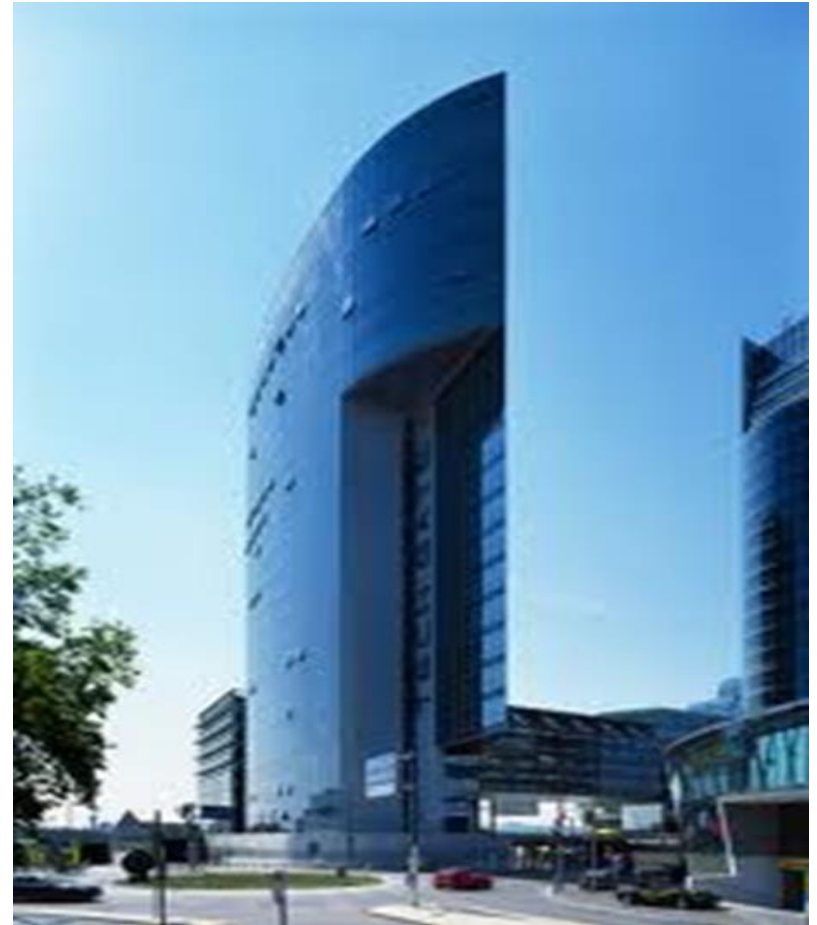# Educating the Digital Generation for Nuclear Science and Technology
