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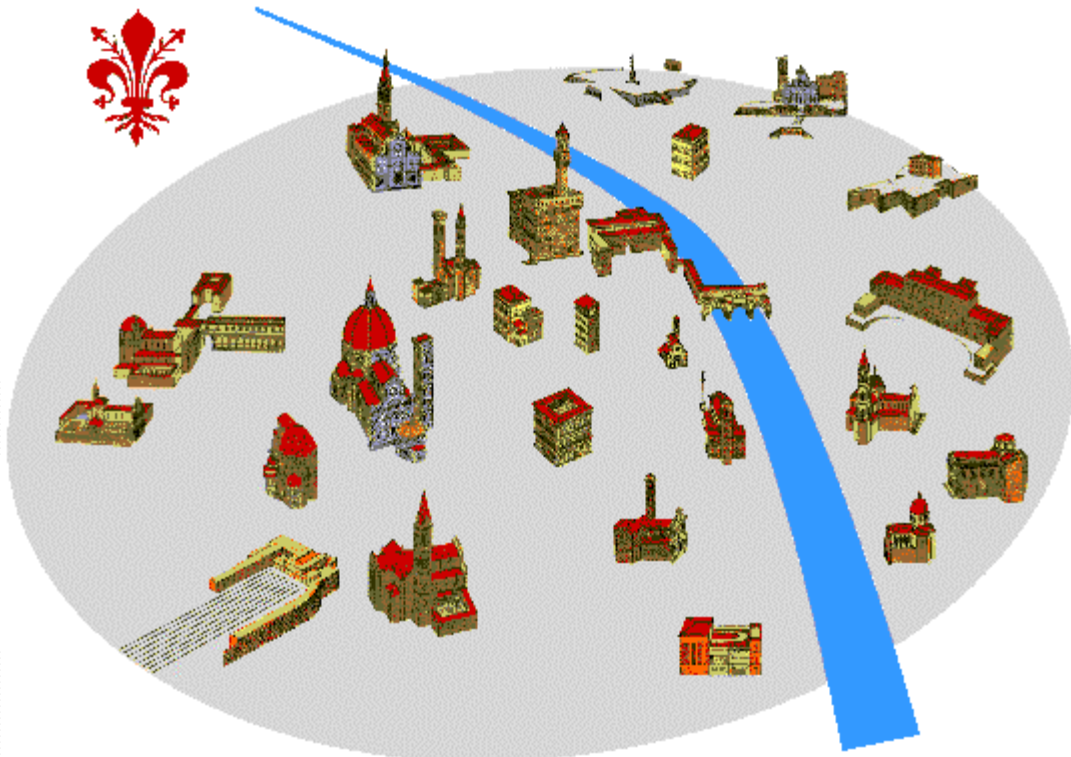

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GAS MANAGEMENT SYSTEMS FOR CHANGING GAS MARKETS

AN APPLICATION AT BEB

GMS for Changing Gas Markets

agenda

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GAS

Supply-Situation
Technical Infrastructure
Operating Infrastructure
Development of the market
Challenges

System

Systemarchitecture
Safety, Security
GAMOS
Project Organisation
Budget
Standardisation

Management

Communication
Organisation
Information
Optimisation

GAS
-Business today and tomorrow

SYSTEM
-technology and development

MANAGEMENT -requirements

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Gas Management = the whole chain

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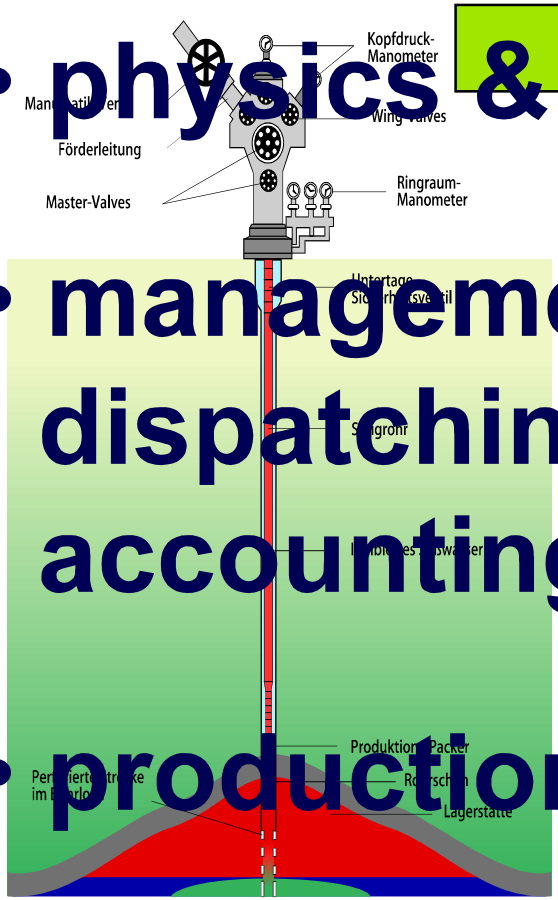
- physics & logics
- management, scheduling, dispatching, operating, accounting
- production, transport & ugs



