EI Research report

Investigation into the possible risks arising from the presence and operation of lithium-ion (rechargeable) button cell energised devices in potentially flammable atmospheres associated with transport fuels

energy institute

EI RESEARCH REPORT

INVESTIGATION INTO THE POSSIBLE RISKS ARISING FROM THE PRESENCE AND OPERATION OF LITHIUM-ION (RECHARGEABLE) BUTTON CELL ENERGISED DEVICES IN POTENTIALLY FLAMMABLE ATMOSPHERES ASSOCIATED WITH TRANSPORT FUELS

First edition

March 2018

Published by

Energy Institute, London

The Energy Institute is a professional membership body incorporated by Royal Charter 2003

Registered charity number 1097899

The Energy Institute (EI) is the chartered professional membership body for the energy industry, supporting over 20 000 individuals working in or studying energy and 250 energy companies worldwide. The EI provides learning and networking opportunities to support professional development, as well as professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The EI's purpose is to develop and disseminate knowledge, skills and good practice towards a safe, secure and sustainable energy system. In fulfilling this mission, the EI addresses the depth and breadth of the energy sector, from fuels and fuels distribution to health and safety, sustainability and the environment. It also informs policy by providing a platform for debate and scientifically-sound information on energy issues.

The EI is licensed by:
– the Engineering Council to award Chartered, Incorporated and Engineering Technician status, and
– the Society for the Environment to award Chartered Environmentalist status.

It also offers its own Chartered Energy Engineer, Chartered Petroleum Engineer, and Chartered Energy Manager titles.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.

This publication has been produced as a result of work carried out within the Technical Team of the EI, funded by the EI's Technical Partners. The EI's Technical Work Programme provides industry with cost-effective, value-adding knowledge on key current and future issues affecting those operating in the energy sector, both in the UK and internationally.

For further information, please visit **http://www.energyinst.org**

The EI gratefully acknowledges the financial contributions towards the scientific and technical programme from the following companies

Andeavor
Apache North Sea
BP Exploration Operating Co Ltd
BP Oil UK Ltd
Centrica
Chevron North Sea Ltd
Chevron Products Company
Chrysaor
CLH
ConocoPhillips Ltd
DCC Energy
EDF Energy
ENGIE
ENI
E. ON UK
ExxonMobil International Ltd
Innogy
Kuwait Petroleum International Ltd
Maersk Oil North Sea UK Limited
Nexen CNOOC
Ørsted
Perenco
Phillips 66
Qatar Petroleum
Repsol Sinopec
RWE npower
Saudi Aramco
Scottish Power
SGS
Shell UK Oil Products Limited
Shell U.K. Exploration and Production Ltd
SSE
Statkraft
Statoil
TAQA Bratani
Total E&P UK Limited
Total UK Limited
Tullow Oil
Uniper
Valero
Vattenfall
Vitol Energy
Woodside
World Fuel Services

However, it should be noted that the above organisations have not all been directly involved in the development of this publication, nor do they necessarily endorse its content.

ISBN 978 0 85293 872 0

Published by the Energy Institute

Hard copy and electronic access to EI and IP publications is available via our website, **https://publishing.energyinst.org**.
Documents can be purchased online as downloadable pdfs or on an annual subscription for single users and companies.
For more information, contact the EI Publications Team.
e: **pubs@energyinst.org**

CONTENTS

Page

Contents continued

LIST OF FIGURES AND TABLES

Page

Figures

Tables

FOREWORD

This Energy Institute (EI) Research Report has been prepared under the direction of the EI's Distribution and Marketing Committee and Electrical Committee. It is an EI-funded study by Mr T. Hedgeland that has been undertaken to assess the possible ignition risks posed by rechargeable lithium-ion button cell energised devices in potentially explosive atmospheres associated with transport fuels. The findings of this EI Research Report have been technically endorsed by the EI's Distribution & Marketing Committee and Electrical Committee.

The potential hazards arising from the presence and operation of devices energised by a single primary non-rechargeable button cell were previously investigated and reported upon in EI Research Report: *Investigation into the possible risks arising from the presence and operation of button cell energised devices in potentially flammable atmospheres associated with transport fuels*, 2014.

The information provided in this publication is intended to be of use to operators of petroleum distribution installations in their assessments of button cell energised devices. It may also be of use to operators of petroleum road tankers. It is hoped and anticipated that this publication will also be of assistance to those responsible for designing, constructing, commissioning, operating and maintaining aviation fuel handling systems.

It is likely that publication will have a wider scope of usage and will encompass differing operating practices and safety and environmental legislation to those that apply in the UK. Therefore, this publication should be read in conjunction with any statutory operating requirements that apply at the point of intended use. It is recommended that if procedures defined in this publication are more stringent than those at the point of intended use, then those in this publication should be followed.

The EI is not undertaking to meet the duties of employers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations under local and regional laws and regulations.

The EI cannot accept any responsibility, of whatever kind, for damage or loss, or alleged damage or loss, arising or otherwise occurring as a result of the application of the guidance contained herein.

Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, London W1G 7AR, UK (e: technical@energyinst.org).

ACKNOWLEDGEMENTS

This Research Report was drafted by Mr. Terry Hedgeland under the direction of the EI's Distribution and Marketing and Electrical Committee.

An earlier draft of the report was submitted to the following companies for technical review:

BP
British Pipeline Agency
ExxonMobil
Federation of Petroleum Suppliers
Health and Safety Executive
Hoyer Petrolog
Oil and pipelines
Phillips66
Shell
Tank Storage Association
Total
UKPIA
Valero

The project coordination was undertaken by Toni Needham (EI).

1 SCOPE

To provide the EI with a risk-based assessment framework/process that is suitable for the assessment of the ignition risk posed by energised devices that embody a single lithium-ion (rechargeable) button cell, that may be worn or carried by persons in a 'hazardous area', and a report providing the justification/description of the steps included in the process. The purpose of this investigation is to establish criteria to assist Duty Holders in fulfilling their duty under UK legislation.