Power Management Systems of Energy Storage Using Artificial Intelligence Tools

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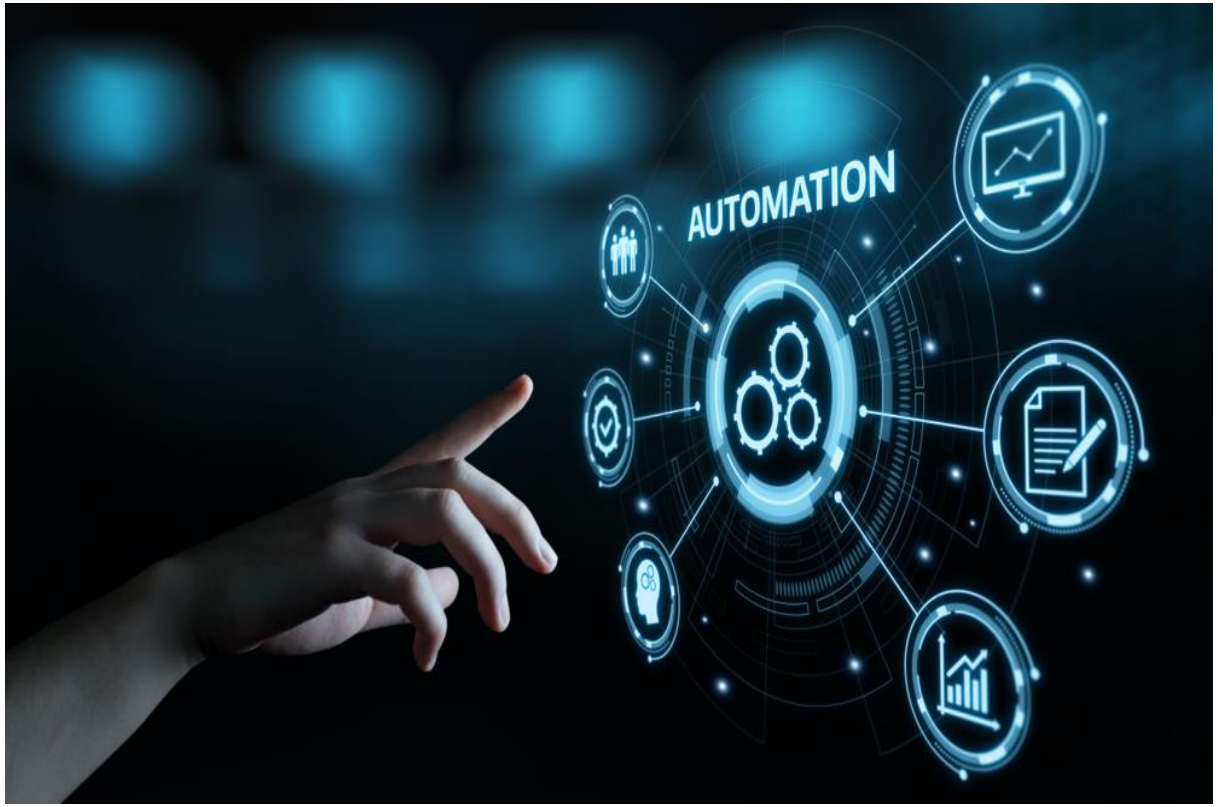

