



# Energy Management System for the Communal Users

---

Marek Pawłowski, PhD student  
Technical University of Lodz

Glasgow, University of Strathclyde, UK

07 April 2011



# Outline

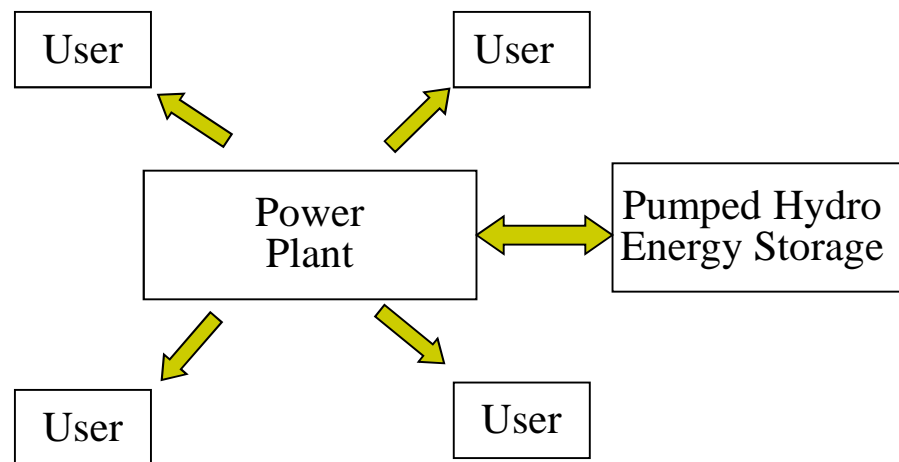
---

- Centralised and Distributed Generation
- Communal User Demand
- Energy Management System
- Laboratory of Building Management System
- Laboratory of Distributed Generation
- Summary

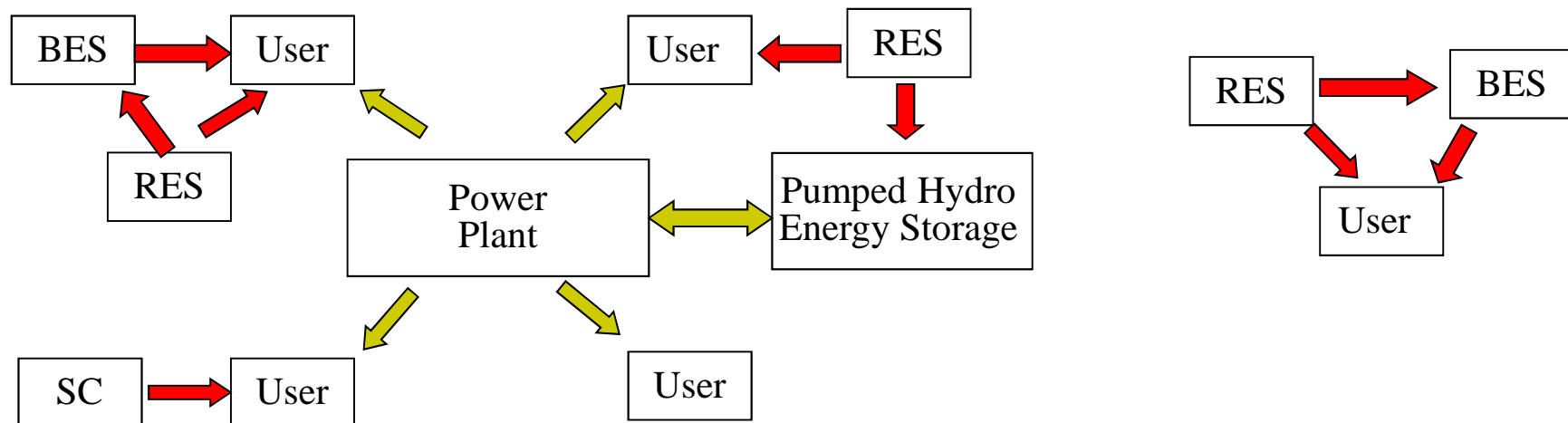
# Centralised System

---

- The energy for users is produced in the centralised power plant
- The number of energy storages is small
- Only the use of pumped hydro energy storages is possible in centralised power system



# Distributed generation



- Additional, unpredictable, weather-dependent energy sources
- Additional, smaller energy storages for the communal users eg. Battery Energy Storage
- The possibility of configuration of stand-alone systems and systems connected with grid
- Since the energy distribution is not always clear and obvious, the energy management system becomes more complicated



# Energy demand in buildings

---

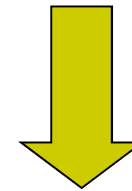
- Buildings are ranked as third in energy consumption after industry and transport
- In UE countries the average energy consumption in buildings accounts for 37% of all energy
- Improving of energy efficiency of buildings of 20% would result in 60 bln EUR savings per year
- Modern Building Management Systems (BMS) allow to save up to 40% of energy

# Communal users demand

---

- + Comfort
- + Safety of users and buildings
- + Lower energy consumption
- System costs

Building Management System BMS



**Energy Management System  
For The Communal Users**



- + „Free” energy
- Installation , maintenance  
and operation costs
- Unpredictability

Renewable Energy Sources

Energy Storage



# Energy Management System

---

- ❑ DOUBLE unpredictability – Renewable Energy Sources and behaviour of users
- ❑ Behaviour of people has a huge influence on the load profile.  
Example: Switching on the cooker or kettle changes definitely load profile of the communal users even by 50-70%
- ❑ Energy storage is necessary
- ❑ The communal user can store the surplus of produced energy in energy storage or sell (only in grid connection configuration ) it to the power system
- ❑ The amount of stored, sold and bought energy depends on the individual user load profile
- ❑ Energy Management System should cooperate with power grid to provide its safety and stability

# Laboratory of Building Management System

---



- ❑ Founded in 2009
- ❑ Part of Union project at University
- ❑ Local Control Network LCN authorized training center



# Laboratory of Distributed Power Generation

---





# Summary

---

- ❑ For the communal user the comfort will be always more important than stability of power grid
- ❑ Building Management Systems allow to improve the comfort of communal users and to save energy
- ❑ BMS used to control DG creates Energy Management System For The Communal User
- ❑ The configuration of energy flow is still an open question



# References

---

- L. Pe´rez-Lombard, J. Ortiz, C. Pout: “A review on buildings energy consumption information.” *Energy and Buildings* 40 (2008), pp. 394-398.
- X. Li, C. Bowers, T. Schnier: “Classification of Energy Consumption in Buildings with Outlier Detection” *IEEE Trans. on Industrial Electronics*, vol. 56 (2009), pp. 1-6.
- Xiaotong Du, Xiaomei Qi, Cundong Wang: “Determination of effective energy in buildings.” 2009. ICAL’09. IEEE International Conference on Volume, Issue, 5-7 Aug. 2009, pp. 56-61.
- P. Borkowski and others: “Fundamentals of integration of building management systems. Laboratory of building automation systems.”. Publisher of WNT, 2009, pages 190, ISBN 978-83-204-3544-3. (in Polish)
- P. Borkowski and others: “Intelligent building management systems.” Publisher of Technical University of Lodz, 2011, pages 231, ISBN 978-83-7283-387-7 (in Polish).



---

# Thank You

Marek Pawłowski (marek.pawlowski@p.lodz.pl) – PhD student at Technical University of Lodz. He is a scholarship holder of project entitled "Innovative education without boundaries - integrated development of Technical University of Lodz - University management, innovative educational offer and an option to enhance the possibilities to take on new employees, also disabled ones. " supported by European Social Fund. Member of IEEE, SEP