ELECTRIFICATION OF PORTS AND VESSELS – CLASSIFICATION SOCIETY'S VIEW

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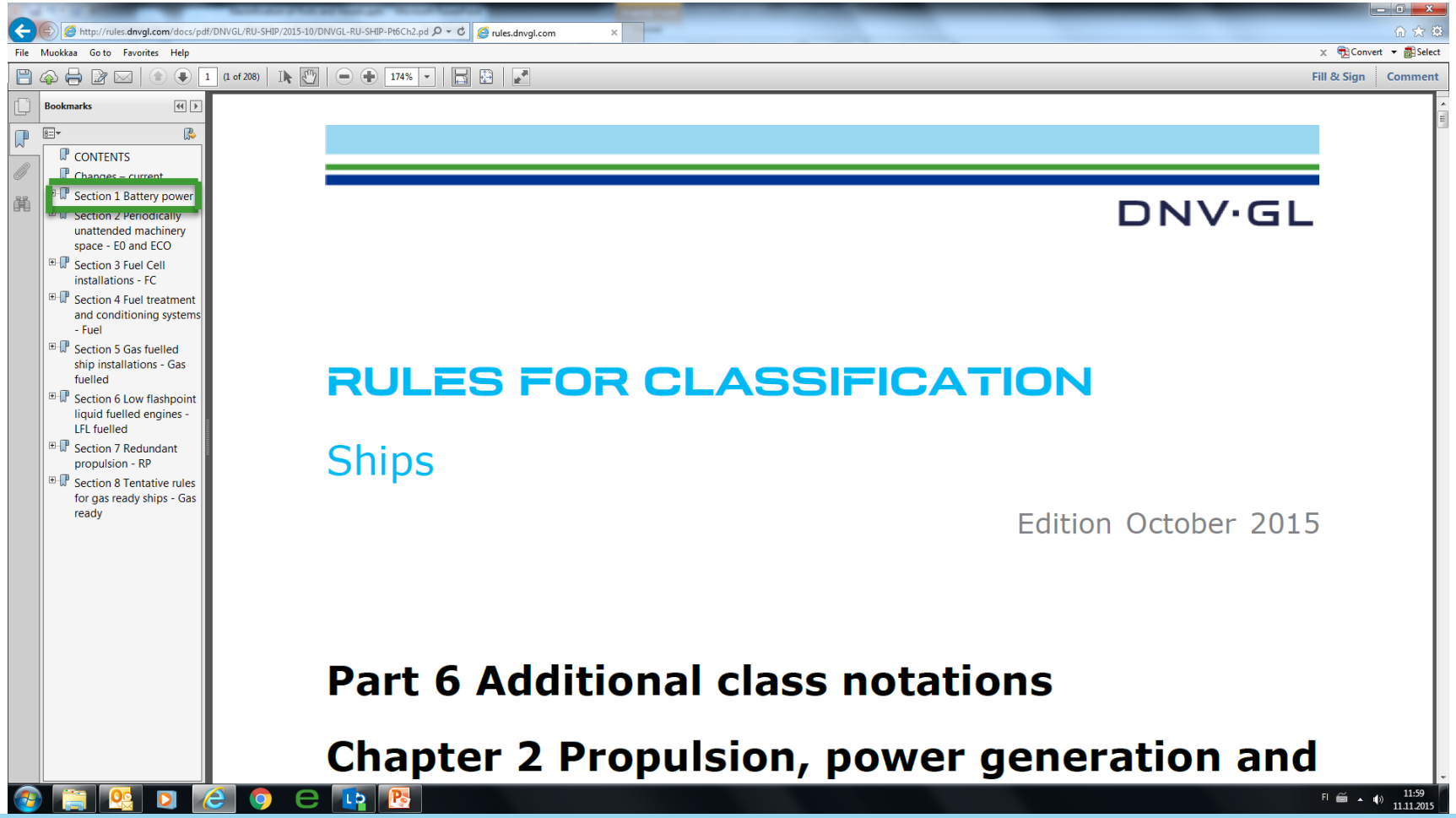
DNVGL

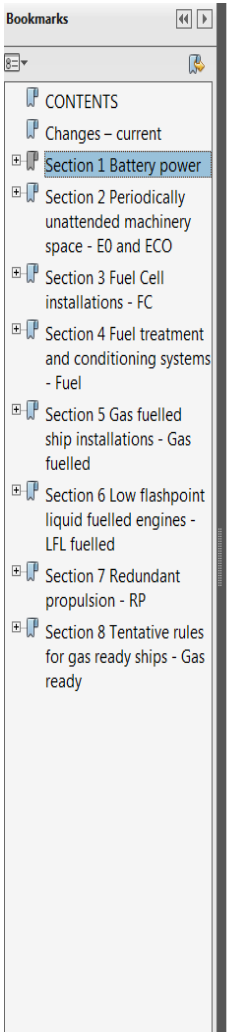
Electrification in ports and vessels – benefits and new business opportunities

Helsinki, 13.11.2015

NEW DNVGL RULES FROM 1 January 2016

http://rules.dnvgl.com/docs/pdf/DNVGL/RU-SHIP/2015-10/DNVGL-RU-SHIP-Pt6Ch2.pdf





SECTION 1 BATTERY POWER

1 General

1.1 Introduction

The additional class notation **Battery (Power)** applies to battery installations in battery powered vessels, vessels with redundant propulsion (RP), or DP vessels where the batteries are included in the redundancy for dynamic positioning. Whereas, additional class notation **Battery (Safety)** applies to battery-hybrid vessels.

