Transitions Pathways and Risk Analysis for Climate Change Mitigation and Adaptation Strategies

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TRANSITION PATHWAYS AND RISK ANALYSIS FOR CLIMATE CHANGE POLICIES

Towards decentralized renewable energy generation and storage: regulations, market designs and requirements

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towards2030

Decentralized future of the Power System

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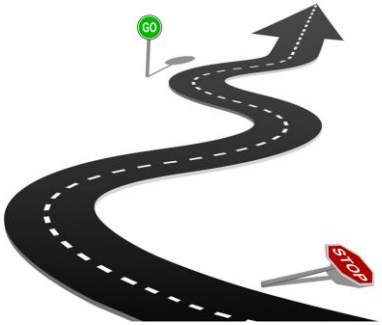
challenges
- Technological
- Regulatory
- Economic
- Social

Reality

Realistic pathway towards a low carbon power system

Vision of consumers
- generating
- storing
- consuming
- Sharing clean energy



..at local level

DECENTRALIZATION…(1/2)

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The wide spread diffusion of PV …

… increasing amounts of PV produced electricity ➔ …that will have a major impact on the power grid

…. challenge

……taking into account ⇨ The majority of the PV systems in the EU are installed in the low voltage grid

..paradigm change ⇨ **..from the top-down structure to fluctuating bidirectional power flows**

DECENTRALIZATION…(2/2)

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….coordinating distributed PV and storage assets at the local level <u>can</u> …

- **Reduce** transmission and distribution line **losses**
- Increase grid **resilience**
- **Reduce requirements to invest** in new utility generation capacity
- **Lower** generation **costs**

IF FITS ARE PHASED OUT …

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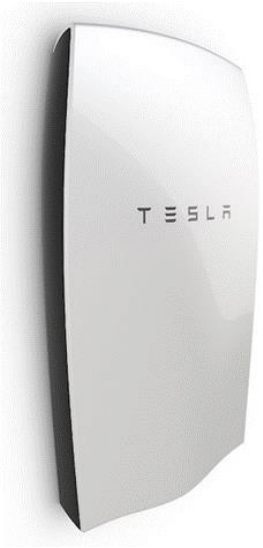
…… what will drive consumer demand for distributed RES-E? (1/2)

Need to …

⇨ ..support self-consumption



⇨ ..**focus on solar+** (eg. solar+storage) packages that provide consumers with **benefits** in terms of **decreased energy costs**

IF FITS ARE PHASED OUT …

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…… what will drive consumer demand for distributed RES-E? (2/2)

According to opinion makers & stakeholders (eg. SolarPower Europe, BPIE etc.) ➔ *self consumption is a key driver for demand side flexibility …*

..because ⇨ …it leads to **concrete economic benefits**

⇨ …making the best use of on-site generation will **steer the development of solutions** such as:

- ⇨ storage
- ⇨ smart appliances
- ⇨ flexible contracts for consumers

OPTIONS FOR IMPROVED SELF-CONSUMPTION (1/2)

