

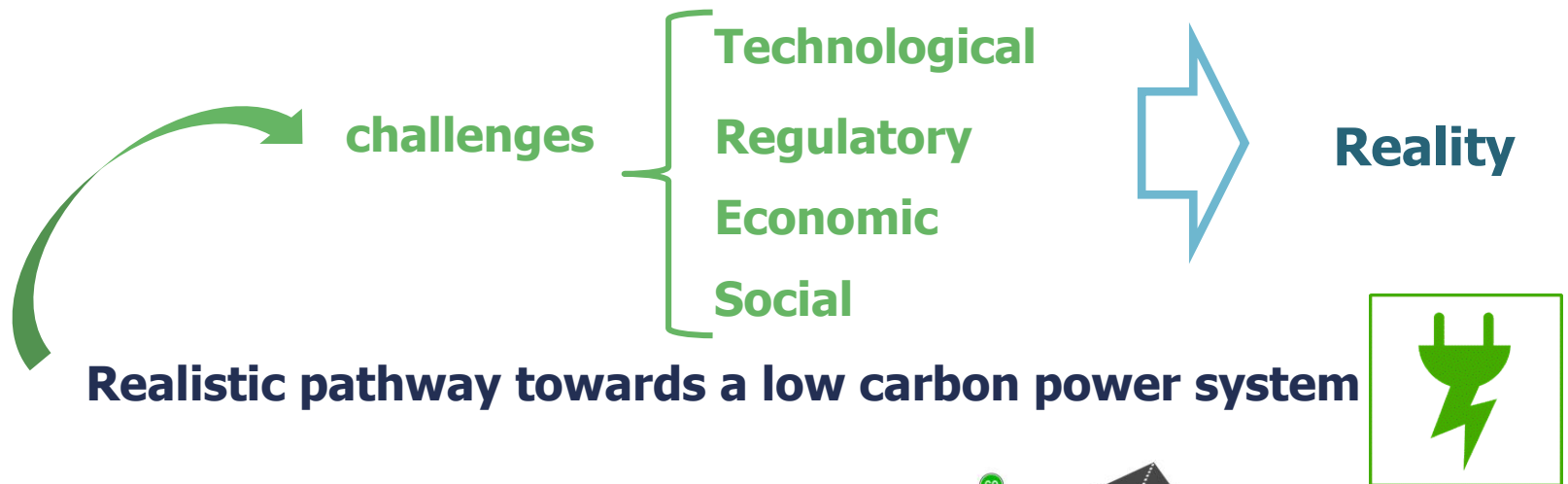
Towards decentralized renewable energy generation and storage: regulations, market designs and requirements

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*Towards 2030 - dialogue & TRANSrisk Regional Workshop, 25<sup>th</sup> of October 2016, Athens, Greece.*

# DECENTRALIZED FUTURE OF THE POWER SYSTEM



**Vision of consumers**

- generating
- storing
- consuming
- Sharing clean energy



..at local level

# DECENTRALIZATION...(1 / 2)

## 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)

....**coordinating distributed PV and storage assets at the local level can ...**




- ⇒ **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 ...

..... 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 ...

