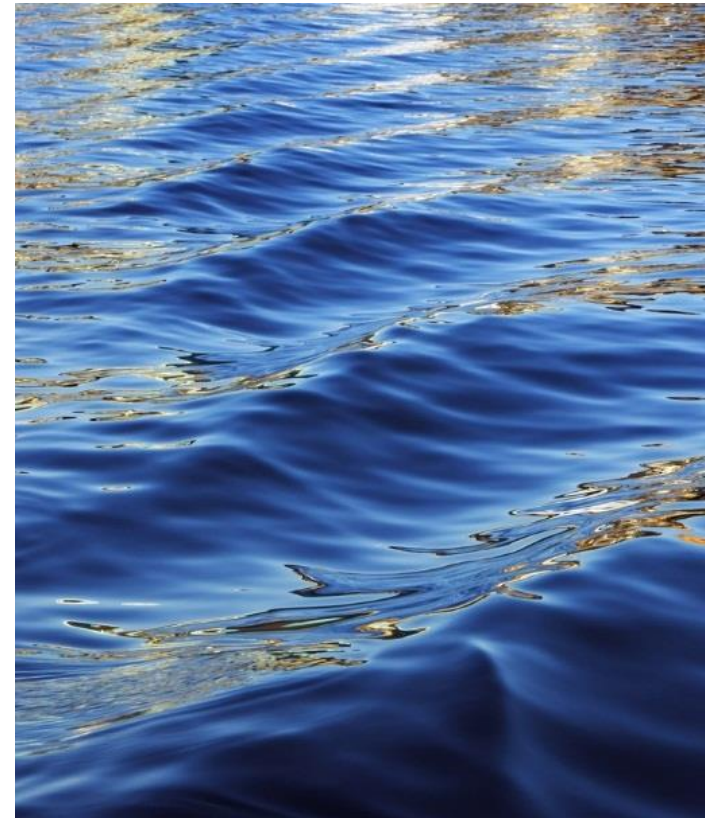
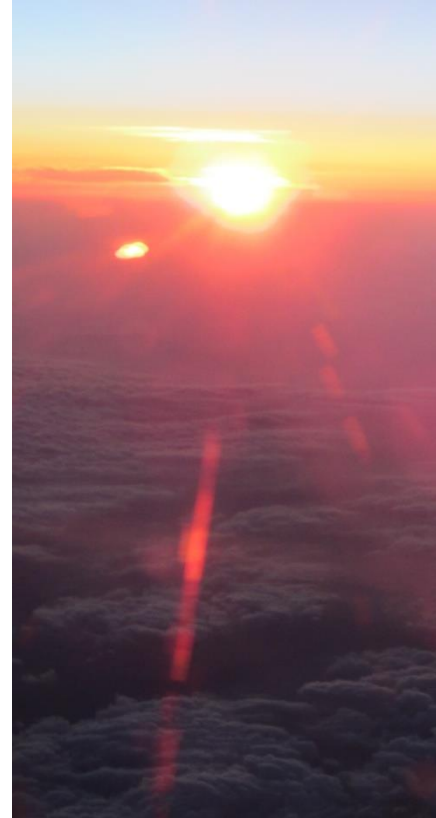


Transforming energy system

Use more Renewables and reduce Energy Cost

Introduction to Easy Smart Grid GmbH
Praia, 13.10.2015
Dr. Thomas Walter (Founder and Managing Director)



Leapfrogging

Your chance to overtake



“Developing countries can **leapfrog** conventional options in favor of cleaner energy solutions, just as they **leapfrogged** land-line based phone technologies in favor of mobile networks.”

Ban Ki-moon, New York Times 2012

- Cisco leapfrogged Siemens and Alcatel in transition to digital communication
- Apple leapfrogged Nokia in transition to smartphones

Source: Blog Prof. Wettengl: wettengl.info/Blog/?p=5072, Download 21.08.2015, Bullet points by Thomas Walter

