2021 Review of the EI Good Practice Programme

Sharing, learning, leading

Transition through collaboration

STAC SCIENTIFIC & TECHNICAL ADVISORY COMMITTEE

energy institute

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A year of collaboration delivering support for the energy transition

'Collaboration is at the heart of everything the Energy Institute does, and this has never been so important, as we witness increasing integration of technologies across a diverse and increasingly complex energy landscape.'

It gives me great pleasure to welcome you to the Energy Institute's summary of good practice work in 2021, a year which saw us build on and deepen our support to industry in accelerating the energy transition towards net zero. The year saw great collaboration across the energy industry, between our members, academia, regulators and wider stakeholders, as we delivered on commitments made with our funding partners to develop good practice on transitioning safely and efficiently to a low carbon world. In particular, I would like to highlight the significant engagement with stakeholders on hydrogen, CCUS, power integration and building climate resilience. I am particularly pleased to see the energy transition front and central across all work undertaken within the Energy Institute's good practice programme.

Collaboration is at the heart of everything the Energy Institute does, and this has never been so important, as we witness increasing integration of technologies across a diverse and increasingly complex energy landscape. Sharing skills, knowledge and experience is absolutely essential if we are to secure a safer, more sustainable future for all. As STAC Chair, witnessing the contribution of all EI members towards this goal makes me very proud of our industry.

Aleida Rios CEng FEI, Senior Vice President Engineering, BP, Chair STAC

STAC SCIENTIFIC & TECHNICAL ADVISORY COMMITTEE

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Vitol
woodside
World Fuel Services

A year in numbers

34
test methods developed or significantly amended – underpinning safe and efficient operations

66
Good practice documents published, downloaded and used in over
100
countries

22000
downloads of EI good practice globally

23
technical workshops and training sessions held – disseminating knowledge and know how

Over
1000
technical specialists globally contributing to the development of good practice

Over 200
organisations engaged across the good practice programme

43000
users of the Toolbox app, accessing learning on 500 real life incidents across 7 languages

Over
50
presentations of EI technical work at events and conferences – sharing learning widely

2021: key themes

2021 saw our work in support of the transition to low carbon broaden and deepen with a focus on **five key themes**

Facilitating the expansion of carbon capture and storage operations

Addressing the scientific and technical challenges that need to be overcome to facilitate CCUS deployment globally.

A key highlight was the review on equations of state (EoS) for CCUS fluids:

- an extensive review of EoS used in commercially available software looked at their limitations, assessing specified mixtures, pressure and temperature ranges and impurities, with recommendations to support flow assurance analysis. This work will inform the relevant ISO Committee TC265.
- efforts continue to update and extend existing databases, validate the EoS(s) at known thermodynamic properties (experimental) across a broad spectrum of operating conditions to assess how well the EoS perform in conditions not originally envisaged (e.g. CO_2 solid formation) and understand requirements to use in different applications.

Hazard analysis for CCUS projects

Key progress was also made on updating existing EI guidelines on hazard analysis for CCUS projects, combining two publications into *Hazard analysis for onshore and offshore carbon capture platforms and pipelines*.

This work has seen significant input from a wide range of stakeholders, bringing together knowledge and expertise to ensure a better informed approach on hazard analysis for CCUS operations.

Contributors include BEIS, CCSA, EEMUA, HSE, IDRIC, ISO, OGA, SPE, UKCCSRC.

This work links to work to revise existing EI Guidelines on Good plant design and operation for onshore carbon capture installations and onshore pipelines

Key work to support transport of CO_2 through pipelines includes:

- developing guidance on repurposing pipelines and new pipeline design to transport CO_2. Providing an outline of the necessary data and assessments required to demonstrate that a pipeline and associated assets can be repurposed safely.
- building understanding on running ductile failure and fracture propagation for onshore and offshore pipelines transporting CO_2 and developing good practice on how to calculate propagation accurately and reduce design pessimism.

CCUS working groups have linked with, and received significant input and support from, wider EI committees, drawing on available expertise in the areas of process safety, asset integrity, corrosion management and hazard analysis.

Building operational resilience to a changing climate

An increasing focus on addressing the growing influence of climate change on industry operations.

Sharing experience on environmental loading on offshore energy infrastructure

The EI MetOceaN is a network of global environmental loading specialists and practitioners (from operators, consultancies and regulators) which, through a collaborative approach, aims to assist industry by sharing experience on environmental loading. Then, as appropriate, develops common industry good practice, for the management of environmental loading related issues (including ageing) to help achieve climate resilience for the global offshore energy infrastructure.

Activities have principally involved:

- building cross industry learning on new methodologies, technologies and failure analysis, for example sharing experience from the Gulf of Mexico, South China Seas, UK and Australia on the mitigation of life-safety risk by persons-on-board reduction or evacuation based on a storm forecast.
- sharing knowledge on the historical performance of fixed steel platforms in the Gulf of Mexico in hurricanes and comparison to industry design standards.
- summaries of and insight into wider work, such as the LOADS JIP or OCG's study on Extreme Weather Loading.
- presentations on structural reliability for marine operations.

Collaboration and working with others is key in developing guidance on building operational resilience to climate change

- working with environmental agencies and the wider onshore industries to help businesses improve understanding of the process safety implications of a changing climate, focussing on major accident hazard facilities and assessing their vulnerabilities over the next 5-50 years. Supporting business decision making and investment.
- EI guidance on applying a creeping change hazard identification (CCHAZID) methodology provides the framework on which to base an assessment of climate adaptation.

The MetOceaN network, and the work with environmental agencies and the COMAH Competent authorities on understanding climate risk and process safety provide the basis for EI and the global industry to address and build climate resilience for energy structures and operations.

Building our support on hydrogen

Engaging stakeholders and facilitating collaboration to progress key projects identified as priority issues for the developing industry value chain.

