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# ARSOS for Intelligent Control: Birds & Bats, Noise and Flickering Automated Operations

Jorge LÓPEZ



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# Company overview

Unlimited Power for Wind Farms and Solar Plants



**9+ Years**

experience in the  
sector



**10+ countries**

Where we  
provide services



**20+ OEM  
Scada's**

We are working  
with



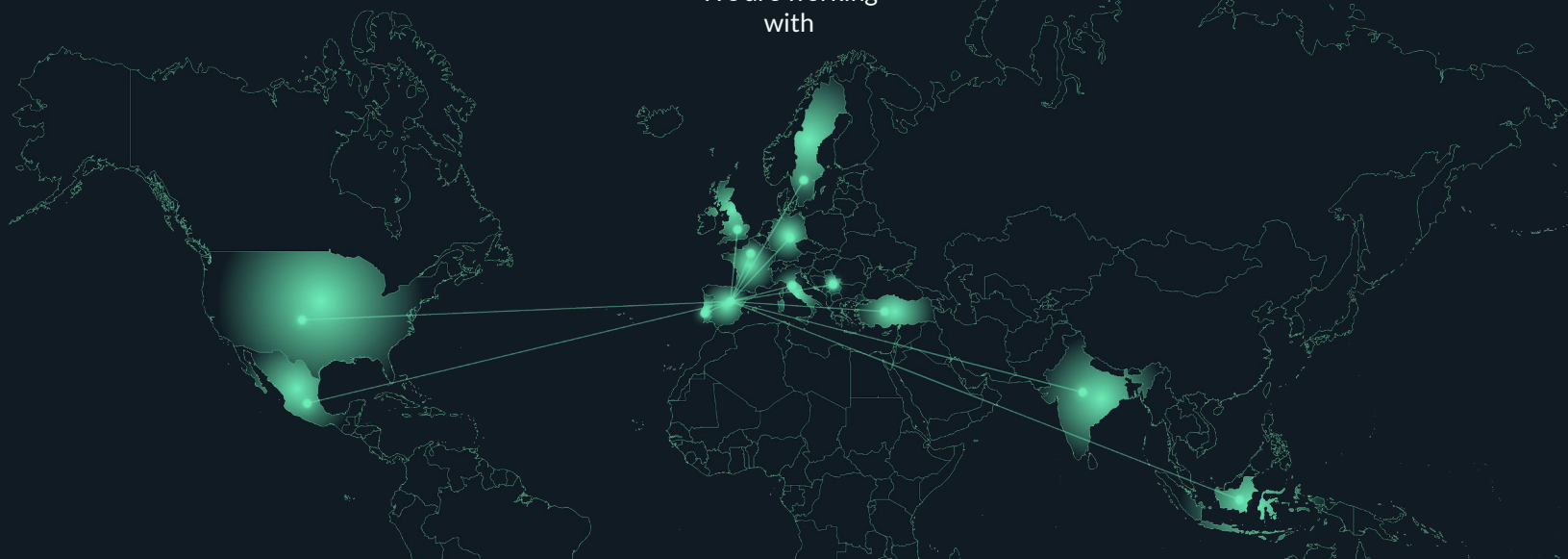
**250+ plants**

Where ARSOS is  
running



**6+ GW**

Total monitored  
installed power



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# The solution: **ARSOS**

Automated Renewable Smart Operations Software

DIGITALIZATION  
↑  
OPERATIONAL  
AUTOMATION

## INTELLIGENT CONTROL

Turn data into action. Automate your operations

## INTEGRATED ANALYTICS

Obtain quality data and gain full analytical autonomy

## INTEGRAL MONITORING

Universal and reliable data gathering platform

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# Operational challenges

Human-based operations

1

**DECREASING  
REVENUES**

Thinner Profit Margins

2

**LACK OF  
SCALABILITY**

Increasing portfolios, increasing  
operational costs

3

**MANUAL  
OPERATIONS**

Adapted to specific wind farms  
conditions



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# Technological Improvements

1

## Quicker & smarter response time

Improve operational processes reducing downtimes and using all available data

2

## Implement multiple Strategies

Adapted to specific wind farm conditions & needs

# Economic Benefits

3

## Increase AVAILABILITY, PRODUCTION & REVENUES

By cutting down response times and increasing time-based availability of WTGs

4

## SCALABILITY: Increase ROC capacity

Avoid repetitive tasks and get operators to focus on customer added value activities

5

## Increase Maintenance savings

Becoming an insurance that all assets are operated following the protocol

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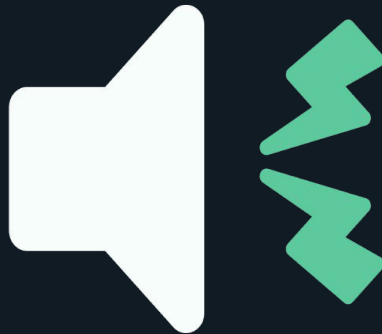


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# Environmental Restrictions in France



**Birds & Bats**



**Noise**



**Flickering**

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# Alternatives for the Operators

1

Accept the consequences

2

Switch-Off the Turbine

3

Manual  
Operations?