Changing Markets

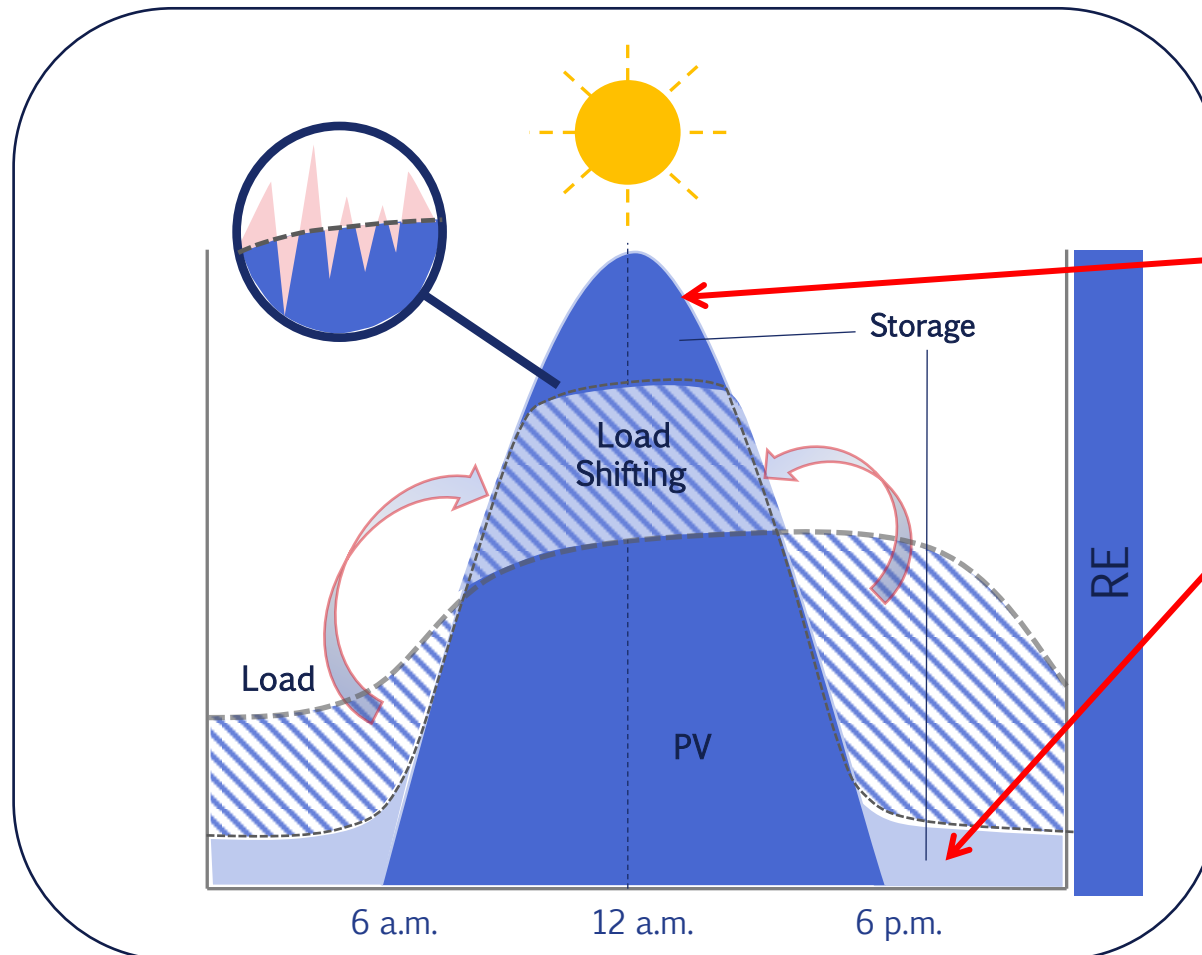
Islands have special situation and needs

- Potential for diesel replacement:
 - > 50 GW equivalent to
 - > 100,000,000,000 €/a
- Save 0,2 €/kWh when replacing diesel by PV (0.4 vs. 0.2 €/kWh)
- Use high DSM potential :
Heating/cooling, pumps, desalination, electro mobility for
More RE with minimum investment in storage



Demand Side Management

Flexibility saves a lot of money



Benefits:

- **Use more renewables:**
Absorb the peaks, don't shed them
- **Pay less:**
For fossil energy and storage
- **Let's make the Grid Smart:**
By coordinating DSM, flexible generation and storage

