Bird Monitoring System®

Protecting Wildlife with
Artificial Intelligence

⊕ DIGISEC

BIRD MONITORING SYSTEM PROPOSAL

PROJECT DETAILS

DATE	CUSTOMER NAME	AUTHOR
January 27, 2022	Renexia	George Diakomanolis
SUBJECT		**OFFER NUMBER**
Bird Monitoring System® Marine		20210144

Dear Mr Melideo,

We are happy to submit our commercial proposal for the provision and installation of 10 BMS Marine systems for your wind farm

We remain at your disposal for any additional information.

Yours Sincerely,

George Diakomanolis
COO

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DIGISEC

1. Who we are

We are a high-tech solutions provider and integrator with a clear vision to satisfy our client's needs. We are consistent and dedicated to providing solutions that will add value to your investments. We design, supply, implement and support **Bird Monitoring Systems for Wind Parks, Blade Inspections for Wind Turbines, Advanced A.I. Security Systems, Visitor and Retail Analytics** and more

We have the knowledge, training, expertise and appropriate collaborations with major hardware and software production companies, enabling us to design and implement appropriate and custom solutions for every need.

We are experts in **Artificial Intelligence** and **Machine Learning** and we design applied solutions based on **advanced Computer Vision algorithms.**

Our philosophy at Digisec, is to combine our values, which are hard bonded with corporate ethics, consistency and transparency, together with innovation and advanced technologies.

TŪV AUSTRIA
EN ISO 9001:2015

TŪV AUSTRIA
EN ISO 27001:2013

TŪV AUSTRIA
EN ISO 14001:2015

2. Executive Summary

Wildlife has brought variety of challenges in different sectors of the economy. Birds could cause significant financial, legal, operational and safety problems for renewable energy facilities (Wind Parks), Airports, Industrial Buildings, Agriculture, etc.

In response to the high demand for an effective and long-term solution for the bird related problems, our Company provides a breakthrough technology, which protects critical infrastructure and facilities from birds, while preserving avian species.

Digisec's Bird Monitoring System has been developed according to the best industry practices and taking into consideration the relevant standards and regulations for renewable energy facilities, Wind and Solar Parks, Airports, and other critical infrastructure.

3. Introduction

Wind Turbines that produce clean energy present significant benefits to the environment and to society in general. However, there are significant collateral issues concerning the safety of birds that arise from their use.

There have been worldwide instances where large numbers of birds have been killed by flying into the turbine blades.

When rare protected species are hurt or fatally damaged, the outcry is very loud and very clear. The commonly used solutions are not solving the problem.

Our team started its study mindful that its mission is to abate the problem with a long-term solution that would be satisfactory to lawmakers and environmentalists and allow for the orderly, profitable growth of the industry free of verbal and other assaults on the companies that operate in this space.

4. Technical Proposal

Every WTG is equipped with 4 special stainless steel (316) boxes, which are all mounted on the tower with high quality neodymium magnets. Each box is equipped with an 8-megapixel super starlight camera. All cameras are set to 45° incline and there is an option for additional camera to each of the boxes. An additional camera could be a thermal vision camera for detecting special birds or bats at night or for better daytime performance during fog or rain.

Bird Monitoring System® arrangement

BMS Day & Night
(Bats & Night Birds)

BMS Daytime
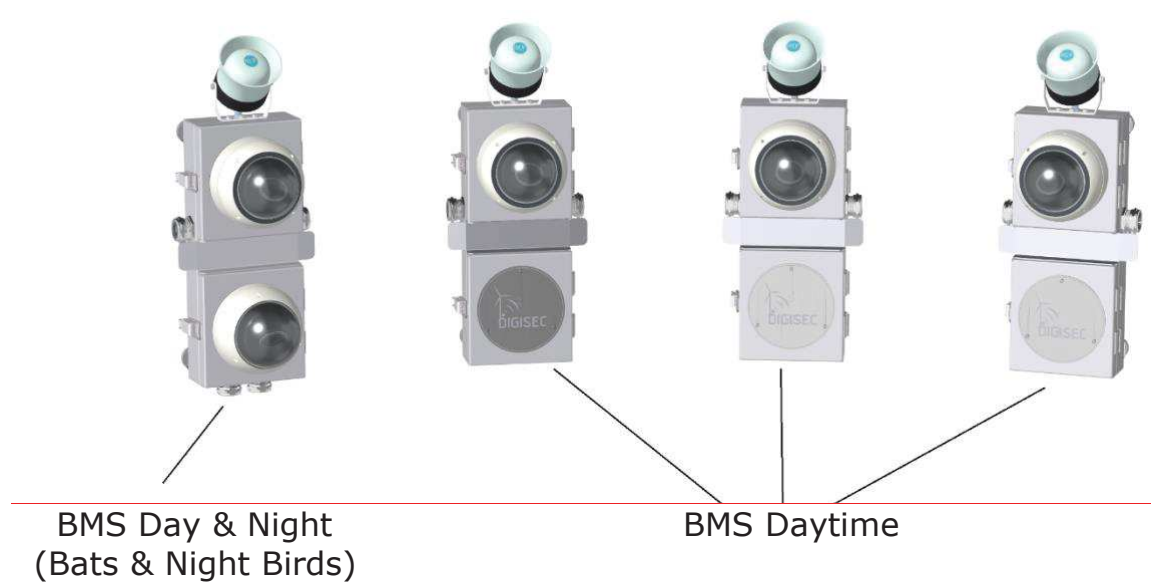
BMS Day & Night is additionally equipped with Flir Thermal cameras for night vision to identify bats and night birds

