

Technical Working Group on Research Reactors (TWGRR)

February 9-11, 2009
Vienna, Austria

Research Reactor Operations and Maintenance

Ed Bradley



IAEA

International Atomic Energy Agency

2008 Recap

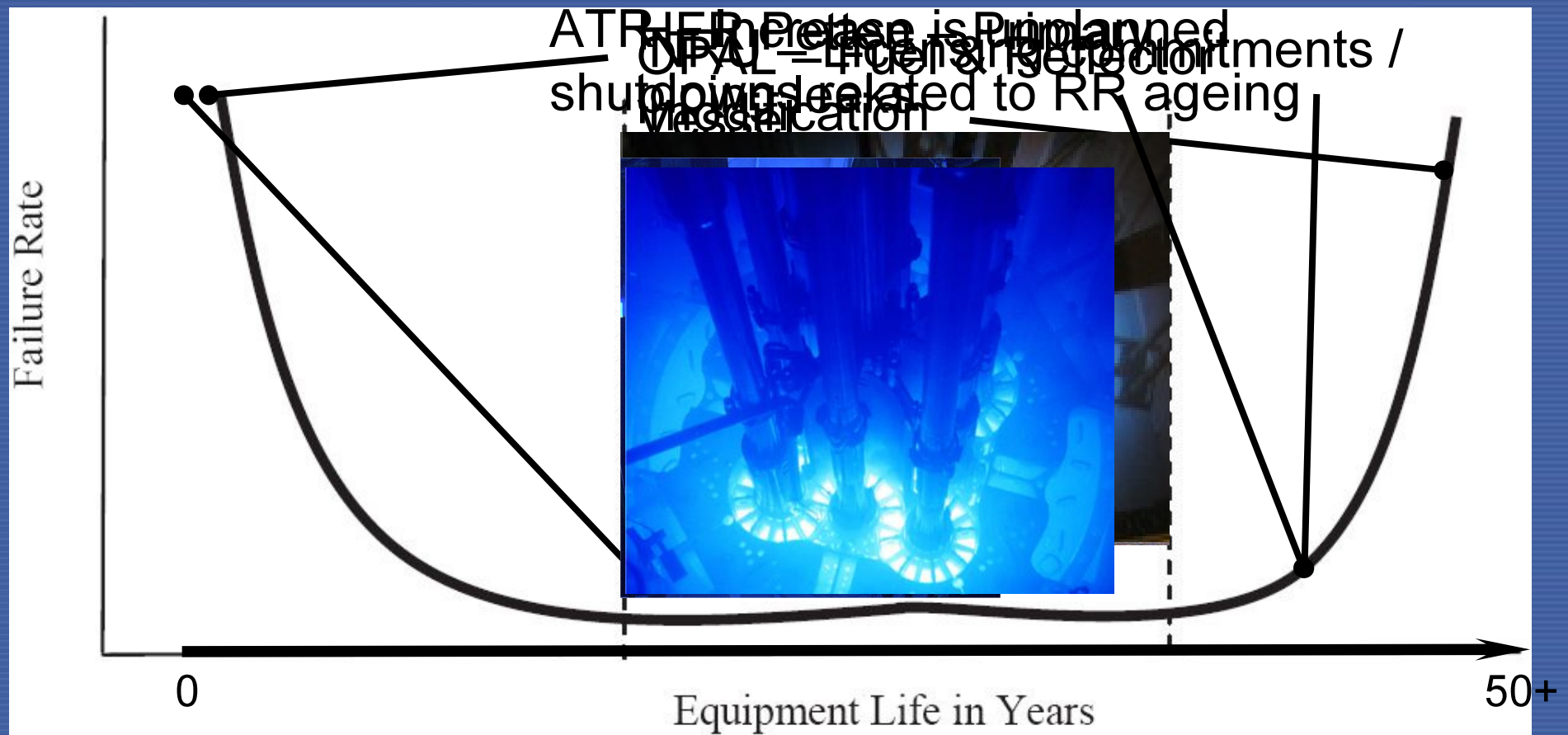
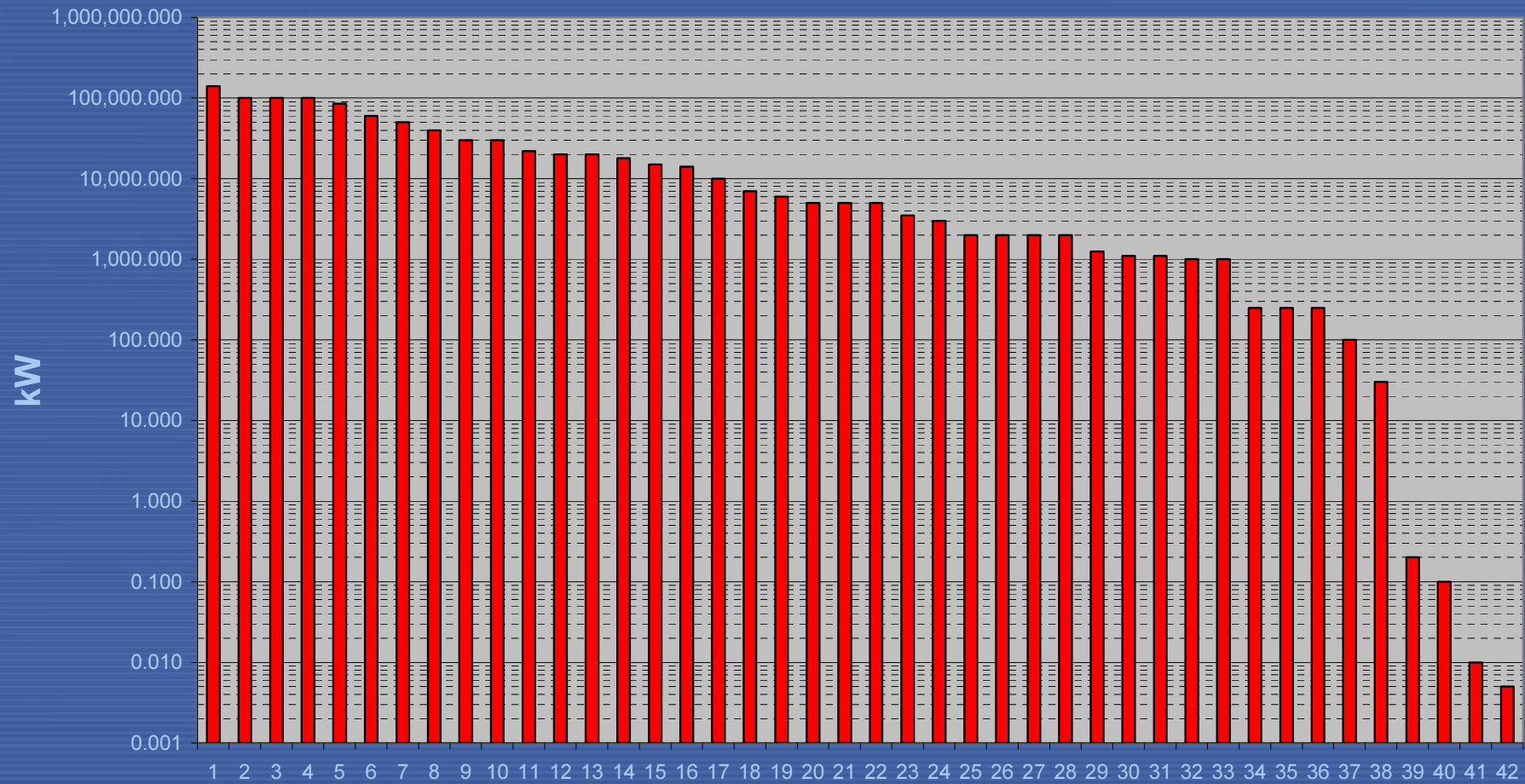


