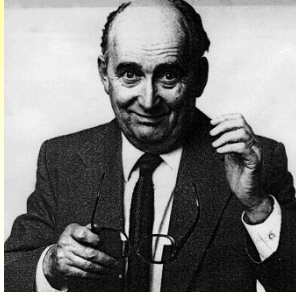


The Bo Lindell Lecture:

Past, Present, and Future Problems – Are There Any Solutions?

Speaker: Jack Valentin



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The Bo Lindell Lecture:

Past, Present, and Future Problems – Are There Any Solutions?

Speaker: Jack Valentin

- Challenges faced by Bosse and his contemporaries
- Common factors underlying their successes
- Challenges facing us today
- Impediments that we must overcome to handle our challenges
- Will we be able to handle future challenges?

Professor **Bo Lindell** TD^{hc} FRSAES



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The fourth and final part of Bosse's History appeared very timely a few days before the NSFS meeting!

A gathering of the five most important people in radiological protection at the time. I know or knew all of them, and had the great fortune to know Dan, Bosse, and John quite well, and we will look closer at how they solved some problems.

Bo Lindell: The History of Radiation And Radiological Protection



Pandora's Box

The Sword of Damocles

The Labour of Hercules

The Pains of Sisyphus



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Ca 1978 ICRP MC Meeting



John Dunster, **David Sowby** (SciSec), **Bo Lindell** (Chair), **Dan Beninson** (Vice-Chair), **Henri Jammet** (C4 Chair)



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Bosse attributes the enormous success of these people to the platform provided by Sievert's unyielding work and the fact that such an unusual person was given much leeway in admiration of his genius.

These are some typical questions facing radiological protection experts in the 1960s – 1980s.

The Man Behind It All: Rolf Sievert in 1922



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Some Past Challenges

- What should be measured, what should be regulated?
- Dangerous habits at work
- Weapons testing fallout
- Introduction of nuclear power – and its releases
- Nuclear accidents with off-site consequences
- Understanding the importance of doses to patients
- Understanding the importance of radon etc



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To understand fully their work, you must recall the political situation: a cold war, and in 1957, the James Bond novel 'From Russia with love' was printed.

The Spirit of The Times When Dan, Bosse, And John Faced Their Challenges

1957: The REAL James Bond



...and here's the sort of girlfriend available to Bond at the time...

In the US, the Atomic Energy Commission –weapons producer and watchdog in an unfortunate combination- was flogging the merits of radiation

1957: The REAL James Bond



US Atomic Energy Commission



The Reds were perceived as the ultimate threat...

...although the US AEC guards appear more ominous than these protesters.

How The Commies Were Perceived



AEC Guards In Action



So, here's our first case

US Atomic Energy Commission 1947-74

- Weapons tester AND fall-out hazard assessor
- 1954 Bravo h-bomb test at Bikini
 - 86 Rongelap inhabitants not evacuated in advance (1750 mSv!)
 - All developed ARS within 24 h; AEC: 'No burns – all are well'
 - 1957: islanders returned but warned of danger areas and local food
 - 1985: Greenpeace (!) organised move to another atoll
 - Lucky Dragon, 23 sailors ARS, 1 died – US compensation \$ 2800
- 1957 Congress hearing, AEC: 'No danger from fall-out'
 - No need to take account of food-chain transfer (!)



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Dan Beninson, 1931 - 2003



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Given the cold-war background, investigations of nuclear weapons tests were not easily handled!