UGS

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G: supply grid Europe

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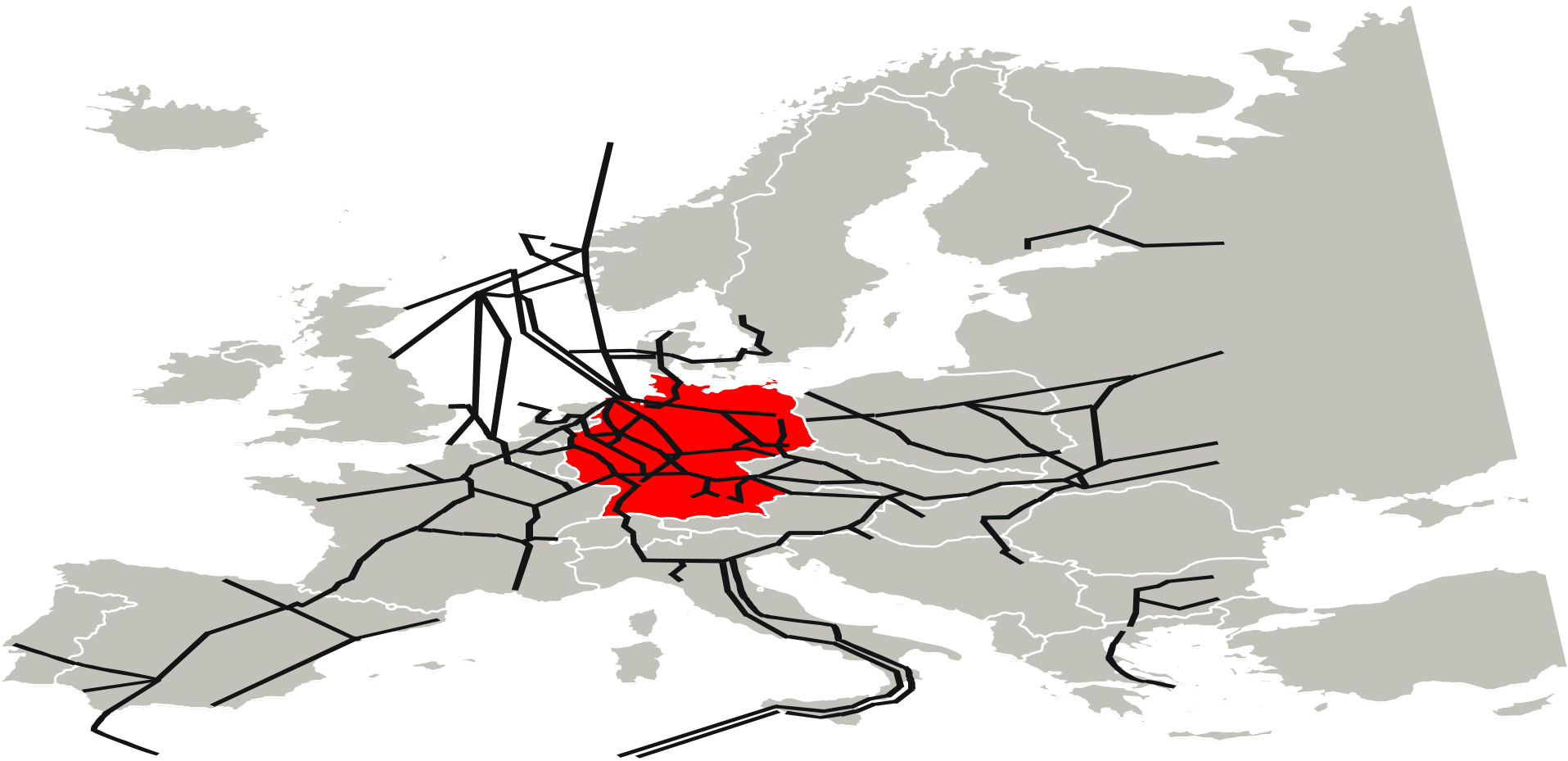

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G: supply Germany vs BEB

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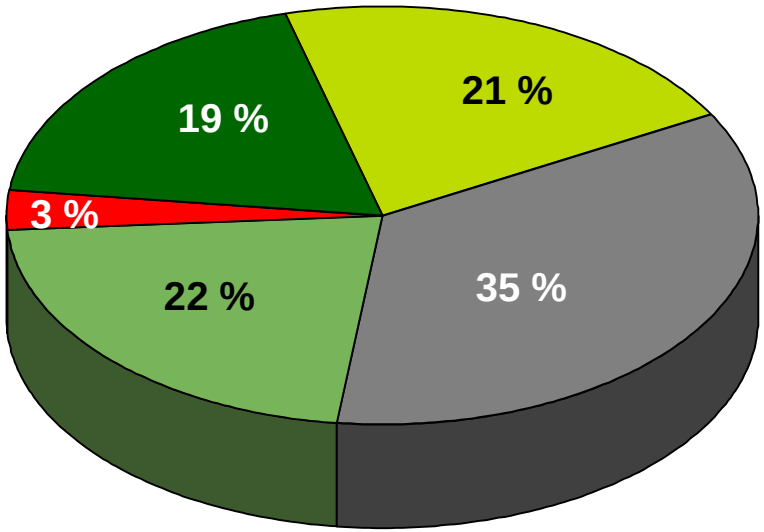
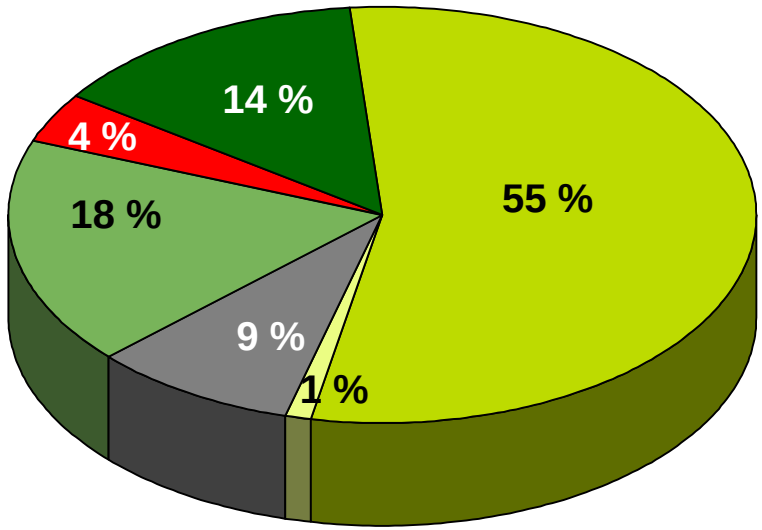
Germany 1998: 96.9 x 10^9 m³



Norway
Denmark
Netherlands
Domestic production
CIS

BEB 1998: 18.3 x 10^9 m³



Norway
Denmark
Netherlands
CIS
BEB Domestic production
Domestic production

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G: BEB‘s infrastructure

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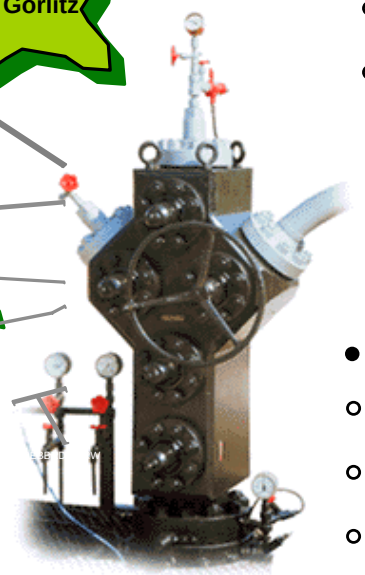

keyfigures 1998

- transported volumes
  - ca. 26 x 10^9 m^3/a
  - 4.8 x 10^6 m^3/h (peak)
    - transportsystem
      - ca. 3500 km pipelines
      - 7 compressorstations, 19 units
      - 230 stations
        - production system
          - ca. 200 wells
          - ca. 1400 km pipelines
- underground storage
  - 2 pore storages
  - 2 cavern locations
  - working gas volume 2.7 x 10^9 m^3
  - withdrawal cap. 1.8 x 10^6 m^3/h

