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IGORR6

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The High Flux Neutron Source, FRM-II at Garching

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The FRM-II project is totally in accordance to the schedule. The technical, financial and licensing basis allows the erection of the plant without major influences from outside. The Technical University of Munich (TUM) as the overall manager of the FRM-II and Siemens being the General supplier of the reactor plant are cooperating closely together.

The detailed design work at Siemens and TUM has been finalised to such an extend, that the first (April 1996) and the second partial license (October 1997) for the erection of the complete facility can be executed. To do so TUM and Siemens have contracted subsuppliers for producing and mounting the systems and components of the plant.

The reactor building including the pool liners and the hot cell is under construction and will be finished late Summer 1998.

Progress has been made for example in improving the reinforcement methods and in the field of pool liner cladding technique in increasing the quality of the facility in combination with reduced costs.

Outlooking to further steps in the project main installation works will be performed between autumn 1998 to spring 2000. The third partial license mainly nuclear commissioning and routine operation is expected September 2000.

1 FRM-II Project Basis

Overhead No.

- **First and second partial license released** — 1

- **Project budget** — 2

  For the years 1998 and 1999 the Bavarian "state-budget" includes the necessary project means. This biennial budget has been accepted by the Bavarian Parliament.
  The budget for the following two years period (2000/2001) up to the finalisation of the project has been principally accepted by the Parliament in a certificate named "Construction Budget Permit HU-Bau". It solely has to pass the Parliament with respect to the state-budget 2000/2001.

- **Project design** — 3

  Besides the engineering and planning requested for the licenses Siemens has completed the detailed design of the entire plant to such extend that supply contracts with subcontractors could (30 %) and can (70 %) be signed.

- **Overall time schedule** — 4

Overhead No. 5

2 Subcontractors Being Involved

- Over the last two years the project has continuously subcontracted companies mainly for fabrication and erection of special works. Today it is not easy to find qualified companies still being used to work in the nuclear field with its special requirements and rules. That special know-how has some short-comings, but is still existing. Siemens as the General Supplier is still in the position to have and to handle this know-how. Similar models will apply for projects anywhere abroad.

3 Status of Erection

Overhead No.

- **Civil construction**
  - Reactor building incl. heavy concrete, especially in the area of the beam tubes (polygone), interface to the experimental installations — 6, 7
  - Protection against air plane crash: reinforced outer walls, 1.80 m, decoupling of the pool walls. — 8

- **Liner for pool and auxiliary pool** — 9
  Stainless steel, very complicated because of many and large beam tubes/holes, pre-fabrication, assembling at site (lower part: 3 pieces, upper part: 3 pieces).

4 Future View to the Completed FRM-II-Plant

- Overall view together with the old FRM — 10
- Vertical section, reactor building — 11
- Horizontal section, reactor building — 12

Contents of the Two Released Partial Licenses in Accordance with § 7 Atomic Law of the FRG

First Partial License (1996-04-04) applied for (1993-02)

- Concept of the entire plant FRM-II incl. the experimental facilities like hot source, cold source, silicon doping facilities, converter plate and rabbit systems

- Erection of the reactor building with all embedded parts like draining pipes, wall frames, steel frame work for the pools, etc.

