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Nuclear Fuel Cycle Policies, Fuel Cycle Technologies

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Nuclear Fuel Cycle Policies, Fuel Cycle Technologies

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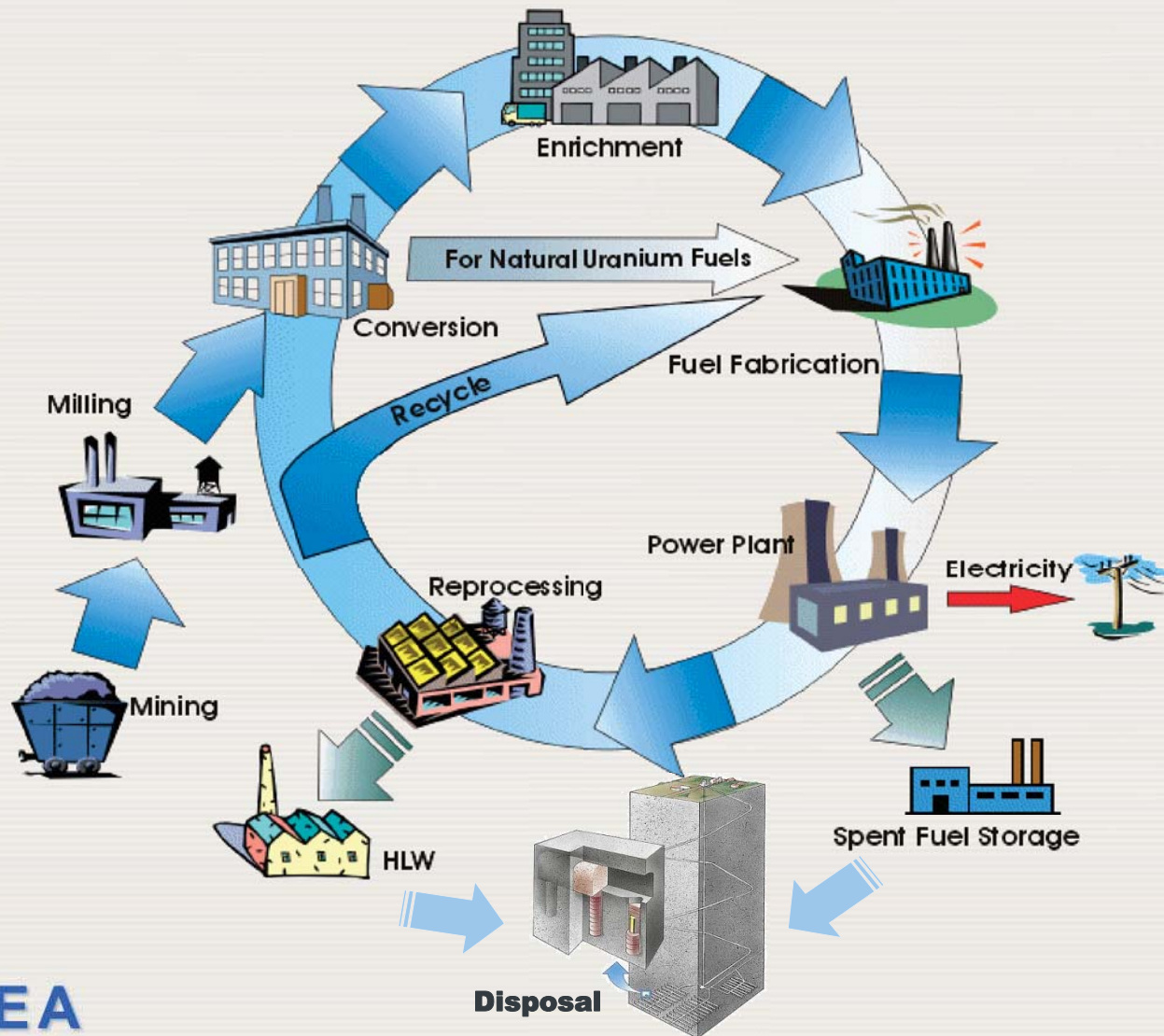
IAEA