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Agenda Points

01 Introduction

02 Data-Driven Models

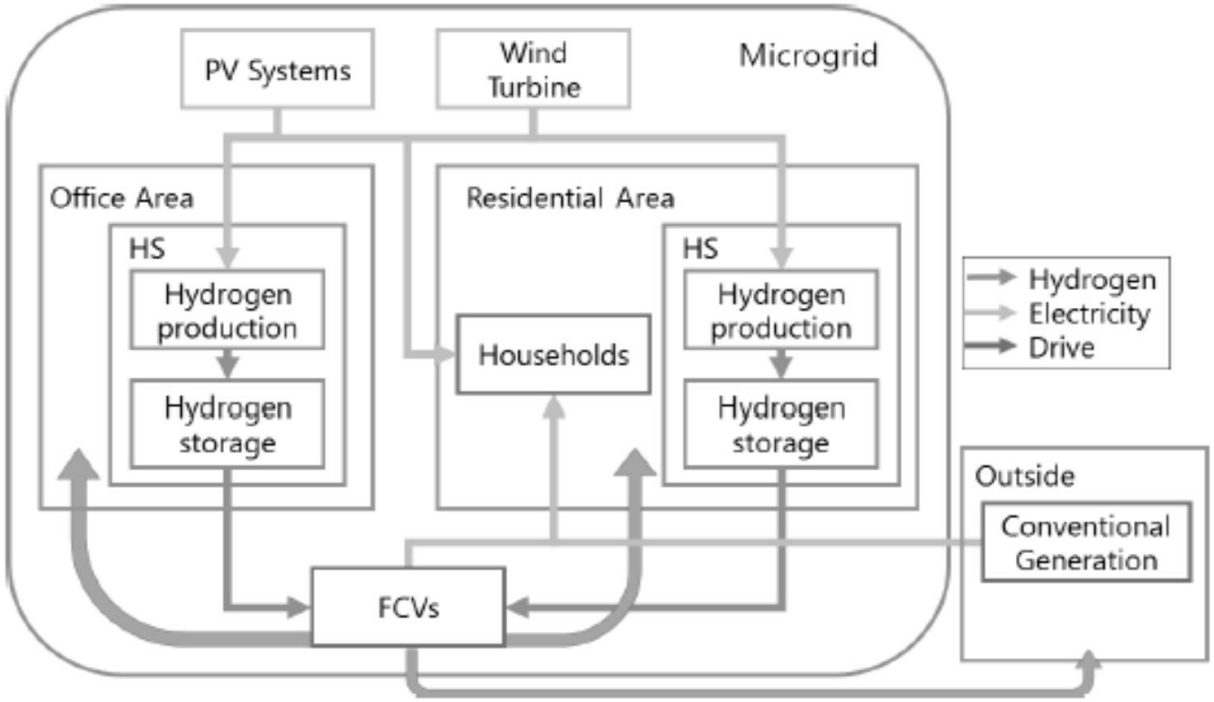
03 Case Study

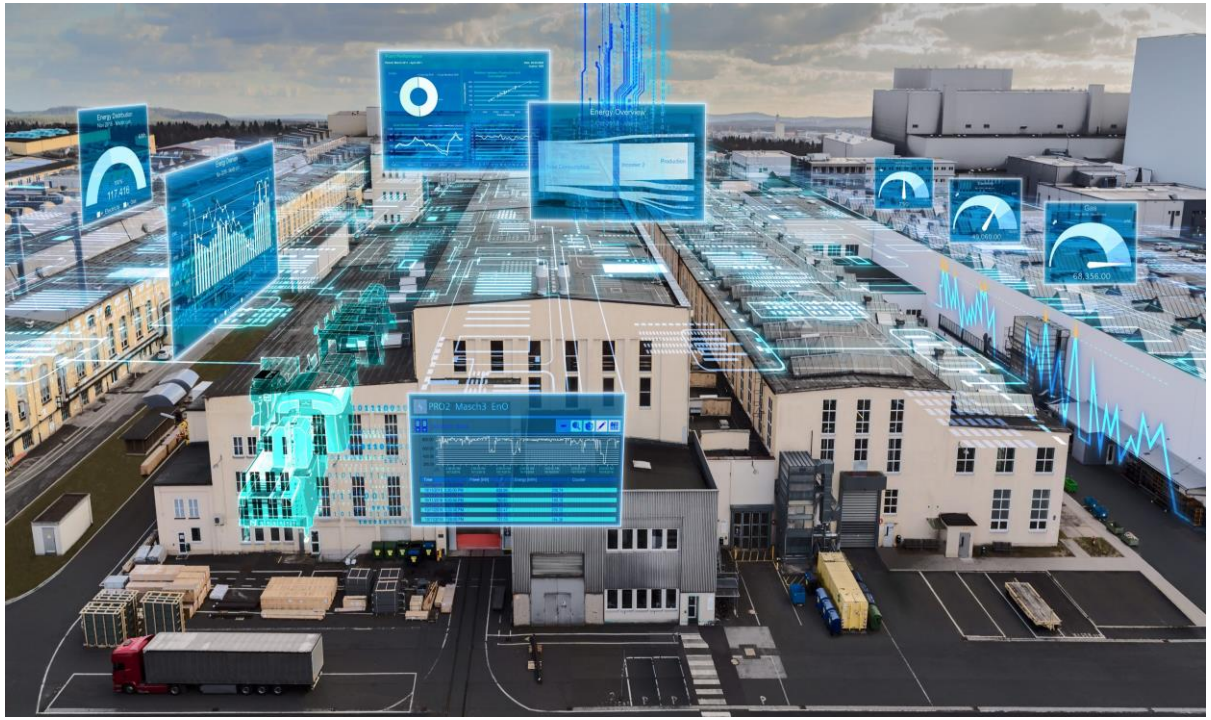
04 System Architecture

05 Industry Solution

06 Conclusion

Introduction





Introduction

The selection of the digitalized control method to be implemented inside the energy