Australian Government

Australian Nuclear Science and Technology Organisation

Accelerator Safety & Licencing

A perspective from ANSTO

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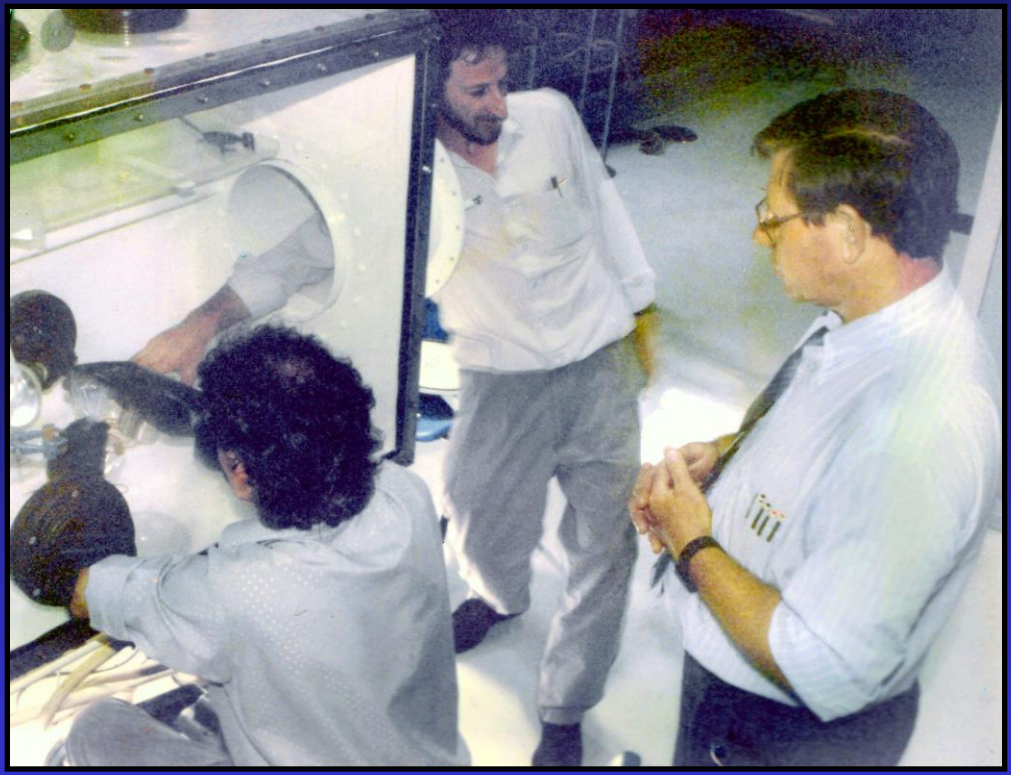
The Changing World

No longer is it acceptable to let *gnomes* fix particle accelerators.

The Changing World

Or is it acceptable to lend a helping hand the *old fashion* way.



Our Experience

- ANSTO has over 40 years of experience operating accelerators
- No significant incidents have occurred during the operation of the accelerators
- Quality of science, excellent

BUT

The (brave) New World

- To obtain an operating licence for the new reactor ANSTO's management processes have to become quality certified to ISO 9001 standard.
- As well, other controlled facilities, including the accelerators, have to be licenced if they are to continue operating.

This is where the fun began!

(ARPANSA = Australian Radiation Protection AND Nuclear Safety Agency)

In 1997, the Federal Government announced that it would establish ARPANSA, as a new regulatory body with underpinning legislation.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is part of the Commonwealth Health and Ageing portfolio. Its functions and activities are set down by the Australian Radiation Protection and Nuclear Safety (ARPANS) Act 1998.
ARPANSA is responsible for:

- Promoting uniformity of radiation protection and nuclear safety policy and practices across jurisdictions of the Commonwealth Government, the States and the Territories;
- Providing advice to Government and information to the community on radiation protection, nuclear safety and related issues;
- Undertaking research and providing services in relation to radiation protection, nuclear safety and medical exposures to radiation;
- Directly and significantly reducing the risk and impact of a radiological attack by improving the physical security of all radioactive sources and by enhancing Australia's capability to undertake comprehensive in-field analysis and provide expert advice in the event of a radiological attack; and
- Regulating all Commonwealth Government entities (including Departments, Agencies and Bodies Corporate) involved in radiation or nuclear activities or dealings.

