

SETTING THE SCENE: ADVANTAGES, CHALLENGES, AND REQUIREMENTS OF DECENTRALIZED RENEWABLE ENERGY SOLUTIONS

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What characterizes decentralized energy production?

- It is realized by **small** and not large units which are in the case of power either connected to the **distribution** and not transmission grid, or are used as stand-alone systems or form part of micro-grids.
- It is in most cases located **nearby the place of consumption**.
- It is first and foremost **consumed by the producer himself**.
- The owner is a **relatively small actor** in the market.
- In a centralized system, power flows in one direction, from a small number of large producers to a large number of small consumers, whereas in a decentralized model, power flows in both directions.



Which commercially viable technologies can serve as DRE?

- **Renewable power:** solar (PV), wind, hydro, biomass (biogas)
- **Renewable heat:** solar (SWH), biomass, geothermal, incl. heat pumps
- **Hybrid solutions:** PV/diesel, solar heating/fuel oil
- **4 main options** for deployment:
 - connected to the grid
 - as stand-alone systems
 - as part of micro-grids
 - and/or with storage



What are the main incentives and benefits (1)?

Offering significant **energy-related benefits** to host countries:

- Helping to broaden, diversify and localize production, thereby contributing to the **security** of supply and the **stability** of the system.
- Allowing for much more **flexible** and **scalable** (modular) approaches, leading to a better incorporation of local demand and resources.
- Supporting **access** to modern energy for un(der)served groups, with major positive impacts on social justice, public health, economic productivity, regional development, and quality of life, more generally.
- Allowing for the bypassing of the grid, thereby helping to avoid or reduce **bottlenecks/outages** and the need to **invest** at this level.



What are the main incentives and benefits (2)?

Offering significant **socio-economic benefits** to local stakeholders:

- Facilitating the participation of new and small actors in the **value chain**, as less capital/experience is required, and less risk involved.
- Opening the possibility to participate in the **production of energy** for households, SMEs, associations/cooperatives, villages/municipalities..
- Creating **more jobs** per capacity installed/capital invested, as DRE are more labor-intensive & have a higher service share in the value chain.
- Facilitating the **mobilization of capital**, as financing can be spread over a multitude of actors; savings are channeled into sustainable and productive assets and not into speculation or rent-seeking.



RE Employment Factors by Technology and Project Phase

Option	Manufacturing (person-years/MW)	Installation (person-years/MW)	O&M (jobs/MW)
Wind			
Minimum	2.7	0.5	0.1
Median	4.0	2	0.3
Maximum	12.5	6.7	0.7
<i>Standard deviation</i>	3.3	2.4	0.2
<i>Sample size^a</i>	8	10	16
PV			
Minimum	6.0	6.4	0.1
Median	18.8	11.2	0.3
Maximum	34.5	33.0	1.65
<i>Standard deviation</i>	9.3	9.7	0.4
<i>Sample size^a</i>	9	9	12
CSP			
Minimum	4.0	6.0	0.2
Median	12.8	10.2	0.5
Maximum	21.6	14.4	1.0
<i>Standard deviation</i>	8.8	4.2	0.3
<i>Sample size^a</i>	2	2	6

^a No units.



**In the case of Tunisia,
decentral applications
led to more than 2800
direct jobs in 2015**

Job	Testing	Development & Study	Manufacturing	Supply & Installation	Operating & Maintenance	Total jobs 2015
Programme						
Energy Efficiency	30	53	99	543	98	822
Audits & CP	-	47	-	-	-	47
Energy Efficiency in buildings	25	6	99	242	-	372
Cogeneration	-	0,5	-	41	63	105
Diagnostic stations	-	-	-	-	35	35
EE equipments	5	-	-	260	-	265
Renewable Energy	15	2	265	1 391	379	2 052
PROSOL Residential	15	-	237	950	264	1 465
PROSOL Tertiary	-	2	-	11	5	18
PROSOL Elec	-	-	29	430	12	471
Wind	-	-	-	-	98	98
TOTAL EE & ER	45	55	364	1 934	476	2 874



Driver for regional development

- Farmers indicate that RE has changed their regions
- RE accelerated innovation
- RE accelerated modernization
- Farmers see a hedge against price volatility, also cross prices with other farms products
- Increases entrepreneurship of farmers, encourages cooperation for larger investments
- RE tourism is used in several regions in Europe:
 - Off-shore wind farms in Denmark
 - RE training and media centers in East Germany
 - 100% renewable villages in South Germany



