The nuclear industry's record of public engagement

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Online workshop on *Understanding the Societal Challenges Facing Nuclear Power*
National Academies of Sciences, Engineering, and Medicine
September 1, 2021

(Over) Selling Nuclear Energy

Propaganda: Information, especially of a biased or misleading nature, used to promote a political cause or point of view

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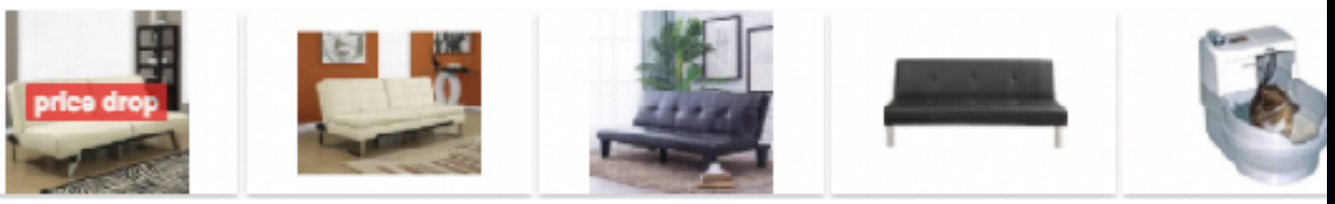


HOME » NEWS » EARTH » ENERGY » NUCLEAR POWER

New nuclear plant 'needed to keep the lights on'

A new nuclear power plant is needed to allow British people to keep watching television and making cups of tea, Ed Davey has insisted, amid claims that the new plant will force up energy prices

Nuclear energy is essential!

Homi Bhabha: "for the *continuation of our civilization* and its further development, atomic energy is not merely an aid; it is *an absolute necessity*"

Presiding over the First United Nations International Conference on Peaceful Uses of Atomic Energy, held in Geneva in 1955. The picture shows, from left to right, Mr. Max Petitpierre, President of the Swiss Confederation; UN Secretary-General Dag Hammarskjold; Dr. Homi Bhabha, and Prof. Walter G. Whitman, Secretary-General of the Conference.

THE WESTINGHOUSE AP1000

Westinghouse is currently pursuing Nuclear Regulatory Commission design certification of its AP1000 nuclear power plant. The AP1000 is a 1,117-megawatt advanced light water reactor. It is essentially a higher power version of Westinghouse's 600-megawatt design, the AP600, which the NRC certified in 1999. Over $400 million was invested in developing and licensing the AP600 design, including an extremely detailed cost database comprising more than 1,900 commodity categories and 25,000 specific items. The cost estimate was verified by Westinghouse, several international architect-engineers, the Electric Power Research Institute, and several utilities. A comparably detailed cost estimate was prepared for the AP1000 by modifying the AP600 estimate to reflect the design changes.

In 2002, an industry team—comprised of Westinghouse, seven major U.S. power companies and architect-engineer Bechtel—completed a $1-million re-evaluation of the AP1000 reactor design. As part of that re-evaluation, Bechtel performed a thorough review of the modifications made to the original cost estimate and, after making some minor adjustments, endorsed the AP1000 cost estimate.

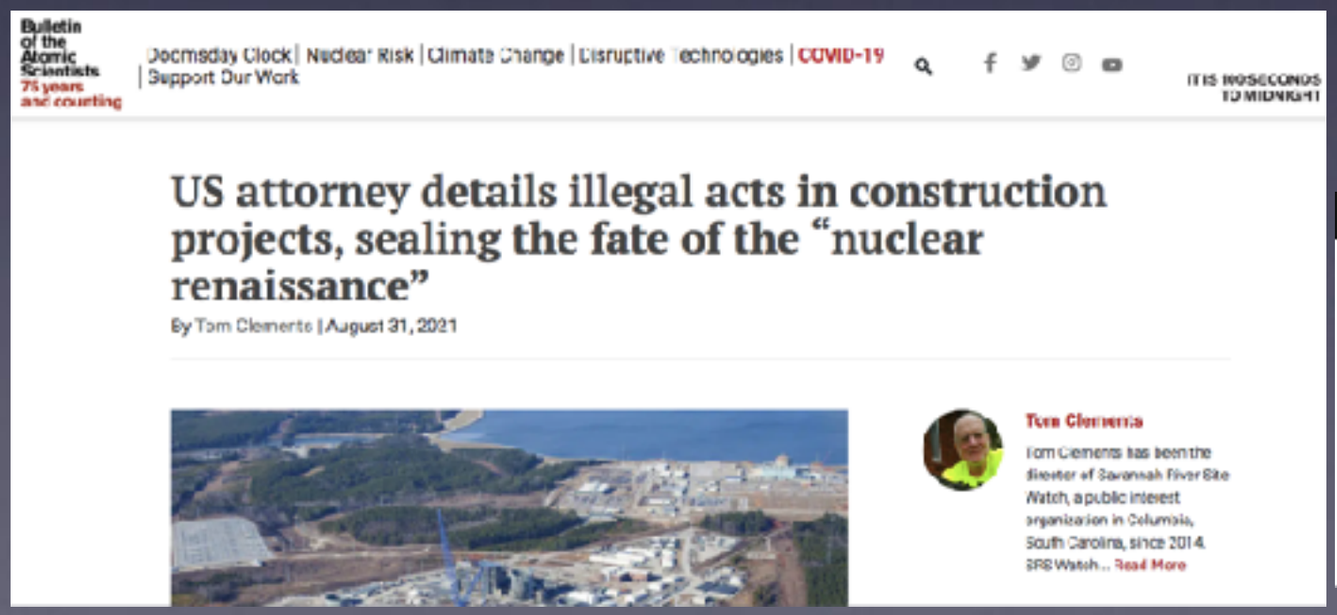
Although the specific numbers are proprietary information, the overnight capital cost for building the first two AP1000 reactors at one site is less than $1,400 per kilowatt. This includes all of the first-time costs for completing design, engineering and licensing of the first project. After the first few projects have been completed, the capital cost for later plants will be approximately $1,000 per kilowatt, which is competitive with other sources of baseload electricity. Once those first reactors are built and capital costs reach the $1,000-per-kilowatt range, all future plants would be financed and built without federal government financial assistance.