ARPANSA's customers are in both the public and private sectors (overseas as well as within Australia) and include:

- People who use radiation in medicine, research and industry (including mining);
- Commonwealth, State and local government agencies;
- Environment protection agencies;
- International organisations;
- Academia and research organisations; and
- General public, interest groups and the media.

Urgh! What do we do?

Two major tasks needed to be completed before we could apply for an ARPANSA operating licence for the accelerators

1. Develop a quality management system based on the ISO 9001 standard
2. Undergo a safety assessment and analysis of all accelerator operations. Raise the standard of safety control if necessary

Quality – Fear then Panic!

- The quality standard, ISO 9001 was foreign to all of us
- We had no starting place or point of reference
- There was more negativity than acceptance
- Information gained from other organisations suggested that we may have "*bitten off more than we could chew*"

Were we naïve?

- We appointed quality representatives from each group and set up committees to deal with the planning
- We estimated that it would take us about 6 months to become certified
- We were lead to believe that the standard (ISO 9001:1994) required us to document every process comprehensively

Where did we start?

- Produced a process plan
- Reviewed and modified each process
- Reviewed and modified our safety protocols
- Began using (with some skepticism) the ISO 9001:1994 standard of management using the 20 elements
- Changed our work practices to include ongoing improvements

And then came Safety …

- Took a broader view of the safety regime
- Worked with safety auditors to identify any safety shortcomings
- Acted on making logical and ‘common sense’ safety improvements
- This took 3 years to *sort out*!

A long time between drinks

- To make life easy, a two stage safety risk assessment was carried out on the accelerator operations.
- Stage 1,
  - Identifying safety hazards,
  - Making improvements to reduce safety hazards and
  - Reviewing and improving safety procedures (both internal and external)
- Stage 2,
  - Changing our quality management system to incorporate the new safety regime

Risk Assessments

HAZARD IDENTIFICATION LIST – RISK ASSESSMENT PROMPTS

This list may be used to help identify hazards around the accelerator facility. It may be used as a prompt when examining each process, equipment and plant for risk assessment.

Radiological

- Gamma radiation
- Neutron radiation
- X-rays
- Activation
- Contamination
- Contact with radioactive items
- Electromagnetic fields

Electrical

- Electric shock
- Electric Loss of power
- Earth leakage
- Short circuit
- Electrical fires

Fire/Explosion

- Loss of cooling
- Overheating
- Leaks of flammable materials
- Ignition
- Explosion
- Fire
- Seismic events
- arcs/flashover

Mechanical

- Leaks/spills
- Breaks

Mechanical (continued)

- Rupture
- Loss of services
- Restoration of services following failures
- Spurious operation
- High pressure
- Low pressure
- Loss of vacuum
- High temperature
- Low temperature

Toxic Environment

- Oxygen depletion
- Toxic gases
- Ventilation failure
- Toxic liquids/solids
- Leaks of toxic materials
- Cryogenic burns

Human Error

- Contact with hazards (electrical, radioactive, heat, toxic, cryogenic, etc)
- Personal access violations
- Incorrect operation /adjustment
- Maintenance error
- Slips, falls, trips
- Manual handling accidents
- Drop of heavy objects
- Inadvertent operation due to human error

Policy and Requirements
Airborne Discharges
Solid Wastes
Liquid Wastes

Review of Operating Experience
Commissioning Program
Commissioning Reports
History since Commissioning
Review of Plant Radiological Monitoring Results
Dose Uptake by the Workforce - Routine and Abnormal
Waste Quantities Arising from Operations and Comparison with Operational Limits
Description of Incidents and Accidents
Description of Audits and Inspections

Review of Plant Condition
Building Condition
Security Systems
Comparison with Regulatory Expectations
Results of Facility Inspections
Comparison with Intended Design
Comparison with Modern Housekeeping and Maintenance Standards
Identification of any Life Limiting Features

Safety Analysis
Hazard Identification
RISK MANAGEMENT
Hazard Control
Protection and Damage Limitation Systems
ALARA
Safety Analysis for Normal Operation
Safety Analysis for Internal Abnormal Events
Internal Fire
Other Internal Pies
Safety Analysis for External Events
Loss of (Offsite) Power
Earthquake
High Winds
Flooding
Lightning Strike
Aircraft Crash
External Fire
Transport Accidents
Industrial Activities