Dan Beninson, 1931 - 2003

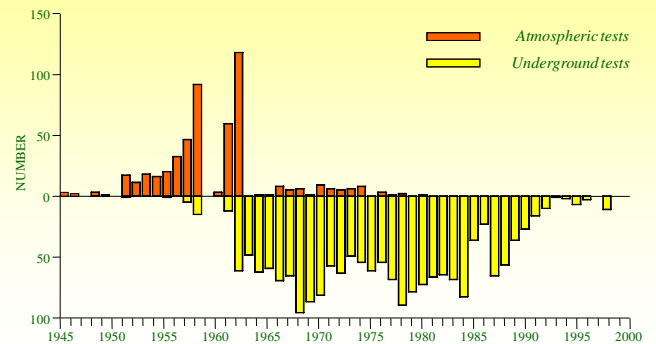
- Involved in the Argentine Atomic Energy Programme 1956 – 2003
 - (1994 – 98 as top regulator, 1998 – 99 as top promoter)
- Involved in UNSCEAR 1956 – 2003
 - (1963, 1983 – 84 Chairman, 1974 – 79 Scientific Secretary)
- Involved in ICRP 1963 – 2003
 - (1985 – 93 Chairman)
- Involved in IAEA 1959 – 2003
 - (1960 – 61 coauthor of the original BSS; later a Governor)



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Nuclear Weapons Concerns



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Dan managed this because he was courageous and honest, and had very good knowledge

Our second case

Reviewing Governments' Reports

- Are they valid and compatible with others?
 - Not always – required considerable diplomatic skill
- Why major differences in measurement protocols?
 - Required considerable insight and effort
- What will be the impact?
 - Short term: significant local doses; waste problems
 - Long term: a dose commitment (cf. Bo Lindell)



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Bo Lindell, 1922 -



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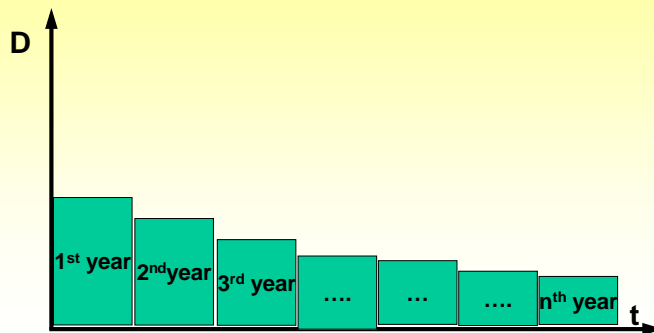


Releases to the environment would also result from civilian nuclear projects, and Bosse developed the concept of a dose commitment...

Bo Lindell, 1922 -

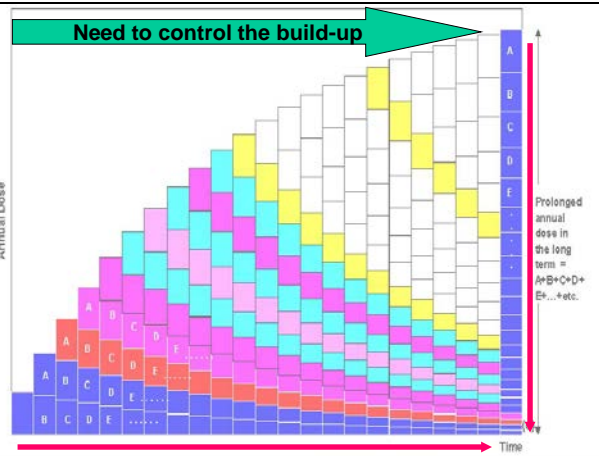
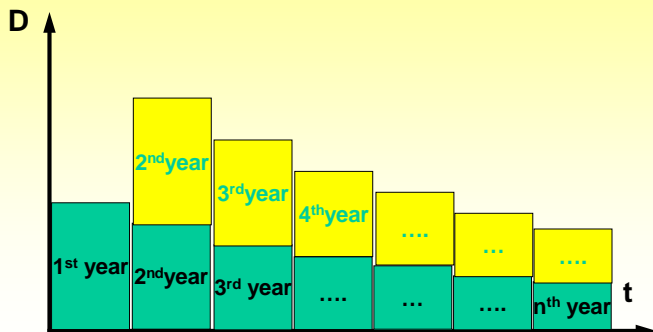
- Involved in the Swedish Radiation Protection Authority 1948 – 2004 (1966 – 82 as top regulator)
- Involved in UNSCEAR 1956 – 1990 (1970 – 71 Chairman)
- Involved in ICRP 1957 – present (1957 – 62 Scientific Secretary, 1977 – 85 Chairman)
- Founder of the Swedish Risk Academy

Doses After 1 Year of Practice



...noting that one would have to regulate the equilibrium level where new releases into the environment are balanced by radioactive decay...

