



# *Swedish Perspective of US ATW Program*

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# Mission impossible??

## Political prerequisites for roadmapping:

- **ATW is not “a survival-kit” for APT**
- **ATW is not “a survival-kit” for IFR or reintroducing of fast reactor programs**
- **ATW must not endanger geological disposal program**

## Questions to be answered in roadmapping:

- What technology options exist for the ATW? - **Good answers given**
- What are the necessary steps required to develop and implement the specific version of ATW technology currently identified? - **Confusing options, but important milestones identified.**
- What is the R&D required, in the next 5 years, to confirm these choices and provide a basis for the development of the ATW concept? - **Good answers given for some topics (e.g. accelerator technology), for some topics rather diffuse answers.**
- How could the U.S. utilize international cooperation to meet its goals? - **Not well defined alternatives, rather general statements, however overview of international activities done.**

- What might hamper development and deployment of ATW technology in the USA? - **Correct attention given to institutional issues, however, some important details missing (no interaction with legislators visible)**



## General concerns and remarks:

- Does any extrapolation in energy issues over a period of time longer than 20-25 years make a big sense?
- Quality (“in-depth”) of roadmapping assessments proportional to amount of money/efforts invested in particular research fields in last 10 - 15 years (see quality of accelerator technology report and rather shallow ATW-fuel assessement ). It may confuse some readers without the insught in this field

## *ATW System Scenarios and Integration for US Roadmap*

- Looks like costing assessment has been driving technical choices:
  - Confusion with preferred and reference (back-up) option, very weak justification for this choice, it rather reflects controversies inside the WG
- Missing comparison to reactors makes assessments less credible (mission for roadmapping should be extended for this topic)

- Missing grounds for a final burner power choice (840 MWth - ALMR choice only?? Should be explained clearly in the report).
- Is power staging 30, 420 and 840 MWth optimal? Is it driven by accelerator development or T&B system development, or other factors?

**Table 1. Total Target/Blanket R&D Costs**

	2000- 2005	2006- 2008	>2008	Total
Blanket Technology	153	35	0	188
LBE Coolant Technology	48	32	86	166
Target Technology	22	3	4	30
Sodium Technology	115	133	244	492
Nuclear Design & Safety	49	23	82	154
Total	387	226	416	1030

Does 16% lower costs justify a choice of “unpreferred” technology??  
Very unclear arguments!!

*ATW System Scenarios and Integration for US Roadmap - cont.*

- *“Fuel fabrication and sample irradiation experiments will be run in existing facilities” - where and how??*
- Fuel issues seem to be not deeply assessed. Na-based an LBE systems will most probably not have the same fuel. So “dual track” (reference/preferred systems) requires clear “dual track” in fuel technology
- Too little attention to radiation damages and irradiation performance for fuel and materials

*ATW System Scenarios and Integration for US Roadmap - cont.*

- Molten salt system should be properly addressed and reevaluated or abandoned - depending who has better arguments.

## *Separations Technology and Waste Forms*

- Choice of an aqueous front-end process seems to be correct - assuming use of as much as possible from existing, proven technologies and infrastructure in an international context - but it is still the biggest post in the projected costs. If so, is it an optimal solution??
- R&D needs well defined
- Benefits clearly stated

## *Target/Blanket Technology and ATW Fuel*

- A very interesting multi-burner system. How about multi-target (in a single) burner?
- Single accelerator with splitters can not provide current control over an individual target/blanket. Multi-accelerator system has to be assessed properly (costs, reliability etc.) Is there sufficient confidence in splitter performance??

## *Target/Blanket Technology and ATW Fuel - cont.*

- Extensive ATW fuel development program and experiments required for credibility of the assessments. Most probably very time consuming efforts

## *Accelerator Technology for ATW*

- Very serious and detailed assessment of a linac technology with modest extrapolations, however a question if it is an optimal system for ATW remains.
- Hazards with splitter failures not clearly assessed (how about shielding and maintenance of splitters)
- Serious assessment of cyclotron technology would be desirable for completeness

## Costing of ATW

- The report makes a solid impression, methodology looks well grounded, however ... it looks like costing assessments determined technical choices.
- It is hard to accept that reliable answers could not be given for LBE-technology costing with the uncertainties acceptable for the Congress
- Consequently - confusion with LBE and Sodium technology

# Conclusions - 1

- Assessments presented in roadmapping have in some cases too many technical unknowns and extrapolations over a period of 50 - 100 years and should be taken with significant uncertainty margins (but compare to geological repository extrapolations....)
- Institutional/political challenges equally important as technical ones and should be addressed from the beginning
- Nuclear facilities are not in a spirit of current market mechanisms (fast revenues are a main criterion today), special drivers are needed. On the other hand, I believe, it makes international collaboration easier

## Conclusions - 2

- The importance of international collaboration has been stated many times but no serious attempts were done to sketch a model for this collaboration, or to specify clearly benefits. EU (or part of it) could be a credible partner for US, a formal political/organisational frame for such collaboration already exist
- **“World experts”, if called upon, could easily help to sketch an effective and aggressive plan for an international cooperation**

## Specific Swedish perspective:

- ATW should not disturb progress of geological disposal activities (like siting) **until there** is more confidence in an ATW impact on geological disposal (a positions shared by a majority of involved scientists). It is considered that well progressing geological repository program is advantageous for ATW research
- Well defined and coordinated international project is to be strongly supported by Sweden. An optimal system for once-through fuel cycle is of the highest priority.