The Westinghouse-Bechtel estimate of less than $1,400 per kilowatt has a solid analytical basis, has been peer-reviewed, and reflects a rigorous design, engineering and constructability assessment.

Source: https://www.edfenergy.com/for-home/energywise/what-are-advantages-nuclear-energy

Nuclear energy is cheap/ affordable

Statement of Marvin S Fertel, Senior Vice President, Nuclear Generation, and Chief Nuclear Officer, Nuclear Energy Institute" (Washington, D. C.: Committee on Energy and Natural Resources, United States Senate, February 3, 2005)



NATIONAL POST

'I have not seen a credible plan for net zero without nuclear as part of the mix,' Natural Resources Minister Seamus O'Regan told a nuclear conference

Ryan Tumilty
Feb 27, 2020 • February 27, 2020 • 3 minute read • 202 Comments

TIME

Want to Stop Climate Change? Then It's Time to Fall Back in Love With Nuclear Energy

A satellite view of the Fukushima Daiichi Nuclear Power plant after a massive earthquake and subsequent tsunami caused a nuclear meltdown on March 14, 2011 in Futaba, Japan. DigitalGlobe—2011 DigitalGlobe

BY HANS BLIX MARCH 11, 2019

Rosatom Global @RosatomGlobal · Aug 27

Certain people would rather watch the world burn than accept the scientific consensus labelling nuclear as essential in fighting the climate change.

Source: https://twitter.com/rosatomglobal?lang=en

Nuclear energy is essential to deal with climate change

Printed for: February 1st, 2021

GE Hitachi Nuclear Energy is a world-leading provider of nuclear power plant technology, nuclear reactors and nuclear services. With the UK committing to becoming zero carbon by 2050, there is an ever growing need to find low carbon energy sources – and GE Hitachi are committed to this. We've been speaking exclusively with the firms Vice President of UK Sales, David Powell about their fat we plans.

Q. What characteristics make nuclear energy a vital resource to expand for the future?

Nuclear generation is a safe and reliable source of low carbon electricity and is essential to help the UK achieve net-zero carbon emissions by 2050. Meeting this challenge will require a quadrupling of reliable, clean electricity

Source: https://www.built-environment-networking.com/news/ge-hitachi-nuclear-energy-uk/

theguardian

Revealed: British government's plan to play down Fukushima

Internal emails seen by Guardian show PR campaign was launched to protect UK nuclear plans after tsunami in Japan

- Read the emails here

Rob Edwards
guardian.co.uk, Thursday 30 June 2011 16.36 EDT

Nuclear energy is safe

HOLTEC HIGHLIGHTS

A Summary Report to Our Clients, Suppliers, and Company Personnel

SMR-160 is a 160 MW(e) nuclear reactor based on Holtec's HI-SMUR (which stands for *H*oltec *I*nherently *S*afe *M*odular *U*nderground *R*eactor) technology. SMR-160 is industry's first truly passive power plant because it relies on no pump or external source of power during normal operations, abnormal excursions, or in response to accident events. SMR-160's modest thermal energy output has permitted Holtec to design the reactor system to shrug off even cataclysmic events of Fukushima's genre or human errors that bedeviled TMI and Chernobyl by deploying (the ever present) gravity as the motive energy in all of the reactor's critical safety systems.

Interpreting Fukushima: the India edition

Deny or trivialize!

"*there is no nuclear accident or incident in Japan's Fukushima plants. It is a well planned emergency preparedness programme* which the nuclear operators of the Tokyo Electric Power Company are carrying out to contain the residual heat after the plants had an automatic shutdown following a major earthquake" [my emphasis]

Chairman and Managing Director Nuclear Power Corporation, 15 March 2011

It wasn't so bad!

"The spread of radiation was not as high as it was projected...total casualty due to the nuclear accident was zero"

"Out of the three known such incidents- Three Mile Island, Chernobyl and Fukushima - the casualty due to nuclear plant malfunction is 50-60 in Chernobyl and zero in the other two incidents"

Chairman, Atomic Energy Commission, 10 November 2011 & 26 February 2012

We are different!

