



GRS

Ludwig Bahr

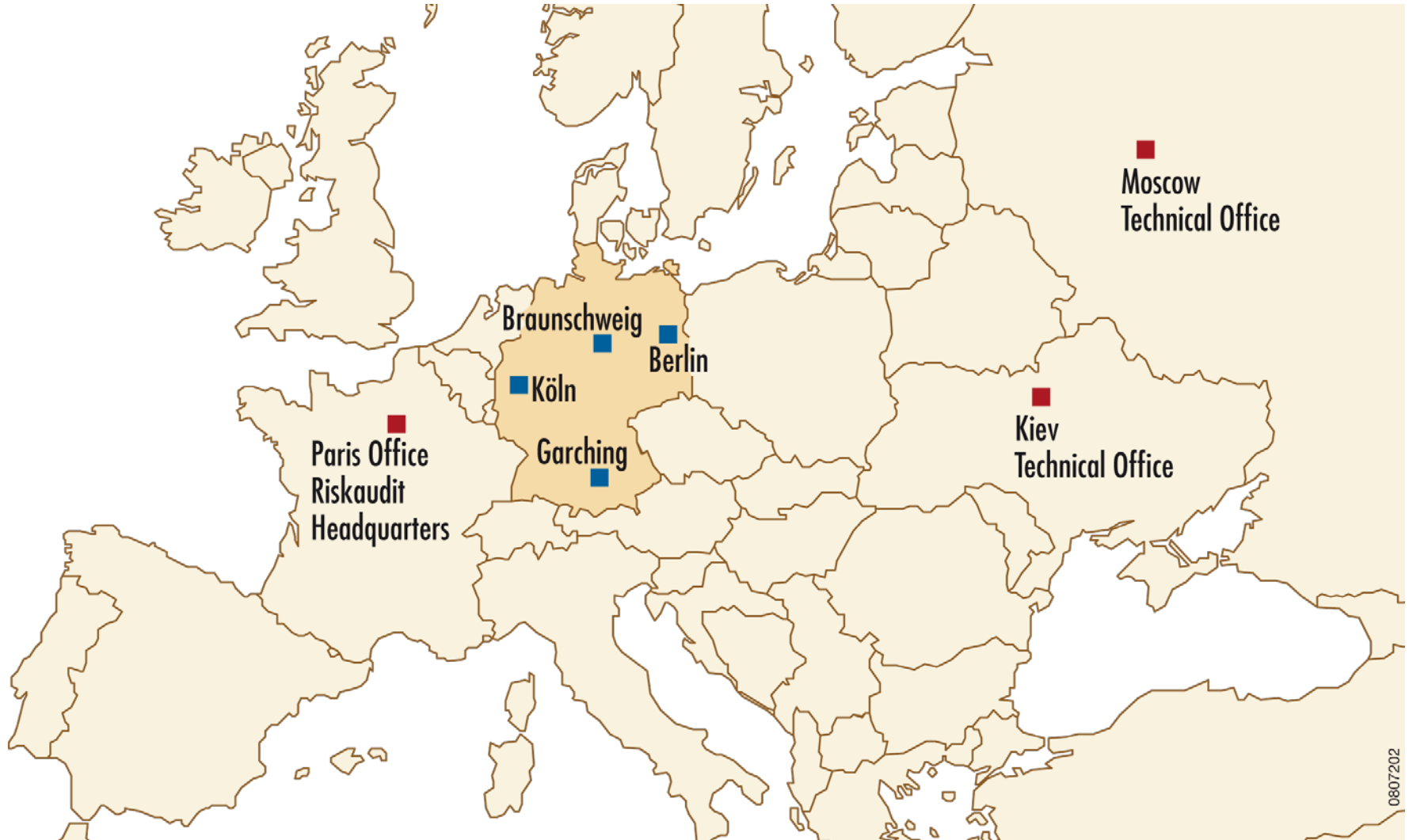
30.06. – 02.07.2010

Workshop for Round-Robin Analysis on Containment
Performance

Contents

1. Introducing the GRS
2. Participation in ISP 48
3. Special interests in framework of SPE

GRS – Company Locations and Technical Branch Offices



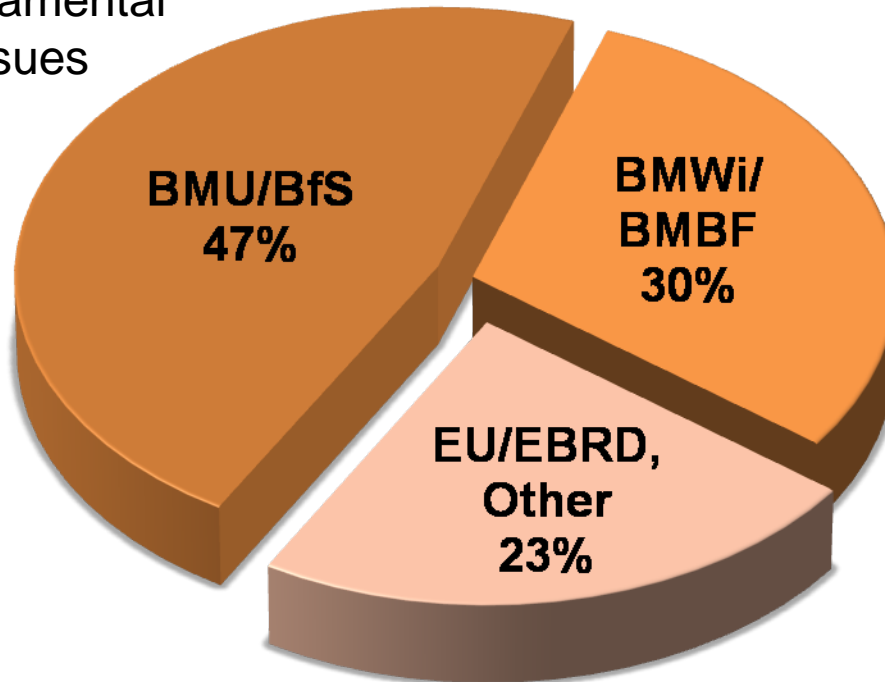
GRS – Gesellschaft für Anlagen- und Reaktorsicherheit

- independent, non-profit company
- main TSO in Germany
on behalf of BMU (ministry of the environment),
the federal regulatory authority for nuclear safety and waste management
- main nuclear research organization
on behalf of BMWi (ministry of economics and technology),
responsible ministry for nuclear research
- participates in international activities mainly by IAEA, OECD and EU
on behalf of BMU and BMWi
- co-operates worldwide with its counterparts on bi-lateral basis

GRS – Customers in 2008

exclusively financed through projects
turnover ~ €50 million p.a.