Doses After 2 Years of Practice



...and showing that the computation was really quite simple.

Our third case

Dose Commitment, E_c

- The infinite time integral of the per caput dose rate, \dot{E}
- For indefinite discharges at a constant rate, the maximum annual p.c. dose rate, \dot{E} , = the dose commitment of one year of practice

John Dunster, 1922 – 2006

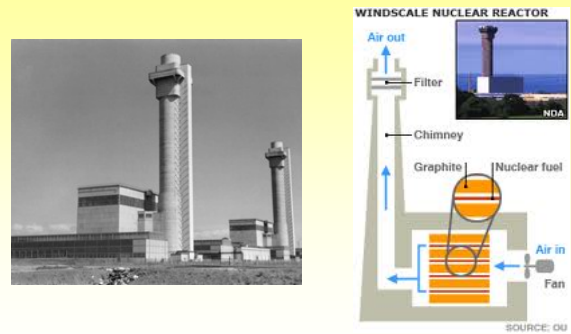


History did not begin with Chernobyl, nor with TMI – *Windscale* was the first known nuclear accident with major offsite consequences – and John developed the protection strategy we now all take for granted

John Dunster, 1922 – 2006

- **Involved in NRPB 1970 – 1987**
(1982 – 87 Director; 1976 – 82 Deputy DG HSE [Nuclear Safety])
- **Involved in ICRP 1959 – 2006**
(1985 – 89 Committee 4 Chairman)
- **Involved in UNSCEAR 1982 - 2000**
(1982 – 92 as UK representative)
- **Initiator, with Andrew MacLean, of the Anglo-Nordic meetings of RP authorities**

Windscale: An Accident Waiting to Happen



So, what did these three great men have in common?

John's Achievements

- **An immediate set of milk restrictions (3.7 kBq/l)**
- **Restrictions on grazing**
- **An environmental monitoring programme**
- **A set of radiological criteria for protection of the public**

Factors Contributing to Their Successes

...

Dan Beninson, Bosse Lindell, John Dunster:

- **COMPETENT PERSONS**
Dan, Bosse, and John are 'household names' in radiological protection
- **Backed up by COMPETENT ORGANISATIONS**
ARN, NRPB, and SSI were world renowned
- **UTTERLY HONEST**
Always ready to admit their own mistakes
- **COURAGEOUS**
Never hesitated to express politically unwelcome facts and feelings
- **CURIOUS**
Showed a genuine interest in people who dissented with their views

Some Current Challenges

- **Proliferation of new diagnostic modalities**
- **Understanding the importance of non-ionising radiation**
- **Insufficient harmonisation with regulation of chemicals**
- **Nuclear power 'new build'**
- **Nuclear accidents and their political repercussions**
- **Loss of competence**
*Due to generation change [=poor succession planning!]
Due to re-casting agencies in a non-flexible bureaucratic mould
Due to unconstructive legalistic attitudes causing lack of trust*

Nuclear Accidents, Political Repercussions

- **Fukushima: Not a single case of ARS**
But ~25,000 deaths due to earthquake and tsunami
- **Milk & other food restrictions were effected promptly**
Doses due to the accident will be limited (Thanks, John Dunster!!)
- **Yet, the accident is rated ...INES 7 – like Chernobyl ???**
Thus, the INES scale is inadequate for its primary purpose = providing comprehensible information to the public



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Nuclear Accidents, Political Repercussions

- **2010: German NPPs allowed 8-12 extra years' operation**
in return for an EXTRA tax of €2,300 million per year
- **2011-03-15: Decision revoked and 8 reactors immediately banned from re-starting**
*causing loss of 55 TWh per year
and loss to utilities of at least €4,300 million
and a projected cutback of 11,000 jobs*
- **If you believe that radiological protection jobs will stay unharmed, raise your hand...**



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Accolades appear to be premonitions of disasters...