Progress made through the year:

- understanding needs around competence, skills and training requirements to enable the safe uptake of new technologies.
- assessing the energy balance and efficiency of a whole hydrogen system to evaluate the relative merits of value chain options.
- understanding the environmental impacts from large-scale deployment of hydrogen.
- delivering guidance on making the safety case for hydrogen operations. Published Technical workshop proceedings: Hydrogen safety cases – Challenges in hydrogen safety case development in UK/ European industrial clusters.
- developing guidance on asset integrity considerations when repurposing existing natural gas infrastructure.

The forward programme on hydrogen includes projects that:

- develop understanding of infrastructure integration across the value chain for hydrogen applications.
- build data for QRAs and HAZOPs drawing on findings from the initial safety case project.
- engage stakeholders, including port and marine transport operators, to develop good practice on the export and import of hydrogen and liquid derivatives (liquid hydrogen, ammonia, liquid organic hydrogen carriers (e.g., methylcyclohexane (MCH)).
- provide guidance on the large scale storage of hydrogen and its derivatives.

Safety and efficiency within the hydrogen energy economy is a focus across the wider good practice programme, with development of:

- test methods to determine hydrogen impurity for fuel cells.
- guidance on the hazardous area classification of hydrogen, including in its liquid form.
- guidance on the assessment of risk and controls for hydrogen fuelled vehicles in hazardous areas.
- understanding on the impact of microbes on sub-surface storage of hydrogen.
- guidance on operating hybrid hydrogen-natural gas fuelled combined cycle gas turbine (CCGT) power generation plant.

Over 170 organisations have engaged with the EI's hydrogen programme, including technical partners, policy makers, regulators, trade associations and peer organisations. Significant support and funding has been provided by the Industrial Decarbonisation Research and Innovation Centre (IDRIC) for which we are very grateful.

Powering the transition through systems integration

Working with stakeholders to facilitate the transition to low carbon renewables within an integrated system.

Electricity generation contributes approximately 25% of global greenhouse gas (GHG) emissions, with coal-fired power stations alone contributing 18% (Environmental Protection Agency). The transition to low-carbon renewables – with natural gas as a bridging fuel – will significantly reduce GHG emissions.

Progress was made by:

- establishing a Solar Projects Working Group to provide guidance on planning, building and operating solar photovoltaic plants.
- publishing guidance that recognises that more distributed power generation will lead to a more distributed workforce, often working alone and in remote locations. Minimal staffing and lone working: ensuring employee safety and wellbeing in the power sector
- helping those in the renewables sector understand the importance of human factors in managing safety by publishing Human Factors in Renewables.

With natural gas as a bridging fuel, the continued and efficient operation of ageing infrastructure is key. Three key deliverables in 2021 were:

- Guidance on managing obsolescence and upgrading industrial automation and control systems (IACS) – upgrading control systems and human machine interfaces (HMIs).
- Managing the replant of a combined cycle gas turbine (CCGT) power plant – when replacing the gas turbine with a more efficient model.
- EI Research report: Evolution of condition monitoring requirements for combined cycle gas turbine (CCGT) power plants Assessment of the options for condition monitoring on ageing CCGT power plants.

Work in development covers hydrogen, solar, battery storage, and includes guidance to:

- help operators understand the changes necessary to ready gas-fired power stations to incorporate hydrogen into their fuel mixes.
- improve efficiency and smooth power disruption from hybridisation and co-location of energy storage (including battery storage) with other power generating plant (gas turbines, solar and wind).
- develop understanding on environmental obligations for battery decommissioning and disposal/recycling.
- inform use of second life electric vehicle batteries for static energy storage.

Building a sustainable future

Building sustainability into industry operations is a theme that has focused prominently across all EI technical committees.

Progress made in 2021 by:

- researching availability of feedstocks and exploring synergies of waste-fuels/product solutions within the concept of a circular economy, to support the transition to a net zero by 2050.
- agreeing a sustainability clause for inclusion in EI aviation fuel filter specifications to encourage the development of more sustainable products.
- developing analytical test methods that facilitate wider deployment of sustainable aviation fuel, and increased use of FAME and ethanol in conventional fuel.
- continuing efforts to remove the amount of hazardous materials (e.g. mercury), and reduce the volume of fuel used, when undertaking test methods.

Examples of ongoing work to improve sustainable operations include:

- understanding the GHG emissions associated with aircraft fuelling (applicable to hub and regional airports) and identify most impactful emission reduction strategies.
- working with the environmental agencies to support industry in meeting European Sustainability Goals and on exploring environmental aspects of renewable technologies.
- exploring environmental and sustainability challenges associated with offshore wind operations across the whole life cycle e.g. refurbishment, recycling and remanufacturing options, so as to reduce landfill waste.

Working with others is key if we are to achieve a sustainable future for all. In 2021 we partnered with:

- the Methane Guiding Principles Group to deliver a global outreach initiative to promote best practice in reducing operational methane emissions.
- CIRIA in scoping guidance to ensure circularity is embedded in the commissioning and decommissioning of assets.
- Regulators (OPRED, BEIS) in developing a framework for assessment of Best Available Techniques (BAT) assessments for offshore oil and gas combustion equipment.

Work on building sustainability into future operations has seen significant collaboration with like minded organisations, industry associations, regulators and academia, leveraging wider knowledge and expertise for the benefit of all.

