# IALABATT / IALALITE 2008

## 30 September – 3 October, 2008

## Copenhagen, Denmark

## Final Report

### Executive Summary

The 6th IALABATT / IALALITE Workshop was held from 30 September to 3 October 2008, at the Radisson SAS Royal Hotel, in Copenhagen, Denmark.

Sixty two delegates from twenty three countries attended the workshop.

The workshop began with a series of presentations on developments in power sources and applications of modern light sources. A table top exhibition permitted the display of new and innovative technologies by eight industrial members.

Subsequently, delegates discussed power sources and application of modern light sources in separate working groups. They reviewed existing IALA guidance documents and developed new ones.

The workshop provided an excellent opportunity for delegates to discuss issues concern and common interest, in both formal and social settings.

The workshop identified 15 conclusions and 10 recommendations.

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# 1 INTRODUCTION

The IALABATT / IALALITE 2008 workshop was held from 30 September – 3 October, 2008, at the Radisson SAS Royal Hotel, in Copenhagen, Denmark. 62 delegates from 23 countries attended the event.

The four day event attracted representation from various national administrations and IALA Industrial Members. A table top exhibition displaying some of the products available from IALA Industrial Members, was held in parallel with the workshop.

# 2 DAY ONE – OPENING AND PRESENTATIONS ON POWER SOURCES AND APPLICATION OF MODERN LIGHT SOURCES

# 3 SESSION 1 - OPENING OF THE SEMINAR

The session was chaired by Ómar Frits Eriksson, Danish Maritime Safety Administration (DaMSA), Denmark.

## 3.1 Opening remarks

Ómar Frits Eriksson welcomed everyone to the sixth IALABATT / IALALITE workshop. He said he was delighted to see so many attending and noted that there were many known and new faces. He said he was looking forward to drawing on their expertise. Ómar Frits Eriksson stated that the workshop had been organized by his administration i.e. DaMSA. He then invited Svend Eskildsen, Director General of DaMSA, to open the workshop.

## 3.2 Welcome by DaMSA

Svend Eskildsen, Director-General of the Danish Maritime Safety Administration, gave the following address:

Mr Torsten Kruuse, Secretary General of IALA, members of IALA secretariat, guest speakers and IALA international delegates, you are all most welcome to Copenhagen.

Over the course of the next few days, (and nights) in addition to your workload here, I hope you will have the opportunity to enjoy the hospitality of the city. I warn you however, that here in Copenhagen, pleasure can very easily interfere with work!

I have great pleasure in opening this workshop. I think of IALA Workshops as one of the main workhorses of the organisation. It is at sessions such as these that the practical elements of the various subjects are discussed and analysed. It is a result of this direct process that guidelines and recommendations are formed and fed back to the various committees for incorporation in the IALA Publications. Such Guidelines are of course the blueprints for marine activities.

The theme of the workshop: “Sharing Knowledge of New Technology” is really one of the core processes of IALA as a truly International Organization, shaping and setting standards for the future.

This workshop in particular will examine advances in power supplies and optical systems for Aids to Navigation. You will be looking closely at topics like Super Capacitors, Light Emitting Diodes, Conspicuity of Lights and other such topics which I am even unable to pronounce. Indeed, the ever increasing background lighting in harbours leading to reduced Conspicuity of marine signal lights, is a major concern of Aids to Navigation Authorities. I don’t expect you to solve this problem completely at this workshop, but hopefully you will shed some light on how we should proceed on this matter.

I wish to thank the IALA Steering Committee, the IALA secretariat, as well as my own Aids to Navigation Department for the organisation of this workshop. I know that there is much work and effort involved in organizing such workshops, and in this case it was Ómar Frits Eriksson who "volunteered" to do the job, ably assisted by Karoline Lundholt and Erik Berthel….or was it the other way around? So, Omar, Karoline and Erik, many thanks for your hard work, making this workshop come true.

I wish you all well in your workgroups and your deliberations, conclusions and recommendations. The vision of the Danish Maritime Safety Administration is that "our waters are the safest in the world to navigate". The theme of this conference is "Sharing Knowledge of New Technology". I firmly believe that proper utilization of opportunities provided by New and Emerging Technologies is the main future enabler for increased Safety of Navigation. Therefore this workshop makes perfect sense to me and I have high expectations to the outcome of your deliberations.

On behalf of the Danish Maritime Safety Administration, IALA and Seafarers in general, I wish to thank you for your continuing contribution to Safety of Navigation at Sea.

I hereby declare this workshop opened. Thank you.

### 3.3 Welcome by IALA

Torsten Kruuse, Secretary-General of IALA, thanked DaMSA for their support in planning and preparing for the workshop. He said that this was the best attended IALABATT / IALALITE workshop (out of the six held). He felt that the workshop programme established by the steering committee was very interesting, and perhaps that was what had attracted so many to the event.

At the first IALABATT workshop, only battery issues were discussed. But, since then, issues relating to light had been added to the programme. The long life of components such as wave generators, solar cells and LED was giving rise to a lot of efficiencies and consequently saving costs for aids to navigation service providers. He added that as aids to navigation authorities moved towards increased awareness of their carbon footprint, their obligations in this regard would increase.

Torsten Kruuse noted that there were a large number of documents to be dealt with at the workshop. He hoped that many of these would be brought up-to-date and finalised, so that they could be presented to the IALA Council for approval in December 2008.

Torsten Kruuse thanked the industrial members of IALA, who, he said has supported the workshop by displaying new products. He also thanked DaMSA for being very forthcoming in their offer to host the workshop. Finally, he thanked Ómar Frits Eriksson and his team for the excellent arrangements.

Torsten Kruuse concluded by wishing delegates a very good working week and said he was looking forward to seeing the outcomes on Friday.

### 3.4 Health and Safety and Administration Brief

Mike Hadley, Technical Co-ordination Manager, IALA, provided information on health and safety matters and made various administrative announcements. He also introduced DaMSA staff involved in supporting the workshop (Karoline Lundholt and Erik Berthel). He advised that a paper copy of the draft workshop report and USB memory stick (with all workshop material) would be provided to delegates on Friday 3 October.

He also provided information on accessing the internet via the hotel's WiFi network and on accessing an FTP server established by DaMSA to distribute and share documents during the meeting.

# 4 SESSION 2 – POWER SOURCES

The session was chaired by Ómar Frits Eriksson, Denmark, who reminded delegates of the objectives of the workshop, which were:

- Provide a forum for delegates to exchange information on the developments in and practical application of the latest light and power technologies, as applied to Marine Aids to Navigation.
- Provide a platform for sharing experiences and identifying possibilities to improve light efficiency and reliability
- Assist IALA in reviewing and updating its guidance documents on lights and power systems

## 4.1 Update on new battery technology (Joakim Aspe, CellTech, Sweden)

Joakim Aspe began with a demonstration of a model (toy) helicopter, flying using a small solid lithium polymer battery, which was developed in 1996. He briefly covered the history of battery development, including how battery weight has reduced. Development continues as lead acid batteries are being replaced. He then explained that production is becoming more involved in how batteries work and it is no longer just + and -. He introduced lithium iron phosphate batteries as an emerging power source in a number of applications, because of its significant advantages - stability, high discharge rate, long life cycle, rapid charging and environmental friendliness. This was followed by the explosion of some battery myths - battery vehicles are slow, battery vehicles are small and ugly, short electric vehicle driving distances, batteries have a short life time (will now outlive the application they are powering), slow battery charging. He concluded by saying that there is considerable interest in batteries with industry pressing ahead.

## 4.2 Presentation on super capacitors (Erik Schaltz, University of Aalborg, Denmark)

Erik Schaltz passed examples of supercapacitors amongst the delegates before outlining their characteristics and benefits. He explained that supercapacitors can be seen as a bridge between batteries and film capacitors. Erik then outlined the basic principles on which supercapacitors work, stressing the need for cell balancing. He then discussed self-discharge, which means that supercapacitors can only be seen as secondary power sources, and the need for a bus connection to get the best performance. He then covered the ripple intolertance disadvantages and frequency response of supercapacitors before looking at some applications of their use, such as in hybrid mains and fuel cell, uninterruptible power supplies.

## 4.3 Overview of solar panel technologies (Søren Poulsen, Danish Technological Institute, Denmark)

Søren Poulsen began with an introduction to the Danish Technological Institute and then introduced the principle of the solar cell. Solar converter, its benefits and development history, mentioning how space activity had been an initial driver but now alternative power source requirements had taken over. He then briefly covered some of the applications. Turning to solar cells as a power supply for AtoN he listed some suggested user requirements:

- Robust;
- Reliable;
- High autonomy;
- Long service intervals;

- Low maintenance;
- Long lifetime;
- Environmentally friendly; …. and of course
- Low price.

