



Beryllium Monitoring for Employees at AWE UK

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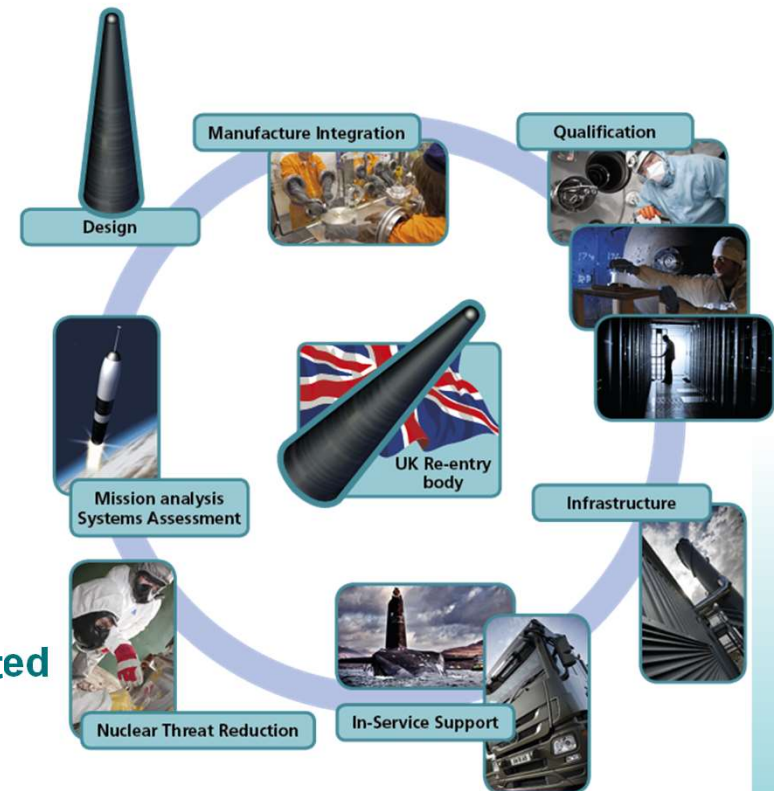
November 2017

Introduction to AWE



Fast facts

- AWE has played a crucial role in **national defence** and **nuclear security** for over 60 years
- We provide and maintain warheads for Trident to ensure the UK continues to have a **credible** and **minimum** nuclear deterrent
- We are a centre of **excellence** in **science**, **engineering** and **technology**
- Using our **unique nuclear skills** and **technical** expertise, we develop and deliver national nuclear security and counter-terrorism solutions for UK government
- AWE is a **Government-Owned Contractor-Operated (GOCO)** organisation operated by a joint venture of Lockheed Martin, Serco and Jacobs Engineering on behalf of MOD



Underpinning continuous at sea deterrence and national nuclear security

Our sites



**Aldermaston
(709 acres)**
Fully nuclear licensed



**Blacknest
(Five acres)**



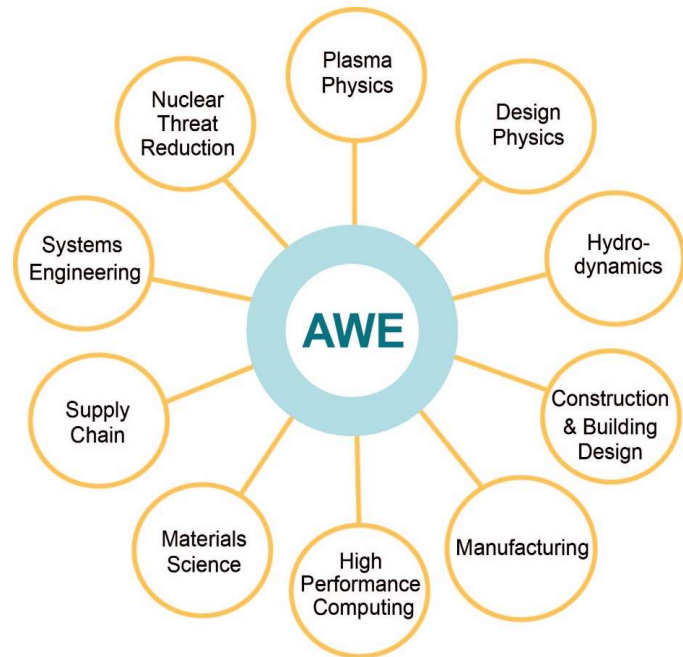
**Burghfield
(215 acres)**
Fully nuclear licensed