storage elements and controlling their status of operation depends on many factors

a) **Reliability of the control method**

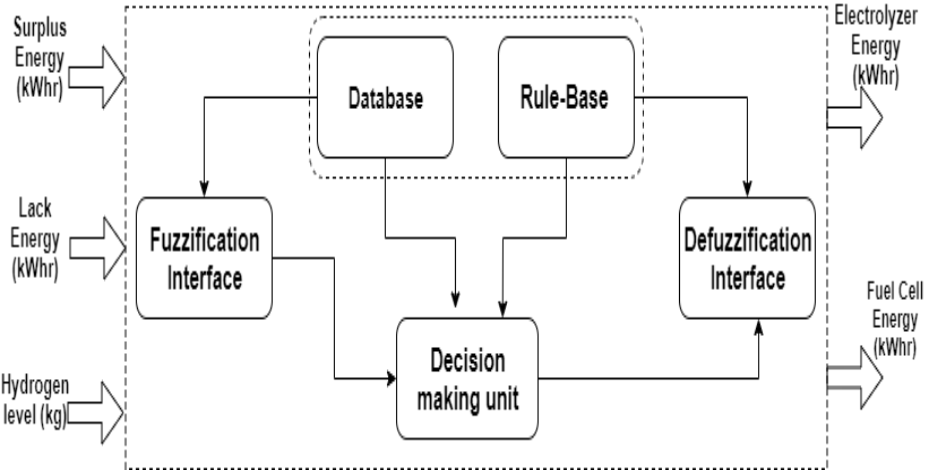
b) **Practical application of the control algorithm**

c) **Scalability of this method to be applied for large scale applications**

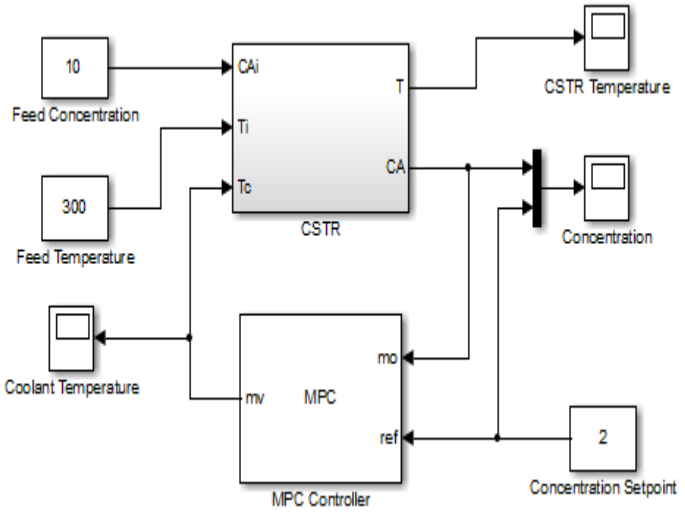
d) **Simplicity of this control method.**