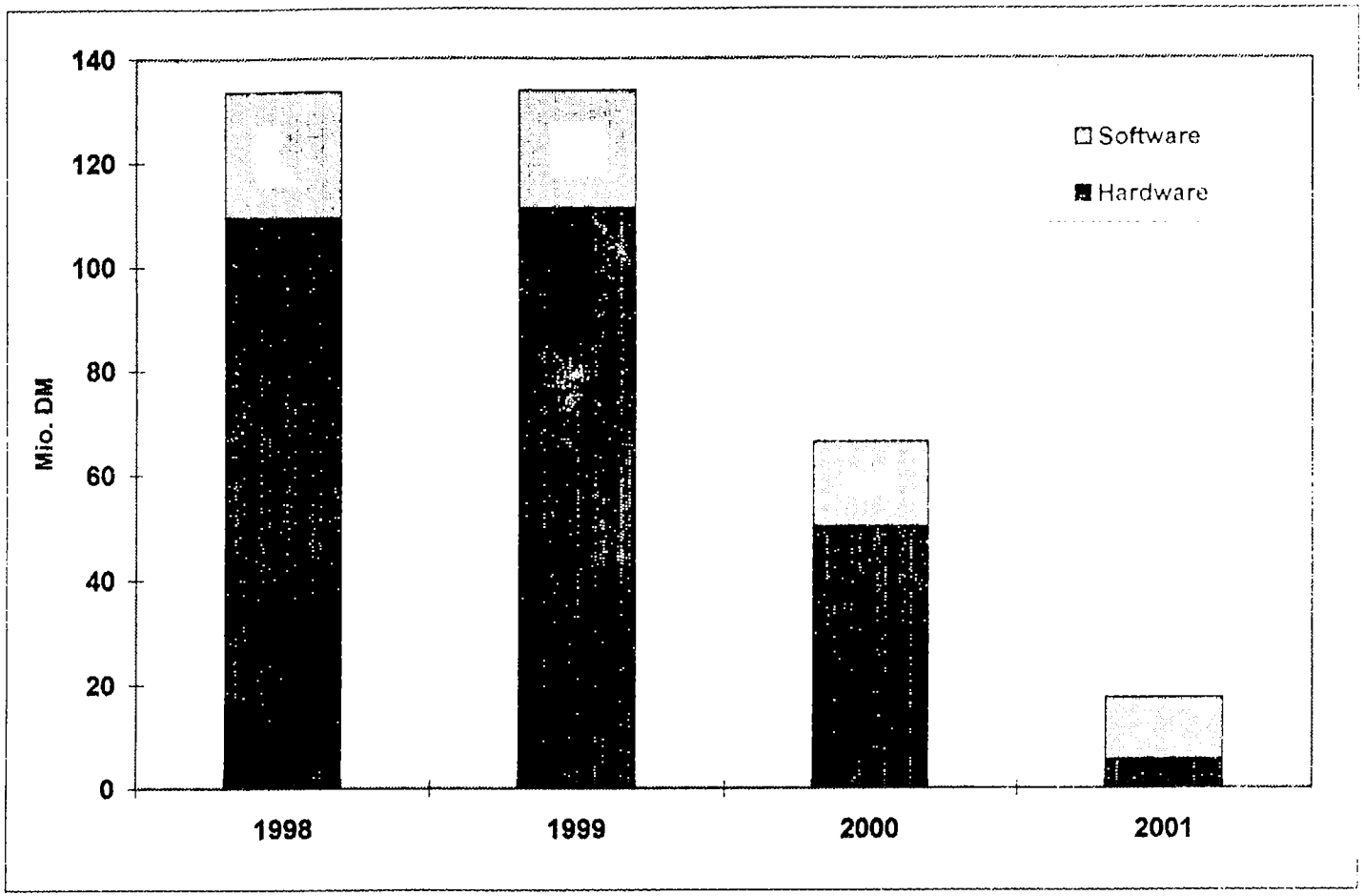
Second Partial License (1997-10-09)

- Erection of all other buildings

- Installation of all remaining equipment, components and systems

- All steps for non-nuclear commissioning as necessary before loading the reactor with the fuel element

Budget foresaon for the finalization of the reactor plant without experimental facilities and fuel



Project Design

- Engineering / Design for
  - 1st Partial License
  - 2nd Partial License

  completed

- Engineering / Design for
  - 3rd Partial License

  under way

- Detailed Engineering / Design for Erection of Plant (Civil, Systems) done to the extend that
  - subcontracting performed (~ 30 %)
  - ready for subcontracting soon (~ 70 %)