1.2 Scope

The scope for additional class notations **Battery (Power)** and **Battery (Safety)** add an increased level of safety related to battery installations in vessels. The rules in this section are considered to satisfy the requirements for specific types of battery installation and certification, in accordance with the following list:

- battery systems used as main source of power
- battery systems used as additional source of power
- battery systems used for miscellaneous services
- safety requirements for batteries other than Lead Acid and NiCd. For Lead Acid and NiCd batteries see Pt.4 Ch.8
- requirements for certification of the batteries.

1.2.1 Since commercial battery technology will be under constant development, the requirements of this section may need to be supported by additional information and requirements, on a case by case basis. Designs that are not in compliance with this section may be approved after evaluation by the Society, provided that it can be demonstrated that the design represents an equal or better level of safety.

Part 6 Chapter 2 Section 1

- A1 LC Car Ferry C Battery(power) R4(nor)

LATEST DEVELOPMENTS; ships

Since 2009 we have seen under development, construction or operation

- 4 hybrid offshore vessels
- 1 hybrid fishing boat
- 7 hybrid tugs
- 8 hybrid ferries
- 1 hybrid research vessel
- 1 100% battery ferry
- 22 in total

SAMPLE SHIPS:

Eidesvik: Viking Lady, hybrid supply vessel, retrofit in Norway 2013

Østensjø: Edda Ferd, hybrid supply vessel, construction Astilleros in Spain 2013

Østensjø: large hybrid offshore construction vessel, construction Kleven in Norway 2016

Fafnir Offshore: hybrid supply vessel, construction Havyard Ship Technology's yard in Leirvik, Norway.

Selfa Arctic: hybrid fishing boat, construction in Norway 2014

SVITZER: 4 battery hybrid tugboats, construction of ASL Marine in Singapore

KOTUG: RT Adriaan, hybrid tugboat in Rotterdam, retrofit 2012

Foss: Carolyn Dorothy hybrid tug of LA, buildings Foss' Rainier Shipyard in USA, 2009

Foss: Campbell Foss hybrid tug of LA, retrofit Foss' Rainier Shipyard in USA, 2012

NORLED: Finnøy, hybrid ferry, retrofit 2013 in Norway

NORLED: Folgefonn, hybrid/pure battery ferry 2014 in Norway

Fjord1: Fannefjord LNG, hybrid hybrid ferry, retrofit

Scottish Government: Hybrid ferry in Scotland, construction of Ferguson in Glasgow

Scandlines: 4 battery hybrid ferries, retrofit 2013

University of Victoria: Tsekola II, hybrid research vessel, retrofit in Canada

NORLED: 100 % battery ferry, new building Fjellstrand in Norway 2015

ReVolt project:

A small unmanned zero emission concept container ship
Low speed combined with high propulsion efficiency, regularity and safety designed to operate in coastal and inland waterways full-electric with battery operation and charging

- **Capacity: 100 TEU**
- **Speed: 6 knots**
- **Coastal Traffic, Oslo - Trondheim**
- **Range: 200 km**
- **Battery: 3 MWh**