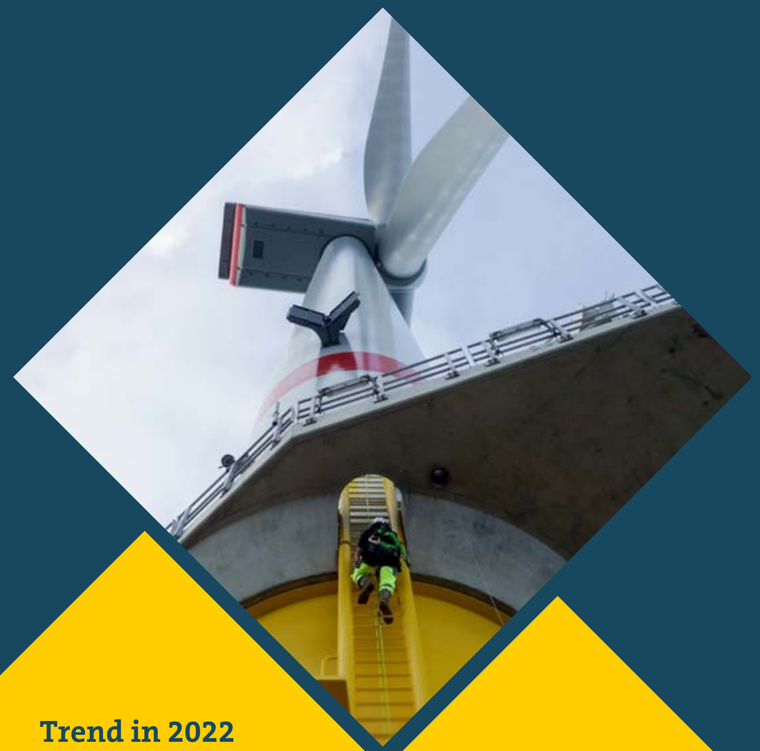
A year in review

Our key work areas

- Ageing and life extension >
- Corrosion management & asset integrity >
- Aviation fuel handling >
- Environment >
- Fuels distribution >
- Health >
- Human and organisational factors >
- Hearts & Minds >
- Learning from Incidents (Toolbox) >
- Accident investigation (Tripod) >
- Hydrocarbon management >
- Process safety >
- Test methods standardization >
- Analytical testing benchmarking >
- Offshore wind (G+) >
- Onshore wind (SafetyOn) >

A year in review > **Ageing and Life Extension (ALE) Committee**

Championing climate resilience



Supporting the global industry on novel technologies, sharing operational experience and developing agreed international good practice. Bringing specialists together to manage life extension for upstream oil and gas assets and increasingly wider energy technologies.

Key highlights

- developed new guidelines for structural integrity management of decommissioned offshore structures in 'Lighthouse Mode'.
- developed new guideline for the application of PBD – Performance Based Design/assessment for ALE.
- published new guidance on Mooring Integrity Management.
- published cross-industry guidance for life extension of unbonded pipe systems which is currently informing various international standards bodies.
- held workshop on *Novel Monitoring & Inspection techniques* to help achieve ALE for structural applications and crucially for structures in the 'Splash Zone'.

Developing understanding on managing rotating equipment, through a dedicated Network, the North Sea Rotating Equipment Network (NSeaREUN) Highlights in 2021 include:

- publishing updated guidance on Centrifugal Compressors.
- hosting a Carbon Reduction Workshop, considering; Operation Efficiency, Methane Abatement, Carbon Capture/ EGR, Fuel Flexibility / Hydrogen and Enhanced Digital for rotating equipment.

Published in 2021

Guidance For The Management Of Mooring Integrity Part 1– Chain Systems And Their Components >

Guidelines For The Life Extension For Safe Operation Of Ageing Rotating Equipment On Offshore Petroleum Installations >

Guidance For Life Extension Of Unbonded Flexible Pipe Systems >

Guidelines For The Integrity Management Of Offshore Platform Conductors >

Links to further publications >

Trend in 2022 and beyond

The Ageing and Life Extension Committee brings ALE and structural specialists together to focus on structural ageing and life extension issues, increasingly to address Climate Resilience for the global industry.

A year in review > **Corrosion management & asset integrity**

Corrosion and wider Asset Integrity Management

Corrosion is estimated to cost companies between 2-4% of annual turnover. It is estimated that up to 25% of those costs can be saved with proactive management – one of the focus areas of the Corrosion Management Committee.

The Corrosion Management Committee brings corrosion, materials and asset integrity specialists together to focus on corrosion and wider asset integrity management issues for the global industry.

It also explores the critical issue of corrosion under insulation (CUI) in its dedicated Network to promote better understanding of degradation mechanisms and solutions.

Key highlights:

- completed drafting of new guidelines for managing corrosion of subsea structures (including pipelines) as well as on applying a Cost-Benefit Analysis for assets, and guidelines for the management of coatings for external corrosion protection.
- worked with the HSE to develop guidance addressing the topic of Temporary Repairs.
- held a workshop on additive manufacturing exploring the potential of the low carbon footprint approach to quality component manufacture.
- brought industry specialists together to explore key issues in CUI and successfully expanded its coverage with a joined meeting with colleagues in Norway.

Published in 2021

Management Of Engineered Composite Repairs End User Good Practice Guidance >

Corrosion Awareness Handbook A Guide For Visual Recognition Of External Integrity Threats To Upstream Oil And Gas Production Plant >

Corrosion Threats Handbook Upstream Oil And Gas Production 2nd Edition >

Guidelines For Management Of Integrity Of Bolted Joints In Pressurised Systems 3rd Edition >

Links to further publications >

CMC provides the platform for EI and the global industry to address asset integrity for offshore energy structures and operations

A year in review > **Aviation fuel handling**

Managing aviation fuel quality, from refineries to aircraft worldwide

Working with senior technical specialists with global aviation fuel quality responsibilities to develop and maintain EI resources that underpin the safe and efficient handling of aviation fuels.

Key highlights:

- progressed a comprehensive study of GHG emissions associated with aircraft fuelling (applicable to hub and regional airports) and identified most impactful emission reduction strategies.
- commenced work expanding the global standard for aviation fuel quality assurance upstream of airports to more fully incorporate experience on handling sustainable aviation fuel.
- responded to a request from the International Air Transport Association and global fuel suppliers, to develop a recommended practice for defuelling aircraft.
- released an animation *Maintaining aviation fuel cleanliness in an airport hydrant system* to showcase essential recommendations of EI 1560 2nd edition (published in 2020).
- released an animation *Control of fuel system icing inhibitor and diesel exhaust fluid at airports* to help operators, particularly at General Aviation facilities, avoid the catastrophic consequences of inadvertently applying DEF to FSII reservoirs of fuelling trucks.
- undertook a significant update to EI 1540 *Design, construction, commissioning, maintenance and testing of aviation fuelling facilities* and issued publicly for stakeholder review.