Coulport

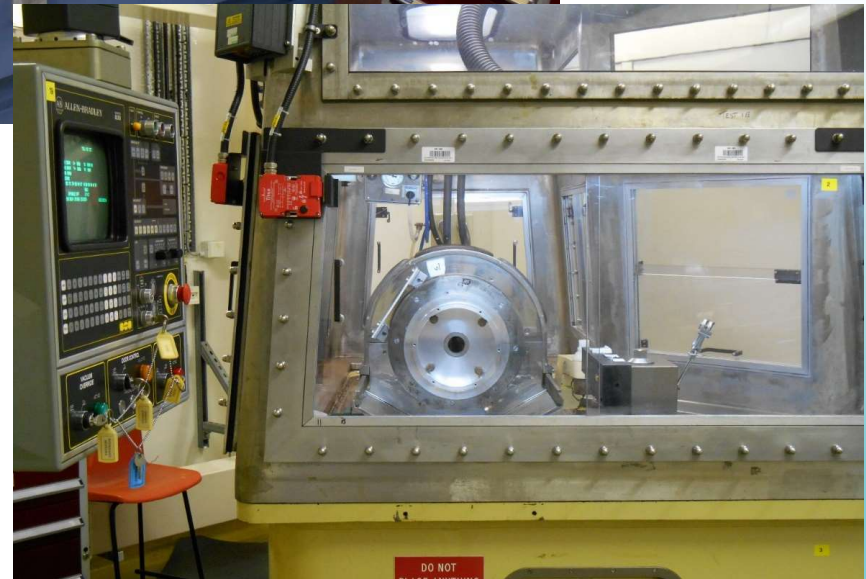
Two nuclear licensed sites and a scientific support facility – approx. 5,500 employees

Our skills and expertise



AWE provides expertise to support the UK's nuclear defence and national security

Beryllium Machining Processes



Oversight of control arrangements



- Legislation
- In house limits
- Area designations
- Sampling and monitoring techniques
- Trending data
- Typical day
- Health programme & contamination process
- Feasibility study
- The future with SCOEL

UK Legislation & Authority



Workplace Exposure Limits - EH40/2005 supplementary Table 1, 2011;
Beryllium and Beryllium compounds (as Be),
Long Term exposure limit (8-hour, (TWA) reference period) 0.002 mg.m-3

COSHH Regulations -

Assessment of risk of exposure to SHH **before** use so that appropriate control can be provided and used to prevent/ reduce exposure to an acceptable level

Control of exposure to substances hazardous to health

EH40/2005 Workplace exposure limits
Containing the list of workplace exposure limits for use with the Control of Substances Hazardous to Health Regulations (as amended)

Control of substances hazardous to health
The Control of Substances Hazardous to Health Regulations 2002 (as amended)



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News

Health and Work strategy plans
These strategy plans include health priorities informed by our
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I am interested in...

- Risk assessment
- COSHH

Tweets by @H_S_E

Beryllium and you
Working with beryllium – are you at risk?

Introduction

Working with beryllium and its compounds may affect you. Beryllium is a lightweight, strong, steel grey metal, and white ceramic. Copper-beryllium alloys are 90% copper, 10% beryllium.

What is beryllium?

Beryllium is a lightweight, strong, steel grey metal, and white ceramic. Copper-beryllium alloys are 90% copper, 10% beryllium.