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Marine Edition Specifications

- Stainless still camera housing

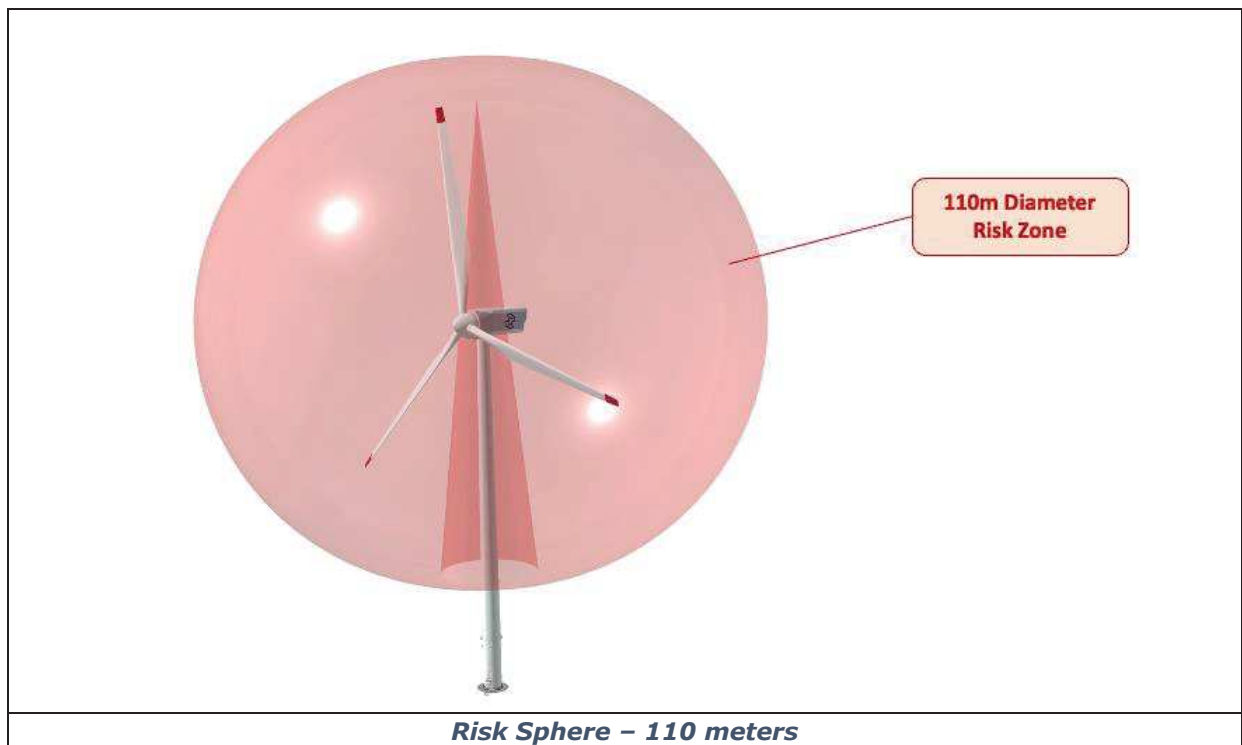- IP 68 rated

- Special heating module with blower to eliminate steam and fog

