

# GemaLogic Energy Flexibility platform – Virtual Power Plant (VPP) case study

# SOLVERA LYNX TODAY

## REGIONAL LEADER IN INDUSTRIAL ENERGY MANAGEMENT WITH MAJOR FOCUS ON PRODUCT AND SOLUTION DEVELOPMENT

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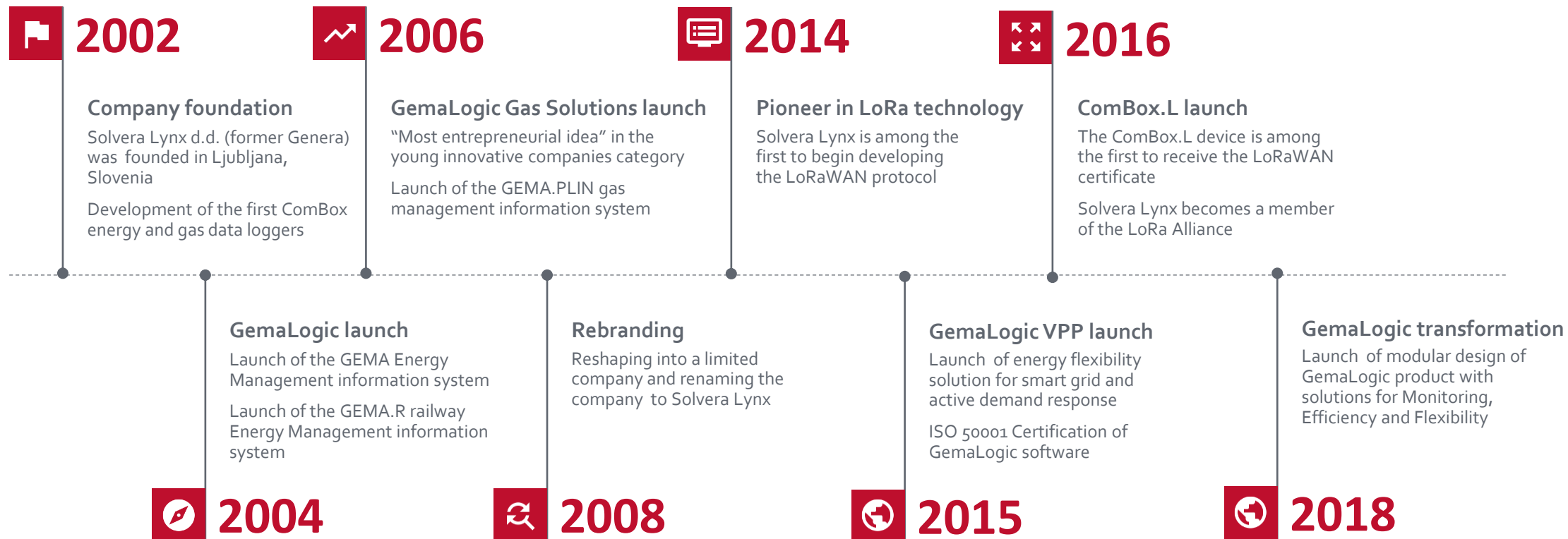
Innovative EM system architect for technical fields in energy, manufacturing, infrastructure, and transport.

Provider of custom-made EM solutions based on state of the art products (software & hardware) developed in-house.

Technical pioneer, incorporating three pillars of modern energy practices: energy monitoring, energy efficiency, and energy flexibility.



# IMPORTANT MILESTONES



# PRESENTED COUNTRIES



# SOLVERA LYNX MARKET MAP



## CORE BUSINESS ACTIVITIES

- Software development (GemaLogic)
- Hardware development (ComBox, ICT, IoT, LoRa)
- Energy Management & Engineering
- Customer support & Installation



## FOCUS ON CUSTOM-MADE SOLUTIONS

- Our Energy Management solutions based on three pillars of modern energy practices
- Energy Monitoring (EM)
  - Energy Efficiency (EE)
  - Energy Flexibility (EF)



## APPLICATIONS

- EM: Gas, Electric Energy, Railways
- EE: Industrial facilities, Buildings, Energy Audits
- EF: Virtual Power Plants, Smart Grid, Power Line Optimisation



## TECHNOLOGICAL PIONEER

- 15 years of software and hardware development
- Certificates: TÜV SÜD, ISO certificates, LoRaWan certificate
- Among the first to certified Data Communication Devices by LoRaWAN standard



## EXPERTISE & STRONG R&D

- The biggest interdisciplinary Energy Management team of experts in the region
- Systematic R&D projects in software, electronics and optimization in the field of Energy Management

# FACTS & FIGURES

## SOLVERA LYNX IN NUMBERS

- 1** Slovenian provider of custom- made Energy Management solutions
- 9** Applications: Gas, Electrical Energy, Railways, Industry, Buildings, Energy Audits, Virtual Power Plants, Smart Grids, Power Line Capacity
- 15** Years of experience in Energy Management
- 30** Countries covered with our EM solutions
- 50+** Best interdisciplinary Energy Management experts (IT, ICT, Energy Management)
- 100+** Satisfied clients and innovative GemaLogic Software installations
- 3000+** Total installations of our state-of-the-art products ComBox.L and ComBox.M
- 20000+** Measuring points connected to our GemaLogic software platform

# USE CASES & REFERENCES



# GemaLogic Flexibility

## Use-case: „Virtual Power Plant“

### Functionalities

- System Balancing – manual Frequency Restoration Reserve (mFRR)
- Market Balancing
- Aggregation
- Forecasting
- Optimization (control and scheduling)

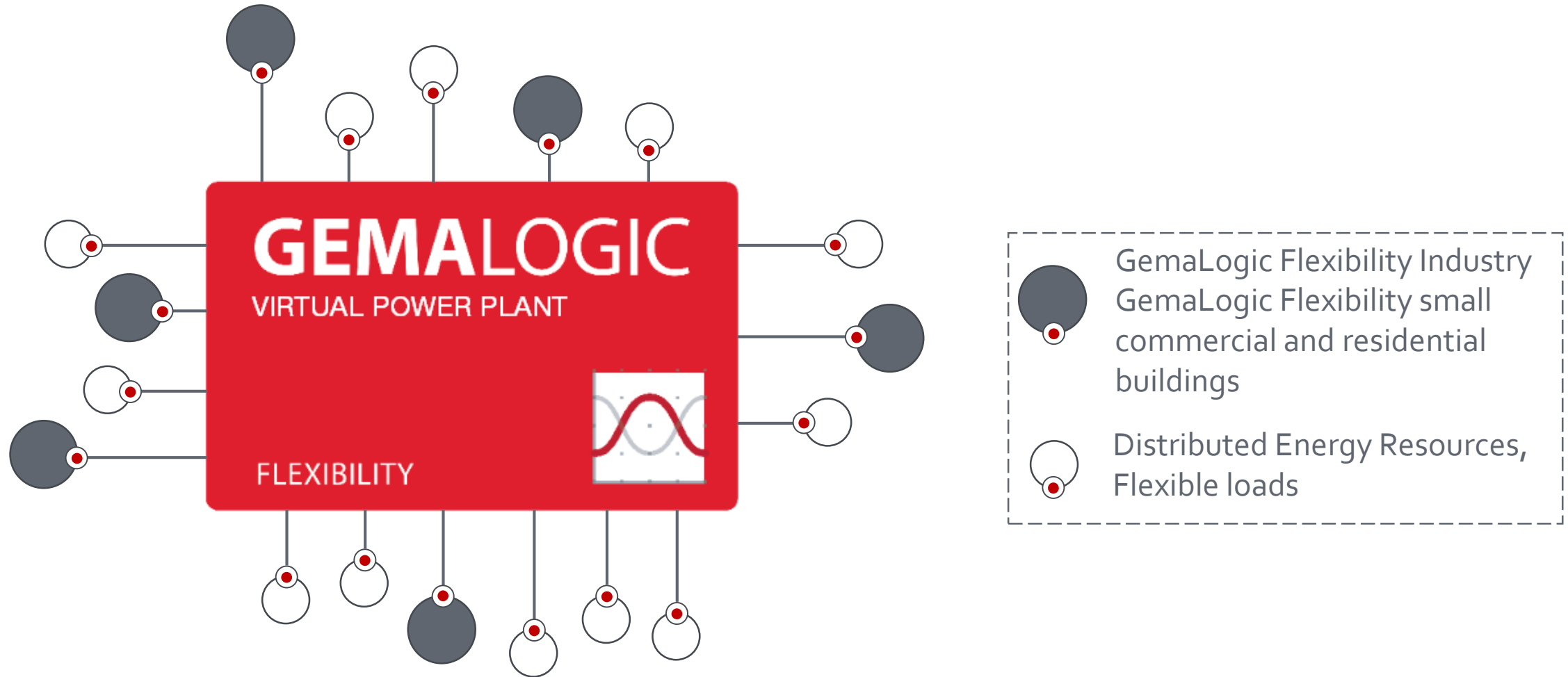
### Sources

- Distributed Energy Resources (DG, Gas, etc.)
- Renewables (PV, CHP, Wind, Hydro, BIO gas, etc.)
- Flexible loads (Industry, commercial and residential buildings)
- Conventional sources and storages





# GemaLogic Flexibility – Virtual Power Plant



# GemaLogic Flexibility

Use-case: „Commercial and residential buildings“

## Demand Response Control System (DRCS)

- integration based on CIM (IEC 61968-100) with distribution management system, meter data management, notifications (e-mail, SMS), HEMS, LoRa

## Functionalities

- Billing data collection
- Automatic LV network topology setup
- Forecasting models for commercial and residential buildings
- Demand Response potential
- Direct Load Control
- Virtual Power Plant integration



# GemaLogic Flexibility

Use-case: „Steel and glass industry“

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## Functionalities

- Monitoring
- Aggregation
- Forecasting (loads and renewables)
- Optimization (control and schedule)
- Demand Response potential
- Load Shifting
- Peak Shaving
- Virtual Power Plant integration

## Integrations

- EMS – specific consumption,
- SCADA – management and control
- MES – production data



# GemaLogic Flexibility

Use-case: „Commercial and residential buildings“



PTUJ

- 3-year Slovenian – Japan smart grid project „Premakni porabo“ – 2017-2020
- Automated Demand Response
- Active users divided into 3 groups:
  - Group A – only mobile messages (800)
  - Group B – HEMS (50)
  - Group C – DLC (50)

826

Participants

17-30%

Demand Response

# GemaLogic Flexibility

## Use-case: „Diesel Gensets control“

### Connectivity

- OpenADR implementation
- Integration platform – Service Mix for backend information system integration:
  - Diesel Gensets
  - Asset management (IBM)
  - Alarming system
  - Meter Data Management System (MDM)
  - SCADA
- Connectivity platform for integrating industry and SCADA protocols:
  - ModbusTCP
  - ICCP – TASE.2
  - OPC UA












# ENERGY FLEXIBILITY REFERENCES



# SOLUTIONS PORTFOLIO

An aerial photograph of a multi-lane highway interchange in a city, overlaid with a complex digital network of white lines and nodes. Various icons are scattered across the image, including a cloud, a Wi-Fi symbol, a car, a truck, a 5G symbol, and a signal tower. The background shows a dense urban landscape with numerous high-rise buildings under a clear sky.