Data-Driven-Models

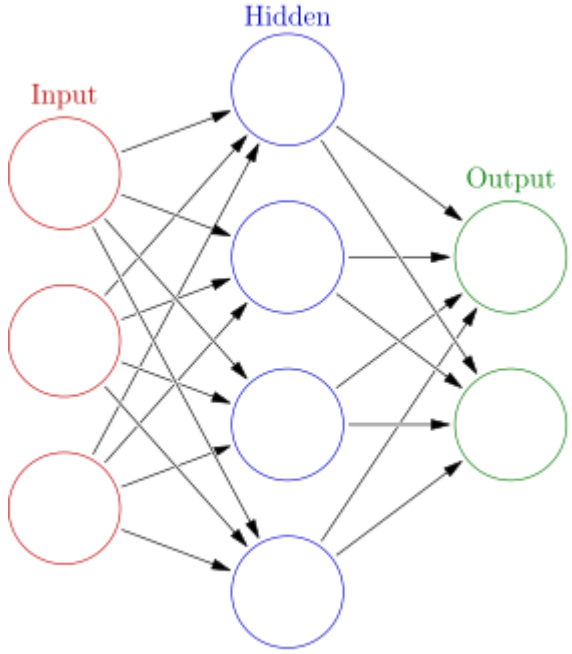
Fuzzy Logic – Expert system



Model Predicative Control



Artificial Neural Network



Case-Study

DERs

AC Bus

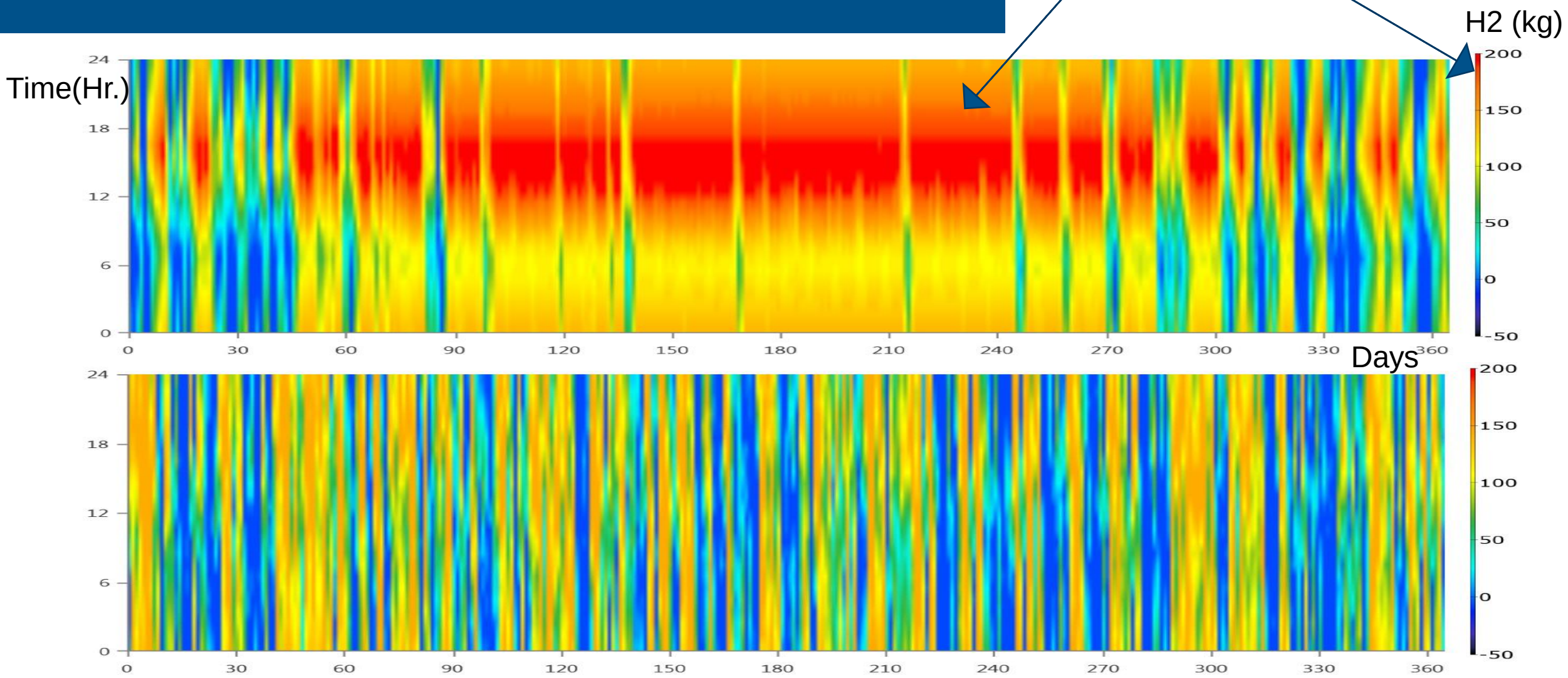
Community Load Profile

Average (kWh/d)	312
