



# Nuclear Energy After Chernobyl

Carol Kessler  
April 26, 2016  
Federation of American Scientists

A smart person  
learns  
from his  
experience,  
but a wise one  
learns from the  
experiences of  
others



## It Changed Everything in Nuclear Energy

- Chernobyl - undeniably worst nuclear accident in history
- Changed international nuclear community forever
- Focus on safe reactor design
- New industry role - World Association of Nuclear Operators



## It Changed Everything (cont)

- New international law/conventions
- New role for IAEA, new missions
- G-7 Heads of State attention for decade - program on nuclear safety assistance
- Nuclear role for international financial institutions
- Economic and social impacts in region





## Focus on Safe Design

- RBMKs have no containment, positive void coefficient
- Safety improvements to all Soviet designed reactors - VVERs
- Safety of reactors and nuclear energy programs worldwide



Inside an RBMK



## New Industry Role

- INPO - Three Mile Island
- 1989 - WANO - Chernobyl
- WANO in Moscow, Atlanta, Tokyo and London HQ
- Operators keeping each other informed
- Missions - peer reviews
- Peer pressure - an accident anywhere is an accident everywhere - all are affected by

## New Conventions

- 1987 Convention on Notification of an Incident/Accident
- 1987 Convention on Assistance in Event of an Incident/Accident
- 1994 Convention on Nuclear Safety (CNS)
- 1997 Convention on Supplementary Compensation for Nuclear Damage Liability



## Enhanced Role for IAEA

- 1986 - New Director General Advisory Group - International Nuclear Safety Advisory Group, INSAG to review Chernobyl
- 1991 first safety review mission to Kozloduy in Bulgaria
- Nuclear safety no longer just a national regulatory mission
- 1996 New IAEA Department of Nuclear Safety

## Enhanced Role for IAEA

- New international missions - Operational Safety Assessment Review Teams, Integrated Regulatory Reviews, Nuclear Safety Culture Reviews
- IAEA Safety Standards and Guides upgraded and used in missions to assess countries' safety

## “Nuclear Safety Culture”

- International concern over lack of attention by government (owner) and plant operator to safety's importance and weak nuclear regulatory oversight



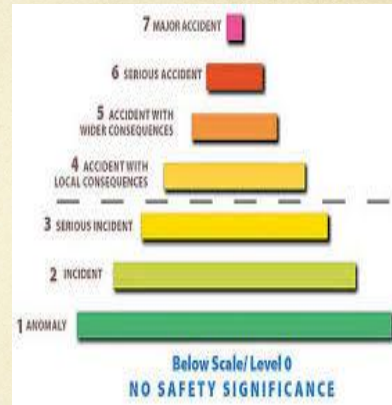
## Nuclear Safety Culture

- Training and missions by IAEA, WANO
- Regulatory Authorities set requirements
- Major IAEA conference in February 2016 post-Fukushima



## Emergency preparedness

- Transnational accident response
- US federal radiological emergency response plan adds State Department and Embassies
- IAEA emergency response center, notifies countries of an incident/accident, clearinghouse for assistance, runs international exercises to test preparedness



## Captured Attention of G-7 Heads

- 1992 G-7 Summit - Post Soviet Union
- G-7 Nuclear Safety Working Group (NSWG)
- G-7 NSWG Goal - improve safety or encourage closure of Soviet-designed reactors
- G-7 NSWG Programs - several billion \$\$\$ assistance and loans
- G-7/Ukraine Chernobyl MOU on closure - technical assistance and loans over \$2.5B
- G-8 Nuclear Safety and Security Summit 1996



## Nuclear Role for International Financial Institutions

- European Bank for Reconstruction and Development - EBRD
  - Nuclear Safety Account -1993 to present
  - Chernobyl Sarcophagus project 1997 to 2017?
  - Energy sector reforms
  - New reactor construction – almost –





## Economic and Social Impacts

- Reactors were cheapest source of electricity
- Closing Chernobyl had large economic and social impacts on Ukraine - G-7 MOU
  - Needed another source of electricity - Kiev affected
  - People not paying for electricity - no revenues for new capacity
  - Energy sector reforms
  - Social impact - Slavutych and region
  - US-EC Social Impacts Plan

## Sum Up

- Safer reactor designs - containments, inherently safe
- Industry and Regulatory Oversight - nuclear safety culture
- International law and conventions govern safety
- IAEA/WANO provide safety assistance and missions
- Emergency preparedness is international
- G-7 mobilized massive assistance for safety, economic and social impacts
- Closing reactors is hard - economic and social impacts



Thank you