Beryllium in house limits

Air Monitoring

The AWE Alert and Action Levels for airborne personal exposure to Beryllium are:

- **Alert level:** 0.25 $\mu\text{g}/\text{m}^3$ (8-hour TWA)
- **Action level:** 0.5 $\mu\text{g}/\text{m}^3$ (8-hour TWA)

Surface Monitoring

The AWE Beryllium surface contamination limits for area designation are as follows:

Controlled Area: 10-20 $\mu\text{g} / \text{m}^2$ Cleaning of contaminated surfaces recommended, RPE as necessary

- **Alert level:** 20-50 $\mu\text{g} / \text{m}^2$ Action required, RPE as necessary
- **Action level:** >50 $\mu\text{g} / \text{m}^2$ Immediate action required, RPE as necessary

Non-Controlled Area: <10 $\mu\text{g} / \text{m}^2$ Supervised (Beryllium)/Un-designated Areas

Beryllium area designations

- Areas in which Beryllium is processed, but in which there is insignificant potential for exposure to Beryllium particulate by any route of exposure shall be designated **Supervised Areas (Beryllium)**.
- Areas in which there is a significant potential for exposure to beryllium particulate by any route of exposure shall be designated as **Controlled Areas (Beryllium)**.
- Areas in which, after all other reasonably practicable controls have been applied, there is a residual risk of exposure to beryllium particulate such that PPE / RPE is required to secure adequate control, shall be designated **Exclusion Areas (Beryllium)**.

Beryllium monitoring



Sampling types; Static Air samples, Personal Air Samples, Surface smears, Article/ item clearances, Stack sampling, Incident sampling at source (combination).

Personnel monitoring; where there is a reason to suspect personal exposure has occurred; Nose blow, Facial smear, Inside RPE, PPE surfaces, Direct wound smears or swab (cuts or embedded material)

Beryllium Analysis; Sample results are sent to our in house analysis group (~1/2 hour turnaround time)