GMS for Changing Gas Markets

S: Topologies

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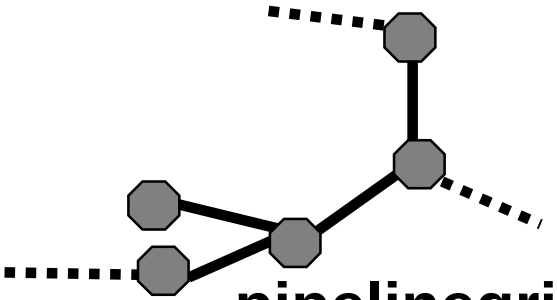
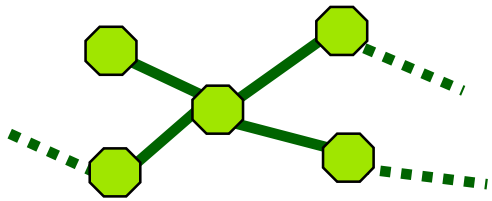


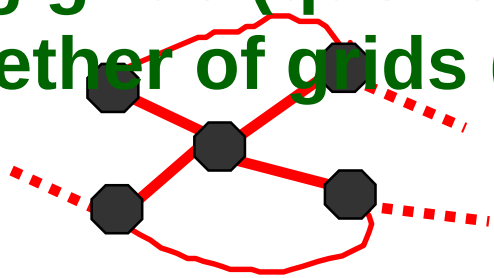
pipelinegrid



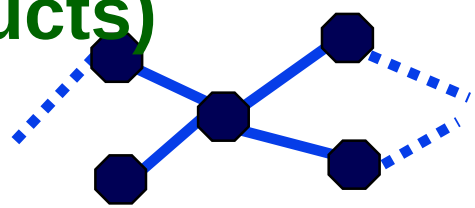
contract relations

New topological features required:

- **part of grid (sub spaces)**
- **product of grids (products)**
- **simplifying grids (quotients)**
- **gluing together of grids (coproducts)**



remote control grid



accounting relations

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S: architecture

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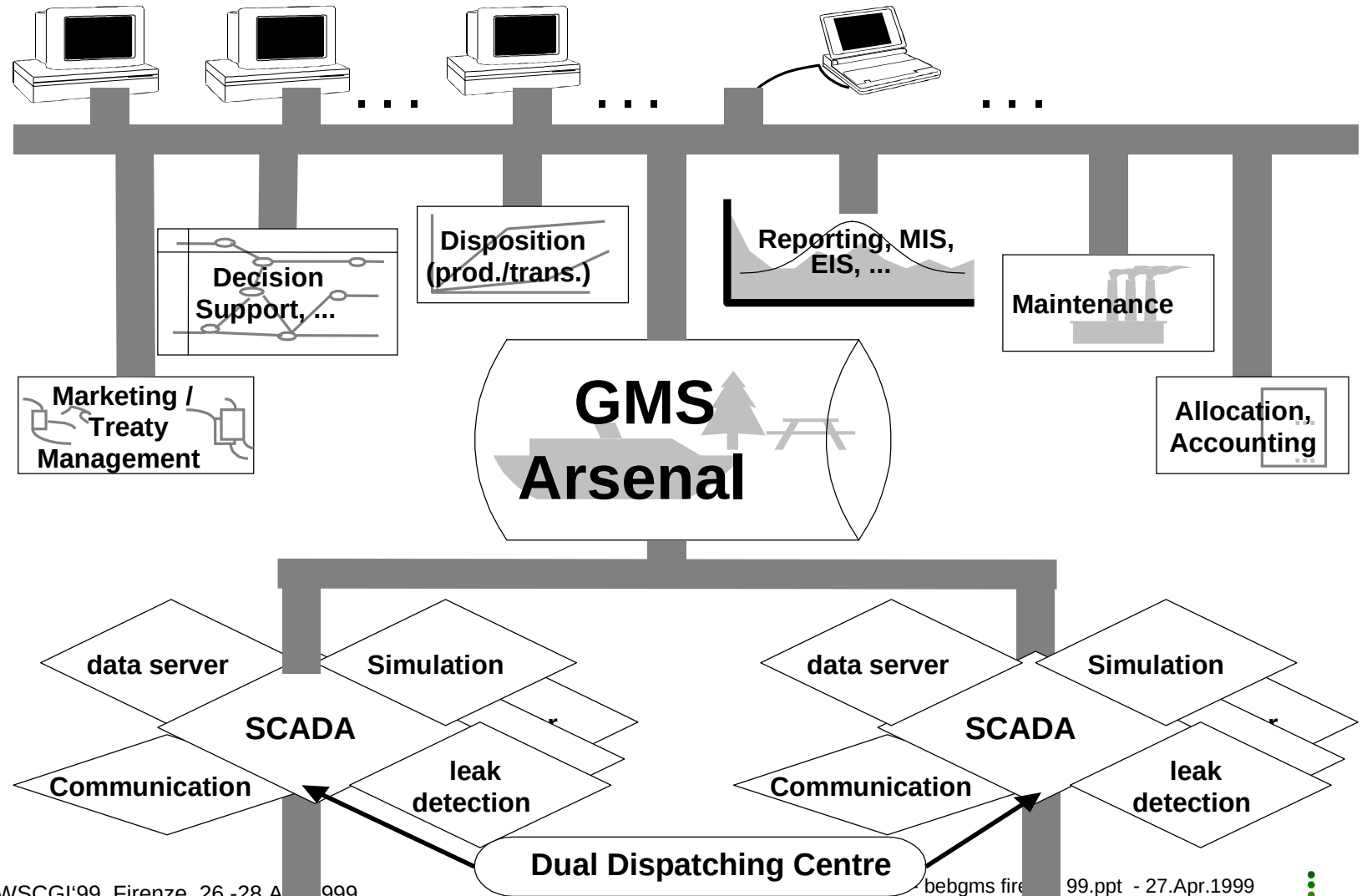