Demand Side Management

DSM is a very cheap battery



Heat
pumps +
Storage



Before: Load with any timing



After: Load shifted by DSM



Charge

Effect on grid: Virtual battery



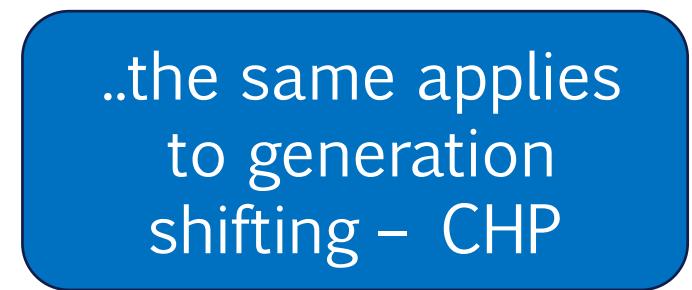
Discharge



White
goods,
Pumps...



In future:
Electric
vehicles



..the same applies
to generation
shifting – CHP

Demand Side Management

Example from Maldives

Cost examples taken from Maldives 2013

Diesel generation cost	0.50 \$/kWh
------------------------	-------------

← Possible savings 0.25 \$/kWh →	PV generation cost	0.25 \$/kWh
----------------------------------	--------------------	-------------

Battery storage	0.40 \$/kWh or more
-----------------	---------------------

Cooling	0.00... \$/kWh
---------	----------------

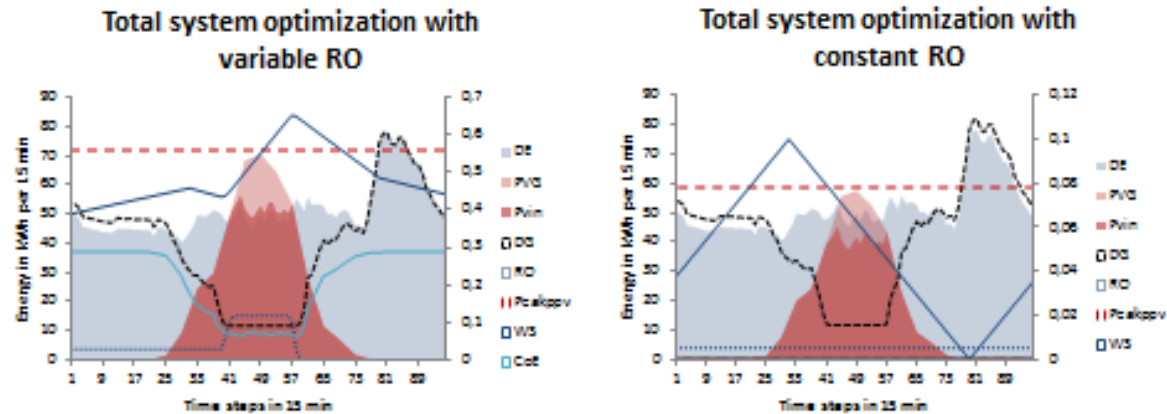
Desalination	0.00... \$/kWh
--------------	----------------

E-mobility	0.00... \$/kWh
------------	----------------

Smart Grid Cost

- PV instead of diesel saves 0,25 \$/kWh
- But: need for storage and smart grid
- DSM cheaper than batteries (shifting of cooling, desalination, vehicle charging)
- Easy Smart Grid more efficient than Smart Grid 1.0 Technologies

Demand Side Management Shifting Desalination Plant in Tonga



515 329 \$	Total annual cost for electricity supply	525 216 \$
0,223 \$/kWh	Cost of energy	0,230 \$/kWh
84 262 \$	Investment in PV system	66 611 \$
288 kW	PV peak power	228 kW
23,23 %	% of PV energy for the whole year	18,33 %