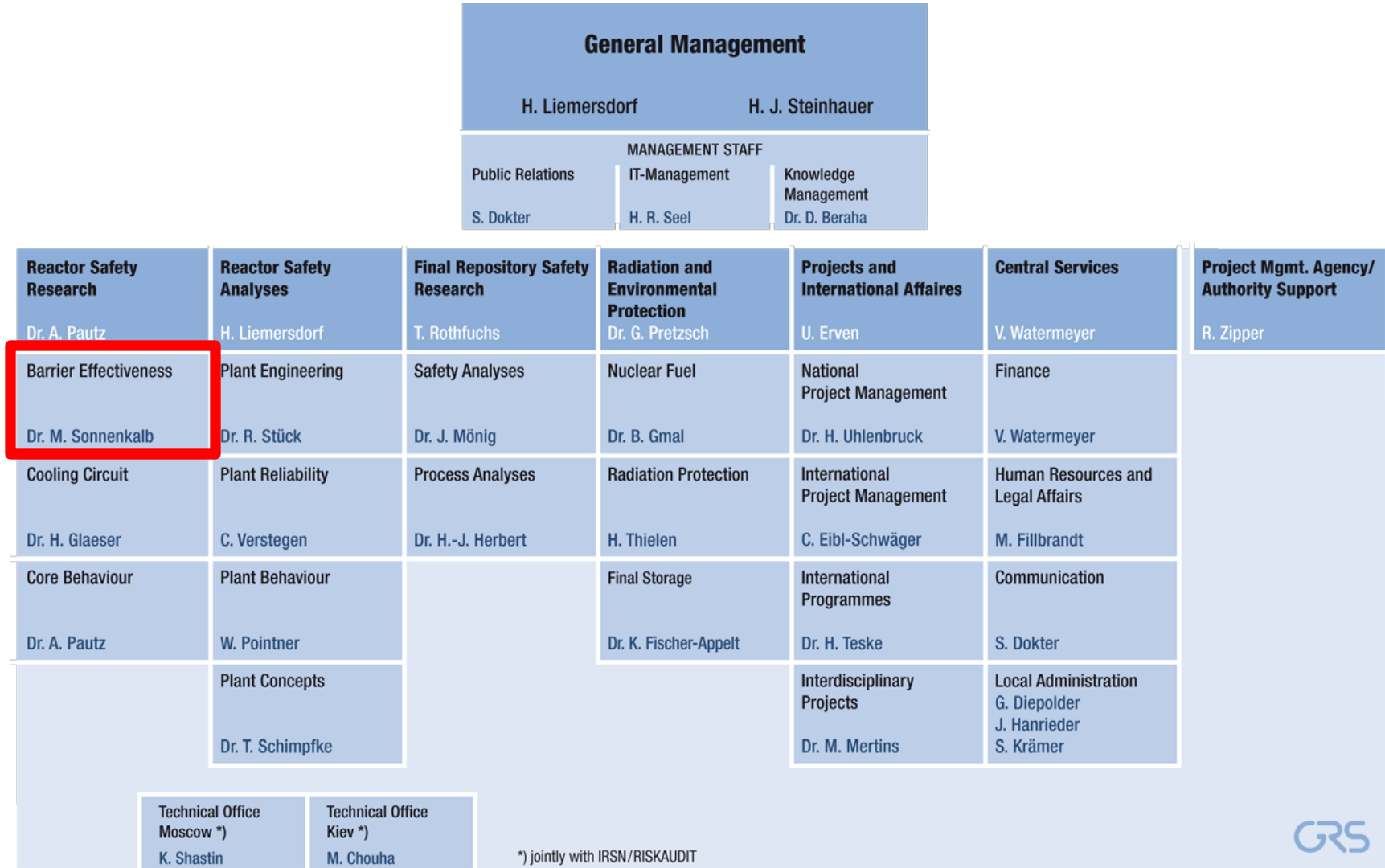
Analyses of fundamental
nuclear safety issues
and ad-hoc
assessments
of current
issues of power
plant operation.



R & D in the field
of nuclear facilities and
waste management,
including the final
disposal of radioactive
waste.

Safety analyses and assessments of
nuclear facilities in Germany and abroad,
providing expert advice to foreign
supervisory and licensing authorities.

GRS – Organization Chart

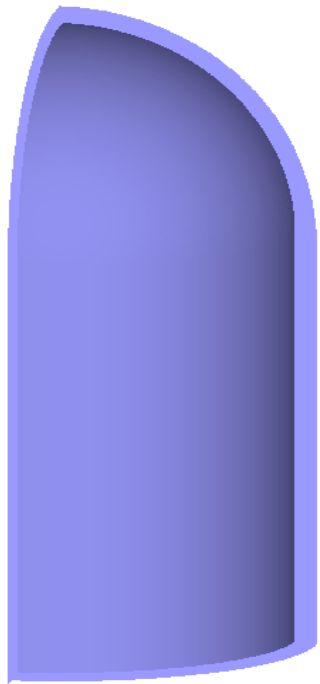


ISP 48

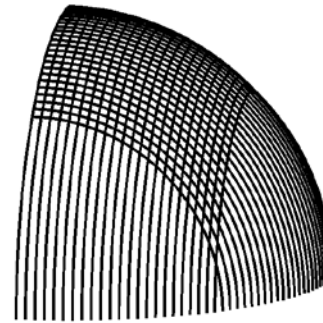
- GRS participated in ISP 48
Phase 2: “Calculation of the Limit State Test (LST), i.e. static pressure loading”
and
Phase 3: “Calculation of response to both Thermal and Mechanical Loadings”
- posttest calculations
- work was conducted by H. Grebner and J. Sievers
- finite element simulations performed with ADINA (www.adina.com)
- penetrations were not included in the models

