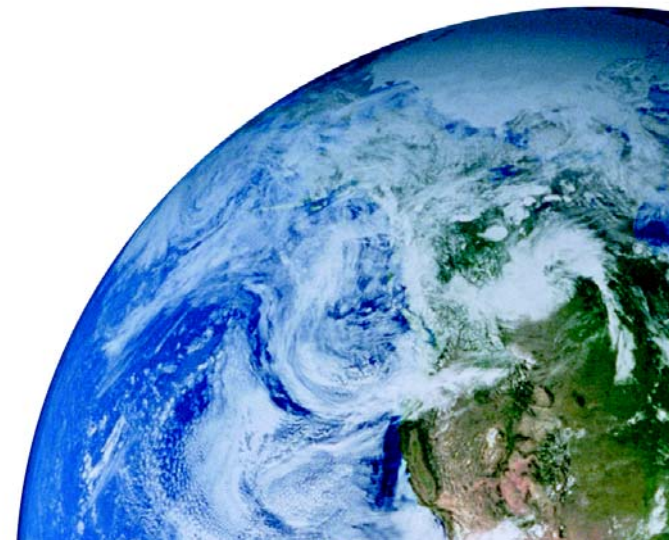


The Transport of Large Front End Facility Components from Decommissioning Operations

Jürgen WERLE



- Nuclear fuel cycle facilities at the end of their operational life span => decommissioning / dismantling
- Large components need to be transported
- Nuclear Power Plants:
 - reactor vessel lids, steam generators, pressurizers
 - Very large, heavy, activated
 - Small in numbers
 - Special Arrangements
 - Transport experience in Germany, Sweden, USA and others
 - Preference for coastal or inland water transport
 - No outer packaging