Organisational Loss of Competence

'Swede Of The Year'

- **1985, Refaat el-Sayed, pharmaceutical entrepreneur**
1986: His PhD was a fake; sentenced to 6 y in prison for accountancy crimes
- **1986, Hans Holmér, Stockholm police commissioner**
1987: Fired from the Palme murder investigation, established the 'Baseball gang' police squad known for its violence
- **1987...**
Please, not Gunnar Bengtsson!



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SSM: From Sievert and Lindell...

'Kronorna Bland Verken' (The Jewels in The Agency Crown)

- **1991: The Swedish Radiation Protection Authority, SSI, named one of the four best agencies in Sweden**
The Swedish Board for Study Support, CSN, was one of the others
- **1997: The Auditor General issues scathing criticism of CSN for inefficiency and failures**
- **2008: SSI merged with the nuclear safety agency – now, no agency deals exclusively with radiological protection**

The Swedish Radiation Protection Authority



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...to an establishment where the library was scrapped and even middle managers have no background in radiological protection

NRPB: From the Mecca we all admired...

The Swedish Radiation Protection Authority



The National Radiological Protection Board



...to a jack-of-all-trades agency

The National Radiological Protection Board



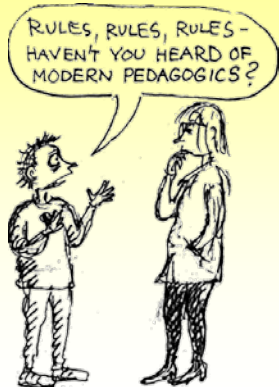
- 1999/2000 Review
'...the best of its kind in the world'
- 2001 New logo
at a cost of £ 100k+
- 2005 Abolished as such, now part of the Health Protection Agency
Chemical & environmental hazards depts fill half of the building

**Unconstructive Regulatory Attitudes
Cause A Lack of Trust**

Regulation cannot work unless there is mutual trust!

Prosecution is not a Panacea and those who confess their weaknesses should be praised, not punished

Regulatory Philosophy



Encourage Frank Incident Reporting



Intensified supervision may be a short-term solution but cannot last forever

Members of the public must be respected in communications

Temporary Intensified Supervision Prevents Early Recurrence



Do 'We' Think 'They' Are Silly?



...so that we may be respected as well

Regulators and operators are not enemies, they must work together towards a common safety goal!

Do 'They' Think 'We' Are Stupid And Evil?



The Four Stages of Being Regulated

- **Criminal: Tries to escape regulations**
May be dangerous – engage local police!
- **Evasive: Will do the very least that is required**
Very cost conscious, unaware that regulations may actually save money
- **Obedient: 'Please tell me what to do, I will follow any instructions'**
Does not understand purpose = may inadvertently cause big problem
- **Mature: A partner collaborating in the quest for safety**
Discusses with regulator on an equal footing – and regulators should listen carefully to licensee's advice!

Requirements on Licensee Organisations

- **Responsibility, Authority, Accountability**
- **An 'inner policeman'**
With direct access to top management and sufficient authority
- **Minimise the number of rules, but enforce those that are required**
- **Can employees be proud of their company?**

Requirements on Regulatory Systems

- **Should place explicit responsibility on user**
- **Licensee should convince regulator, and the public, that protection is adequate**
- **Should not be prescriptive**
Prescriptive systems
 - transfer responsibility and accountability to the regulator;
 - reduce the incentive for self-improvement;
 - do not encourage optimisation

Future Challenges

- **We cannot predict the technical details**
- **We CAN predict the philosophical issues – nothing new**
- **We know the tools that are needed**
Competent persons in competent organisations
Honesty
Mutual trust
Courage
Curiosity
Communication skills

How Can This Be Achieved?

- **Employ scientists at senior positions**
It's easier to turn a scientist into a bureaucrat than the reverse
- **Encourage staff to learn more and participate actively in international co-operation**
Even at the cost of delaying or skipping entirely some important activities
- **Avoid knee-jerk prosecutions, help licensees to improve**
Encourage frank incident reporting and UTILISE the reports
- **Cherish strange ideas proposed by junior staff**
They may be the future of radiological protection

**Thank You –
And Let's Meet Again 2012 in Glasgow!**