FIG. 1. Classic 'Bathtub' Reliability Curve.

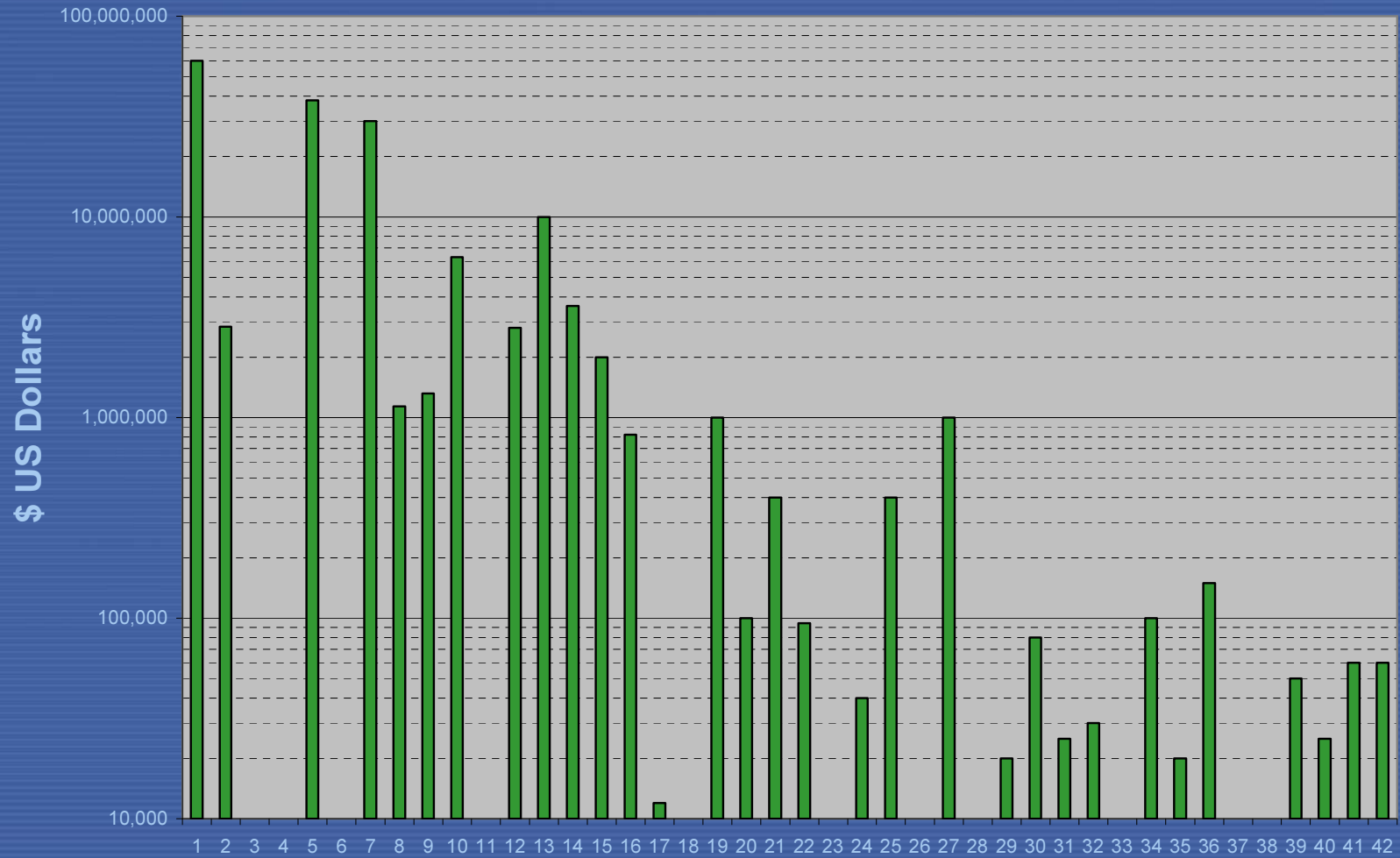
Questionnaires

Reactor Power



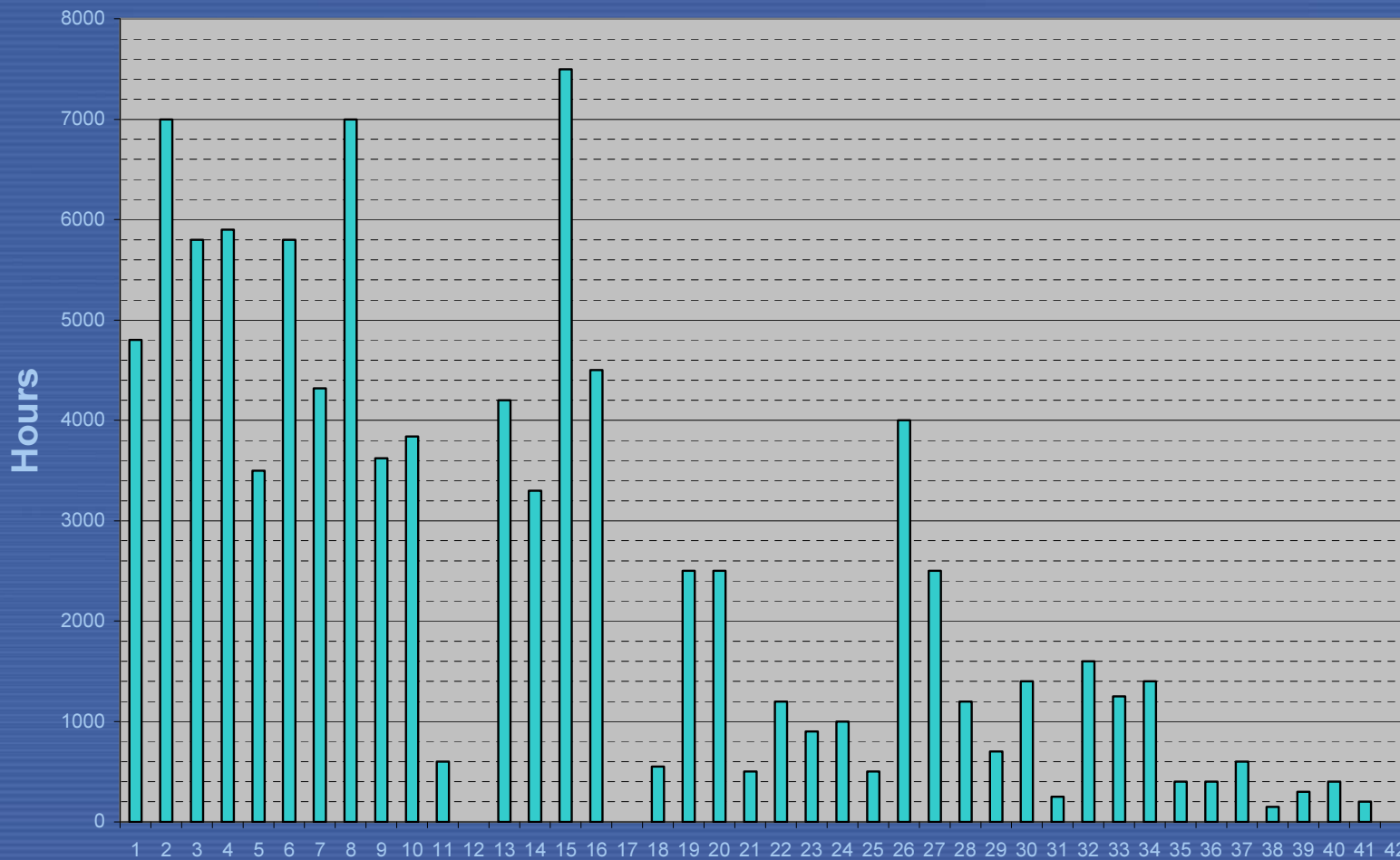
Questionnaires

O&M Budget



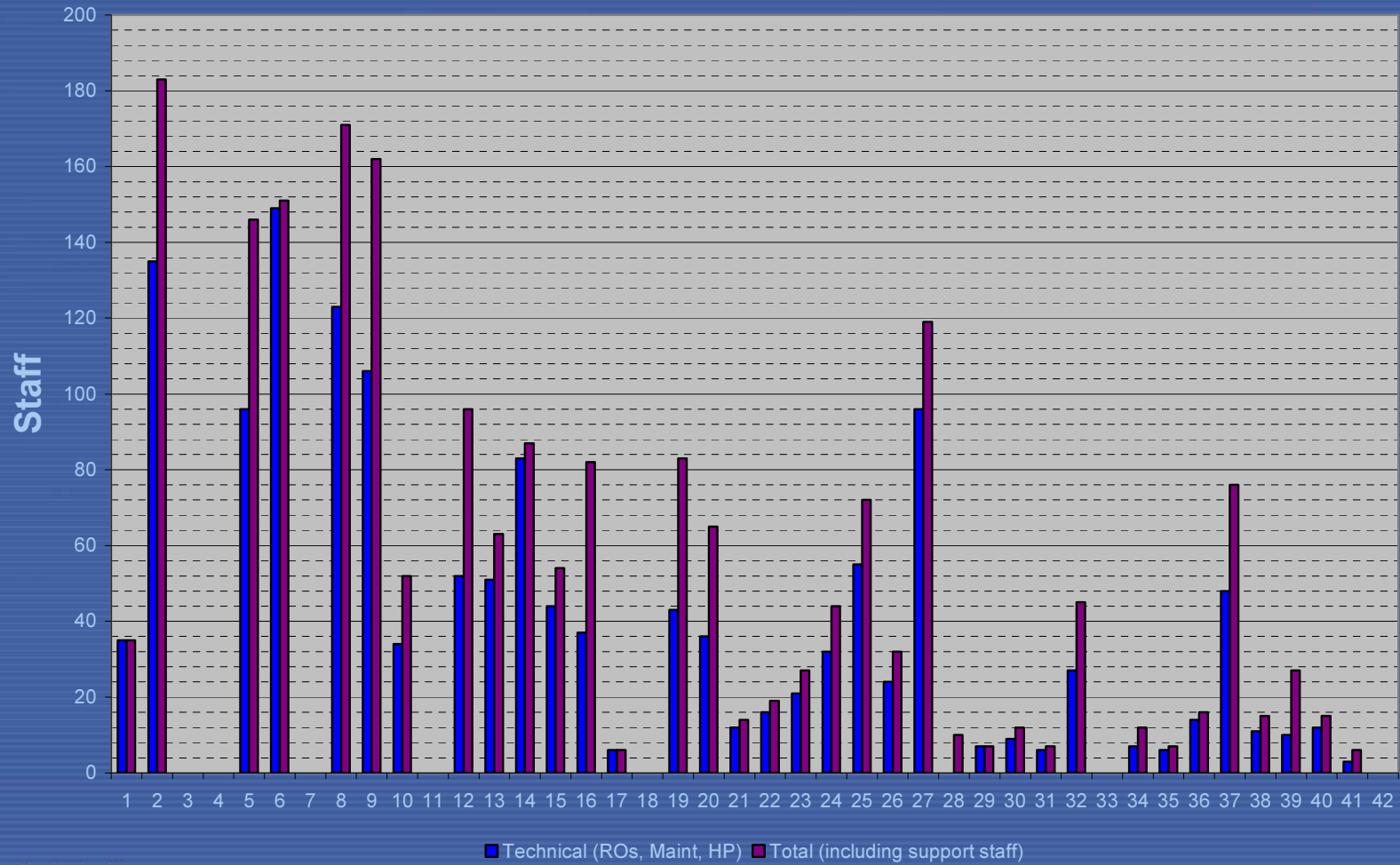
Questionnaires

Yearly Operation



Questionnaires

Staffing Levels



Questionnaire responses

Most frequently reported projects

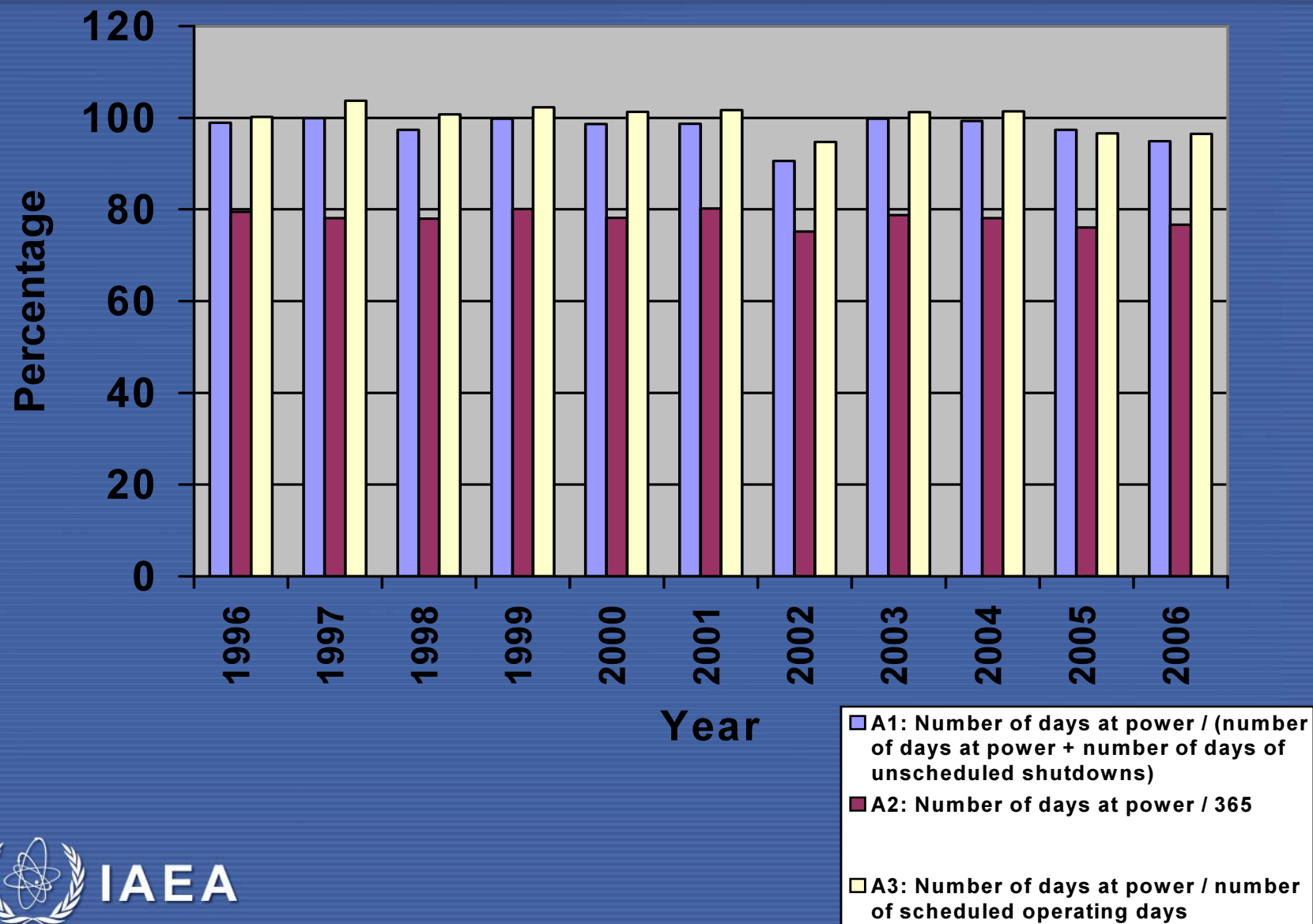
- Reactor operation ~220 projects reported
 - 43 (19.5%) RPS, I&C, NI's (incl. console mods)
 - 22 (10.0%) Primary cooling
 - 21 (9.5%) Electrical power & distribution (incl. emergency power)
 - 19 (8.6%) Fuel / core design
 - 19 (8.6%) Secondary cooling (incl. cooling towers and chilled water systems)
 - 12 (5.5%) Ventilation / AC
 - 10 (4.5%) Control rods / drive system
 - 8 (3.6%) Reactor / SNF pool and pool support structure
 - 8 (3.6%) Radiation monitoring system
 - 7 (3.2%) ECCS
 - 7 (3.2%) Security / physical protection
 - 7 (2.3%) Fire detection / protection
 - 37 (16.8%) Other (general facility overhaul, water treatment, reflector, seismic upgrades, shielding, buildings / structures (incl. containment), documentation / management system (incl. SAR, license renewal, etc.), rad waste (solid, liquid and gaseous), compressed air, heavy water management system)