THE HINDU

News » National

Published: June 30, 2011 02:49 IST | Updated: June 30, 2011 02:49 IST

Fukushima-like disaster cannot happen in India: AEC Chairman

THE HINDU

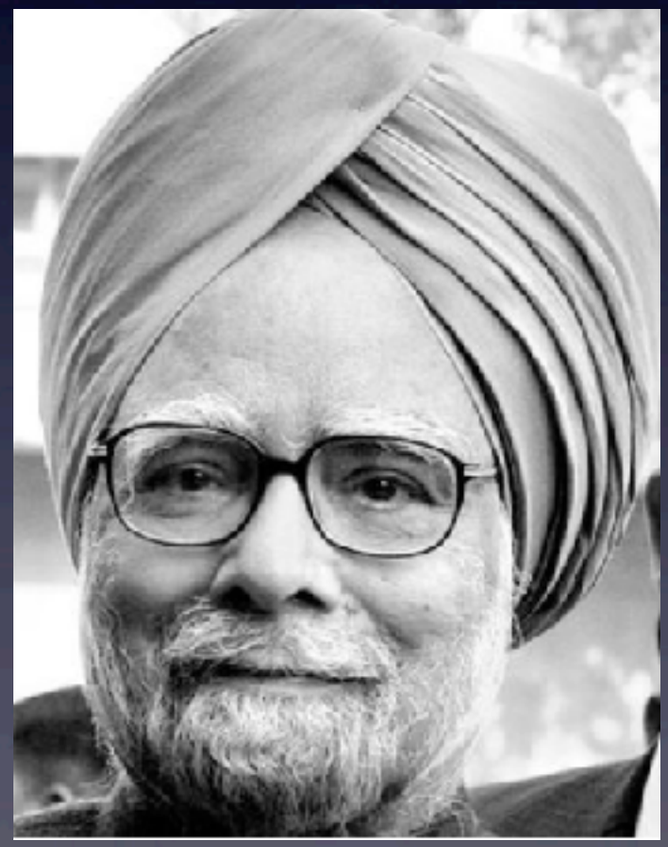
Today's Paper » NATIONAL

Published: March 15, 2011 00:00 IST | Updated: March 15, 2011 04:07 IST

Safety review ordered in nuclear plants: Manmohan

J. Balaji

Also argued that Indian reactors are safe because they have survived the Bhuj earthquake in January 2001 and the December 2004 Tsunami



We have it all figured out!

‘We are prepared to handle an event like the Fukushima disaster’

HT Correspondent, Hindustan Times
Mumbai, September 30, 2011

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Email to Author

First Published
Last Updated:

Chairman, Atomic Energy Commission

Reality check: Ministry of Health and Family Welfare “is nowhere to meet an eventuality that may arise out of nuclear and radiological emergencies,”

Secretary, Ministry of Health and Family Welfare to Parliamentary Standing Committee on Science & Technology, 2010

Stress superior knowledge!

"We have got total knowledge and design of the seismic activities. Worst seismic events and tsunami have been taken into consideration in our designs"

S.K. Jain, Chairman, Nuclear Power Corporation, 20 March 2011

Precursor : "For coastal sites, flooding may be due to tropical cyclones, tsunamis, seiches and wind waves. In India, tsunamis and seiches do not occur. Hence cyclones alone have been singled out for detailed study."

Reactor Safety Analysis Group, Department of Atomic Energy, 1986

Relax!

THE HINDU

News » National

Published: November 10, 2011 18:57 IST | Updated: November 10, 2011 19:05 IST

AEC chief puts odds of N-plant accidents at '1-in-infinity'

"The design feature of having more than 1000 individual primary circuits increases the safety of the reactor system – a serious loss of coolant accident is practically impossible. The safety of nuclear power plants in the Soviet Union is assured by a very wide spectrum of measures… ."

Bulletin of the International Atomic Energy Agency (Vol. 25, June 1983)

