



CATOP 2000



NEWEST MATHEMATICS APPLIED IN ENERGY INDUSTRY

Congress on Categorical Topological Methods

July 4 - 6, 2000

Fribourg, Switzerland





ad topic ...

Congress on Categorical Topological Methods

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TOPIC:

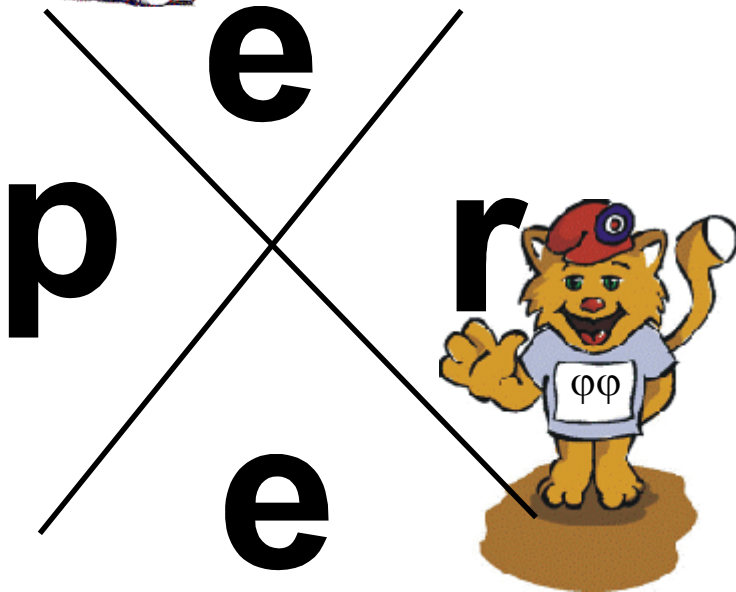
It is the aim of this conference to discuss categorical topological methods that are likely to be mathematically important in the next century. Furthermore, ...



agenda & ad „furthermore, ...“



- **K**itchen: cats and tops
- **l**ogic of topos
- **e**nergy
- **i**ndustry
- **s**ystems
- **l**ook for next century
- **i**nformation and forecasts



70th of Heinrich Kleisli

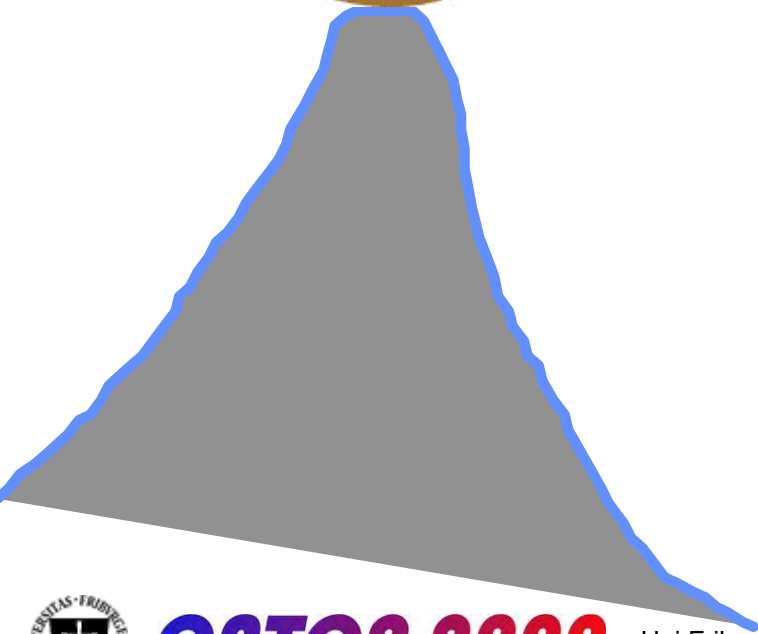
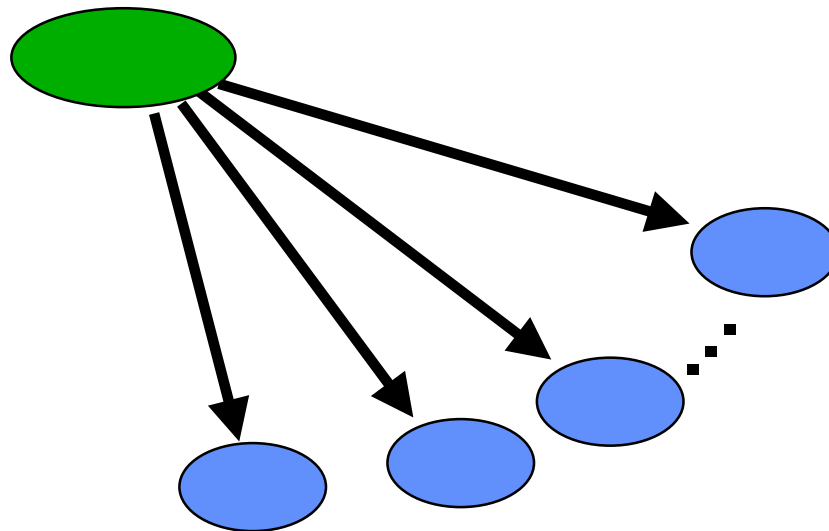