**Data-driven  
Automated  
Operations**

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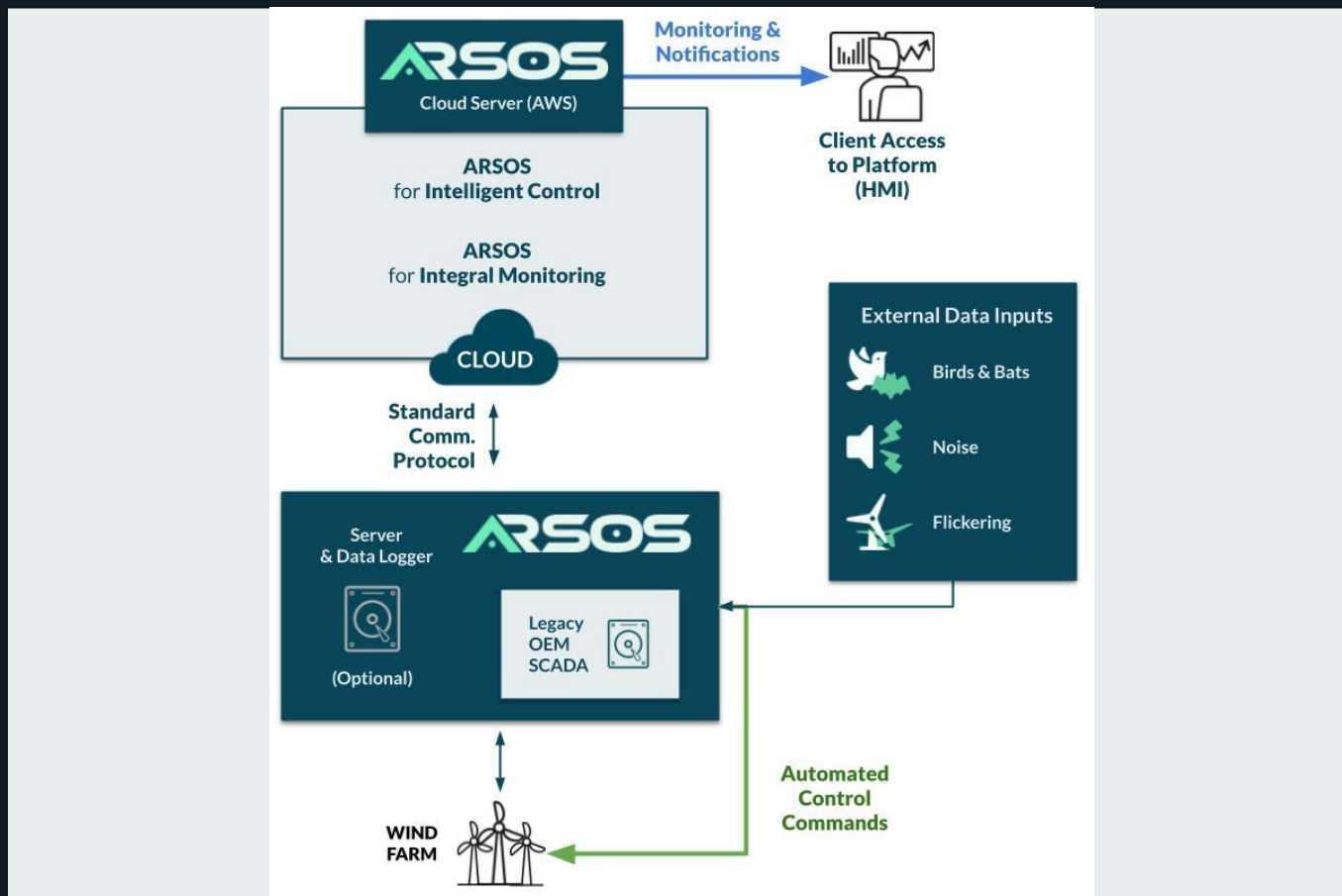


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# ARSOS Solution Architecture



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# Business Case Study:

## WF Gueltas

**9 MW**

Rated Power

**6**

WTGs

**SENVION REPOWER**

Technology

**EDPR**

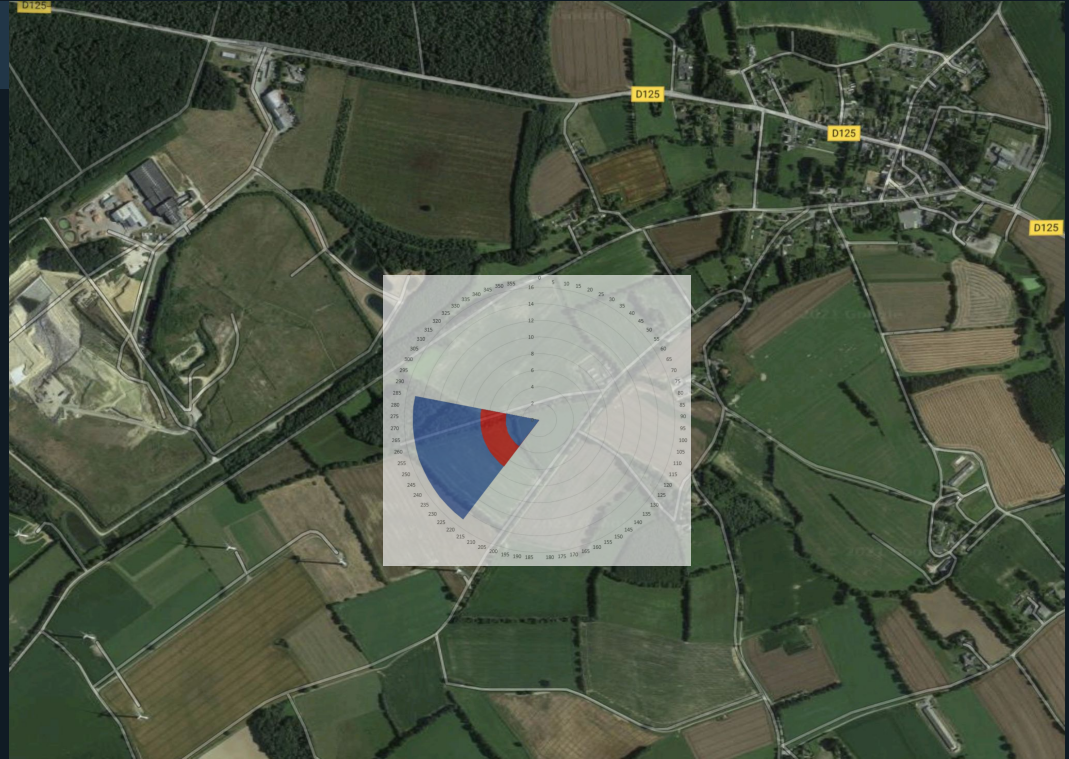
Operator

**Bretagne**

France

**ARSOS**

Automated Operations Technology



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# ARSO5 Noise Regulation

Wind Speed	Operational strategy for acoustic restrictions optimization					
	E1	E2	E3	E4	E5	E6
3 m/s	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal
4 m/s	Mode normal	Mode normal	Mode normal	Mode normal	STOP	Mode normal
5 m/s	STOP	Mode normal	Mode normal	STOP	STOP	Mode normal
6 m/s	Mode normal	Mode normal	Mode normal	Mode normal	STOP	Mode normal
7 m/s	Mode normal	Mode normal	Mode normal	Mode normal	STOP	Mode normal
8 m/s	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal
9 m/s	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal	Mode normal

This operational procedure only should be applied **from 22:00 to 7:00** (Paris time zone) and when wind turbine wind direction measurement is **between 220° and 285°**.

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# ARSOS Noise Regulation Performance Summary - STOPs