ISP 48 – Analysis model

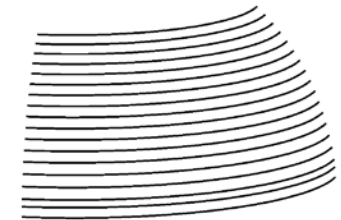
Finite element analysis: 90°-section model of PCCV



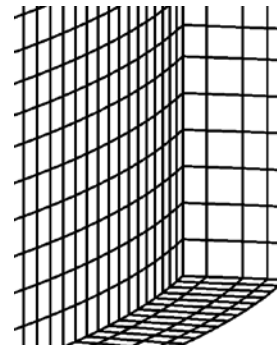
meridional
tendons
within dome



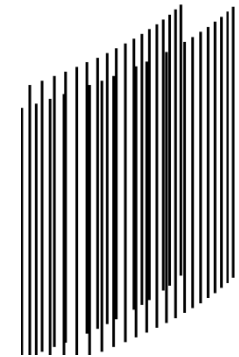
hoop
tendons
within
dome



concrete
modeling near
base plate



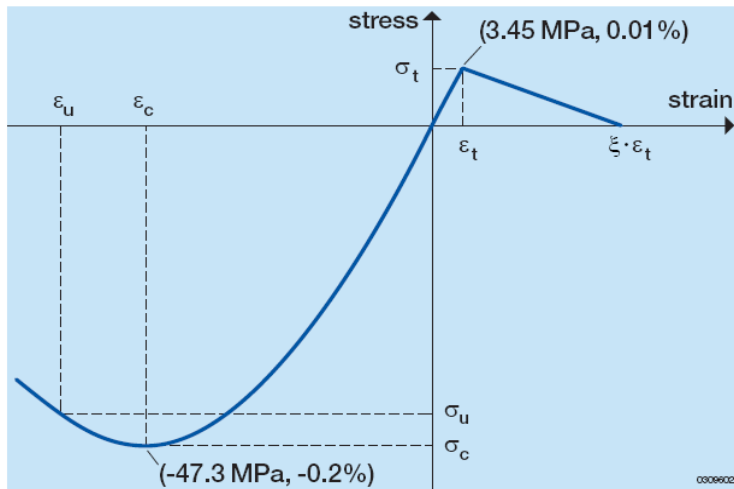
meridional
rebars
within
cylindrical
part



