SOLVE

SOLELFORSKNINGS
CENTRUM SVERIGE

Theme 3 & 6

Theme 3: Enhanced PV system

Theme 6: Planning for large-scale PV expansion

Xingxing Zhang, Joakim Widén, Joakim Munkhammar, Andreas Theocharis

2024 - 08 - 30

CONTENT

The webinar will be recorded!

- 10:00-10:10, Welcome and Agenda (Xingxing Zhang, Dalarna University)
- 10:10-10:20, What is SOLVE (Joakim Widén, Uppsala University)
  - Theme 3: Enhanced PV system (Joakim Munkhammar, Uppsala University),
  - Theme 6: Planning for large-scale PV expansion (Andreas Theocharis, Karlstad University)
- 10:20-10:35, How are PV systems optimized from aspects of technique, economy and environment? (Santiago Valencia Gonzalez, Dalarna University)
- 10:35-10:50, How can PV systems, alongside wind power and electric vehicle charging, be optimized to enhance the performance of urban energy systems (EV)? (Reza Fachrizal, Mälardalen University)
- 10:50-11:05, How do large solar parks and battery storages contribute to the Swedish frequency regulation market? (Mohamad Koubar, Uppsala University)
- 11:05-11:20, How can data analytics and modelling provide information in smart grid energy saving? (Phil Aupke, Karlstad University)
- 11:20-11:30, Conclusion and comments (All)

WELCOME

Introduction of the Speakers

WHAT IS SOLVE?

Solar Electricity Research Centre, Sweden

One of 11 new Competence Centres approved by the Swedish Energy Agency for 2022-2026

The purpose of the competence centers
To strengthen collaboration between business, the public sector and academia

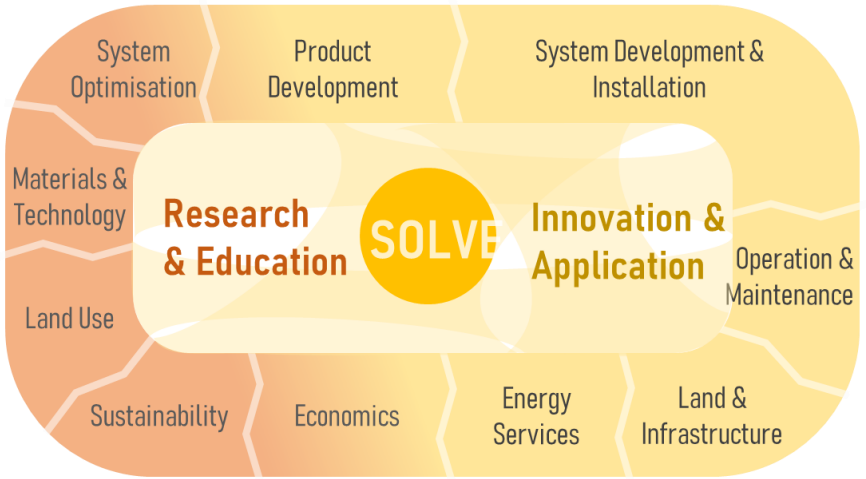
To build up and make available knowledge of the highest quality and competence for society's transition to a sustainable energy system.

Energimyndigheten

PARTNERS

Who is involved?