Automatic Operations

## KPIs

**570**  
STOP Attempts

**365**  
Successful STOPs

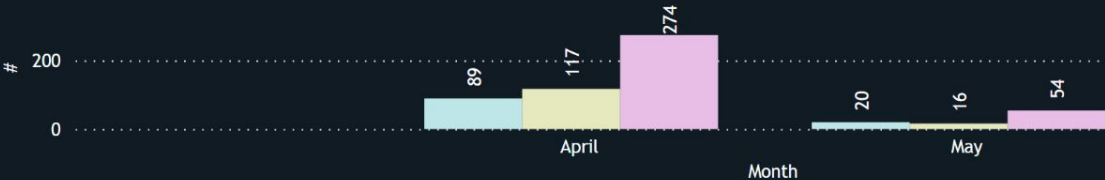
**64 %**  
STOPs Success Rate

**3**  
Turbines Stopped

Month	E1	E4	E5	Total
April	89	117	274	480
May	20	16	54	90
Total	109	133	328	570

## Monthly STOPs Attempted per Turbine

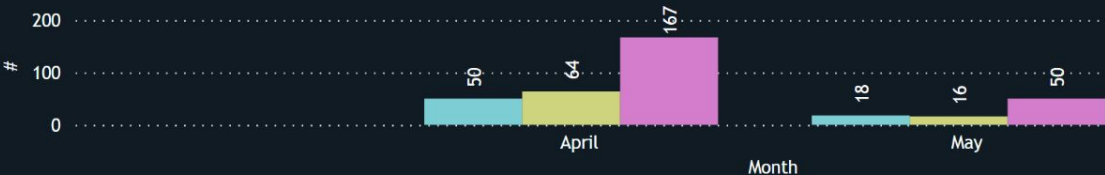
ASSET ● E1 ● E4 ● E5



**570**  
STOPs Attempted

## Monthly Successful STOPs per Turbine

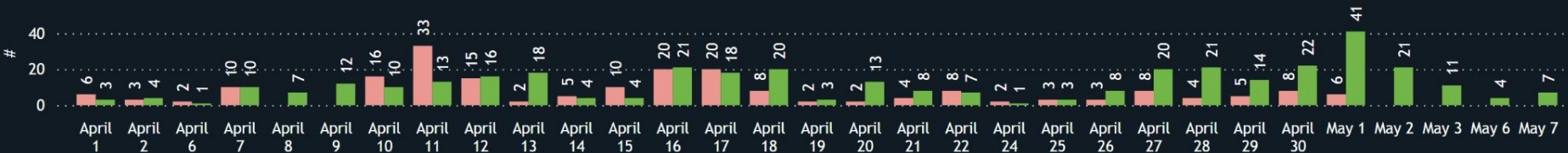
ASSET ● E1 ● E4 ● E5



**365**  
Successful STOPs

## Daily Successful and Failed STOPs

STOP SUCCESS or FAIL ● 0 ● 1





# ARSOS Noise Regulation Performance Summary - RESETs

Automatic Operations

## KPIs

236  
RESET Attempts

104  
Successful RESETs

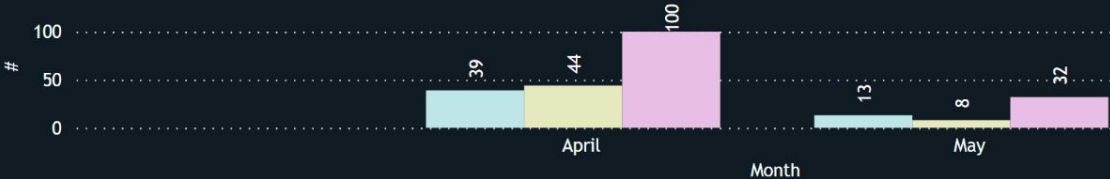
44 %  
RESET Success Rate

3  
Turbines Reseted