Søren then described the various types of solar cell technologies, with crystalline silicon having almost 90% of the current market. However, this involves a complicated production process and is expensive, necessarily incurring high wastage, which is driving research into alternative solar cell technologies, such as thin film, flexible developments as, dye-sensitised amorphous silicon, CI(G)S, CdTE and organic. It was stressed that many of these developments were still at the research stage but some were identified as having potential for use with AtoN. Søren then showed a comparison of efficiency before turning to application trends, where grid connected systems are the current driving force. It was stated that uptake of the technology is dependent on public support, as the technology cannot, at the moment, compete with conventional power technologies. It was shown that the cost of solar cell technology is forecast to reduce. This led to the mention of some market place indicators, showing how interest in solar cell technology may expand, and current research trends. Søren ended with the following predictions:

- The PV market will continue huge growth in a foreseeable future … ***but*** the market is still extremely dependent on public support for grid-connected systems;
- Prices will come down considerably;
- Many factories are in the pipeline;
- Several companies are addressing present bottlenecks in Si-supply;
- Thin film production is ramping up to real mass production;
- Improvements in technologies and production processes, not quantum jumps but many smaller steps;
- Many new technologies on the way, but only few have really moved into mass production: Mono- and polycrystalline silicon, amorphous silicon, CIS, CdTe;
- The thin film technology, CdTe, though mature and attractive in price, not relevant for AtoN due to the content of cadmium;
- Flexible high quality cells (a-Si or CIS) commercially available, but expensive!
- Dye cells and organic cells promising in a cost perspective but in research stage.

### 4.4 Vertical Axis Wind Turbines (Risto Joutsinemi Oy Windside Production Ltd, Finland)

Risto Joutsinemi commenced by introducing his company, explaining that it is working in a niche market, Antarctica. He then illustrated some of Windside's products, which showed the harsh conditions in which they function, including buoys in northern Norway, typhoon prone Japanese waters and the Sahara, where a common denominator is difficulty of access. Various marine applications were illustrated before the advantages of Windside's turbines, including greater efficiency, silent and environmentally friendly operation and planned long life-span were stated. The presentation ended with itemisation of current Windside products and their classification, which depends upon the user's requirements.

### 4.5 Fuel cell – Direct Methanol (Morten Christensen, SABIK, Germany)

Morten Christensen started by stating that using methanol to generate electrical energy was the aim. This process had an efficiency of 30% (the rest of the energy being lost as heat). Water, diluted with 3% methanol was used as fuel. It was quite a simple system, which therefore offered reliability and price advantages.

Typically, one litre of undiluted methanol generated 110 Ah of load (at 12V). With the aid of a block diagram, Morten Christensen explained how methanol was used to generate electric energy. A by product of the fuel cell was water – which was partly recycled to generate new methanol diluted water for fueling. He then listed the many of the advantages (weather independent, power on demand, no self discharge, easy to increase capacity etc.) and disadvantages (moving and rotating parts, reduced stack life time (3000 to 6000 hrs)) of these fuel cells. Another disadvantage was that this was new, and in some ways, unproven technology.

In relation to integration with existing aids to navigation, Morten Christensen said that these were often integrated with solar cells, particularly in high latitudes. Also, a battery was always required to start up and then to support the fuel cell (air pump). So, a direct methanol fuel cell was best utilised as a back-up system, at this point.

Morten Christensen then gave some facts and figures on a demonstrator that was being built for Germany. This would be installed on a remote lighthouse site at the end of 2008.

In closing, he said that direct methanol fuel cells were not as far developed as hydrogen fuel cells. However, good progress was being made. The technology was available commercially for leisure activities, but not yet for applications where high reliability was required.

### 4.6 Fuel cell applications (Michael Tausch, IdaTech, Germany)

Michael Tausch began by outlining the profile of the company, which he said, was the leader in the development of integrated fuel cell systems for portable power, critical back up power and remote power applications.

He listed the ‘old’ power requirements for lighthouses (230 V, power 1 to 5 kW and a lamp life of 500 hrs). Now, the task could be carried out by a 100W to 1 kW power source, 12 or 24 V voltage, and a lamp life of 10,000 hrs.

The disadvantages with wind turbines and solar-based back up batteries were high maintenance costs and low reliability. It was recognized that batteries were expensive to maintain and unreliable. So, a hybrid was the solution. A fuel cell was a simple electro-chemical process. He then explained the chemical reactions and added that this generated 45% electricity, 45% heat and water.

He stated that for critical power applications, fuel cells were the clear leaders. He then outlined their many advantages – reliability, maintenance, weight, size, life expectancy, and hazardous emissions. He then indicated that a freely available program (Homer) is available from the internet, which allows user to calculate their system requirements, given the specific parameters that they input.

With the aid of a block diagram, Morten outlined a typical fuel cell back-up power system. He then listed the many outdoor applications where fuel cells could be used. He also showed a comparative table in which fuel cells, photo voltaic cells, generator sets and wind power were rated against various criteria. He concluded by stating that a fuel cell system with battery back-up was the best (and the most reliable) combination.

The URL for Homer is https://analysis.nrel.gov/homer/ and Michael Tausch is happy to answer any queries delegates may have about its use.

### 4.7 Wave hub generator (Martin Wickett, WITT, France)

Martin Wickett said the WITT (Wave Input to Torsion Transfer) was a new concept in energy collection. The WITT could be built in many sizes, depending on the application. It could collect energy from the movement of water and wind, and so was suited for installation on buoys. The first working prototype would collect energy from a buoy (a new style of buoy, with an offset anchorage), with excess energy being stored for later use.

The WITT could provide power to offshore installations by the buoy and gantry method, or a triple buoy configuration, in triangular formation (to provide a stable platform).

Martin concluded by stating that the low centre of rotation wind turbine was ideal in situations where swirling wind conditions did not make the use of conventional wind turbines viable.

### 4.8 Questions

In response to a question about where tellurium, as used in lithium batteries, is mined and if it could become a scarce resource, Joakim Aspe said that he was not sure but confirmed that it is a rare material.

When asked if the water tank in a fuel cell freezes in winter, Morten Christenson said that the water can freeze and that the fuel cell will need electrical energy to heat up the water but when the cell is working it is very efficient at keeping the tank above freezing.

When asked about cost, Michael Tausch said that IdaTech's 250W fuel cell is 7000 dollars per system per user.

Joakim Aspe was asked if he was predicting the demise of lead acid batteries and the rise of (lithium) ferrous phosphate ones. He said yes but acknowledged concerns about risks associated with lithium, adding that there was now increased use of technology, with batteries, that use built in circuits to protect against overcharge / discharge and high temperatures

Price wise, despite being new technology, prices are decreasing as uptake increases. Currently, it is roughly 7 x the price of lead acid batteries but expected to reduce by 50% in 5 years. However there is benefit from an increased number of charge cycles (3,000 cf 300 in the case of lead acid batteries) which implies overall savings. Life cycle and consumption need to be tested and the answer is currently unknown.

In response to a question on whether $LiFePo_4$ batteries had been tested with solar panels, the presenter replied in the negative. As regards disposal, the presenter advised that, as there were no heavy metals (such as lead), there were no major issues to consider.

Søren Poulsen responded to a query about the comparison of supercapacitors and conventional battery technology by saying that they were better than lead acid, with no risk of freezing, just a temporary loss of capacity, which returns as temperature rises.

In a further question to Joakim Aspe on the operating temperature range for lithium-ion batteries, he responded that they worked very well in high temperatures (up to 45°C), but in low temperatures, of say -10°C, there was 60% less performance than lead acid batteries. SABIK confirmed that it had conducted similar tests.

When questioned about efficiency and power production, Risto Joutsinemi said that the efficiency of his vertical axis wind turbines is 33%. However, he considered that the efficiency was not as important as the quantum of energy produced annually. He then confirmed that, as the turbines produce AC, an AC/DC converter is required, the separation of which from the turbine is dependent on the voltage requirement.

Asked if there are any siting limitations for vertical axis wind generators, Risto Joutsinemi replied that there were none and that siting, for instance near cliffs, is not a problem. The only siting limitation is that the mounting base for the turbine be strong. He was then asked about any maintenance requirements, given the 10 year guarantee and claimed 50 year life-time. He

replied that annual lubrication is required but that this can be automatic or manual; automatic lubricant attendance intervals can be 3 – 5 years.

