



## A New Computer Centre

ILO Forum  
17 March 2009

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IT Department Head

# Agenda

- What is the problem?
- Why a new building?
- Current Status

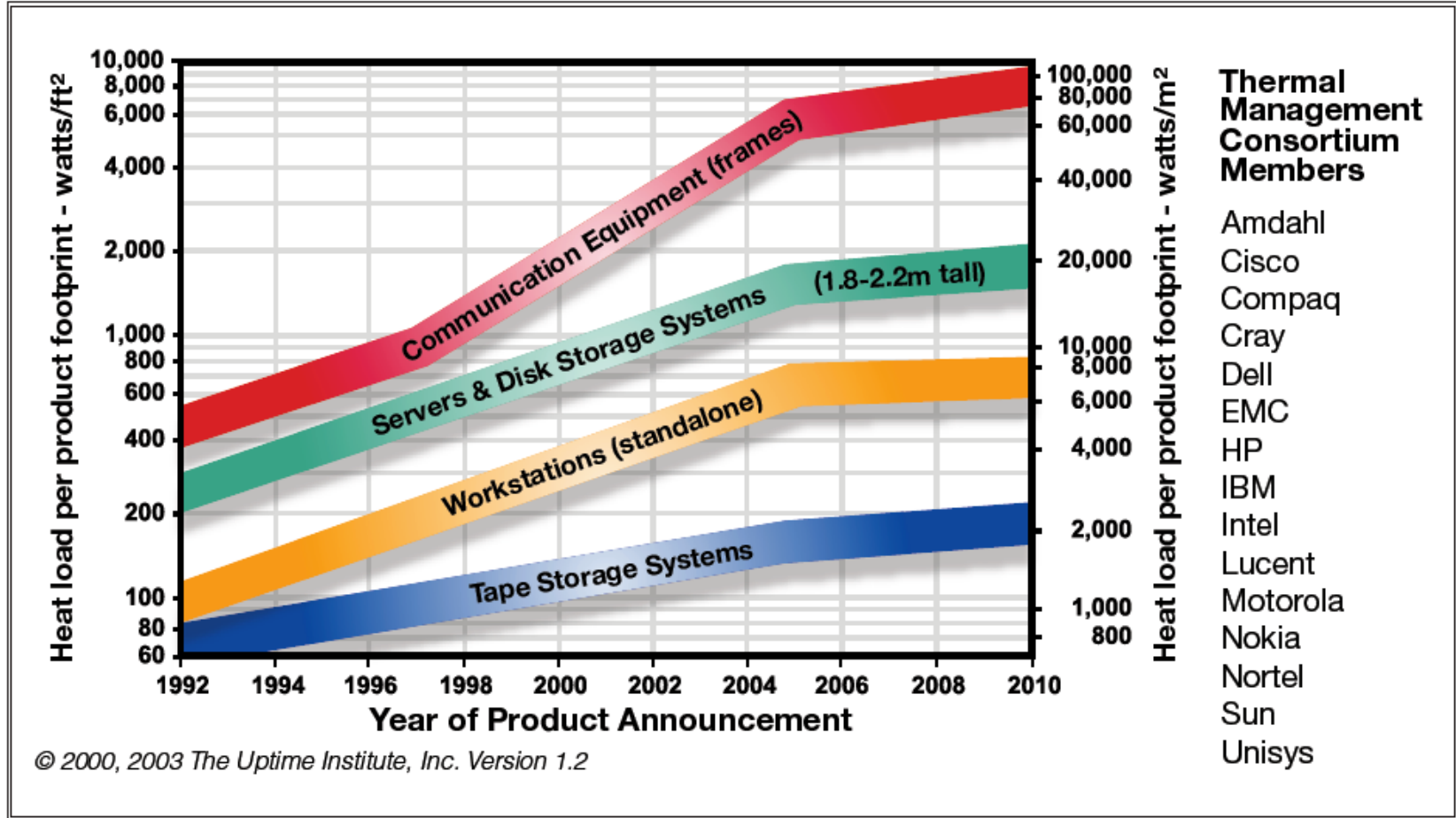


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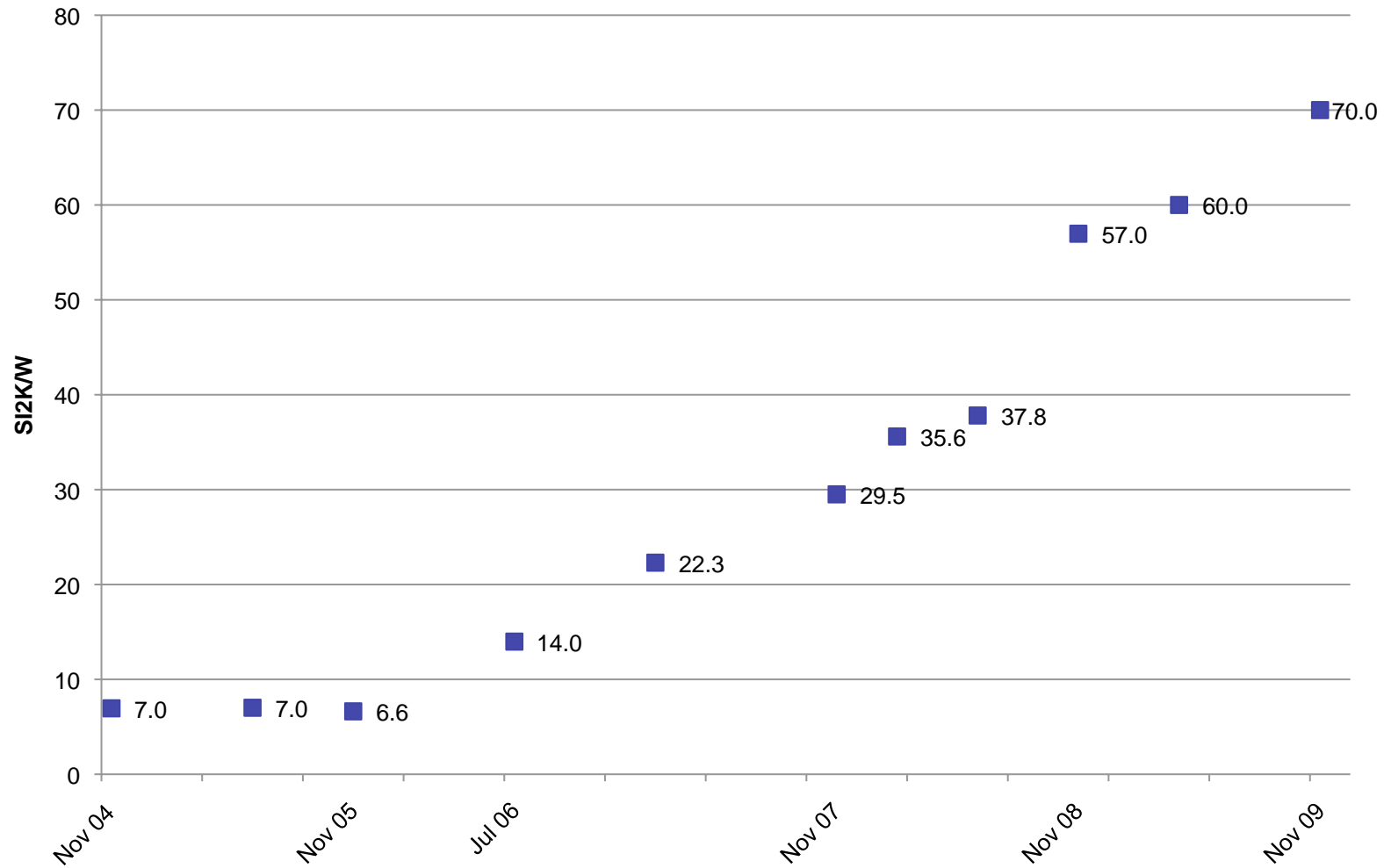
# The Problem