Month	E1	E4	E5	Total
April	39	44	100	183
May	13	8	32	53
Total	52	52	132	236

## Monthly RESETs Attempted per Turbine

ASSET ● E1 ● E4 ● E5

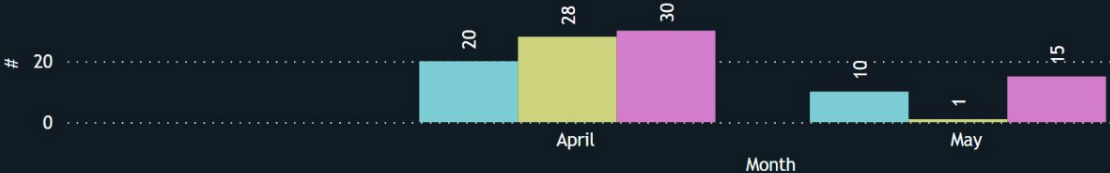


236

RESETs Attempted

## Monthly Successful RESETs per Turbine

ASSET ● E1 ● E4 ● E5

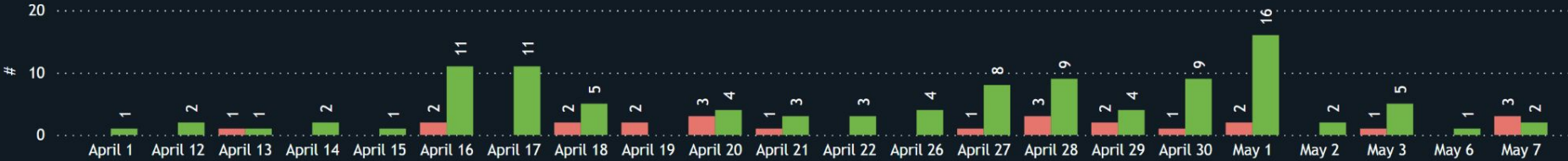


104

Successful RESETs

## Daily Successful and Failed RESETs

RESET SUCCESS or FAIL ● 0 ● 1





# Time Series STOPs & RESETs

ARSOS Analysis

Month

April

18

18

Turbine

E1

20

Stops

5

Resets





# Time Series STOPs & RESETs

ARSOS Analysis

Month  
April

18 18

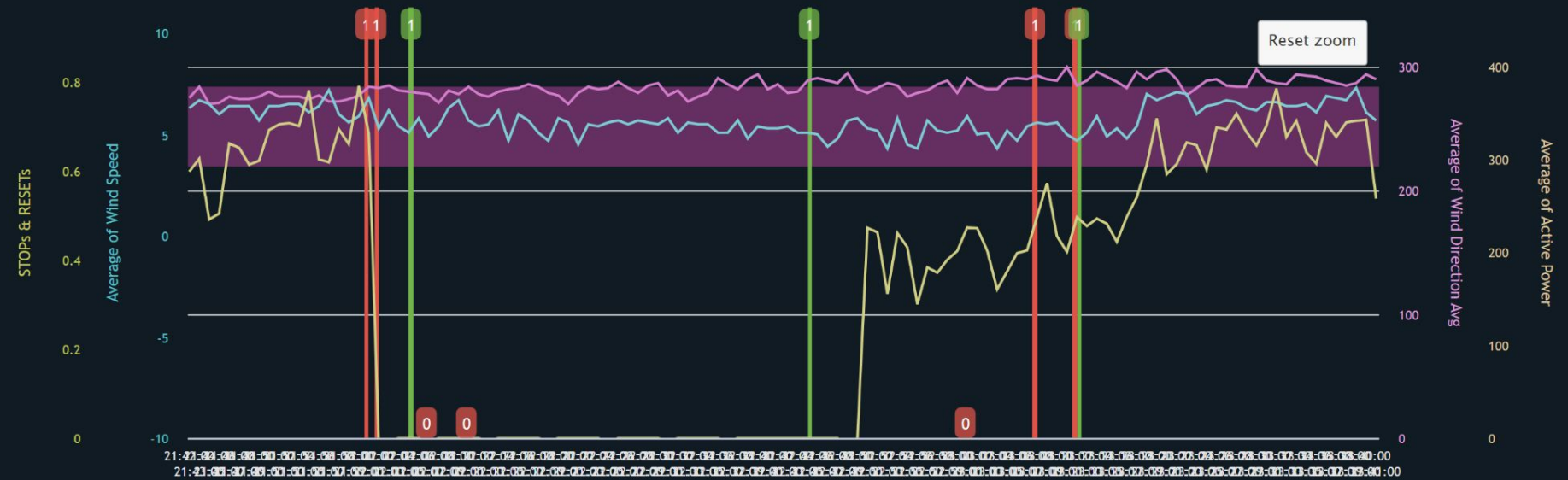
Turbine  
E1

20  
Stops

5  
Resets

Legend

- STOP SUCCESS or FAIL
- RESET SUCCESS or FAIL
- Average of Wind Direction Avg
- Average of Wind Speed
- Average of Active Power