When it was suggested that the predicted efficiency loss of supercapacitors due to leakage looks high, over time, Erik Schaltz accepted that this is a disadvantage but pointed out that this is not a problem if the intention is to use them only for short periods as a back-up energy storage system.

Questioned about the lifespan of a fuel cell's membrane, Morten Christensen said that the lifetime continues to increase, having recently risen from 1000 to 3000 hours it was now 6000 hours. Michael Tausch added that in a low temperature laboratory test IdaTech had achieved 10000 hours, which could be practically adjusted to, say, 5000 hours in the field. However the lifetime achieved will differ from application to application.

Asked about the expected annual fuel consumption when running fuel cells in a lighthouse, Michael Tausch said that this depends on usage but gave a figure of 450ml per hour for the 250KW cell. He said that the Homer program, mentioned in his presentation, can be used to calculate and optimise the performance of hybrid systems using fuel cells. Morten Christen volunteered a figure of approximately 150 litres of methanol per year

In response to a question about $CO_2$ emissions Michael Tausch said that there were no $CO_2$ emissions from Hydrogen fuel cells. However there is a small emission from a Methanol fuel cell.

Following a question about the perceived limited availability of lithium, which presumably affected the price, Joakim Aspe said that the limitation is on factory production capacity and not the source of the material. Despite this, he still believed lithium is the way ahead.

Asked if there was any certification for fuel cells in hazardous area operations, Morten Christensen said no, following which Michael Tausch said that some testing had been done but nothing specific for offshore.

When it was commented that the rolling motion the WITT generator requires is contrary to what is required for AtoN lights and so was there any chance of vertical rather than rotational transformation? Martin Wickett said possibly but pointed out that the three buoy configuration shown may already suffice, with its existing power output being better than for solar power.

The Chairman closed the session by thanking the speakers for their presentations and the delegates for their questions. He then asked the speakers to come forward to receive a token of the workshop's appreciation.

## 5 SESSION 3 – APPLICATION OF MODERN LIGHT SOURCES

The session was chaired by Seamus Doyle, CIL, Ireland. He opened the session, saying that he was aware of the wealth of experience available but also that there were a number of presentations to run through. Delegates were, therefore, advised to make a note of their questions, which could be posed at the end of the session. He further advised that some presenters were only available during this first day.

### 5.1 Latest development in LED technology (Peter Baasch, Future Electronics, Denmark)

Peter Baasch first introduced his company, indicating that it is already involved in the area of AtoN. He then briefly described the working of an LED, comparing it with Luxeon, before describing the spectral distribution of LEDs and showing an LED CIE chart. He went on to describe the associated temperature issues, with the light output degrading with increasing temperature, wavelength decreasing and forward voltage decreasing. The benefits of introducing phosphor converted colours were stated, again temperature was mentioned as an issue, with the lifetime of the LED decreasing as temperature rises. This was followed by the introduction of a web based tool to permit the prediction of reliability under specified

circumstances. The benefit of introducing a thin film flip chip (TFFC) was described and the developments that flowed from it. The planned introduction of Lumiramic was described, before a brief mention of the current product range. It was stated that the price of LEDs is reducing and that this trend is expected to continue. Future expectations included:

- Lumen / $ will decrease;
- Lumen / W will increase. (max. ~ 330 lm for white);
- Intensity / LED will increase;
- Higher operating temperatures;
- The spread in white LEDs will decrease;
- More phosphor converted products;
- Haitz' law: pricing down 10x and intensity 20x up every decade.

### 5.2 Latest development in modern non-LED light sources (Viggo Bremner, Phillips Light, Denmark)

Viggo Bremner said that Phillips is constantly developing new lamps, looking to produce better and more efficient ones. Although current products are not necessarily aimed at AtoN there are expected to be some applications in the area. He began with Cosmopolis, which comes in a wide variety of sizes, describing its improved characteristics and specifications. He then went on to describe a recently released medium wattage lamp, which is already being further improved, being more efficient and what was described as a crisp white light and better colour rendering, it also performs well to the end of its working lifetime. Having stressed the 'green' credentials of the company, he averred that the future lies with LED and then went on to describe a claimed breakthrough in energy saving, with the aid of a practical demonstration. This was followed by a demonstration of an 'incandescent' LED lamp.

### 5.3 Varne lightvessel high intensity red LED navigation light (Peter Kelly, THLS, UK)

Peter Kelly began by saying that the start of the project described had involved considerable dialogue with the Trinity House navigation manager, to ensure coverage of the user requirement. The potential savings in converting a diesel driven system to one employing a solar powered LED light were emphatically described. After which, the user requirements were outlined. The geography around the Varne bank was described, together with the intensive shipping in the area. A short video clip of the type of light used was shown. The absence of loom from an LED was noted, which led to a decrease in the timing characteristic of the light and a reduced intensity light being added. The battery usage and specification were described, before a more detailed specification of the light was given.

### 5.4 Vertical divergence of lights (Roger Lewis, THLS, UK)

Roger Lewis said that he had a two part presentation. He started with vertical divergence of lights, which he hoped would have a direct impact on the deliberations of the working group(s). A clip of a buoy in a seaway was shown, the movement of which had been carefully analysed. The results of the analysis were briefly illustrated, and it was indicated that this had led to mention of narrow and wide skirted profiles. The analysis of range and character recognition was described, which had led to identification of benefits in character recognition in a wide skirted design, albeit with a reduction in range. Turning to the introduction of gimbal and pendulum arrangements, Roger described the improvements in range achieved and the trials that this had involved, producing a system redesign. The need to separate the system and lightvessel periodicity of movement was discussed.

### 5.5 Conspicuity of lights – a case study (Malcolm Nicholson, GLA R & RNAV)

Malcolm Nicholson started by saying that he could now give a case study based on the methodology that he had expounded at IALABATT / IALALITE 2004. First he outlined the geography and setting of the trial site – Kinnaird Head, Scotland. Explaining that the impetus for the work was comment from mariners that they could not see the light. Malcolm then ran through the theory flowing from IALA 1051 on the Provision and Identification of AtoN in Built-up Areas, introducing the factors in improving conspicuity, before using a video clip to illustrate the work undertaken, including the effects of varied background lighting. He went on to point out that colour contrast is easily discernable to the eye and this characteristic can be usefully employed. The practical trials were outlined, leading to a description of the solution derived and the results achieved. This underlined the usage of the IALA guideline

### 5.6 Conspicuity Theory and Practice (Hugh Barton, Opti Consulting, UK)

Hugh Barton said that he could not cover all aspects of conspicuity but would address five points, starting with what is conspicuity, saying that its assessment has, traditionally, been subjective, with no readily available units with which to describe it. This is something that affects all transport modes, with marine having an advantage in being able to use flashing characteristics. He then turned to 'can we measure conspicuity?' Drawing on experience in other forms of transport, Hugh ran through conspicuity factors associated with a light source, its environment and the observer. This led to consideration of 'what do we know about conspicuity', in which the dynamic range of the visual system was described, followed by discussion of spectral sensitivity and dark adaption. This was followed by a description of visual acuity as a function of background luminance, sensitivity to hue difference, which was supported by an extract from the CIE chromaticity chart and the problems of presentation that this introduces. Hugh then turned to consideration of the effectiveness of flashing lights. This was followed by some remarks on the work that has been conducted in the field of conspicuity, again drawing on experience in other fields of transport. The presentation was summarised as follows, with the proviso that forces of nature can still intervene:

- Conspicuity is relevant to signal lights for all transport modes;
- Conspicuity is a subjective term and may not be measured directly;
- The factors associated with conspicuity are increasingly well understood, such that conspicuity may be described and optimised in a given situation;
- Ongoing work on conspicuity should further inform our understanding of conspicuity issues.

### 5.7 New model to calculate effective intensity (Ian Tutt, GLA R & RNAV)

Ian Tutt stated that he would discuss the various models available to calculate the effective intensity of marine aids to navigation lights.

Ian stated that as soon as flashing lights were introduced in marine aids to navigation, the issue of effective intensity was raised.

He defined effective intensity and listed the different methods to calculate this. Ian Tutt also mentioned the merits and de-merits of the different methods (Allard, Modified Allard's Method, Schmidt-Clausen, Blondel and Rey etc.).

Ian Tutt then defined effective intensity, threshold of visual perception and luminous range – as defined by IALA and CIE. He added that what was needed was not effective intensity, but a means to measure apparent intensity at levels above threshold of visual perception. A proposed definition of apparent intensity was presented.

In conclusion, Ian Tutt stated that the Modified Allard's Method of CIE offered a means to calculate the effective intensity for all flash characters. However, marine aids to navigation

lights needed a different concept based on flash brightness above threshold. Work was underway in this regard.