Questionnaires

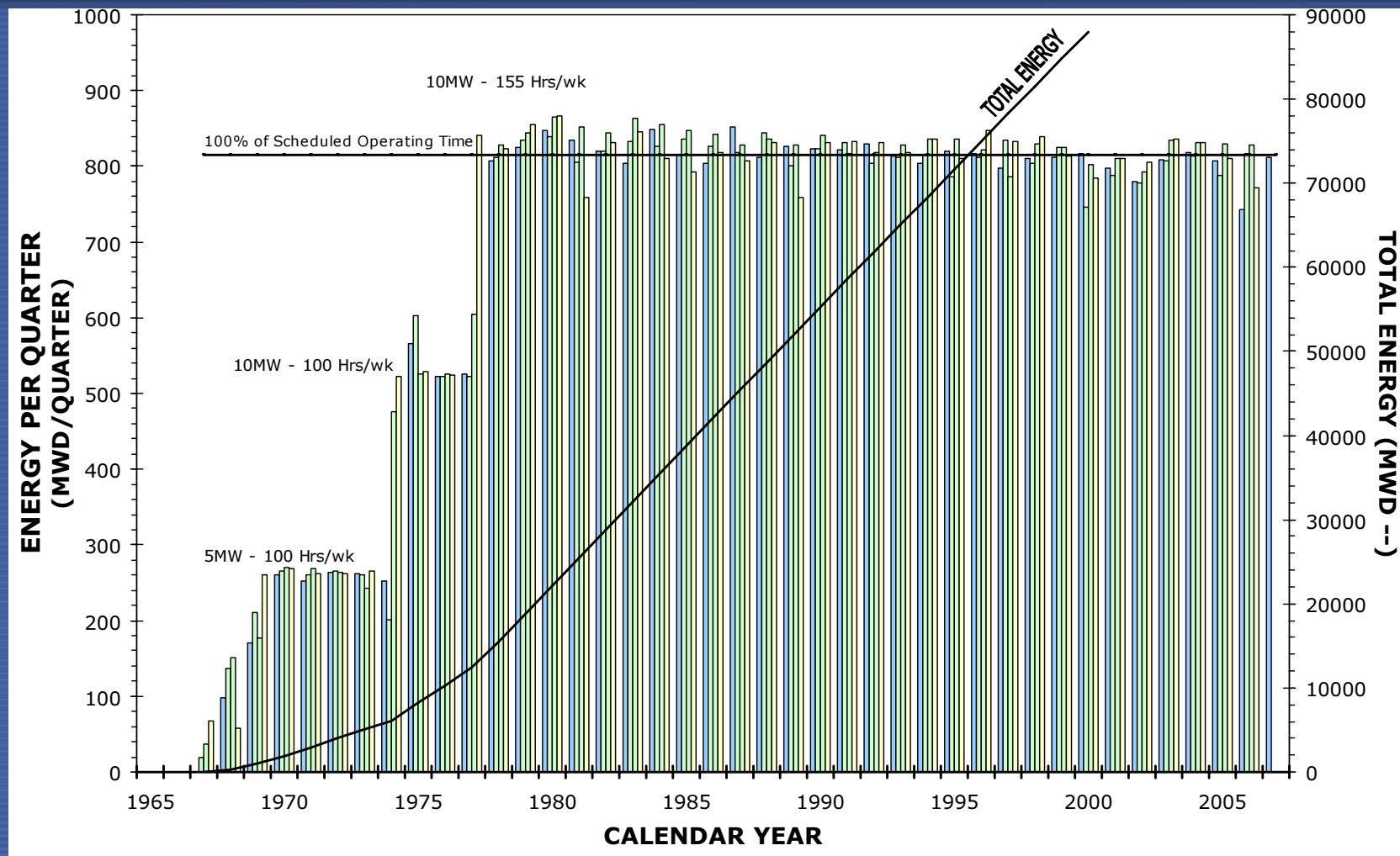
Performance Indicators

- ~ 30% respondents listed some type of operational PI (others reported PIs but none related to operation)
- Most chart performance against their own goals / plans