International Atomic Energy Agency

Presentation Outline

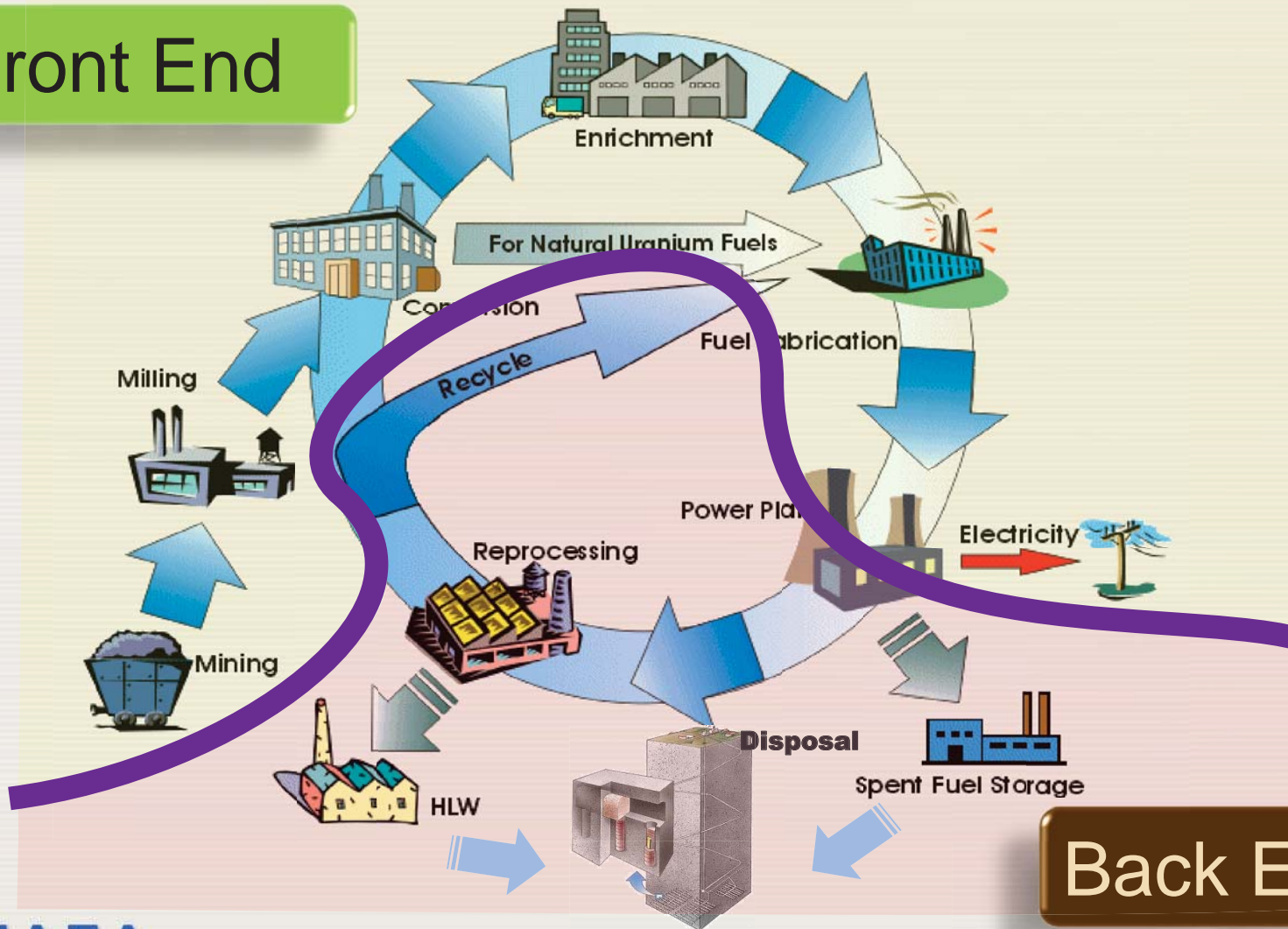
- Even Briefer review of nuclear fuel cycle
- Spent Fuel Storage
- Spent Fuel Policies
- Importance of deciding on policies
- Resources