K: top cats - initial structures



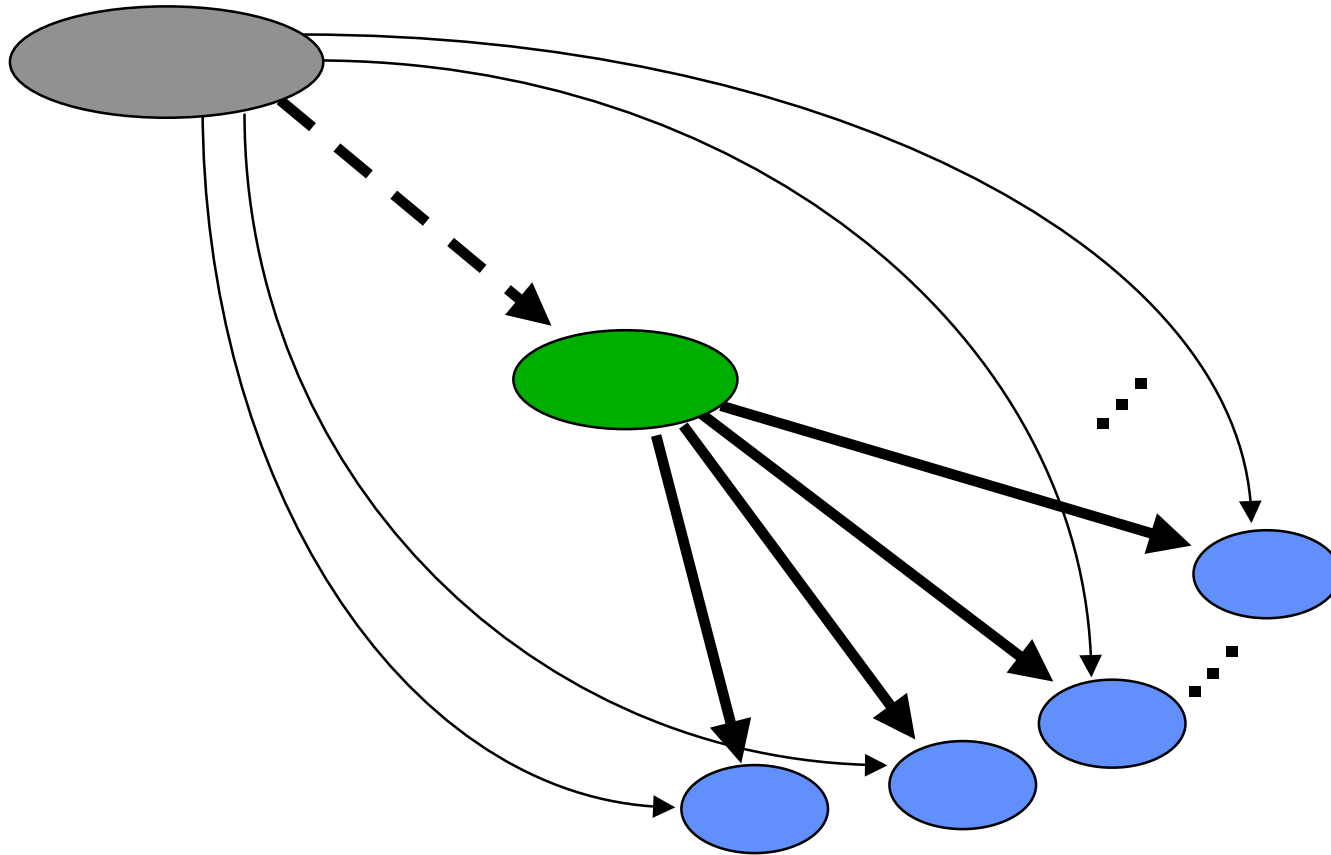
Kant vs Newton

...



