

# Maximizing Economic Benefits of VRE. Building and Sharing VRE Knowhow.

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CONFERENCE: ON INTEGRATING VARIABLE RENEWABLE ENERGY INTO POWER  
GRIDS - OCTOBER 21, 2014 - COPENHAGEN

SESSION 4: Perspectives from dynamic markets with ambitious VRE targets: how to leapfrog  
from previous experiences

On behalf of

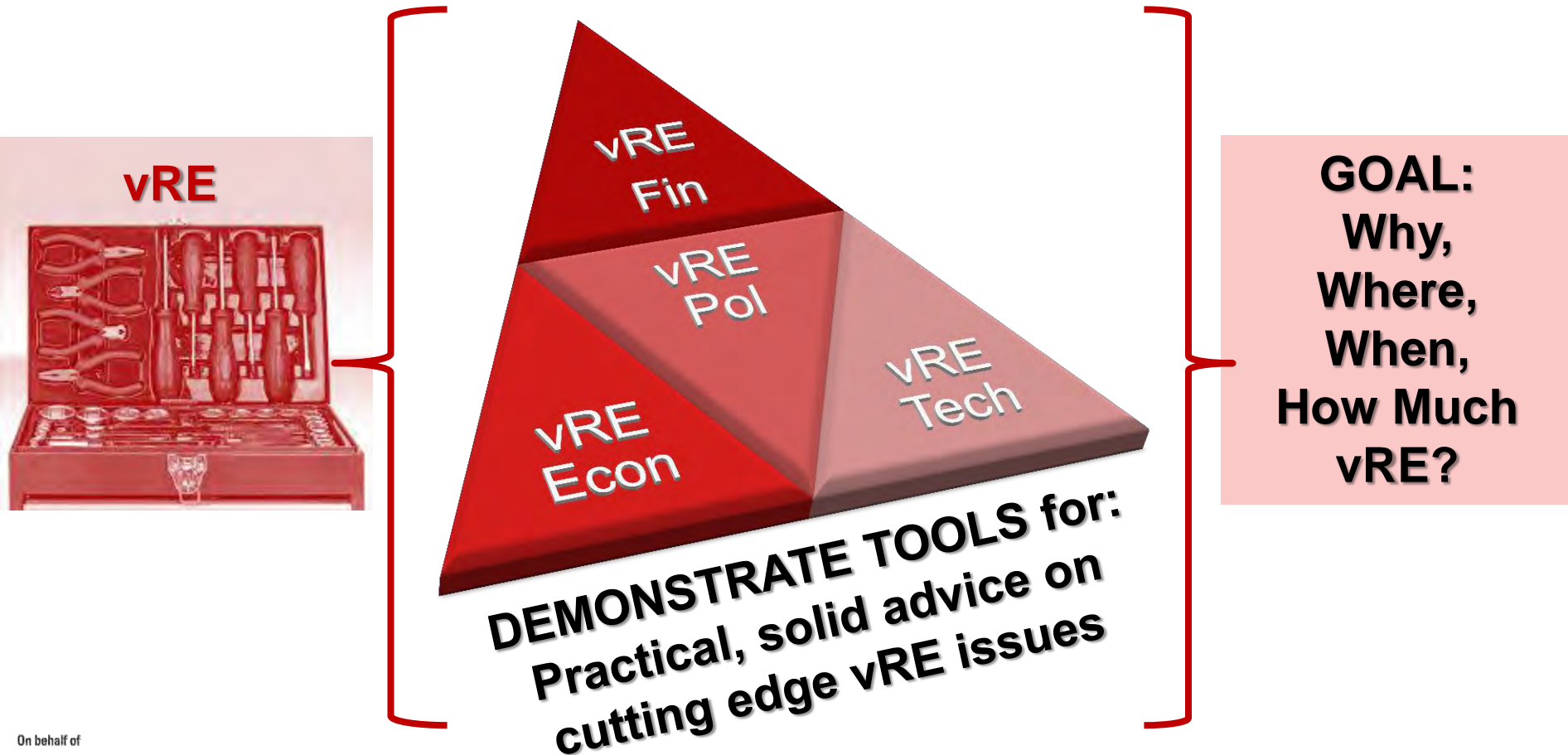
**BMZ**



Federal Ministry  
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## vRE Tech Coop: Real-Life Advice for Evidence-Based Energy Policies





Apply a growing Toolbox in client countries: 4 categories, >10 cases, >5 Papers  
Planners need practical overview fast: The trick is to simplify „just right“ for each country, market stage and question (tool example 1: quick “no regret pilot”)...