Results of overconfidence

Poor choices in design and other parameters

Inadequate safety studies

Poor safety practices

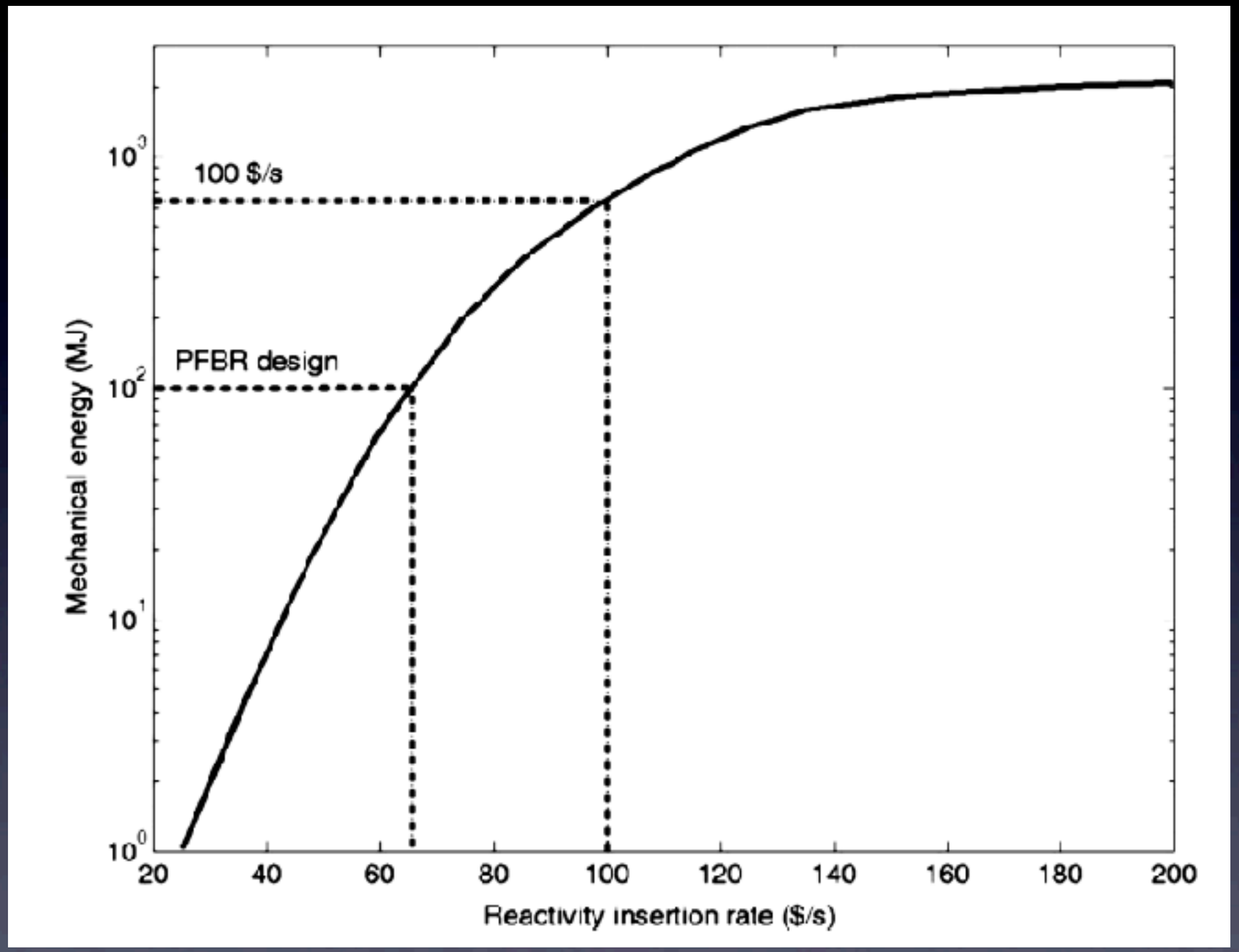
Choice of containment design for India's first demonstration fast breeder reactor

Table 2: Containment design specifications of demonstration fast reactors.*

Name	Thermal power (MWth)	Sodium void coefficient ($)	Volume V (m^3)	Pressure P (kPa)	V*P/E (kNm/MWth)