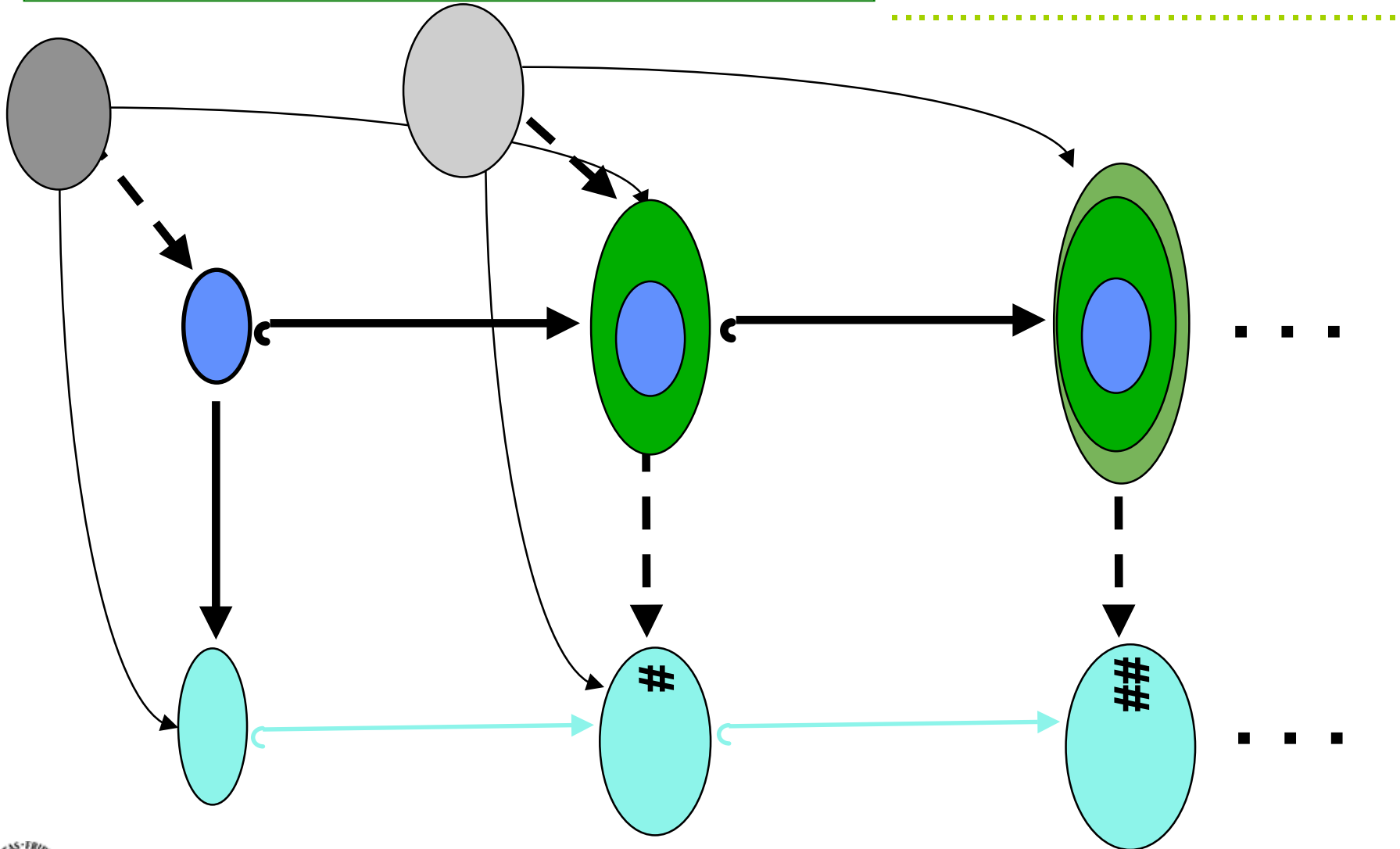


K: top cats - initial structures



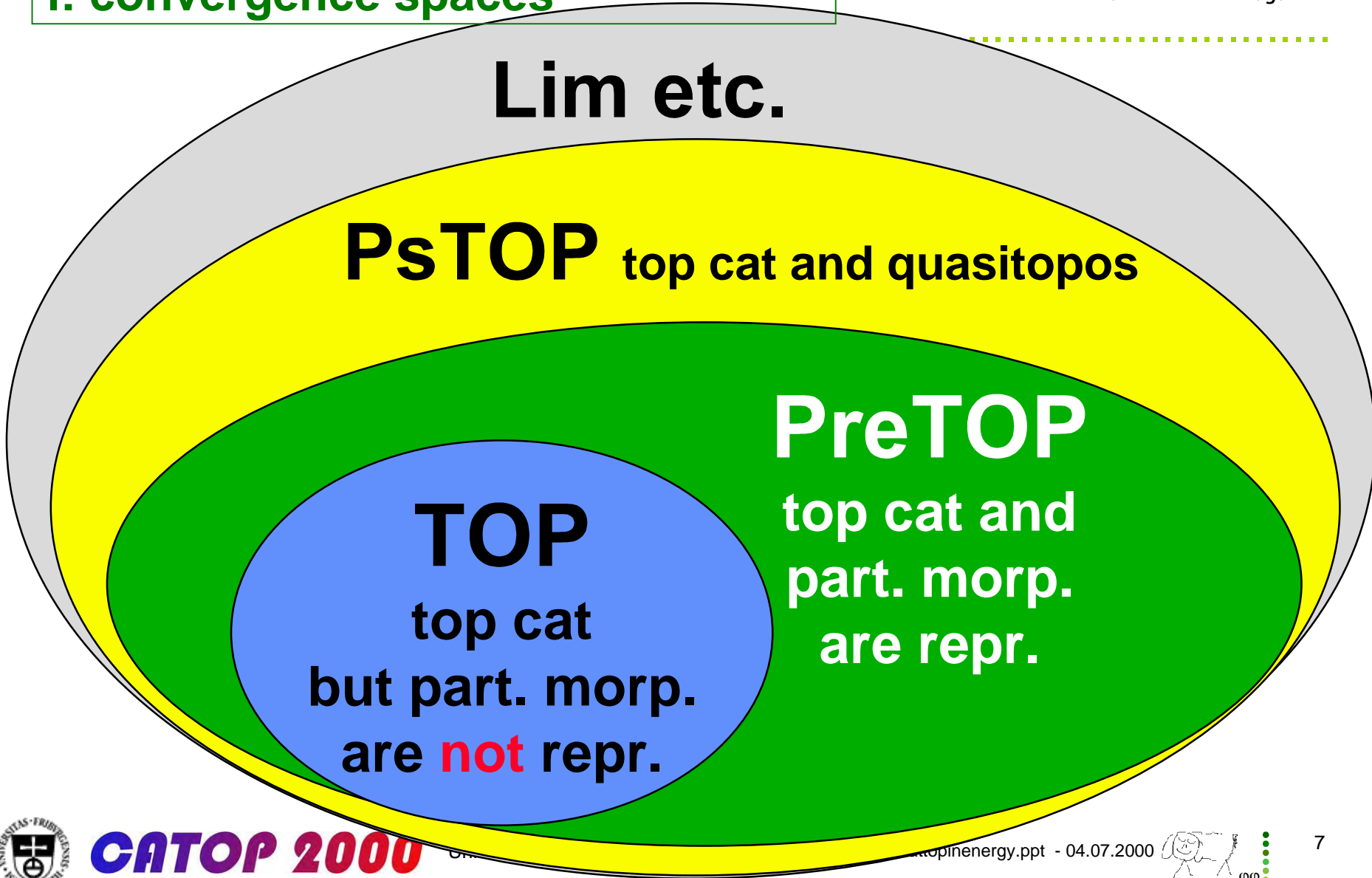


I: quasitopoi - partial morphisms





I: convergence spaces





I: viva PreTOP ...

in practice:

- look for non idempotent hull operators
- look for "partial knowledge"
- look for extensions

pretopologies have the "build in" iterative process, in particular needed, if no direct solutions are possible and/or known !!!