Average (kW)	13
Peak (kW)	25
Load factor	0.52

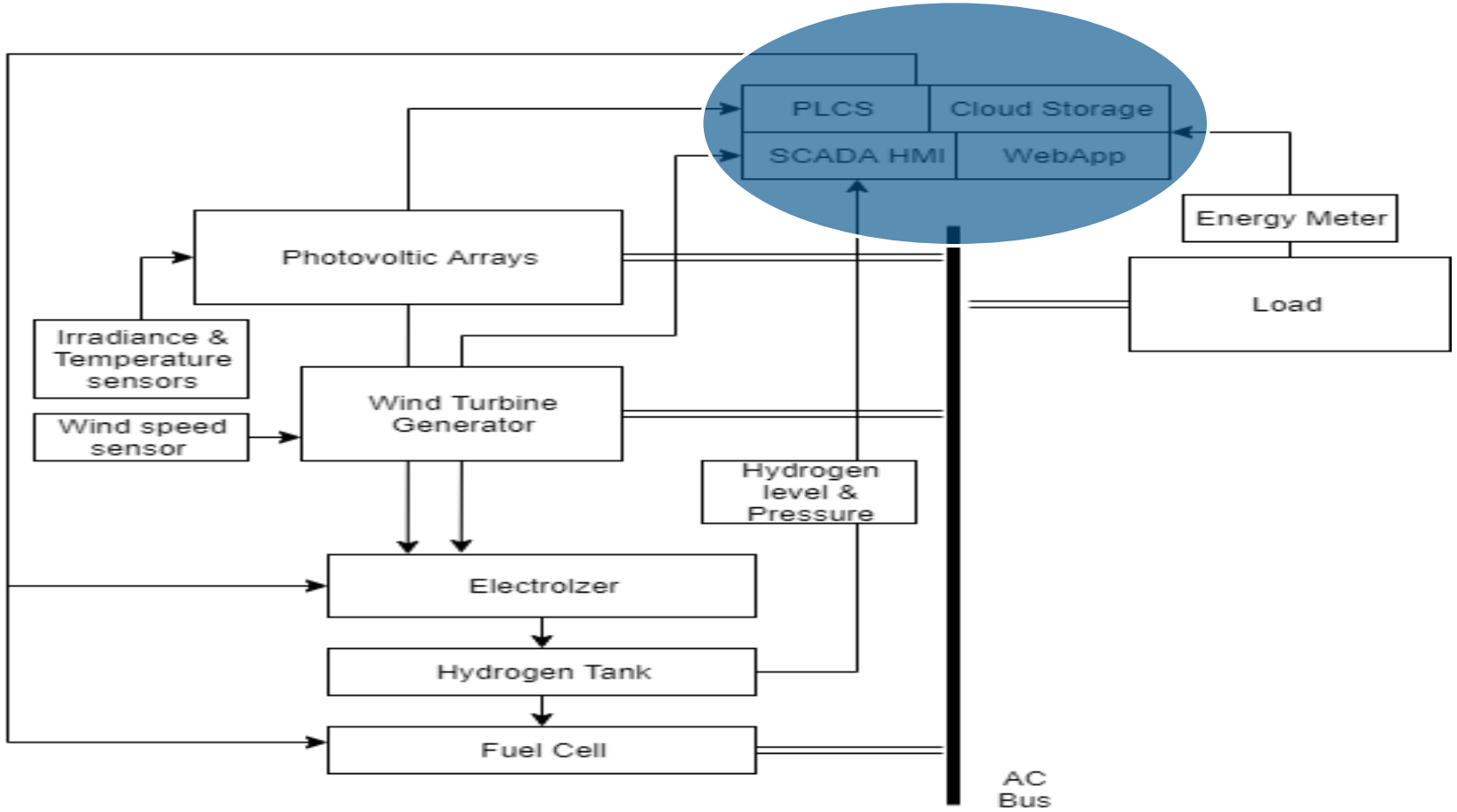
Energy Storage System

Power Management system

Case-Study


Maximum Limit
H2 (kg)
Time(Hr.)
Days
24
18
12
6
0
0
30
60
90
120
150
180
210
240
270
300
330
360
200
150
100
50
0
-50