Published in 2021

EI 1545 Recommended practice for the defueling of aircraft >

EI Standard 1566 Injection of biocide into jet fuel during underwing pressure refuelling for aircraft maintenance >

CGI animation: Control of fuel system icing inhibitor and diesel exhaust fluid at airports (November 2021) >

CGI animation: Maintaining aviation fuel cleanliness in an airport hydrant system (December 2021) >

Links to further publications >

Trend in 2022 and beyond

- **Delivery of updated standard for handling of sustainable aviation fuel from refineries to airports (EI/JIG Standard 1530) to remove potential barriers to widescale deployment.**
- **Progress initiatives to help operators ramp down GHG emissions associated with aircraft fuelling.**

Supporting the fuels value chain

Producing resources to facilitate the fuel supply chain to operate efficiently and safely from refineries to end users, bringing together safety and engineering specialists from industry, trade associations, regulatory bodies and enforcement agencies.

A key highlight from the year was the progress made on investigating the risk and impact associated with non diesel fuel engine vehicles entering or working within hazardous locations such as refineries, terminals and storage sites. Vehicles assessed include those powered by LNG, CNG, electric, petrol, hybrid, LPG, hydrogen combustion, and hydrogen fuel cell.

A key success in 2021 has been the subsequent development of good practice to assist operators to achieve and maintain an acceptable level of safety, and the development of an associated risk matrix for hydrogen, LPG, CNG, and LNG powered vehicles.

The committee will continue to focus on:

- collaborating closely with wider committees to ensure safe and efficient distribution of future fuels.
- ensuring existing service stations can safely house new technology refuelling facilities alongside hydrocarbon dispensing pumps.
- provision of high quality guidance to allow technological advances such as tyre pressure monitoring systems, to be safely retrofitted to existing road tanker fleet.
- providing a forum to enable collaboration across industry, regulators and trade associations.

Published in 2021

Investigation Into The Risk And Impact Associated With Non-Diesel Fuel Engine Vehicles, By Type, Whilst Entering Or Working Within Hazardous Storage Locations, 1st Edition (November 2021) >

Service Station Panel Guidance Note – Checklist Prior To The Introduction Of E10 Fuels Into Service Station Storage Tanks, 1st Edition (August 2021) >

Links to further publications >

Trend in 2022 and beyond

Adaptation of existing EI good practice products to ensure safe and efficient distribution of future fuels

A year in review > **Environment**

Supporting the transition to a low carbon and sustainable future for all

Bringing experts together to minimise the potential environmental impact on receptors from the production, generation and consumption of energy.

Worked in partnership with CONCAWE to research waste-to-product streams and technologies that could help reach a net zero economy by 2050.

Highlights have included

- working with the Methane Guiding Principles Group to deliver a global outreach initiative to accelerate action to reduce methane emissions through promotion of methane abatement options.
- commissioning research on how to implement a circular economy and develop sustainable business models to contribute to net zero targets.
- developing guidance to quantify emissions related to soil and groundwater management activities, providing industry with a standardised methodology as reduction in greenhouse gas (GHG) emissions becomes an increasingly high priority for companies, governments, and society in general.
- developed report on economic guidance to provide an economic value to apply when undertaking a Cost Benefit Analysis (CBA) under COMAH for environmental purposes (Phase 1 – Literature review).

Supporting the transition to low carbon by

- working with the environmental agencies to support industry in meeting European Sustainability Goals and on exploring environmental aspects of renewable technologies.
- developing training to raise awareness around actions to achieve a net zero future and to support those responsible for delivering net zero strategies.
- exploring environmental and sustainability challenges associated with offshore wind operations across the whole life cycle operation e.g., refurbishment, recycling and remanufacturing options so as to reduce landfill waste.

Published in 2021

Guidance on the identification and assessment of contaminants of emerging concern in soil and groundwater and industrial sites (1st edition, June 2021) >

Guidance on Petroleum Hydrocarbon Forensic Chemistry for Site Investigation and Remediation (Volume 1 1st edition, June 2021) >

Guidance on Petroleum Hydrocarbon Forensic Chemistry for Site Investigation and Remediation (Volume 2 1st edition, June 2021) >

Links to further publications >

A year in review > **Health**

Protecting worker health

A collaborative forum for company doctors, hygienists, nursing and occupational health professionals to discuss key issues relating to the energy industry and to develop good practice.

The health committee links the energy sector with other recognised bodies and leading educational facilities to ensure knowledge exchange and access to latest research and understanding on key health issues affecting the workforce.

Key highlights:

- collaboration between regulator and industry on common respiratory health surveillance methods to assist occupational health professionals and medical practitioners in ensuring employees receive the appropriate surveillance for work-related exposures.
- monitoring the health of key industry cohorts in the refining and distribution sectors and benchmarking against the wider population. The major epidemiological study is published every five years.
- continuing to support member companies in managing mental wellbeing in the workplace, in the context of the transition to low carbon and during the COVID 19 pandemic.

Published in 2021

Guidance On The Declassification Of Tanks Previously In Leaded Gasoline Service >

Links to further publications >

Work continues in 2022 to:

- **produce good practice for future health issues as a consequence of new technologies and energy sources.**
- **develop industry guidance on exposures associated with diesel engine exhaust emissions from equipment used across energy industries, including work and living spaces. This will enable a risk-based health assessment of the risks these emissions pose, and provide appropriate management strategies to inform future decisions on workplace exposure limits.**

A year in review > **Human and Organisational Factors Committee (HOFCOM)**

Managing risk by supporting human performance

Hazardous industries rely on human performance to improve safety and reliability. HOFCOM develop resources on how people interact with plant, processes and each other, addressing fatigue, ergonomics, staffing levels, task analysis, and learning.