Nuclear Fuel Cycle - Review



Nuclear Fuel Cycle - Review

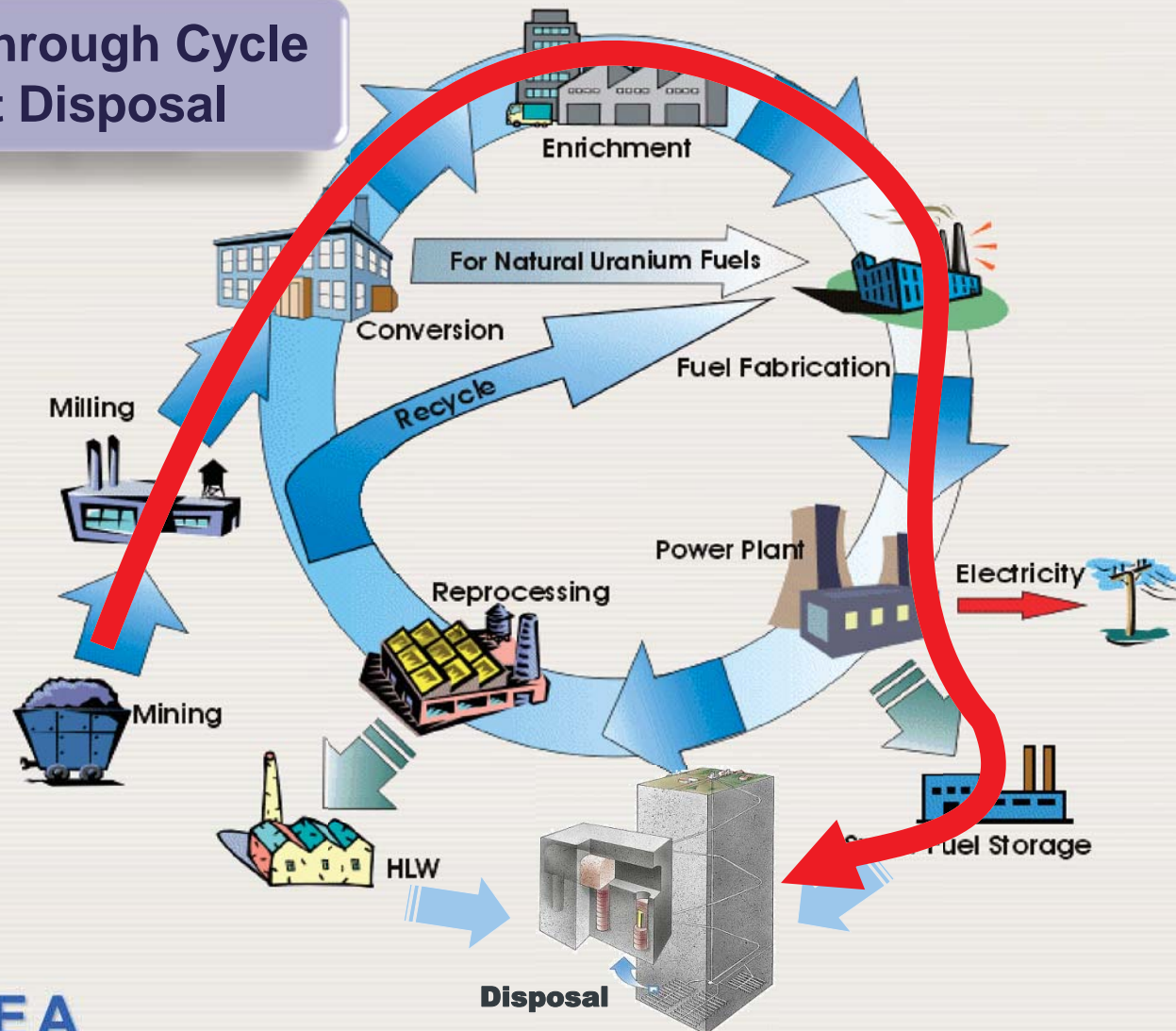
Front End



Back End

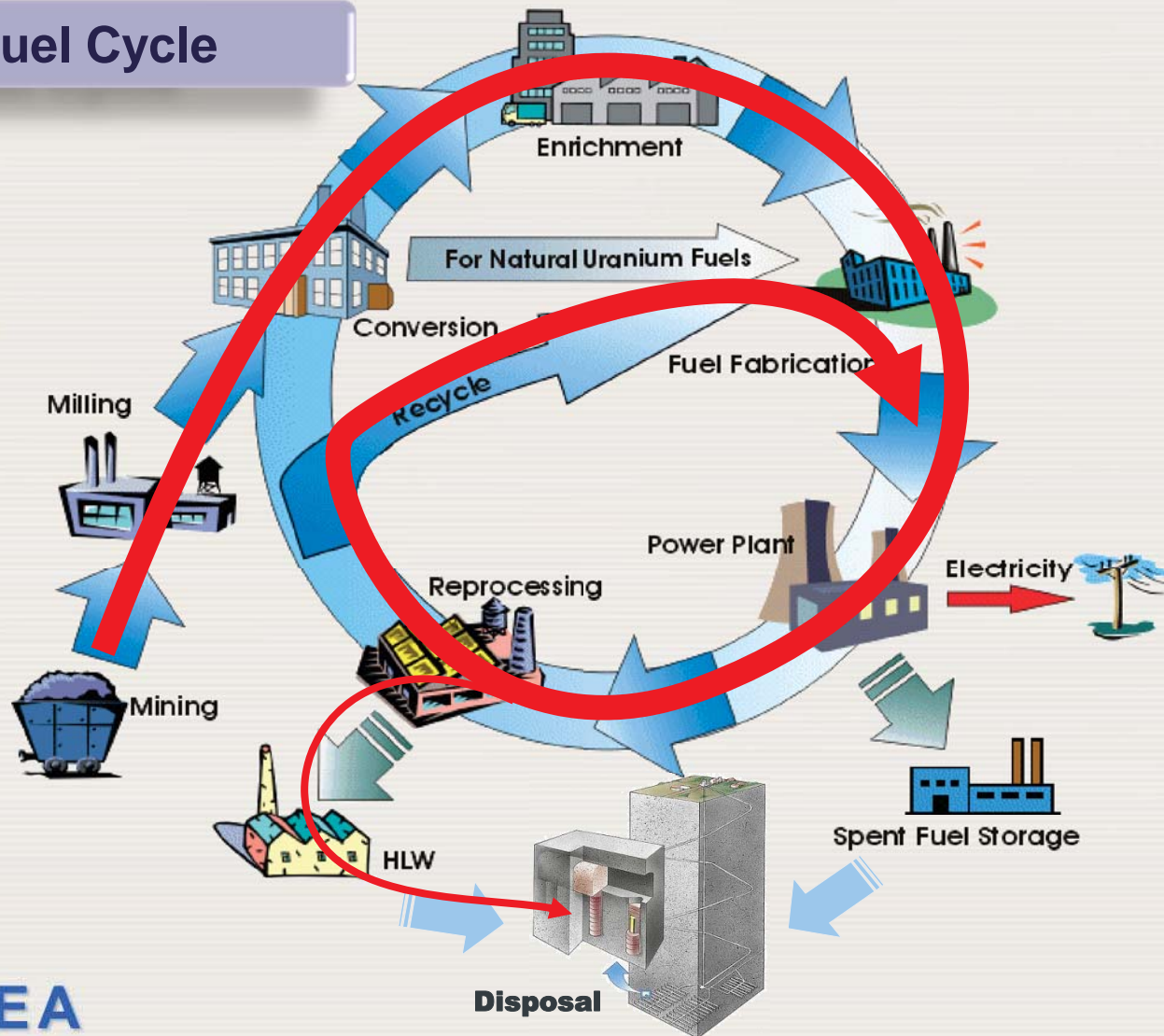
Nuclear Fuel Cycle - Review

Once Through Cycle
- Direct Disposal



Nuclear Fuel Cycle - Review

