

International Repositories: a necessary component of a global nuclear future

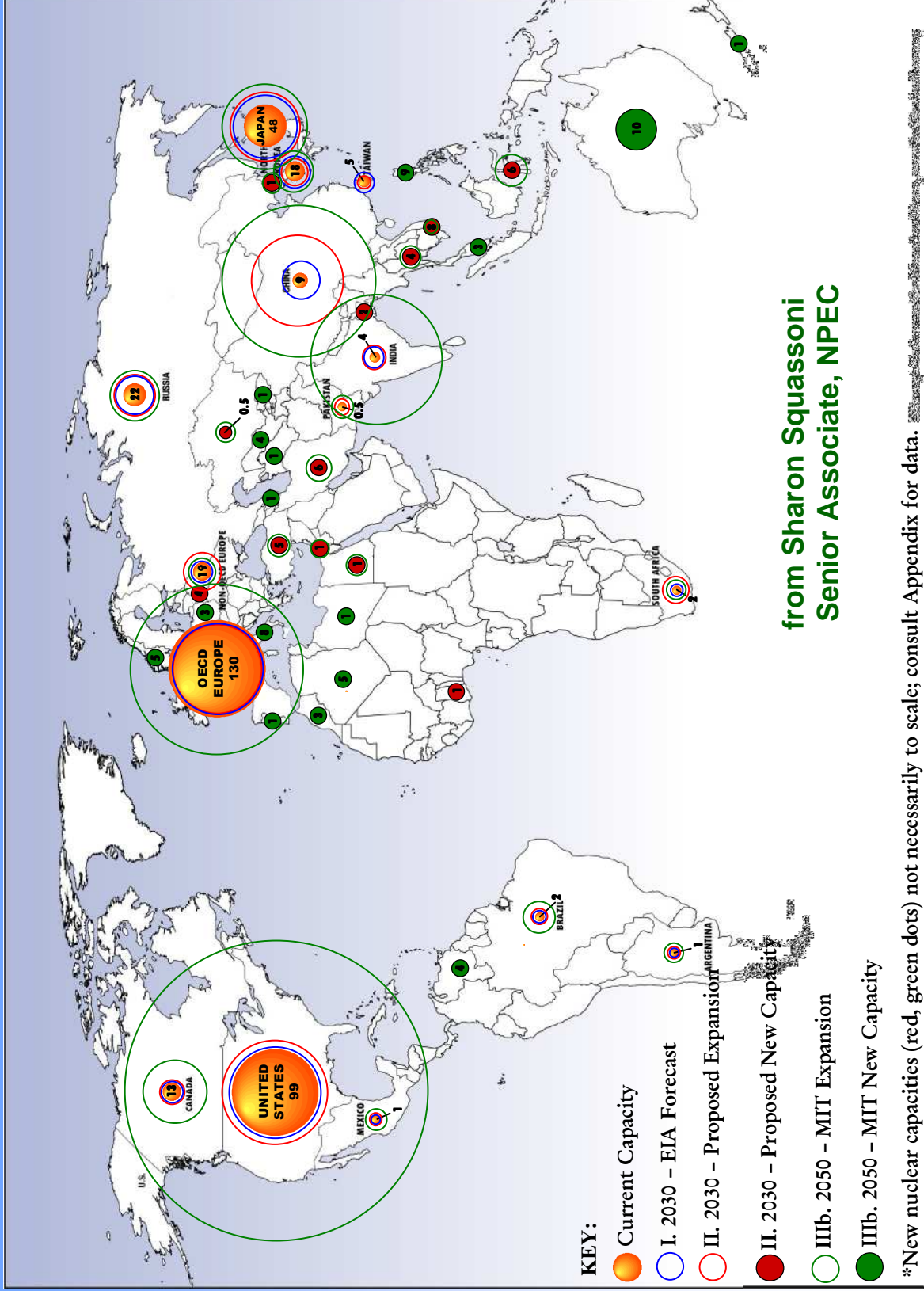
Charles McCombie

Erice International Seminar, August 2008



Reactor Capacities for all Scenarios*

(Gigawatts electric, GWe)