# SOLVERA LYNX SOLUTIONS

Energy Monitoring	 <p>Monitoring of the conditions in the gas grid</p> <p><b>GAS</b></p>	Energy Efficiency	 <p>Low costs, improve efficiency and safety, improve your carbon footprint</p> <p><b>INDUSTRY</b></p>	Energy Flexibility	 <p>Utilize flexible energy from distributed energy resources and local flexibility platforms</p> <p><b>VIRTUAL POWER PLANT</b></p>
	 <p>Control and analysis of electric energy consumption</p> <p><b>ELECTRIC ENERGY</b></p>		 <p>Low costs, improve the effectiveness and safety. Offer extra to building tenants</p> <p><b>BUILDINGS</b></p>		 <p>Provide demand response functionality &amp; connect industry into responsive unit</p> <p><b>INDUSTRY</b></p>
	 <p>Optimization of energy use on railway infrastructure</p> <p><b>RAILWAYS</b></p>		 <p>The key step in efficient decrease in energy use</p> <p><b>ENERGY AUDITS</b></p>		 <p>Demand response control system increase the ampacity of existing distribution network</p> <p><b>COMMERCIAL AND RESIDENTIAL</b></p>



# PRODUCT PORTFOLIO

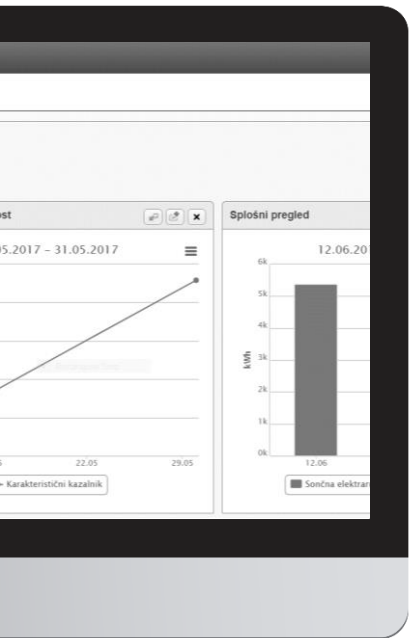


# INNOVATIVE TOOLS FOR ENERGY MANAGEMENT

OUR OWN SOFTWARE, COMMUNICATION EQUIPMENT AND LORAWAN SOLUTIONS

## GEMALOGIC

ADVANCED ENERGY  
MANAGEMENT  
SOFTWARE  
PLATFORM



## COMBOX

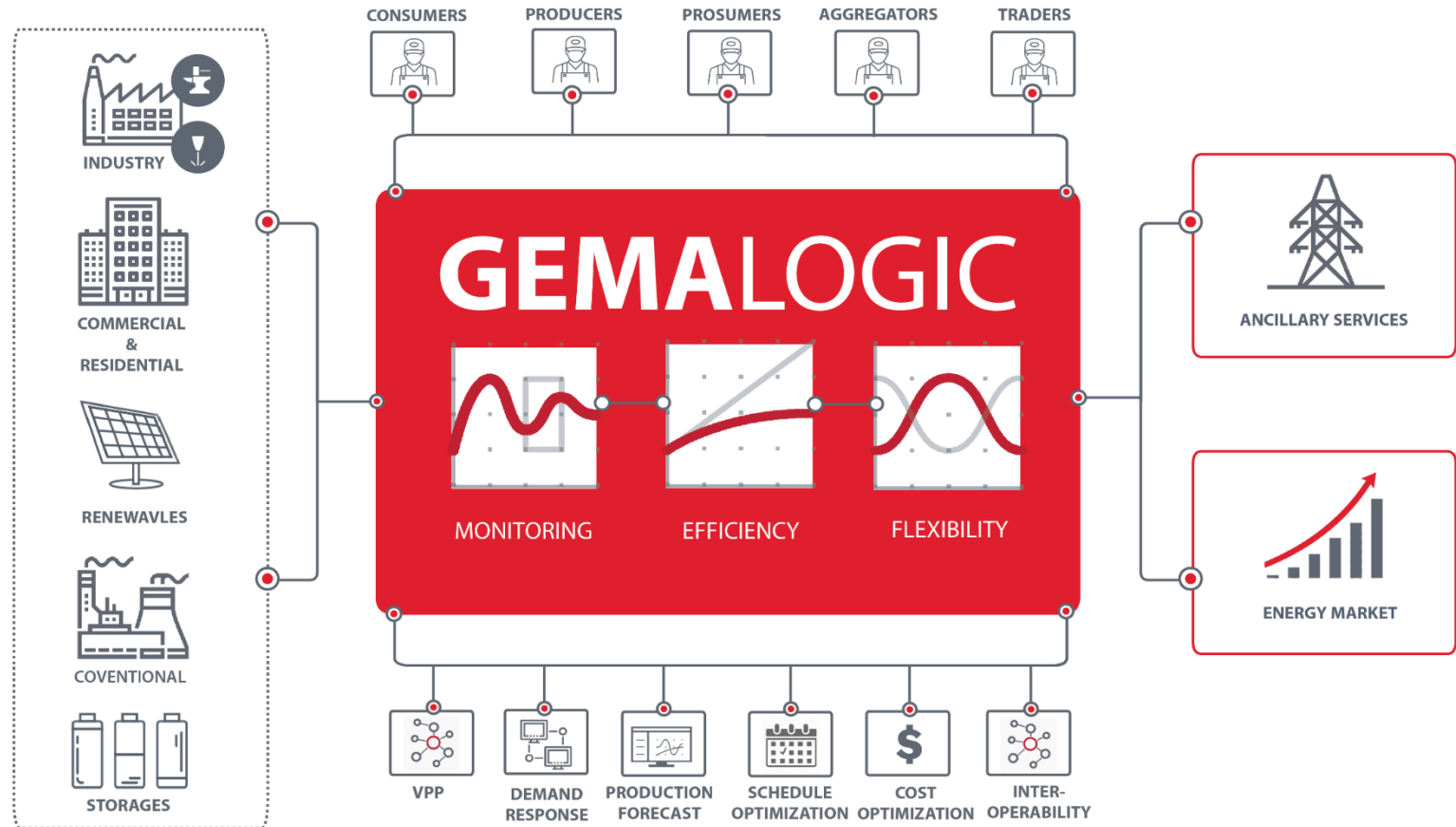
INNOVATIVE DATA  
COMMUNICATION  
EQUIPMENT



# GemaLogic Energy Flexibility Platform

## VIRTUAL POWER PLANT, INDUSTRY, COMMERCIAL AND RESIDENTIAL

- **VIRTUAL POWER PLANT**- utilize flexible energy from distributed energy resources and local flexibility platforms.
- **INDUSTRY** - provide demand response functionality & connect industry into responsive unit.
- **COMMERCIAL AND RESIDENTIAL** demand response control system increase the ampacity of existing distribution network.



# GemaLogic FUNCTIONALITIES

## Resources overview

- Partners
- Resource types: Loads, Generators, Prosumers

## Monitoring panel

- Actual load,
- Load forecast (48h),
- Calculation and presentation of adjusted forecast,
- Request for load curtailment from activation

## Load optimization (automatic/manual)

## Load forecast (prediction models):

- Machine learning methods (LR, NN, RT, SVM)
- For each resource – adaptive prediction models with different models  
e.g.: 48 h / 1min resolution