Closed Fuel Cycle



The Reactor: Core of the Nuclear Fuel Cycle



Picture courtesy of Areva

Spent Fuel



Spent Fuel Storage

- Wet and dry storage provide flexibility for spent fuel management

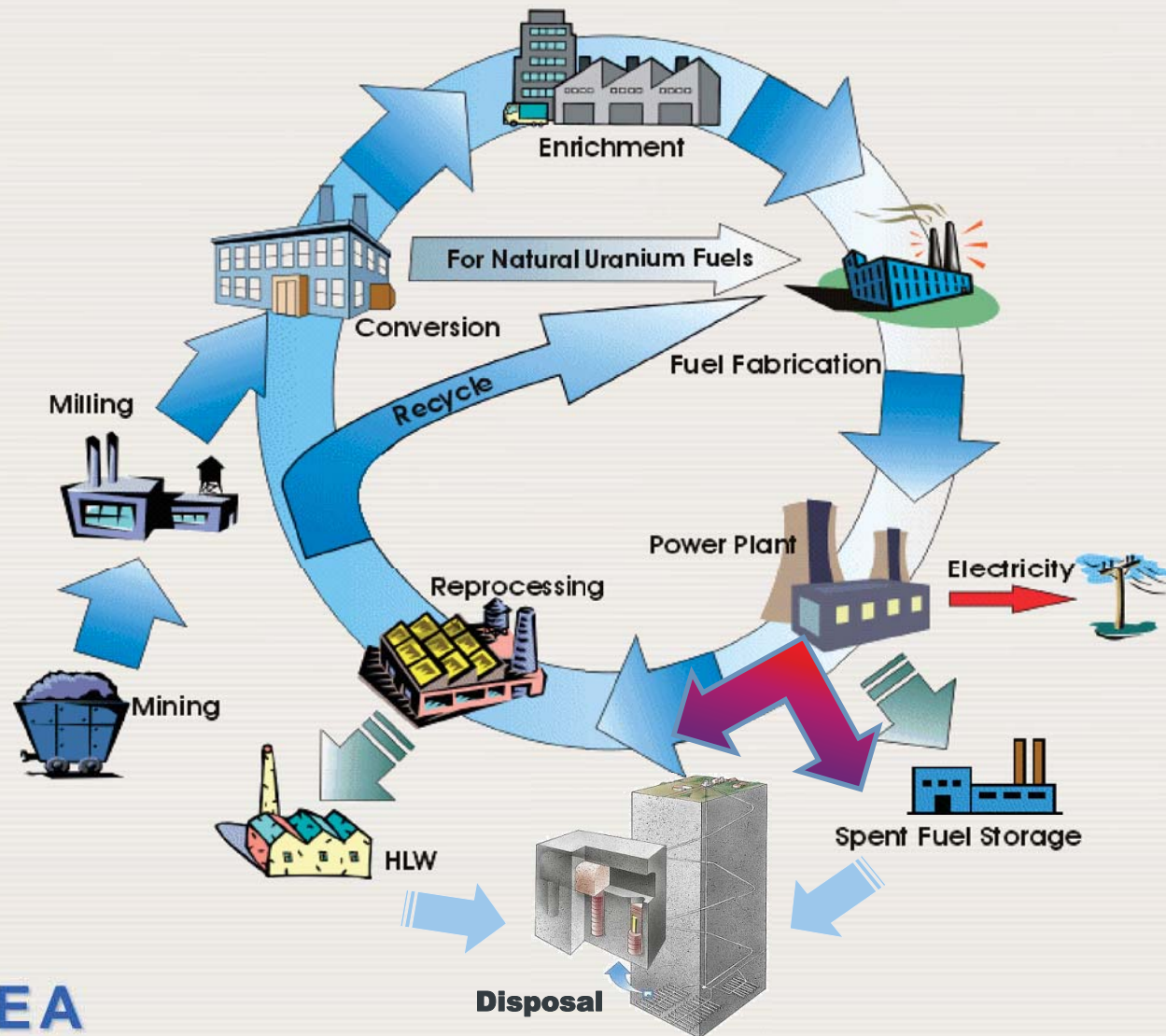


Wet Storage (CLAB-Sweden)