Phenix	563	—	31000	40	2.20×10^3
PFR	650	2.6	74000	5	0.57×10^3
CRBRP	975	2.29	170000	170	29.6×10^3
SNR-300	762	2.9	323000	24	10.2×10^3
MONJU	714	—	130000	30	5.46×10^3
PFBR	1250	4.3	87000	25	1.74×10^3

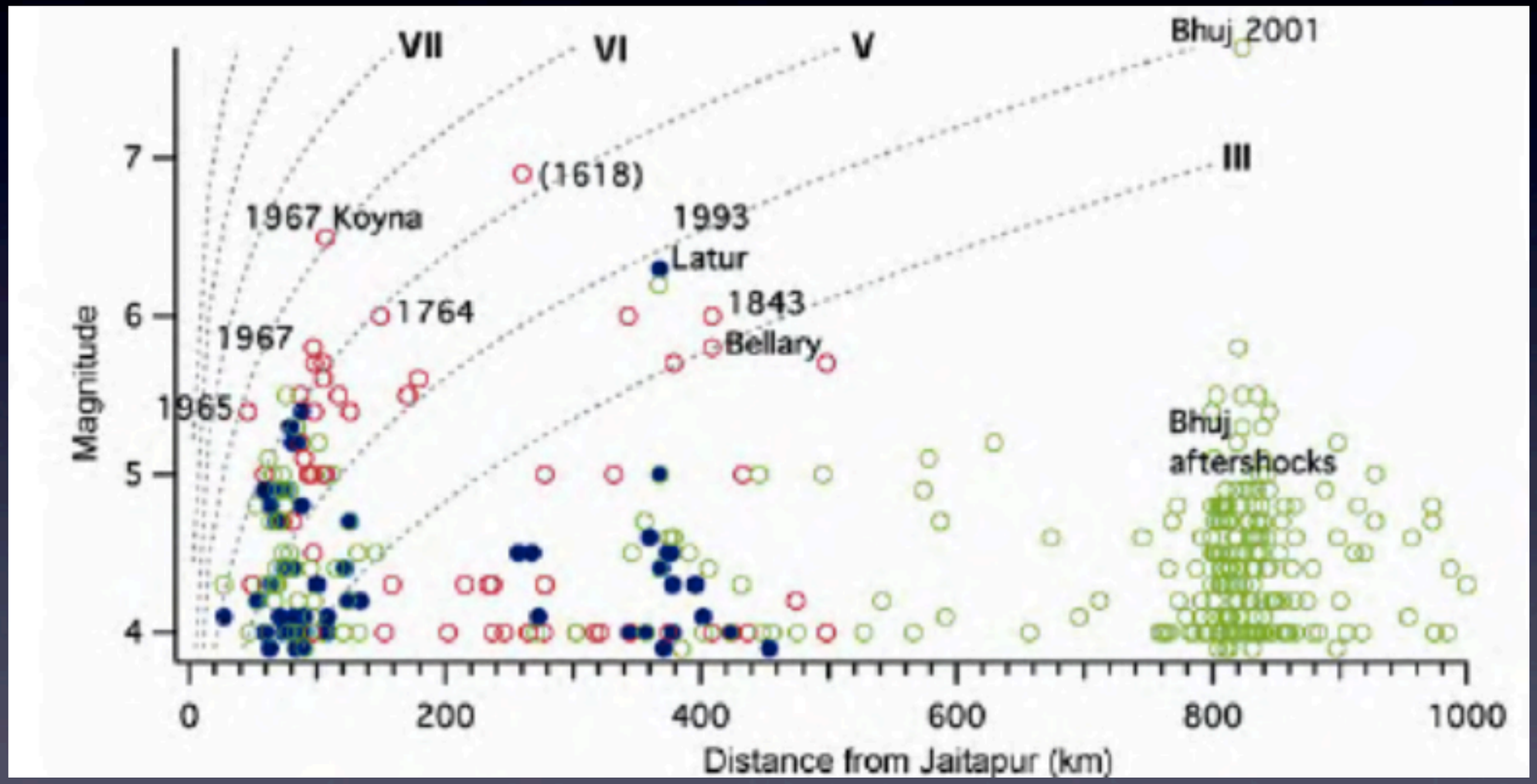
Source: Kumar, Ashwin, and M V Ramana. "Compromising Safety: Design Choices and Severe Accident Possibilities in India's Prototype Fast Breeder Reactor." *Science and Global Security* 16 (2008): 87–114.