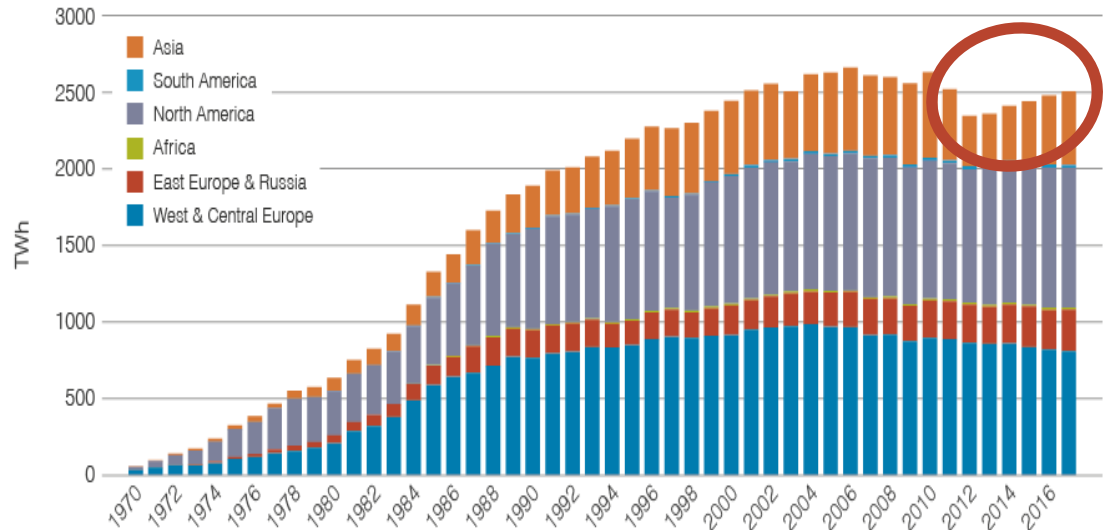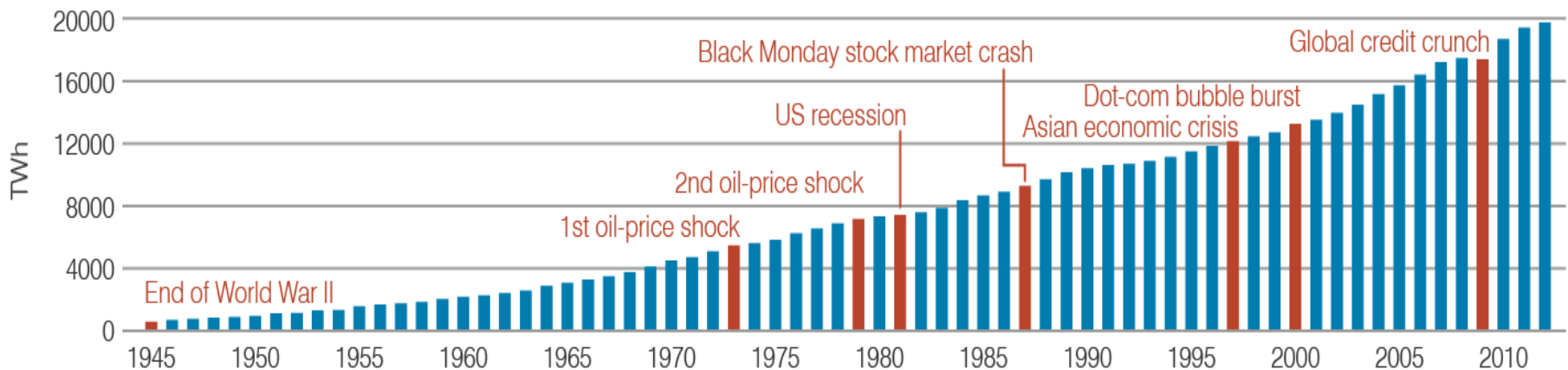
Yanko Yanev