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S: safety, security

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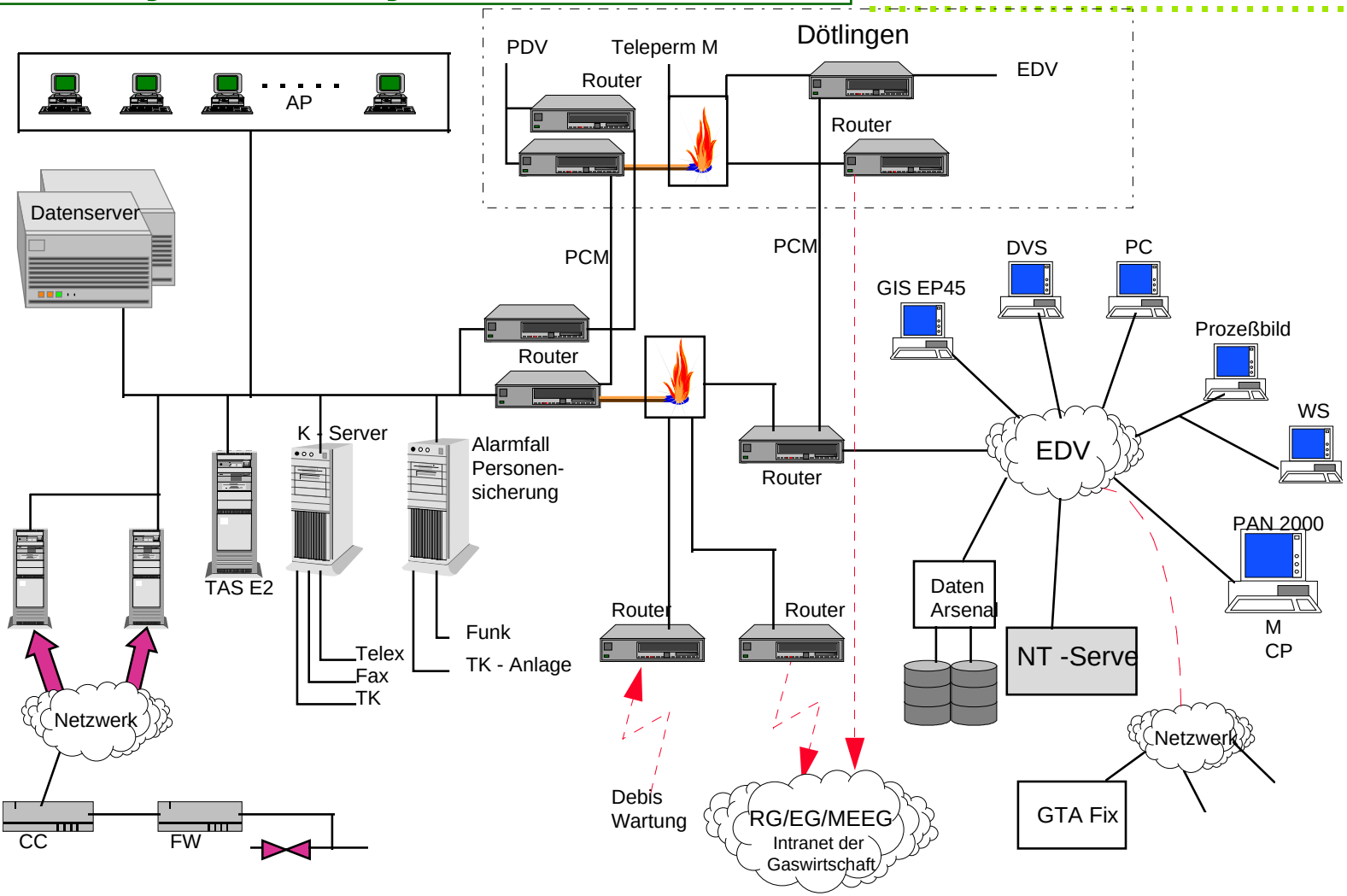

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S: GMS organisation

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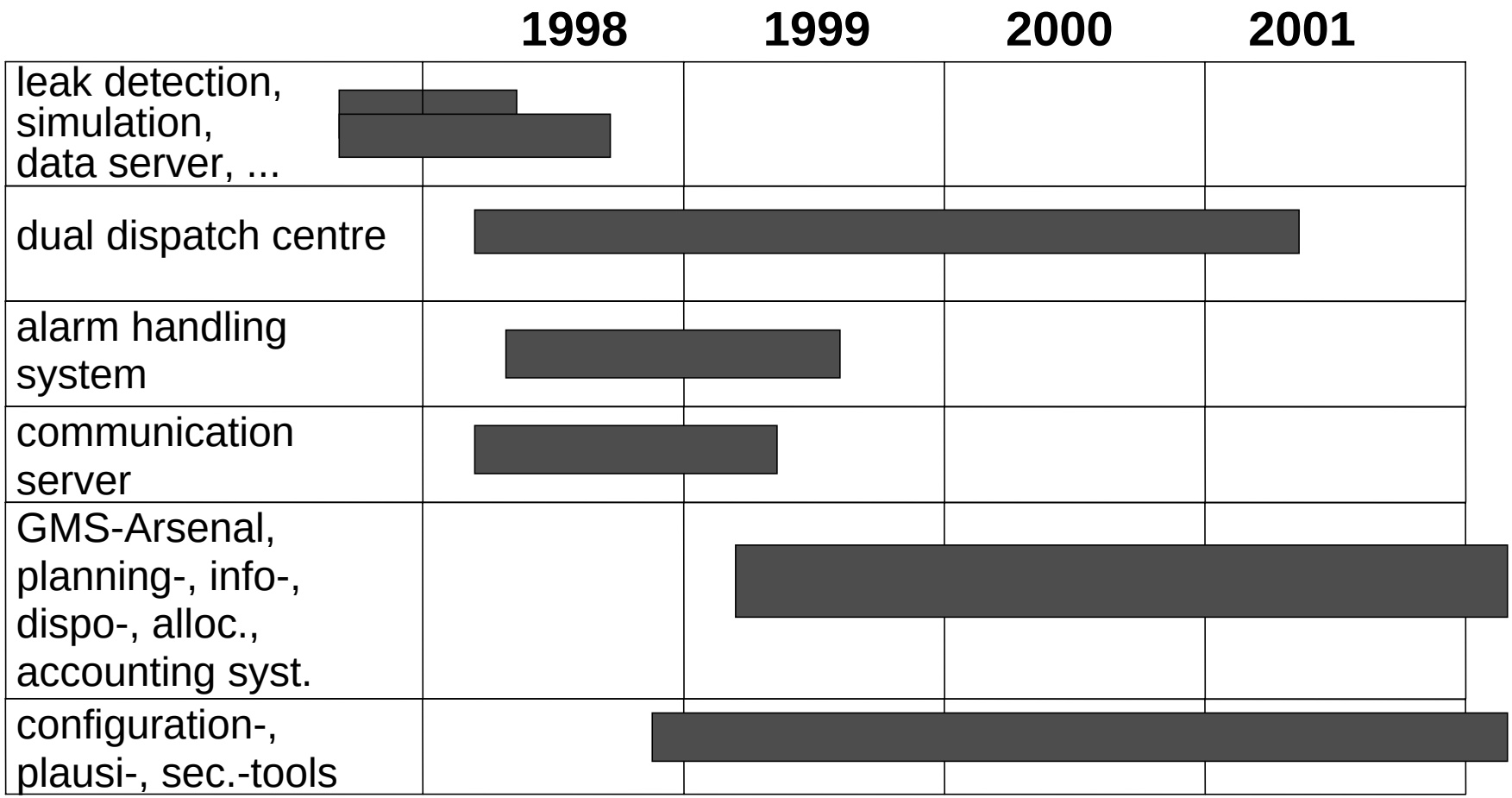