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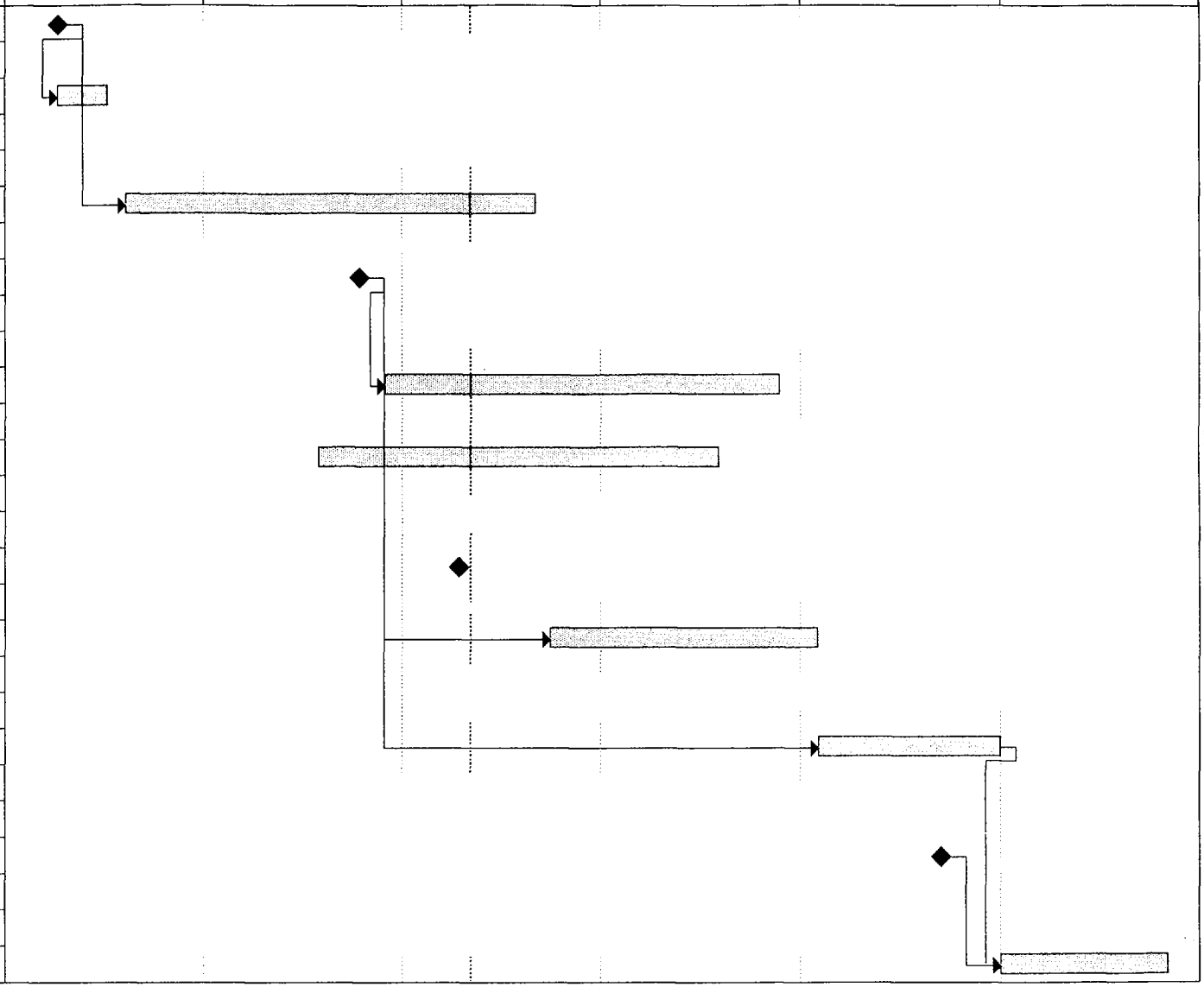
Nr.	Vorgangsname
1	1st partial license and building erection
2	
3	Order of pool liner, civil works, preparation
4	of erection area & reactor building
5	
6	Erection of reactor building & pool liner
7	
8	2nd partial licence for complete
9	equipment & buildings
10	
11	Errection of other buildings
12	
13	Orders & manufacturing of SIEMENS
14	complete equipment
15	
16	Order Hot & Cold Source TUM
17	
18	Installation of systems & equipment
19	TUM+SIEMENS
20	
21	Cold commissionimg & acceptance
22	phase TUM + SIEMENS
23	
24	3d partial license for hot commissioning
25	phase & operation
26	
27	Hot commissioning phase