from Sharon Squassoni
Senior Associate, NPEC

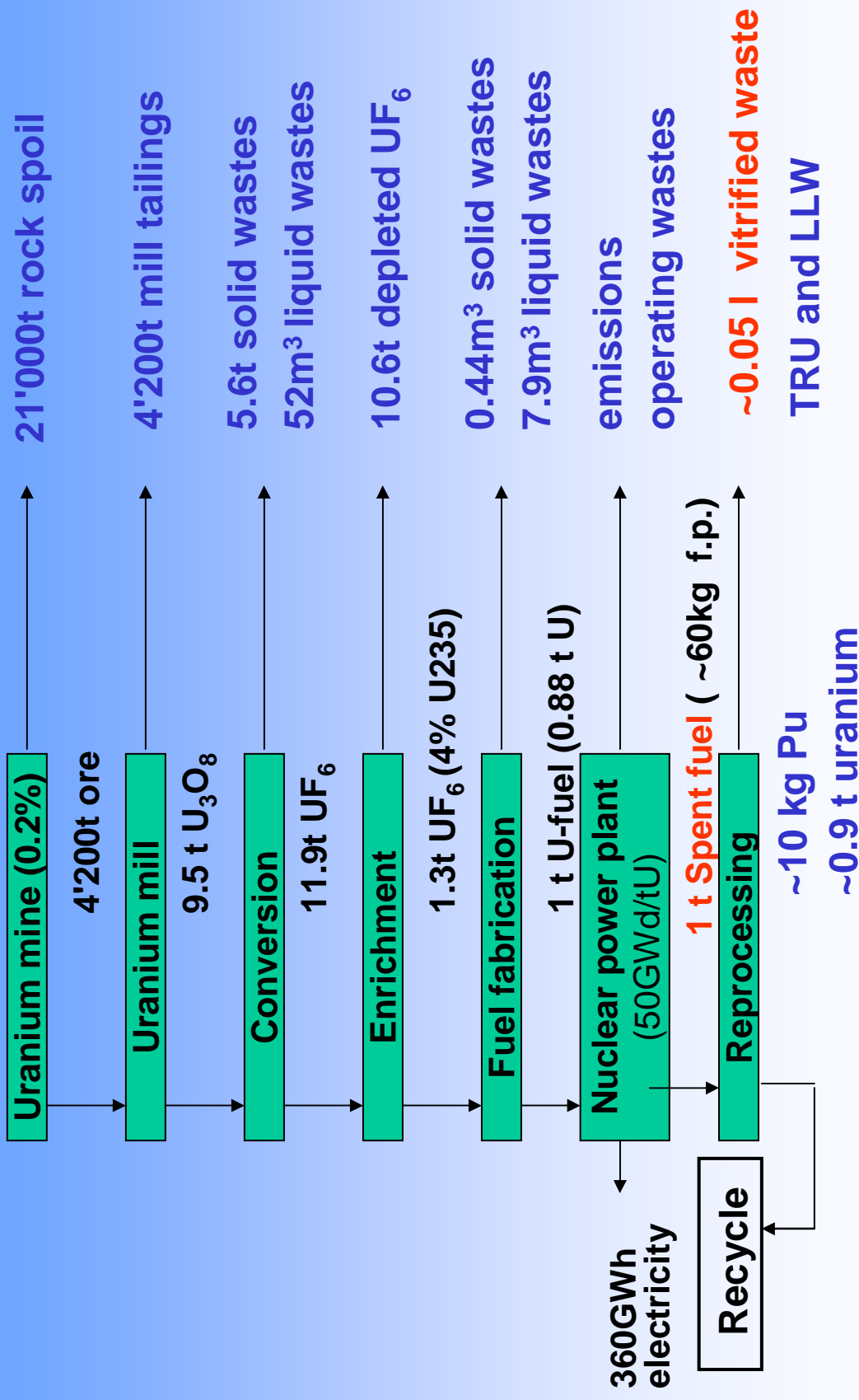
*New nuclear capacities (red, green dots) not necessarily to scale; consult Appendix for data.

