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Input paper for the following Committee(s): check as appropriate Purpose of paper:

**□** ARM **🗹** ENG **□** PAP **□** Input

**□** ENAV **□** VTS **🗹** Information

Agenda item [[2]](#footnote-2) 10

Technical Domain / Task Number 2 …………………………………

Author(s) / Submitter(s) …Peter Dobson………………

Comparison of Solar Model Performance

# Summary

This paper presents information from the Trinity House solar model and the Cerema solar model, for comparison with the IALA solar model during EEP2 WG2. Given the reference load information given in appendix 1, the indication is that 1 battery bank and 14 solar modules are required.

## Purpose of the document

Forward to WG2 for information to their on-going work.

## Related documents

ENG1 Working Paper 11.2.3

Guideline 1039

# Background

During EEP1, Task Group 2 identified that a review and combining of a number of guidelines on power systems is needed. This was to start with a comparison of solar sizing techniques to be able to update the IALA calculator. Members were requested to use their own calculators and submit the results for comparisons and discussion. Trinity House was to provide the load, location, battery and solar module data.

# Discussion

## Trinity House

The load data detailed in Appendix 1 was applied to the Trinity House solar model. The output indicating that to allow for a 21 day period of no sun, the system needs to have 14 solar modules and 1 bank of batteries as detailed in Figure 1 below.



1. Solar Model Summary
2. Solar Model

|  |  |
| --- | --- |
| Trinity House Solar Model (embedded) |  |

## Cerema

Below are the different data sheets that the "Magelan" calculator produced.

We calculated with different type of loads, specially a Fog signal at 1% and 5% and Racon and AIS for 100%.

We calculate in two different way:

* with the actual battery 1363 Ah, we find between 13 and 15 days of autonomy battery.
* with a 21 days we have the capacity of the battery

With your informations of 21 days without direct sunlight, we find different type of battery:

* 5% fog signal and Racon AIS: 2155 Ah and 1599 Wcc of solar panel
* 1% fog signal and Racon AIS: 1934 Ah and 1436 Wcc of solar panel
* 0% fog signal and Racon AIS: 1869 Ah and 1388 Wcc of solar panel

1. Cerema Solar Model Output

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |

1. Solar Model Data
2. Back Ground Information
3. Mumbles Lighthouse



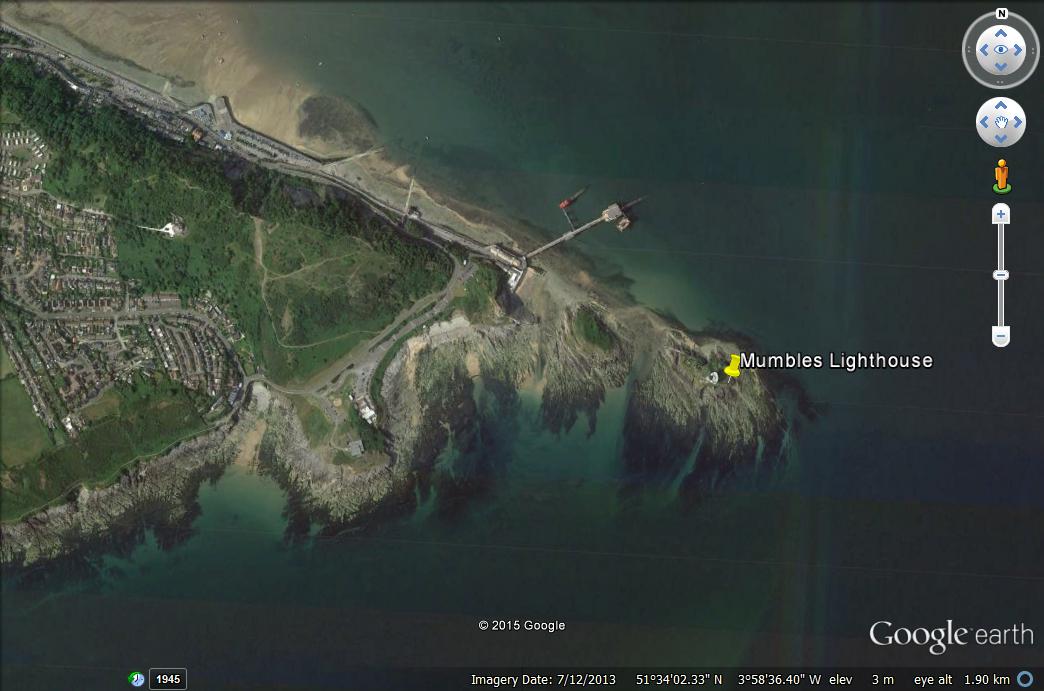
This is a new AtoN system to be installed at a historic lighthouse known as Mumbles.

Location - Mumbles Head, West side of Swansea Bay, SA3 4JT

Lat: 51º 34.009 N

Lon: 003º 58.268 W

Solar Panel Type: Solanova SOL 58D - 58W panel – See data sheet



1. Google View

Solar Panel orientation: South facing inclined at latitude +15° = 67°

Battery type: Sonnenschein A602/1250 Gel battery type 10 OPzV 1000 = 1248Ah @C20 to 1.80v @ 20°C = 1363Ah @ C100 to 1.80v @ 20°C – See data sheet

1. Data Sheets

|  |  |
| --- | --- |
| Solar Panel Data Sheet |  |
| Battery Data Sheet |  |

1. System Concept
2. Effective Loads

Main Light

Navigation Light Control System

Distribution

Solar Modules

Charge regulator

Cyclic control cubicle

Visibility detector

Fog Signal Emitters

Fog Signal Driver

Racon

Battery

AIS

1. System Block Diagram
   1. Main Light

LED Lantern, 15nm white light with Flash Character of Group Flash 4 every 20s (0.3s flash length).

Power during a flash = 290W

Power during the eclipse = 0.4W

Effective power = 290 x (4 x 0.3/20) + 0.4 x (20 - (4 x 0.3))/20 = **17.77W (Night time & Fog)**

* 1. Navigation Light Control

Continuous load, day and night = 1**.81W**

* 1. Charge Regulator

Continuous load = **2.7W**

* 1. Fog Signal System

The Fog Character for Mumbles is 3 x 1s blast ev 60s, giving a Duty Cycle of 5.0%.

Fog Signal & Driver during the blast = 141.6W

Fog Signal & Driver during the eclipse = 0.29W

Effective power = 141.6 x (3 x 1/60) + 0.29 x (60 - (3 x 1))/60 = **7.35W (During Fog)**

* 1. Visibility Detector

On for 3 minutes every 20 minutes

Power when on = 7.9W

Power when off = 0W

Effective power = 7.9 x (3/20) = **1.185W continuous**

* 1. Cyclic Control

Continuous load = **1.725W**

* 1. Racon

Continuous load = **1.4W**

* 1. AIS

Continuous load = **1.2W**

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
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