



Hydrogen Supply Infrastructure HyFleet:CUTE - Berlin

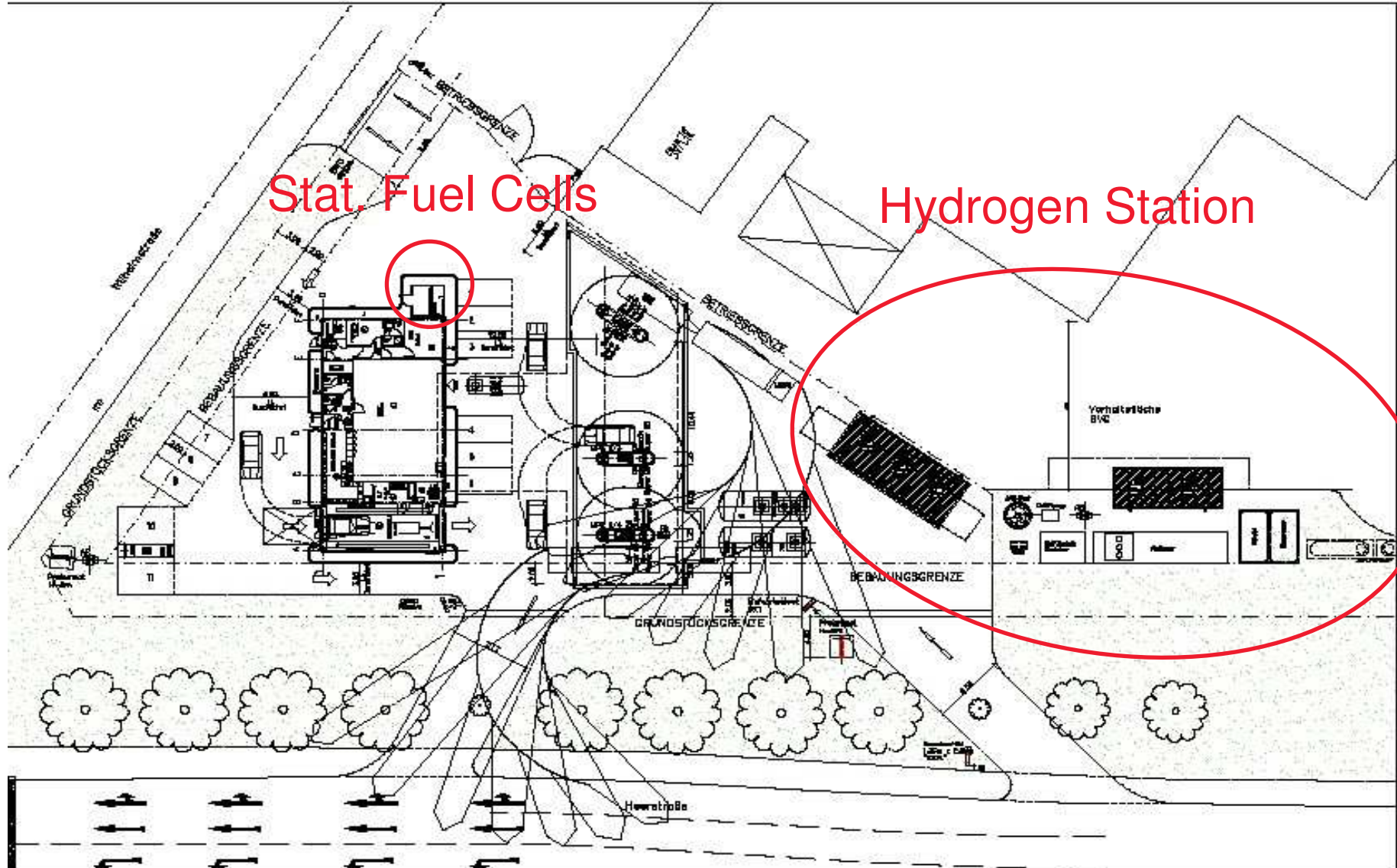
Ulrike Wäser, TOTAL

Brussels, January 25th, 2006

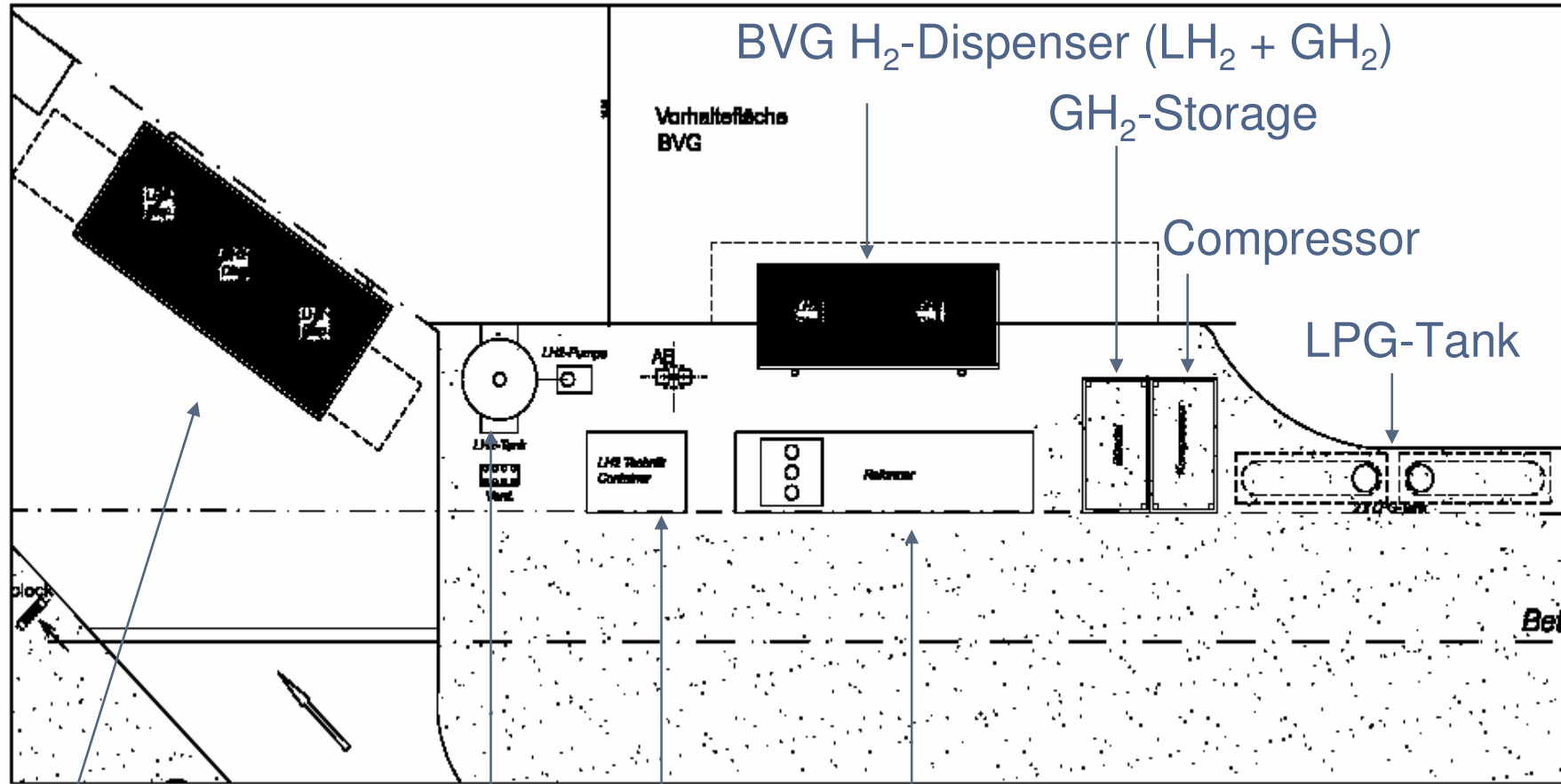
TOTAL Station Berlin – Lay Out Plan



TOTAL



Hydrogen Station Berlin



Public H₂-Dispenser
(LH₂ + GH₂)

LH₂-Tank

LPG-Reformer

LH₂-Technology

TOTAL Hydrogen Station – by Day



TOTAL Hydrogen Station – by Night



Technologies Employed Today



- Liquid Hydrogen (LH₂)
 - Delivery by Linde, Storage in Cryo-Tank (max. 1.3 t)
 - Two LH₂-Dispensers; one on the public and one on the BVG side
 - Generation of gaseous hydrogen through vaporisation of LH₂ (1st phase until June 2006, later as backup)
- Gaseous Hydrogen (GH₂)
 - Two GH₂-Dispensers; one on the public and one on the BVG side
 - H₂-Compressor for up to 450 bar (output 240 Nm³/h)

Technology Upgrades



- On-Site LPG-Reformer (June 2006)
 - **Output 100 Nm³/h**
 - **Capacity to refuel 7 H₂-Busses daily**
- Ionic-Compressor for gaseous Hydrogen (3rd Q 2006)
 - **Compression up to 450 bar (upgrade to 700 bar possible)**
 - **Output 540 Nm³/h**
- Stationary Fuel Cells (June 2006)
 - **Two 5 kWel fuel cells**
 - **Utilisation of excess hydrogen to produce heat and power for the service station**

Hydrogen Customers