Key highlights include:

- offering a new qualification: Human Performance Learning Pathway for the Energy Sector – collaboration between EI and Chartered Institute of Ergonomics and Human Factors (CIEHF), includes a free introductory e-learn.
- Guidance on ensuring safe staffing levels – helping organisations to understand the numbers and types of staff they require to maintain safe and effective operations.

2022 work programme includes:

- human factors integration in energy transition projects – ensuring the tools we use to manage human performance in the oil and gas sector are applicable in fast-moving energy transition projects.
- working with Bristol and Bath universities on developing greater resilience to the causes of major events, producing a practical question set to help companies 'audit' themselves against good practice.
- producing guidance and checklists to improve procurement of goods and equipment.

Published in 2021

Task Improvement Process e-learn course >

Hearts and Minds HSE 001 Making compliance easier (formerly Managing rule breaking >

Research report: Achieving greater resilience to major events – Organisational learning for safety risk management in complex environments >

Guidance on the human aspects of cyber security >

Links to further publications >

A year in review > **Hearts and Minds**

Driving cultural change through better safety behaviour and performance

Hearts & Minds provides a toolkit to help organisations improve their safety culture by involving the workforce in improving the way health, safety, and environment (HSE) is managed.

Key highlights in 2021 include:

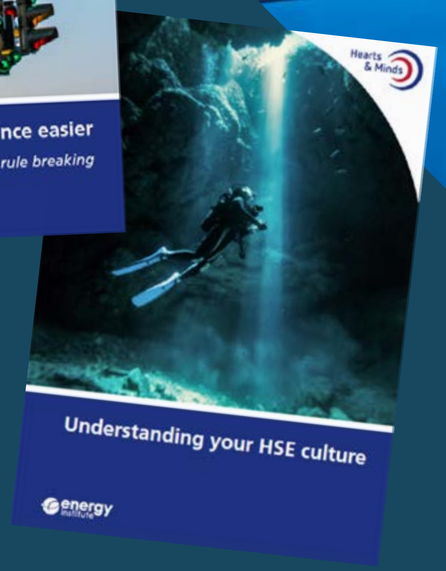
- Published Making compliance easier – a new tool to improve compliance with procedures by enhancing the work environment, the job and human performance.
- Understanding your HSE culture now available as an online survey.
- Understanding your HSE culture (v6) published in several languages.

Published in 2021

HSE 001 Making compliance easier (formerly Managing rule breaking) (English) >

Hearts & Minds is now available as digital downloads > (All Hearts & Minds tools freely available online to all EI Technical Partners) >

Links to further publications >



https://heartsandminds.energyinst.org/

A year in review > **Toolbox**

Just in time cross-industry learning, made simple

Toolbox is the EI's flagship, free to use webapp for delivering just in time learning to frontline operators and supervisors. Toolbox contains lessons learned from nearly 500 real incidents, delivered in a timely and targeted way. Learning material, including videos, is readily accessible for use by supervisors during toolbox talks and planning meetings.

Key highlights in 2021 include:

- 160 new learning resources added.
- 8 new animations produced.
- Translated 300-400 new learning resources in French, German, Portuguese, Malay, Russian, Spanish, and Traditional Chinese.
- New language versions: Japanese and Simplified Chinese.
- 43,000 separate users in 2021 (83,000 user since 2019 launch).

In 2022...

- Toolbox presents.... free monthly webinars on different learning from incidents and related topics.
- Forming partnerships with other industry bodies to help make Toolbox the 'go to' resource for cross-industry learning.

toolbox

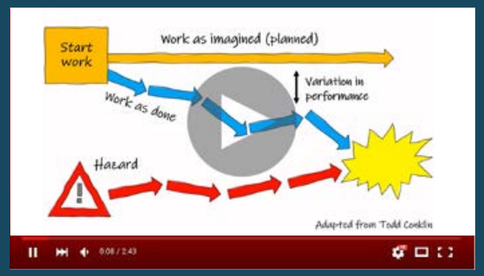
https://toolbox.energyinst.org/

Supporting learning within industry

The Tripod Foundation has been at the forefront of organisational learning since 1998. In partnership with the Energy Institute, the Foundation leads a growing community of Tripod Practitioners and Trainers. Together we strive to provide thought leadership, tools, and resources to improve how organisations learn from, and prevent, incidents.

Key highlights

- Developed learning from incidents leadership models, helping companies improve how they learn from incidents by actively supporting their leaders in engaging with accident investigations. Having been piloted in a number of organisations the tool will be published in 2022.
- Developed an accessible investigation tool 'Tripod Lite' to help non-experts (supervisors, middle managers) investigating low potential incidents and near misses to uncover the failed risk controls and human factors elements. Piloting and launch expected in 2022.
- 450 people trained in Tripod Beta methodology, 84 people accredited as Tripod Practitioners (expert level) in 2021.
- New video: Learning before incidents.



http://tripodfoundation.com/

https://publishing.energyinst.org/tripod

A year in review > **Hydrocarbon management**

Measurement – the essential tool for management

Comprising technical specialists with global measurement and product handling responsibilities, the Hydrocarbon Management Committee develops and maintains a portfolio of EI guidance.

Key highlights in 2021:

- continued to engage with global stakeholders, including via the Asian Region Sub-Committee, American Petroleum Institute, and ISO, providing the secretariat for ISO Technical Committee 28 / Sub-Committee 2 *Measurement of petroleum and related products*.
- published a fourth edition of HM 21 *Calculation procedures for static and dynamic measurement of light hydrocarbon liquids (LNG, LPG, ethylene, propylene and butadienes*).
- published third editions of two key resources for refinery and terminal operators: *HM 31 Guide to hydrocarbon management in petroleum refinery operations* and *HM 32 Guide to hydrocarbon management at petroleum product marketing and distribution terminals.*
- published a fourth edition of detailed guidance on uncertainty calculations: HM 25 *Guidelines for assessment of uncertainty in the oil and gas industry.*
- developed and published a new EI title HM 79 *Shore tank handbook – tank design and ancillary equipment relating to measurement and sampling of hydrocarbon liquids in shore tanks* to identify designs and equipment required to satisfy measurement and sampling requirements.
- published three research reports, covering determination of shrinkage when blending petroleum product mixtures, determination of recalibration intervals for fiscal metering measurements and the findings of a water in crude oil interface study.

