other energy authorities) in
  - Argentina, Bolivia, Brazil, Chile, Ecuador, El Salvador, Mexico
  - Ghana, Kenya, Morocco
  - Pakistan, Philippines, Vietnam and others
- Several solid techno-economic modelling approaches successfully applied.
- Including capacity expansion pathways and system optimization (MILP dispatching routines, optimal vRE deployment over time and space, etc).
- **However:** So far, only few modeling tools and approaches capable of solid modelling for handling optimal VRE expansion, intermittent generation and dynamic technical and economic aspects
A systematic approach to vRE modeling

The vRE Energy Planning “Cooking Recipe”

DATA INPUTS

MODEL SPECIFICS

OUTCOMES

1 Conventional Power Plants
Experiences from partner countries – cont‘d

- Initially (before modelling): Discuss and establish clear & genuine vision for sector, visualizing options and trade-offs in a palpable and transparent way (with decision support tools and a structured process)

- Set-up steering group with relevant partners - sector specialists required

- National (marco) economic view and growing body of solid and accessible data needed for optimal (or at least incrementally improving) oversight

- Review input data wisely (generic databases not sufficient; e.g. real-life time series mandatory, allow for step-by-step incremental improvements by mixing methods over time)
Experiences from partner countries – cont‘d

- **Simplifications** of complex problems (e.g. unit-commitment) often leads to inaccuracy and false estimations, and then to flawed decisions. **Build national pathways step by step and frequently re-visit error margins & options.**

- Therefore, complete scenario spaces needed (not just a few selected ones) to properly inform the national discussion (and stakeholder negotiation processes) about possible Vs optimal energy pathways (under conditions changing over time).

- **Masterplans are helpful** – but need to be updated far more frequently and complemented by „quicker analysis“ for shorter planning horizons (2y - 5y - 10y - 15y) – **incremental planning**!

- **Building local modelling competences takes time** – ongoing capacity building essential to build grounds for assessments of models and results. Learning by doing!

**Successfully RE scale-up needs solid, evidence-based and country-specific policies!**
National RE Governance for Optimal Scale-Up

- Develop plausible and evidence-based roadmaps to scale-up green investments
  - *How much RE should be implemented at which point in time – and where – to optimize national welfare?*

- Formulate appropriate & transparent regulation
  - *Clarify objectives, regulation, procedures, and responsibilities → lower WACC → lower LEC (VRE Finance Discussion Papers 2013+2016)*

- Ensure long-term, legally enforcable contracts for investors
  - *Best case: back decisions with government guarantees*

More proactive *public* guidance of *private* sector RE investments will be needed to avoid unnecessary welfare losses.
The vRE Toolbox: Real-Life Advice for Evidence-Based Energy Policies

1. **Technology**
   - micro, meso
   - Pöller; Rüther; Siemens; 50Hz

2. **Economics**
   - meso, macro
   - Teplitz/Reiche; DLR

3. **Finance**
   - micro (spv)
   - Hille; Dersch

4. **Policy**
   - Heising et al

Next batch in Q2 2016!

https://energypedia.info/wiki/VRE_Discussion_Series
Thank you for your attention!

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