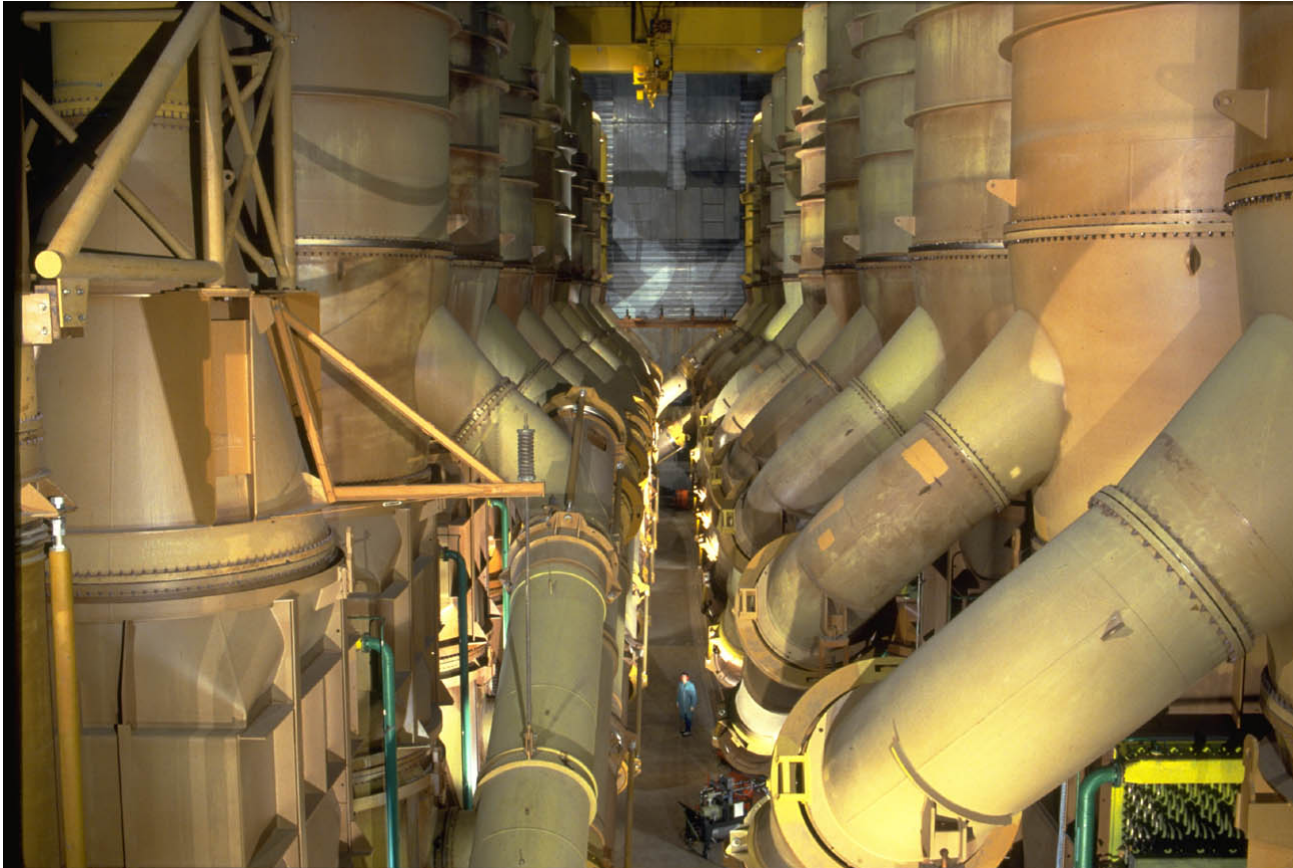
Front End Facility Components

- Some very large components, especially in gaseous diffusion enrichment plants
- Large number of identical components
- Non activated, surface contaminated only
- Very low dose rates
- Dismantling is an industrial process over several years
- Feasibility
- Cost efficiency is very important

AREVA Georges Besse Gaseous Diffusion Plant

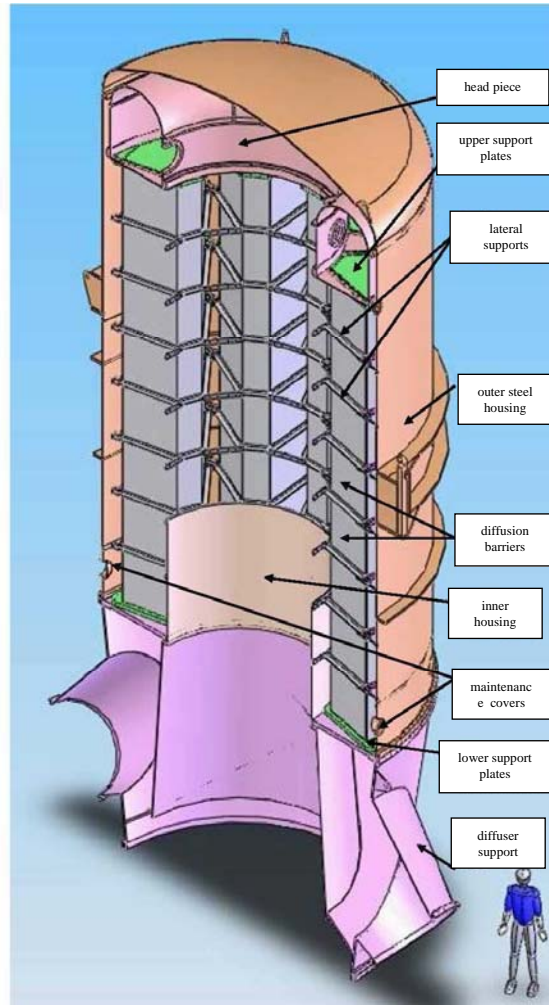
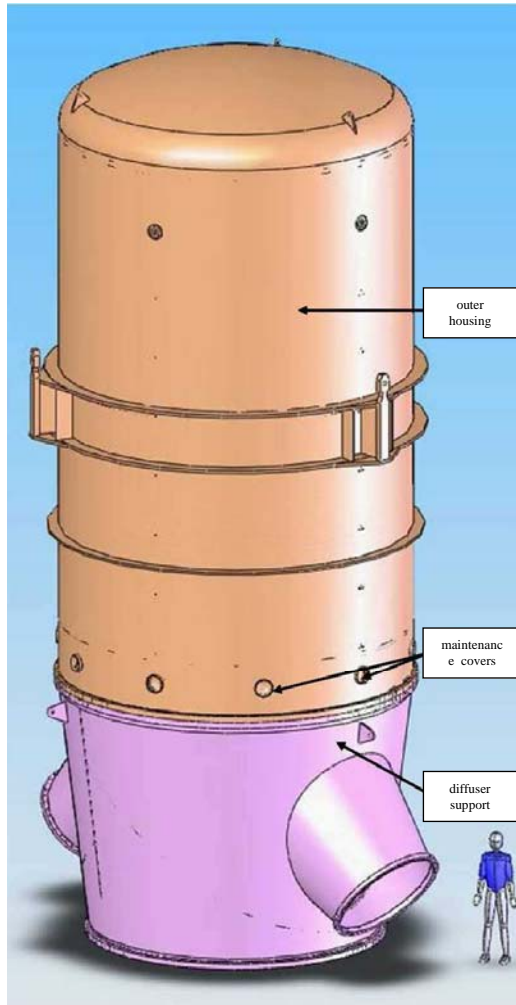
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4 buildings, 1400 diffusers in 70 groupes of 20 stages