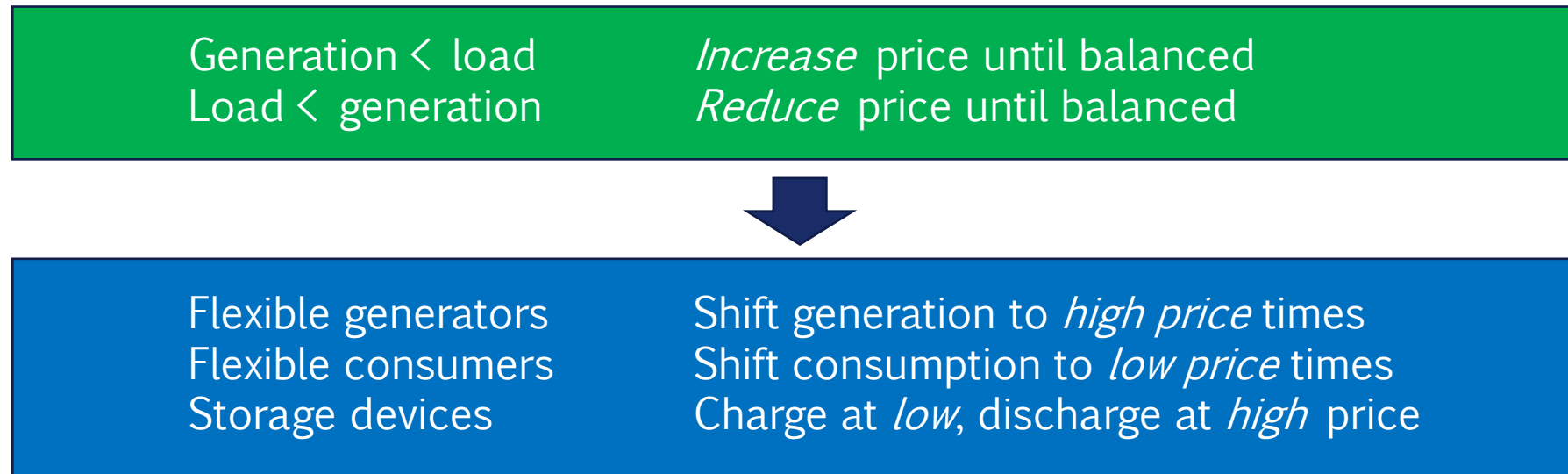
➔ Savings on cost for electricity supply (diesel fuel + PV investment):
1,88 % (9887 \$)

- Water desalination is one very interesting option (calculation with Tonga data)
- Desalination is switched on when sun/wind are available
- If no sun or wind energy is available, fresh water is taken from a tank
- Batteries are not needed
- Our first proposed step:
 - Use surplus renewable energy
 - Very low investment and good return!
- Collaboration of grid operator and customer is necessary
- And has benefit for both!