In house analysis method for analysis published & still used to date

ICP AAS method LOD: 0.02 (acid digest synergy to NIOSH method),

Health programme

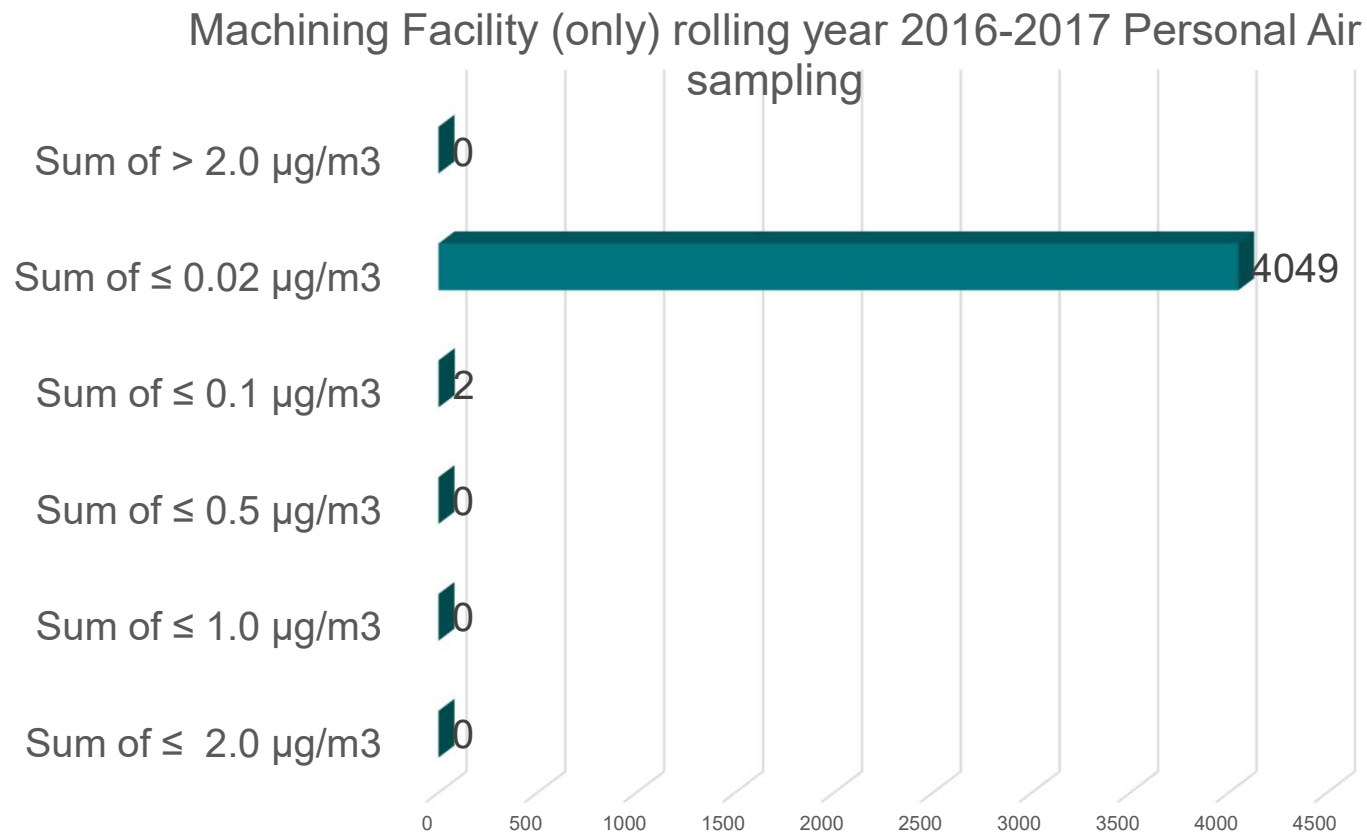


- A job hazard analysis form leads to initiate a health assessment application and a subsequent relevant health assessment programme for employees i.e. “health surveillance”.
- There are 2 categories of health surveillance.
 - Lower risk categories record only (as per carcinogen requirements)
 - Higher risk categories will lead to inclusion on a programme based on the criteria under COSHH for exposure potential which currently has about 160 workers. Which includes an annual medical examination by the Occupational Health Physician
- Spirometry is included in the pre-employment health examination as part of establishing a baseline
- There are no CBD cases currently; there may have been two in the past.
- Unplanned events/incidents lead to direct involvement by Occupational Health. There is a policy to relocate a worker from Be work if necessary, but to date no removals have been required, and no results that have caused concern.
- The BeLPT (US method) was reviewed in the late 1990s but was not adopted. For this reason, there are no BeS data available.
- AWE is studying biological monitoring options including urine and faecal sampling. Measurement of body burden is better than testing nasal swabs.