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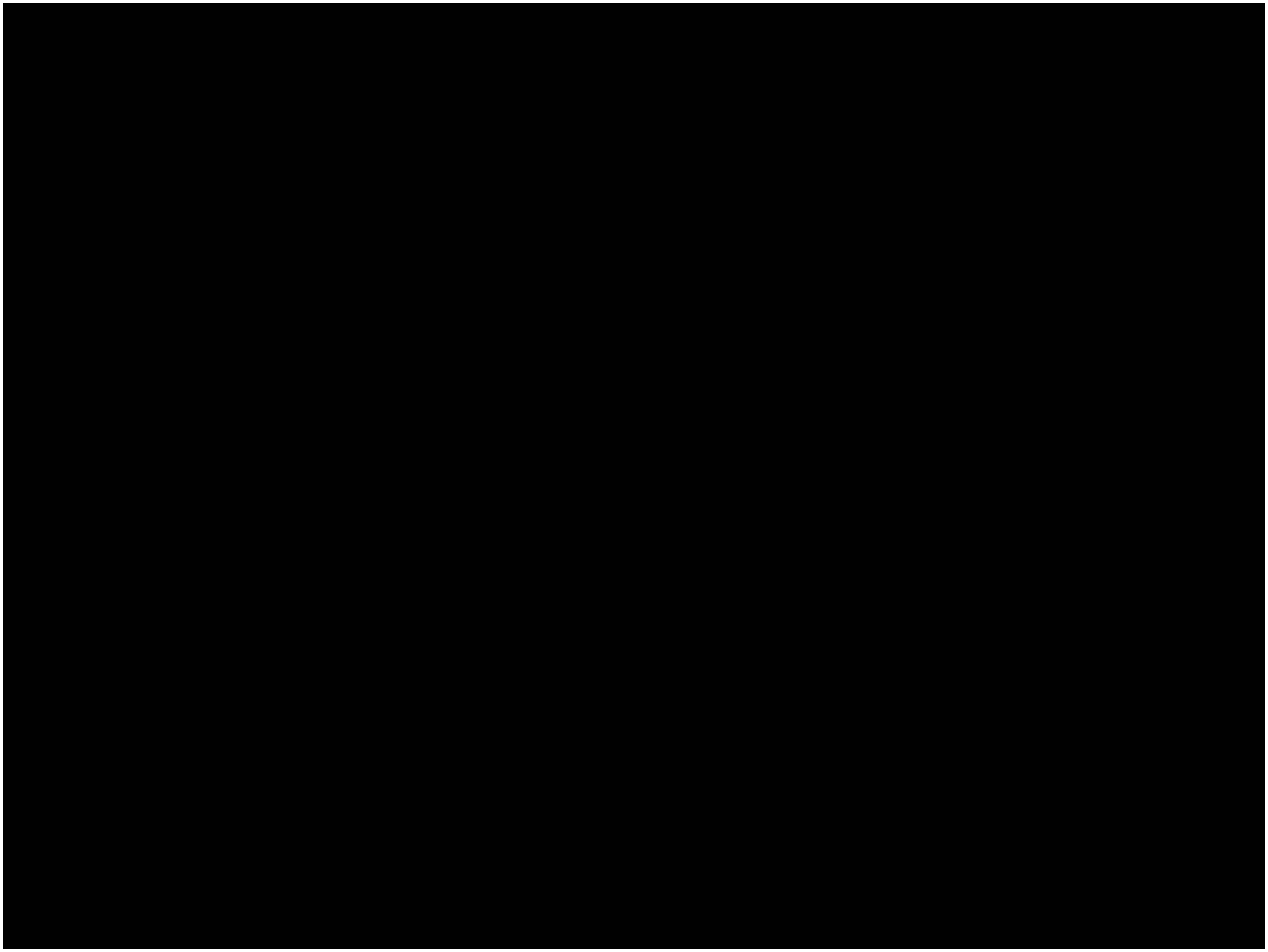


Norwegian ReCharge Project:

The main goal of the project is to analyse the emission reduction potential of building out charging- and shore power infrastructure for a number of Norwegian ports. The project will also seek to highlight the investment costs of the proposed infrastructure, and hence give different stakeholders access to potential business models and barriers for implementation.

Norwegian ReCharge Project:

Consisting of 4 work packages:

-WP1: On the basis of «Landstrøm på skip i Norge»; analyze the need for shore power at different ports by:
- Select ports to analyze
- **Analyze which ship types that operate in different ports**
- ***Analyze which ship types that are relevant for hybridization and battery power***
- **Establish a total power demand for each port**

WP2: Estimate the emission reduction potential by building out charging- and shore power infrastructure that covers the identified power demand

WP3: Estimate the investment and operational expenses related to the building out charging- and shore power infrastructure that covers the identified power demand. The return of investment on both ship and shore side to be calculated

WP4: Propose different business models that renders the building of charging- and shore power infrastructure possible. Barriers for implementation to be detailed

Norwegian ReCharge Project:

Participants:
- DNVGL
- Oslo Havn KF
- Cavotec

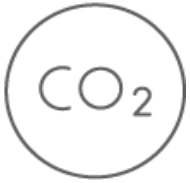
- Hafslund
- ABB

Time period:

September 2015 – September 2016

VISION 2025; Classification in general

CO_2 emissions



900
million tonnes
per year

60 % reduction in CO_2 emissions

Freight cost

7-11%
of cargo value

Maintain or reduce present freight cost levels

Lives lost at sea

900
ship accident fatalities
per year
Average 2003-2012

90 % reduction in fatalities in shipping

VISION 2025; Electrification of Ports and Vessels

Battery development essential

Other items to be studied:

- Competencies of the crew
- Compliance with international conventions (e.g. SOLAS)
- Battery degradation in ship-scale applications
- Battery spaces in ships
- Maintenance and repair of battery systems


- THANK YOU FOR YOUR ATTENTION -