Inadequate safety assessment: Energy release in a Core Disassembly Accident



Source: Kumar, Ashwin, and M V Ramana. "Compromising Safety: Design Choices and Severe Accident Possibilities in India's Prototype Fast Breeder Reactor." *Science and Global Security* 16 (2008): 87–114.

Choice of location for 6 X 1650 MW reactor complex



Source: Bilham, Roger, and Vinod Gaur. "Historical and Future Seismicity Near Jaitapur, India." *Current Science* 101, no. 10 (2011): 1275–1281

Paradox of confidence in safety

"if an organization is convinced that it has achieved a safe culture, it almost certainly has not"

Reason, James. "Safety Paradoxes and Safety Culture." Injury Control & Safety Promotion 7, no. 1 (2000): 3–14.

What you don't hear from the nuclear industry about Small Modular (Nuclear) Reactors

Small also means…

More cost

$$\frac{K_1}{K_2} = \left(\frac{S_1}{S_2}\right)^{0.6}$$

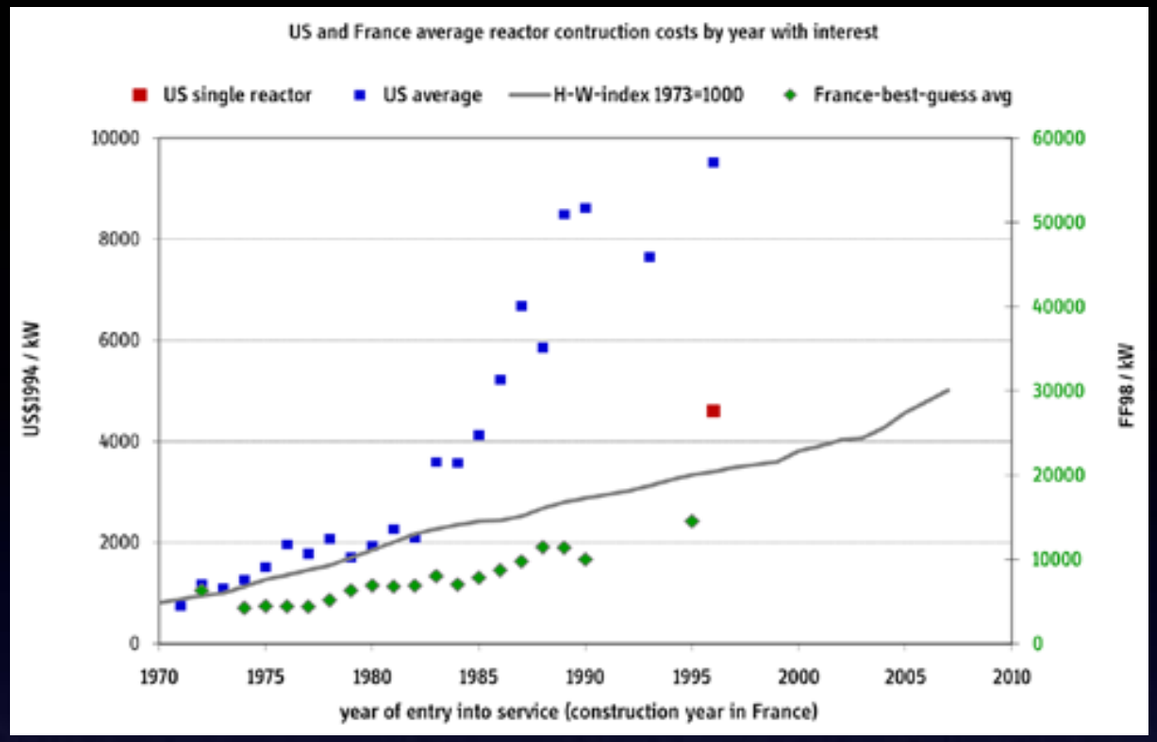
More spent fuel/waste

RESOURCE REQUIREMENTS AND PROLIFERATION RISKS ASSOCIATED WITH SMALL MODULAR REACTORS

ALEXANDER GLASER,* LAURA BERZAK HOPKINS, and M. V. RAMANA

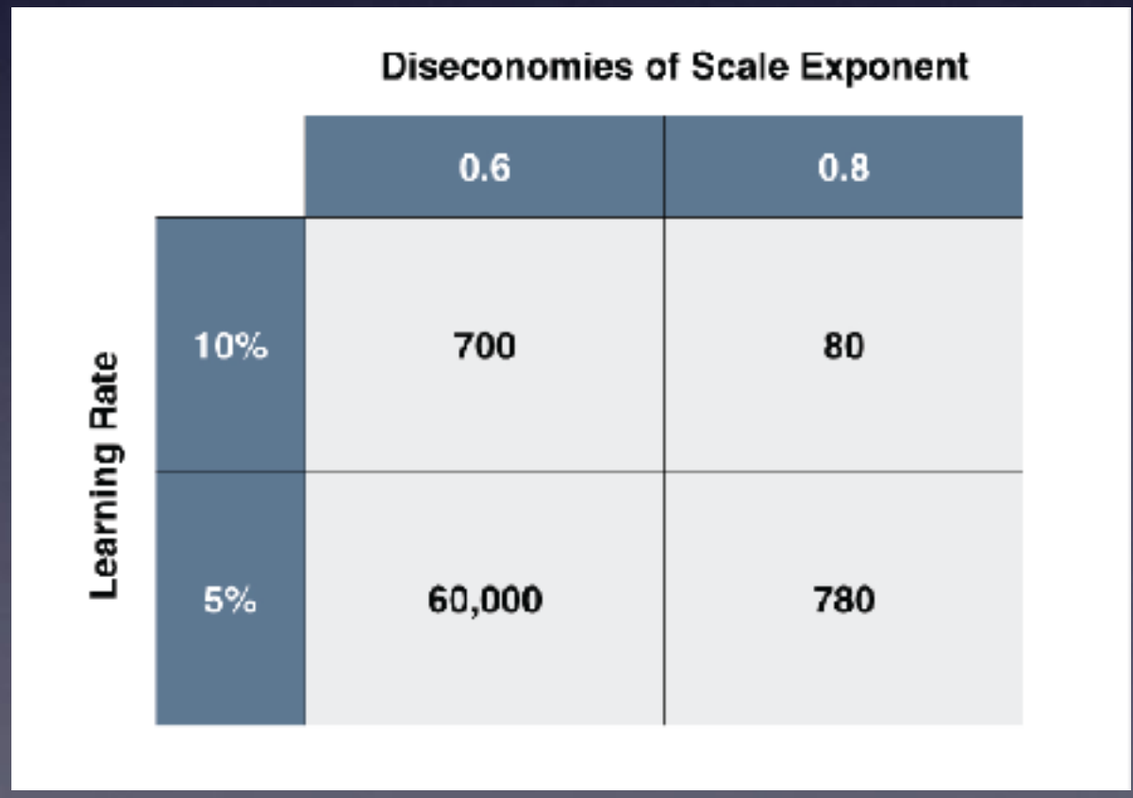
NUCLEAR TECHNOLOGY VOL. 184 OCT. 2013

"Learning" might make plants more expensive



Grubler, Arnulf. 2010. "The Costs of the French Nuclear Scale-up: A Case of Negative Learning by Doing." Energy Policy 38 (9): 5174–88.

Even if there was learning, too many "loss leaders" have to be built



Glaser, Alexander, M.V. Ramana, Ali Ahmad, and Robert Socolow. 2015. "Small Modular Reactors: A Window on Nuclear Energy." An Energy Technology Distillate. Princeton, N.J.: Andlinger Center for Energy and the Environment at Princeton University. http://acee.princeton.edu/distillates/distillates/small-modular-reactors/.

Even small nuclear plants have “large” requirements

200 MWe Small reactor => sufficient enrichment capacity for about 8 HEU based (Hiroshima style) weapons and about 10 Pu (Nagasaki style) weapons per year