Typical working control expectations



Trending & overview



SCOEL proposed changes from the WPC

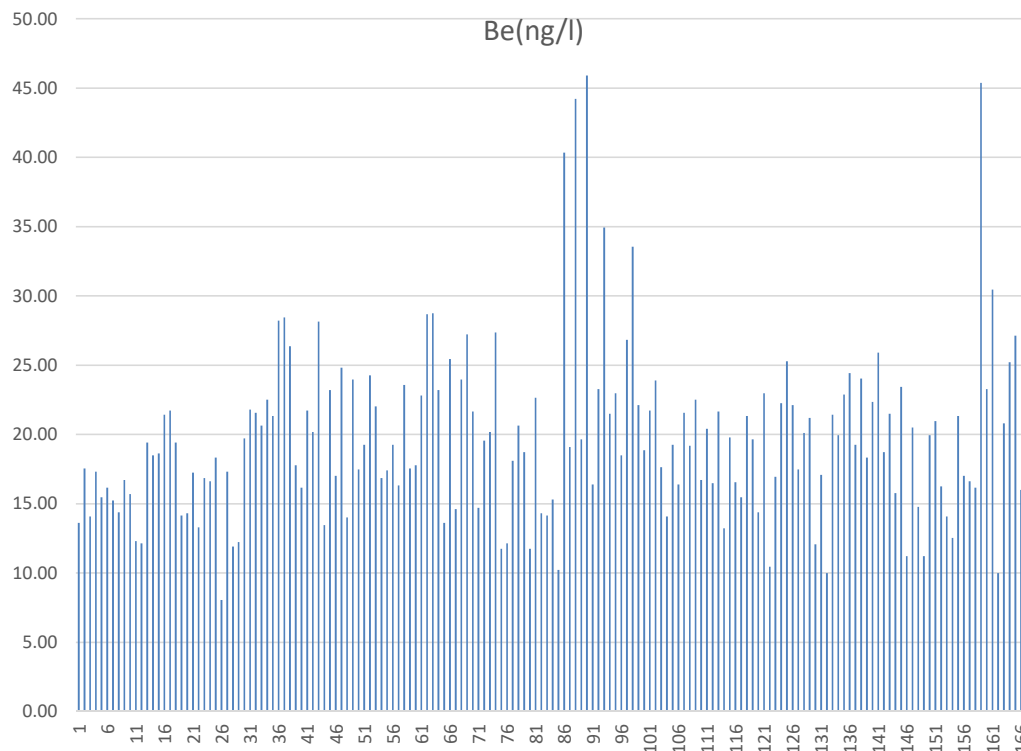


- Proposed drop in airborne exposure limit from $2\mu\text{g}/\text{m}^3$ to $0.6\mu\text{g}/\text{m}^3$, potentially dropping after a 5 year transition to $0.2\mu\text{g}/\text{m}^3$ TWA (Time Weighted Average) daily personal inhalation limit
- Introduction of a BGV (biological monitoring guidance value) of $0.04\mu\text{g}$ beryllium/L urine
- The issue of economic feasibility has been noted leading to the above counter proposal increasing from the initial Nov '2016 proposal
- The amendments are noted as not protecting against sensitivity, although recognising dermal & respiratory sensitisation, *not skin sensitisation*

AWE Biological Monitoring Results 2014



	AWE results 2014	Background levels
Number of samples	166	295
Number of individuals	18	132
Median	24.9 ng/L	5.4 ng/L
95 th percentile	37.2 ng/L	11.6 ng/L
Range	10.4-59.4 ng/L	<LOD-50.8 ng/L



Benchmark:

German 50 ng/L Be in urine for unexposed individuals

Study results

Uncorrected: Max 59.4ng & Min 10.4ng

Corrected: Max 45.9ng & Min 8.04ng

No significant difference in the study between occupationally exposed & control or occasional visitors but we can view Be in urine for staff & have a starting point for data.