### 5.8 Synchronised and sequential lights (David Jeffkins, AMSA, Australia)

David Jeffkins said that the purpose of his presentation was to provide an overview of a new draft guideline on synchronized and sequential lights. He said he was presenting on behalf of two intersessional drafting groups, one from the ANM committee and the other from the EEP commitee that had created the draft guideline.

David Jeffkins explained that new guidance was required because a) background lighting was an issue in ports and their approaches, b) technological advances now allowed synchronisation, and c) many trials had been conducted with successful results.

He stated that synchronisation enhanced conspicuity. Further, equipment costs had dropped and the accurate timing required for synchronisation was now available. He said that there were some key benefits of synchronised lights, the main one being increased conspicuity and improved spatial awareness for the mariner. He added that sequential lights provided directional awareness for the mariner.

David Jeffkins listed some of the considerations and limitations of synchronisation. He also listed the many methods available for timing – GPS and radio were the most widely used, he said.

David Jeffkins concluded by saying that the technology for synchronised lights was sufficiently mature and reliability had improved. However, a holistic approach, including an assessment of the navigational requirement, was required before implementing synchronised lights.

### 5.9 New LED sector light (Lars Mansner, SABIK, Finland)

Lars Mansner introduced an innovation in creating sector lights using omni-directional LED lights. This had been developed over the past few years, based on feedback from users. An omni-directional LED light, with a nominal range of 7NM, was used. The sectors were created in the factory (1-6 sectors) and the design uncertainty area was ‘better than 0.5 degree.’

Lars showed an example of one light with six sectors (3 white, 2 green and 1 red). This was used by the Northern Lighthouse Board. Test results in the GLA laboratory established that the worst case of measured angle of uncertainty was + or - 0.25 degrees. He further explained how the sectors were set up in the factory and how compliance with the IALA colour boundaries was carried out.

Lars Mansner concluded by stating that it was possible to create sectors in lanterns at the factory prior to their installation. The sector definition was clearer than when incandescent lamps are used. The sector uncertainty is equal that with good quality standard and shadow casting sector lights. He hoped this solution would resolve a number of issues with regular sector lights.

### 5.10 Spectral absorption over distances (Xavier Kergadallan, CETMEF, France)

Xavier Kergdallen’s presentation showed that because of the aerosol and molecular scattering effect, there is a modification to the spectral radiation of light, which is important at short wavelengths; aerosol scattering is more significant than molecular scattering. This why it can be shown that, with the IALA recommendation, luminous range is under evaluated in the red and white portions of the spectrum and over evaluated in green.

It was also mentioned that LED lights are better than halogen for white lights at long range.

### 5.11 Questions

Sven Kurin said that he had a strong objection to synchronising the character of leading lights. Whilst it is good for observer, when working, should one fail then the other should be extinguished, as mirroring of the single remaining light can be misleading. For this reason he asked that it be deleted from the draft guideline on synchronisation of lights. In response, David Jeffkins said that the reference in the presentation that "in some countries unsynchronised lead lights are considered to be unserviceable" was in relation to an example in Germany and he believed that they have remote monitoring systems in place that automatically disable the operating lead light in the event that one fails. This requirement could be included in the draft Guideline to cover this issue. It was then said that in the UK, characteristics of front and back lights can be differentiated but the problem is real and does require mitigating measures. It was added that Irish experience is that best effectiveness is synchronised lights with the same length of flash.

A question was then posed about the flash length of green lights on buoys for synchronised systems and it was noted that longer flash lengths for green lights should be used as short flash lengths can be confused for another colour e.g. white. In response, David Jeffkins said that this was not specifically mentioned in the draft guideline but could be included.

There is a known reduction in performance of blue light, with distance, compared with yellow light. However, it was said that the yellow light can be lost in peripheral vision but it was noted that the blue can still be detected. It was admitted that this is an odd effect but should be noted in discussions about direct vision.

Discussion then turned to the fact that GLA GPS jamming trials had affected light synchronisation. When experienced after light up synchronisation was retained but if experienced before light up, lights were not synchronised. Industry were requested to do something about this. Lars, Mansner said that better GPS jamming resistant receivers may be possible but could have an energy consumption penalty. This was generally supported but it was stressed that flasher clock accuracy is important. There was also a word of caution about being beware of delays in using GSM for timing synchronisation.

In response to this point, David Jeffkins said that Australia had no experience in GSM synchronisation. In his view, the most widely used methods of synchronisation are GPS and radio, with possibly eLORAN in the future.

Trinity House reported that in trials, some confusion had been experienced between red and green sequenced lights, especially in relation to the direction of travel. It was asked if it was possible, to use porthand buoy lights sequenced in one direction and starboardhand the other? It was said that Swedish experience is that it is best to use instantaneous synchronisation as opposed to sequencing. Alan Mitchener said that this was the first he had heard of a disorienting effect, resulting from the direction of travel. However, some customers, having tried the existing method, are coming back for more equipment. Sven Kurin then said that in his view, synchronised lights are better for bends than sequenced, to which it was added that South Africa used synchronisation based on grouping lights in a channel, such that blocks of lights within the group flash in synchronism, with the whole group flashing in synchronism at the beginning of the overall common period of the group

In response to a statement that the proposed Recommendation E200-2, notation of luminous range and intensity, guidance needed to be included on the required illuminance levels for the day-time use of leading lights, Malcolm Nicholson said that this would be taken into consideration.

When it was asked why the direct gimbal light arrangement, with pendulum, was used, as opposed to an earlier system using cables to a weight at the vessel's metacentric point?, Ian Tutt said that it was found that the tension on the wires was creating too much friction and the solution described was the method chosen to overcome this, within the given time constraints. Mike Card then added that the earlier system is hard to model mathematically, which presumably explained the appeal of the gimbal system.

The Chairman closed the session by thanking the speakers for their presentations and the delegates for their questions. He then asked the speakers to come forward to receive a token of the workshop's appreciation.

## 6 SESSION 4 – SETTING UP OF WORKING GROUPS

The Workshop Chairman opened this session by first running through the Conclusions derived from IALABATT / IALALITE 2004. He then addressed the resulting Recommendations, as follows:

1 IALA should develop guidance on aspects relating to the integration of both light and power sources into modular units (e.g. self-contained lanterns, reduction of light output in times of poor solar insolation).

*A draft Guideline on Integrated Power System Lanterns is expected to be completed at EEP12.*

2 IALA should work proactively with other international organizations to promote research and development on aspects of light and power sources for aids to navigation.

*This is an ongoing Task; CIE and others are attending the workshop. The Ad hoc Specialist Working group on Lights liaises widely and people within the IALA community bring their research results to IALA.*

3 IALA should develop a quality assurance process for documents created through the workshop process.

*IALA now usually runs Workshop outputs through one or more of the Technical Committees before submitting these to Council for approval.*

4 IALA should undertake to review the existing IALA Recommendation for the colours of light signals on aids to navigation, December 1977.

*Almost complete, with E200 being addressed at the workshop. This also falls within the remit of the terms of reference for the Ad hoc Specialist Working group on Lights.*

5 IALA should monitor and encourage current developments in rechargeable lithium battery technology which indicate the promise of extended maintenance free intervals for AtoN.

*Work is ongoing; the EEP committee monitors developments in battery technology in general.*

6 IALA should monitor the trend in power systems for AtoN towards PV solar, where developments in efficiency of the PV technology allow a greater use of this power source without increase in cost per watt.

*Work is ongoing; the EEP committee monitors developments in battery technology in general. A number of Guidelines are being reviewed and updated as part of the EEP work programme.*

7 IALA should monitor the trend towards short production life of PV solar products as this necessitates a careful consideration of the spares required over the full life cycle of these systems.

*Not much could be done about this recommendation. The AtoN segment is too small to be of significant influence in an area that is market driven.*

8 IALA should monitor Fuel cells as an emerging technology, noting that direct methanol systems show the greatest promise.

*Work is ongoing; the issue is a Monitoring item for the EEP Committee.*

9 IALA should develop guidance on the use of modern light sources, such as clusters of lamps or LEDs or single high-powered LEDs in traditional optics.

*Work on this topic is almost complete. A new Guideline on Modern Light Sources in traditional optics will be finalized by the end of EEP12.*

Malcolm Nicholson then introduced the plans for the work on E200, using a short presentation.