Finally, well near the end anyway…

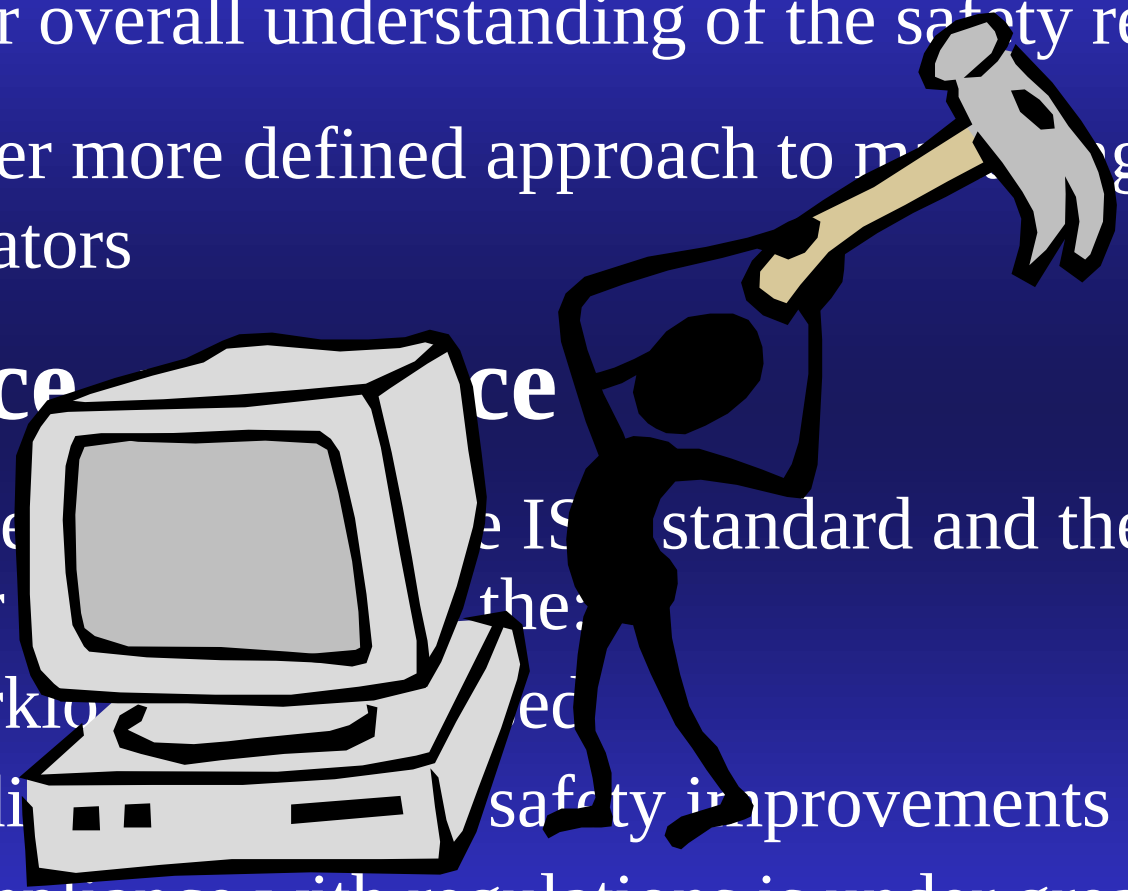
- End of Physics Division
- A new version of the ISO standard, ISO 9001:2000
- The new accelerator arrived
- Internal restructuring
- ARPANSA was very thorough and fair in their assessment of the licence application and it was assessed in a timely manner
- We reached what we thought was the final stage. What we didn't realise was the magnitude of extra work created.

So, what was learnt?