- Wiper with auto side stop function even in power loss

- Auto spray every week with Water & Alcohol solution for salt stains

- Special Water tank with power pump for 30 meters water lift

- Lower water level indicator (Need to refill tank every 6 months)
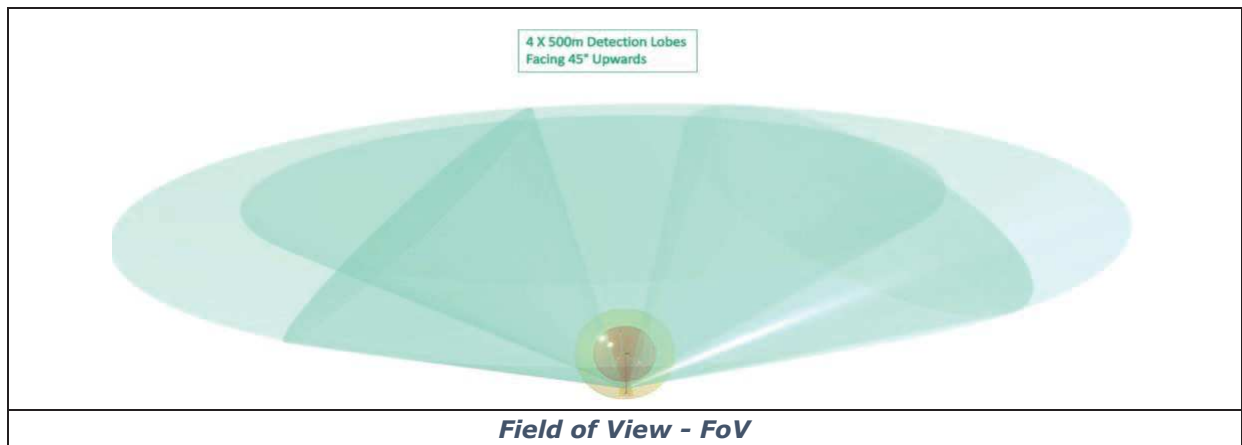
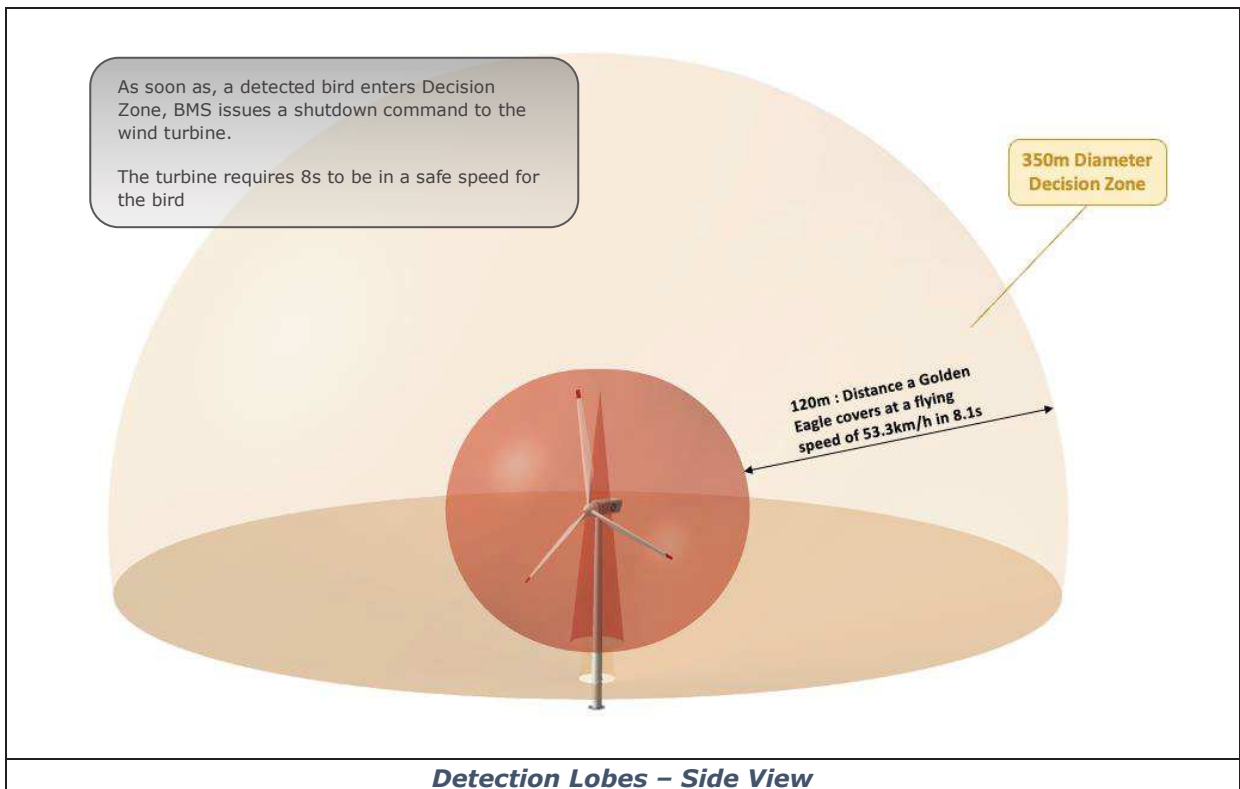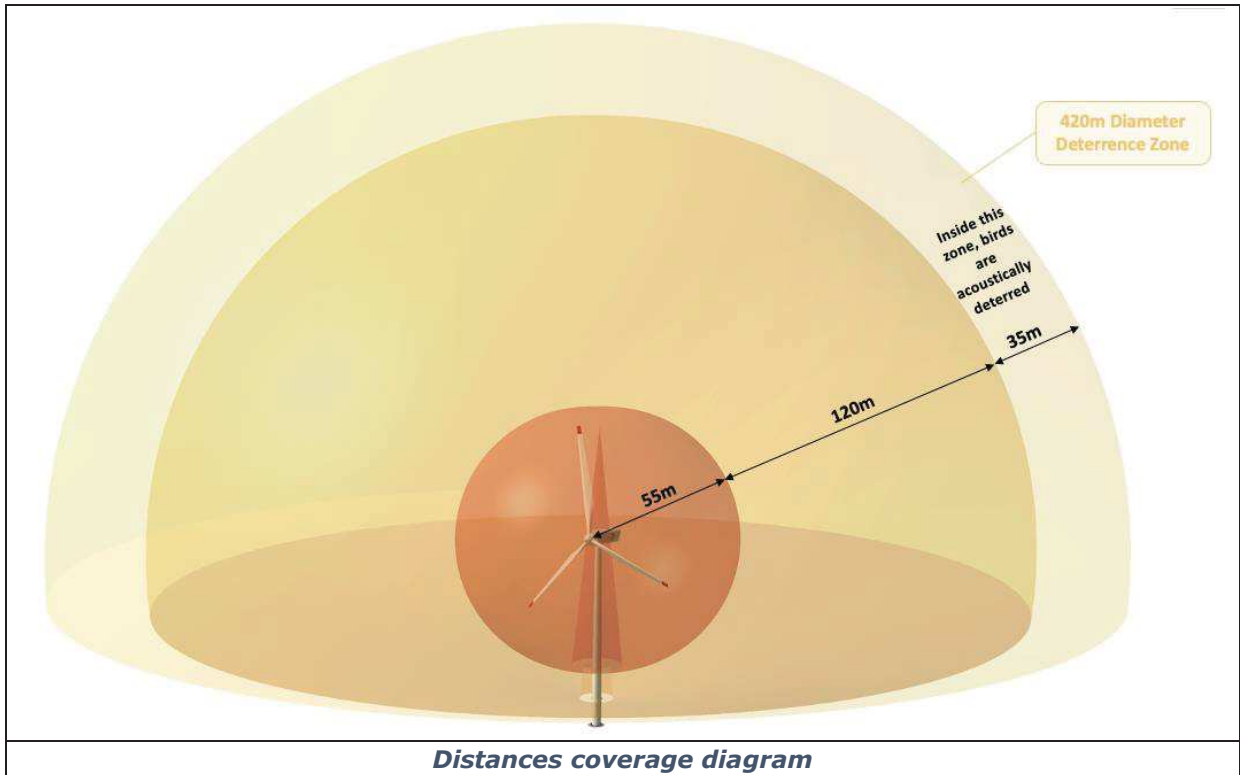- Float switch prevents the washer unit from running dry
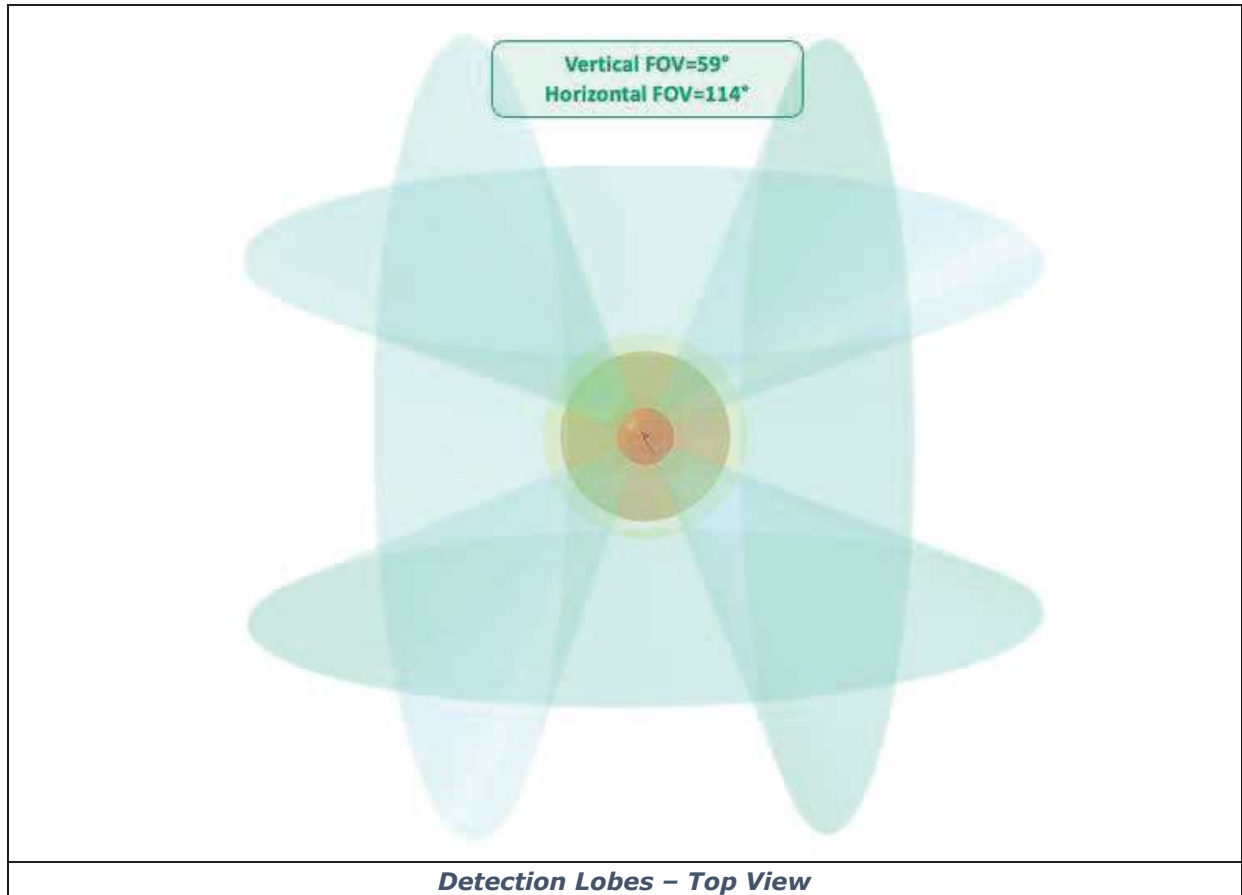
Wiper with auto side stop function even in power loss