Source: Master Thesis M. Burkhard @KIT – yet unpublished. 28.09.2015

Make Grid Smart

We apply new concepts to balance grids

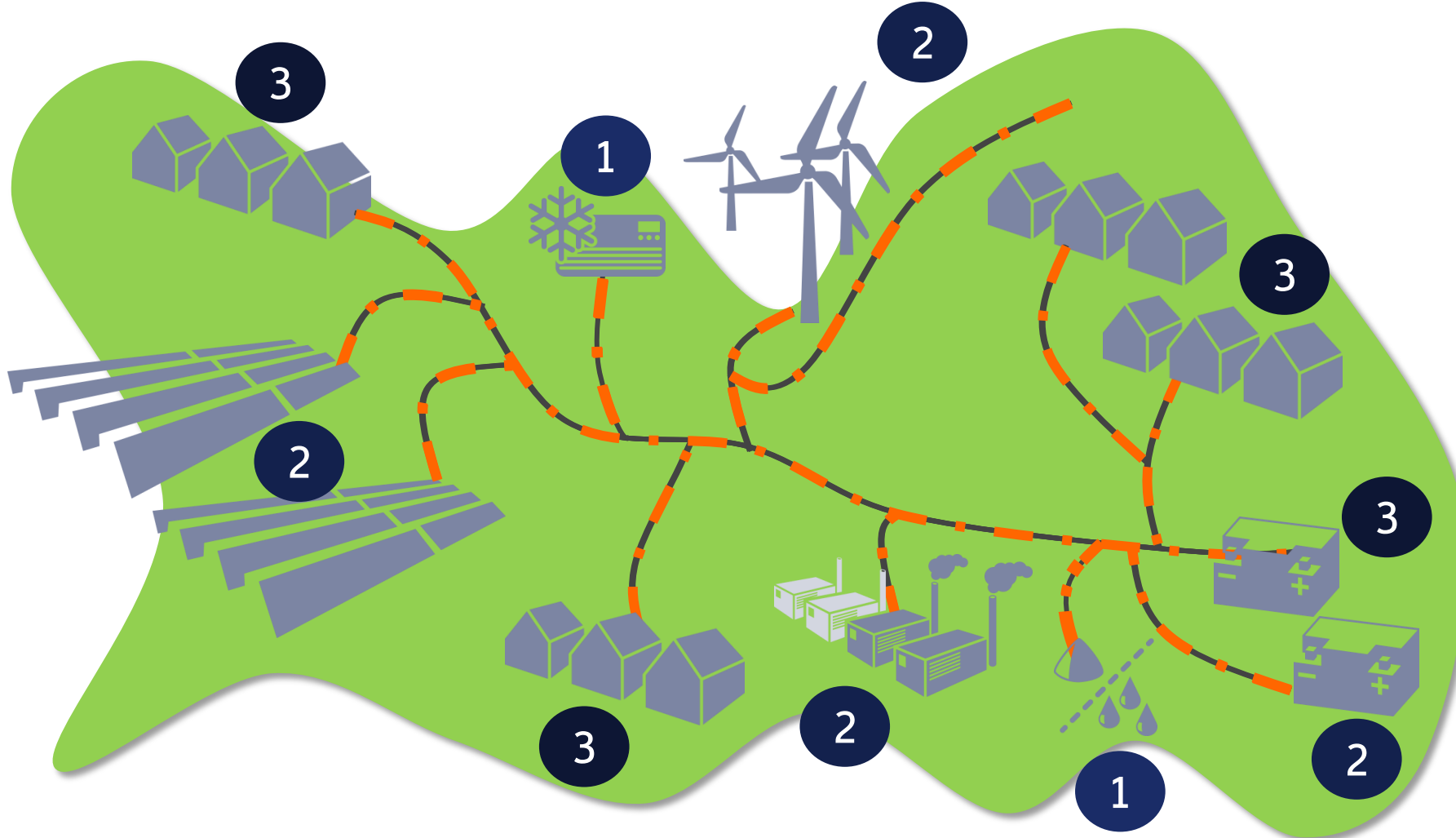


A Real Time Market pilot implemented by „ECOGRID“ on the island of Bornholm/Denmark

- ICT investment over 10 M€ (collect, process and communicate data)
- Price update every 5 min. to influence CHP (Combined Heat and Power) plants

Easy Smart Grid

Step by step deployment



1. **Low hanging fruit**
 - Deploy pilot
 - Use more RE by flexible large loads
2. **More RE, storage**
 - Additional RE
 - Power storage for system stability
3. **Full functionality**
 - Integrate small flexibilities (household)
 - Energy storage if needed

Easy Smart Grid

What do we offer?

Assumptions: Smart Grids need

Decentral management
with price signal

Low cost implementation
All flexibility can be used



Transmit price by grid frequency (easy on island grid)