Vienna **I**nternational **N**uclear **C**ompetence **C**enter

Nuclear Power Role in a Carbon Free World?

Nuclear growth is the **fastest in 25 years** but the industry has not kept pace with electricity demand globally
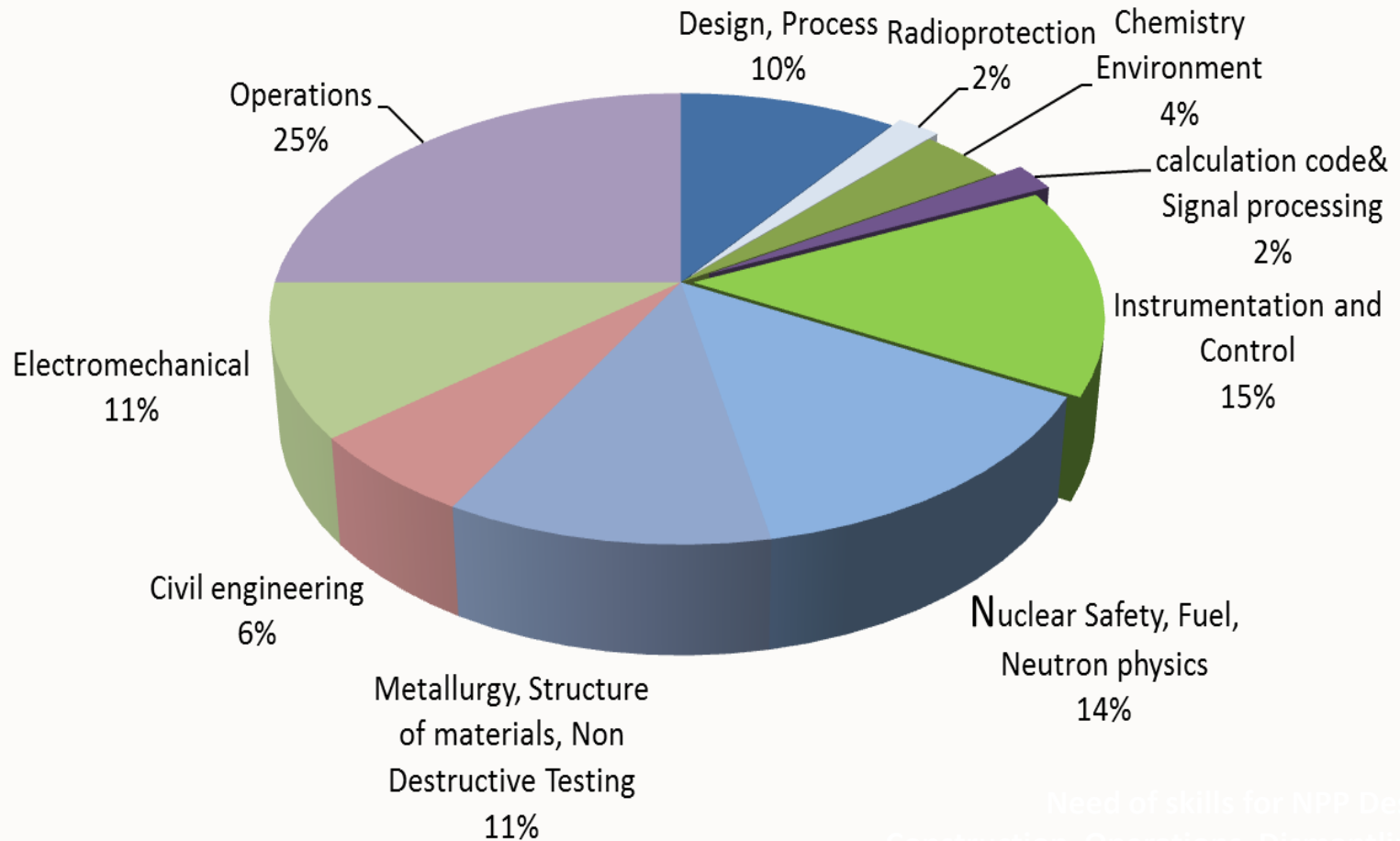

Source: World Nuclear Association and IAEA Power Reactor Information Service (PRIS)

Legend:
- Asia
- South America
- North America
- Africa
- East Europe & Russia
- West & Central Europe