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S: standardisation

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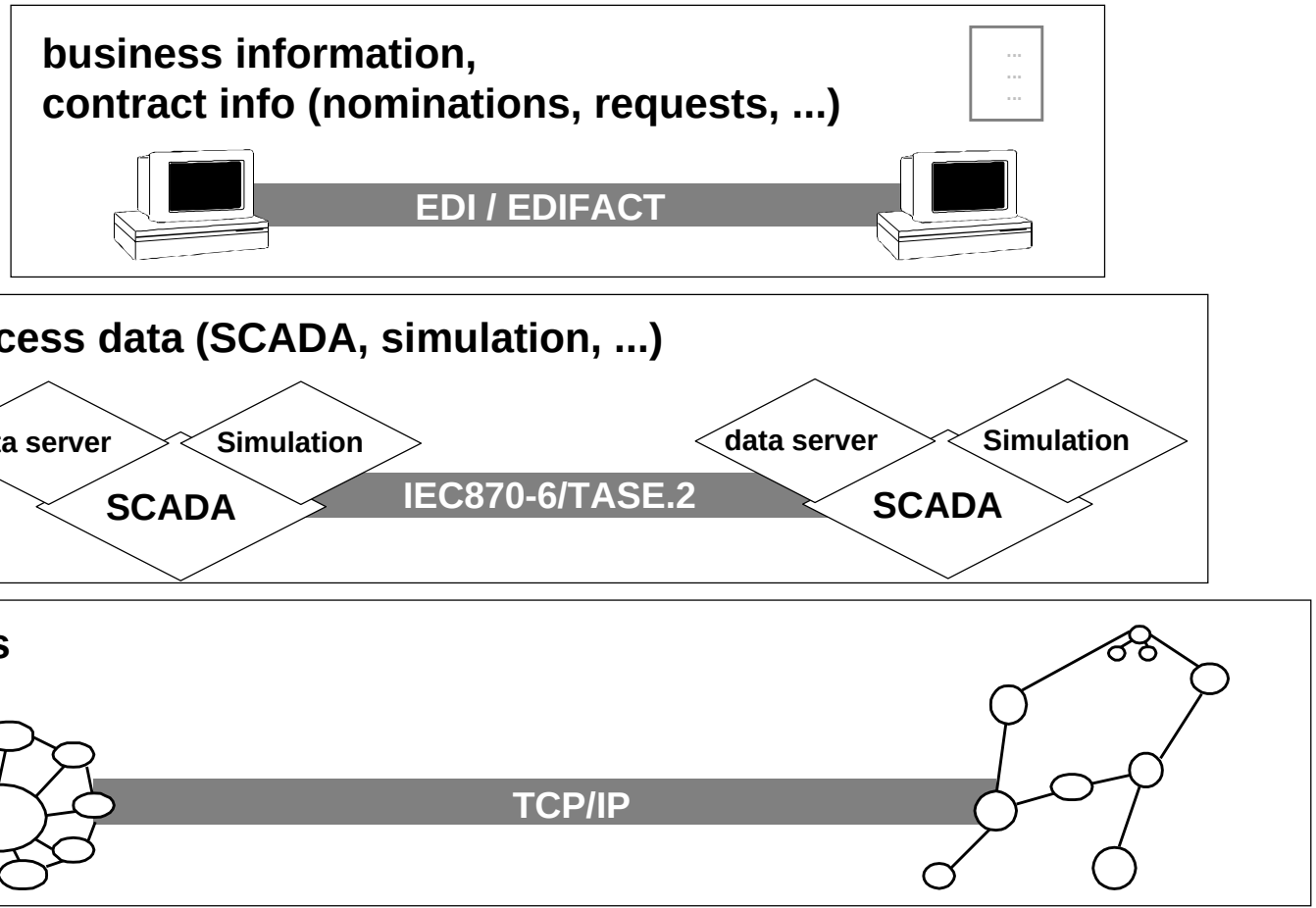