Dry Storage (Surry – USA)

Nuclear Fuel Cycle – decision point



The Joint Convention

Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

(vii) Recognizing that the definition of a fuel cycle policy rests with the State, some States considering spent fuel as a valuable resource that may be reprocessed, others electing to dispose of it;

<http://www.iaea.org/Publications/Documents/Conventions/jointconv.html>



International Consensus

Much international advice:

- Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- EC “Radioactive Waste and Spent Fuel Management Directive”
- IAEA Safety Standards
- IAEA NE-series documents

All emphasize national responsibility.

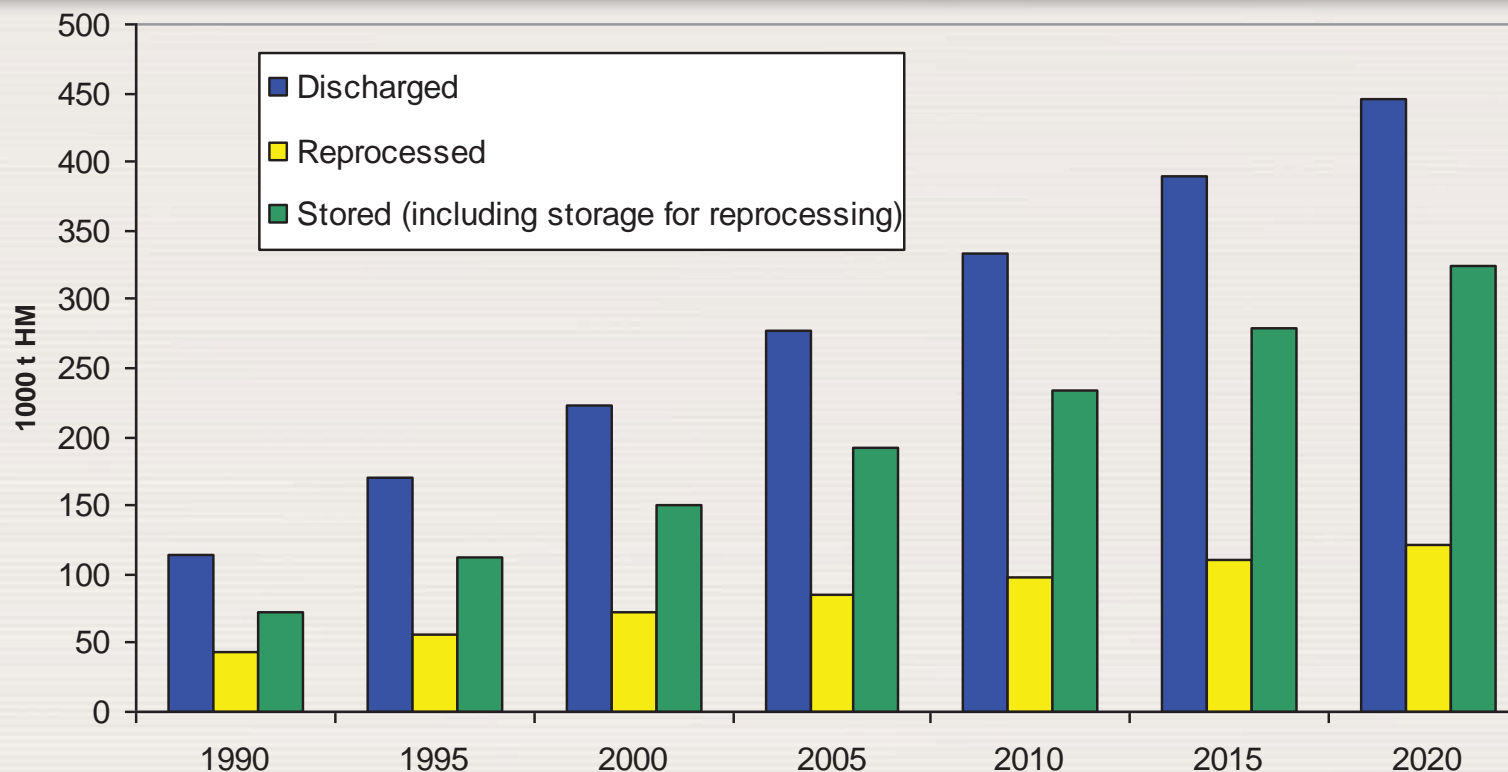
International Consensus

The management of spent fuel and radioactive waste is the responsibility of the state in which they were generated.