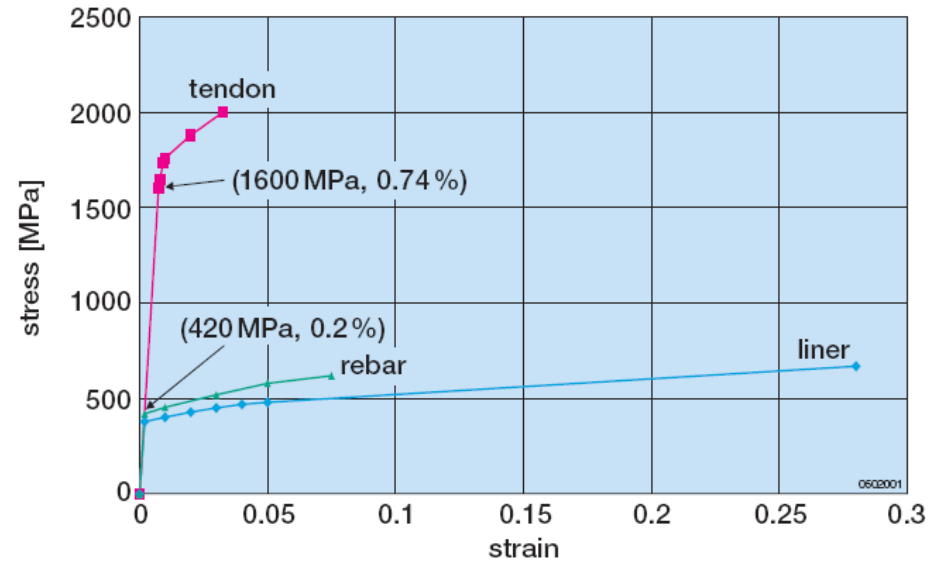
ISP 48 – Material properties

Stress-strain-curves of the PCCV materials used in simulations:

concrete

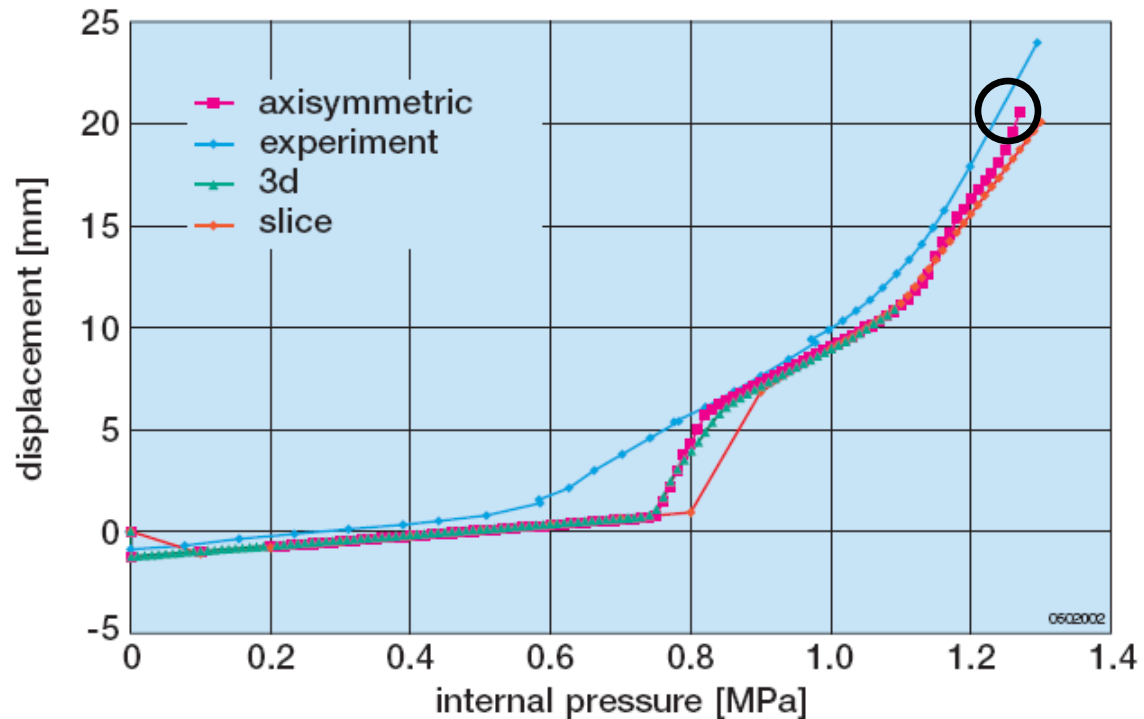
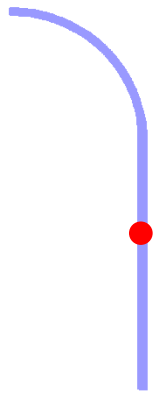