# GemaLogic FUNCTIONALITIES

## Activations

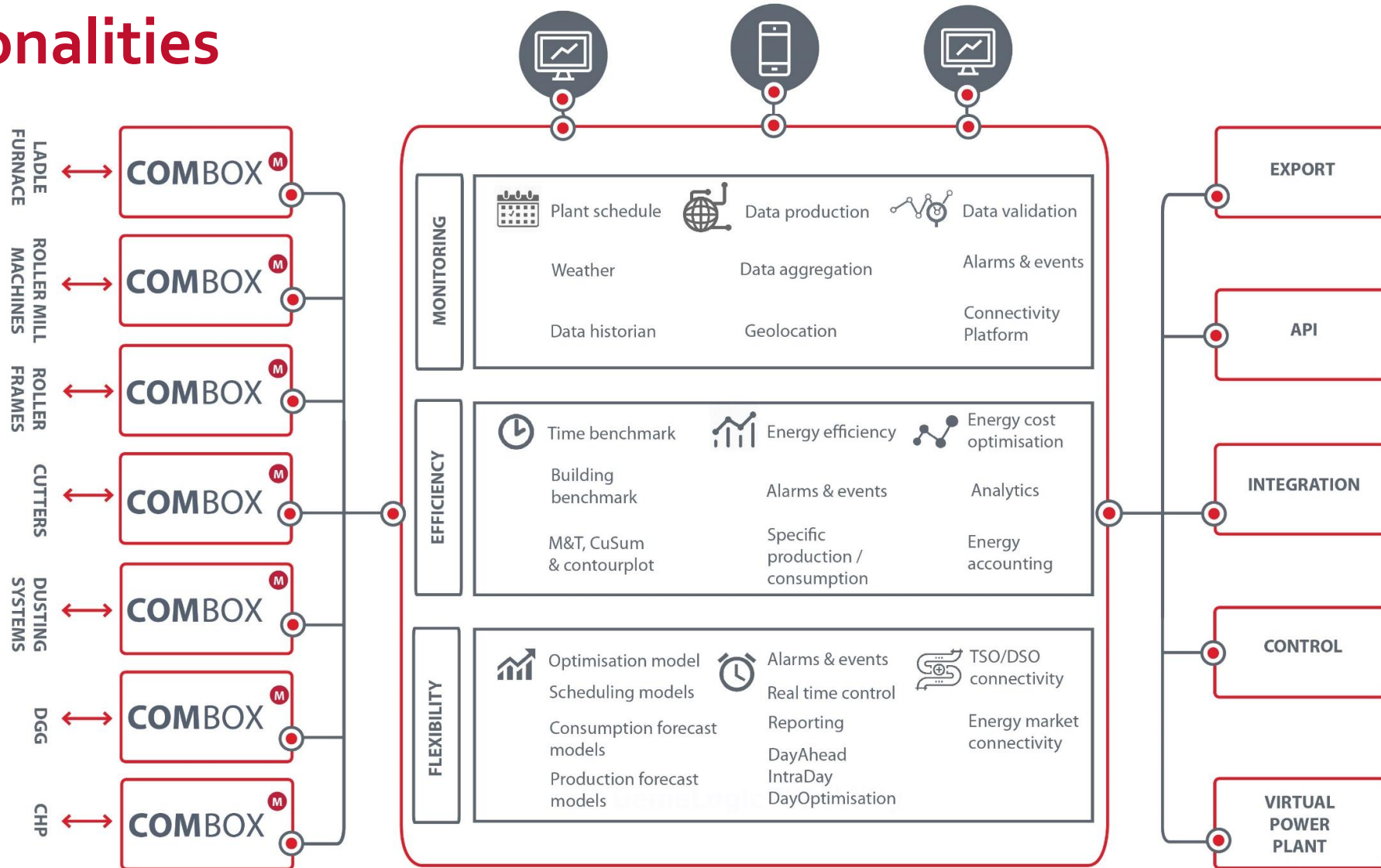
- Activation overview (history)
- Activation triggering (sent request,
- Example for tertiary reserve
  - 100% of offered power in 15 minutes from the request
  - Maximum duration of activation is 4 hours
  - Maximum unit non-availability time after finished activation is 10 hours

## Settlement reports

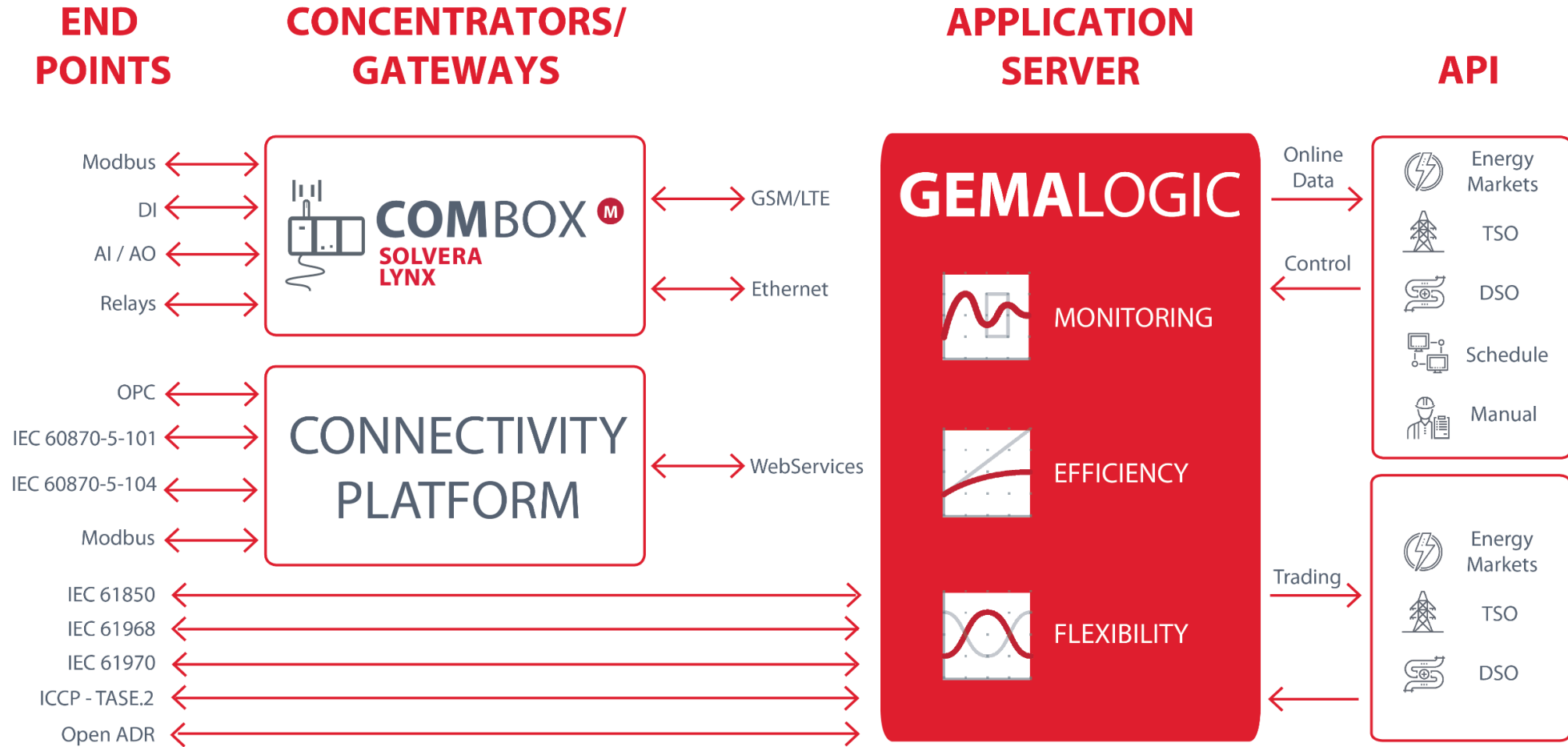
- How many kW/time was successfully activated
- Availability time
- Comparison of data from system operator and measured data



# Functionalities



# Connectivity



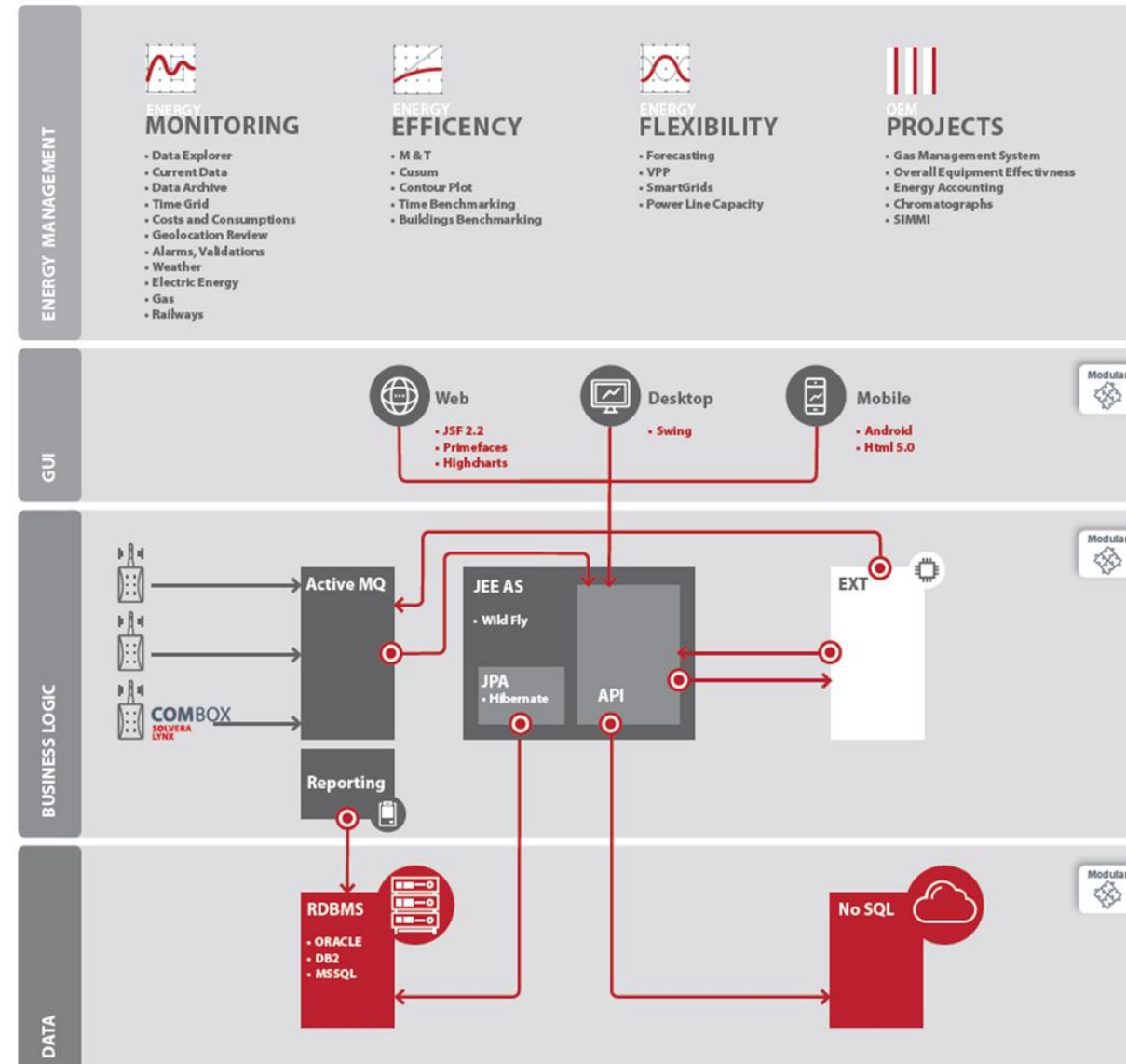
# ARCHITECTURE

## MODULAR

- User interface
- Business logic
- Data acquisition and aggregation
- Energy Monitoring, Efficiency, Flexibility