System Architecure



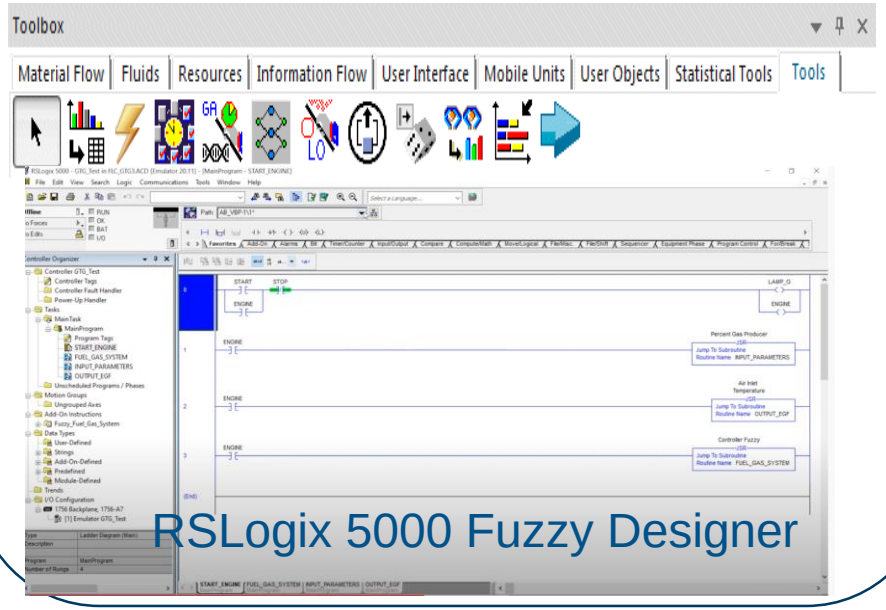
Industry Solution

Field Devices

AI Methodology

FuzzyControl++
ANN tool

Model Predictive
Controller block



RSLogix 5000 Fuzzy Designer

Cloud Computing

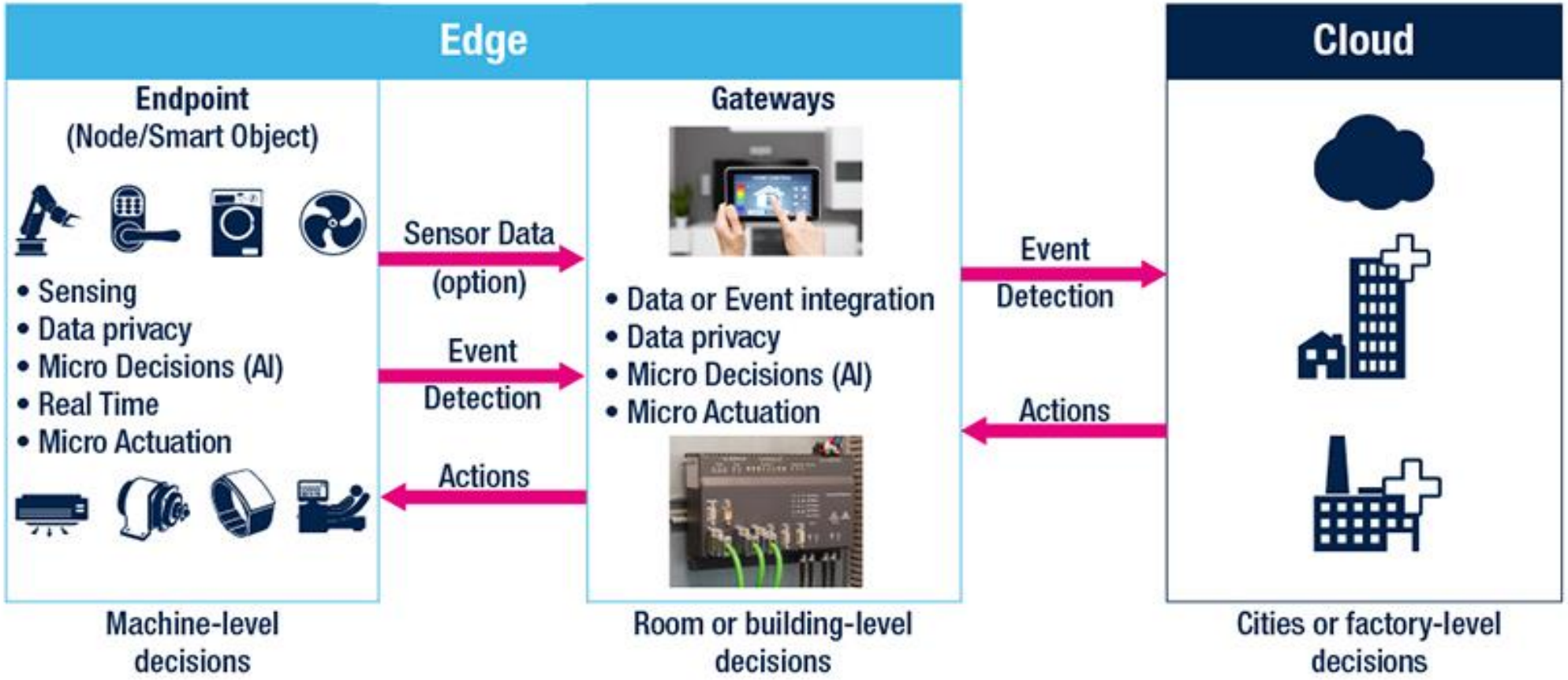
IBM Cloud

Microsoft Azure

amazon web services

Communication channels (ex.Modbus, OPC, MQTT, etc.)