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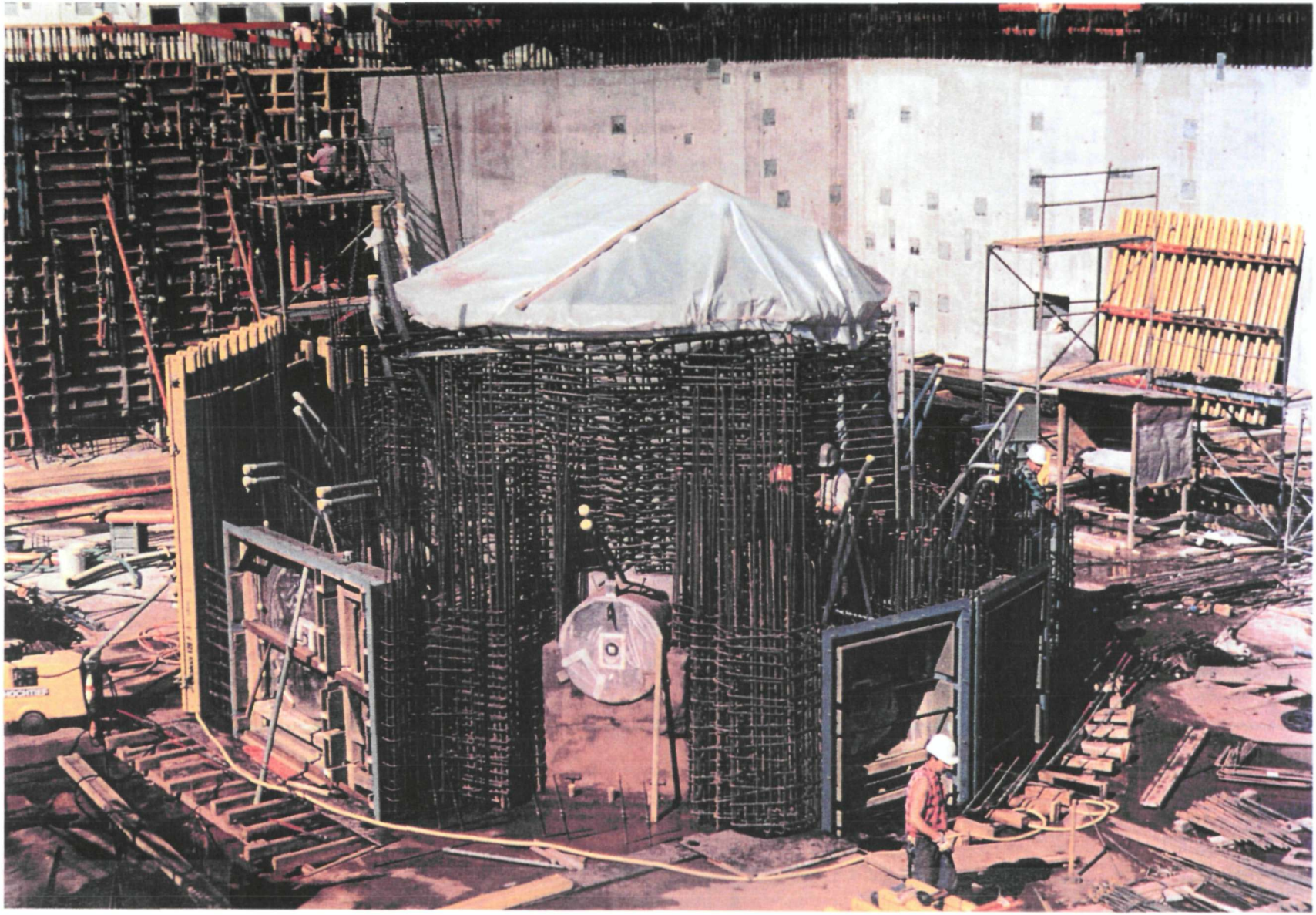