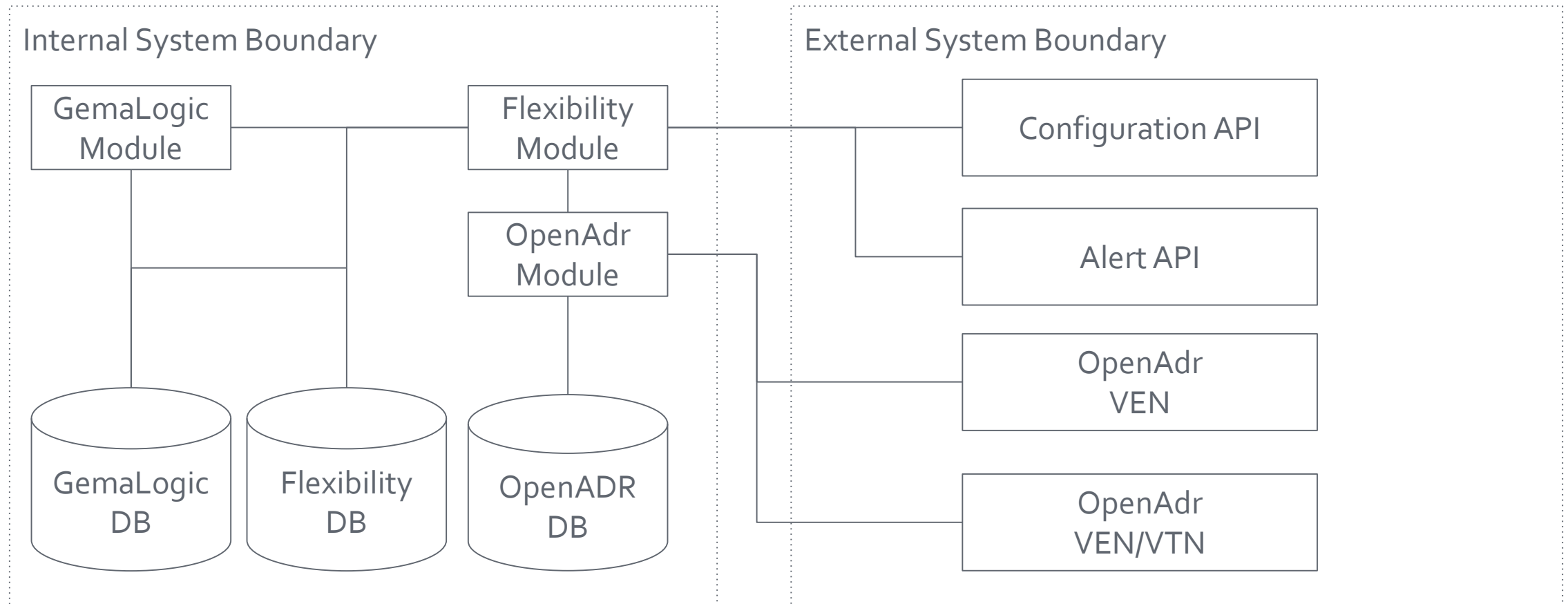
## TECHNOLOGY

- MS SQL
- Java EE
- WildFly Application Server
- WebServices (REST, SOAP)
- Apache Service Mix
- Active MQ (RabbitMQ, Kafka, Artemis, JMS)
- TypeScript
- PrimeFaces
- OmniFaces