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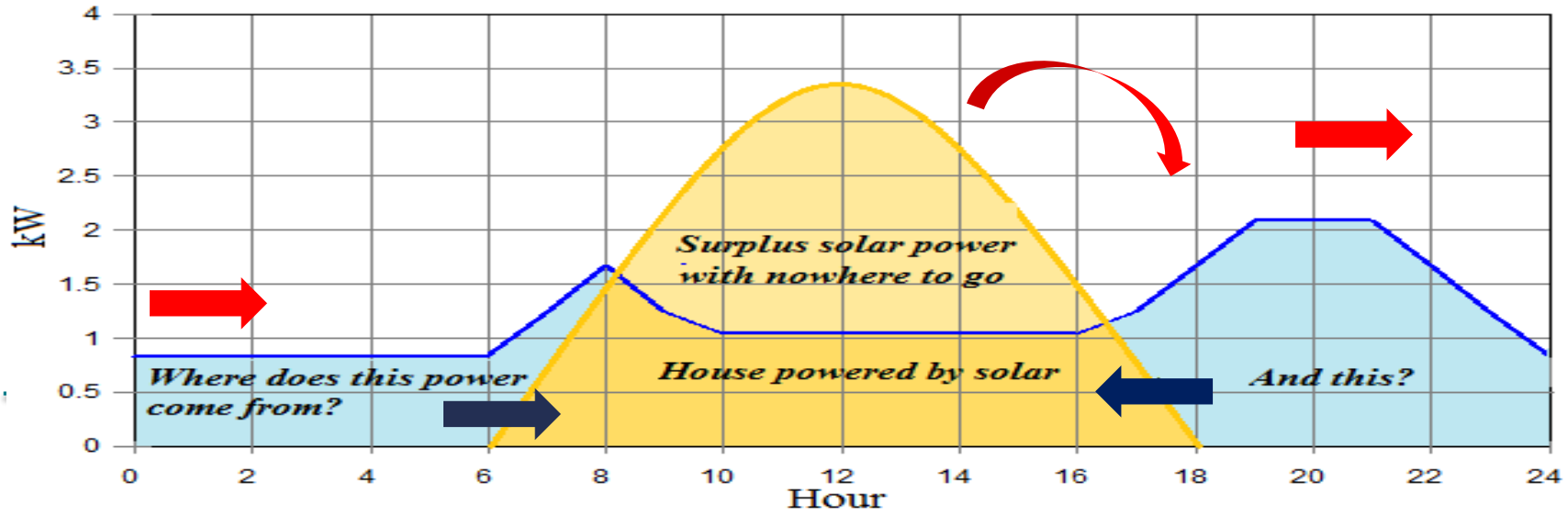
Demand Side Management (**DSM**) systems **to shift demand** … ..for example:

⇨ …to **shift demand** of washing machines, heating, ventilation and air-conditioning (**HVAC**) systems

⇩

From time periods with **surplus consumption**
➔ to periods with **surplus PV-E production**



OPTIONS FOR IMPROVED SELF-CONSUMPTION (2/2)

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..battery **storage** can be **coupled with PVs**

There are a few different battery technologies available on the market suitable for residential electricity storage (lead-acid, lithium-ion etc.)

The PV-E can be **converted into heat**

..for example with a heat pump, and stored in a hot water tank.

What business cases and business models ….

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..can increase the value of decentralized syst?

….already several EU projects:

- **H2020** BestRES ➔ Best practices and implementation of **innovative business models** for Renewable Energy **Aggregators**, http://bestres.eu

- **FP7** INCREASE ➔ Increasing the penetration of renewable energy sources, http://www.project-increase.eu

START SMALL

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..... before address power market design and operations issues.

- Demonstrate that coordination is achievable at the distribution sub-station level

  ...**then integrate the functionality** into the enterprise systems of **power retailers, utilities, aggregators or DSOs**

- UNEP - The District Energy in Cities Initiative (http://www.districtenergyincities.org)