End of World War II
1st oil-price shock
2nd oil-price shock
US recession
Black Monday stock market crash
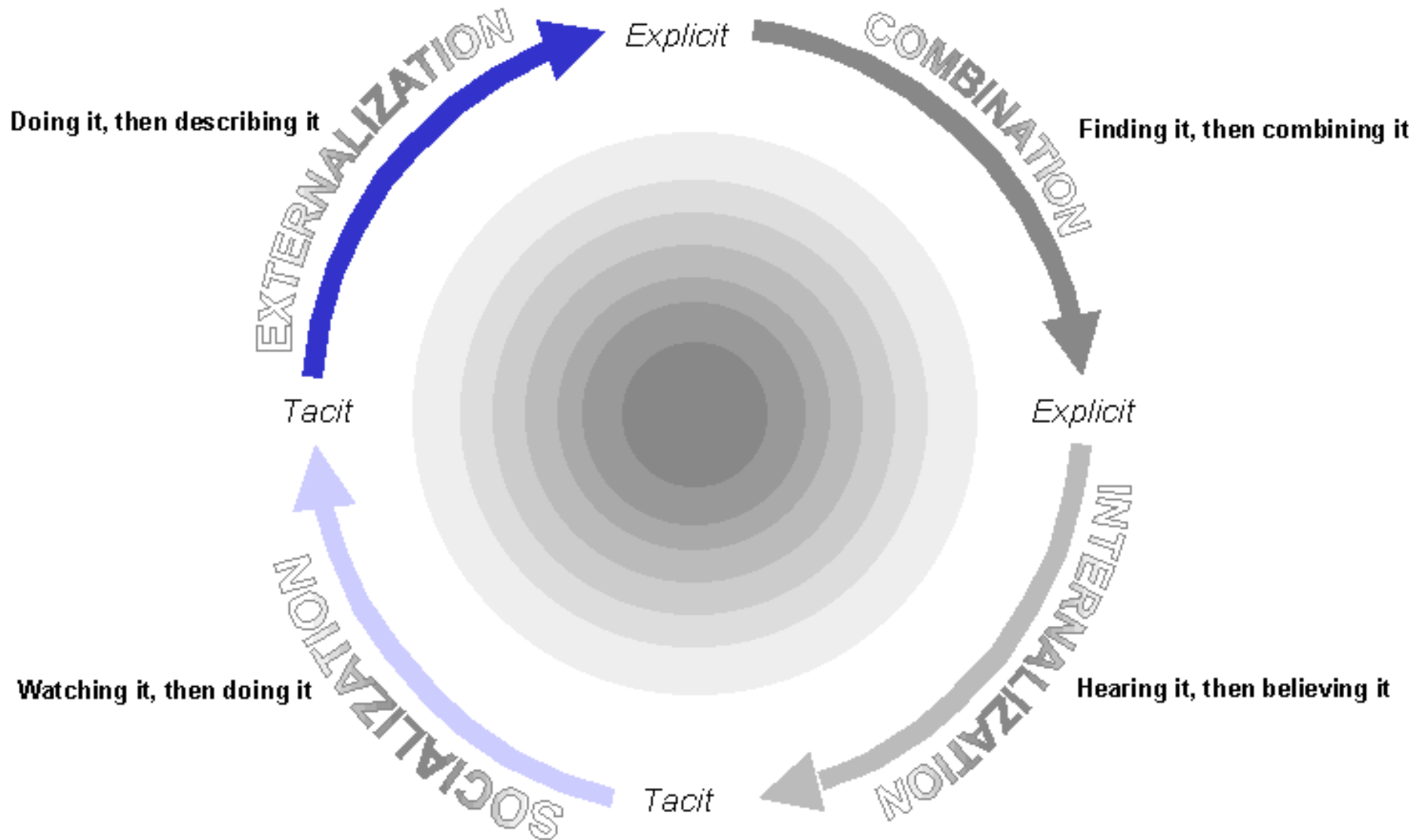Asian economic crisis
Dot-com bubble burst
Global credit crunch

Source: 1945-1979, International Energy Agency databases and analysis, 1980-2012, Energy Information Administration

Specialist areas needed

Design, Process 10%

Radioprotection 2%

Chemistry Environment 4%

calculation code & Signal processing 2%

Instrumentation and Control 15%

Nuclear Safety, Fuel, Neutron physics 14%

Metallurgy, Structure of materials, Non Destructive Testing 11%

Civil engineering 6%

Electromechanical 11%

Operations 25%

Need of skills for NPP Design, Construction, Operation, Dismantling goes beyond pure nuclear education and training

Knowledge Conversion
(Nonaka and Takeuchi 1995)

Explicit

EXTERNALIZATION

Doing it, then describing it

COMBINATION

Finding it, then combining it

Tacit

Explicit

SOCIALIZATION

Watching it, then doing it

INTERNALIZATION

Hearing it, then believing it

Tacit

Generation 21st = Digital People

The generation who will run the nuclear power plants we built!

VR and Knowledge management

- "Virtual reality is a medium composed of interactive computer simulations that sense the participant's position and actions and replace or augment the feedback to one of mere senses, giving the feeling of being mentally immersed or present in the situation (a virtual world)."

3D immersive environment

- **Application areas:**

• Operator training: control room operations, visualizing field tasks, practicing emergency situations, disseminating efficient work methods