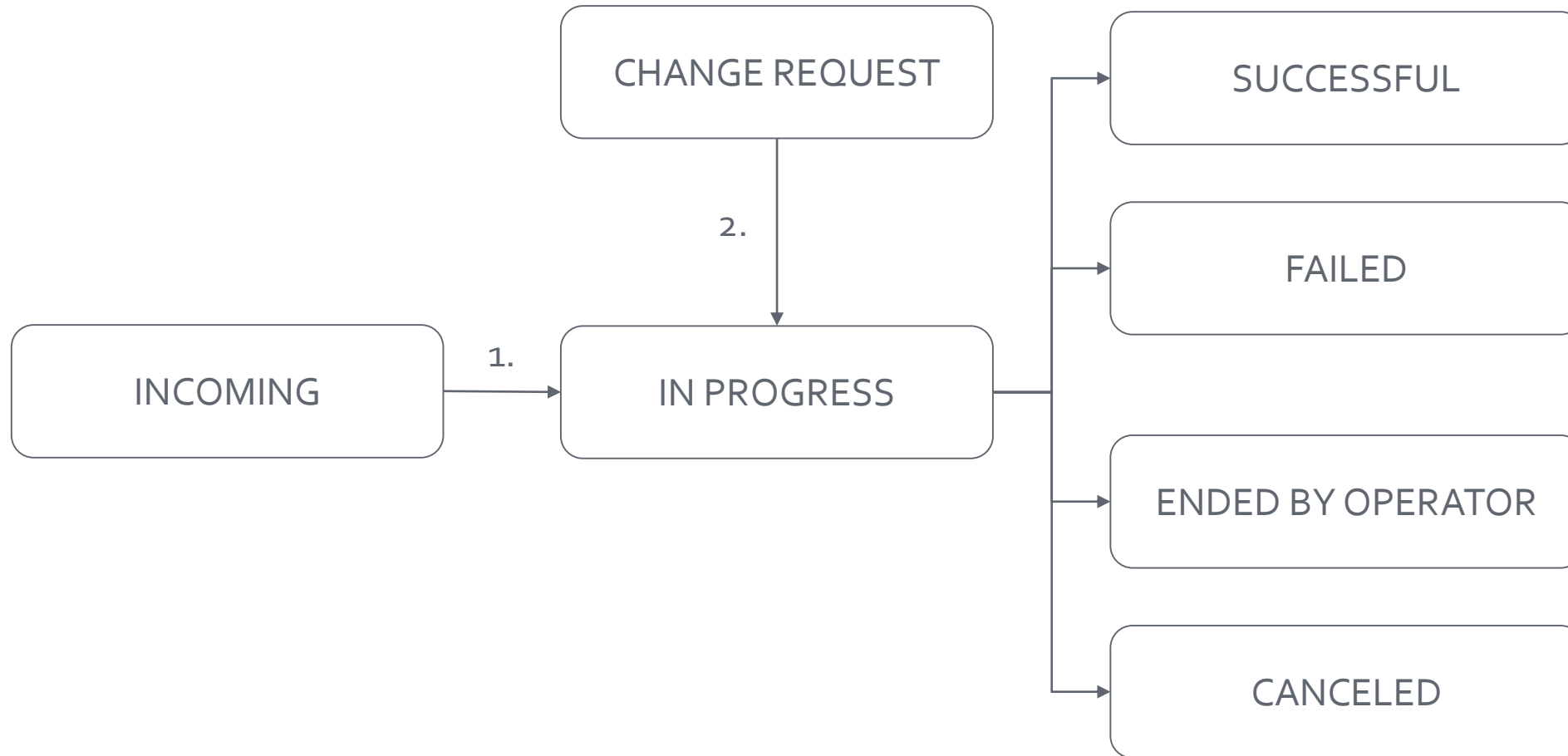




# Overview



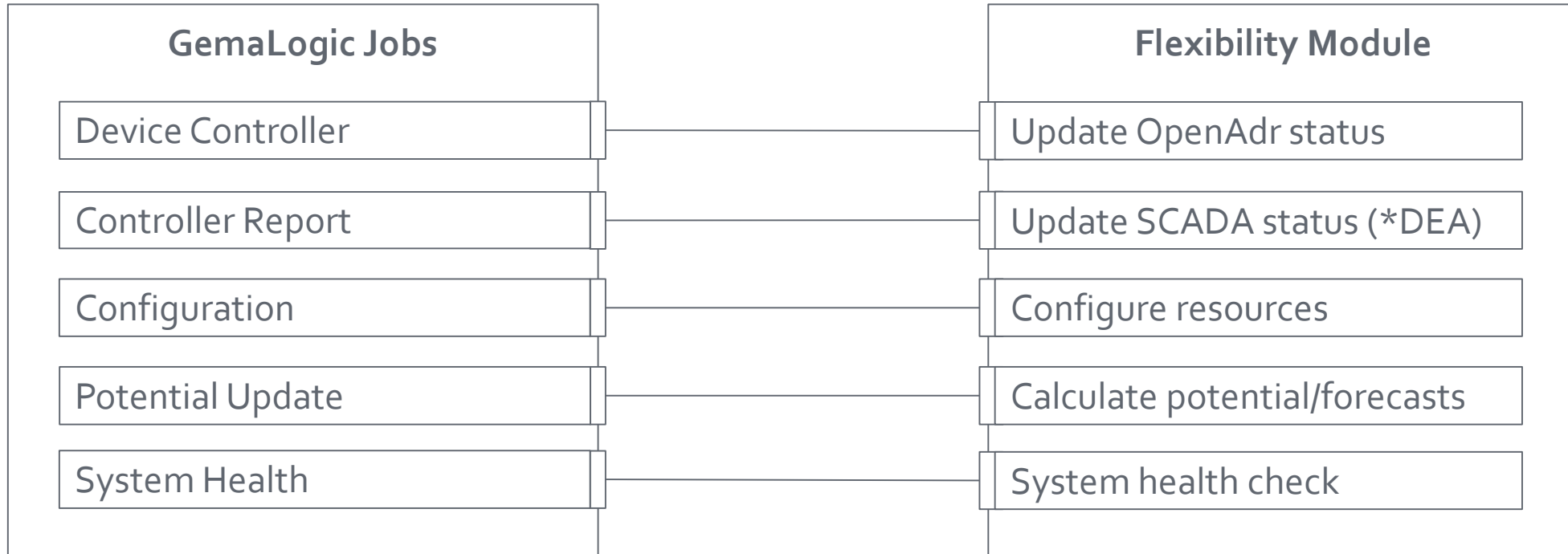
# Activation State



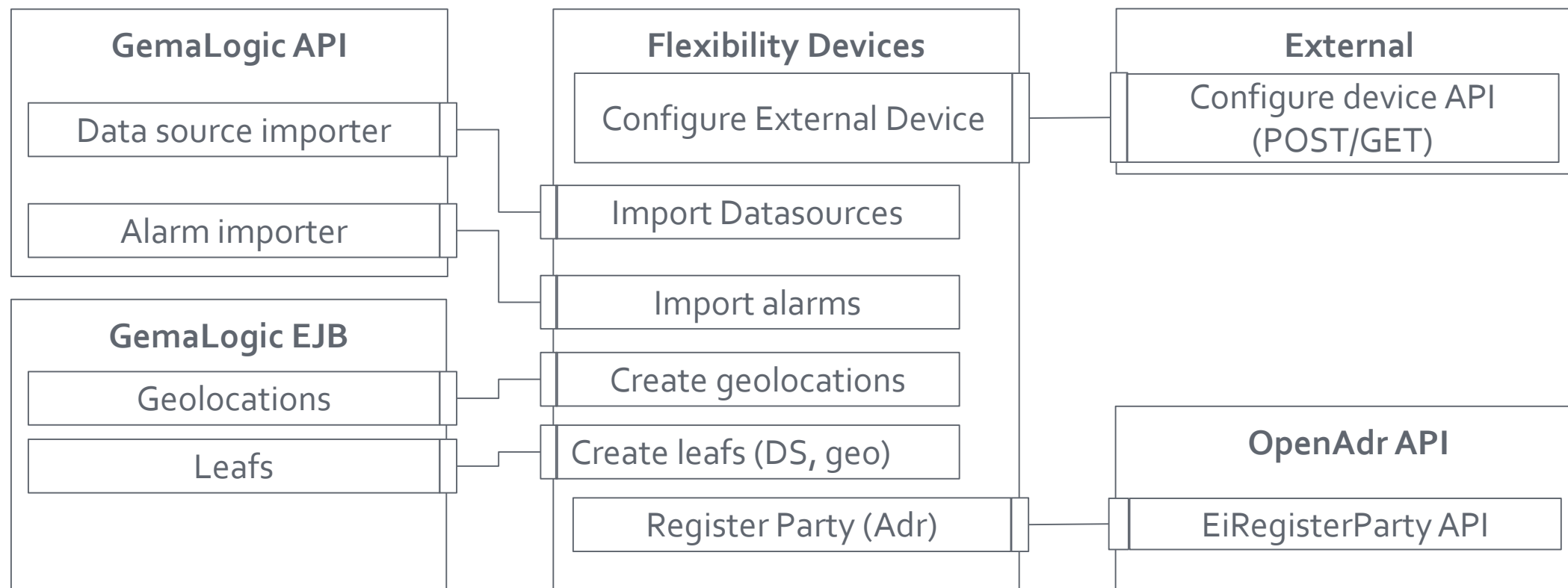
# Activation Timeline



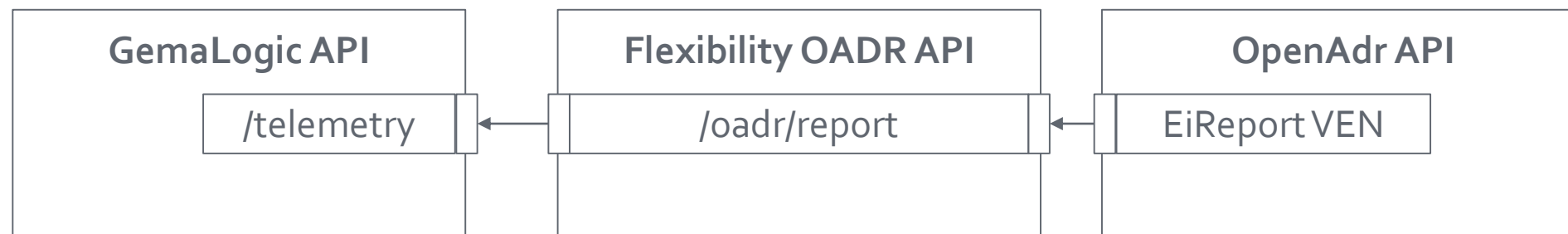
# Flexibility Jobs



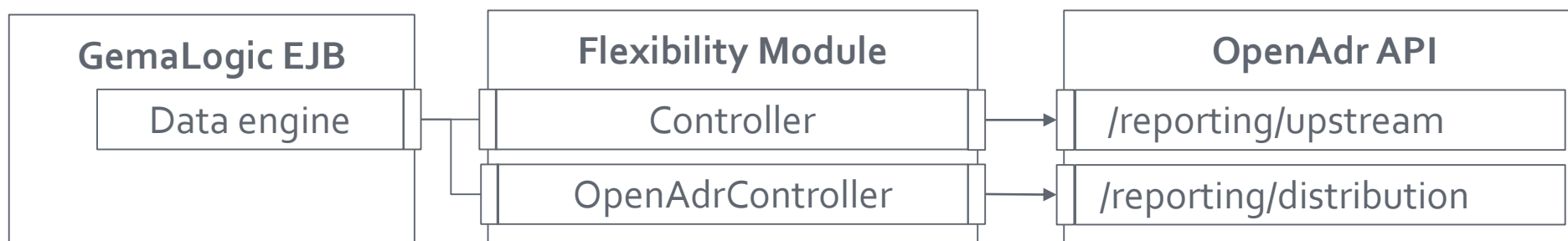
# Flexibility Configurator



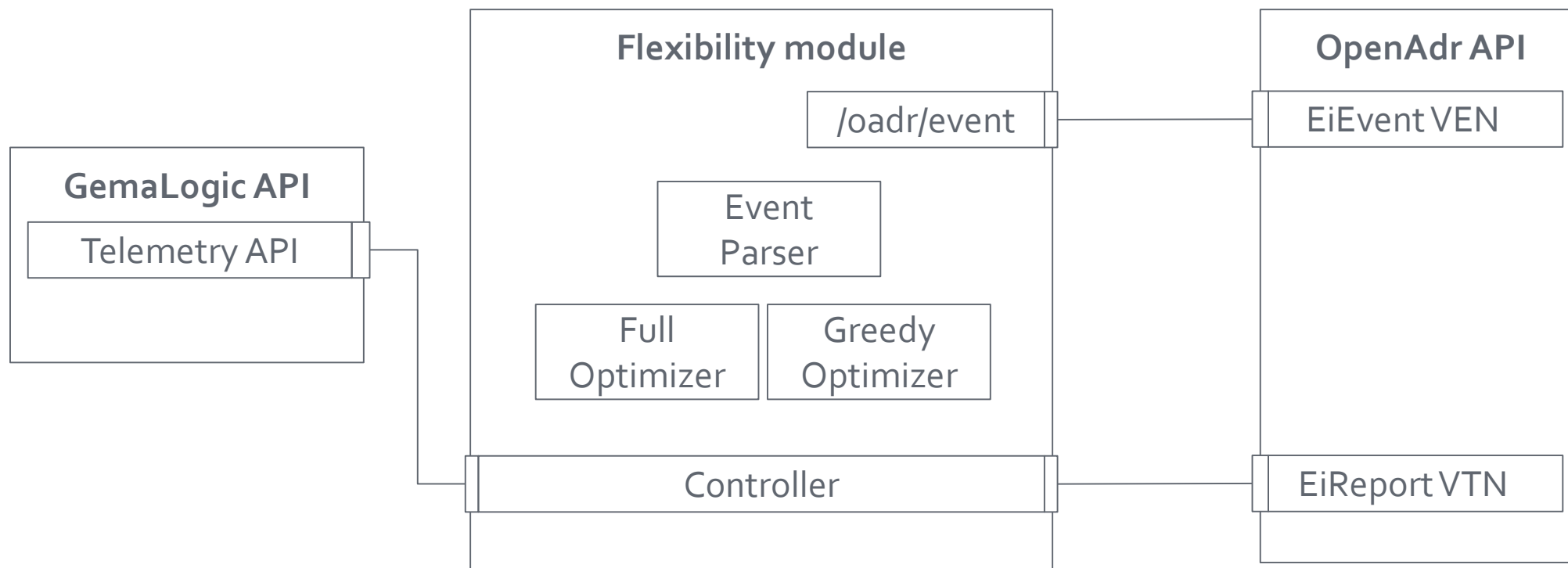
# Flexibility Data Flow (IN)