Automated load shifting - cheaply
Fail safe communication

Real time, secure, resilient
No investment in infrastructure

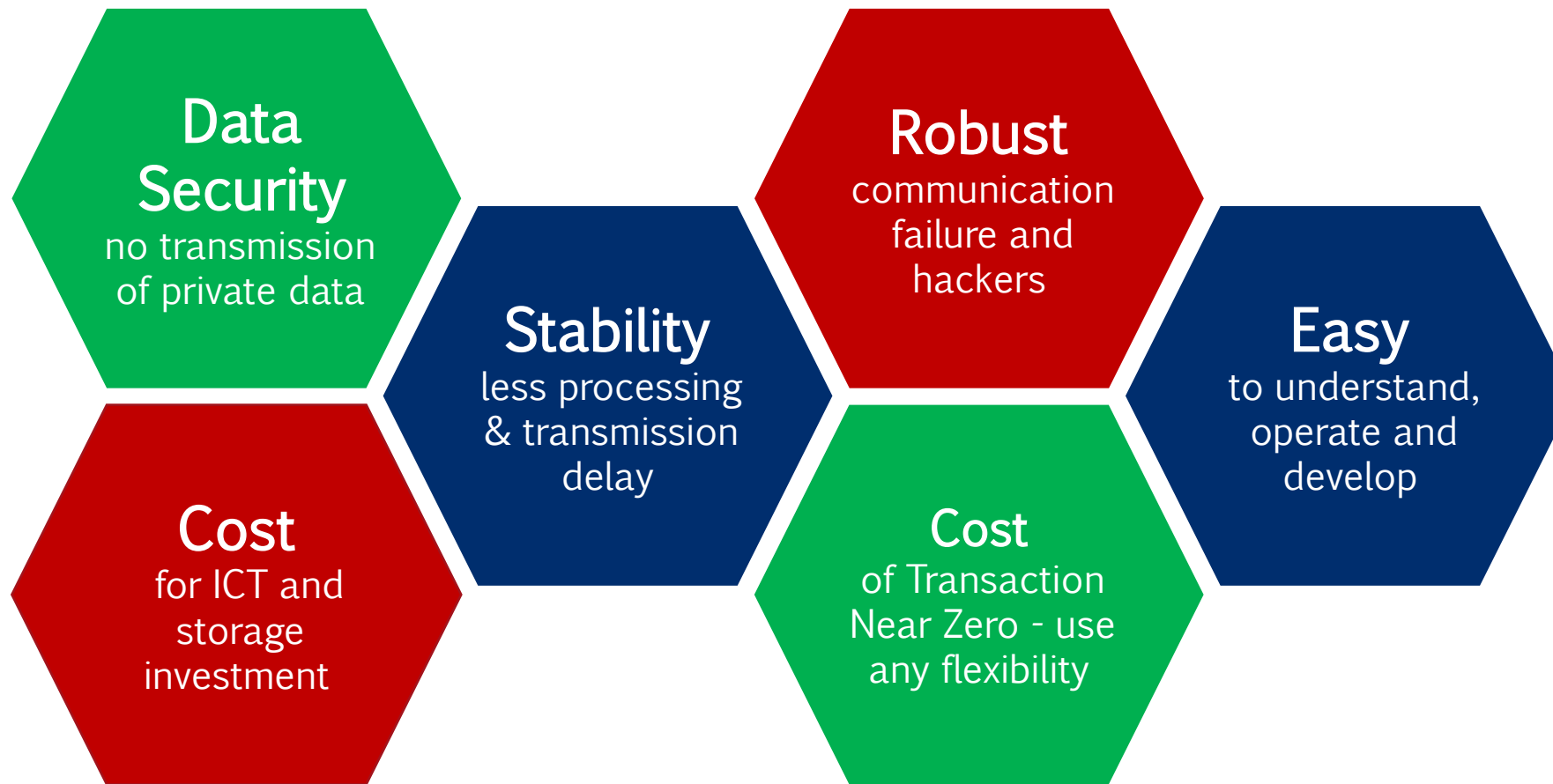


Evolutions with the same benefits

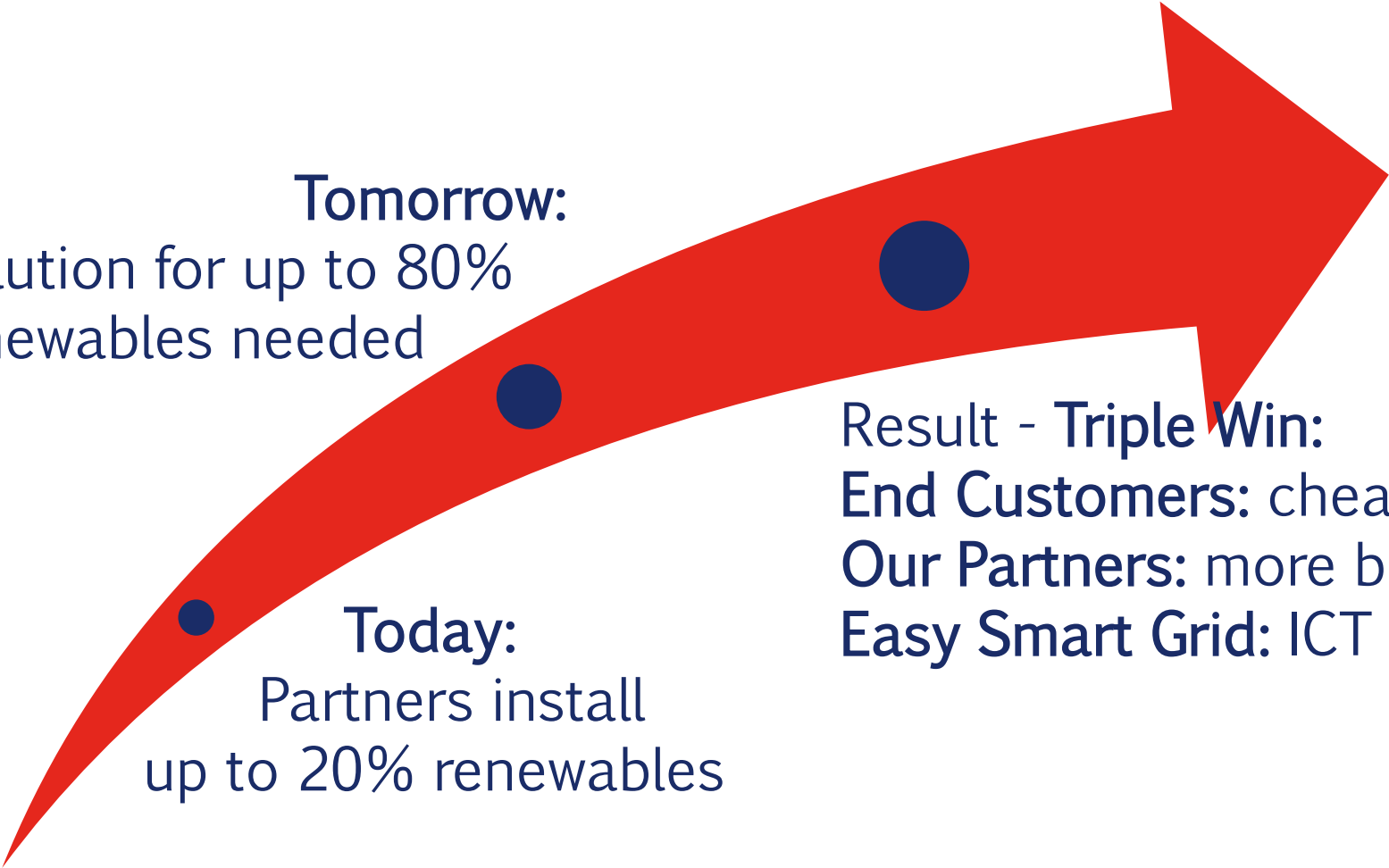
Real Time Market
Self Balancing Grid

Basis of Cellular Grids
Cells coupled by power electronics

Benefits over Conventional Smart Grid (1.0)