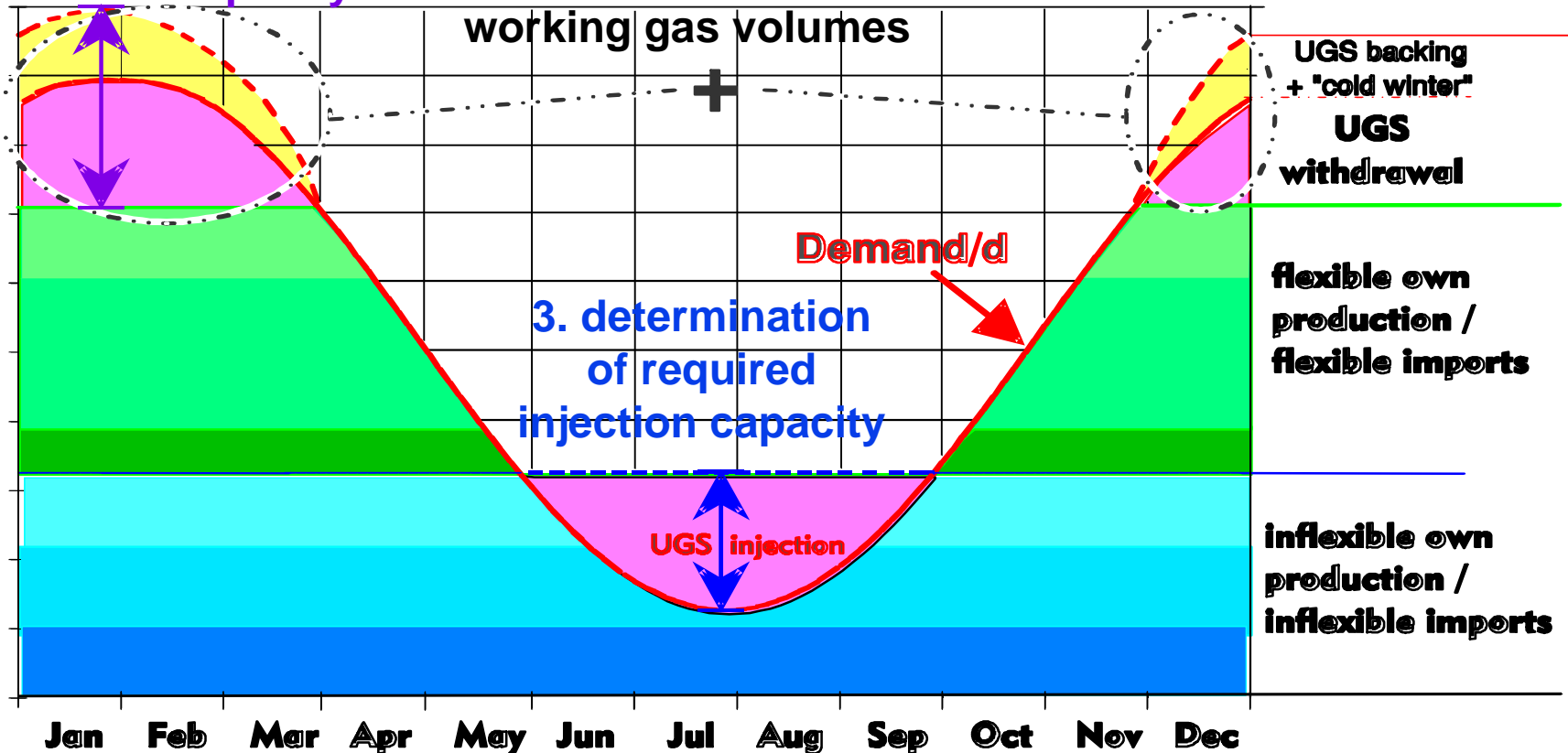


e: load balancing

2. determination of required withdrawal capacity