Pre-requisites for a Nuclear Future

1. Safe and secure nuclear power plants
2. Economic nuclear electricity
3. Safe and secure waste management
4. Public recognition that 1 – 3 are OK!!

Activity

Wastes



N.B. Global distribution of these activities!

European Union Wastes

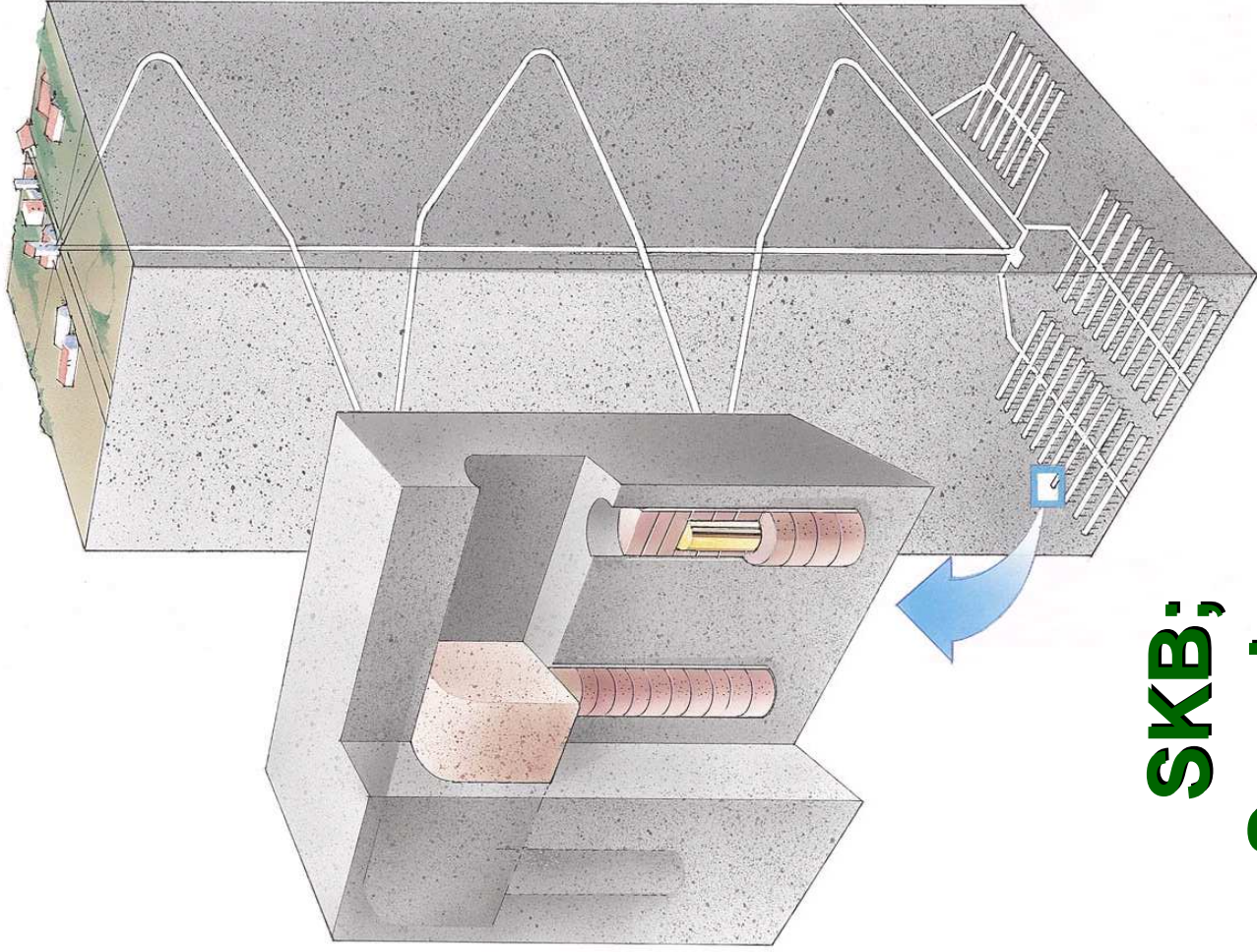
- Annual waste production 2'700 million m³
- Annual hazardous waste production 46 million m³
- Annual radioactive production 50'000 m³
- (0.0002, m³ per inhabitant – 15 litres/lifetime)
- HLW = 1% of radioactive waste by volume
- In the EU there are 55'000 contaminated sites (half in a critical state)