Then, based on preferences indicated by a show of hands, three working groups were formed. The Chairman stated that the objective of the working groups was to review and update existing IALA guidance documents, as indicated in the programme and, where required, develop new guidance. The three working groups formed were:

WG 1 Review of IALA Guidance documents on power systems, with chairperson Mike Card

WG 2 Review of IALA guidance documents on optical systems, with chairperson Lars Mansner

WG 3 Review of draft IALA Recommendation E 200, with chairperson Malcolm Nicholson

END OF DAY

# Working Groups in Session

## 7 SESSIONS 5 TO 12 – WORKING GROUPS

The working groups met over two days, Wednesday 1 September (Sessions 5-8) and Thursday 2 September (Sessions 9 – 12).

## 8 REPORTS OF WORKING GROUPS

Prior to the reports from the Working Groups (WG), the Chairman began by asking delegate's for their views about the flickering lights observed during the dinner cruise the previous evening. He also thanked Lars Mansner for his help in setting up the display.

Sven Kurin said that with little background lighting and with the lights being too close it was not a significant test. Seamus Doyle agreed, saying that with no background interference or other lights, the flickering light was easy to see but wondered how easy would it have been with other flickering lights to contend with. With regard to intensity, he felt that that the non-flickering light seemed more intense than the flickering. Ian Tutt said that the potential use of a set of synchronised / sequenced is to indicate the entrance or 'gateway' to a channel and that flickering helps this.

Kiru Coopoo said that there is some danger, at longer ranges, of seeing a double flash as a single flash and therefore causing misidentification.

The Chairman thanked the delegates for their comment, observing that it had been a demonstration and not a scientific test. He then showed what should have been observed, describing the duty cycle. He then said that being close to the lights was intentional, at the start, with the vessel then moving away to a distance of 1.3nm, by when the known irritation caused by flickering lights should have reduced but this had not been the case.

Hendrik Eusterbarkey, queried the amount of flickering on the lights observed, as he could not count the number of flickers. Lars Mansner said that the intensity of flicker is higher, being the same as for the first pulse.

Before asking the individual Chairs to present their WG output documents, the Chairman reminded the delegates of the workshop's objectives and said that this session's aim was to reach agreement.

### 8.1 WG1 – Review of IALA Guidance documents on power systems (Chairman: Michael Card)

WG1 was tasked with updating IALA documents to incorporate developments and practical applications of the latest power source technology, as applied to marine aids to navigation, taking account of the outcome of IALABATT IALALITE 2008 and with the scope and content approved at EEP10. The documents involved were:

- 1011 - Guideline on a standard method for defining and calculating the load profile of aids to navigation
- 1039 - Guideline on designing solar power systems for aids to navigation
- 1042 - Guideline on power sources used in visual aids to navigation - Replaces 1022
- 1044 – Guideline on secondary batteries for aids to navigation (replaces 1025 and 1002)
- Guideline for renewable energy sources for marine aids to navigation, Oct 1997

- Specification for solar photovoltaic systems, June 1988
- Practical notes on the use of mooring chain for floating AtoN (1989)
- Recommendation on the design of normal moorings E107 (1998)
- Guidelines on synthetic moorings 1024 (2001)

WG 1 comprised 23 persons, and was chaired by Mike Card. The participants represented competent authorities and industrial members from Argentina, Australia, Canada, China, Denmark, Eire, Finland, France, Germany, Korea, Norway, Poland, Portugal, Spain, Sweden, and the United Kingdom. The group therefore contained a reservoir of expertise in AtoN power systems derived from working in a wide range of geographical and environmental conditions.

The task of the group was to update the existing IALA documentation on power systems, and incorporate recent developments and latest technology, with an emphasis on practical applications in the AtoN field.

The expected output was as follows.

- Bring document 1042 up to date
- Merge into this document, the following
  - ✓ Document 1011
  - ✓ Document 1044
  - ✓ Document 1039
- Delete the two existing documents
  - ✓ Specification for solar PV systems
  - ✓ Guideline for renewable energy sources

With the approval of the Workshop chairman, the group decided to produce a suite of documents, modelled along the lines of the new e-200 series of IALA documents. These were to be on the following lines.

- 1042-0 Introduction to AtoN power systems
- 1042-1 Load calculations
- 1042-2 Power sources
- 1042-3 Energy storage

The work was carried out in the 1.5 working days allocated, and the recent technological developments, which had earlier been presented in the Workshop, were added to the existing documented knowledge.

The four documents which represented the work of the group, were thus available for final editing at EEP-12 which was to commence the following week. The group believed that EEP should be able to complete the checking and editing of these documents to enable them to be sent to Council for approval in December.

### 8.2 WG2 – Review and update optic system guidelines (Chairman: Lars Mansner)

WG2 was tasked with updating IALA documents to incorporate developments and practical applications of the latest light and power source technology, as applied to marine aids to navigation, taking account of the outcome of IALABATT IALALITE 2008 and with the scope and content approved at EEP10 and the work programme of EEP WG4. The documents involved were:

- 1041 – Guideline on Sector Lights
- 1043 – Guideline on light sources used in visual aids to navigation

- 1048 – Guideline on LED Technologies and their use in Signal Lights
- 1049 – Guideline on the Use of Modern Light Sources in Traditional Lighthouse Optics

The working group consisted of 24 delegates, who were split up in 5 breakaway working groups.

1 Guidance on Synchronized Lights (Chair David Jeffkins):

- Allen Mitchener;
- Chris Procter;
- Xavier Kergadallan.

The document was upgraded and considered to be completed.

2 Guidance on Vertical Divergence (Chair Roger Lewis):

- Aivar Usk;
- Tiit Palgi;
- Oleg Ivanov;
- Jörg Hagmeyer;
- Ivano Baschieri.

This document, initialized at IALA Workshop in Floating Aids to Navigation, was further developed focusing more on the vertical divergence than the floating platform. In the vertical divergence also fixed stations were included in the description. One main conclusion was reached:

- Current way of describing the vertical divergence needs an update. The document proposed an alternative way of presenting the vertical divergence of the light.

3 Guidance on Light Applications

This document is a new IALA document. The scope was to develop guidance on the focusing on the *practical* use of different light applications.

The workgroup decided to take a modular approach and create parts that covered the various light applications as individual sections of the guidance. Five light application areas were suggested, of which the sector light application was an existing document, but needed an upgrade.

a Part 1 – Buoy Lights

b Part 2 – Lights on Fixed Structures

c Part 3 – Sector Lights

d Part 4 – Traffic Signals

e Part 5 – Flood lights

The following breakaway groups were started:

a Buoy Lights (Chair Mike Sale)

- ✓ Vincent Roget;
- ✓ Enrique Bernabeu;
- ✓ Osamu Toyama.

Good progress was made and this document forms a good starting point for the practical guidance in using buoy lights.

b Sector lights (Chair Alistair Taylor)

- ✓ Kiru Coopoo;
- ✓ Raul-Vello Rebane;
- ✓ Fernando Romero;
- ✓ Manuel Santos;
- ✓ Rolf Holtet;
- ✓ Piotr Jesion.

The original document, dated 2004, required a major upgrade and the group was not able to complete this work within the time frame of this venue. The group estimated that the document would require at least a couple of days more work. Members of the group would be available for inter session work in order to further progress the document.

c Illumination of fixed structures (Chair Sven Kurin)

- ✓ Peter Dam

The group focused on the practical sides of floodlights, with the work being done in parallel with a similar paper that is under development within the EEP Committee as intersessional work. It is recommended that the two documents should be combined.

Time did not permit starting work on Lights for Fixed Structures and Lights for Traffic Signals.

### 8.3 WG3 – Review Draft Recommendation E200 (Chairman: Malcolm Nicholson)

WG3 was tasked with reviewing the draft E200 documents (Parts 1 to 5) produced by Specialist Working Group on Lights incorporating the following background documents:

- IALA Recommendation for the colours of light signals on aids to navigation, December 1977;
- IALA Recommendation on the determination of the luminous intensity of a marine aid to navigation light, December 1977;
- IALA Recommendation on the calculation of the effective intensity of a rhythmic light, November 1980;
- IALA Recommendation E-122 on the photometry of marine aids to navigation signal lights, June 2001 (as revised during IALABATT/IALALITE5, October 2004).

During the course of IALABATT/LITE 2004 it was identified that a number of documents relating to visual AtoN parameters was in need of updating. Over the past four years a specialist WG has developed an all-encompassing suite of documents that contains all the information relevant to visual AtoN. The format of which follows:

8.3.1 E200-0 Overview

This document gives an over view of the E200 series and directs members to the relevant document for their purpose. It requires updating to reflect the changes made leading up to and during the workshop.

8.3.2 E200-1 Colours of Light Signal

The content was agreed by first the WG and then the Workshop; no amendments are needed prior to seeking Council approval for publication.