RESOURCE REQUIREMENTS AND PROLIFERATION RISKS ASSOCIATED WITH SMALL MODULAR REACTORS

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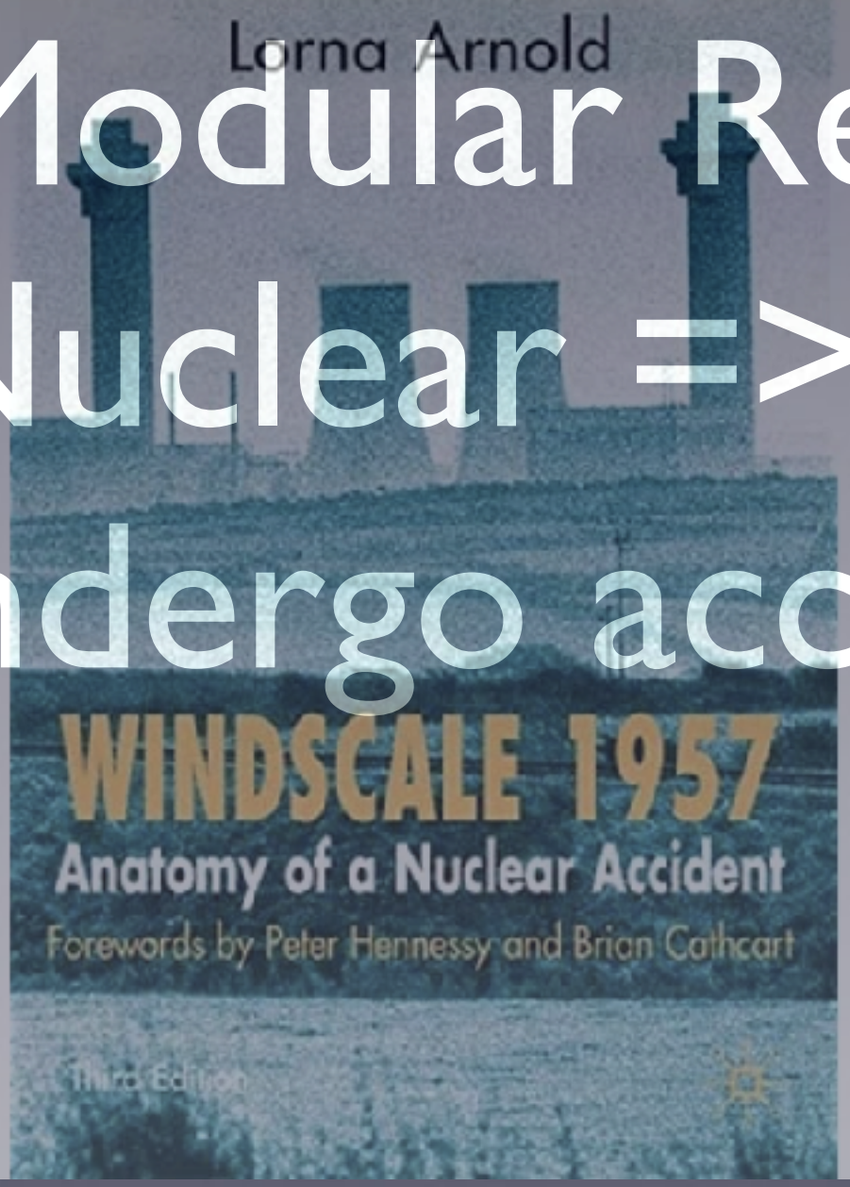
NUCLEAR TECHNOLOGY VOL. 184 OCT. 2013

Small Modular Reactors are Nuclear => they can undergo accidents



Very hard to envision all possible accident pathways

Cannot set up safety systems to protect against un-anticipated accident sequences

Risk assessments are unreliable


Regulation & Governance

Regulation & Governance (2020) doi:10.1111/rego.12330

Empires built on sand: On the fundamental implausibility of reactor safety assessments and the implications for nuclear regulation

John Downer

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Liu Institute for Global Issues, School of Public Policy and Global Affairs, University of British Columbia, Vancouver, British Columbia, Canada


Bulletin of the Atomic Scientists

Beyond our imagination: Fukushima and the problem of assessing risk

BY M. V. RAMANA | 19 APRIL 2011

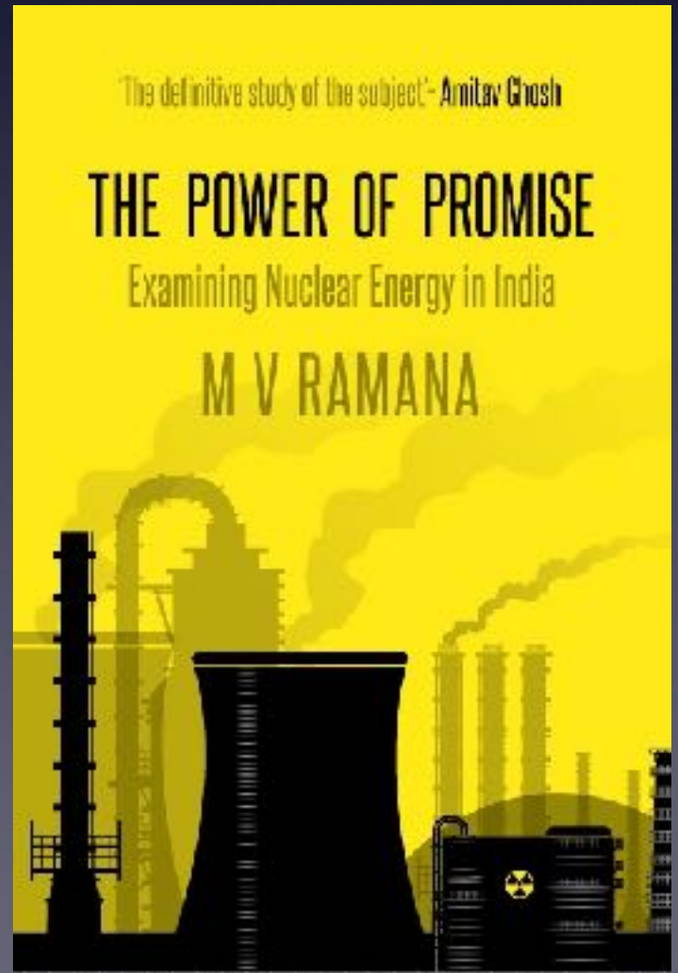

JOURNAL OF CONTINGENCIES AND CRISIS MANAGEMENT

High Reliability Organizations:
Unlikely, Demanding and At Risk

Todd R. La Porte*

Berkeley HRO Group:
Organizations that have to manage such technologies have very stringent demands that are hard to meet

Not met by India's nuclear establishment: after decades of experience. What are the chances that a new country adopting nuclear power will meet these safety demands?