**SF/HLW disposal is NOT the biggest problem per se
- but is bound up with energy, environmental and climate challenges**

Spent Fuel Repository Concept – Sweden

Site chosen: 2008

Operation: ~2015-20



**SKB;
Sweden**

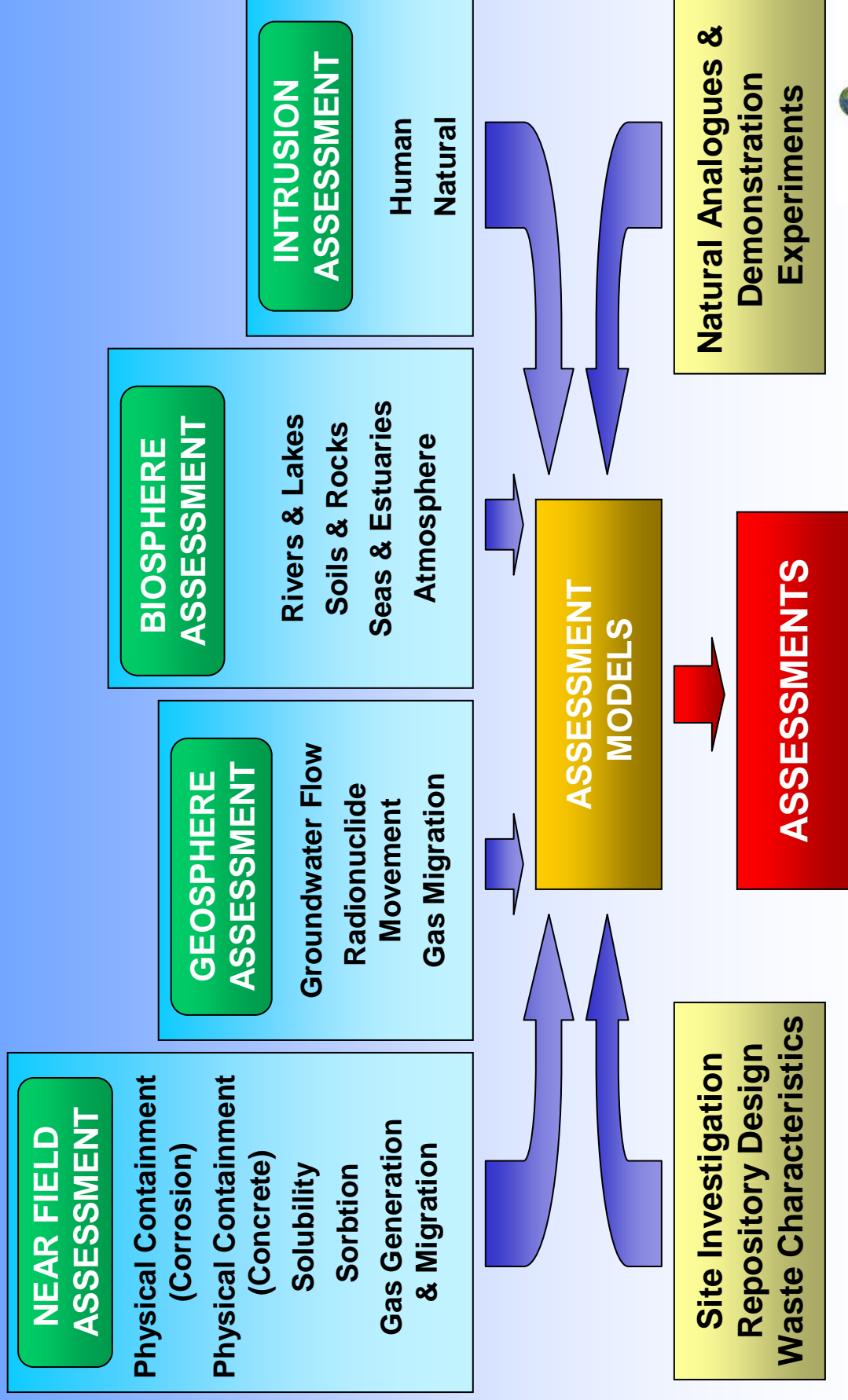
"Deep geological disposal is technically feasible now and can demonstrate the guarantees of long-term isolation and protection the public demands"