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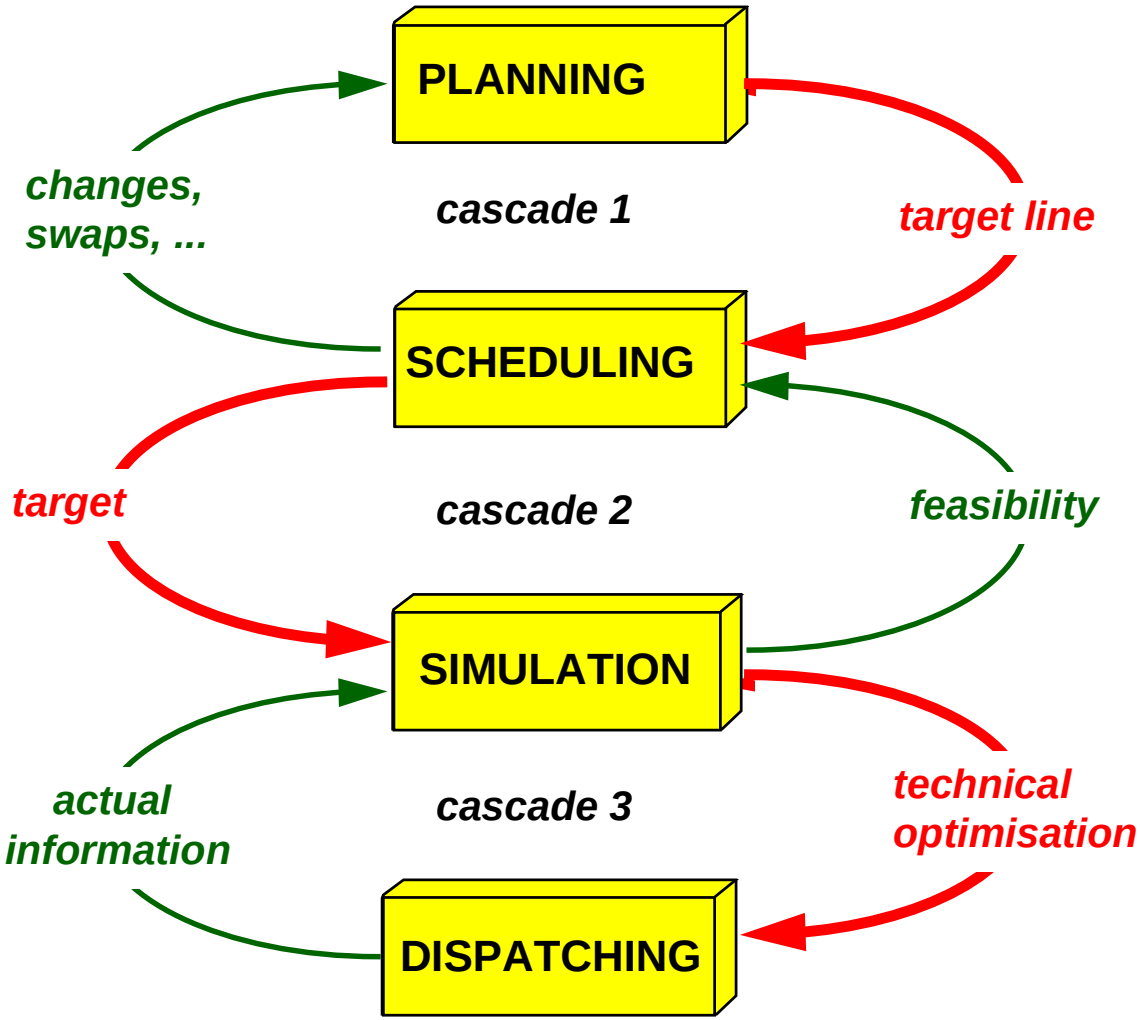
M: optimisation



economical optimisation

technical optimisation

control & operating

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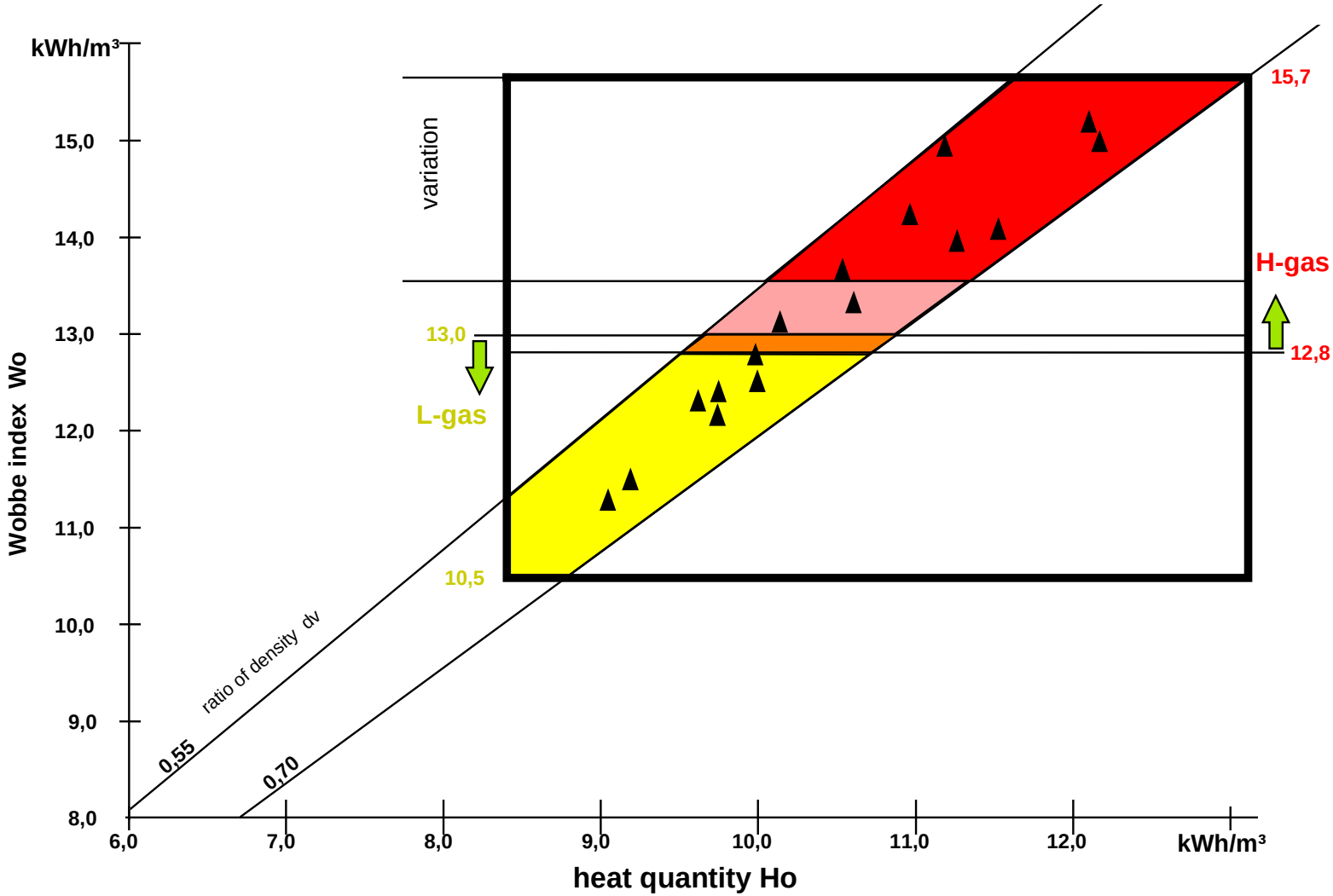
G: gas quality