DISTRICT ENERGY IN CITIES UNEP

BARRIERS FOR LARGER UPTAKE

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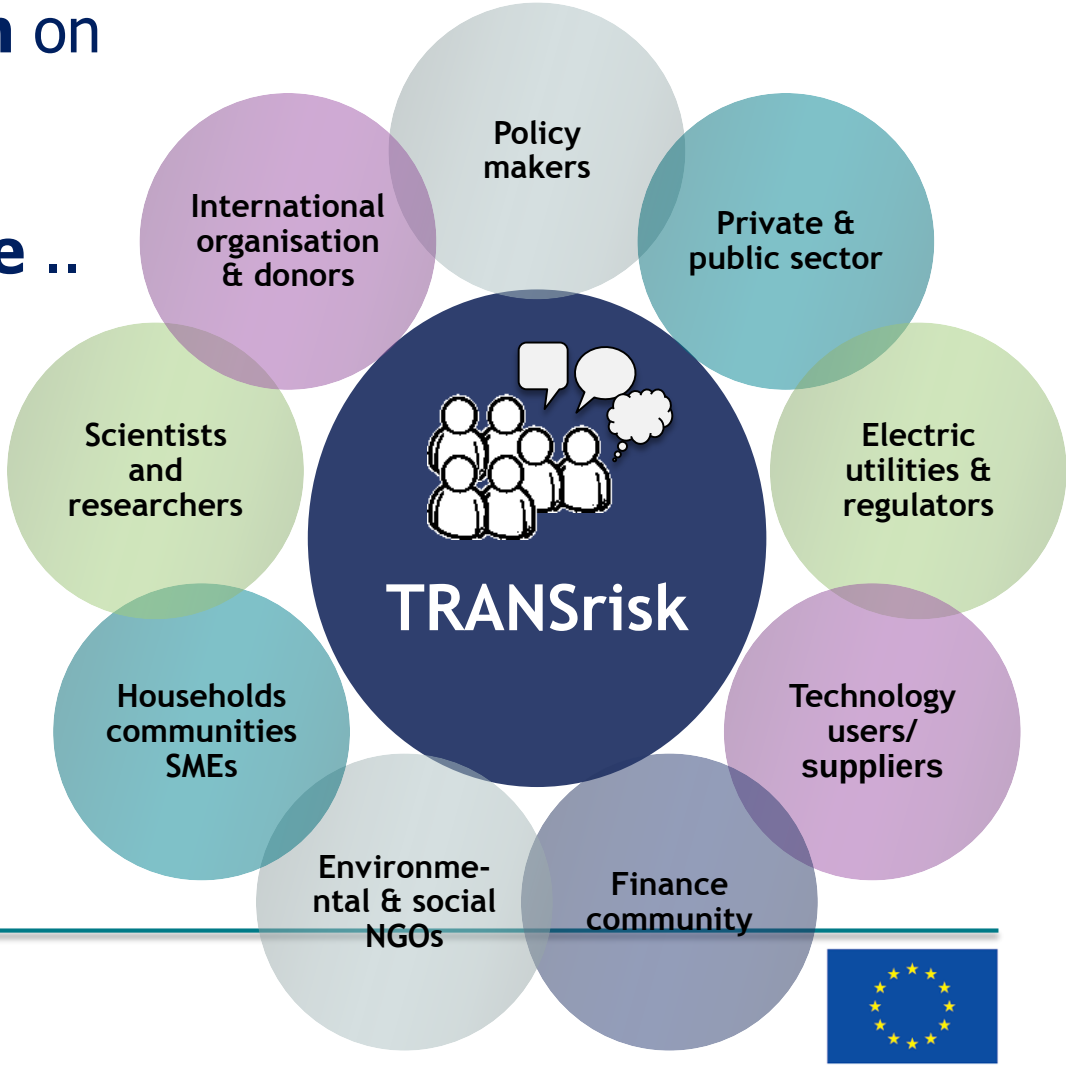
....UPRC has been carrying out stakeholder **consultation** on the **barriers** for the **decentralized RE generation** and **storage** ..



TECHNOLOGICAL CHALLENGES

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Local generation

…storage and

..sharing of power

…require **significant intelligence** at both …

Distribution and

Transmission grid

Interoperability is a crucial technology issue ➔ … need for **standardized interfaces** for the deployment of small-scale solutions for **innovative energy system integration** and management.

….need for **technical specifications** for **small-scale electricity storage**

REGULATORY CHALLENGES (1/2)

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- In Greece, electricity storage has been **excluded** from **net metering programmes**
- …need for **legal support** for **new business models** in the energy sector
- **Inertia** due to existing and **planned investments** in **centralized generation**

REGULATORY CHALLENGES (2/2)

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- …need for **clear responsibilities** and **contractual arrangements** to ensure system's stability

- …need for **alignment between** current **technological capabilities** and the current **building code** (including the regulation of the energy performance of buildings)

ECONOMIC CHALLENGES

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The **diffusion** of decentralized power generation and storage technologies **requires private investments** by the consumers

To **mobilize capital**, it is necessary to find ways **to increase the value of the decentralized power assets**, as well as to find ways to **monetize** this value.