8.3.3 E200-2 Notation of Luminous Range

The content was agreed by first the WG and then the Workshop, however the COUNCIL page needs to be finalised and approved by the authors (Larry Jaeger and Frank Hermann).

8.3.4 E200-3 Measurement

The content was agreed by first the WG and then the Workshop, however the COUNCIL page needs to be finalised and approved by the author (Ian Tutt).

8.3.5 E200-4 Effective Intensity

The content and proposals were agreed by first the WG and then the Workshop, however the COUNCIL page needs to be finalised and approved by authors (Ian Tutt & Larry Jaeger).

8.3.6 E200-5 Estimation of Optical Performance

The content was agreed by first the WG and then the Workshop, however the COUNCIL page needs to be finalised and approved by the author (Malcolm Nicholson).

In general there are one or two editorial and formatting issues to be ironed out, but there has been general approval of the content and style of this methodology of providing recommendations to members.

After once again thanking the WG Chairmen and their WG participants for much hard work during the breakout sessions, the Chairman closed the session by briefing the workshop on the next morning's technical visit.

There was then a brief plea for assistance in dealing with a serious problem being posed by cormorants to Swedish lighthouse operations.

END OF DAY

# Day Four – Closing of the Workshop

## 9 SESSIONS 13 & 14 – TECHNICAL TOUR

During the morning of Friday 3 October the delegates visited the Tycho Brahe Planetarium, where they attended a lecture on Cosmic Light and Shadow, given by Michael Linden-Vørnle, an astrophysicist. Afterwards there was an IMAX presentation our Cosmic Journey. This was followed by some refreshment whilst delegates were able to view an associated exhibition.

## 10 SESSIONS 15 – CONCLUSION OF THE WORKSHOP

This session was chaired by Ómar Frits Eriksson, DaMSA.

At the session start a USB memory stick containing electronic copies of all input documents, presentations, output documents, photographs and the draft report (but without an up-to-date version of the conclusions and recommendations) were provided to each delegate.

Mike Hadley said that the current draft report would be finalised fifteen days after the workshop; 18 October. The finalised report would be posted on the FTP server, which would remain active for the following month and would be forwarded to the Council meeting in December 2008.

Ómar Frits Eriksson then gave details of the weekend activities, including the transport arrangements. He then said that it was not his intention to run through the draft report

### 10.1 Conclusions and Recommendations

This part of the session was facilitated by Mike Hadley. The conclusions and recommendations below were reviewed and then agreed by the workshop.

10.1.1 Conclusions

1 Vertical wind generators have the potential to service a wide range of applications and are now available with a 10 year warranty and long life in maritime applications.

2 Where GPS is used for synchronisation of lights, care should be taken to ensure that the lights will switch on and operate in synchronism in the absence of GPS for an acceptable period of time.

3 There is a need to continue reviewing the documentation on light and vision (the E-200 series of documents) particularly in relation to:

- The use of effective intensity to determine the performance of a flashing light should be reviewed. The notion of 'apparent intensity' should be used to quantify the performance of a flash based on brightness matching, instead of luminous range matching. The concept of $I_{a,X,}$ (where X is the illuminance at the eye of the observer), should form the basis of apparent intensity;
- Consideration of chromatic atmospheric extinction when calculating the luminous range of marine signal lights.

4 Due to atmospheric extinction the blue light on the Emergency Wreck Marking Buoy is lost before the yellow light at range, thereby causing confusion and possibly leading to incorrect identification.

5 Energy systems may benefit from a hybrid approach with flexible energy management and energy storage systems, thereby maximising efficiency and energy capture.

6 Conspicuity theory, as presented at IALABATT / IALALITE 2008, should be considered for inclusion in the draft Guideline on conspicuity.

7 In addition to the rapid development of LED technology, new and improved incandescent lamps are being introduced to the market and are still worthy for consideration as marine aid to navigation light sources.

8 There is a need for standardised methods for estimating the carbon footprint of AtoN service provision.

9 There is a need to develop better guidance in relation to vertical divergence.

10 Synchronisation based on grouping lights in a channel, such that blocks of lights within the group flash in synchronism, with the whole group flashing in synchronism at the beginning of the overall common period of the group has proven to be effective in South Africa and may have wider application.

11 IALA documents would be easier to use and maintain if they were structured in a modular way.

12 Lead Acid and Nickel Cadmium batteries continue to provide the main means of electrical energy storage. Development of Lithium Ferrous Phosphate batteries, which is driven by the electric car industry, is expected to provide high energy density storage and overcome the thermal runaway problems associated with Lithium batteries.

13 Lights with a short flicker in the beginning of a character can possibly be useful to improve the conspicuity and thus identification of a specific aid.

14 Interruption of AtoN provision due to cormorant bird droppings is becoming an increasing problem in some parts of the world and various methods of dissuading bird activity have been tried without long term success.

15 When replacing rotating glass lens optics with a flashing light, the non-focussed component of the light, between flashes (the glow in the lantern), is lost, reducing the permanent point of reference performance of the AtoN at shorter ranges.

10.1.2 Recommendations

1 IALA draft Guideline on Synchronization of Lights should be amended to reflect that when GPS is used for synchronisation of lights, care should be taken to ensure that the lights will switch on and operate in synchronism in the absence of GPS for an acceptable period of time.

2 IALA should continue reviewing its documentation on light and vision (the E-200 series of documents) particularly in relation to:

- The use of effective intensity to determine the performance of a flashing light should be reviewed. The notion of 'apparent intensity' should be used to quantify the performance of a flash based on brightness matching, instead of luminous range matching. The concept of $I_{a,X,}$ (where X is the illuminance at the eye of the observer), should form the basis of apparent intensity;
- Consideration of chromatic atmospheric extinction when calculating the luminous range of marine signal lights.

3 IALA should amend the Recommendation on the Emergency Wreck Marking Buoy to take into account atmospheric extinction of blue light compared with yellow light.

4 IALA should monitor developments in hybrid energy management and storage systems capability that provide increased efficiency and energy capture.

5 IALA should continue to work on AtoN conspicuity modelling.

6 IALA should assist its members in developing standardised methods for estimating the carbon footprint of AtoN service provision.

7 IALA should continue to work on providing better guidance in relation to vertical divergence.

8 IALA guidance documents should be structured so that related topics are grouped in a modular way.

9 The concept of using flicker to enhance conspicuity should be considered for inclusion in the draft guideline on conspicuity and recognition of visual aids.

10 Consideration should be given to using a fixed light in conjunction with a flashing light and / or reducing the character period when replacing a rotating glass lens optic, in order to retain the permanent point of reference performance of the AtoN at shorter ranges.

### 10.2 Closing of the Workshop

Ómar Frits Eriksson began by thanking everyone for their hard work, which had been most productive; a considerable achievement, mixed with fun. He expressed special thanks to the WG and sub-WG Chairs and then his DaMSA Karoline Lundholt, Erik Berthel and Jorgen Royal Petersen, to whom he made small presentations. He said that it had been a pleasure for DaMSA to host the workshop and that his Director General sent his regards.

Torsten Kruuse then thanked DaMSA for organising a successful workshop. He then also thanked the delegate for their participation, saying that international co-operation is the only way forward. Turning to the DaMSA staff he showed his personal thanks to Ómar Frits Eriksson, Karoline Lundholt and Erik Berthel with individual presentations.

Ómar Frits Eriksson then declared the workshop closed and wished everyone a safe journey home and expressed his hopes that he would see them all again in four years' time.

Ómar Frits Eriksson thanked his team from DaMSA, the Steering Committee, the Secretariat and the WG Chairmen and sub-WG Chairmen before adjourning the workshop.