Published in 2021

HM 5 Guideline for analytical results verification >

HM 63 Independent inspection company auditing, preaudit information >

HM 71 Oil field produced water metering and analysis, offshore UK waters >

HM 95 Guidelines for marine petroleum cargo superintendents >

Links to further publications >

Progress initiatives to develop resources to assist industry effectively manage hydrogen, carbon dioxide, methane and LNG.

A year in review > **Process safety**

Prevention and control of major accident hazards

The role of the Process Safety Committee is to enable effective process safety management to prevent and control major accident hazards, thereby protecting workers, the public, the environment, and assets.

The 2021 work programme included:

- revision of a leak frequency database for offshore pipelines and risers.
- revision and integration of guidelines on the impact of severe fires on process plant, and control and mitigation options (e.g., relief and blowdown systems).
- revision of onshore process plant and tank farm fire hazard management guidance ('EI 19').
- development of tank farm scenario-specific control measures guidance.
- revision of hydrocarbon release reduction guidance for small-bore tubing and flexible hoses.

The 2022 work programme includes:

- increased focus on the implications of the energy transition on process safety risk management.
- addressing post-Covid pandemic risk management (e.g., efficacy of remote process hazard analysis).
- application of Creeping Change Hazard Identification methodology for assessing climate resilience.
- investigating how best to manage technical change, which is a common threat to continued process safety management.
- understanding whether contracting introduces weaknesses in process safety management.

Published in 2021

Model Code of Safe Practice Part 9: Liquefied petroleum gas – large bulk storage (3rd edition, April 2021) >

Guidance on the management, achievement, operation and maintenance of functional safety employing safety instrumented systems in support of IEC 61511 (1st edition, May 2021) >

Failure mode and effects analysis tool for above-ground storage tanks storing petroleum, petroleum products or other fuels – Part 1: Failure mode analysis for primary containment (1st edition, May 2021) >

Links to further publications >

A year in review > **Test Method Standardization**

Assisting the industry in its transition to lower carbon fuels

Developing analytical test methods for hydrogen, ammonia and methanol as transport fuels and for use in power cells, as well as maintaining the portfolio of methods critical to existing petroleum products.

Supporting the transition by:

- drafting a new test method to measure trace contaminants in hydrogen that may adversely affect fuel cells.
- drafting a new test method to measure the permittivity of synthetic aviation fuels using a small-scale automated instrument, so enabling SAF to be safely combined with existing fuels in larger quantities.
- drafting a new test method (IP 631) to allow for the rapid measurement of the amount of biodiesel in diesel using a small, portable roadside instrument.
- publication of a research report following an international interlaboratory study on the measurement Kinematic Viscosity (IP 71) supporting the use of renewables (biofuels) in modern fuels.

Underpinning operations by:

- publishing the 2021 edition of the 'Standard Test Methods' books (3 vol set) that included 34 methods that were new or significantly amended in this edition.
- developing a method (IP-PM-FA) to measure the amounts of abrasive particles that can contaminate diesel fuel and lead to the early failure of modern high pressure injection systems.
- developing a method (IP-PM-FF) to enable the detection of short chain fatty acid methyl esters (FAME), which can contaminate jet fuel when handled in non-dedicated transport systems.
- developed a new test (IP 634) for the determination of the turbidity point and aniline point equivalent, eliminating the use of aniline, a highly toxic chemical.

Published in 2021

IP Standard Test Methods For Analysis And Testing Of Petroleum And Related Products And British Standard 2000 Parts. 2021 >

Links to further publications >

Energy Institute correlation schemes

The EI runs a well-established and globally recognised suite of testing schemes, participation in which is critical to optimise operations by correcting biases and drift in analytical measurements.

Engine Correlation Scheme (ESC)

The Engine Correlation Scheme (ESC) is specifically aimed at laboratories determining the Research Octane Number (RON), Motor Octane Number (MON) and Cetane numbers of gasoline and diesel fuels.

These laboratories may be using the traditional single cylinder engines to determine the RON, MON, and Cetane numbers or more modern alternative instruments, the scheme caters for all types.

In 2021, over 40 laboratories worldwide received the same set of fuels to test, distributed on a monthly basis, with their data correlated with other scheme participants by the EI and anonymously reported each month.

The report gives the mean RON, MON and Cetane values for the fuels and tells each laboratory how far they are away from the mean using a Z score metric. This allows them to benchmark against peers.

RON, MON and Cetane number are vital parameters in the trading of fuel, with small biases in their measurement at any location potentially leading to a “giveaway” resulting in significant financial implications for the operator.

The EI Proficiency Testing Scheme (EI PTS)

With over 70 laboratory participants worldwide in 2021, the EI PTS is one of the largest such schemes available. Laboratories received monthly samples of gasoline, diesel, jet fuel and fuel oil. Participants had the option to take over 90 different tests on these fuels, addressing specifications and important physical and chemical properties.

Each laboratory receives a bespoke report which not only contains the Z score for each test for benchmarking but also other statistical metrics including standard deviation and method reproducibility.

The reports also contain graphs which show long term trends for each test they have conducted allowing, for example, instrument drift to be spotted.

The reports are used to demonstrate to management, customers, and auditors th the laboratory processes are under contro and are essential evidence for accreditati to international standards such as ISO 17025.

Analysis of the data generated by the scheme is used by the EI, CEN and ISO standardization bodies to monitor how their standards are performing in all laboratories and over a long period of time.