Joint Convention notes “that, in certain circumstances, safe and efficient management of spent fuel and radioactive waste might be fostered through agreements among Contracting Parties to use facilities in one of them for the benefit of the other Parties, particularly where waste originates from joint projects”.

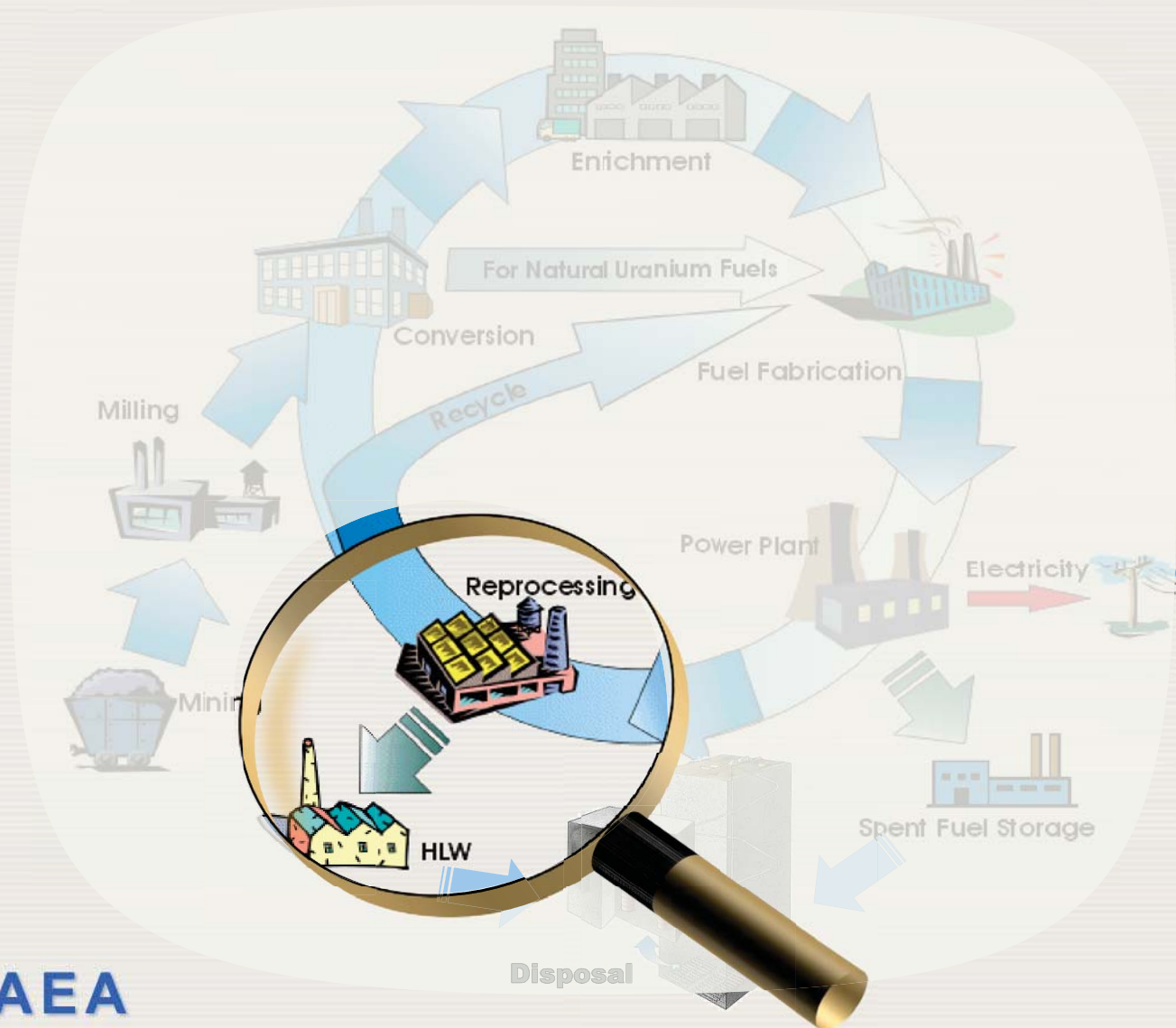


Status of Spent Nuclear Fuel

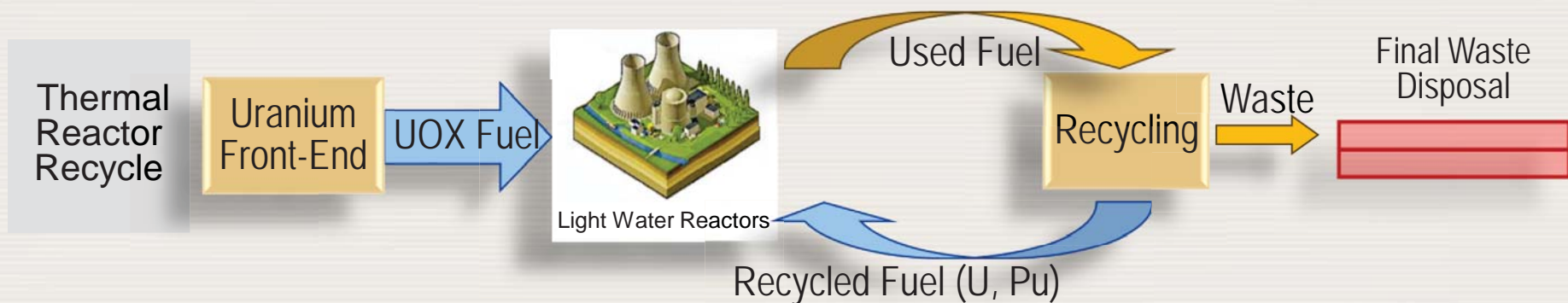
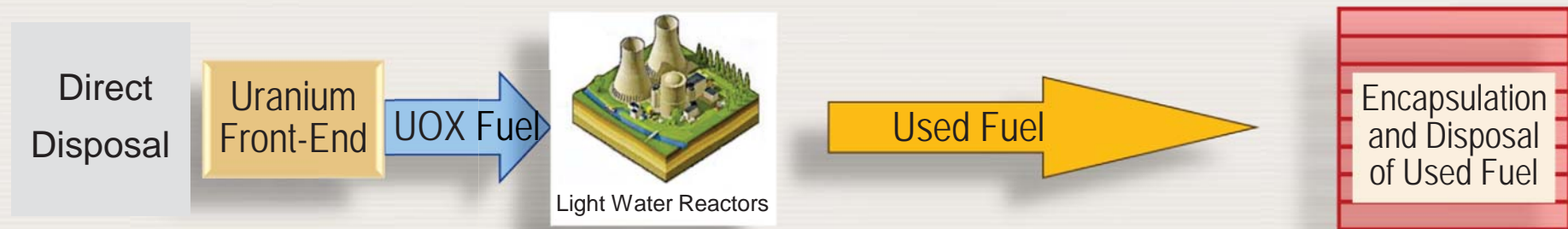


- The total amount of spent fuel that has been discharged globally is approximately **360 800** tonnes of heavy metal (MTHM).
- The annual discharges of spent fuel from the world's power reactors total about **10 300** MTHM per year.

Nuclear Fuel Cycle



Uranium Fuel Cycle Options / Policies



National Policy on Spent Fuel

Country	NPP	Policy	Remark
USA	104	Disposal	AR/AFR interim storage - longer terms Work on Yucca Mt. repository stopped
Finland	4	Disposal	Olkiluoto repository AR wet storage
Canada	20	Disposal	AR dry storage Adaptive Phased Management
Sweden	10	Disposal	CLAB AFR wet storage Östhammar repository site