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M: side constraints

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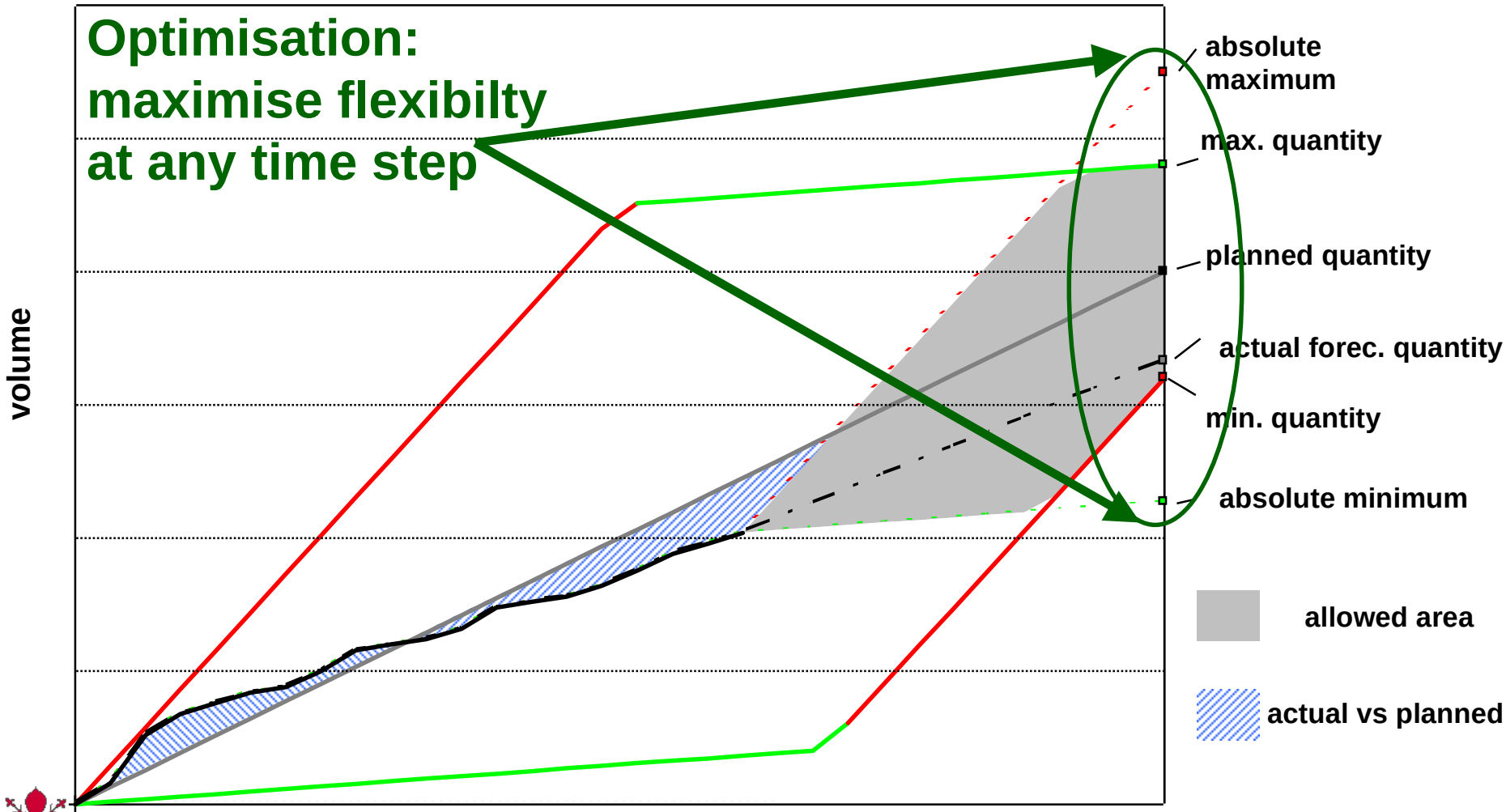