# Power Efficiency does improve...



## CPU Server Power Efficiency



... but



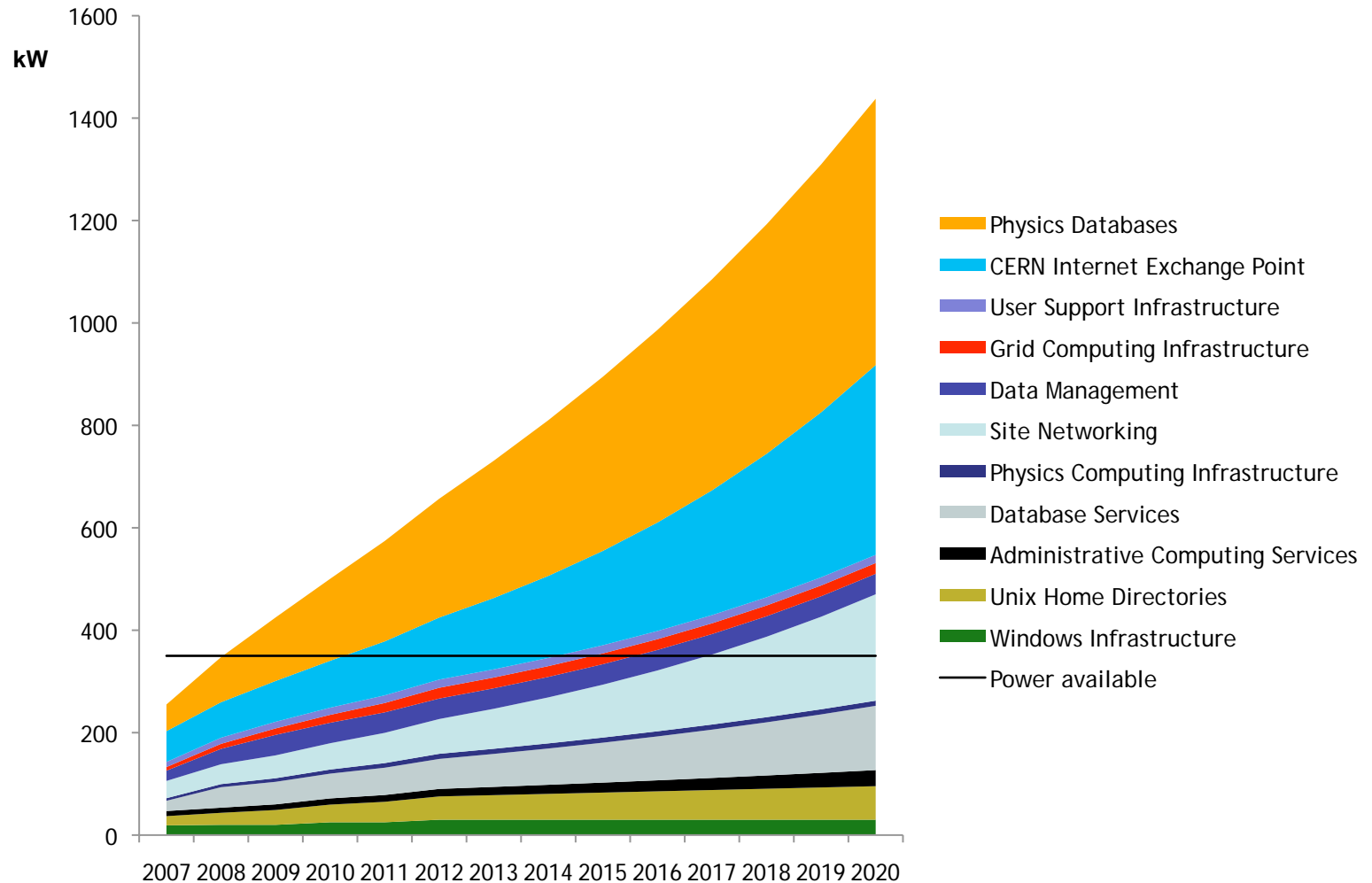
LHCC - 16 February 2009

## Evolution of the computing model (1)

- The computing model is fundamentally unchanged since the Computing TDR (2005)
- Some model parameters have been adjusted all along, based on our experience with real data (cosmics) and intensive simulation campaigns during the last few years, and to reflect reality:
  - ESD and AOD sizes doubled to 1 MB and 0.2 MB/event to include more information needed to study detector performance
    - We try to avoid to go back to RAW (from ESD) or ESD (from AOD) when not necessary
    - Sizes will most probably decrease again as we gain experience with real data
  - Full simulation processing times increased from 100 to 1000 kSI2k-s/ev to allow for a very detailed detector geometry and much better physics models in Geant4
    - This level of detail is needed for some physics processes
    - We have developed a complete suite of full, medium and fast simulations that we will use and mix according to the physics needs and the availability of CPU capacity
    - Tuning the Geant4 parameters on real data will help us to optimise CPU usage
  - For reconstruction, CPU time is in the correct ballpark (15 kSI2k-s/event) at low luminosity, but more work is needed for higher luminosities ( $>2 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ )
    - Targeted effort for memory reduction is now starting to pay off (improvements in the forthcoming s/w release)



# Critical Power Requirements...



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# Why a new building?

- Various alternatives considered in 2006/7
  - Grid Computing
    - Not an option: Grid is access method to existing resources, not a “free lunch”



# Why a new building?

- Various alternatives considered in 2006/7
  - ✗ Grid Computing
    - Further expansion of B513
      - Possible: use the “barn” and start another rolling upgrade, introducing water cooled racks or “in row cooling”, but
      - Major impact on services just as LHC starts
      - **No power on the Meyrin site before 2013.**



# Why a new building?

- Various alternatives considered in 2006/7
  - ✗ Grid Computing
  - ✗ Further expansion of B513
  - Hosting services
    - Extremely expensive: ~100CHF/kW/month excluding electricity — 1.2MCHF/MW/year.
    - Commitment needed up-front to reserve space.



# Why a new building?

- Various alternatives considered in 2006/7
  - ✗ Grid Computing
  - ✗ Further expansion of B513
  - ✗ Hosting services
  - Commercial services (“Cloud Computing”)
    - Also expensive, especially for large volume data transfers
    - Studies in US indicate Cloud services not (yet) appropriate for HEP computing
      - Grid: move computing to available resources: need CPU cycles and data availability
      - Cloud: location of data and resources is invisible to end-user.