# Wind Rose Analysis

Noise Control Analysis

Month



All



1

31

379

Stops

ASSET



☐ Select all

☒ E1

☐ E2

☐ E3

☒ E4

☒ E5

☐ E6

☐ Gueltas

MESSAGE



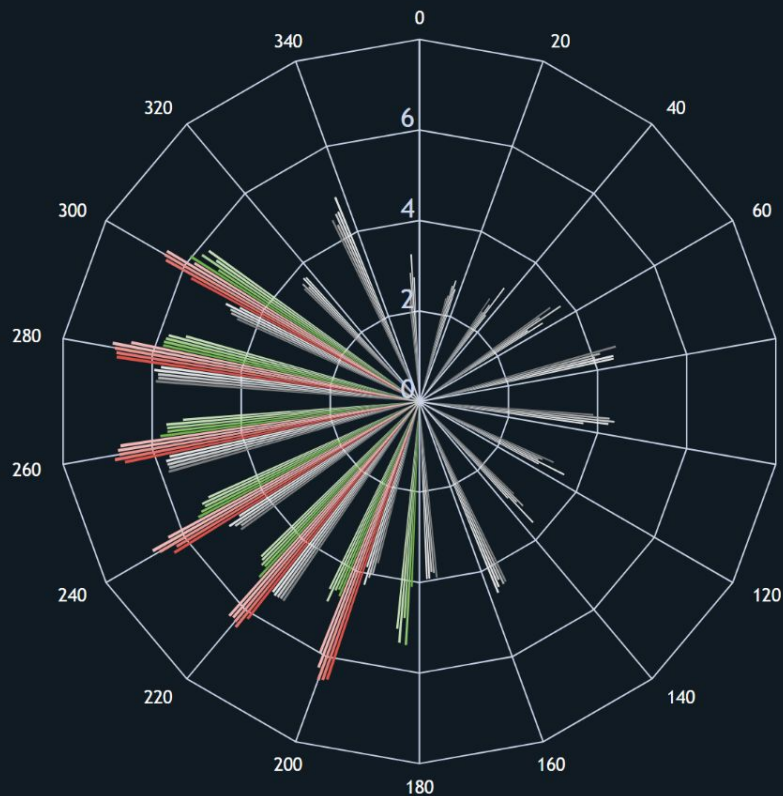
Multiple selections



STOP SUCCE...



All



STOP SUCCESS or FAIL

- Wind Speed - Blank
- Wind Speed -1 min - Blank
- Wind Speed -2 min - Blank
- Wind Speed -3 min - Blank
- Wind Speed 1 min - Blank
- Wind Speed - 0
- Wind Speed -1 min - 0
- Wind Speed -2 min - 0
- Wind Speed -3 min - 0
- Wind Speed 1 min - 0
- Wind Speed - 1
- Wind Speed -1 min - 1
- Wind Speed -2 min - 1
- Wind Speed -3 min - 1
- Wind Speed 1 min - 1



# ARSOS Performance Summary

Automatic Operations

## Hour Rounded

Select all

- ☒ 0:00:00
- ☒ 1:00:00
- ☒ 2:00:00
- ☒ 3:00:00
- ☒ 4:00:00
- ☒ 5:00:00
- ☒ 6:00:00
- ☐ 7:00:00
- ☐ 8:00:00
- ☐ 9:00:00
- ☐ 10:00:00
- ☐ 11:00:00
- ☐ 12:00:00
- ☐ 13:00:00
- ☐ 14:00:00
- ☐ 15:00:00
- ☐ 16:00:00
- ☐ 17:00:00
- ☐ 18:00:00
- ☐ 19:00:00
- ☐ 20:00:00
- ☐ 21:00:00
- ☒ 22:00:00
- ☒ 23:00:00

## Turbine

Select all

- ☒ E1
- ☒ E4
- ☒ E5

Month	E1	E4	E5	Total
April	106,84	93,44	89,59	289,87
May	90,36	110,24	80,61	281,21
Total	197,20	203,68	170,20	571,08

Turbine E1 E4 E5



571,08

Energy (MWh)

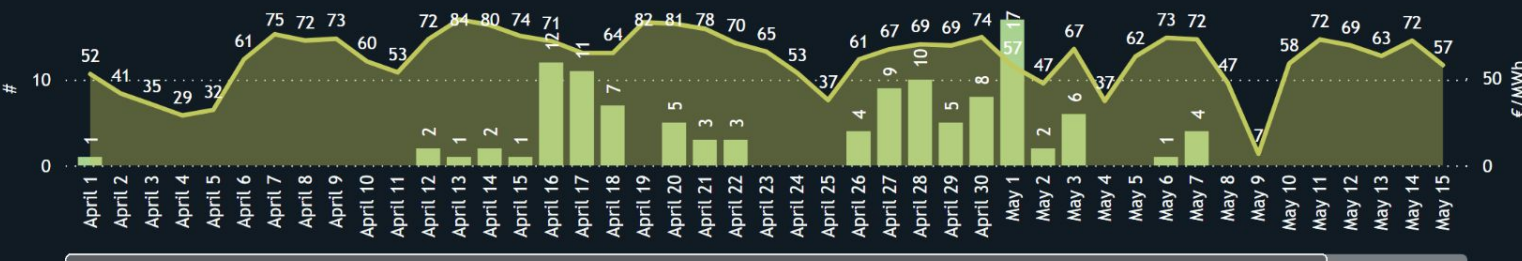
59,08

Average of PRICE

29.114,30

Revenues (€)