..... 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

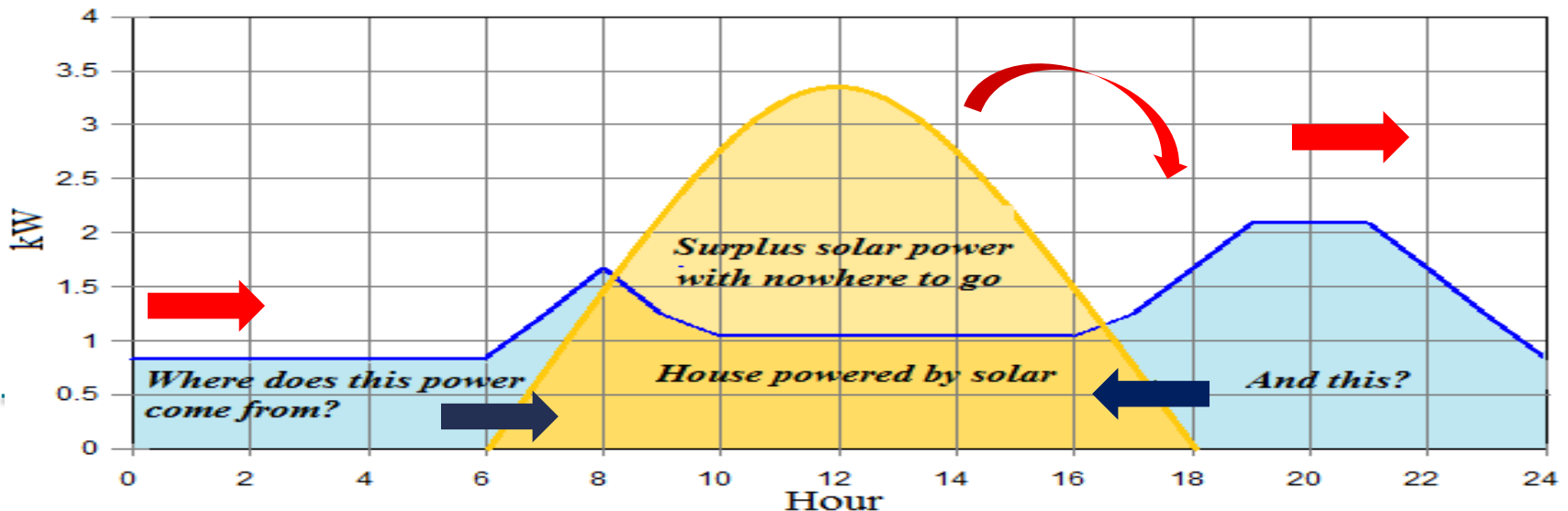


# OPTIONS FOR IMPROVED SELF-CONSUMPTION (1 / 2)

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)

⇒ ..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 ...

**..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>

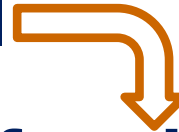
➔ **FP7**  **INCREASE** ➔ Increasing the penetration of renewable energy sources, <http://www.project-increase.eu>

# START SMALL

..... 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>)