## 1. Technology

micro, meso  
- Pöller; Rüter et al.

## 2. Economics

meso, macro  
- Reiche et al

## 3. Finance

micro (spv)  
- Hille et al.; Dersch

## 4. Policy

- Heising et al

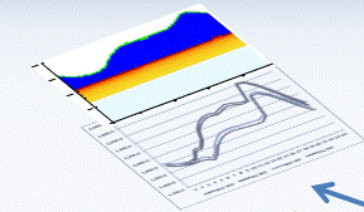
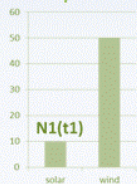




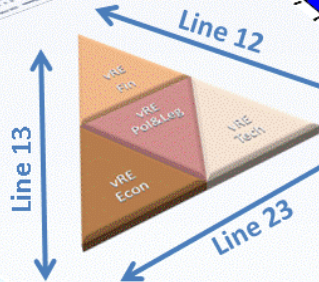
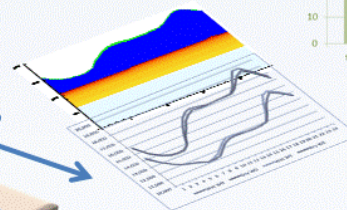
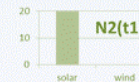
# Maximizing benefits: policy makers need to understand VRE economics, not just cost & yield. Best via pragmatic TOOL MIX.

## vRE in your country: why, when, where and how (much)?

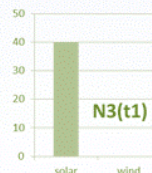
**Substation N1:**  
PV=?, Wind=?



**Substation N2:**  
PV=?, Wind=?



**Substation N3:**  
PV=?, Wind=?



- **The Promise:** coming of age → more options for growth (WEC2014)
- **The Problem:** „VRE bulls & bears“ are lying to you!
- **The Solution:** vRE neither impossible nor simple: plan  
→ **OPTIMAL VRE MIX** (time, space) with  
→ **PRACTICAL TOOL MIX** (time)
- **GIZ VRE TechCoop:** Demonstrate Toolbox in real-life power systems, with clients (MoE, regulator, TSO, dispatch, utility)