Germany	17	Disposal	2005 reprocessing moratorium AFR dry storage (Ahaus, Gorleben) Gorleben repository site under investigation
Switzerland	5	Disposal	Zwilag AFR dry storage 3 repository candidate sites

National Policy on Spent Fuel

Country	NPP	Policy	Remark
France	59	Reprocess	AFR wet storage Bure repository site under investigation
Japan	(54)	Reprocess	Rokkasho reprocessing plant (2012) Mutsu AFR dry storage (2015)
China	11	Reprocess	Reprocessing plant planned
Russia	31	Reprocess	AFR wet/dry storage
UK	19	Reprocess & Disposal	Magnox and AGR reprocess – AFR wet storage LWR spent fuel disposal
India	18	Reprocess	

International Consensus

Fuel Cycle Policy should be set early in a nuclear power programme, ideally at the outset.

- Early study allows definition of sizes and types of storage facilities
- EC “Radioactive Waste and Spent Fuel Management Directive”
- IAEA Safety Standards
- IAEA NE-series documents

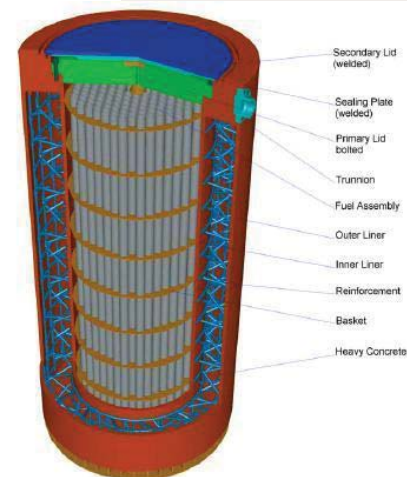
All emphasize national responsibility.



International Consensus

Fuel Cycle Policy should be set early in a nuclear power programme, ideally at the outset.