Special fresh Water tank with power pump for 30 meters water lift

4 X 500m Detection Lobes
Facing 45° Upwards

Field of View - FoV

110m Diameter
Risk Zone

Risk Sphere – 110 meters

420m Diameter
Deterrence Zone

Inside this zone, birds are acoustically deterred

35m

120m

55m

Distances coverage diagram

As soon as, a detected bird enters Decision Zone, BMS issues a shutdown command to the wind turbine.

The turbine requires 8s to be in a safe speed for the bird

350m Diameter
Decision Zone

120m : Distance a Golden Eagle covers at a flying speed of 53.3km/h in 8.1s

Detection Lobes – Side View

Vertical FOV=59°
Horizontal FOV=114°

Detection Lobes – Top View

Detection Phase

The Bird Monitoring System® uses advanced cameras) configuration in combination with **Artificial Intelligence** to identify birds. We can accurately distinguish between birds, and other flying or moving objects, like planes, turbine blades, clouds etc.

The Bird Monitoring System® can continuously improve its detection capabilities using **Machine Learning** video content analysis algorithms. It uses advanced classifiers and large databases to achieve its performance.

Tracking Phase

After the system detects the bird, an advanced tracking technology is used to track the course.

Deterrence Phase

After setting specific rules, we can initiate deterrence procedures:

- ✓ If a bird enters a specified zone (less than 'X' meters from the wind turbine generator
- ✓ If a bird's tracking path is towards the wind turbine.
- ✓ If a bird is more than X seconds in a specified zone in the field of view of the camera.

Deterrence is achieved by using special sounds through state-of-the-art acoustic driver modules.