Driving world class health and safety performance in offshore wind

G+ is the global health and safety organisation for the global offshore wind industry, bringing together business leaders, health and safety experts and organisations operating in offshore wind. It works collaboratively and in partnership with the EI and is committed to promoting and maintaining the highest possible standards of health and safety from US to Europe to Asia Pacific

Health and safety statistics

The backbone of the work. All G+ members provide their health and safety incident data for all their offshore wind farm sites across the world, from development to decommissioning stage. Data are analysed by the EI to monitor performance and trends and identify risks. This is the evidence base for the G+ work programme. www.gplusoffshorewind.com

Good practice guidelines

Driven by the incident data and drawing on knowledge and expertise from G+ members, subject matter experts, academia, regulators, and industry stakeholders. Examples in 2021 include Good practice guidelines for safe helicopter operations in support of the global offshore wind industry Part A, and Good practice – Offshore wind farm transfer, 1st edition (February 2021).

Safe by design workshops

High risk topics are addressed in workshops to review the current design controls and potential failures, identify opportunities for improvement and demonstrate the potential for risk reduction throughout the lifecycle of an offshore wind farm. Is there a specific topic you would like to suggest for a Safe by Design workshop? Get in touch on gplus@energyinst.org

Forward programme

Work in 2022 will see guidance developed on topics such as floating wind, safety in steel fabrication yards and physical capability assessments for offshore wind technicians. Work also continues to engage the offshore wind industry globally, with a focus on the US and Asia Pacific Region.

Supporting the onshore wind industry

SafetyOn is the health and safety organisation for the onshore wind sector ensuring transparency on the industry's performance, promoting good practice and assisting the industry in mitigating key emerging risks through cooperation and shared learning.

Health and safety incident data collection

SafetyOn released its first annual onshore wind health and safety incident data report in June 2021.

Benchmarking the health and safety performance of the UK onshore wind industry for the first time, the report provides transparency on the industry's performance, as well as a solid platform for the development of SafetyOn's work programme and good practice guidance.

Developing good practice

Collaboration is key in developing good practice, drawing on expertise from members, subject matter experts, academia, regulators, and industry stakeholders. Driven by the incident data, examples in 2021 include good practice on *Traffic management for onshore wind farms, decommissioning for onshore wind turbines, and post-incident decommissioning of onshore wind turbines.*

Covid-19

A dedicated Covid-19 work group continued to meet to review and revise guidance regarding site operations in line with government policy and regulation, as well as emerging learning from members of SafetyOn. The guidance notes facilitated safe operations during the pandemic.

Published in 2021

Good practice guideline on post-incident decommissioning of onshore wind turbines >

Planned decommissioning framework for onshore wind turbines >

Traffic management for onshore wind farms >

Links to further publications >

Get involved

Be part of something amazing

The achievements highlighted in this report show the benefit of collaboration between our technical partners, regulators, trade bodies, academia and wider stakeholders. The opportunity to work with others and share intellectual resource and learn from the wider experience of peers is a powerful driver for membership of the Energy Institute. Nothing in this report would be possible without the support of our technical members, project sponsors and committee volunteers. On behalf of my colleagues at the EI, I would like to thank all for their support and commitment throughout 2021. For those of you in organisations that are not currently technical partners of the EI (page 4), with experience to offer across any of the topics included in this report, please do get in touch to discuss the benefits of engagement with the EI.

To find out more and be involved, contact

Martin Maeso, Good Practice Director
mmaeso@energyinst.org

‘The opportunity to work with others and share intellectual resource and learn from the wider experience of peers is a powerful driver for membership of the Energy Institute.’

The Energy Institute

Creating a better energy future... for our members and society

By accelerating a just global energy transition towards net zero.

The Energy Institute does this by:

Attracting, developing and equipping a diverse future energy workforce

- Increasing diversity in the industry
- Engaging with future leaders, today: Generation 2050
- Supporting personal development through training

Informing energy decision making by convening expertise and offering advice

- Giving a voice to energy professionals: Energy Barometer
- Helping people access knowledge about energy: Energy Knowledge

Working with industry to make energy lower carbon, safer and more efficient

- Developing and providing access to industry good practice
- Working to facilitate collaboration, and the transfer of knowledge (as summarised in this report)

To learn more about the extensive work of the EI beyond its good practice programme see www.energyinst.org

2021 publications

Publications in 2021

Asset integrity

Corrosion threats handbook- Upstream oil and gas production (A5/A6/PDF)

Corrosion incident reporting tool - Guidance for integrity root-cause analysis

External corrosion awareness handbook: A guide for visual recognition of external integrity threats to upstream oil and gas production plant (A5/A6/PDF)

Guidelines for in-service management of passive fire protection coating systems

Guidance for life extension of unbonded flexible pipe systems

Guidelines for management of integrity of bolted joints in pressurised systems

Guidelines for the life extension for safe operation of ageing rotating equipment on offshore petroleum installations - centrifugal compressors (2nd edition)

Guidance for the integrity management of offshore platform conductors

Guidance for the management of mooring integrity part 1: chain systems and their components

Management of engineered composite repairs: End user good practice guidance. (HSE jointed)

Managing risk

Guidance on ensuring safe staffing levels

Human Factors in Renewables e-book

Process safety

Guidelines for offshore oil and gas installations that are not permanently attended (animation) (1st edition, November 2021)

Failure mode and effects analysis tool for above-ground storage tanks storing petroleum, petroleum products or other fuels - Part 1: Failure mode analysis for primary containment

Failure mode and effects analysis tool for above-ground storage tanks storing petroleum, petroleum products or other fuels – Part 2: Effects analysis for secondary containment

Guidance on managing obsolesence and upgrading industrial automation and control systems (IACS)

Guidance on the management, achievement, operation and maintenance of functional safety employing safety instrumented systems in support of IEC 61511

Model Code of Safe Practice Part 9 Liquefied petroleum gas - large bulk storage

Technical workshop proceedings: Hydrogen safety cases – Challenges in hydrogen safety case development in UK/European industrial clusters

Hearts and Minds

HSE 202 Understanding your HSE Culture (version 6) (German)

