EEP20 Input paper

Agenda item 14.2

Task Number -

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NAVGUIDE updates Section 7

# Summary

This paper outline a number of changes to various parts of section 7 of the NAVGUIDE 2010 effecting changes in technology, operating practices and minor errors.

## Purpose of the document

This paper proposes some minor updates to section 7 of the NAVGUIDE 2010 which need to be reviewed by committee members at EEP20, prior to approval.

## Related documents

NAVGUIDE section 7 (P139 to 146)

# Background

Following a brief discussion with WG3 chairman at EEP19, this section of the NAVGUIDE has been worked on inter-sessionally as part of the review for NAVGUIDE 2014.

# Discussion

Following review of section 7 of the NAVGUIDE 2010 the following are proposed changes or observations.

## Page 139 - Section 7.1 Types

This section contains a reference box as follows:

**Refer to IALA publications:**

*IALA Guideline 1067-0 on Selection of Power Systems for Aids to Navigation and Associated Equipment.*

*IALA Guideline 1067-1 on the Total Electrical Loads of Aids to Navigation.*

*IALA Guideline 1067-2 on Power Sources.*

*IALA Guideline 1067-3 on Electrical Energy Storage for Aids to Navigation.*

I note on the IALA web site that - *IALA Guideline 1067-0 on Selection of Power Systems for Aids to Navigation and Associated Equipment* does not open correctly.

## Page 140 - Section 7.2.1 Solar Power (photovoltaic cell)

3rd bullet point should be amended as follows:

* slight deterioration in power output over its life; and

and the following sentence changed as follows:

When used to power a light, the battery recharging process is separated from the operation of the light source so that the recharge voltage can be optimized without detriment to lights operation.

## Page 140 – Table 24 – Silicon solar cell technology

The 3rd section of the table to be changed as follows:

|  |  |
| --- | --- |
| Thin Film Technology | Are made by depositing thin films of silicon directly onto a glass or stainless steel  substrate a thin slice cut from a single large crystal of silicon.  The cell has a lower efficiency than either of other technologies but can be multi-layered  for enhanced performance. Problems have been found with lifetime of these cells. |

## Page 141 – 7.2.1 Solar Power (Photovoltaic cell) - Types

Amend the 2nd paragraph as follows:

In addition to the silicon cell technologies, there are two optional module configurations based on the numbers of series connected cells. The standard module normally has 36 cells in series to give an open circuit voltage of around 20 volts. For all battery charging applications, a voltage (charge) regulator is considered essential.

Remove paragraphs 3 and 4 if none of the committee members use self regulating solar panel systems.

Add the following paragraph:

Modern developments in electronics have allowed new voltage (charge) regulators to be developed that use maximum power point tracking (MPPT). This ensures that they operate the solar module at a level to obtain the maximum power, for any given level of irradiance. This operating level is independent to the battery charge voltage level. This technology can lead to up to 30% more output than would be achieved with conventional voltage regulators.

## Page 141 – 7.2.2 Wind Energy – Aids to Navigation Application

Changes as follows:

Wind generators (or wind turbines) have been used by a number of IALA Members to power aids to navigation. The most popular type were horizontal axis machines with a two or more bladed (propeller type) turbine. The maintenance requirements arising from the number of moving parts of a wind generators and the susceptibility to storm damage, has limited the use of wind generators.

## Page 141 – 7.2.2 Wind Energy – Installations

Delete the final bullet point,

* and replace with the following:The operation of wind generators to power aids to navigation needs to take into account the impact it may have on any environmental factors associated with the location, such as; flora, fauna, birds, etc.

## Page 142 – 7.3.1 Principal types

Amend the 2nd paragraph as follows:

The lead acid type is generally preferred because of its lower cost and higher energy exchange efficiency (up to 95% vs. 80%) than the nickel cadmium battery. However, the nickel cadmium battery can operate in lower temperatures and for a greater number of deep discharge cycles.

And the 3rd paragraph as follows:

Recently, new secondary battery technologies have appeared, including lithium batteries, nickel-metal-hydride (Ni-MH) batteries and lithium-iron phosphate (LiFePO4) batteries. All of which offers lower weight and longer life span from more charge-discharge cycles, for a given capacity.

## Page 143 – 7.3.1 Principal types – Lead Acid

Amend the 1st paragraph as follows:

The basic form of this battery uses a lead dioxide positive plate and a pure lead negative plate immersed in an electrolyte of dilute sulphuric acid. These were originally wet or flooded cells. However in recent years various forms of “sealed” cell batteries have become available and are quite common in aids to navigation applications.

## Page 144 – 7.3.2 Primary Cells – Sea-water Cells

Amend the 3rd paragraph as follows:

Copper was selected for the cathode material because of its inherent antifouling properties. A magnesium anode was considered environmentally acceptable because it is a naturally occurring element of sea water. The cell produces a voltage of 0.8 to 1 volt under load.

And the 4th paragraph as follows:

ADC-DC converter is used to raise the voltage to the level required by the load as it is impractical to use more than one cell due to the current leakage that would occur.

## Page 144 – 7.3.3 Internal Combustion Engine/Generators – Diesel Generators

Add to the 2nd paragraph as follows:

The generator capacity to support the operational and domestic loads of a standard lighthouse is in the range of 10 to 30 kW. Diesel generators of this size are expected to consume around 0.4 litres/kWh. However, smaller generators in the range of 2 to 5kW, combined with batteries and inverter-charger systems are now available to meet this variable load demands.

## Page 145 - 7.3.3 Internal Combustion Engine/Generators – Fuel cell

Amend the 1st paragraph as follows:

This is a solid-state device that uses a catalytic process to oxidise fuel to generate an electrical current. A common fuel is Hydrogen, or Hydrogen rich fuels such as Methanol. It can be thought of as a continuously fed battery ideally preferring a constant load.

And the 2nd paragraph as follows:

The commercial fuel cell is still adeveloping technology and at this stage is an expensive power source40. Aids to navigation applications are likely to be limited to situations where solar energy (photovoltaic) is impractical due to limited insolation or icing conditions.

Add a 4th paragraph as follows:

Fuel cells do present an environmentally suitable solution, as Methanol can be manufactured from sustainable sources and the byproducts of the generation of electrical energy is heat and water.

## Page 145 - 7.4.1 Electrical Loads

After all the bullet points add the following reference:

**Refer to IALA publication:**

*IALA Guideline 1011 On A Standard Method For Defining And Calculating The Load Profile Of Aids To Navigation*

## Page 146 – 7.5 Non-Electric Energy Sources – Acetylene

Does anybody use Acetylene for aids to navigation, given the use of solar and the difficulties in the manufacture of the gas mantles? If not, then this section can be removed and Acetylene removed from table 23 on page 139.

## Page 146 – 7.5 Non-Electric Energy Sources – Propane

Amend the 1st paragraph as follows:

Propane gas (C3H8) has been used as an alternative fuel to acetylene, particularly in buoys. Although propane has to be consumed in an incandescent mantle burner to provide a white light, it has several advantages over acetylene:

# Action requested of the Committee

The Committee is requested to: (Body text)

1. Are to consider the above amendment and adjust as they see fit.
2. Approve the final amendment.