European Commission 2004

"In our view, the only sustainable solution to the long-term management of these wastes entails a clear commitment to developing a deep geological disposal facility"

UK Environment Agency 2005

Geoscience in Radwaste Disposal Assessment



Repositories: The Good News

- ▶ **Technical feasibility widely recognized**
- ▶ **Long-term safety recognized (in technical community); proof is challenging – but feasible**
- ▶ **International cooperation intensive**
- ▶ **Progress positive in a few countries**

Repositories: The Bad News

- ◆ Public confidence insufficient
- ◆ Too little progress with implementation
- ◆ Repositories are still LULUs
- ◆ Costs high and escalating
- ◆ Small countries also need solutions

Planned Operational Dates for Geological Repositories

COUNTRY: DATE	COUNTRY: DATE
Austria: no plans	Belgium: after 2025
Bulgaria: no plans	China: after 2040
Czech Republic: 2065	Finland: 2020
France 2025	Germany: 2030
Hungary: 2047	Italy: open
Japan: 2035	Lithuania: no date
Netherlands: after 2100	Romania 2049
Slovakia: 2037	Slovenia: 2066
Spain: 2035	South Korea: open
Sweden: 2017	Switzerland: 2040
United Kingdom: open	USA: 2018?

**Can we expand nuclear without
“solving the waste problem”?**

Benjamin Franklin

***“The definition of insanity is doing the
same thing over and over and
expecting different results”***

A credible waste disposal strategy

- The components:
 - availability of the necessary proven technologies
 - availability of the necessary personnel and funding
 - a siting strategy that that can deliver **at the required time** an **acceptable** location for a repository
- Large nuclear programmes must work on all three components
- A prudent approach for new nuclear countries
 - recognise the technological and financial implications
 - start out on the siting task in a “dual track” manner

Siting: “dual track” strategy

- ➔ Perform **national survey** of geologically, environmentally and socially acceptable disposal concepts and siting options
- ➔ Link up with potential partner countries to investigate **multinational approaches** that could provide safe and economic disposal options.
- ➔ The multinational option might be achieved by:
 - partnering with other small or new nuclear countries
 - negotiating export of spent fuel or HLW (and other long-lived wastes) to a third country.