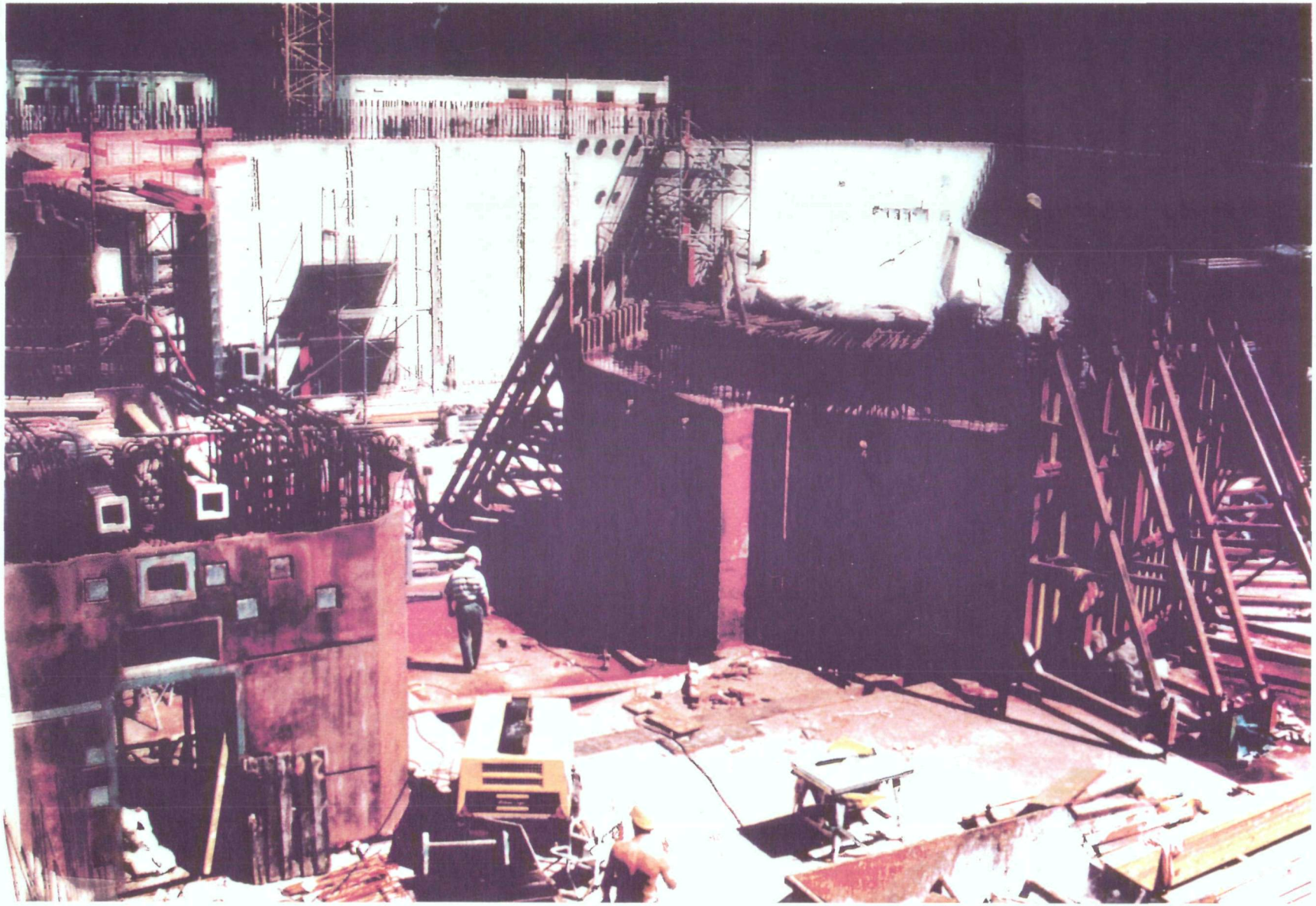
FRM-II Main Subcontractors