• Engineering: virtual visits to areas that can't be visited during operation, documenting existing physical spaces
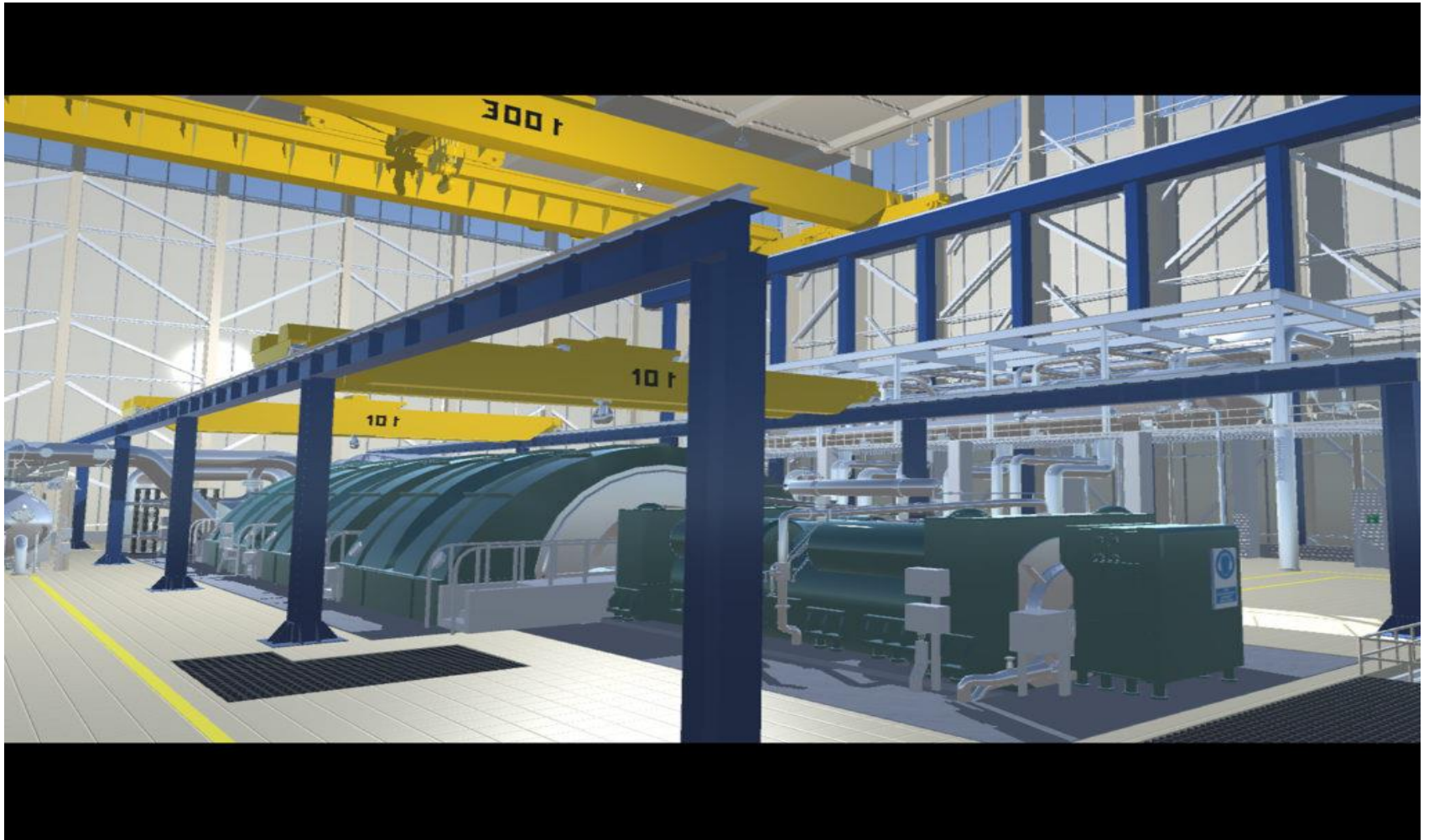
• Maintenance: pre-job briefing, preparing for outages, practicing use of equipments, documenting and sharing good working practices

