



## Development of a Comprehensive Battery Energy Storage System Model for Grid Analysis Applications

By : Ing. Mostafa Kamal

Supervised By : Prof. Dr.-Ing. Peter Zacharias

Prof. Dr.-Ing. Adel Khalil

Dr. Dipl.-Ing. Stefan Kempen

# Contents



1. Company introduction.
2. Topic Introduction.
3. Task.
4. The System.
5. Further Applications of Battery Energy Storage System



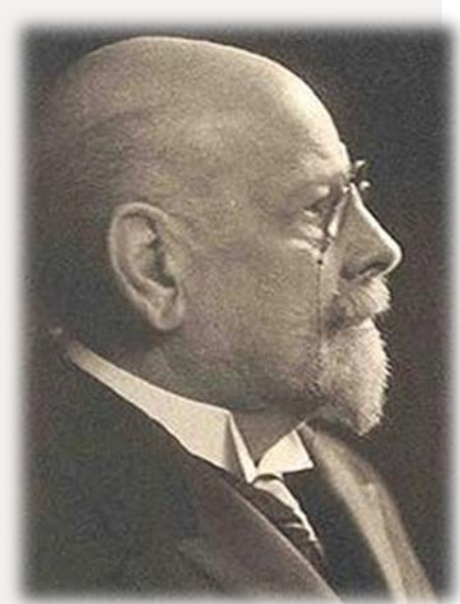
# Company introduction



**AEG Stands for  
(Allgemeine Elektrizität-Gesellschaft).**

**Founded in 1887 by Emil Rathenau.**

**In 1947, AEG Power Solutions established itself a new  
as a leader in the technological fields of power  
interfaces to the electrical grid, where it continues  
to excel to this day.**



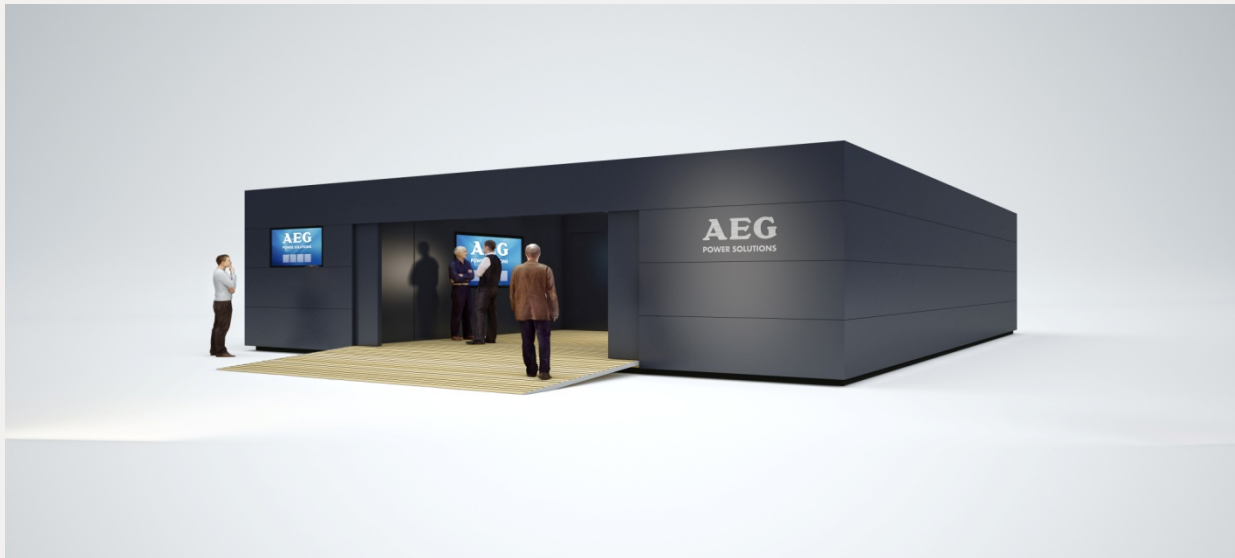
## Products and services:

- **Renewable Energy Solutions**
  - i. **Central Inverters.**
  - ii. **Power Controller.**
  - iii. **Solar Monitoring.**
  - iv. **String inverters.**
- **Energy Efficiency Solutions.**
  - i. **Rectifier & Chargers**
  - ii. **UPS & Inverters**
  - iii. **Power Supply Modules**
  - iv. **Data & IT UPS**
  - v. **DC Telecom**
  - vi. **ECOpX: Hybrid Energy**
  - vii. **Control Modules**
  - viii. **Embedded Power Supplies.**
  - ix. **LED Drivers**
- **Power Services.**
  - i. **Planning & Installation.**
  - ii. **Maintenance.**
  - iii. **Battery Services.**
  - iv. **Repair & upgrades**

# Topic Introduction



The major challenge now days is to store the excess energy from energy generated when demand is low, and reuse this energy in later time or in the high demand times.