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# ANNEX 1 LIST OF OUTPUT DOCUMENTS

***The following documents were forwarded to the EEP Committee (EEP12).***

## 1. FROM WG1:

1 Draft IALA Guideline 1042-0 on Selection of Power Systems for Aids to Navigation and Associated Equipment

2 Draft IALA Guideline 1042-1 on Total Electrical Loads of Aids to Navigation

3 Draft IALA Guideline 1042-2 on Power Sources

4 Draft IALA Guideline 1042-3 on Electrical Energy Storage for Aids to Navigation

## 2. FROM WG2:

1 IALA Guideline 1041 on Sector Lights Edition 2

2 Draft IALA Guideline on Vertical Divergence

3 Draft IALA Guideline on Synchronisation of Lights

4 Draft IALA Guideline on Buoy Lights

5 Draft IALA Guideline on Light Applications – Floodlights

## 3. FROM WG3:

1 Draft IALA Recommendation E200 - 0 on Marine Signal Lights Part 0 - Overview

2 Draft IALA Recommendation E200 - 1 on Marine Signal Lights Part 1 - Colours

3 Draft IALA Recommendation E200 - 2 on Marine Signal Lights Part 2 - Notation of Luminous Range

4 Draft IALA Recommendation E200 - 3 on Marine Signal Lights Part 3 - Measurement

5 Draft IALA Recommendation E200 - 4 on Marine Signal Lights Part 4 - Effective Intensity

6 Draft IALA Recommendation E200 - 5 on Marine Signal Lights Part 5 - Estimation of Optical Performance

# ANNEX 2 LIST OF PARTICIPANTS

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## Sept 30 – 3 October 2008

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# ANNEX 3 LIST OF WORKING GROUP PARTICIPANTS

## WG1 – Review and update power system guidelines

| | Name | Organisation / Company |
|---|---|---|
| 1. | Michael Card (Chair) | Zeni Lite Buoy, Japan |
| 2. | Young K Bang | Daekee Marine Corp., Korea |
| 3. | Steve Burrows | THLS, UK |
| 4. | Peter Barse Bohsen | Sealite Pty Ltd, Australia |
| 5. | Alan Cran | NLB, Scotland |
| 6. | Jose Garcia Escudero | La Maquinista, Valencia, Spain |
| 7. | Sebastian Garcia | Hidrovia SA, Argentina |
| 8. | Sigge Gustafsson | Swedish Maritime Administration |
| 9. | Errol Joppich | Australian Maritime Systems |
| 10. | Risto Joro | Finnish Maritime Administration |
| 11. | Khaled Jaber | Pintisch Bamag, Germany |
| 12. | Jan Jűrgensen | DaMSA |
| 13. | Risto Jutsiniemi | Oy Windside Prodcution Ltd., Finland |
| 14. | Peter Kelly | THLS, UK |
| 15. | Sami Lasma | Finnish Maritime Administration |
| 16. | Marek Ledochowski | Maritime Office, Gdynia, Poland |
| 17. | Richard Moore | Canadian Coast Guard |
| 18. | Ole Arne Nilsen | Norwegian Coastal Administration |
| 19. | Ignacio Rodriguez | Mediterraneo Servicios Maritimas, Spain |
| 20. | Arlindo Santos | Direcção Faróis, Portugal |
| 21. | Richard Tomkins | THLS, UK |
| 22. | Joel Tourbot | CETMEF, France |
| 23. | Shen Zhijiang | China Maritime Safety Administration |

## WG2 – Review and update optic system guidelines

| | Name | Organisation / Company |
|---|---|---|
| 1. | Lars Mansner (Chair) | Sabik Oy, Finland |
| 2. | Ivano Baschieri | Italian Lighthouse Technical Service |
| 3. | Enrique Bernabeu Dolz | La Maquinista Valenciana SA, Spain |
| 4. | Kribashin Coopoo | Transnet NPA, South Africa |
| 5. | Peter Dam | DaMSA |
| 6. | Jörg Hagmeyer | Pintisch-Bamag, Germany |
| 7. | Rolf Holtet | Norwegian Coastal Administration |
| 8. | Oleg Ivanov | Estonian Maritime Administration |
| 9. | David Jeffkins | Australian Maritime Safety Authority |
| 10. | Piotr Jesion | Maritime Office in Szczecin, Poland |
| 11. | Xavier Kergadallan | CETMEF / DSANM, France |
| 12. | Sven Kurin | Swedish Maritime Administration |
| 13. | Roger Lewis | THLS, UK |
| 14. | Allen Mitchener | Tideland Signal Corp., USA |
| 15. | Tiit Palgi | Estonian Maritime Administration |
| 16. | Chris Procter | Sealite Pty ltd, Australia |
| 17. | Raul-Vello Rebane | Cybernetica AS, |
| 18. | Vincent Roget | GISMAN, France |
| 19. | Fernando Romero | Mediterraneo Servicios Maritimos, Spain |
| 20. | Mike Sale | Canadian Coast Guard |
| 21. | Manuel Santos | Direcção Faróis, Portugal |
| 22. | Alistair Taylor | Vega Industries, New Zealand |
| 23. | Osamu Toyama | Zeni Lite Buoy, Japan |
| 24. | Aivar Usk | Cybernetica AS, Estonia |
| 25. | Yang Youliang | Guang Dong MSA, China |

# WG3 – Review Draft Recommendation E200

| | Name | Organisation / Company |
|---|---|---|
| 1. | Malcolm Nicholson (Chair) | GLA R&RNAV |
| 2. | Seamus Doyle | Commissioners of Irish Lights |
| 3. | Hendrik Eusterbarkey | Waterways & Shipping Directorate, Germany |
| 4. | Björn Erik Krosness | Norwegian Coastal Administration |
| 5. | Roody Mackay | Northern Lighthouse Board |
| 6. | Hans Morten Midtsand | Norwegian Coastal Administration |
| 7. | Jørgen Royal Petersen | DaMSA |
| 8. | Dan Kaarsberg Schmidt | DaMSA |
| 9. | P C To | Tideland Signal Corp., USA |
| 10. | Alan Trojanowski | Pharos / Automatic Power Inc, USA |
| 11. | Ian Tutt | GLA R&RNAV |

# ANNEX 4 SOCIAL EVENTS & WEEKEND ACTIVITIES

1 On Monday, 29 September, 2008, an evening reception for delegates and partners was held in the Radisson SAS Royal Hotel, Copenhagen.

2 On Wednesday, 1 October, 2008, delegates boarded the vessel *M/S Jeppe,* at approximately 1830, for a dinner cruise around Copenhagen harbour and its approaches.

3 On Saturday, 4 October, 2008: Delegates and EEP Committee members were able to visit a DaMSA buoy maintenance yard and a buoy tender in Korsør.

4 On Sunday, 5 October, 2008, EEP Committee members were able to visit Nakkehoved Light House, which was built in 1772. This was organised as a heritage lighthouse case study.

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# ANNEX 5 WORKSHOP PROGRAMME

**Monday, 29 September 2008**

*1730 - 1830 hrs: Registration desk open*

**Welcome reception**

**Venue – Radisson SAS Royal Hotel, Copenhagen**

*Time: 18: 30 hrs to 20: 00 hrs*

(*Beverages and finger food will be served*)

Dress Code: Smart Casual

(*The Radisson SAS Royal Hotel is located in the heart of the Danish capital, across from the main railway station*)

Address
Radisson SAS Royal Hotel
Hammerichsgade 1
København 1611
Denmark

Tel: +45 38 15 65 00
Fax: +45 33 42 63 00
Email: copenhagen@radissonsas.com

## Day 1 - Tuesday 30 September, 2008

| Time | Activity | Presenter | Chair |
|---|---|---|---|
| **0800 - 0900** | **Registration / welcome tea and coffee** | | |
| 0900 - 0945 | ***Session 1 – Opening of the Workshop*** | | Ómar Frits Eriksson, DaMSA |
| | Welcome from DaMSA | Svend Eskildsen, DG, DaMSA | |
| | Welcome from IALA | Torsten Kruuse, IALA Sec. Gen. | |
| | Over view on key work done by other IALA Committees and administrative details | Mike Hadley | |
| | ***Workshop Photo – prior to coffee*** | | |
| **0945 - 1015** | **Break - exhibition open** | | |
| 1015-1200 | ***Session 2 – Power Sources*** | | Ómar Frits Eriksson, DaMSA |
| 1 | Update on new battery technology | Joakim Aspe, CellTech | |
| 2 | Presentation on super capacitors | Frede Blaabjerg, University of Aalborg | |
| 3 | Overview of solar panel technologies | Frederik Krebs, Nat Research Laboratory Risoe | |
| 4 | Vertical Axis Wind Turbines | Risto Joutsiniemi Oy Windside Production Ltd. | |
| | **Short break** | | |
| 5 | Fuel cell – Direct Methanol | Morten Christensen, SABIK | |
| 6 | Fuel cell applications | Michael Tausch, IdaTech | |
| 7 | Wave hub generator | Martin Wickett WITT | |
| 1200-1230 | Questions | | |
| **1230-1330** | **Lunch** | | |

| Time | Activity | Presenter | Chair |
|---|---|---|---|
| 1330-1600 | ***Session 3 – Application of Modern Light Sources*** | | Seamus Doyle, CIL |
| 1 | Latest development in LED technology | Peter Baasch, Future Electronics | |
| 2 | Latest development in modern non-LED light sources | Viggo Bremner, Phillips Light | |
| 3 | Varne lightvessel high intensity red LED navigation light. | Peter Kelly, THLS, UK | |
| 4 | Vertical divergence of lights | Roger Lewis, THLS, UK | |
| 5 | Conspicuity of lights – a case study | Malcolm Nicholson, GLA R&RNAV, UK | |
| 6 | Conspicuity Theory and Practice | Hugh Barton, Opti Consulting UK, | |
| | **Short break** | | |
| 7 | New model to calculate effective intensity | Ian Tutt, GLA R&RNAV, UK | |
| 8 | Synchronised and sequential lights | David Jeffkins, AMSA, Australia | |
| 9 | New LED sector light | Lars Mansner, SABIK | |
| 10 | Spectral absorption over distances | Xavier Kergadallan | |
| 1600-1630 | Questions | | |
| **1630-1700** | **Break** | | |
| 1700-1730 | ***Session 4 – Setting up of Working Groups***<br>Preamble<br>1 Review the Conclusions and Recommendations of IALABATT / IALALITE 2004.<br>2 Introduce the draft IALA Recommendation E 200<br>*3* Discussion on work of the WGs, including outcome | | Ómar Frits Eriksson, DaMSA |