Subject	Company
Civil Construction	Hochtief AG / Dyckerhoff & Widmann AG
Pool Liners	Deggendorfer Werft und Eisenbau GmbH
Hot Cell	Babcock Kerntechnik GmbH
Ventilation Systems	Kraftanlagen Anlagentechnik GmbH, München
Shutdown and Control Rods	Siemens AG
Moderator Tank	SDMS S.A.
Forged Pieces of Aluminium	Fortech S.A.
Heat Exchangers	Pitton + Gessner GmbH & Co.
Primary Pumps	Rütschi Pumpen GmbH
Valves	Maschinenfabrik GmbH / Xomos International GmbH & Co.
Cranes	J. Brunnhuber Maschinenfabrik GmbH
Physical Protection Devices	Sommer Stahlbau, Glasbau Sicherheits-technik GmbH & Co. KG
Diesel Power	Hitzinger GmbH
Cold Neutron Source (TUM)	Linde AG
Hot Neutron Source (TUM)	ACCEL GmbH



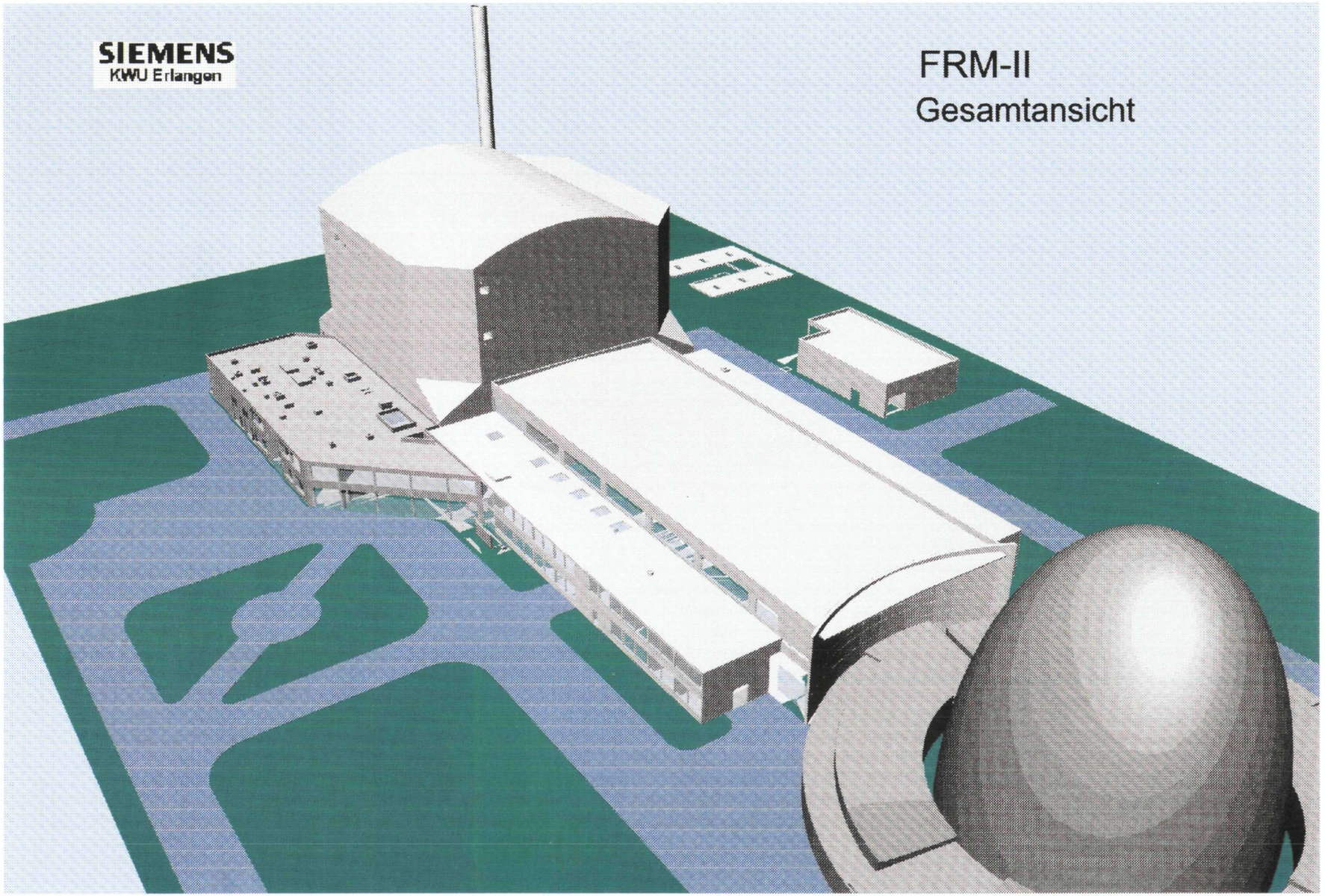
FRM-II Reaktorgebäude
Montage der Stahlrahmen für Strahlrohröffnungen