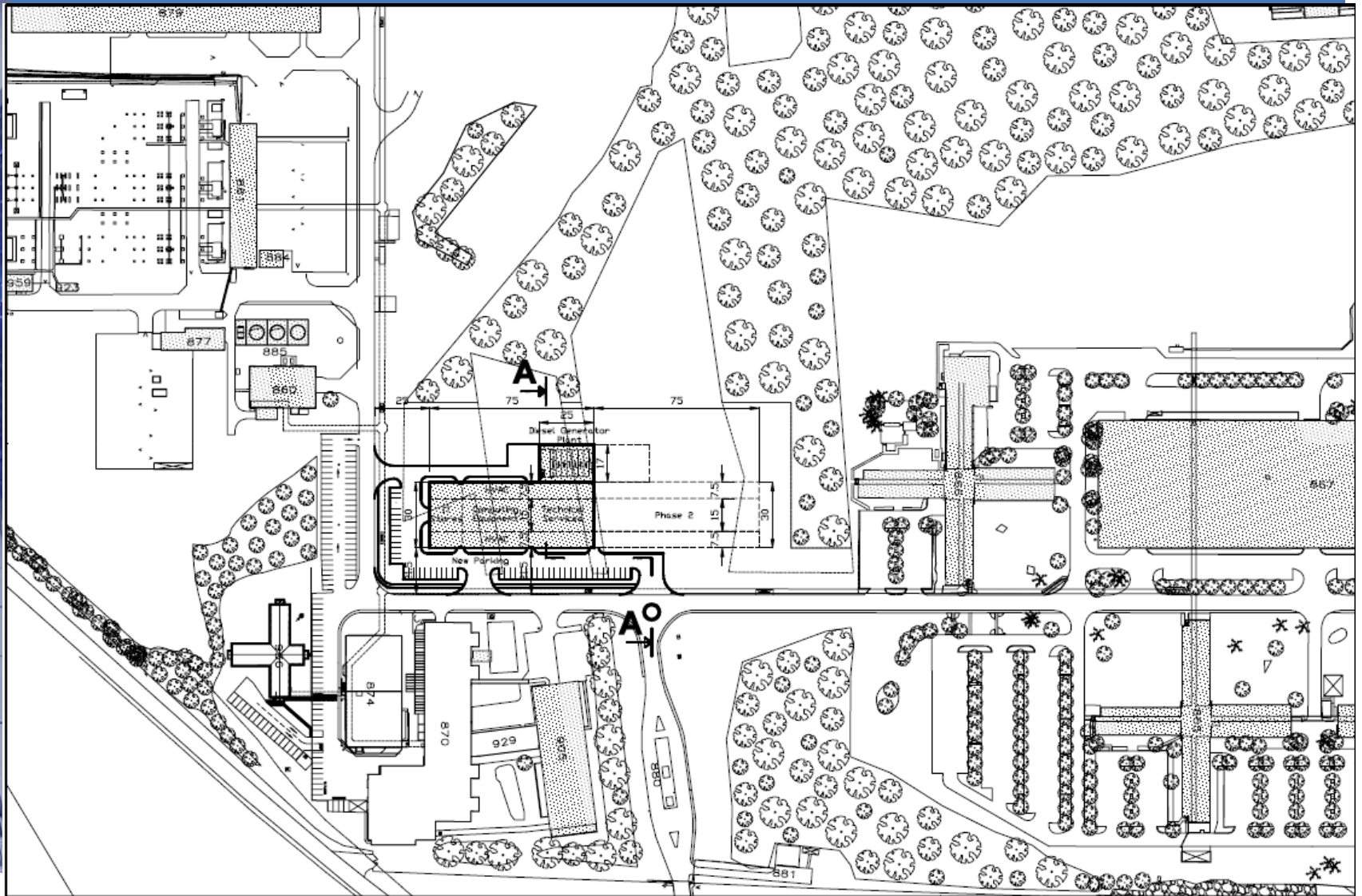


# Why a new building?

- Various alternatives considered in 2006/7
  - ✗ Grid Computing
  - ✗ Further expansion of B513
  - ✗ Hosting services
  - ✗ Commercial services (“Cloud Computing”)
- Reuse existing building
  - Needs to be on Prévessin site for power reasons
  - B904/927 reviewed with TS department
    - feasible, although severe constraints on design, but
    - civil engineering works considered relatively small fraction of overall costs, not justifying
    - loss of building with gantry crane for other uses.



# Why a new building?



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# Current Status

- Four “outline designs” were reviewed in December
  - Estimated costs of 50-65MCHF; Ten-year building & electricity costs of ~120MCHF.
  - Intention to issue a single tender covering
    - Civil Engineering, Electricity, Cooling & Ventilation, Integration
  - IT requirements for rapid delivery of new building
    - 18-24 months from Directorate approval vs. 36-42 months.
- Requirement now to consider option of heat recovery for Prévessin and general “Green” status.
  - Estimated at 2-3 months work.
- Seek final Directorate approval in June
  - In the meantime, MS/tender for a “client advisor” to assist in preparation of tender documents and, later, to supervise construction.





# A possible new Computer Center

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# A possible new Computer Center

CERN  
IT  
Department

CERN European Organization for Nuclear Research  
DATA CENTER PROJECT

SOUTH ELEVATION



EAST ELEVATION