Technology learning(GE)
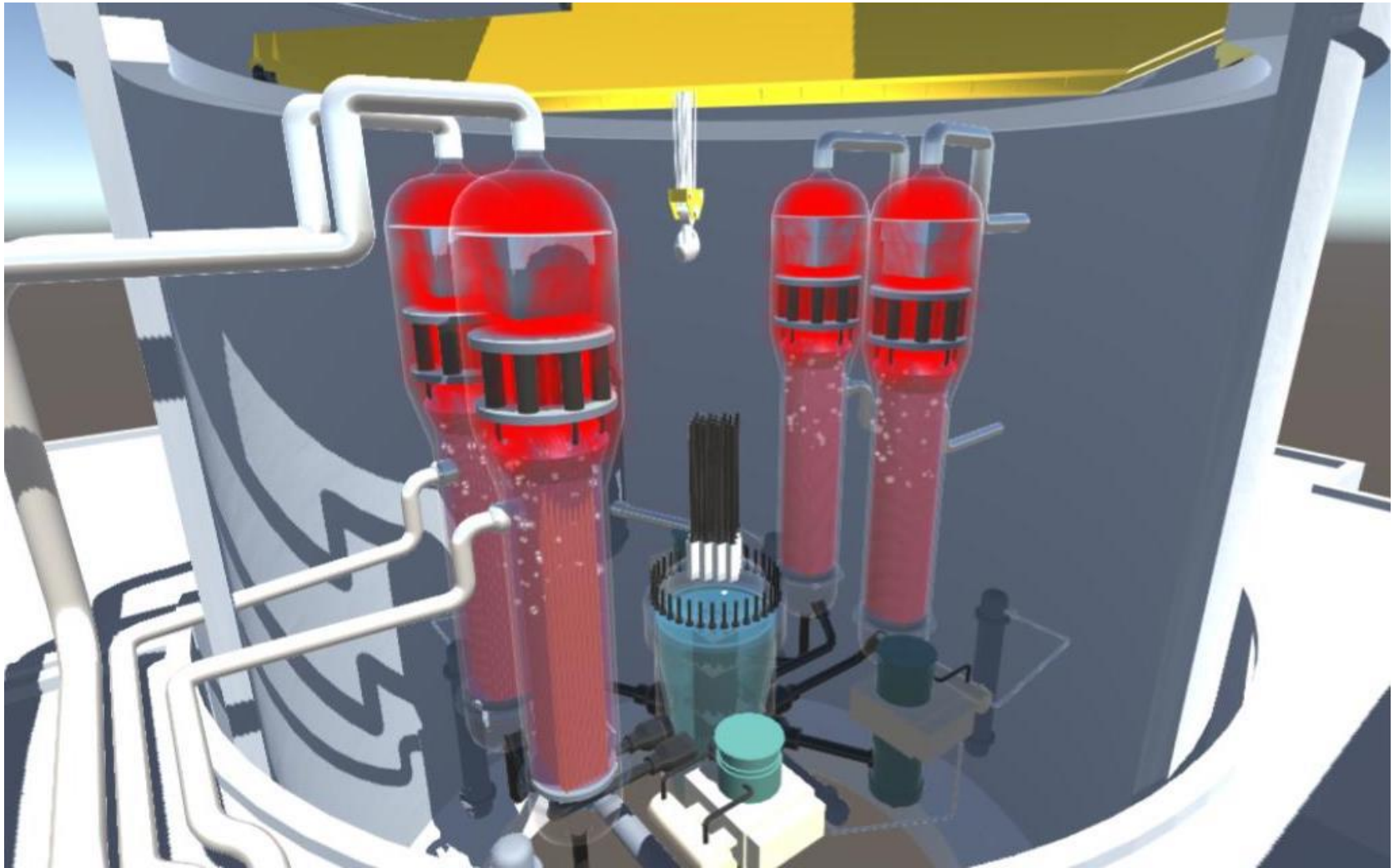
Maintenance(GE)

Control room verification

Decommissioning and Waste

Nuclear Infrastructure in Newcomer Countries

- Nuclear infrastructure is expensive and not existing or its minimal:
  - None or minimum nuclear facilities
  - No special programs for nuclear education and training
  - Lack of competent educators
  - Lack of appropriate regulatory control
- Virtual laboratories and "internet based facilities" can be done almost immediately.

EXAMPLES of Virtual Reality

- https://youtu.be/FppDS8QswAA
- https://youtu.be/ZX0Wd_tc9aQ
- https://youtu.be/IYpovgka-9Q
- https://www.uccs.edu/vgcl/nuclear-chemistry/experiment-2-types-of-radiation

What can VINCC offer?

- ***Nuclear Knowledge Digital Learning***

- Virtual courses (VR Internet lectures, VR Laboratory exercises, "ask the expert" sessions, etc.)
  - Bolivia?
  - Kenya?
  - Zambia?
- Digital Engineering ?

Benjamin Franklin
Lao Tzu
Or someone else?

?

- Tell me and I will forget,

- Show me and I may remember,

- Involve me and I will understand.

THANK YOU FOR YOUR ATTENTION

VINCC is a knowledge network of industrial and scientific organizations driving nuclear development for peaceful, safe, secure and competitive application. It provides **nuclear competence** and **nuclear infrastructure support.**