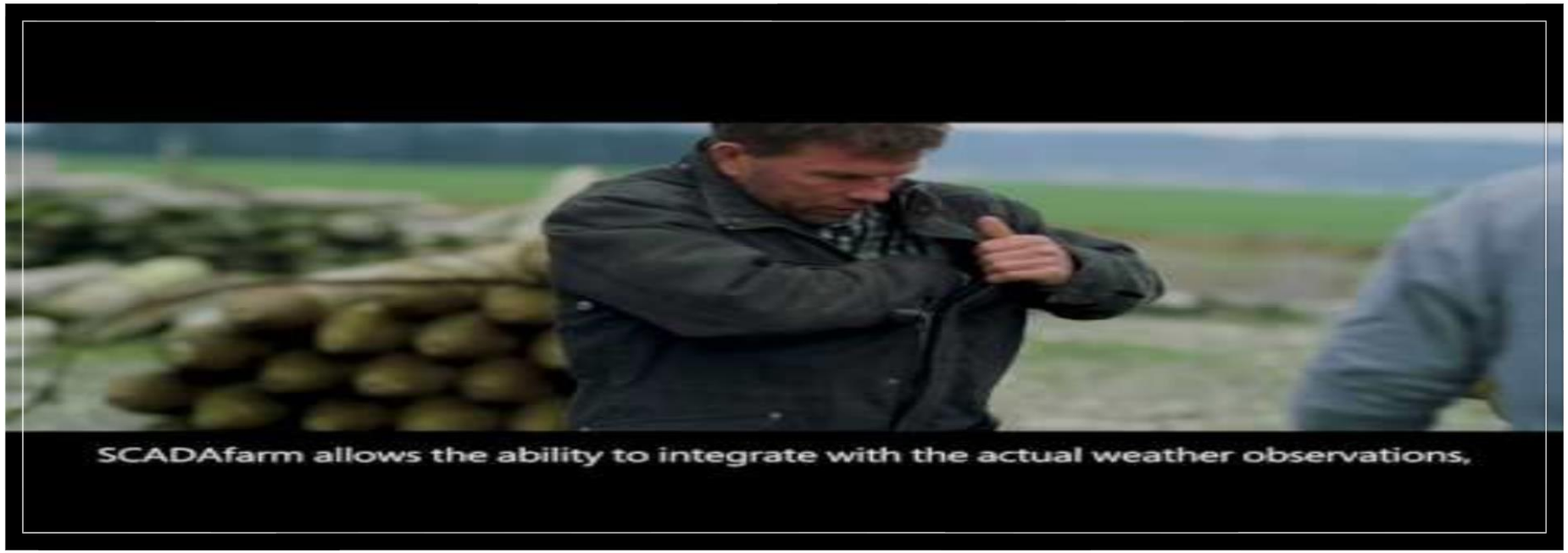
Industry Solution



"If you look at most of the controllers that exist in the market today, they are reactive…. We want to be proactive and include predictive analytics at the edge. It's a real game changer.". Helenio Gilabert: Schneider Electric

Industry Solution

- Schneider Electric, in collaboration with AVEVA, and Microsoft



Click here to view the Case Study video of an agricultural application created by Schneider Electric in collaboration with AVEVA and Microsoft.

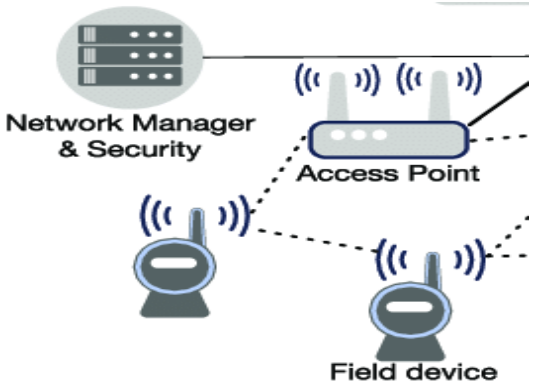
Conclusion

- Using **AI algorithms** to be implemented for a full hardware and software solution using Remote terminal units (RTUs) and SCADA system for real time control and monitoring of hybrid energy-storage systems.