# The Task



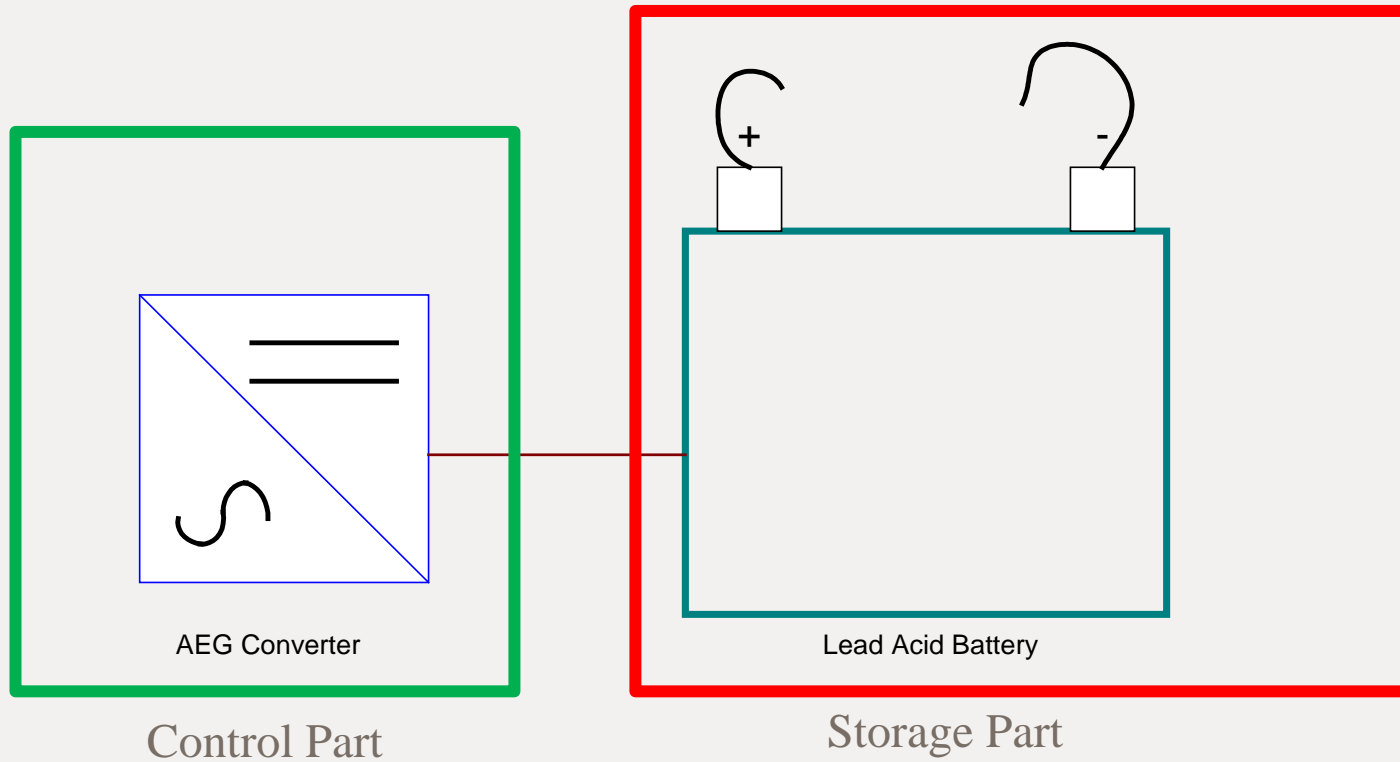
To Build comprehensive model of the battery energy storage system to be able to analyze different grid integration scenarios using Power Factory Digsilent.