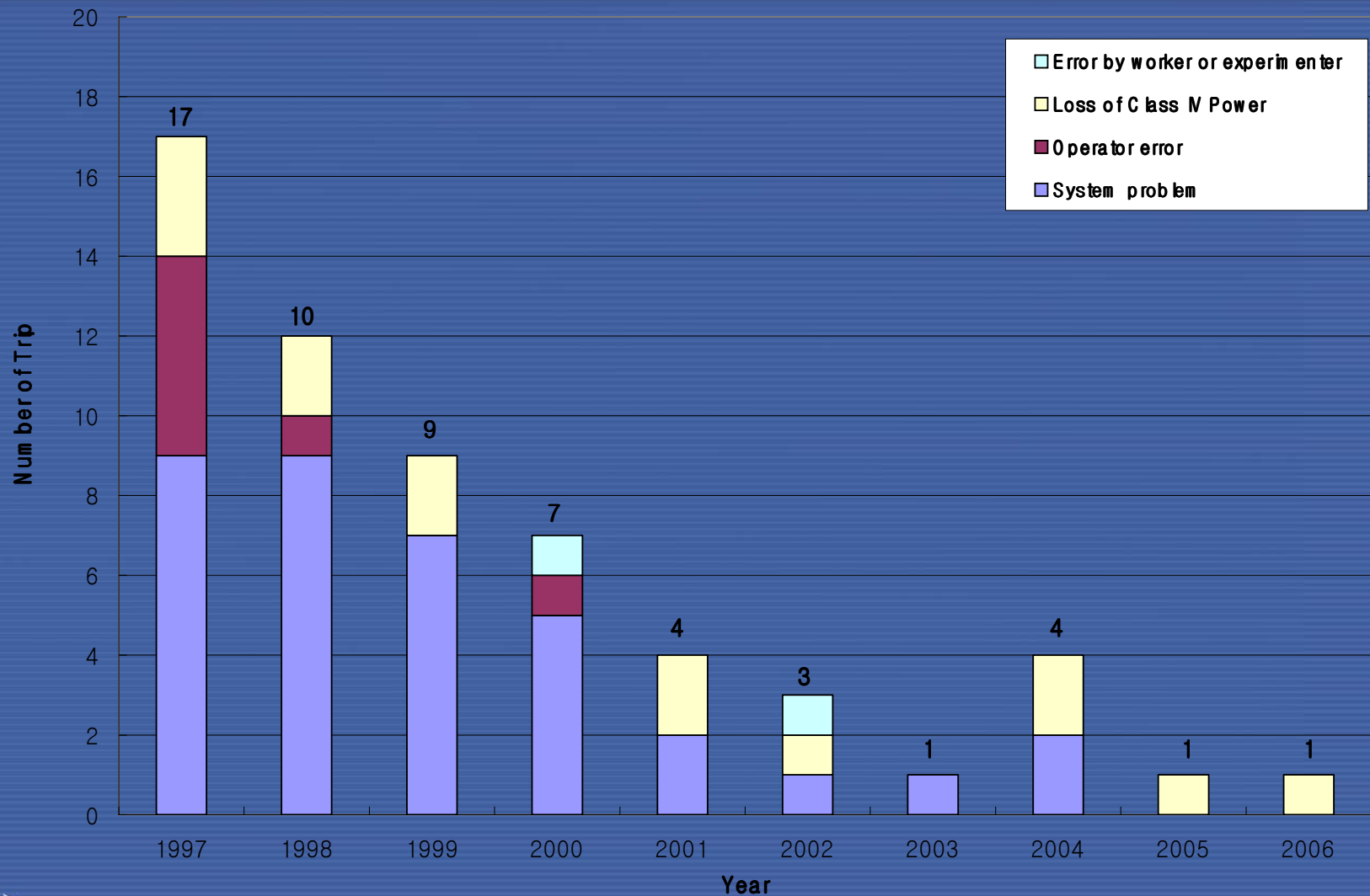
Performance Indicators (O&M)



Performance Indicators (O&M)

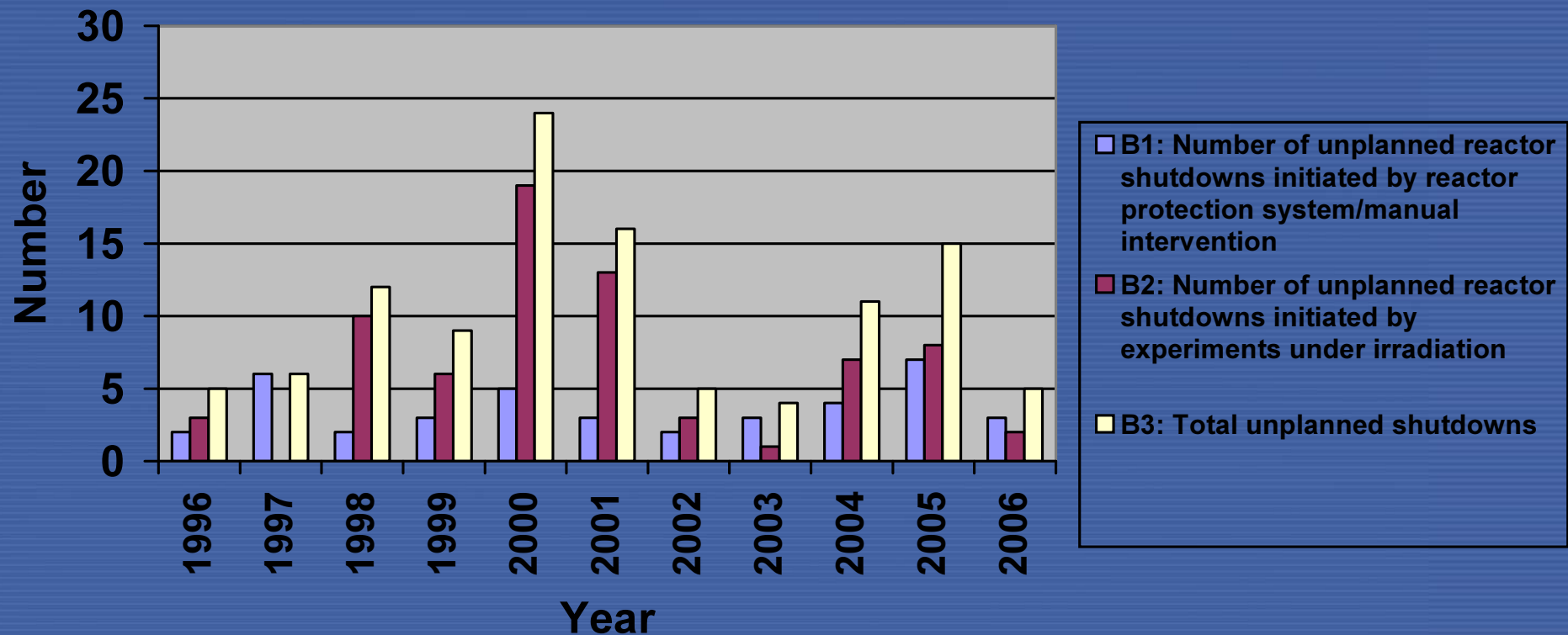


Performance Indicators (O&M)