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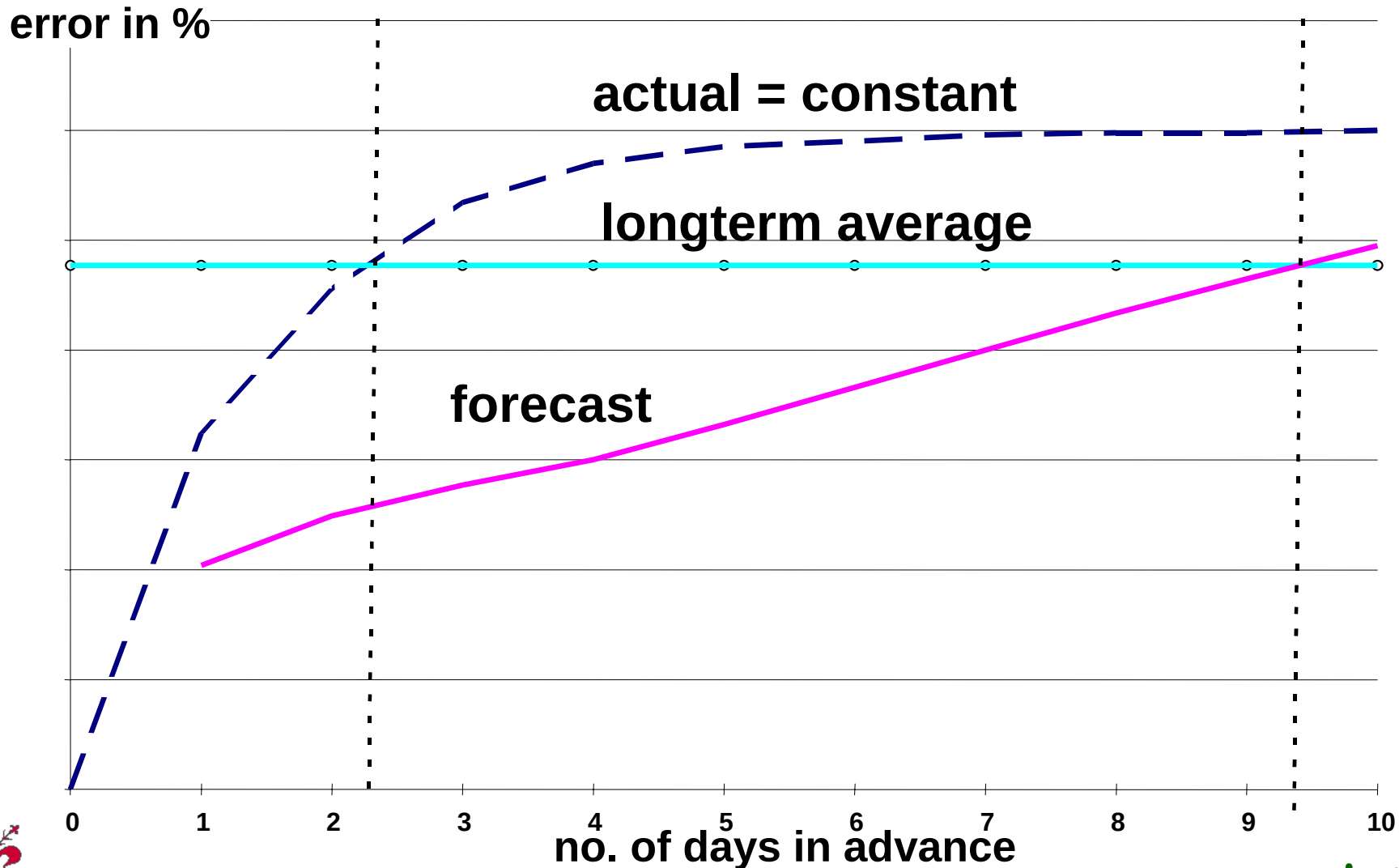
M: optimisation



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M: forecasting energy over temperature

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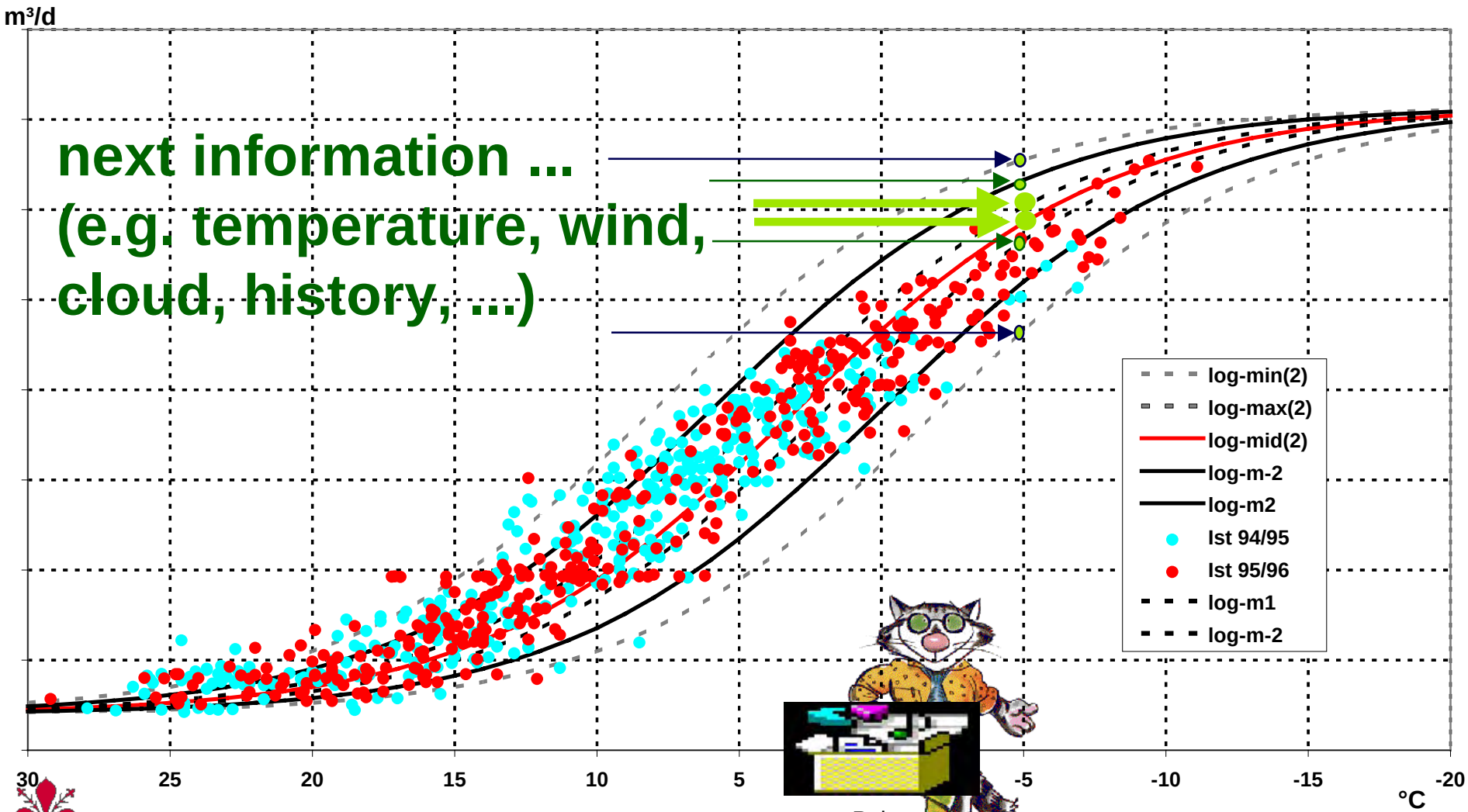

… thank you for your kind attention …