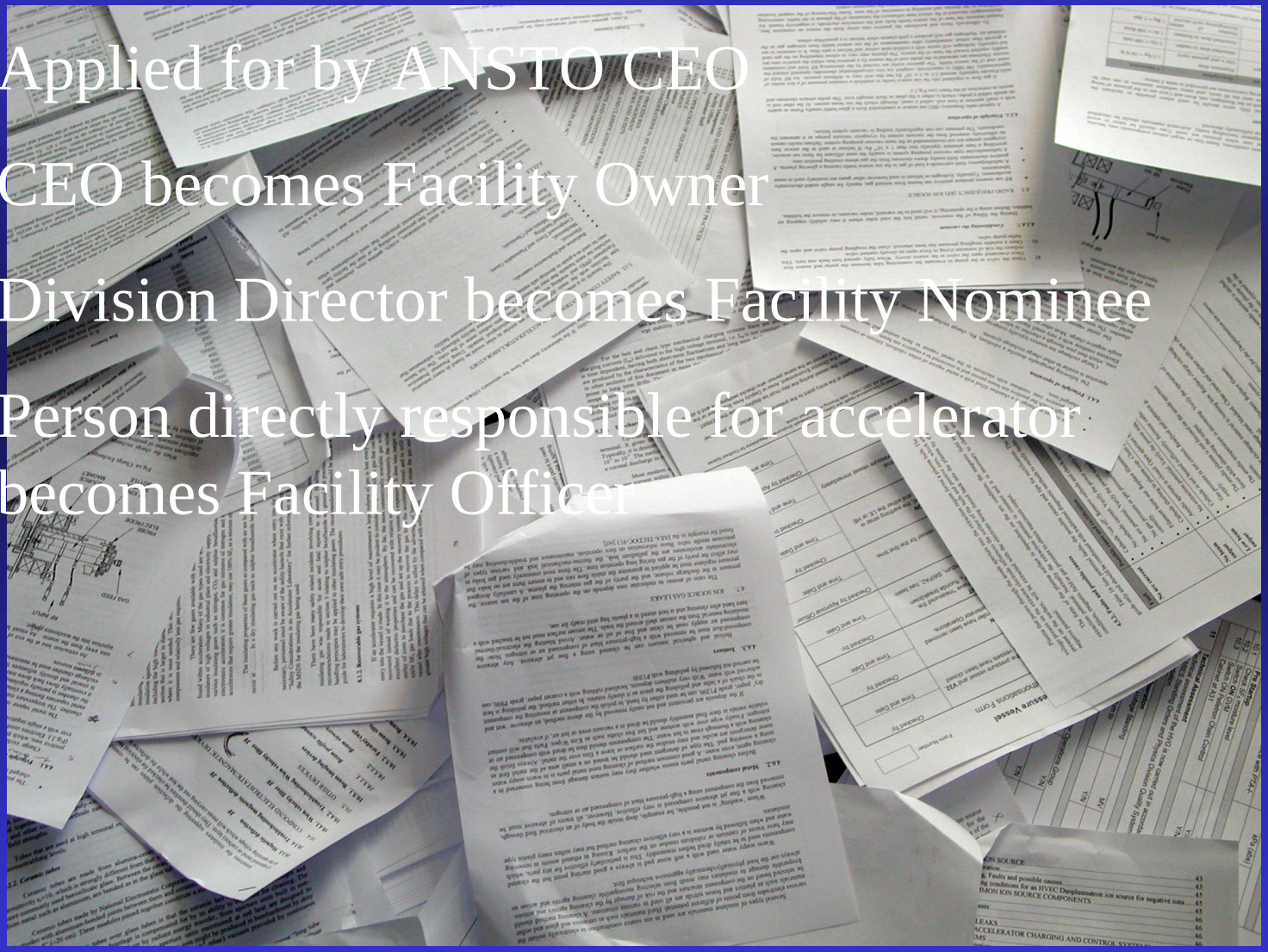
- A better overall understanding of the safety regime
- A clearer more defined approach to m[illegible]g the accelerators

Licence [illegible]ce

- With the [illegible]e IS[illegible] standard and the broader [illegible] the:
  - Workl[illegible]ed
  - Addi[illegible] safety improvements
  - Compliance with regulations is under greater scrutiny



Licence Application



- Applied for by ANSTO CEO
- CEO becomes Facility Owner
- Division Director becomes Facility Nominee
- Person directly responsible for accelerator becomes Facility Officer

Quality certification to ISO 9001:2000	Better defined and structured responsibilities
	More reporting
	Greater responsibility for everyone to ensure records are kept up to date
	Auditing
	Review of processes, continuous improvement
	Meeting formats changed
Safety Analysis Reports	The safety regime must be regularly reviewed and updated
	Normally good for 5 years
ARPANSA Licence	Compliance with Quality and Safety documentation and regulations
	All modifications to the facility must be reported
	Comprehensive ARPANSA Quarterly and Annual reports