6 Universities/Institutes
50 Companies/Organisations



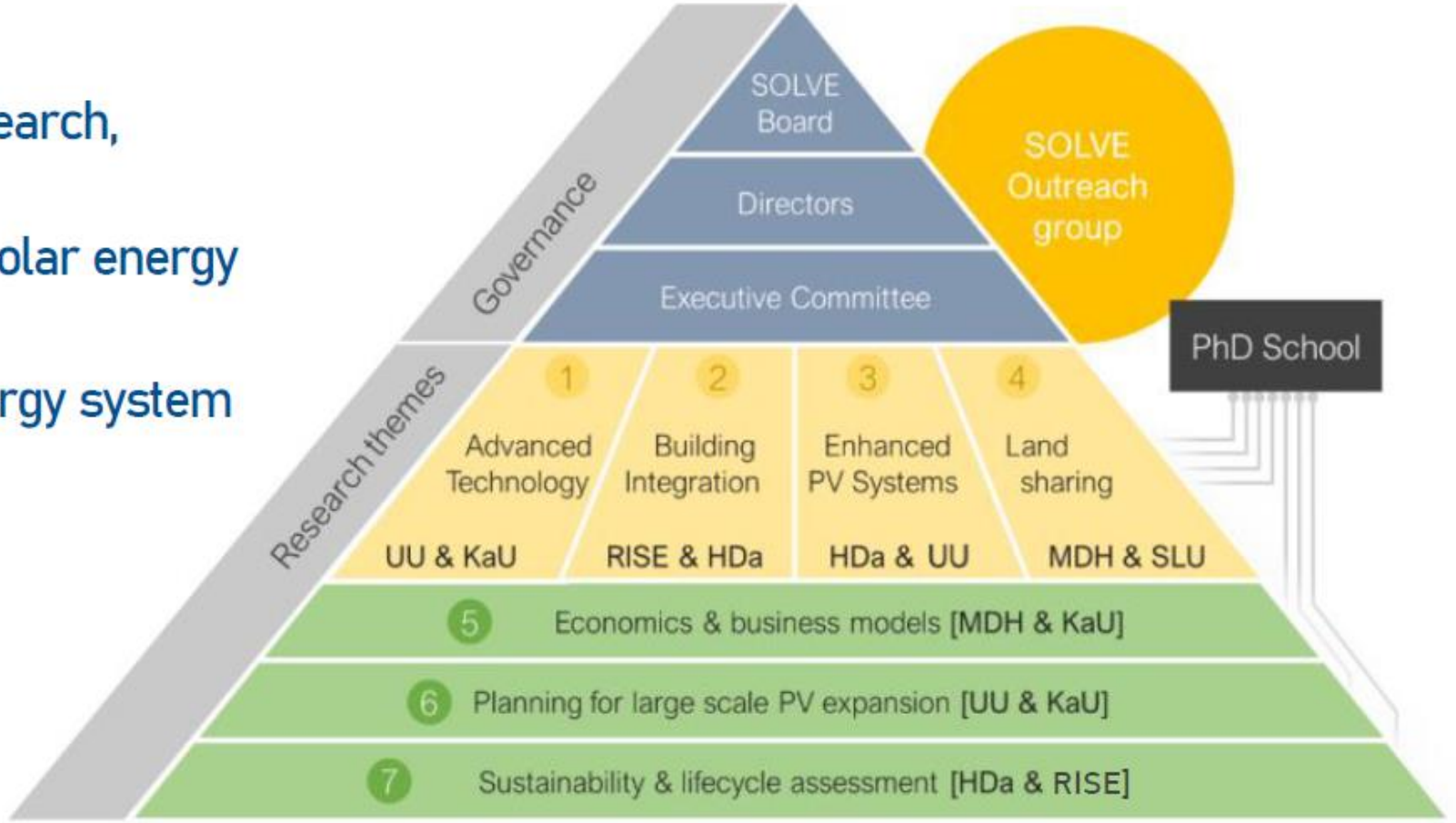
From 2023 also EQUA.

SOLVE OBJECTIVES

Needs-driven, collaborative research,

enhancing the role and contribution of solar energy

as part of a sustainable energy system



SOLVE RESEARCH THEMES

1. ADVANCED TECHNOLOGY

Technology development for improved performance and sustainability

Marika Edoff, Uppsala University

Markus Rinio, Karlstad University

2. BUILDING INTEGRATION

Improved function and uptake of BIPV, for energy-efficient, functional and attractive buildings

Malin Unger, RISE

Chris Bales, Dalarna University

3. ENHANCED PV SYSTEMS

Optimising PV in complex new energy systems over different scales

Xingxing Zhang, Dalarna University

Joakim Munkhammar, Uppsala University

4. LAND SHARING

Effective sharing of PV and other land uses in urban and agricultural environments