AREVA Georges Besse Gaseous Diffusion Plant



USG Diffuser with its support	
Quantity	720
Length	6 900 mm
Width	6 102 mm
Height	12 440 mm
Total mass	87 000 kg
Surface in contact with U	358 m²
Est. U mass after rinsing	19 kg
Est. fissile mass (U-235)	475 g

Topics studied by the **WNTI Waste Transport Working Group:**

- Special Arrangements
- Characterisation and Classification
- Fissile Exceptions

Special Arrangements

- Cater for
 - Unusual transports
 - Newly emerging transport flows
 - One-off (often back-end) transports
- Require a full safety case
- Considered as just as safe as any other types of transport
- Only “special” in name, yet still:
 - TS-G-1.1 § 238.1:
« the use of special arrangements should not be taken lightly »

**Improve the perception by all stakeholders
of special arrangements**

Special Arrangements

- Until now, no particular consideration given to front end transports
- New revision cycle of TS-R-1/TS-G-1.1 20XX edition:
 - Draft of new **appendix VII**, which recommends Special Arrangements also for **front end transports**
- Made possible by:
 - Excellent track record of past transport operations world-wide
 - Feed back from the nuclear transport industry to the regulator of newly emerging waste flows
 - Communication between all stakeholders, where WNTI plays an important role

Characterisation and Classification



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- Natural Uranium enriched up to 20% in U-235
 - A2 value unlimited
 - LSA-I material (under certain conditions)
 - Potentially fissile
- Contaminated objects
 - SCO-I classification possible (under certain conditions)
 - Radiation dose rate very low

Practical issues

- Surface contamination of large inner surface areas
 - Large quantities of Uranium
 - Fissile, when mass of U-235 more the 15 grams per packaging
- Complex or inaccessible inner structure
 - Physical examination not possible/practical
 - No SCO classification possible since regulatory contamination measurements on inaccessible surface areas impossible
 - No LSA characterisation possible, since accumulation of material cannot be excluded

Characterisation and Classification



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- Over-classification of packaging
 - Type A packaging
 - Potentially for fissile material

No apparent new safety issue!

Only the size and complex structure of large components leads to over-classification!

Characterisation and Classification



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- New proposals
 - Objects contaminated by LSA-I material => can be classified as SCO-I immediately
 - Emerging new technology: use of external dose rate measurements to show non accumulation of material
- TS-G-1.1 § 310.2
 - Encourages the use of new techniques and new controls
 - Proposes the use of Special Arrangements for these cases
- WNTI encourages the stability of the regulations

No change to regulations needed!

Show the way forward by using Special Arrangements

Fissile Exceptions

- Existing fissile exceptions:
 - Uranium enriched to under 1% of U-235
 - U-235 limited to 15 grams per packaging (+ limits on consignment)
 - But for Uranium enriched to only 5% the criticality-safe mass is much higher
 - Beryllium is limited to 1% of the maximum consignment mass = 4 grams
 - Be is normally part of a Copper alloy which acts as neutron poison

Classified as fissile material without a scientific need!