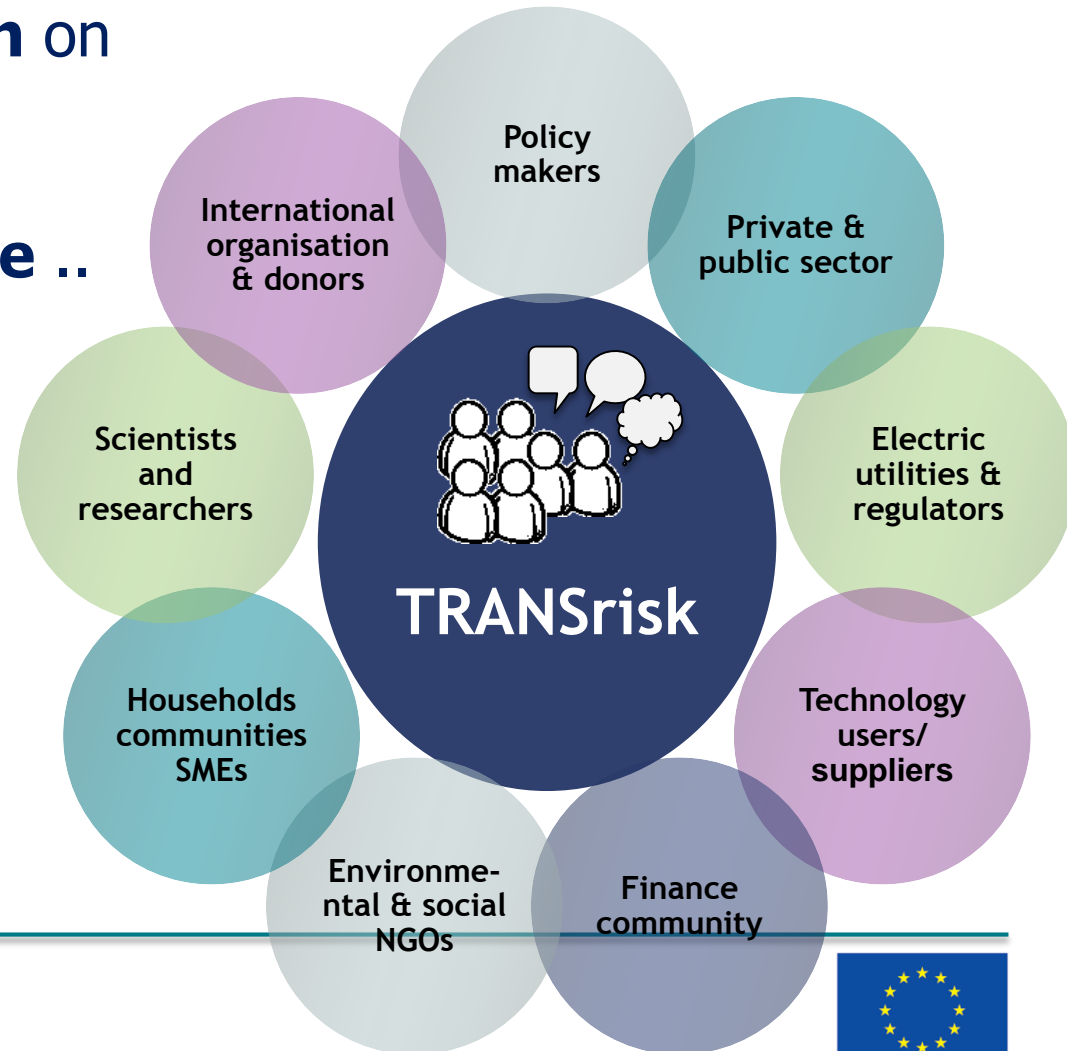


DISTRICT  
ENERGY  
IN CITIES



# BARRIERS FOR LARGER UPTAKE

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



# TECHNOLOGICAL CHALLENGES



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)

- ➔ 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)

➔ ...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)



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

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



**Visit our Website:**

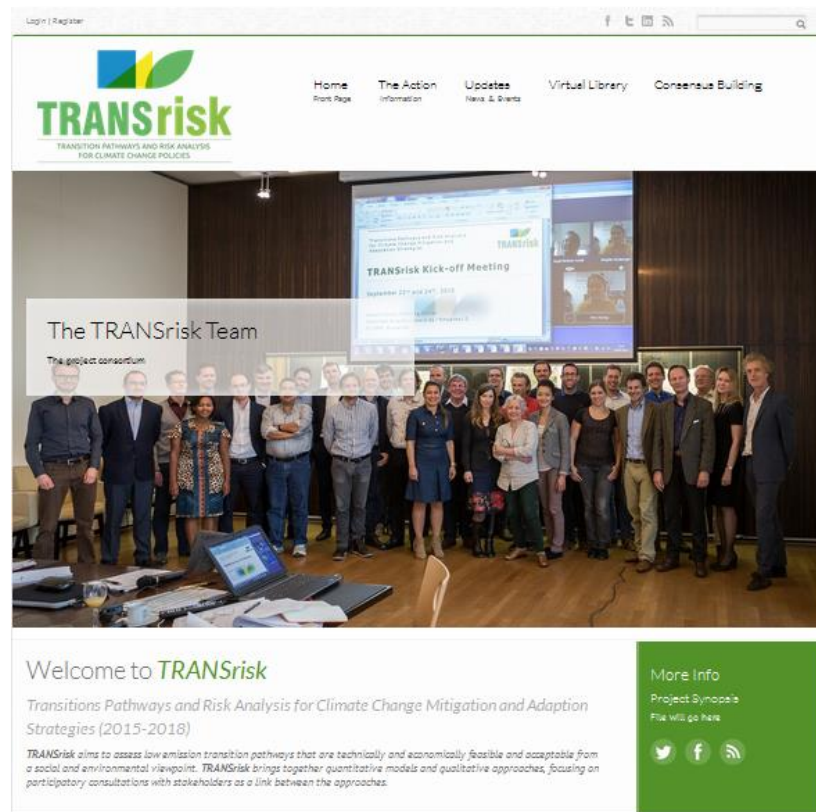
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# INFORMATIONAL MATERIAL



**Who we are**

SPRU Science Policy Research Unit, University of Sussex  
 BC3 Raque Centre for Climate Change  
 Cambridge Econometrics  
 ECR Energy Research Centre of the Netherlands  
 ERAC Energy Research Centre of the Netherlands  
 IIR Institute for Environmental Research  
 IIR National Institute for Research in Theoretical and Applied Sciences  
 Institute for Environmental Studies  
 IPRC University of Graz  
 IPRC University of Pavia Research Centre  
 CLARIFIC Pontifical Catholic University of Chile

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The TRANsrisk project has received funding from the European Union Horizon 2020 research and innovation programme under grant agreement No 101019718.

**TRANSrisk**  
 Transition Pathways and Risk Analysis for Climate Change Mitigation and Adaptation Strategies (2015-2021)

**TRANSrisk**  
 Transition Pathways and Risk Analysis for Climate Change Mitigation and Adaptation Strategies

**WELCOME TO TRANSRISK**

TRANSrisk is an EU funded research project aiming to innovatively transform the way in which climate change policy pathways are developed.

TRANSrisk seeks to understand the needs, level of public acceptance, and the risks, uncertainties and co-benefits associated with different mitigation pathways and low-carbon technologies.