**1730: Steering Group & Working Group Chairs meeting – IALA Office**

**Free evening**

# Establishment of Three Working Groups

**WG 1 – Chairman Mike Card**

Task - Review of IALA Guidance documents on power systems

Update, review or merge

**WG 2 – Chairman Lars Mansner**

Task - Review of IALA guidance documents on optical systems

Update, review or merge

**WG 3 – Chairman Malcolm Nicholson**

Task - Review of draft IALA Recommendation E 200

***(See Annex for list of IALA guidance documents to be reviewed)***

Day 2 - Wednesday 1 October 2008

| ***Time*** | ***Activity*** | ***Group Number / Topic*** | ***Location / Chair*** |
|---|---|---|---|
| 0900 | Administrative Details (if required) | All | |
| 0900 – 1030 | ***Session 5***<br>Working groups in session | Working Group Chairs / Rapporteurs | |
| **1030 – 1100** | **Break** | | |
| 1100 – 1230 | ***Session 6***<br>Working groups in session | - | |
| **1230 – 1330** | **Lunch** | | |
| 1330 – 1500 | ***Session 7***<br>Working groups in session | - | |
| **1500 – 1530** | **Break** | | |
| 1530 – 1700 | ***Session 8***<br>Working groups in session | - | |

**1700: Steering Group & Working Group Chairs meeting – IALA Office**

### *Workshop Dinner Boat cruise on M/S Jeppe*

Dress Code: Smart Casual

Departure: 18:15, by bus from Radisson SAS Royal Hotel

Departure: 18:30, Boat cruise '*M/S Jeppe*', from Havmegade

If the weather is good '*M/S Jeppe*' will sail to the Øresund Bridge between Denmark and Sweden.

If the weather is poor '*M/S Jeppe*' will keep within the Copenhagen harbour area.

Expected return to Havmegade: 23:00.

Transportation to hotels will be arranged.

Day 3 - Thursday 2 October 2008

| ***Time*** | ***Activity*** | ***Group Number / Topic*** | ***Location / Chair*** |
|---|---|---|---|
| 0900 | Administrative Details (if required) | | |
| 0900 – 1030 | ***Session 9***<br>Working groups in session | | |
| **1030 – 1100** | **Break** | | |
| 1100 – 1230 | ***Session 10***<br>Working groups in session | | |
| **1230 – 1330** | **Lunch** | | |
| 1330 – 1500 | ***Session 11***<br>Working groups report outcomes to Plenary | | Chairpersons from Working Groups |
| **1500 – 1530** | **Break** | | |
| 1530 – 1700 | ***Session 12***<br>Working groups report outcomes to Plenary | | Chairpersons from Working Groups |

**1700: Steering Group & Working Group Chairs meeting – IALA Office**

**Free evening**

Day 4 - Friday 3 October 2008

| ***Time*** | ***Activity*** | ***Chair*** | ***Presenter*** |
|---|---|---|---|
| 0900 - 1230 | ***Sessions 13 and 14***<br>Technical tour<br>Planetarium visit | | |
| **1230 – 1330** | **Lunch (at Workshop hotel)** | | |
| 1330- 1500 | ***Session 15 – Conclusion of the workshop***<br>Review of draft report, Conclusions and Recommendations.<br>Status of output documents | Ómar Frits Eriksson, DaMSA | Mike Hadley |
| 1500 – 1530 | ***Closing of the workshop***<br>DaMSA<br>IALA | Ómar Frits Eriksson, DaMSA | Ómar Frits Eriksson<br>Torsten Kruuse |

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## Weekend Activities

Saturday, 4th October, 2008: Visit to buoy maintenance yard (travel by coach: 1.5 hrs away) – For Workshop delegates and EEP members (sponsored by DaMSA)

Expected departure 1000

Sunday, 5th October, 2008: Case study – Nakkehoved Light House (heritage lighthouse) – (built in 1772) – For EEP members only)

Expected departure 1000

Delegates will be asked to indicate attendance at registration.

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# Annex

# IALABATT/ IALALITE 2008

# 30 Sep – 03 Oct, 2008

# Copenhagen, Denmark

# IALA GUIDANCE DOCUMENTS TO BE REVIEWED BY WORKING GROUPS

## 1. WG 1 – REVIEW AND UPDATE POWER SYSTEM GUIDELINES (CHAIRMAN: MIKE CARD)

Objective: Update IALA documents to incorporate developments and practical applications of the latest power source technology, as applied to marine aids to navigation, taking account of the IALABATT IALALITE Scope and Content approved at EEP10.

1011 - Guideline on a standard method for defining and calculating the load profile of aids to navigation

1039 - Guideline on designing solar power systems for aids to navigation

1042 - Guideline on power sources used in visual aids to navigation - Replaces 1022

1044 – Guideline on secondary batteries for aids to navigation (replaces 1025 and 1002)

Guideline for renewable energy sources for marine aids to navigation, Oct 1997

Specification for solar photovoltaic systems, June 1988

Expected Output:

1. Bring Guideline 1042 On Power Sources for Aids to Navigation, Edition 1 December 2004 up to date.
2. Merge the content of the following into Guideline 1042, with detailed explanations or technical content moved into appendices
   - IALA Guidelines on a Standard Method for Defining and Calculating the Load Profile of Aids to Navigation, December 1999
   - IALA Guideline 1044 on Secondary Batteries for Aids to Navigation, Edition 1, June 2005
   - IALA Guideline 1039 on Designing Solar Power Systems for Aids to Navigation, Edition 1, December 2004
3. Deletion of:
   - Guideline for renewable energy sources for marine aids to navigation, Oct 1997.
   - Specification for solar photovoltaic systems, June 1988.

## 2. WG 2 – REVIEW AND UPDATE OPTIC SYSTEM GUIDELINES (CHAIRMAN: LARS MANSNER)

Objective: Update IALA documents to incorporate developments and practical applications of the latest light and power source technology, as applied to marine aids to navigation, taking account of the IALABATT IALALITE Scope and Content approved at EEP10 and the work programme of EEP WG4.

1041 – Guideline on Sector Lights

1043 – Guideline on light sources used in visual aids to navigation

1048 – Guideline on LED Technologies and their use in Signal Lights

1049 – Guideline on the Use of Modern Light Sources in Traditional Lighthouse Optics

Expected Output:

1. Draft IALA Guidance on Vertical Divergence of lights
2. Draft IALA Guidance on Synchronised lights
3. Updated 1041 Guideline on Sector Lights
4. Draft Guidance on Light Applications

## 3. WG 3 – REVIEW DRAFT RECOMMENDATION E200 (CHAIRMAN: MALCOLM NICHOLSON)

E200 documents (Parts 1 to 5) produced by Specialist Working Group on Lights incorporating the following background documents

5 IALA Recommendation for the colours of light signals on aids to navigation, December 1977;

6 IALA Recommendation on the determination of the luminous intensity of a marine aid to navigation light, December 1977;

7 IALA Recommendation on the calculation of the effective intensity of a rhythmic light, November 1980;

8 IALA Recommendation E-122 on the photometry of marine aids to navigation signal lights, June 2001 (as revised during IALABATT/IALALITE5, October 2004)

Recommendation - For the notation of luminous intensity and range of Lights 11/1966

Recommendation - For a definition of the nominal daytime range of maritime signal lights intended for the guidance of shipping by day 04/1974

Expected Output:

Agreement on draft IALA Recommendation E 200

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