Performance Indicators (O&M)

UNSCHEDULED SHUT-DOWNS



Performance Indicators (O&M)

Fiscal Year	Magnet Failure Blade Drops	Reactor Instrument / Equipment Scrams	Experiment Scrams	Offsite Factors	Other Unscheduled Shutdowns
2006	0	6	0	3	1
2005	0	6	2	6	1
2004	4	6	4	4	1
2003	10	12	2	7	2
2002	2	6	2	9	1
2001	5	9	4	6	2

Performance Indicators (O&M)

Corrective Maintenance Backlog

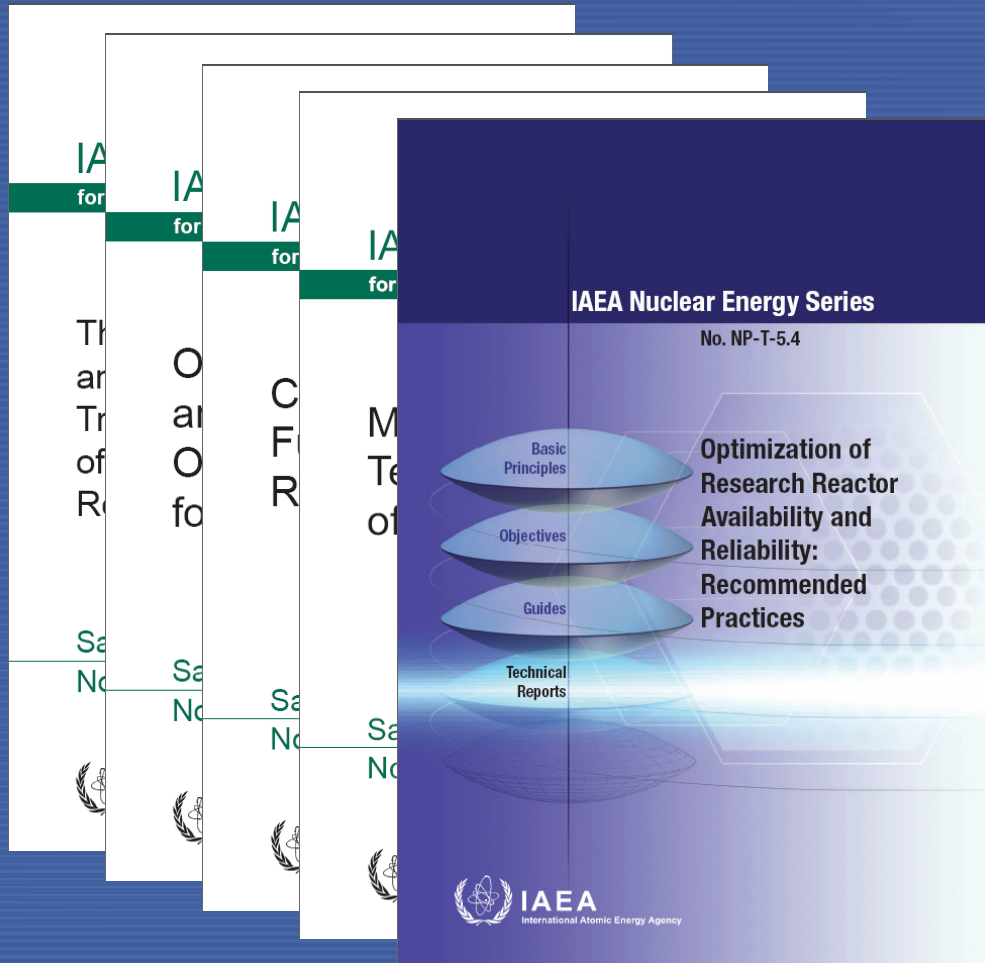


Questionnaires

Conclusions

- Semi-distinct groups (power, staff, budget, etc.)
- Objective facility-facility comparisons are difficult

Recent publications



Available for free
online at at:
<http://www.iaea.org>

Specific feedback from discussion

Overarching

- Keep all activities practical and focused on information sharing

Ageing Management (in addition to planned activities)

- Include asset integrity / condition monitoring programs
- Consider a probabilistic approach to maintenance (all systems relevant to operation)
- Relevant to all facilities of any age
- Consider the impact of changing engineering and safety codes / standards
- Expert meet on safety analysis and surveillance activities to extend life of the RRs.
- CRPs for residual life measurement in core components, assessment of Wigner energy in graphite etc.
- Technical meet on facing the challenges in C&I issues with the threat of obsolescence looming around (verification / validation – computer based systems.)

Specific feedback from discussion

Human skills and resources

- Innovative RR O&M staff development and retention techniques / succession planning
- Utilize previous A&R approach / team to capture and share experiences and lessons learned

Other

- Creation of a platform for exchange of information for improvements in O&M practices

Thank You

For your attention

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RR Ageing

RR Age distribution