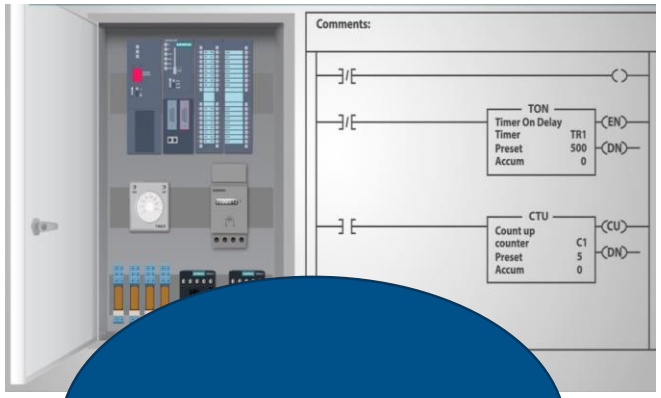
- **Data-Driven Models** can be applied to energy storage systems so that when an excess of generation happens or stresses happens for the storage device , switching controller of charging for **battery/Capacitor/hydrogen tank** is applied to operate in medium and low power modes in order not to exceed the maximum boundaries of the system.

Conclusion

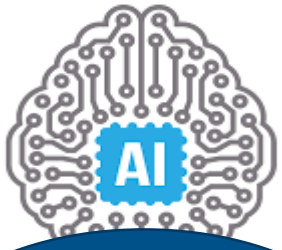
- Cloud Computing and IOT services plays a major role in make analytics and predictive models for the operation of the system.



Access



Code



Optimize

Store and Analyze

Thanks for your Attention