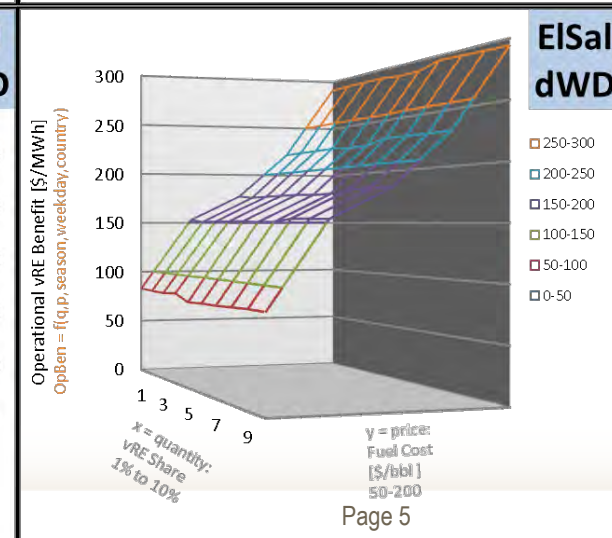
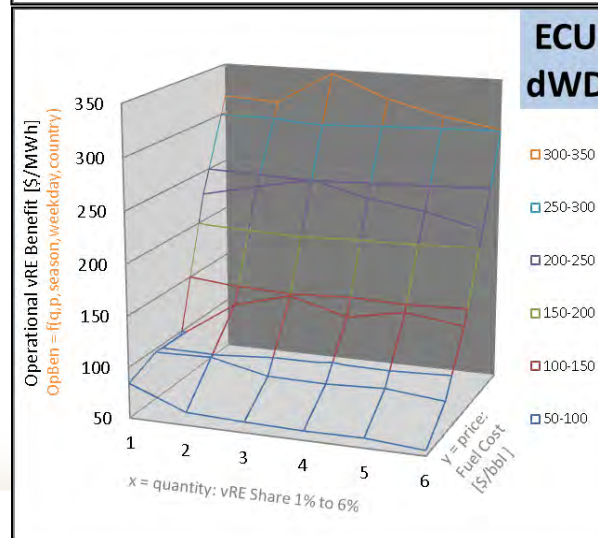
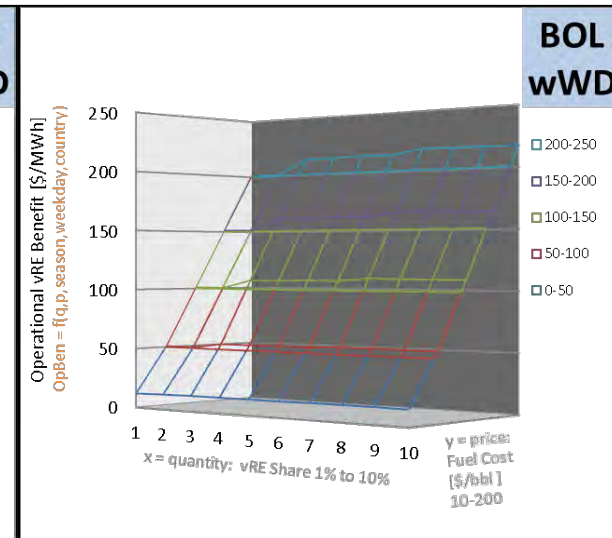
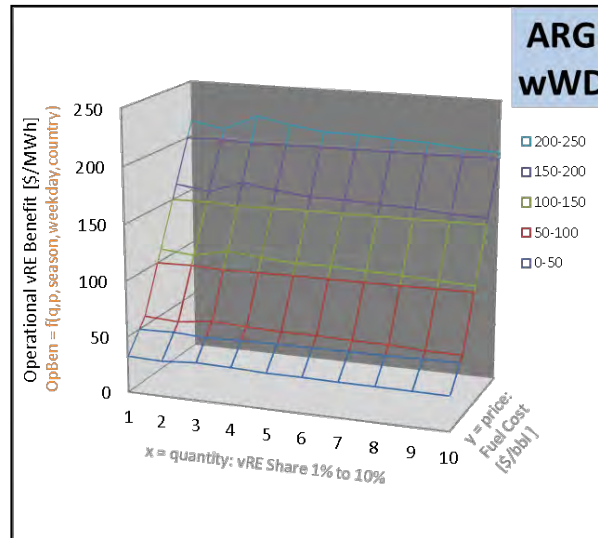




Tool Example 2: OpBen = min fuel savings under optimal dispatch = avoided cost = F(country, wind & solar share 1-100%, fuel price)

**Results 4 LAC countries 2012-2013:**

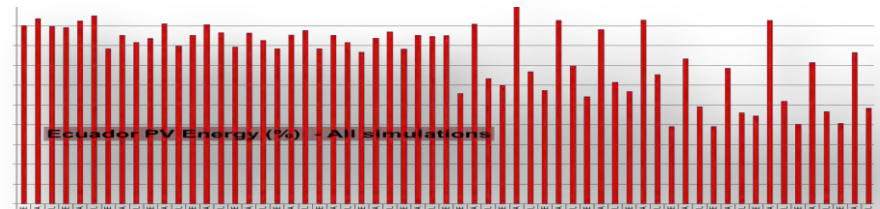
1. RE benefits large during weekdays: 15 cents/kWh + X > 0. Thus **Benefits > Cost**. Partly thanks to hydro “battery”.
2. Fuel price level strongest impact on benefits
3. Negative impact of RE penetration less than expected + depends on fuel price + **initial increase possible**
4. Additional spinning reserves reduce RE benefits - but **not as much as expected!**
5. Currently applying in 5+ new countries (SSA, Asia)