FRM-II Reaktorgebäude
Abschirmbeton
Strahlrohrbereich und Neutronenleitertunnel

Bewehrung - Reaktoraußenwand von +6,00 m bis +11,00 m
(24.08.1997)

15. September 1997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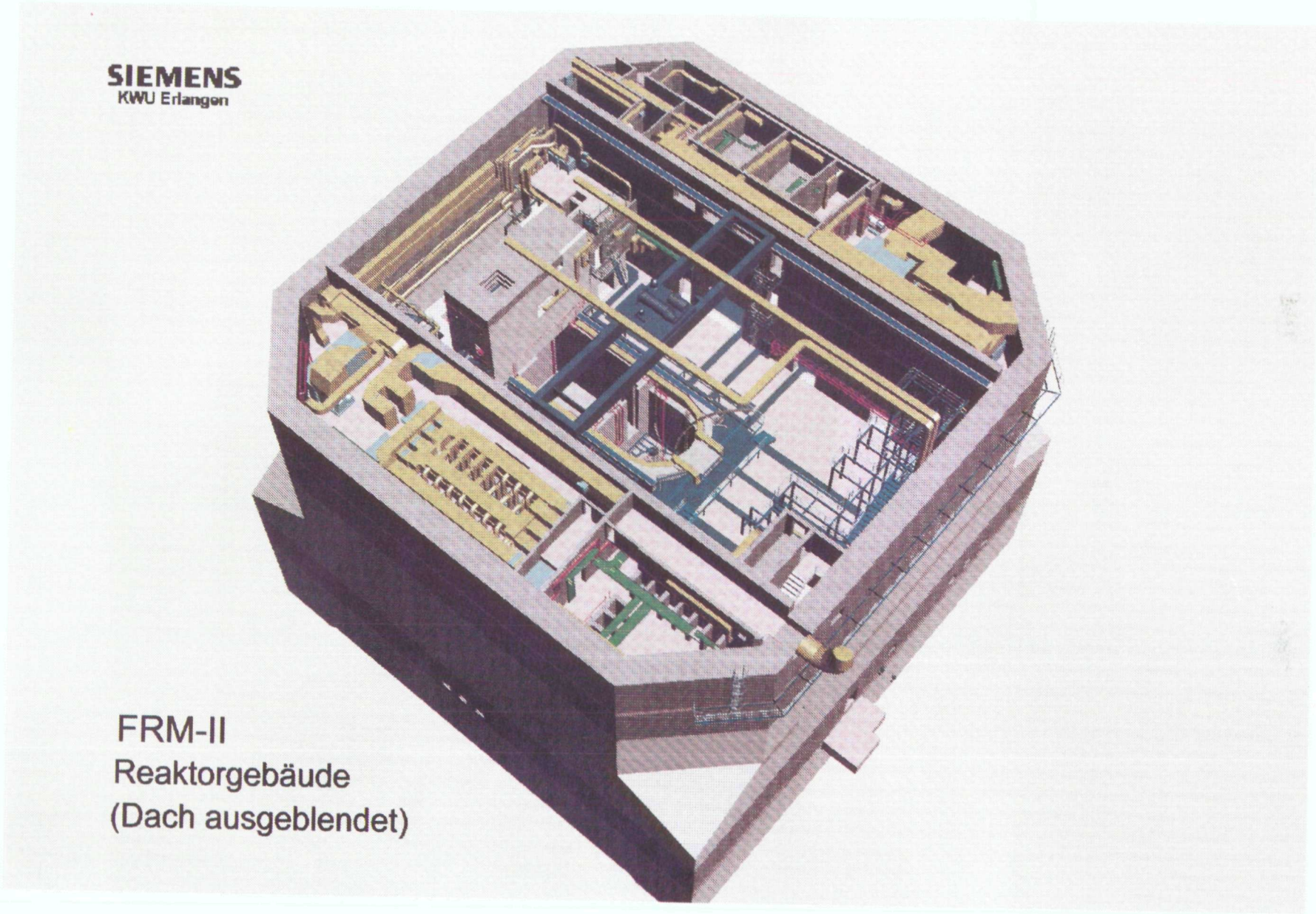
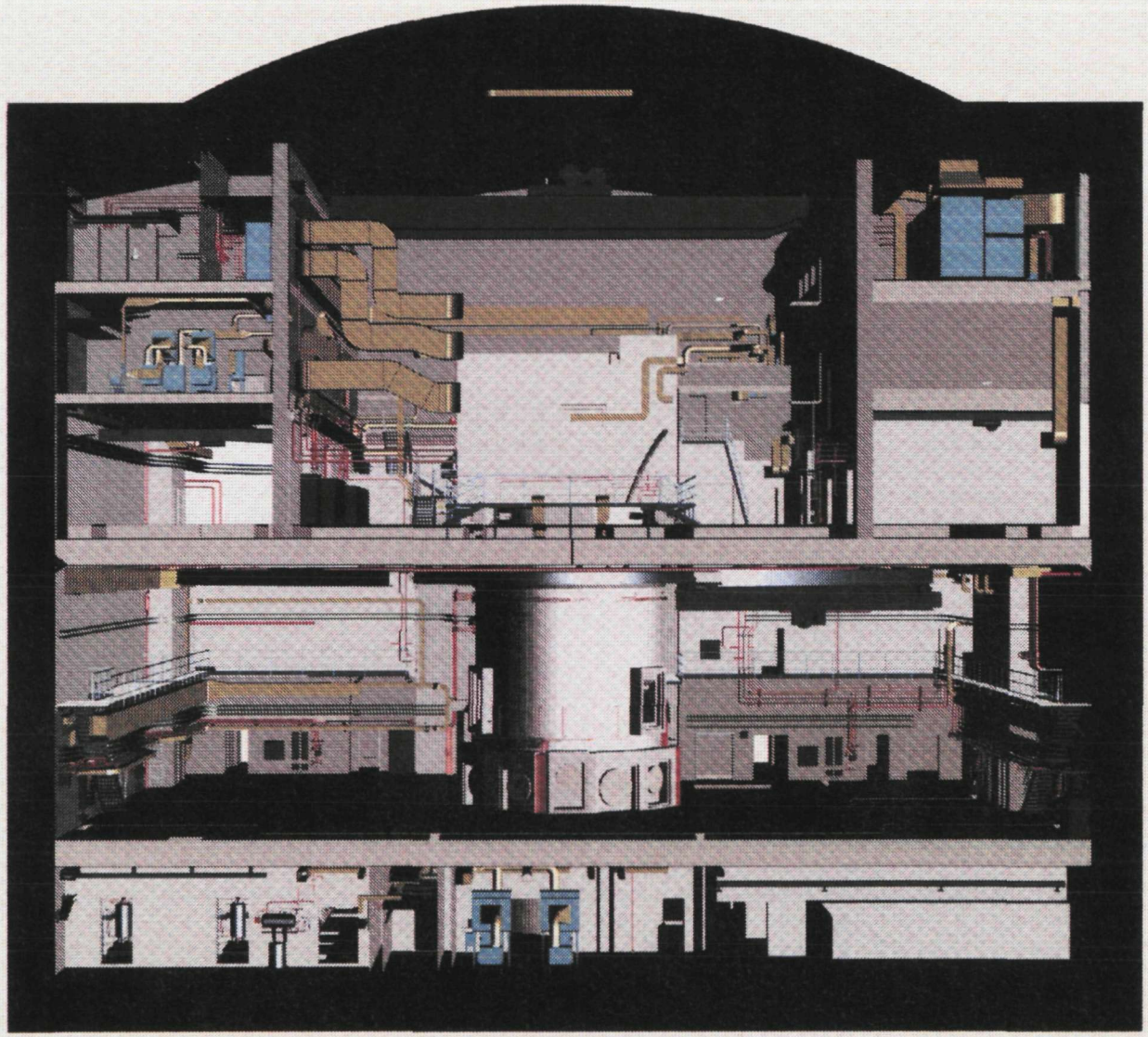
FRM-II
Gesamtansicht


SIEMENS
KWU Erlangen
FRM-II
Reaktorgebäude
(Dach ausgeblendet)

SIEMENS
KWU Erlangen



FRM-II
Schnitt Reaktorgebäude UJA