WTG Pause / Stop Phase

If a bird enters the designated critical zone (sphere), the turbine can receive signals in various formats to stop its operation and prevent collision. Our advanced detection technology minimizes the shutdown incidents of the Wind Turbine Generators.

Reporting

The software generates interactive reports from the detections captured by the system. All data are uploaded to a cloud platform where multiple functions and customizable reports are available to the users/admins.

Systems Deterrence Sound

During Systems operation and if the Bird Monitoring System® is equipped with a Deterrence module, the sound is activated when needed.

The sound signal is emitted only in the direction of the flying birds.

The behavior of the treated 'objects' is being monitored during and after the sound emission, and if the direction of the flight has not been deflected in a sufficient order, the sound is applied again until the 'object' leaves the protected area. Nevertheless, Wind Turbine shutdown would be applied in case of need, while still emitting the deterrence signals.

The System provides *a variety of options for programming and controlling the deterrence* sound level, to avoid big disturbance of people and wildlife around the protected zones.

Decibel levels measuring

After the installation of our BMS to the wind farm, measurements take place to all nearby villages. In case they are above the limit we alter the volume accordingly.

4.2 Monitoring, Reporting & Administration Cloud Platform

You will be granted access to our Monitoring, Reporting and Administration Platform.

Overview:

In the overview dashboard you can have a general idea of all WTGs in regard of detections, deterrence, and shutdowns.

<u>WTGs Menu</u>:

➢ You can reboot the Control Module and all the sub-Systems remotely

➢ You can shut down the WTG on demand to check functionality

➢ You can activate and deactivate the BMS remotely

Events - Reports

➢ You can choose area / wind farm / site / WTG

➢ You can set the dates and time for your report

➢ You can choose the type of event for your report (detection, deterrence, shut down)

➢ For each event you get: WTG number, camera number, timestamp, action (detection, deterrence, shut down), wind speed, wind direction, nacelle position