Journal of Risk Research, 2013
http://dx.doi.org/10.1080/13669877.2013.822920

Routledge
Taylor & Francis Group

'One in infinity': failing to learn from accidents and implications for nuclear safety in India

M.V. Ramana[a]* and Ashwin Kumar[b]

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[b]*Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA, USA*

Overconfidence

Conflicting priorities

Regulatory failures

Asian Perspective 39 (2015), 607–635

The China Syndrome?
Nuclear Power Growth and Safety
After Fukushima

Amy King and M. V. Ramana

Journal of Risk Research, 2015
http://dx.doi.org/10.1080/13669877.2014.1003958

Routledge
Taylor & Francis Group

Negligence, capture, and dependence: safety regulation of the design of India's Prototype Fast Breeder Reactor

M.V. Ramana[a]* and Ashwin K. Seshadri[b]

Reality Check

Energy Research & Social Science 2 (2014) 115–124

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Original research article

One size doesn't fit all: Social priorities and technical conflicts for small modular reactors

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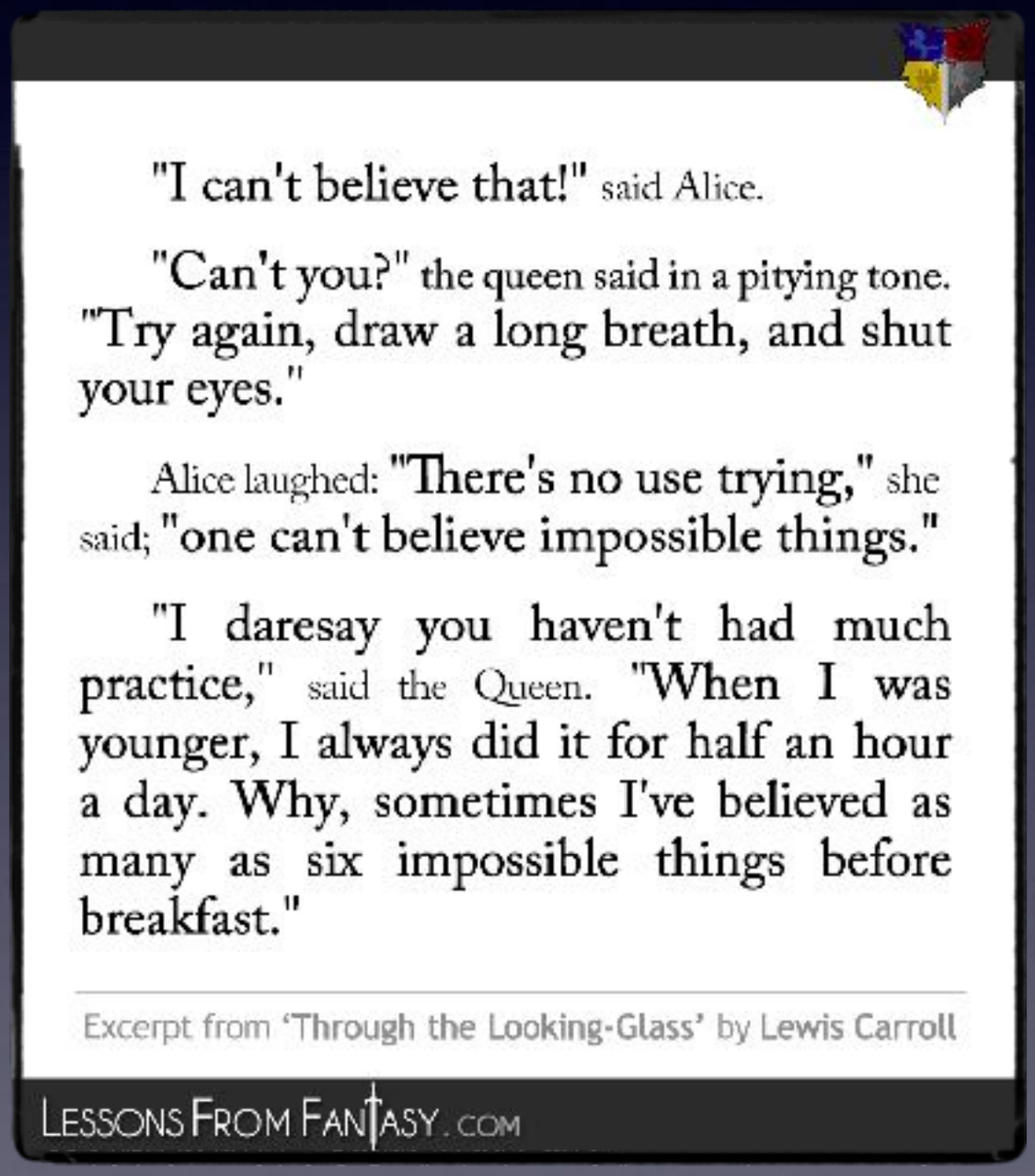
Advocacy strategies to persuade people that nuclear power is safe, cheap, clean



Gatsby believed in the green light, the orgiastic future that year by year recedes before us. It eluded us then, but that's no matter—tomorrow we will run faster, stretch out our arms farther . . . And one fine morning—So we beat on, boats against the current, borne back ceaselessly into the past.