Successful RESETs SPOT Price





# ARSOS Performance Summary

Automatic Operations

## Hour Rounded

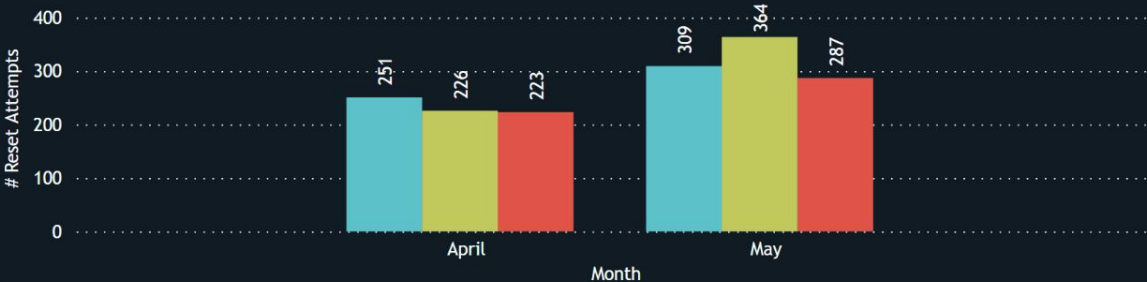
- ☒ Select all
- ☒ 0:00:00
- ☒ 1:00:00
- ☒ 2:00:00
- ☒ 3:00:00
- ☒ 4:00:00
- ☒ 5:00:00
- ☒ 6:00:00
- ☒ 7:00:00
- ☒ 8:00:00
- ☒ 9:00:00
- ☒ 10:00:00
- ☒ 11:00:00
- ☒ 12:00:00
- ☒ 13:00:00
- ☒ 14:00:00
- ☒ 15:00:00
- ☒ 16:00:00
- ☒ 17:00:00
- ☒ 18:00:00
- ☒ 19:00:00
- ☒ 20:00:00
- ☒ 21:00:00
- ☒ 22:00:00
- ☒ 23:00:00

## Turbine

- ☒ Select all
- ☒ E1
- ☒ E4
- ☒ E5

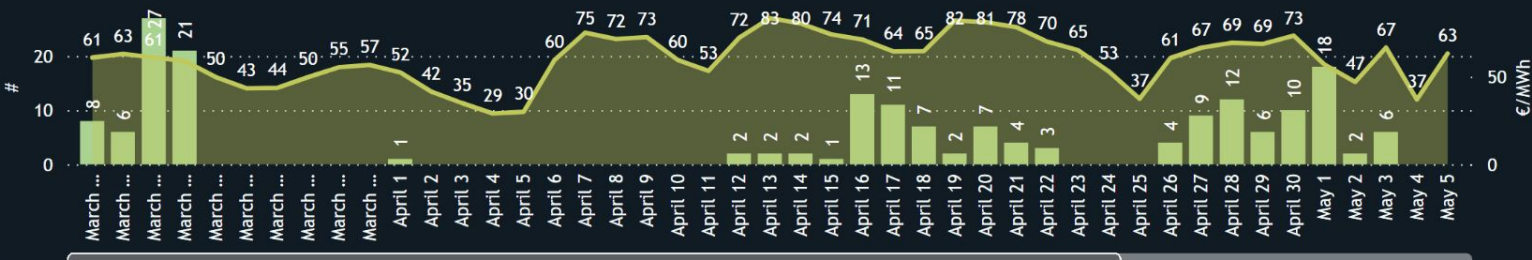
Month	E1	E4	E5	Total
April	250,80	225,51	223,20	699,52
May	309,20	363,58	286,83	959,61
Total	560,00	589,09	510,04	1.659,13

Turbine ● E1 ● E4 ● E5



1.659,13  
Energy (MWh)  
59,02  
Average of PRICE  
85.860,56  
Revenues (€)

● Successful RESETs ● SPOT Price





# ARSOS Performance Summary

Automatic Operations

## Hour Rounded

Select all

- ☒ 0:00:00
- ☒ 1:00:00
- ☒ 2:00:00
- ☒ 3:00:00
- ☒ 4:00:00
- ☒ 5:00:00
- ☒ 6:00:00
- ☐ 7:00:00
- ☐ 8:00:00
- ☐ 9:00:00
- ☐ 10:00:00
- ☐ 11:00:00
- ☐ 12:00:00
- ☐ 13:00:00
- ☐ 14:00:00
- ☐ 15:00:00
- ☐ 16:00:00
- ☐ 17:00:00
- ☐ 18:00:00
- ☐ 19:00:00
- ☐ 20:00:00
- ☐ 21:00:00
- ☒ 22:00:00
- ☒ 23:00:00