1. determination of required working gas volumes

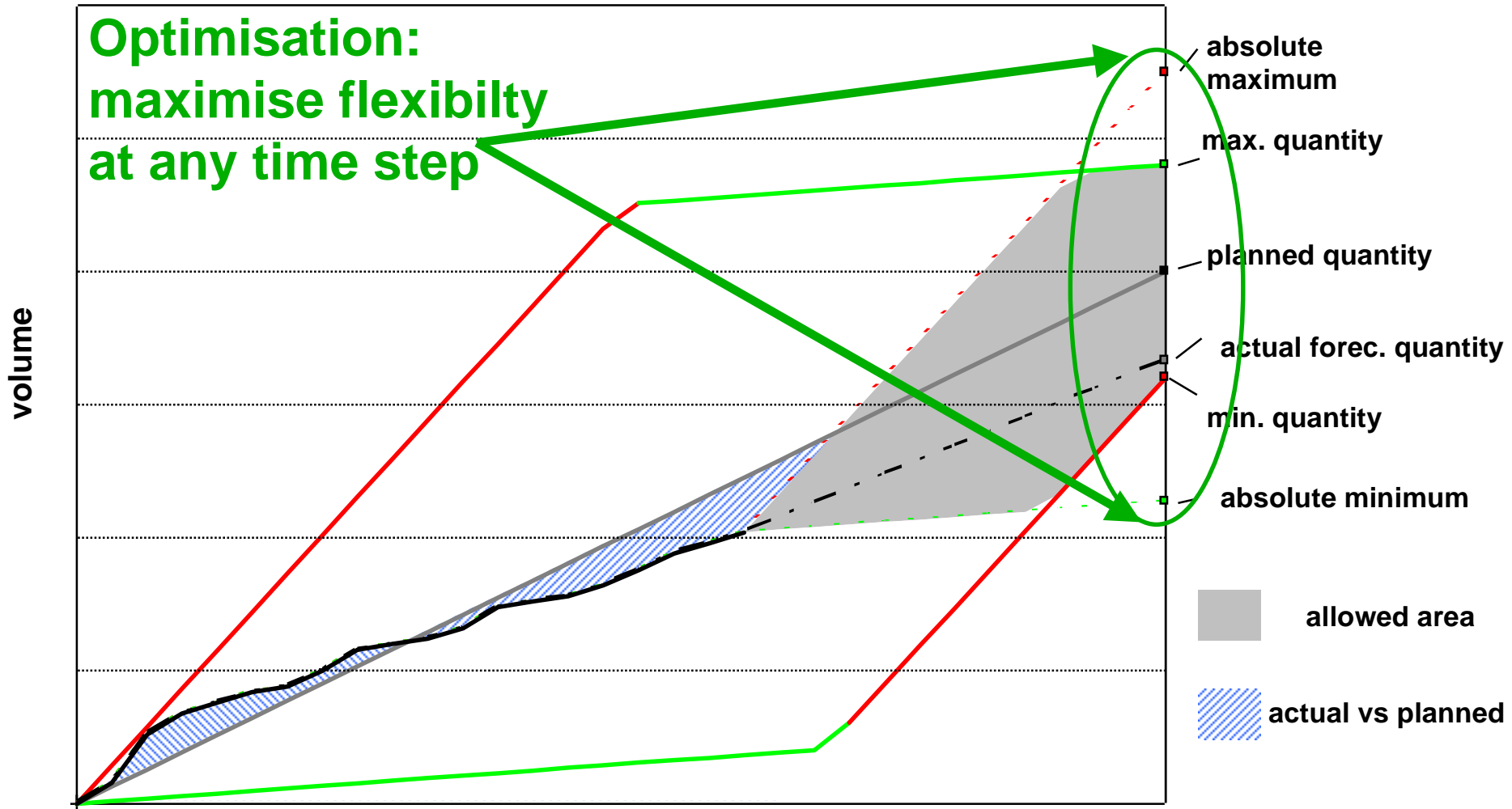
3. determination of required injection capacity