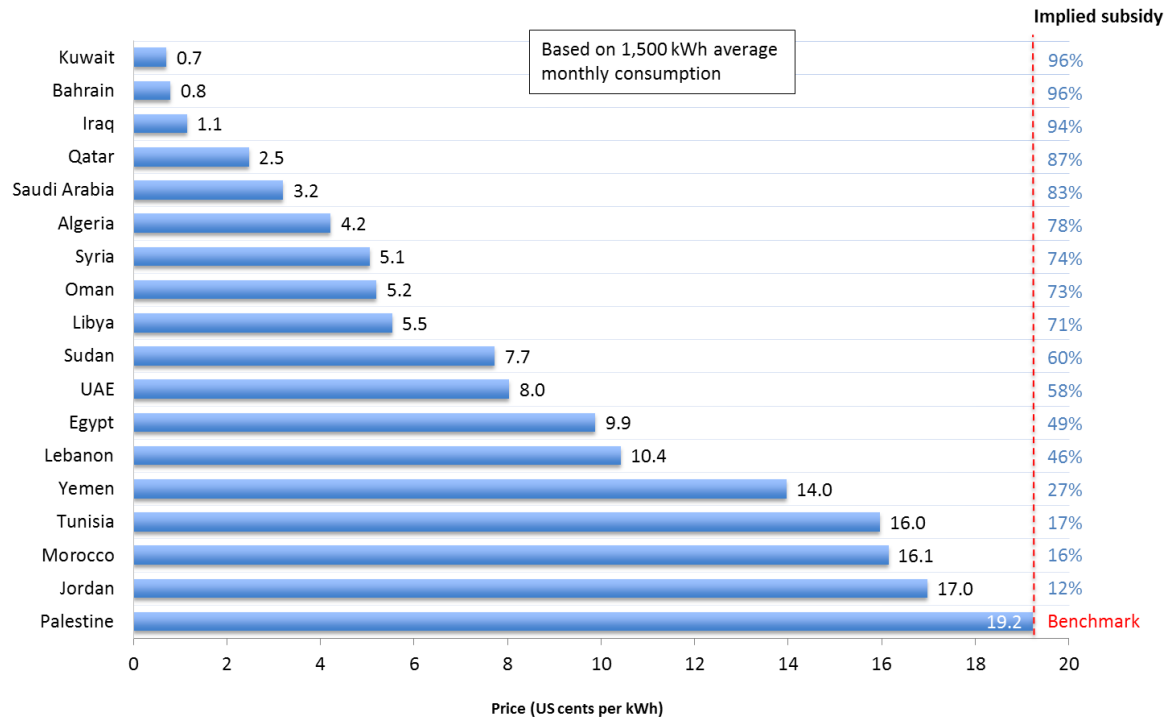
What are the main incentives and benefits (3)?

Fostering **new technological and financial solutions** for old problems:

- **Innovative business models**, e.g. leasing and community ownership, open up the market to a new tranche of investors, even if these lack the financial means (or risk appetite), incl. if they are tenants or apartment-owners (or their home is not suitable for other reasons).
- The **digital revolution** creates new possibilities to create block power plants in the two-digit megawatt range based on DRE, and to provide for a much smarter linking of supply and actual demand.
- **Improved (battery) storage technology** makes it easier to create fully autonomous systems (stand-alone or mini-grid), and even if still grid-connected it might tilt the ‘balance of power’ in favor of the latter.



Consumption subsidies perpetuate losses for the state



Source: RECREE staff/network, national energy utilities, AFEX 2014

**Energy
subsidies
counteract
efficiency
incentives**

➤ **Investment subsidies can lead to value creation**



What are the main challenges and requirements (1)?

- A **conducive policy, legal-regulatory and administrative framework** must be in place and effect, reducing insecurity and transaction costs.
- A **level-playing field** must be created with conventional energies and/or large suppliers, entailing free and fair access to the market and grid (if applicable) along with undistorted, non-discriminatory price structures for conventional and renewable producers.
- Incl. effective regulatory control and the possibility for judicial redress
- Avoid creating market barriers which lead to price increases and slow down the adoption and deployment of RE technologies.



What are the main challenges and requirements (2)?

- **Quality and performance control are, by contrast, key:**
- Local suppliers must be prepared to have the necessary competences and capabilities, and quality criteria and control mechanisms need be set up in order to oversee and if necessary enforce this.
- DRE require a **sufficient build-up of human capital** together with an **effective quality infrastructure for technology *and* service inputs**, which is why **absolute priority must be given to the training sector**.
- The larger the share of DRE, and the greater the role of local actors, the more important become **the notions of performance and quality** and the need for the state to pro-actively support and secure them.



What are the main challenges and requirements (3)?

- **Public outreach and awareness-building are likewise crucial:**
- People need to become aware and convinced of the opportunities DRE offer, they have to be ready to invest, produce, and consume.
- Accurate and reliable information (data!) about ground conditions and/or real-life business cases must be collected and disseminated.
- Concrete pilot and demonstration projects must be implemented and duly showcased (especially when successful).
- The constructive involvement of the utilities, the grid operators, and the regulators (where existing) is paramount.