In order to help policymakers manage uncertainties TRANsrisk will gather data via 15 case studies from the EU and other regions, and employ a variety of different models to explore scenarios and pathways.

TRANSrisk will also engage a wide range of stakeholders to help develop credible transition pathways, thus integrating quantitative and qualitative analysis in a unique and innovative way.

An initial meeting of the TRANsrisk partnership was successfully held in Brussels, on 23 - 24 September 2015.

At this 2-day event, 41 participants had the opportunity to meet in person, present overviews of their expectations for the project and discuss the challenges of the forthcoming tasks. Participants included partners' representatives and European Commission officers.

**TRANSrisk Objectives**

- Create an innovative assessment framework for analysing the risks and uncertainties, as well as costs and benefits, of low carbon transition pathways;
- Engage with policy makers to embed consideration of risk and uncertainty at the heart of policy design;
- Establish an assessment framework that brings together quantitative models and qualitative approaches, focusing on participatory consultations with stakeholders as a link between the approaches;
- Design decision support tools to help policymakers better understand uncertainties and risks, therefore supporting robust policy design.

**TRANSrisk Expected Results**

- Enhanced support for technological, institutional and socio-economic 'climate-action' innovation;
- Reduced uncertainties in the assessment of costs, benefits and economic values of mitigation actions;
- Support for the EU and global climate policy goals;
- Scientific underpinning for implementation of the EU's 'Roadmap for moving to a low - carbon economy in 2050';
- A contribution to major international scientific assessments (e.g. IPCC).

**Who we are...**

Science Technology Policy Research, University of Sussex  
 Raque Centre for Climate Change  
 Cambridge Econometrics  
 Energy Research Centre of the Netherlands  
 Swiss Federal Institute of Technology (funded by Swiss Govt)  
 Institute for Structural Research  
 Joint Implementation Network  
 National Technical University of Athens  
 Stockholm Environment Institute  
 University of Graz  
 IPRC University of Pavia Research Centre  
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**Our Aim**

TRANSrisk's aim is to support EU and global climate change goals by providing analytical tools for risk and uncertainty aware policy making.

TRANSrisk acknowledges the importance of modelling scenarios, such as those outlined in the EU's Roadmap for moving to a low-carbon economy, consistent with the Paris Agreement, and the need to understand the uncertainty associated with mitigation pathways.

There is a clear need to consider implementation of the EU's Roadmap for moving to a low-carbon economy, and the need to understand the uncertainty associated with mitigation pathways.

**TRANSrisk's main objectives are to:**

- Create a novel assessment framework for analysing costs and benefits of transition pathways, which is at the heart of policy design, rather than assumed for longer modelling horizons at the end of the pathway.
- Engage in decision support that to help policy makers better understand uncertainties and risks that arise when making policy design.

**About TRANsrisk**

TRANSrisk aims to transform the way in which alternative climate change policy pathways are identified and evaluated through the following key areas:

**Robustness, Resilience & Participatory Assessment**  
 Robustness: Rigorous modelling and analysis, providing the link between theory and practice. Through participatory processes, stakeholders have to test assumptions for uncertainty associated with energy, technology, and policy in the context of policy design.

**Stakeholder Co-design**  
 Synergies and conflicts between different energy system pathways and other societal objectives are explored. Robustness, resilience and participatory assessment: the uncertainty of energy, and impacts on water, land use and ecosystems.

**Assessment Pathways & Transition Pathways**  
 Decision trees to capture complex energy system planning being undertaken with many different stakeholders. The impact of feedback loops is captured. The impact of feedback loops is captured. The impact of feedback loops is captured.

**Assessing Uncertainties & Risks**  
 To test whether the climate change goal will require energy, water, land, and other resources, and to understand the uncertainty associated with the pathway. TRANSrisk supports an understanding of the uncertainty associated with the pathway, consistent with the transparency and availability of different technical pathways.

**What is expected**

TRANSrisk expects to have an impact across the policy, business, social and academic sectors.

- Provide new insights on mitigation pathways across different regions and scenarios, and to use within the EU and in Canada, China, India, Indonesia and Brazil.
- Provide decision support with tools to assess and compare low-carbon transition pathways & benefits of transition systems.
- Engage with policy makers to embed consideration of risk and uncertainty at the heart of policy design.
- Contribute to major international scientific assessments (e.g. IPCC).

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# Thank you!

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*More Information:*  
[www.transrisk-project.eu](http://www.transrisk-project.eu)