# Flexibility Data Flow (OUT)



# Flexibility Event Flow (IN)

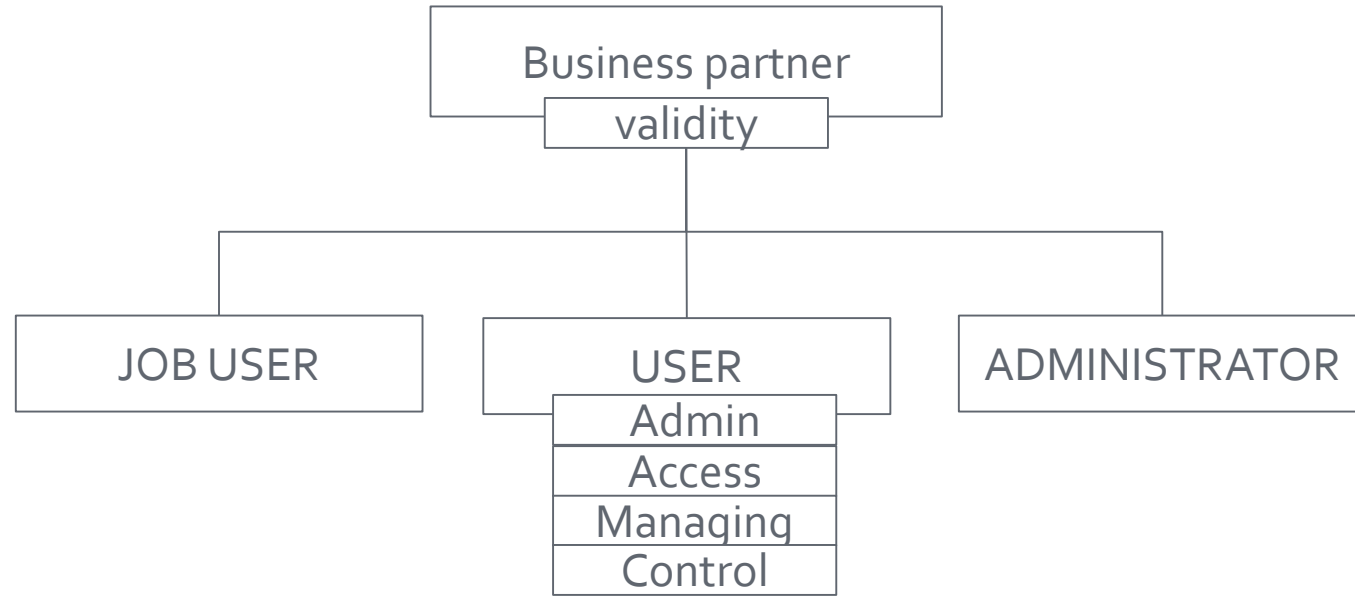




# Flexibility Event Flow (OUT)



# User management



Leaf

DataSource

GeoLocation

Alarm

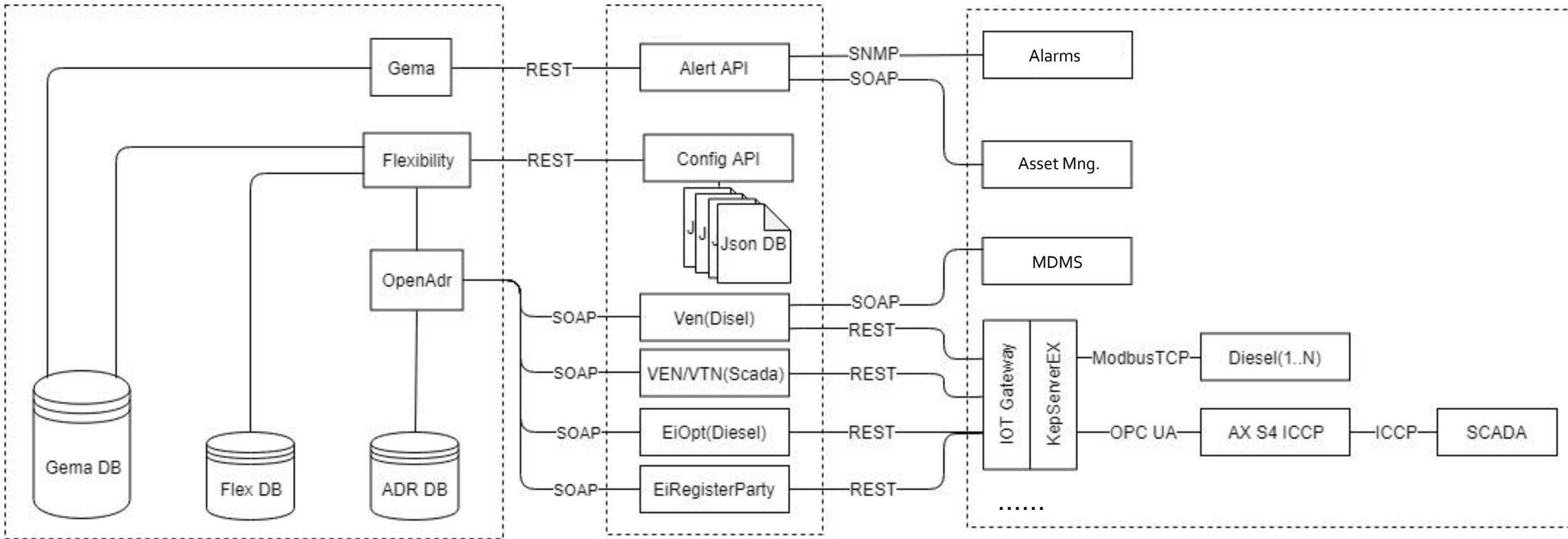
Price list

# System architecture

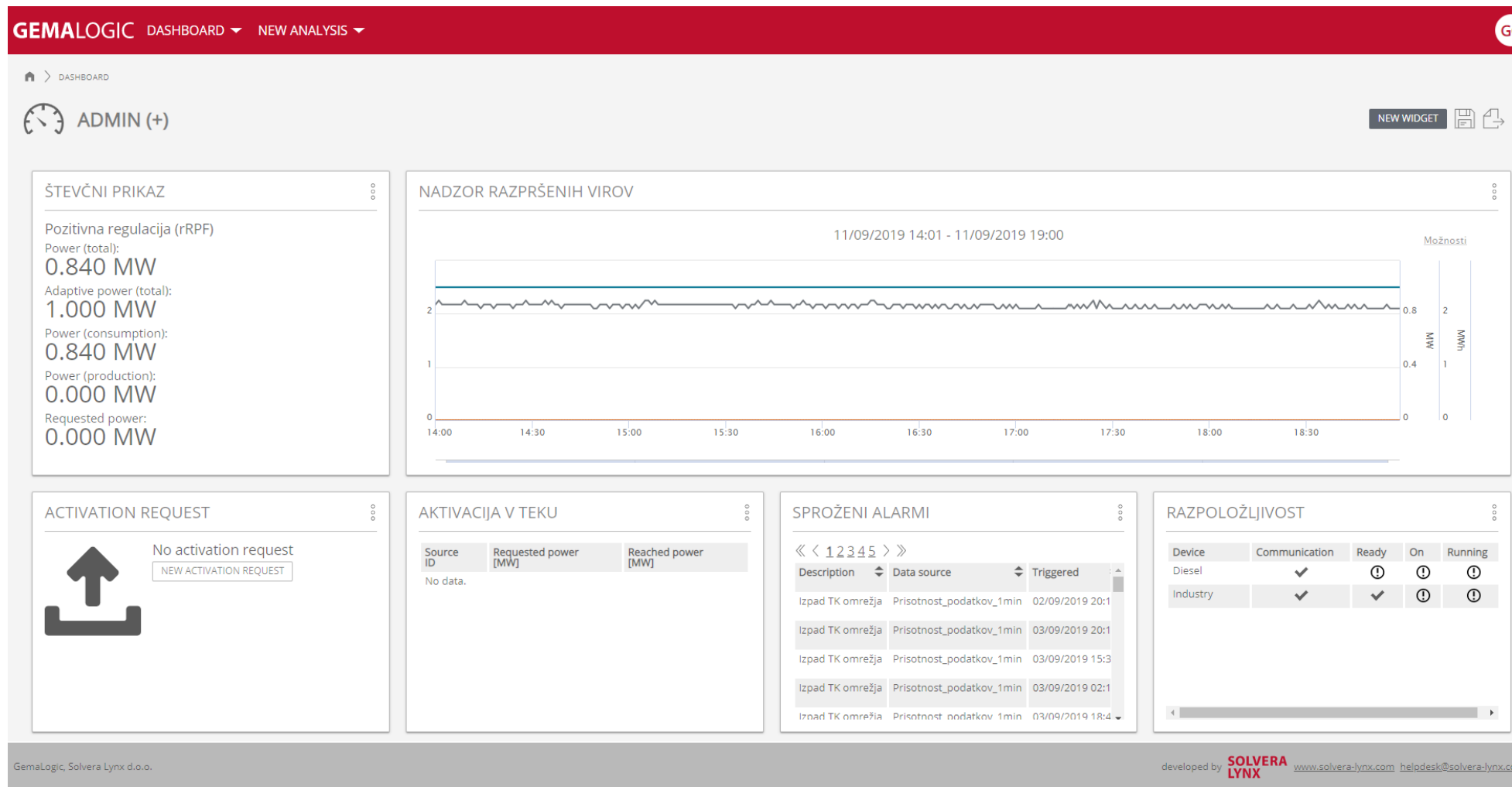
Application layer

Integration layer

External services



# Dashboard



- Current available power,
- Measurements, Forecast, Corrected forecast and requested power
- Availability
- Activation request

# Owners

GEMALOGIC PREGLEDNA PLOŠČA MOJE SHRANJENE ANALIZE NOVA ANALIZA SD

NOVA ANALIZA

LASTNIKI

### LASTNIKI

Št.	Šifra	Naziv	Največja moč prilagajanja [MW]	Akcija
1	Default Value[1994005912]	ELES d.o.o.	0,400	<a href="#">Podrobnosti</a>

Podrobnosti

Šifra: Default Value[1994005912] Naziv: ELES d.o.o.