Multinational Scenarios for Repositories (IAEA)

- ◆ **Type I – "add-on,"**
 - Country with large national programme
 - Weapons State

e.g.
GNEP
GNPI
- ◆ **Type II – "co-operation"**
 - equal partners with small inventories
 - repositories for specialised waste types

e.g.
SAPIERR
- ◆ **Type III - international or supranational**
 - e.g. UN/IAEA

Global Nuclear Energy Partnership

◆ Goals:

- “Increase U.S. and global energy security”
- “Encourage clean development around the world and improve the environment”
- “Reduce the risk of nuclear proliferation”
- Expand the capacity of Yucca Mountain

◆ Approach:

- Develop advanced fuel cycles
- Restrict spread of sensitive technologies (enrichment and reprocessing)

Conclusions on Advanced Fuel Cycles

- +ve** Can conserve uranium resources
- +ve** May enhance proliferation resistance
- +ve** Can change quantities and properties of wastes
- +ve** Can reduce long lived waste fraction
- ve** Need a **LOT** of development work
- ve** Need a **HUGE** infrastructure
- ve** Will not affect many legacy wastes
- ve** Do **NOT** remove the need for geologic disposal

GNEP: view from small countries

➤ Before

- Choice of NPP supplier
- Choice of U-enricher and fuel supplier
- Choice of reprocessor
- Choice to enter into other parts of fuel cycle
- Waste disposal is a problem

➤ After

- Reduced choices or no choice
- Waste disposal is **STILL** a problem!!

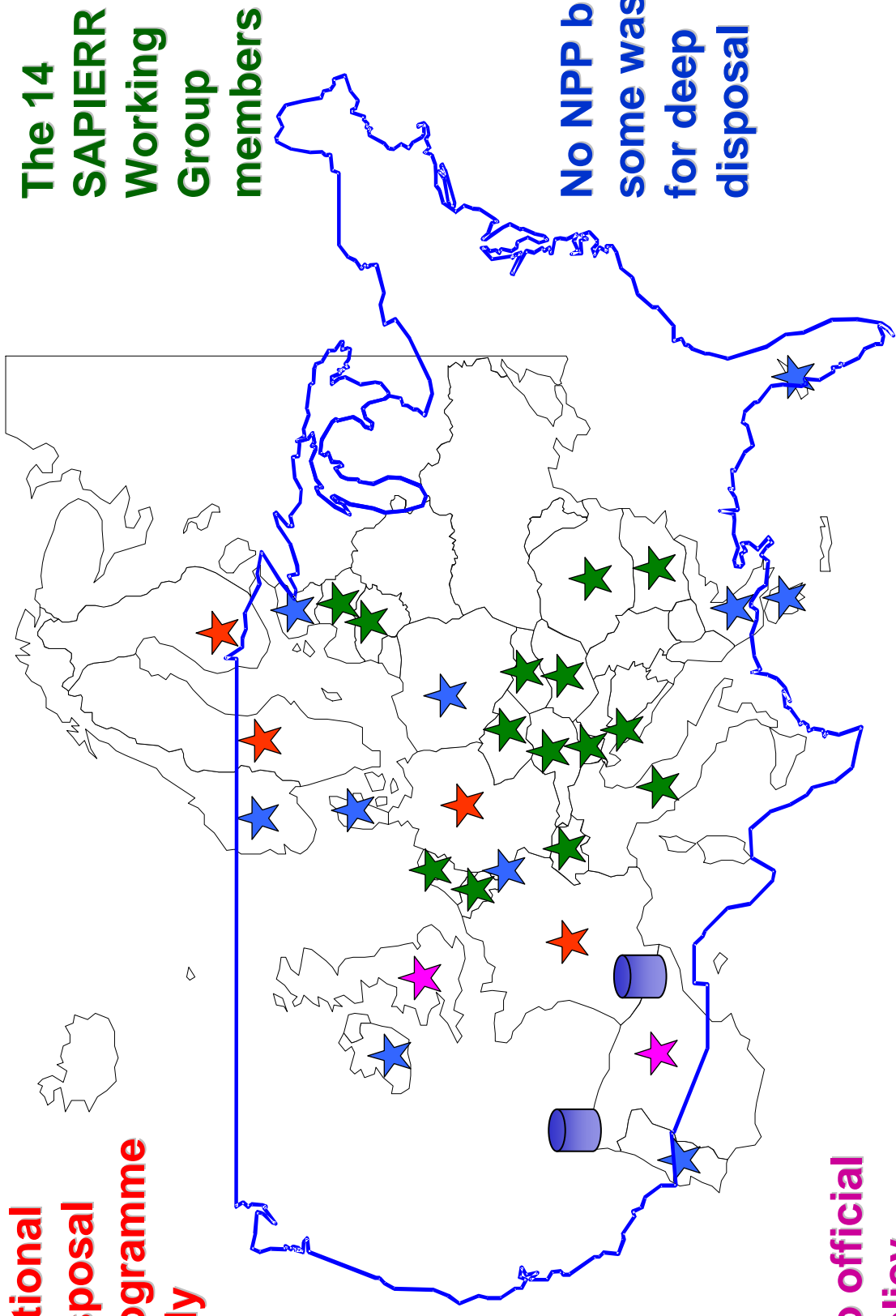
“Take back” has to be part of the equation