...need for a **clear business proposition** in order to **facilitate access to funding**

QUESTIONS FOR DISCUSSION

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1. *The vision of consumers generating, storing, consuming and sharing clean energy at the local level* ***is a realistic pathway towards a low-carbon Greek power system****?*

2. ***What services*** *can consumers* ***offer*** *to the distribution grid, and* ***which conflicts between these services*** *may decrease the potential revenue?*

3. *Should Greece* ***become a frontrunner*** *or should we* ***wait*** *for new technology advancements?*

4. *How would* ***the value*** *of existing and new power plants* ***be affected****? Under which conditions* ***capacity adequacy issues could arise****?*

How to Contact us

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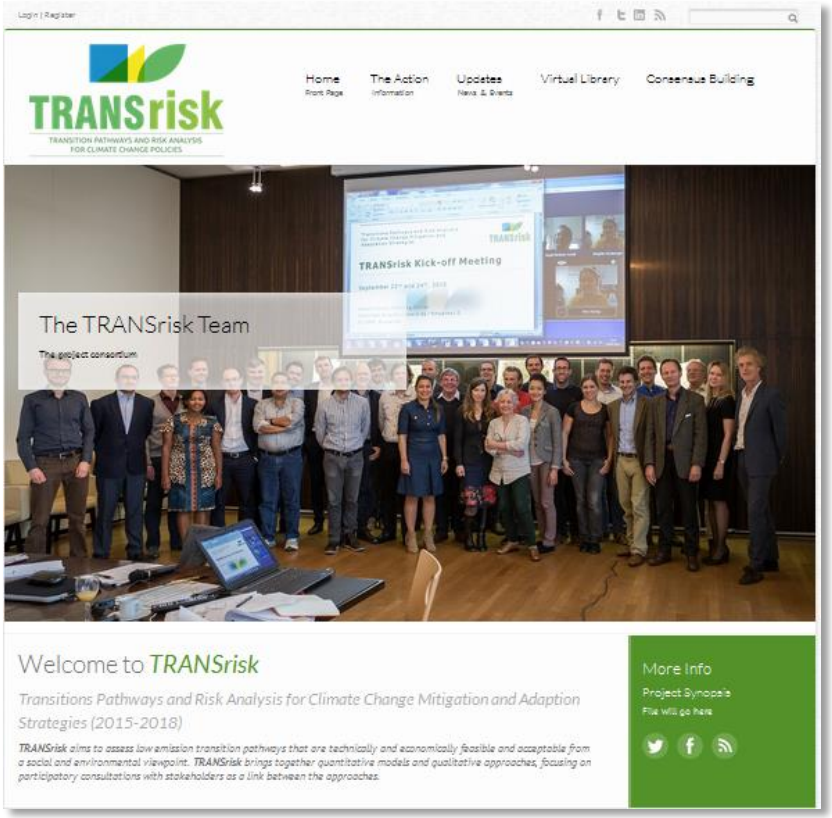

Informational Material

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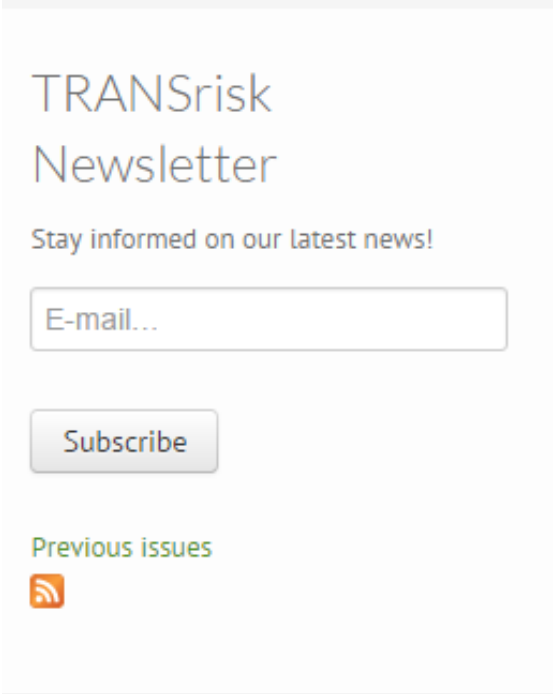
Leaflet

Flyer



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