steel components



ISP 48 – Selected analysis results

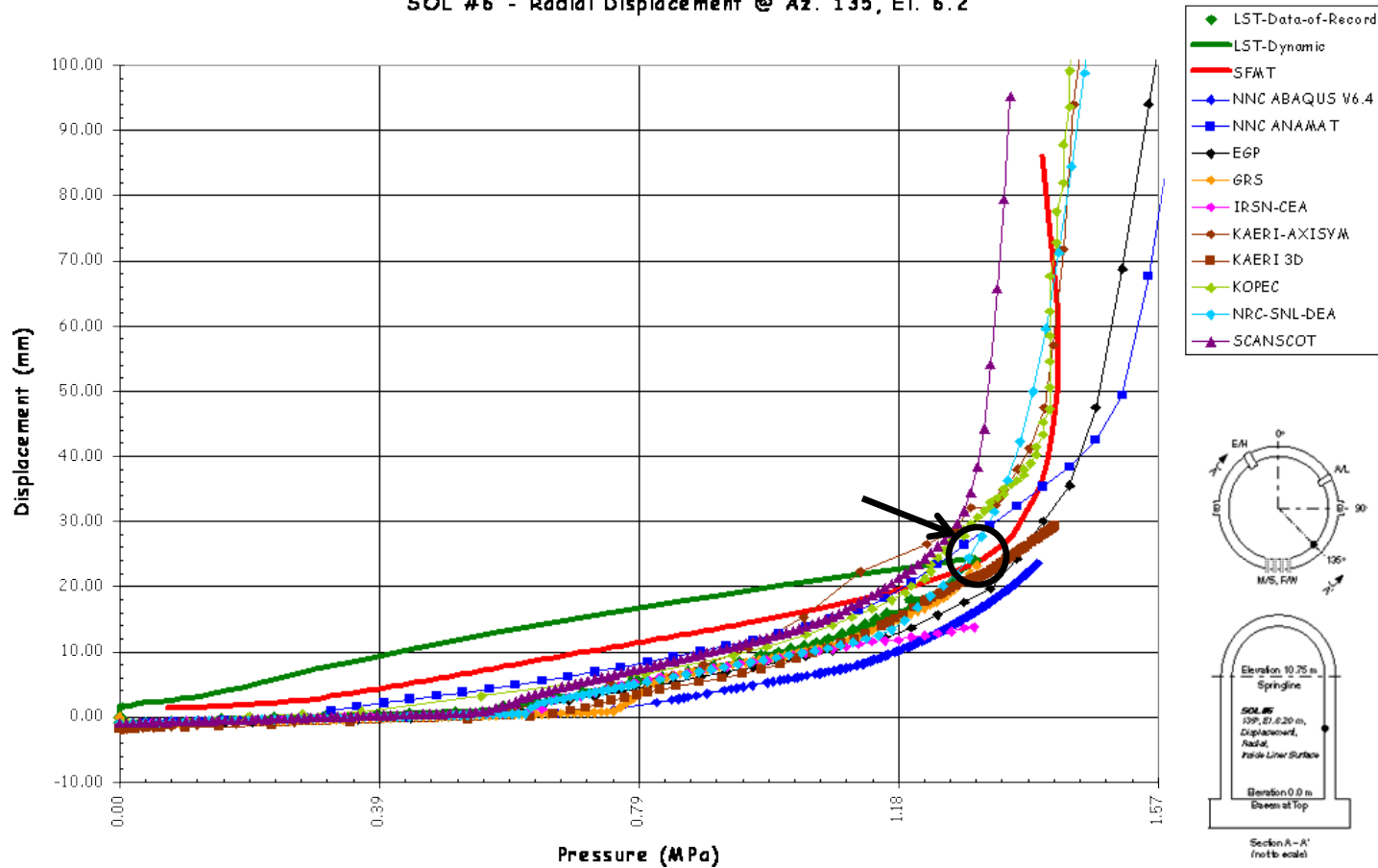
Radial displacement at the inner surface of the model
(cylindrical part at position 6.2 m above base plate), pressure only case



ISP 48 – Selected analysis results

Radial displacement at the inner surface of the model
(cylindrical part at position 6.2 m above base plate), pressure only case

SOL #6 - Radial Displacement @ Az. 135, El. 6.2



Source:
NEA/CSNI/
R(2004)11

Special interests in framework of SPE

- determination of leak rates through cracks
- failure mechanisms in liner
- steel-concrete interaction (bond model)
- influence of penetrations
- concrete behavior under temperature loads