Regional Repositories

- ◆ Europe – SAPIERR as role model
- ◆ Arab States
- ◆ Asia
- ◆ Central/South America
- ◆ Africa

A European Example

**National
disposal
programme
only**



**The 14
SAPIERR
Working
Group
members**

**No NPP but
some waste
for deep
disposal**

**No official
policy**

SAPIERR-I and -II

- EC supported projects under FP6 (2003 – 2008) to study regional/multinational disposal solutions
- SAP-I: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Hungary, Italy, Latvia, Lithuania, Netherlands, Romania, Slovakia, Slovenia, Switzerland
- SAP-II: Main deliverables
 - Legal and business structures
 - Legal liabilities
 - Economics (costs, benefits)
 - Safety and Security
 - Public and political attitudes
 - STRATEGY AND PROJECT PLAN FOR NEW ORGANISATION

Interest in EDO Working Group

EU State
Candidate
Other

Definite
Likely
Open
Unlikely
National

Albania	
Austria	
Belgium	
Bosnia Herzegovina	
Bulgaria	
Croatia	
Cyprus	
Czech Republic	
Denmark	
Estonia	
Finland	
France	
Germany	
Greece	
Ireland	

Italy	
Hungary	
Latvia	
Lithuania	
Luxembourg	
Moldova	
Montenegro	
Netherlands	
Norway	
Poland	
Portugal	
Romania	
Serbia	
Slovakia	
Slovenia	
Spain	
Sweden	
Switzerland	
Turkey	
United Kingdom	

Emphasis on moving ahead with waste disposal

- **May increase** because of:
 - Public & political pressure
 - Waste disposal as a reactor sales incentive
- **May decrease** because of:
 - Urgent hunger for more energy
 - Recognised need to combat climate change
 - Implications of advanced fuel cycles

**Will waste disposal become
“the Achilles Heel” of nuclear again??**

CONCLUSIONS

- The “renaissance” long prophesised by the nuclear industry appears more concrete than ever before
- The resurgence of nuclear can have positive or negative effects on the global efforts devoted to implementing safe and acceptable waste management strategies
- We neglected **safety** aspects of waste management for too long; we must not neglect **safety OR security** aspects now
- We neglected **national** waste management planning for too long; we must not neglect **multinational** initiatives now!

Conclusions

- **Multinational initiatives should complement rather than follow the national disposal programmes that some countries will choose to implement**
- **Multinational repositories are the carrot that can best convince new nuclear nations to accept further constraints on their activities**
- **In its original period of expansion, the nuclear industry paid too little attention to waste disposal; it is imperative at this time that the positive impulses dominate if the nuclear renaissance is to succeed**

The End

- ◆ **Further information**
 - **www.arius-world.org**
 - **www.sapierr.net**