- **Passenger cars**
 - 16 H₂-vehicles from BMW, DC, Ford and Opel (part of the Clean Energy Partnership, Berlin, CEP)

- **Busses**
 - 14 MAN H₂-ICE Buses (three different generations)
 - 1 LH₂-Bus



Learning Process



- Integration of hydrogen into a conventional service station
 - **How suitable are different technologies?**
 - **Which difficulties arise for authority approvals?**
 - **How can hydrogen be integrated into an existing safety management ?**
- Production and refuelling of large quantities of hydrogen
 - **Efficiency of technologies**
 - **Management of refuelling processes**
- Useful hydrogen management during off-times
 - **Use of boil-off**
 - **Use of excess hydrogen**
- Studies
 - **Use of Bio-DME in the Reformer**
 - **Capture and use of CO₂ generated by the Reformer**

Next Steps – Hydrogen Station Berlin



- February 2006 **starting operation of the hydrogen station for CEP-vehicles**
- March 14th, 2006 **Official opening of the hydrogen station (non-EU funded part) inside CEP**
- May / June 2006 **Delivery of LPG Reformer and stationary Fuel Cells**
- June 2006 **Event as part of the FIFA World Cup**
- June / July 2006 **Operation of two MAN H₂-ICE busses during the FIFA World Cup**
- 3rd Quarter 2006 **Installation of the Ionic Compressor**