➢ Immediate access to pictures and video of every event along with bird classification and annotation
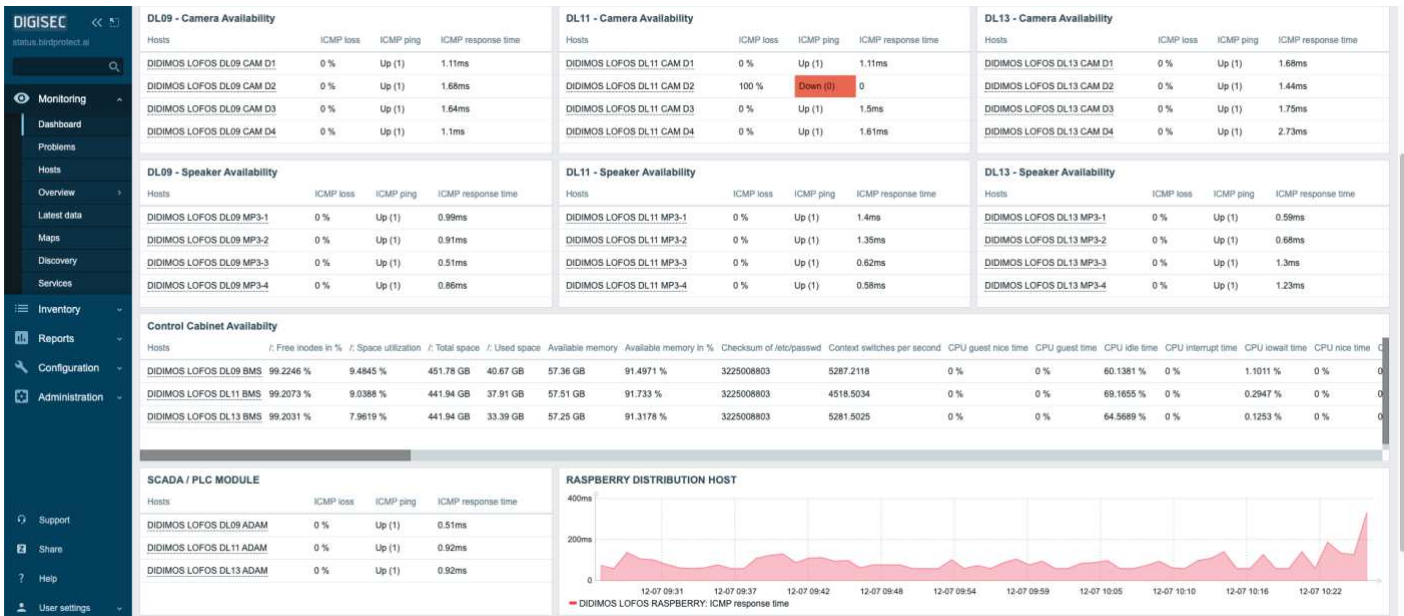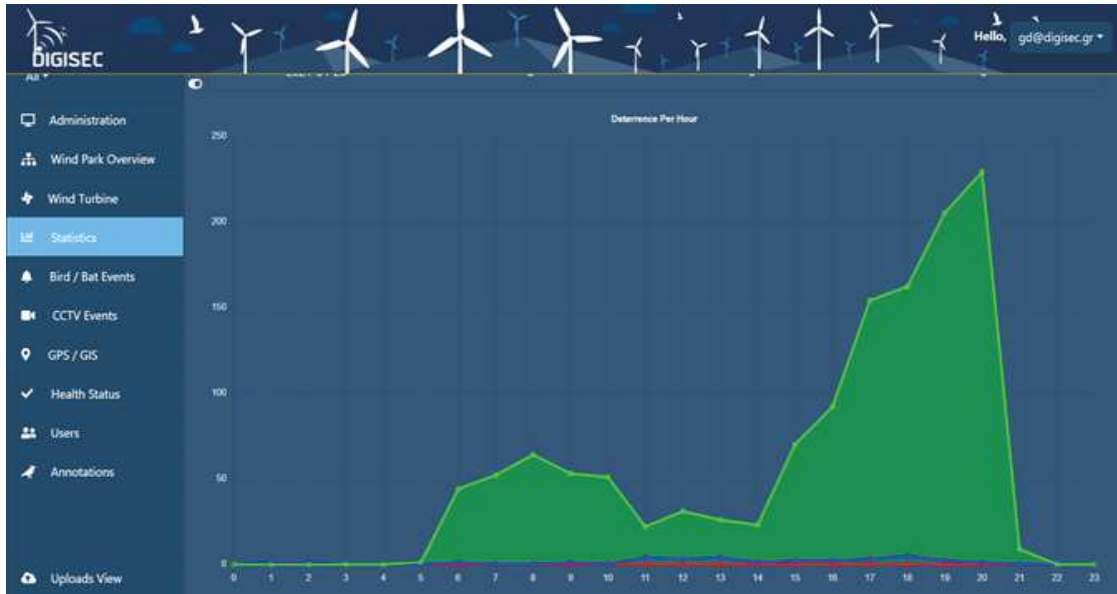
[Deterrences Per Hour]
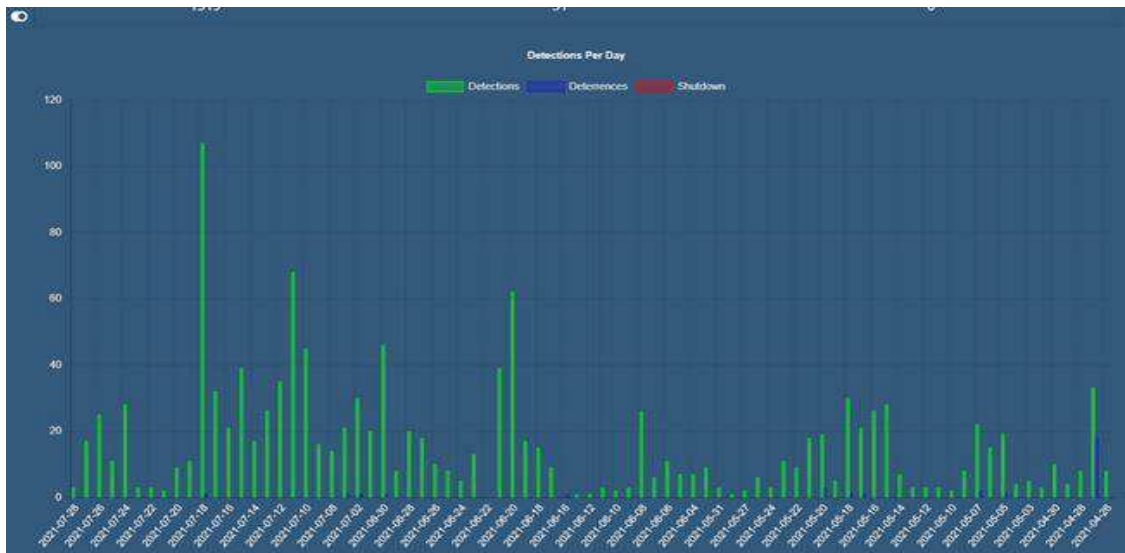
[Deterrence's Per Day]