What we look for: Partnerships for more RE



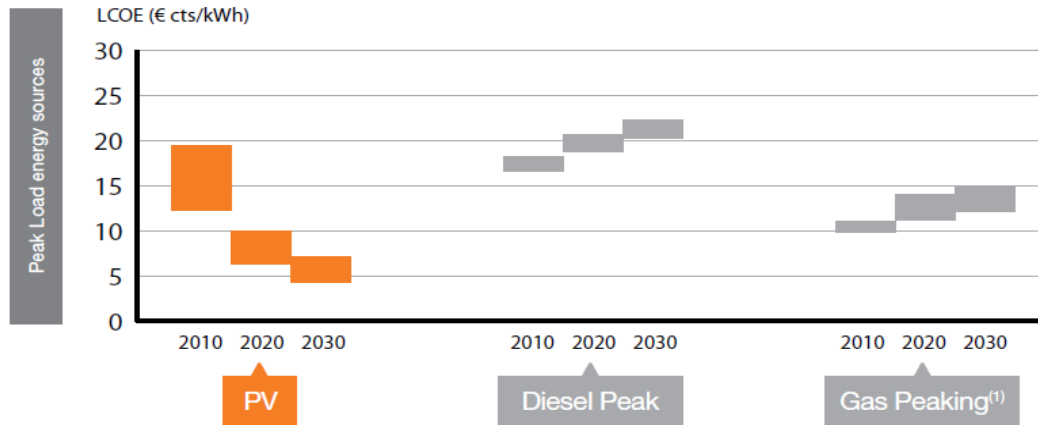
Tomorrow:
Solution for up to 80%
renewables needed

Today:
Partners install
up to 20% renewables

Result - Triple Win:
End Customers: cheaper energy
Our Partners: more business
Easy Smart Grid: ICT solution

Changing Markets Transformation: First oil, then gas...