HSE 205 Understanding your HSE culture (version 5) English with Bahasa cultural dimensions

HSE 204 Understanding your HSE Culture (version 6) (Polish)

HSE 203 Understanding your HSE Culture (version 6) (Turkish)

Aviation fuel handling

EI 1545 Recommended practice for the defuelling of aircraft

EI 1566 Injection of biocide into jet fuel during underwing pressure refuelling for aircraft maintenance

EI Research report: Aviation fuel hydrant pit box loading

Proceedings of an EI aviation fuel filtration seminar held 24 March 2021

Environment

Guidance on the identification and assessment of contaminants of emerging concern in soil and groundwater at industrial sites

Guidance on petroleum hydrocarbon forensic chemistry for site investigation and remediation Volume 1

Guidance on petroleum hydrocarbon forensic chemistry for site investigation and remediation Volume 2

Hydrocarbon management

HM 5. Guidelines for analytical results verification

HM 21. Calculation procedures for static and dynamic measurement of light hydrocarbon liquids (LNG, LPG, ethylene, propylene and butadienes)

HM 25. Guidelines for the assessment of uncertainty in the oil and gas industry

HM 31. Guide to hydrocarbon management in petroleum refinery operations

HM 32. Guide to hydrocarbon management at petroleum product marketing and distribution terminals

HM 63. Independent inspection company auditing – Pre-audit information

HM 71. Oil field produced water metering and analysis, offshore UK waters

2021 publications

Publications in 2021

HM 75. A guide to uncertainty of measurement in the oil and gas industry

HM 79. Shore tank handbook. Tank design and ancilliary equipment relating to measurement and sampling of hydrocarbon liquids in shore tanks

HM 95. Guidelines for marine petroleum cargo superintendents

EI Research Report: Determination of shrinkage when blending petroleum product mixtures (HM 1602)

EI Research Report: Determination of recalibration intervals for fiscal metering measurements (HM 1803)

HM 1805. Water in crude oil interface study

Hazardous area classification

Investigation into the risk and impact associated with non-diesel fuel engine vehicles, by type, whilst entering or working within hazardous storage locations

Human factors

Guidance on the human aspects of cybersecurity

Research report: Achieving greater resilience to major events – Organisational learning for safety risk management in complex environments

Renewables (offshore/ onshore)

Good practice guidelines for safe helicopter operations in support of the global offshore wind industry Part A

Good practice guidelines for safe helicopter operations in support of the global offshore wind industry Part B

G+ Incident data report 2020

Guidance on the application of Wind Turbine Safety Rules

Japanese translation - G+ Global Offshore Wind Health and Safety Organisation Brochure

Safetyon Incident data report 2020

SafetyOn Good practice guidelines: Planned decommissioning framework for onshore wind turbines

SafetyOn Good practice guidelines: Post-incident decommissioning of onshore wind turbines

SafetyOn Good practice guidelines: Traffic management for onshore wind farms

Traditional Mandarin translation - Case study on reducing manual handling and ergonomics related incidents in the offshore wind industry

Wind Turbine Safety Rules 4th Edition 2021

Wind Turbine Safety Rules Procedure 1: Approval of general provisions special instructions (GP3) and other procedures

Wind Turbine Safety Rules Procedure 2: Approval of tools, equipment and processes

Wind Turbine Safety Rules Procedure 3: Objections on safety reasons

Wind Turbine Safety Rules Procedure 4: Addition and removal of safety rules to plant and LV apparatus

Wind Turbine Safety Rules Procedure 5: Temporary addition of alternative safe systems of work

Wind Turbine Safety Rules Procedure 6: Appointment of persons

Wind Turbine Safety Rules Procedure 7: Control and management of cross boundary safety precautions between the wind turbine safety rules and other safety rules

Wind Turbine Safety Rules Procedure 8: Approval of electronic safety document systems

Petroleum product storage

Guidance on the declassification of tanks previously in leaded gasoline service

Power generation

Managing the replant of a combined cycle gas turbine (CCGT) power plant

Research report: Evolution of condition monitoring requirements for combined cycle gas turbine (CCGT) power plants

Standard test methods

IP Standard Test Methods for analysis and testing of petroleum and related products, and British Standard Parts. 2021

New full methods:

IP 631

Determination of the contamination level of fatty acid methyl esters in middle distillate and residual fuels using flow analysis by FTIR – rapid screening method.

IP 634

Determination of turbidity point and aniline point equivalent.

IP PM ET

Determination of sulfur content in crude oil - Wavelength-dispersive X-ray fluorescence spectrometry

2021 publications

Publications in 2021

Existing standards with significant changes:

IP 34

Determination of flash point – Pensky-Martens closed cup method

IP 71.1

Determination of Kinematic viscosity and calculation of dynamic viscosity

IP 123

Determination of distillation characteristics at atmospheric pressure

IP 130

Determination of bromine number of distillates and aliphatic olefins – Electrometric method

IP 131

Gum content of fuels – Jet evaporation method.

IP 177

Determination of weak and strong acid number- Potentiometric titration method

IP 219

Determination of Cloud Point

IP 323

Determination of Thermal oxidation stability of gas turbine fuels

IP 367-1

Precision of measurement methods and results – Part 1: Determination of precision data in relation to methods of test

IP 367-3

Precision of measurement methods and results – Part 3: Monitoring and verification of published precision data in relation to methods of test

IP 391

Determination of aromatic hydrocarbon types in middle distillates – high performance liquid chromatography method with refractive index detection

IP 395

Assessment of the dryness of propane – Valve freeze method

IP 412

Determination of water separability of petroleum oils and synthetic fluids

IP 436

Determination of aromatic hydrocarbon types in aviation fuels and petroleum distillates – High performance liquid chromatography method with refractive index detection

IP 582

Determination of boiling range distribution – Gas chromatography method

IP 585

Determination of fatty acid methyl esters (FAME), derived from bio-diesel fuel, in aviation turbine fuel, GC-MS with selective ion monitoring/scan detection method