[Events Summary]

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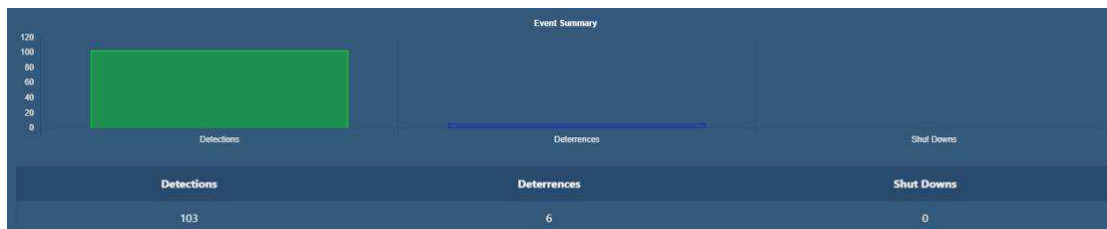
Health Status Monitoring

➢ Live health status of each System and sub-System on every WTG

➢ Customizable dashboards with graphs

➢ Customizable alerts with colors

➢ Automatic e-mail notifications in case of System or Subsystem failure

➢ Mobile push notifications

➢ Daily, monthly, yearly customizable status reports and System availability

Note: SW updates, new versions, bug fixing, new patches are included

4.3 Technical Specifications

CONTROL MODULE CABINET

Control Module Technical Requirements	
Power Requirements:	Single Phase, 230 V, 16A, 50Hz
Cable specifications:	SiHF 3 X 2,5 mm
Dimensions:	80cm(H) X 60cm(W) X 30cm(D)
Weight:	55Kgr
Connection to mains power:	TBD
Terminal Block Number #:	TBD
Mounting method:	Floor Mount base + Magnets
Power Consumption:	Minimum: 2.1 A @ 230 V Maximum: 6.5 A @ 230 V

CAMERAS AND SPEAKERS

Cameras & Speakers Requirements	
Number of Day Cameras per WTG:	4
WTG numbers:	TBD
Number of Thermal Vision Cameras per WTG:	0
WTG numbers:	0
Number of Speakers per WTG:	6
Speaker Height:	9.5m
Camera mounting Height:	9.5m

WTG SHUT DOWN MODULE

Shut Down module	
Stop Command (Trigger method):	Normally Open ☒ NC ☐ OPC ☐
Start Command (Trigger method):	NO ☐ NC ☐ OPC ☐ Auto Start ☒
Terminal Block Connection location:	TBD
Terminal Block numbers:	TBD
Wind Speed, Rotor Speed, Nacelle Position	Analog ☐ Modbus ☒

NETWORK REQUIREMENTS

Network Requirements	
Fiber Cable type between WTG's	Single Mode ☒ Multi Mode ☐
WTG Connector type	ST ☐ LC ☐ SC ☐ FC ☐ MU ☐
Spice Box terminal block numbers to use (IN):	TBD
Spice Box terminal block numbers to use (OUT):	TBD
Network Switch Location:	Control Building
Network Switch port number (Internet Access)	
Internet Bandwidth	Upload: Download:
Amazon AWS Ping / Latency report	https://ping.psa.fun

5. Infrastructure requirements

Power Requirements

Each system will be connected to a relevant power supply of the Wind Turbine where it is going to be installed. The provided power will be terminated in a distribution box with appropriate environment protection (IP65) near each system module or inside the WTG, if possible.

For each BMS system unit the following connection is required (provided by the customer):

- Power requirement: 230 VAC (Single-phase voltage) + - 10%
- Supply current: - 16A/230V AC
- Frequency: 47 -63 HZ
- Circuit breaker: 16A
- Appropriate grounding

Network connection

We assume that a network connection (ETHERNET) is available at each Wind Turbine (*provided by the customer*). Data communication for each BMS module will use TCP/IP. At least 1 (one) RJ45 port, 10/100BaseT must be available for each system module.

Network connectivity will enable the system to collect useful information, reports, statistics and enable maintenance, calibration, and monitoring.

2.2 Cloud Computing Award Platinum

3. Appendix: BMS Photos

[Production Line]

[BMS Control Module]

[Outside installation overview – SIEMENS GAMESA]

[Outside installation overview – SIEMENS GAMESA}

[Outside installation overview – ENERCON E44}

[Outside installation overview – VESTAS}

Night & Day for Birds and Bats