Marcos Lana, SLU

Pietro Campana, Mälardalen University

RESEARCH THEMES

5. ECONOMICS & BUSINESS MODELS


Improving economic performance of PV in new energy markets

Bengt Stridh, Mälardalen University

Markus Rinio, Karlstad University


6. PLANNING FOR LARGE SCALE EXPANSION

Enabling smart, sustainable and rapid expansion of PV in Sweden

Andreas Theocharis, Karlstad University

Joakim Widén, Uppsala University

7.SUSTAINABILITY AND LCA


Quantifying the contributions of PV to our sustainability goals

Michiel van Noord, RISE

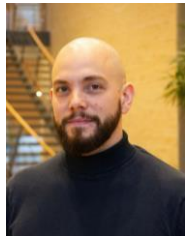
André Augusto, Dalarna University

SOLVE PhD STUDENTS

Amal

Phil

Nicklas



Marieke

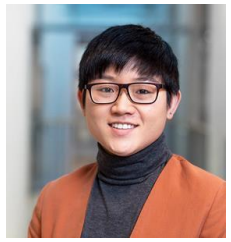
Santiago

Majid

Elin

Mohamad

Silvia



Bhavya

Sebastian

Klara

11 PhDs started/recruited
1graduated
1-2 positions planned/under discussion

Theme 3: Enhanced PV system

Aim: Optimized PV system in local community level but with connections with buildings and grid/city scale

Sub objectives defined in the proposal

- To provide research on optimal system design and real time, data-driven management
- To maximise economic return of PV system
- To control power distribution
- To couple with battery/hydrogen storages
- To perform usage/production predictions for the end user.

Improve functionality, flexibility, transparency and economic return for the PV prosumer!

Theme 6: Enhanced PV system

Background: The diverse types of PV systems at all scales contribute to local, regional and national energy systems and sustainability targets.

Aim: How can PV development in Sweden be guided with via top-down holistic approach to optimize the system as a whole?

Sub-objectives:

- Hosting capacity studies to determine levels of PV penetration on different scales.
- Optimization of energy management of solar power in combination with e.g. battery storage, charging of electric vehicles, heat pump systems and ancillary services to the electricity grid.
- Energy production and load consumption forecasting on different grid scales.
- We will also investigate PV expansion scenarios in Sweden considering the coming developments in large scale energy storage, hydrogen and electrification.

Methods and tools

- Big data and digitalization tools, urban modelling.
- Development of modeling tools, stochastic methods, statistical tools, numerical simulation and optimization
- Machine learning-based methods and edge computing.

Main interest

Company interests:

- New PV products (new PV, BIPV, PVT)

PhD B

- PV-storage (batteries) and smart EV charging
- Energy community and its smart district control (including PV system)
- Monitoring PV system for data analysis and prediction PV production with satellite data

PhD A

- Implement different types of smart solar parks, or large-scale roof installations
- Grid ancillary services: frequency related and non-frequency related
- PV power crisis, offgrid and EV charging

Academic interests:

Dalarna University | Uppsala University | Karlstad university

Any further question or comment?

- Optimization in both existing and future scenarios
- Political goals' influence on PV modules' quality and environmental objectives
- Existing EV capacity to reach a net zero scenario of urban energy system
- Low synergy between solar PV park and battery storage with more elaboration on optimization of the operation of battery for different auxiliary services (FCR-N and FCR-D up and FCR-D down), and the influence due to PV production
- Historical weather data and weather forecast data for data-driven model
- Benefit from more technical data influence on the accuracy of data-driven model

SOLVE

Thank you!

Xingxing Zhang xza@du.se
Joakim Widén joakim.widen@angstrom.uu.se
Joakim Munkhammar joakim.munkhammar@angstrom.uu.se
Andreas Theocharis andreas.theocharis@kau.se

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