Fissile Exceptions

- Revision process of TS-R-1/TS-G-1.1
 - Takes into account a great number of these issues
- WNTI TS-R-1 Working Group
 - Representing the industrial perspective
 - Observer to TRANSSC
 - Made several proposals to changes in TS-R-1
 - Provided additional expertise to substantiate views
 - For more details, see WNTI presentation on the subject

**Proposed changes to TS-R-1 and TS-G-1.1 are
a great help to the nuclear transport industry**

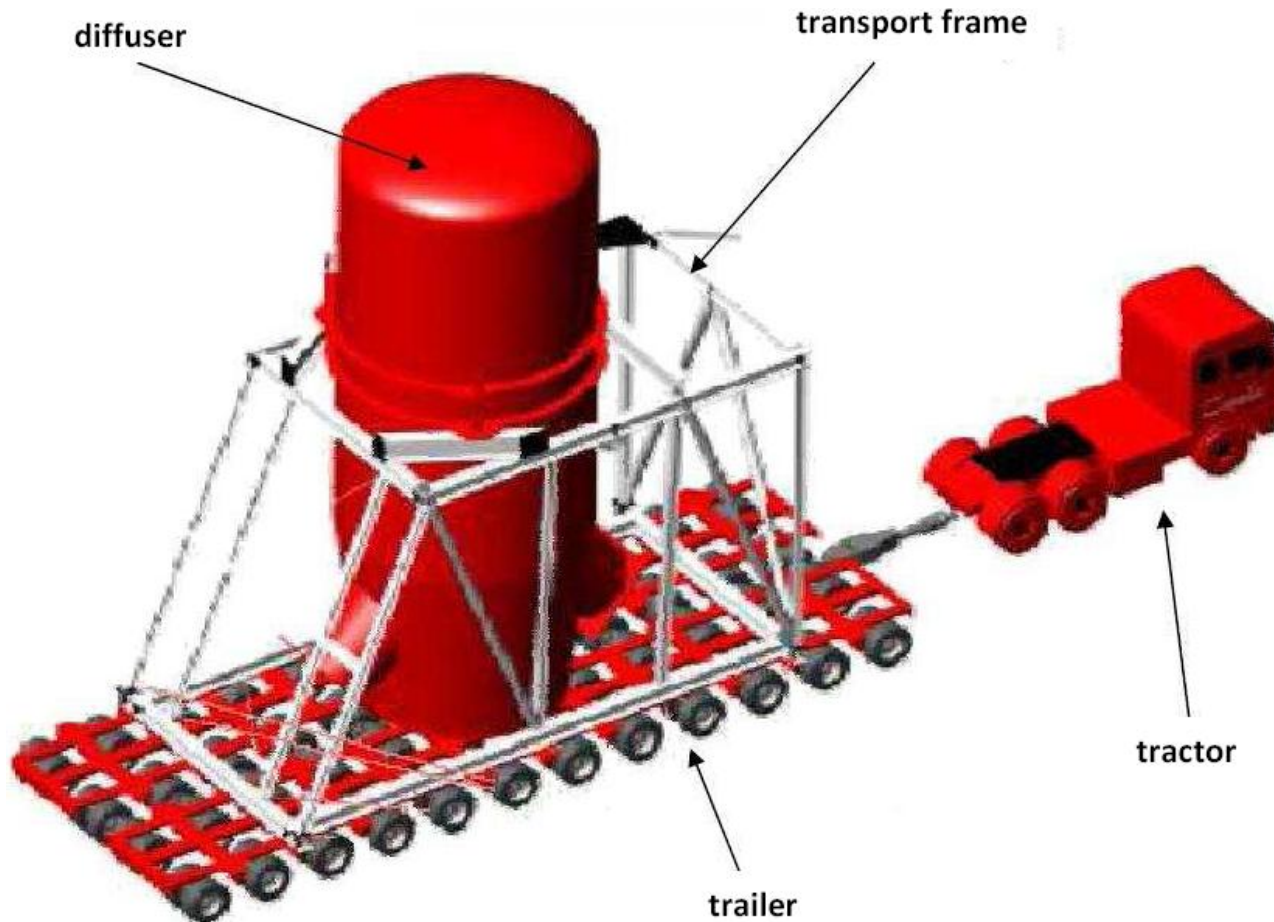
Conclusions

- There are no new safety issues
- Proposed changes to TS-R-1 and TS-G-1.1 will resolve most of the criticality issues
- New techniques and controls will help with characterisation and classification
- Special arrangements will be used more commonly
- Public perception of special arrangements needs to be improved
- Involvement of WNTI has been essential in obtaining these results and will continue to do so in the future

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**Transport
equipment
used for the
transport of
diffusers**

The Transport of Large Front End Facility Components from Decommissioning Operations



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Thank you for your attention!

Any questions?

Contact: jurgen.werle@areva.com