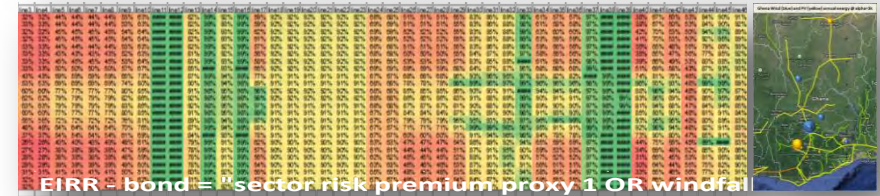


# Tools 2-N: Toolbox growing - pick tools based on needs over time!

## 1. Technology



## 2. Economics



## 3. Finance

	bond - inflation	loan = 0%	loan = 30%	loan = 60%	H?	L?	rank (yield)	rank (IRR)	rank (ra-IRR)
Kenya	2%	-5%	-8%	-11%		x	1	13	28
South Africa	2%	0%	1%	-1%		x	2	7	23
Thailand	2%	5%	6%	7%			3	3	1
Philippines	2%	4%	5%	6%		x	4	2	6
Algeria	-6%	FALSCH	FALSCH	FALSCH			5	1	#NV
Nigeria	7%	-4%	-6%	-7%		x	6	9	26
Malaysia	3%	4%	5%	7%		x	7	6	5
Argentina	-15%	FALSCH	FALSCH	FALSCH			8	37	#NV
India	1%	-2%	-4%	-6%		x	9	14	25
Cyprus	-2%	FALSCH	FALSCH	FALSCH			10	4	#NV
Jordan	-5%	FALSCH	FALSCH	FALSCH			11	10	#NV

## 4. Policy





Thank you!

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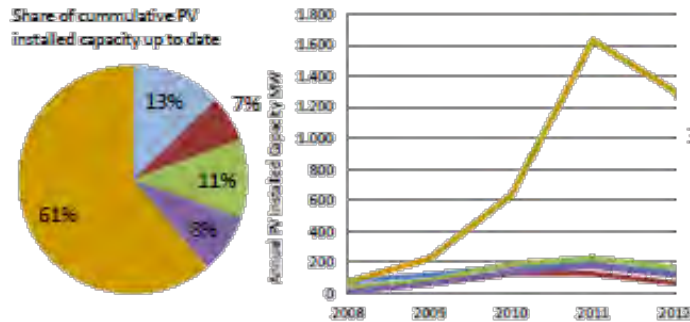
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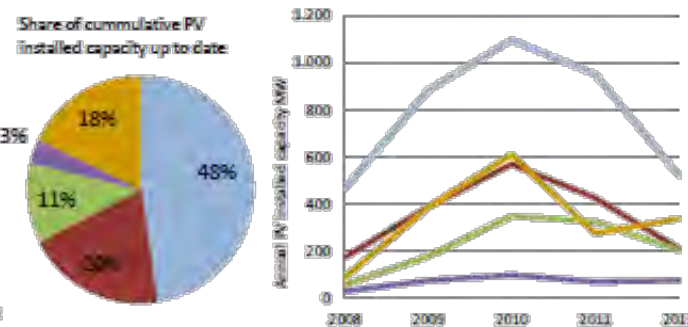
# ANNEX: Economics → Policy: „Subsidy Demand Response“

## PV installed capacity in Germany (up to July 2013)

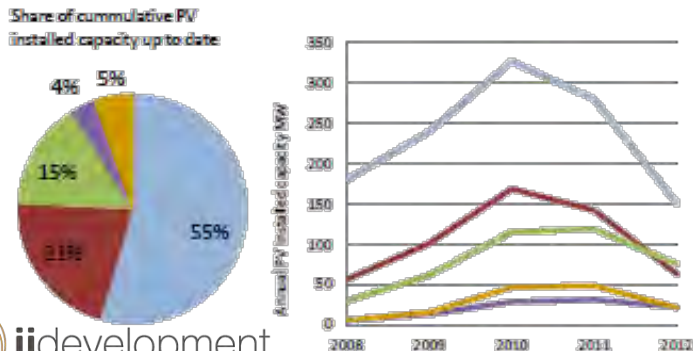
**50 Hertz region**  
Total capacity: 6,9 GW



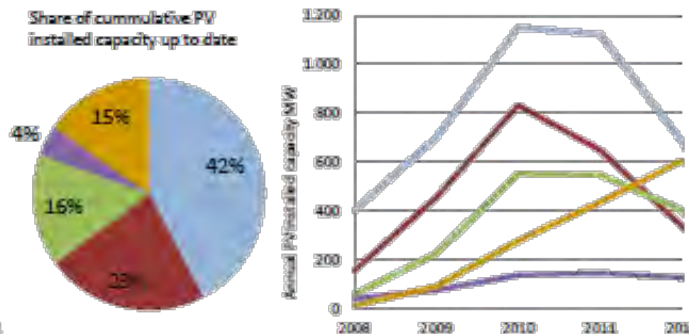
**Bayern**  
Total capacity: 10,7 GW



**Baden Württemberg**  
Total capacity: 3 GW



**Germany (Rest)**  
Total capacity: 11,9 GW



- 0-30 kW
- 30-100 kW
- 100-500 kW
- 500-1000 kW
- 1000-200000 kW

**Cummulative PV installed capacity in Germany (1990-2013)**  
Total capacity: 32,5 GW

