APPENDIX I. PRESENTATIONS AT THE MEETING

(8) **The Austrian Research Centers Activities in Energy Risks**, Gert Sdouz, Austrian Research Center Seibersdorf

The Austrian Research Centers Activities in Energy Risks

IAEA Technical Committee on Recommended Approaches for Estimating and Comparing Risks from Energy Systems in the Far Future
Oct.6-10, 1997

Among the institutions involved in energy analyses in Austria the risk context is being treated by three different entities: the Energy Consumption Agency, internationally known as EVA, the Federal Environmental Protection Agency, or Umweltbundesamt assessing mainly the environmental risks involved and the Austrian Research Centers, working on safety and risk evaluation.

The Austrian Research Center Seibersdorf draws form its proficiency in Reactor Safety and Fusion Research, two fields of experience it has been involved in since its foundation, for some 40 years now.

Nuclear energy, as you probably know, is not well accepted by the Austrian population. Therefore in our country only energy systems with advanced safety level might be accepted in the far future. This means for us that the development of methods to compare risks is an important task.

The characteristics of energy systems featuring advanced safety levels are:

A very low hazard potential and a focus on deterministic safety instead of probabilistic safety, meaning to rely on inherently safe physics concepts, confirmed by probabilistic safety evaluation results.

In our opinion this can be achieved by adequate design of

- **FUSION REACTORS**
- **ADVANCED FISSION REACTORS**
- **ALL DIFFERENT RENEWABLE SOURCES OF ENERGY**

Fusion:

Expecting essential progress in the fusion research, Austria participates in the fusion program of EURATOM. Our present activities are:

- Plasma physics
- Dynamics of the fusion reaction
- Modeling of the abnormal transport behavior
- Divertor and First Wall plasma interaction and activation

A further area of research is the development of materials capable to carry all the loads of a fusion power plant.

In the EURATOM framework program which will start in 1999 we will make proposals for further fusion research projects. The group at the Austrian Research Center Seibersdorf will step up its activities. It is planned that in addition to physics and material science, safety will become an important topic.

The basis of this new work is our extensive experience in fission reactors safety research. This research includes the accident analysis, fault tree analysis and the deterministic investigation of accident scenarios.

Though the source term in a fusion plant is different in nature, we are convinced that big part of the methodological approaches can be transferred from fission to fusion safety. Top of the list is:

Tritium release. A lot of work has been already performed there, I refer to the following studies: UWMAK-II, NUWMAK and STARFIRE.

Contrary to the source term in a fission reactor, toxic poisons have to be considered.
Be, Be-steam reactions and their control can serve as one example.

Transient analysis code development: pressurized water cooling tube ruptures in a fusion blanket (STARFIRE concept)

In this context an important subject will be the Probabilistic Analysis Methods (accident initiating events, event trees, fault trees to define the key accident sequences, release magnitudes and radioactive inventory, consequences).

A large family of accidents (in the ITER case) are grouped around the cooling system. In case of ex-vessel coolant loss with continued plasma burn the plasma facing components can potentially reach high temperatures and produce hydrogen by reacting with steam in cases of an additional failure of in-vessel components.

Lastly it has to be proved that in the case of failure of the cooling system natural convection can remove all excess heat.

In summarizing the goals to mention are:

- Endorse the fusion power plants acceptability for the public.
- Maximize the benefit from the inherently favorable safety characteristics of fusion.
- Assess dose/release limits for the design derived from the recommendations of ICRP and IAEA and further reduce release potentials and dose to the public to as low as reasonable achievable quantities.
- Minimize the safety relevance and dependence on safety assessments otherwise required for plasma physics effects not investigated to the appropriate extent yet.

Advanced fission reactors:

The basis in this area are evaluations of several different more advanced reactor concepts which have been conducted already. Studies on such proposals as the "Rubbia concept" are conducted when the scientific community is taking notice of their development. As soon as one of the concepts will become more realistic, we are prepared to focus on it and set up a research task force.

All these work would not address the full spectrum of risk potential of the technology in question if there would not be enough experience available also for the waste treatment and decommissioning part of the energy technology to be analyzed. We have worked in this field and developed processes allowing for controlled risk perspectives also for final disposal.

Finally I would like to stress that we expect this meeting to broaden our view on the methods to compare risks posed by energy systems and we wish for a successful meeting.