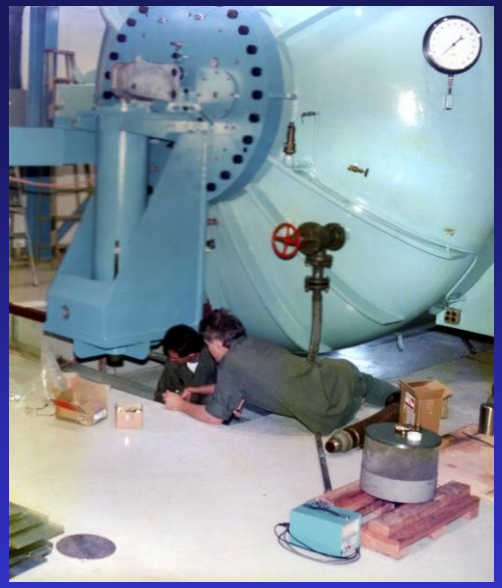
Hazards of operating accelerators

Workshop equipment

High pressure gases and vacuums

High voltages

Lifting, falling, bumping and tripping hazards



Confined spaces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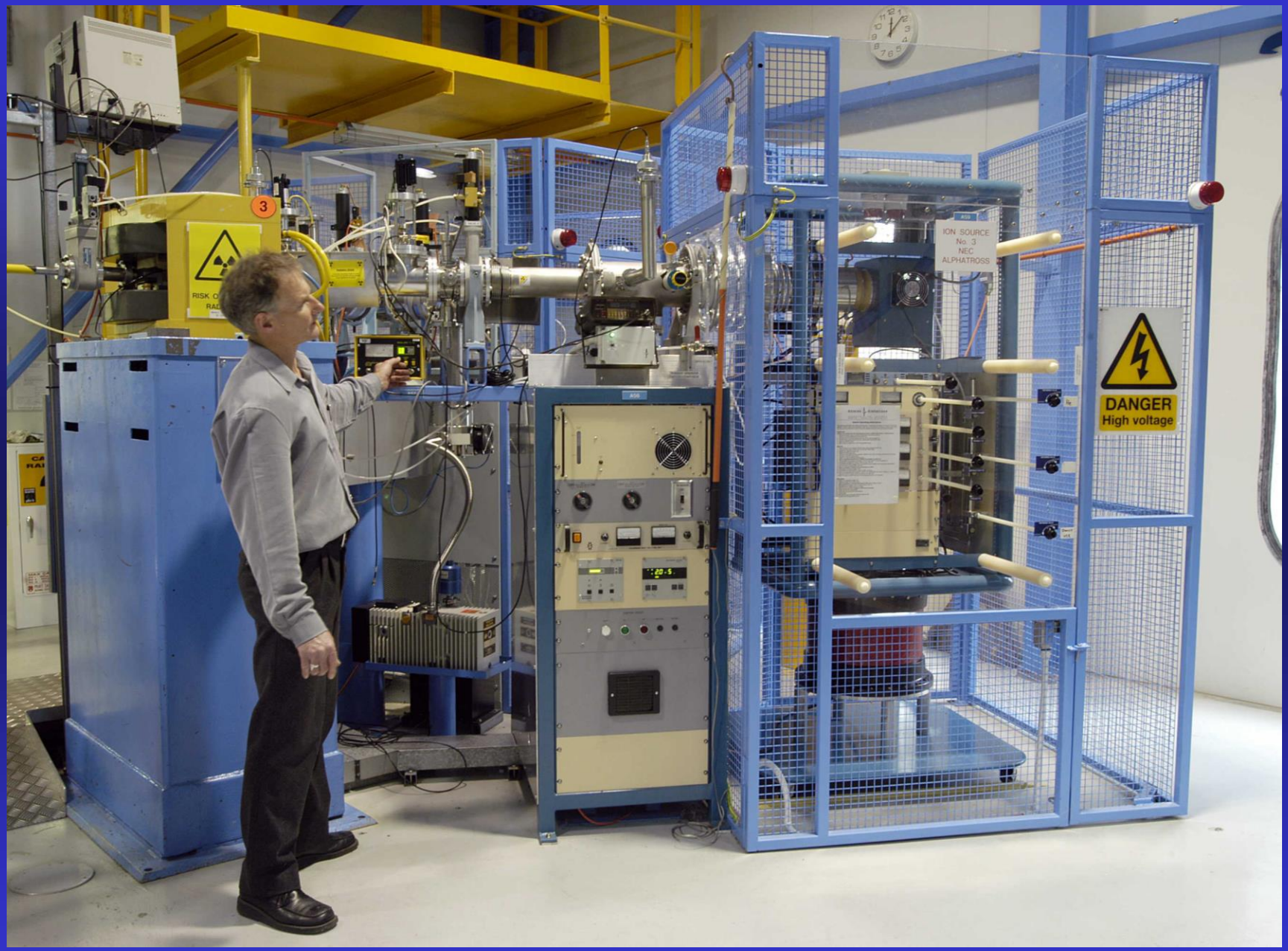
4
5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No. 3
NEC
ALPHATROSS
DANGER
High voltage