# The System



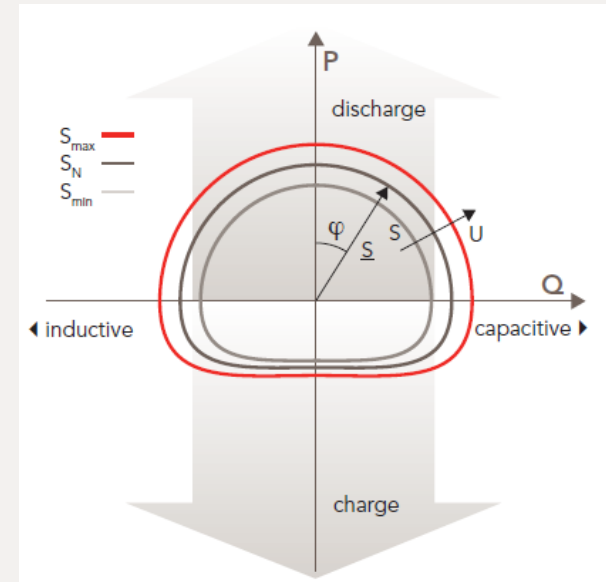
## Battery Energy Storage System Contents:



# Benefits and Advantages



- Active power output/input (support grid frequency)
- Reactive power output/input (voltage control)
- Pure phase shift operation possible
- Charge and discharge at any desired  $\cos\phi$
- Active filtering of selected harmonics
- Off-Grid capability

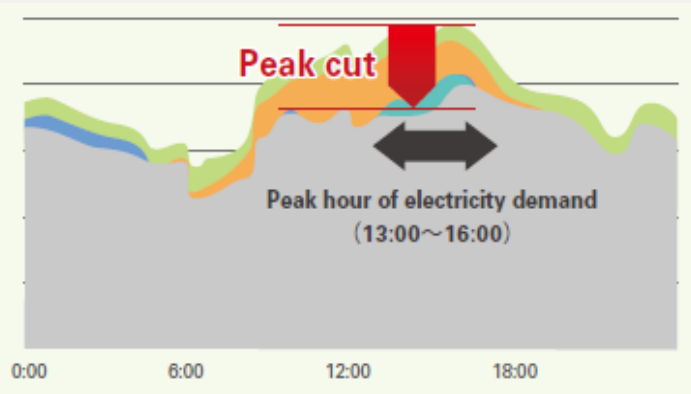




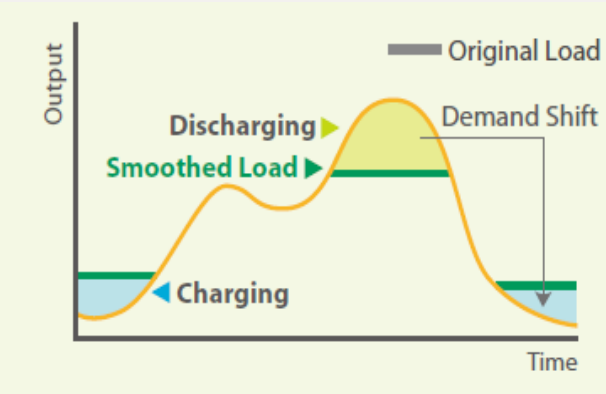
# Further Applications of Battery Energy Storage System



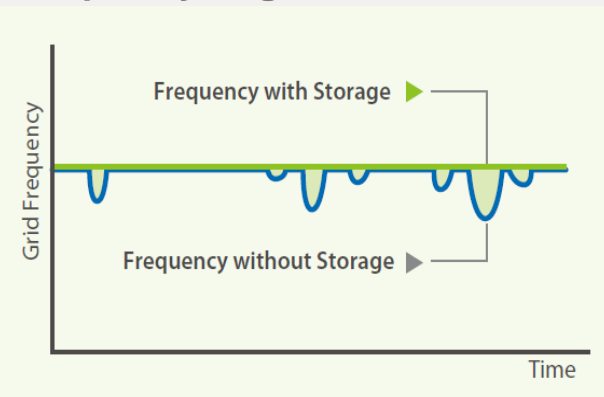
## Peak Shaving



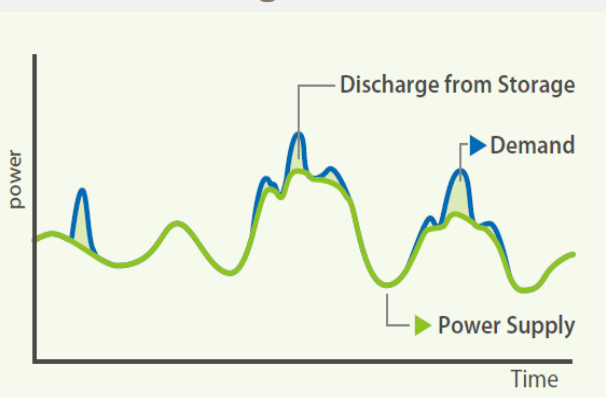
## Peak Demand Shifting



## Frequency Regulation



## Load Levelling





**Thank You for your attention**



Contacts: [mostafa.kamal@aegps.com](mailto:mostafa.kamal@aegps.com)  
Mno\_23@hotmail.co.uk  
Mobile : +49 176 202 87058