Naslov: Hajdrihova 2 Kraj: Ljubljana Poštna številka: 1000

Kontaktna oseba: Srkbnik DEA Telefon: 031343788 Elektronski naslov: srkbnik.dea@eles.si

Največja moč prilagajanja [MW]: 0,400

**UREDÍ**

Virtualna elektrarna: Celotna elektrarna

Največja moč prilagajanja [MW]: 0,400

Dizli

Št.	Šifra vira fleksibilnosti	Naziv	Prikjučna moč [MW]	Največja moč prilagajanja [MW]	Tip	Aktivno
1	P8125480	RCV Ljubljana	0,500	0,400	DEA	Da

Konfiguracija virtualne elektrarne

Št.	Od	Do	Vključeni razpršeni viri	Akcija
1	27.03.2019	27.04.2019	RCV Ljubljana	<a href="#">Uredi</a> <a href="#">Briši</a>

**DODAJ**

**DODAJ RAZPRŠENI VIR NA PREGLEDU RAZPRŠENIH VIROV**

ZAPRI

UVOZI NOVE LASTNIKE

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# Distributed Energy Resources

GEMALOGIC PREGLEDNA PLOŠČA MOJE SHRANJENE ANALIZE NOVA ANALIZA SD

NOVA ANALIZA

RAZPRŠENI VIRI

### RAZPRŠENI VIRI

Št.	Kreiran	Šifra	Naziv	Naslov	Poštna številka in kraj	Tip	Akcija
1	26.03.2019 14:14	default_flexibility_resource	Celotna elektrarna	Hajdrihova ulica 2	1000, Ljubljana	PRIMARY	<a href="#">Podrobnosti</a>
2	26.03.2019 14:16	P8125480	RCV Ljubljana	Hajdrihova ulica 2	1000, Ljubljana	DEA	<a href="#">Podrobnosti</a>

DODAJ

#### Osnovni podatki

Šifra: default\_flexibility\_resource  
Naziv: Celotna elektrarna  
Naslov: Hajdrihova ulica 2  
Poštna številka: 1000  
Tip vira: PRIMARY  
Aktiven: Da  
Najmanjši čas do aktivacije [min]: 0  
Največje število aktivacij na dan: 1000  
Največje število aktivacij na leto: 1000

Naziv: Celotna elektrarna  
Koordinate: X: 14,490563 Y: 46,044902  
Kraj: Ljubljana  
Lastnik: ELES d.o.o.  
Trenutna največja moč prilagajanja [MW]: 0,000  
Čas nedosegljivosti po aktivaciji [min]: 0  
Največje število aktivacij na mesec: 1000

UREDI

#### Protokoli obveščanja

Tip	Ime	Stacionarni telefon	Mobilni telefon	Elektronski naslov	Akcija
Ni podatkov.					

DODAJ

ZAPRI

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# Configuration wizard

GEMALOGIC PREGLEDNA PLOŠČA MOJE SHRANJENE ANALIZE NOVA ANALIZA SD

NOVA ANALIZA

## RAZPRŠENI VIRI

Št.	Kreiran	Šifra	Naziv	Naslov	Poštna številka in kraj	Tip	Akcija
1	26.03.2019 14:14	default_flexibility_resource	Celotna elektrarna	Hajdrihova ulica 2	1000, Ljubljana	PRIMARY	<a href="#">Podrobnosti</a>
2	26.03.2019 14:16	P8125480	RCV Ljubljana	Hajdrihova ulica 2	1000, Ljubljana	DEA	<a href="#">Podrobnosti</a>

### Osnovni podatki

Šifra: P8125480	Naziv: RCV Ljubljana
Naslov: Hajdrihova ulica 2	Koordinate: X: 14,490603 Y: 46,044789
Poštna številka: 1000	Kraj: Ljubljana
Tip vira: DEA	Lastnik: ELES d.o.o.
Virtualna elektrarna: Celotna elektrarna	Aktivni: Da
Daljinski vtiop: Da	Priključna moč [MW]: 0,500
Največja moč prilagajanja [MW]: 0,400	Trenutna največja moč prilagajanja [MW]: 0,000
Najmanjši čas do aktivacije [min]: 3	Čas nedosegljivosti po aktivaciji [min]: 1
Največje število aktivacij na dan: 50	Največje število aktivacij na mesec: 600
Največje število aktivacij na leto: 1000	Tip odjema: Proizvajalec

### Konfiguracija

Vir podatkov: KewareEX klient	Vir podatkov merilnega mesta: Advance	Številka merilnega mesta: 123456789
Naziv merilnega mesta: ACR_M_110_TR_TR3m	Protokol: ModbusTCP	IP naslov: 10.154.1.10
Port: 502	Tip naprave: DSE8620	

[UREDI](#)

### Razpoložljivost

Št.	Od	Do	Razlog	Razpoložljivost	Dodano	Višina [MW]	Akcija
Ni podatkov.							

[DODAJ](#)

### Protokoli obveščanja

Tip	Ime	Stacionarni telefon	Mobilni telefon	Elektronski naslov	Akcija
Ni podatkov.					

[DODAJ](#)

[ZAPRI](#)

[DODAJ](#)

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# Optimization models wizard

GEMALOGIC DASHBOARD ▾ NEW ANALYSIS ▾ SO

NEW ANALYSIS

## OPTIMIZATION MODELS

No.	Created	Code	Name	Owner	Action
1	30/08/2019 19:40	OM01001	Optimizacijski model 1	/	<a href="#">Details</a>
2	02/09/2019 11:35	OM01002	Optimizacija po ceni	/	<a href="#">Details</a>

### OPTIMIZATION MODELS

Details

Code: **OM01001** Name: **Optimizacijski model 1**

Flexibility type: **3** **DEA** Owner: **0** **Steklarna Hrastnik**

Transmission system operator: **0** **Ela** Distribution system operator: **4** **Elektro Ljubljana, [**

Balance group: **0** **Ezpada Commodity** Switched on remotely: **0** **No**

Regulation: **0** **Discrete** Energy price [EUR/MWh]: **0** **>** **0.000** **Descending**

Standby energy price [EUR/MWh]: **5** **>** **5.000** **Descending** Standby energy price [EUR/MWh]: **0** **>** **0.000** **Descending**

Flexibility energy price [EUR/MWh]: **0** **>** **0.000** **Descending** Own price [EUR/Production unit]: **0** **>** **0.000** **Descending**

Production cycle duration [min]: **0** **>** **0.000** **Descending** Opportunity [EUR/Production unit]: **0** **>** **0.000** **Descending**

Opportunity [EUR/h]: **0** **>** **0.000** **Descending** Connected power [MW]: **0** **>** **0.000** **Descending**

Maximum adaptation power [MW]: **1** **<** **0.000** **Descending** Adaptation power [MW]: **0** **>** **0.000** **Descending**

Minimal requested power amount [MW]: **0** **>** **0.000** **Descending** Minimal requested power step [MW]: **0** **>** **0.000** **Descending**

Minimum autonomy time [min]: **2** **>** **0** **Descending** Maximum autonomy time [min]: **0** **>** **0** **Descending**

Ramp up time [kW/s]: **0** **>** **0.000** **Descending** Recovery time [kW/s]: **0** **>** **0.000** **Descending**

Remaining activations per day: **0** **>** **0** **Descending** Remaining activations per month: **0** **>** **0** **Descending**

Remaining activations per year: **0** **>** **0** **Descending** Consumption type: **0** **Producer**

**EDIT**

**CLOSE**

**ADD** **EDIT**

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# Activation requests

GEMALOGIC DASHBOARD ▾ NEW ANALYSIS ▾ SO

NEW ANALYSIS

## ACTIVATION REQUESTS

### ADD ACTIVATION REQUEST

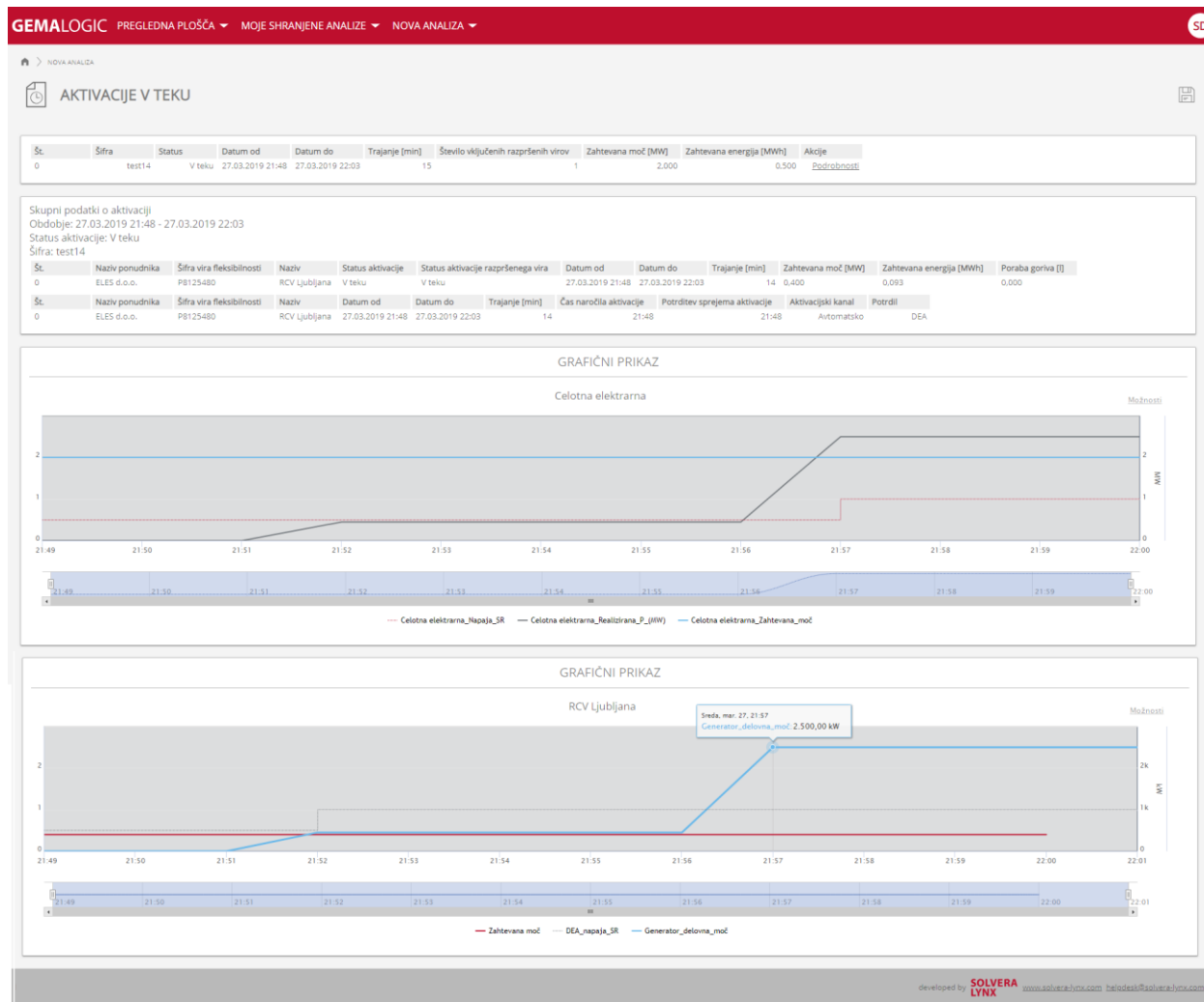
Virtual Power Plant	Pozitivna regulacij
Optimization model	<input type="checkbox"/> Optimizacijski model 1 <input checked="" type="checkbox"/> Optimizacija po ceni
Code	1234
Requested power [MW]	10.000
Announcement time	03/09/2019 09:04
Activation beginning	03/09/2019 09:07
Activation end	03/09/2019 13:07
Standby power price [EUR/MW]	
Standby energy price [EUR/MWh]	
Flexibility energy price [EUR/MWh]	