COMPARISON OF LCOE 2010, 2020, 2030, LOW CASE FUEL PROJECTION (€cts/kWh)



Grafic presentation: Unlocking the Sunbelt – Potential of Photovoltaics – March 2011
National Renewable Energy Laboratory, National Energy Technology Laboratory, EPIA Set for 2020, World Bank, A.T. Kearney analysis.

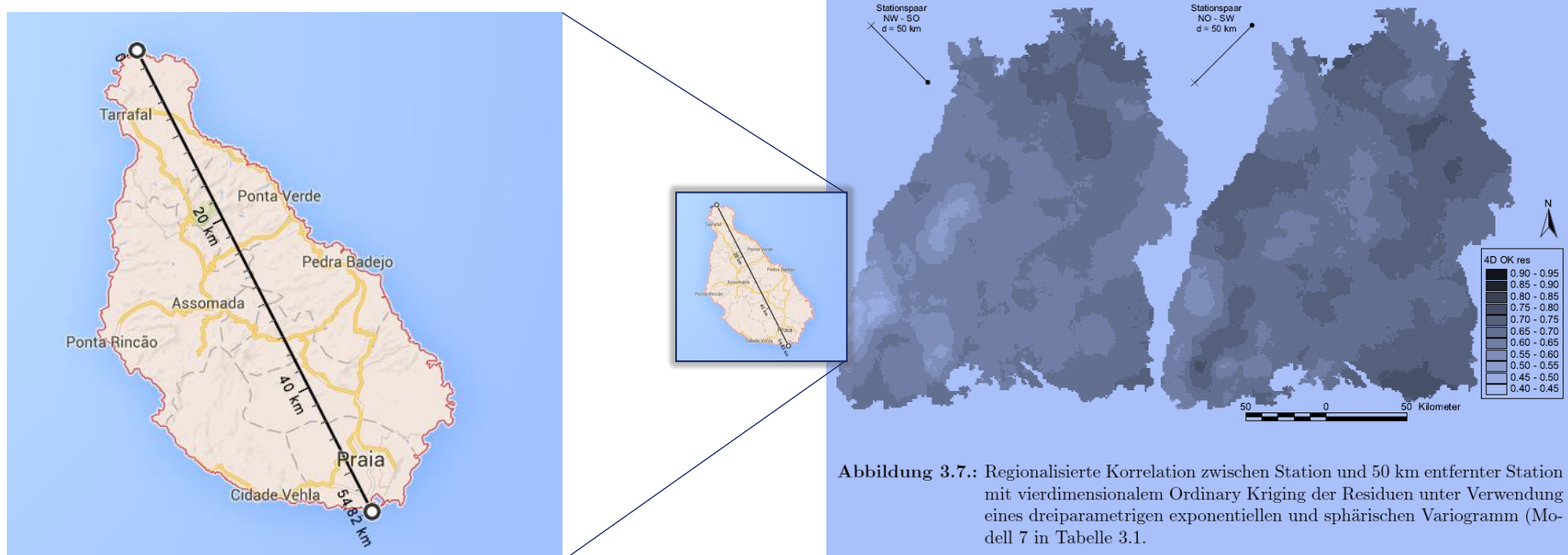
LCOE: Levelized Cost Of Energy
O+M: Operation and Maintenance



Outlook

Can Cabo Verde leapfrog Germany?

- Islands today, Germany tomorrow: Smart Grid Cells
- VDE: Cellular grid for 80% PV/wind scenario of 2050 with 60 km Ø?



Source graphics: Dissertation Jürgen Brommundt, 2008 Institut für Wasserbau Uni Stuttgart, Download 20.08.2015
http://elib.uni-stuttgart.de/opus/volltexte/2008/3470/pdf/Brommundt_170_online.pdf, Google Maps

A vertical image on the left side of the slide showing a bright sun setting or rising over a layer of white clouds, with a red lens flare effect.

Thank you for your
attention and let's speak!

Thomas Walter
Easy Smart Grid GmbH
thomas.walter@easysg.de
+49 171 229 4629
www.easysg.de

