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Enhancing Storage Integration in Buildings with Photovoltaics (PV-ESTIA project)

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Outline

- Overview of the PV-ESTIA Project
- Methodology
- Proposed Innovative Management Scheme
- Evaluation via Pilots
- Optimization Tools
- Expected Outputs
- Conclusions

Overview of the PV-ESTIA Project

■ Main target?

- ✓ To enhance the integration of **PVs** and **storage systems** in the building environment

■ Why?

- ✓ To transform buildings into a controllable energy source
- ✓ To enable the transition towards NZEB concept
- ✓ To add flexibility to the electrical network

■ How?

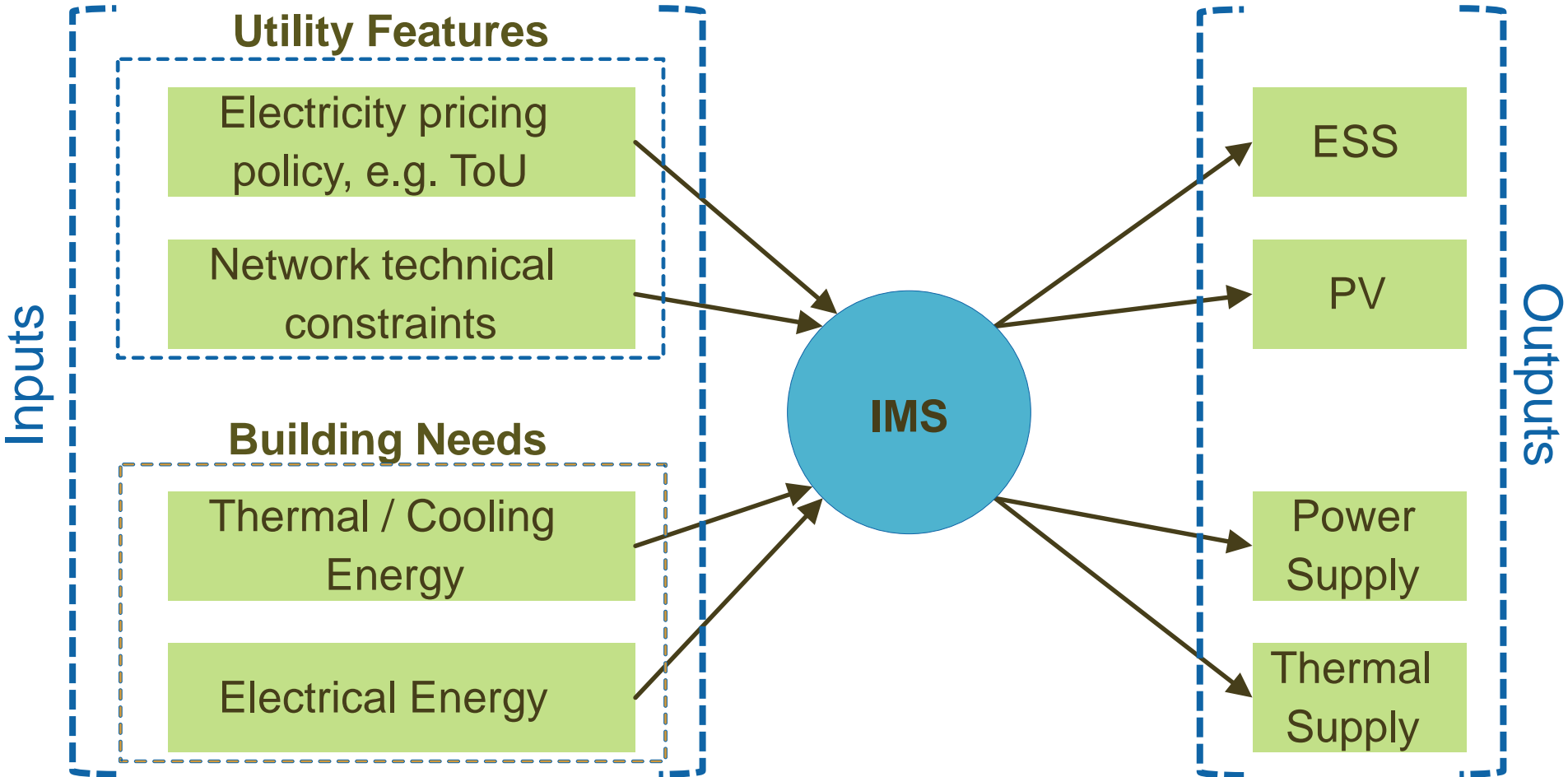
- ✓ Through an innovative management scheme of the **hybrid PV+storage** system



Methodology

- A. Analysis of **existing policies and regulatory frameworks** at the participating countries
- B. Development of an **innovative management scheme (IMS)** for hybrid PV+storage systems
- C. Development of **optimization tools** to evaluate the performance of the proposed IMS under different electricity pricing policies
- D. Development of **pilot installations** for the assessment of the proposed IMS under real-field conditions