### ACTIVATION REQUESTS

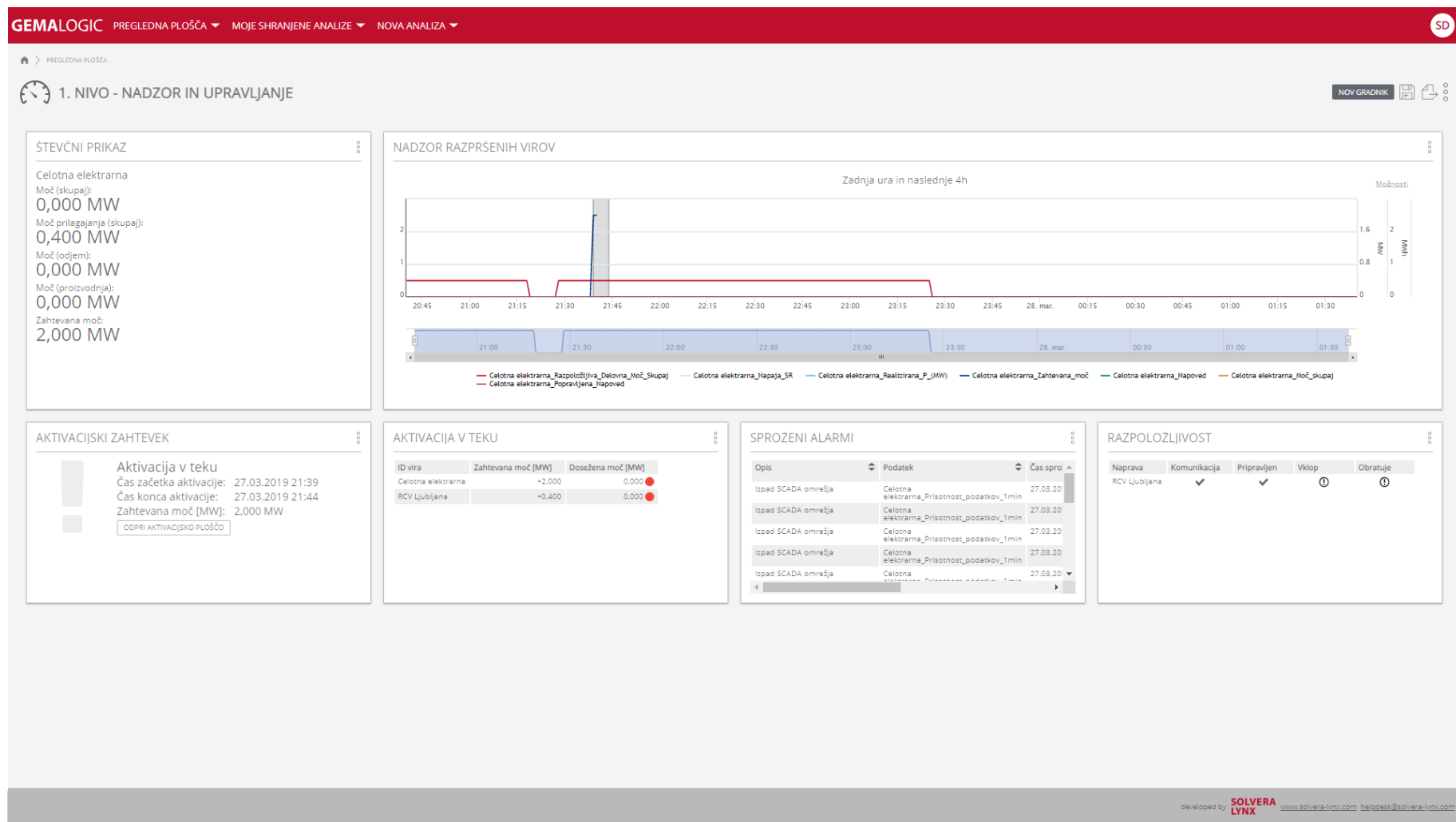
Code	Virtual Power Plant	Status	Announcement time	Date From	Date To	Duration [min]	Number of active flexibility resources	Requested power [MW]	Requested energy [MWh]	Actions
No data.										

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# Running activation



# Dashboard



# Report on Activation

**GEMALOGIC** PREGLEDNA PLOŠČA ▾ MOJE SHRANJENE ANALIZE ▾ NOVA ANALIZA ▾ SD

NOVA ANALIZA

**POROČILO O AKTIVACIJAH** 📄 📤

### SEZNAM AKTIVACIJ

Št.	Šifra	Akcija
1	test1	<a href="#">Podrobnosti</a>
2	test2	<a href="#">Podrobnosti</a>
3	test3	<a href="#">Podrobnosti</a>
4	test4	<a href="#">Podrobnosti</a>
5	test5	<a href="#">Podrobnosti</a>
6	test6	<a href="#">Podrobnosti</a>
7	test7	<a href="#">Podrobnosti</a>
8	test8	<a href="#">Podrobnosti</a>
9	test9	<a href="#">Podrobnosti</a>
10	test10	<a href="#">Podrobnosti</a>
11	a53e6fd1-1cb5-4242-845d-d3f937510a27	<a href="#">Podrobnosti</a>
12	eb1d4085-10cc-4c3f-a193-f7d3cebaface5	<a href="#">Podrobnosti</a>
13	4287185e-a86d-4627-b237-7865ea974136	<a href="#">Podrobnosti</a>
14	e6256646-f255-46c9-9e3f-53a3f06b1fc	<a href="#">Podrobnosti</a>
15	308cea4f-9eb2-4dca-84b2-1c6eaf857ab9	<a href="#">Podrobnosti</a>
16	test11	<a href="#">Podrobnosti</a>
17	test12	<a href="#">Podrobnosti</a>
18	test13	<a href="#">Podrobnosti</a>
19	test14	<a href="#">Podrobnosti</a>
20	8fbf1cbe-79f6-4dcb-8a8d-cc4d0fa916e7	<a href="#">Podrobnosti</a>
21	15418f52-e1c9-4e8c-9a52-75e2136e0264	<a href="#">Podrobnosti</a>
22	2e2420c4-dce2-4050-a588-2b2478b0d682	<a href="#">Podrobnosti</a>
23	862c94a8-44dd-45e5-8c60-f12faedfa9d5	<a href="#">Podrobnosti</a>
24	d0ded844-41d1-4177-b1d3-a2761439fdea	<a href="#">Podrobnosti</a>
25	51b8ad93-dcd9-443e-95d9-c6795480b486	<a href="#">Podrobnosti</a>
26	1799555c-6041-4a22-a01a-a0893296d689	<a href="#">Podrobnosti</a>
27	test15	<a href="#">Podrobnosti</a>
28	fae116	<a href="#">Podrobnosti</a>

**Podrobnosti**

Obdobje  
26.03.2019 16:00 - 26.03.2019 17:32

Status  
**Aktivacija neuspešna**

Šifra  
**test6**

Razpršeni viri

Št.	Lastnik	Šifra vira fleksibilnosti	Naziv	Status aktivacije	Status aktivacije RV	Datum od	Datum do	Trajanje [min]	Zahtevana moč prilagajanja [MW]	Zahtevana energija [MWh]	Dosežena moč [MW]	Dosežena energija [MWh]	Poraba goriva [l]
1	ELES d.o.o.	P8125480	RCV Ljubljana	Aktivacija neuspešna	Aktivacija neuspešna	26.03.2019 16:00	26.03.2019 17:32	92	0,400	0,613	-0,397	-0,608	-13,889

Razpršeni viri

Št.	Lastnik	Šifra vira fleksibilnosti	Naziv	Datum od	Datum do	Trajanje [min]	Čas naročila	Čas sprejema	Aktivacijski kanal	Potrdil
1	ELES d.o.o.	P8125480	RCV Ljubljana	26.03.2019 16:00	26.03.2019 17:32	92	16:00	16:00	aRPF	

Grafični prikaz

Celotna elektrarna 26.03.2019 13:01 - 26.03.2019 20:32

Možnosti

MW 2 300  
1 150  
0 0

14:30 15:00 15:30 16:00 16:30 17:00 17:30 18:00 18:30 19:00 19:30 20:00 20:30

— Celotna elektrarna\_Zahtevana\_moc — Celotna elektrarna\_Popravljena\_Napoved — Celotna elektrarna\_Razpoložljiva\_Delovna\_Moc\_Skupaj — Celotna elektrarna\_Napoved — Celotna elektrarna\_Realizirana\_P\_MW

# Communication device



# WHY SOLVERA LYNX?



## Custom-made solutions

Complete Energy Management package based on SW and HW solutions.

Potential for full customization according to customer's request



## Expertise

The biggest interdisciplinary Energy Management team of experts (IT, ICT, energy management) with 17 year+ experience



## Partnership

Long-term cooperation with customers after the implementation of the EMS (upgrade, maintenance)



## Quality

Certification: TÜV SÜD, ISO, LoRaWAN

LoRaWAN member since 2015 to warranty data collection

# THANK YOU!

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