## Turbine

Select all

- ☒ E1
- ☒ E4
- ☒ E5

Month	E1	E4	E5	Total
April	106,84	93,44	89,59	289,87
May	90,36	110,24	80,61	281,21
Total	197,20	203,68	170,20	571,08

Turbine E1 E4 E5



571,08

Energy (MWh)

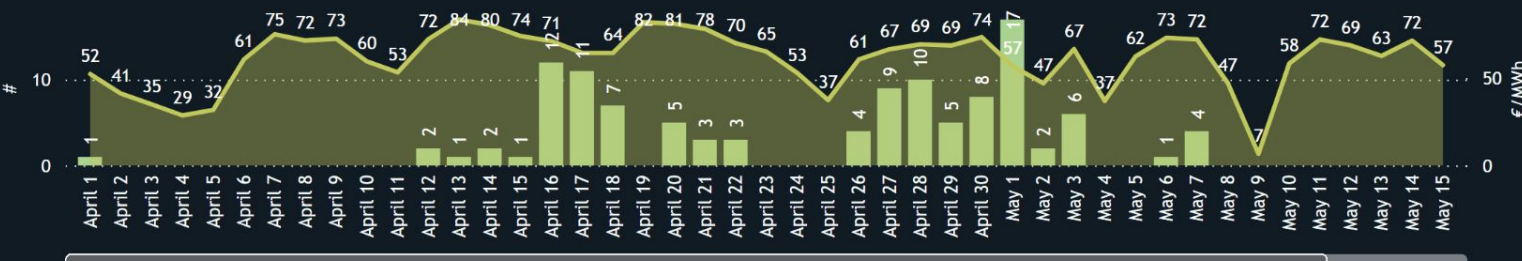
59,08

Average of PRICE

29.114,30

Revenues (€)

Successful RESETs SPOT Price





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## Smart Control Overview

Operations > Automated Operations > Smart Control Overview

John Doe  
Admin

### Last actions done

ARSOS activity log

WTG	Site	Action done	Time
JP03	Jupiter	RESET: Executed 1/3 attempt	3 min. ago
JP13	Jupiter	Changed to human mode	30 min. ago
JU16	Juno	RESET: Executed 1/2 attempt	45 min. ago
JP11	Jupiter	RESET: Executed 2/3 attempt	1 hr. ago
BA12	Bosque Alto	Maintenance mode detected	2 hr. ago
BA21	Bosque Alto	Maintenance mode detected	2.5 hr. ago
JP11	Jupiter	RESET: Executed 1/2 attempt	3 hr. ago
JU12	Juno	RESET: Executed 1/2 attempt	4.5 hr. ago
JU13	Juno	Maintenance mode detected	5 hr. ago
JU15	Site	Maintenance mode detected	6 hr. ago

### ARSOS Upcoming Actions

The following table shows the scheduled automated actions

WTG	Site	Automated control	Remaining time	Manual Control
JP11	Jupiter	NOTIFY: No more Remote RST allowed, Sending notification to on-site technicians	00:00:30	
JP03	Jupiter	RESET: Executing 2/3 attempt	00:07:00	
JU13	Juno	STOP: due to Vibrations, low production forecast and low energy price	00:22:00	
JP12	Jupiter	RESET: Executing 1/2 attempts	00:50:00	

### ARSOS WTG Overview

Search

WTG	Status				Power Kw	Wind speed m/s	OEM Status	Pith Angle	Smart Control Scenario	Next Actions	GU Operations Protocol	Manual Control
Jupiter												
JP01	Curtailed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-29.3	19.8	PRO	-0.1	--	--	MADE_AE56_AL_S	
JP02	Curtailed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1310.6	22.2	PRO	0	--	--	MADE_AE56_AL_S	
JP03	Fault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3.9	23.0	PAR	87	--	--	MADE_AE56_AL_S	
JP11	Fault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4.3	24.2	PAR	87	--	--	MADE_AE56_AL_S	
JP12	Fault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3.9	22.9	PAR	87	--	--	MADE_AE56_AL_S	
JP13	Fault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	56.999	22.4	PAR	87.1	error '107-Termico Inter.Gen' (12225 sec.)	WTG on quarantine mode, O&M was last notified on: 2021-02-08 14:18:55	MADE_AE56_AL_S	
Bosque Armijo												
BA12	Stopped - Service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0.0	8.9	B	--	--	Turbine in maintenance, ARSOS will not operate it during this state	MADE_LLPP_GR_S	
BA21	Stopped - Service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	297.4	4.9	B	--	--	Turbine in maintenance, ARSOS will not operate it during this state	MADE_LLPP_GR_S	



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Carlos GOBERNA

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