Proposed IMS conceptual design



Proposed IMS

- **Scope** of the developed IMS: to meet the energy needs of the building in an **optimal** way:
 - Maximizing building self-consumption rate (SCR)
 - Maximizing owner's profit for an investment in hybrid PV+storage system
- **How?**
 - By exploiting all the available energy resources
 - While satisfying the technical requirements introduced by the local DSO

Proposed IMS

- **Main output of developed strategy**
- A unified and coordinated management scheme that aims to control:
 - ESS operation
 - Electrical loads
 - Thermal and cooling loads
- **IMS offered functionalities**
 - Peak load shaving
 - Voltage support
 - Support of DC- / AC-coupled PV+storage systems
 - Support of different electricity pricing policies

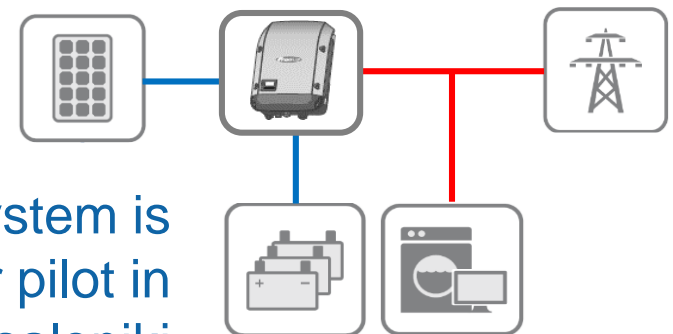
Evaluation via Pilots

Two groups of pilots

1. Placement of **battery ESSs** in buildings with existing OR new PVs
 - > To assess the performance of the proposed IMS
2. Installation of **measurement devices** on existing prosumers OR consumers
 - > To create a portfolio of typical consumption and generation profiles in the Balkan-MED area

Evaluation via Pilots

- Pilots places
 - Thessaloniki (GR), Kozani (GR), Nicosia (CY), Plovdiv (BG), Skopje (FYROM)
- Battery technology
 - Lead-acid OR Lithium-ion
- PV and battery system coupling:
 - AC-coupled OR DC-coupled



DC-coupled system is selected for pilot in Thessaloniki

Optimization tools

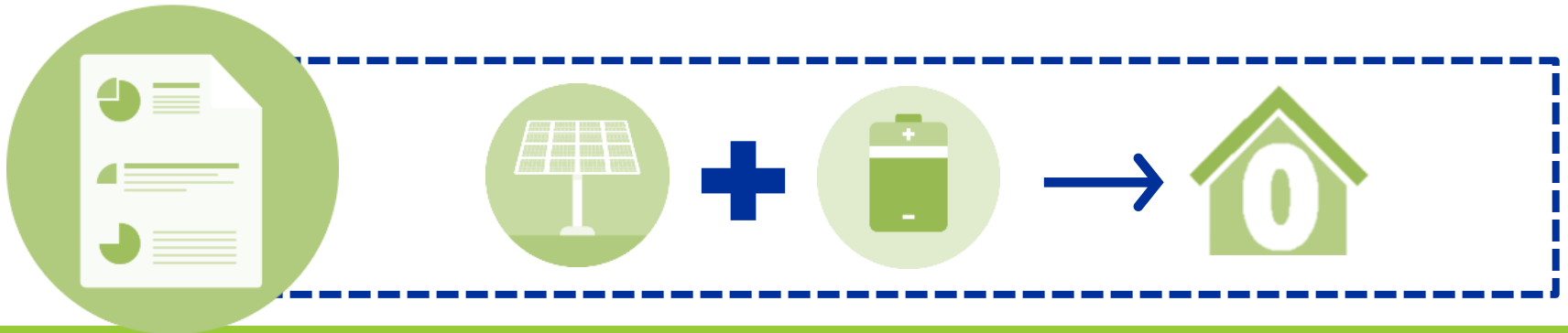
- **Inputs:** climatological data, electrical, thermal, cooling needs
- **1st Tool:**
 - Online user-friendly tool
 - Outputs: optimal PV and battery size, replacing other forms of energy for electricity
 - Maximize: SCR, prosumer's profit
- **2nd Tool:**
 - Advanced tool (offline) targeted to policy makers
 - Inclusion of dynamic tariffs/market-based policies
 - Towards advancing demand response and demand side management policies

Expected outputs

1. **New joint regulations and recommendations** for the Balkan-Med region that can be widely applied, while taking into consideration the specific needs of each country
2. **An innovative management scheme** for the optimal exploitation of building's energy resources
3. **Pilot installations**
 - ✓ for the evaluation of the IMS and
 - ✓ For the construction of a database for typical generation and consumption profiles
4. **Two optimization tools** aiming to empower stakeholders and engineers to deal with hybrid PV+storage systems.

Conclusions

- Main activities and expected outcomes of PV-ESTIA project were presented
- Developed tools will optimize the operation of ESS and thermal/cooling systems towards buildings transformation into NZEBs
- Project outputs will **enhance the integration of PVs and storage systems** in the building environment



Thank you for your attention!

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