Overall situation -Biological Limits

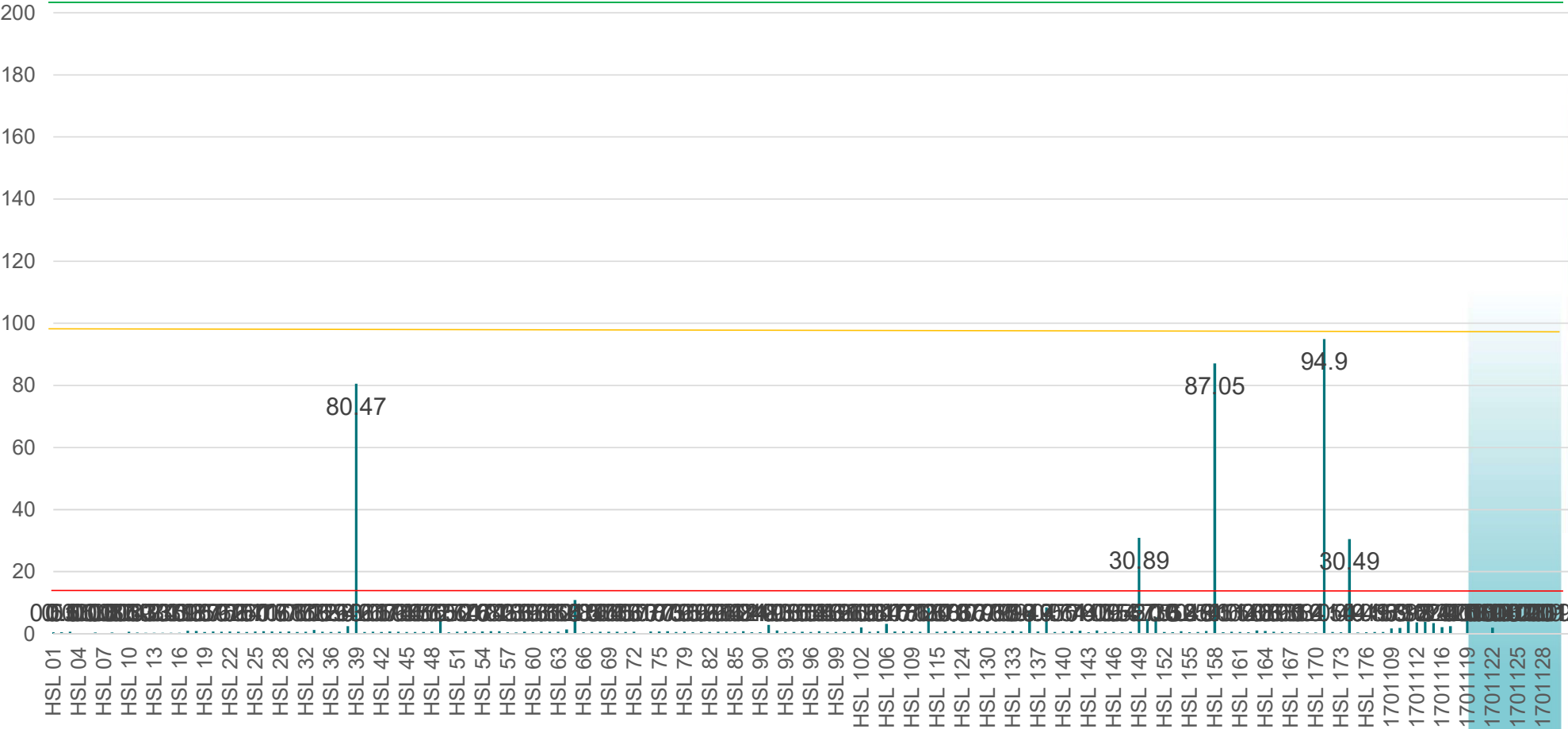


- No current biological monitoring programme in place proposed value is **set at 95%ile** (AWE & HSL work supports 90%ile participation in 2014 feasibility study & reflection on 1991 AWE study)
- Correlation to air exposure is poor, no demonstrable link
- Potential link to secondary exposure from surfaces etc
- Development of a biological monitoring programme is an emergent need
- SCOEL advocate the importance of biological monitoring in exposure risk management – this will be necessary
- Any new processes or uplifts should seek the opportunity to implement clean practices in support of biological intake

Baseline data study 2017 – comparison with SCOEL



Analysis of personal exposure per 8 hour TWA ng/m3



Summary



Continued approach:

- Monitoring practices and techniques – *improvements in standards, inter-laboratory practices, sampling media & analysis techniques*
- Engineered system performance & testing monitored
- Continued proactive culture
- Behavioural reinforcement of health benefits
- Continue a reduction of residual risk through design (engineered solutions)
- Further work to reduce and remove any residual RPE uses

The future:

- Plan improvements/ changes to support control efficacy
- Monitor performance during interim period as changes may take up to 2 years to implement legislative change
- Learn from experience (events & incidents), new technology & science



Thankyou