- Early study allows definition of sizes and types of storage facilities:



- Storage Canisters
- Dual-Purpose Canisters
- Multi-Purpose Canisters

International Consensus

Fuel Cycle Policy should be set early in a nuclear power programme, ideally at the outset.

- Early definition and costing allows determination of required funding

Resources

The Joint Convention

<http://www.iaea.org/Publications/Documents/Conventions/jointconv.html>

Strategies and Policies for RWM

http://www-pub.iaea.org/MTCD/publications/PDF/Pub1396_web.pdf

Costing of Spent Fuel Storage

http://http://www-pub.iaea.org/MTCD/publications/PDF/Pub1398_web.pdf

O&M of SF Storage and Transportation

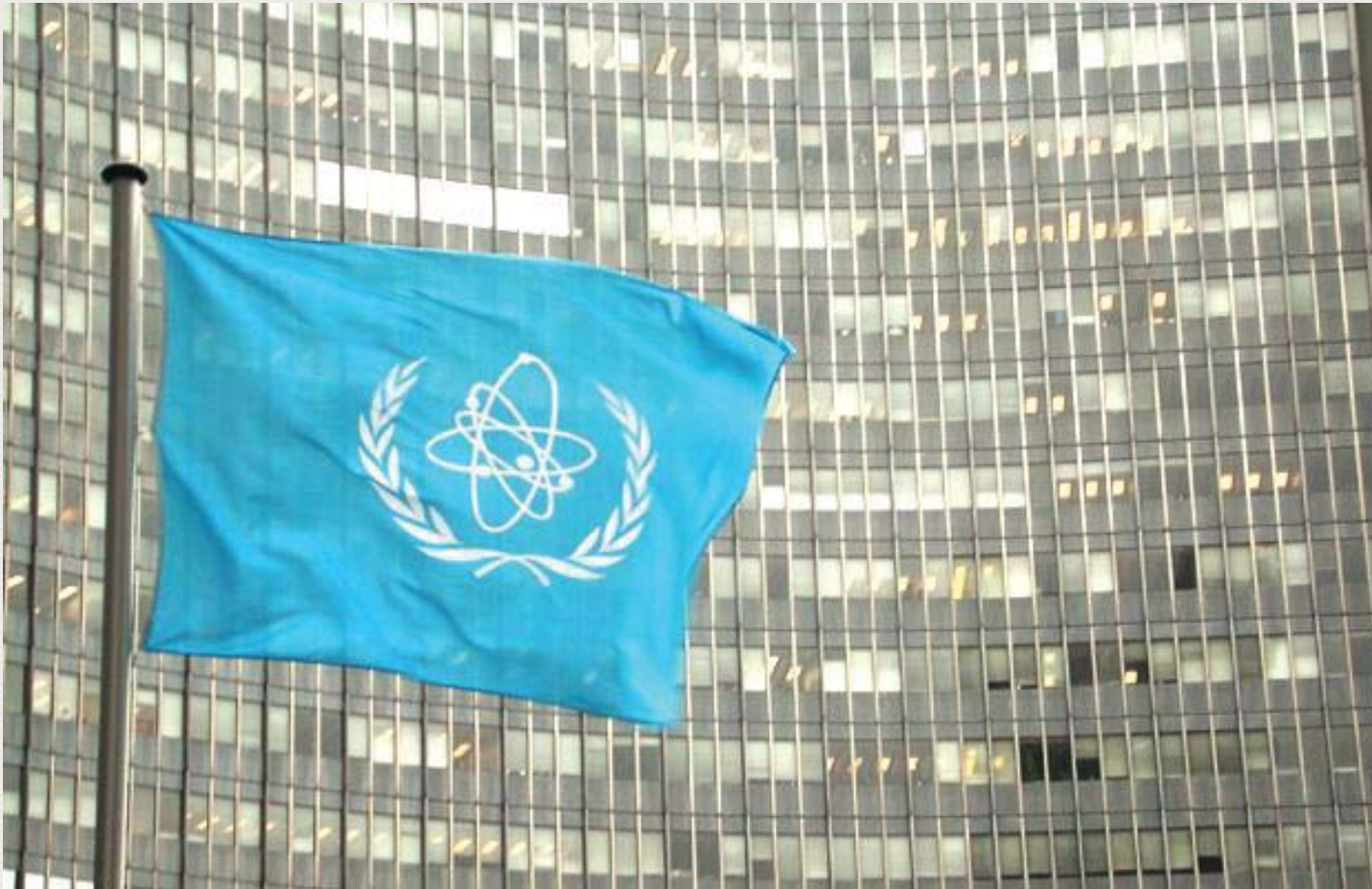
http://www-pub.iaea.org/MTCD/publications/PDF/te_1532_web.pdf



Summary

- Understand the entire fuel cycle
it is a 100-year undertaking
- Accept responsibility for the management of
Spent Fuel and Radioactive Waste
- Set policies on Spent Fuel Management
early
- Implement strategies to take benefit from
early policy decisions

Thank you for your attention



...atoms for peace.