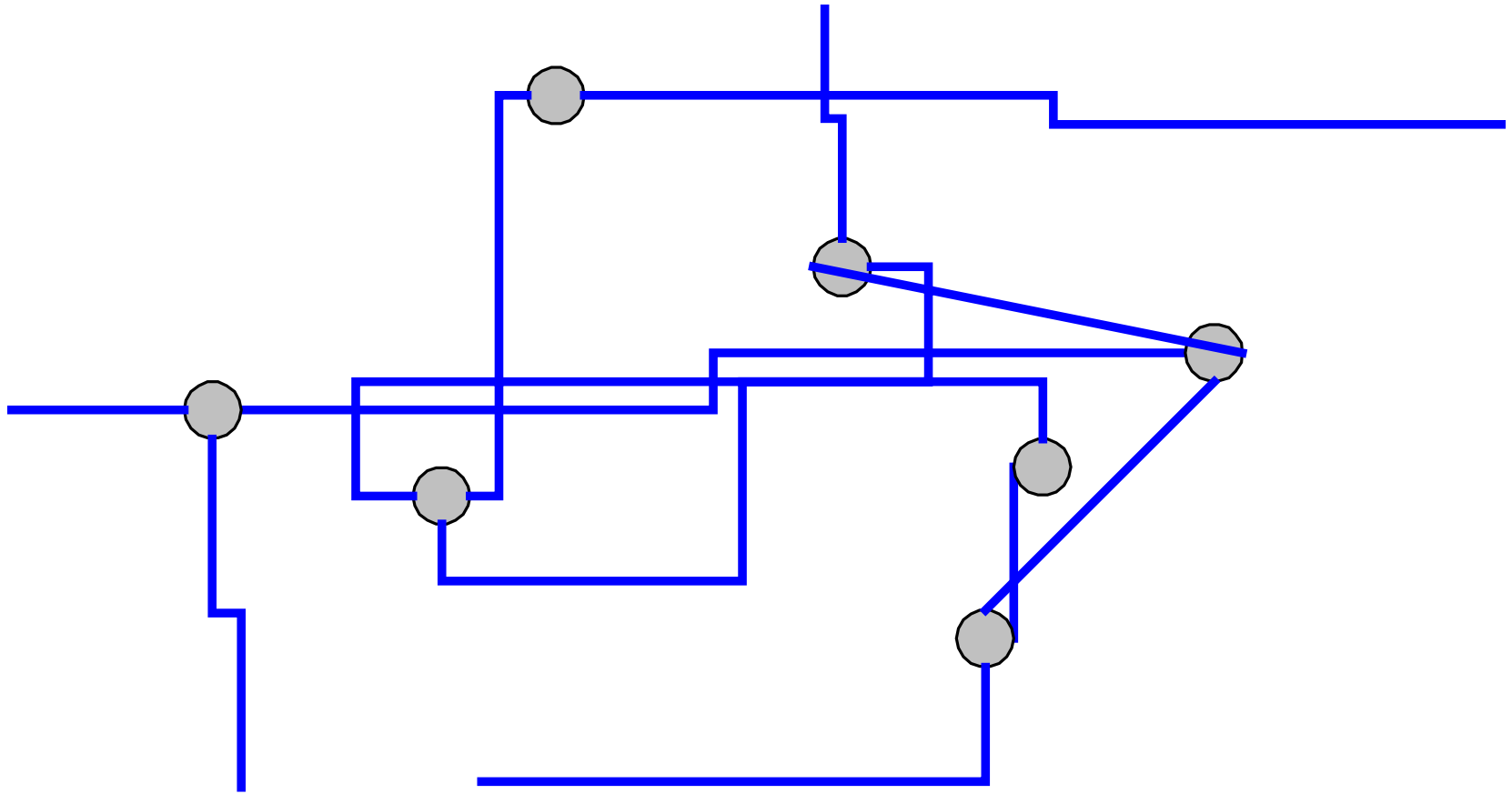
e: side constraints

**Optimisation:
maximise flexibility
at any time step**





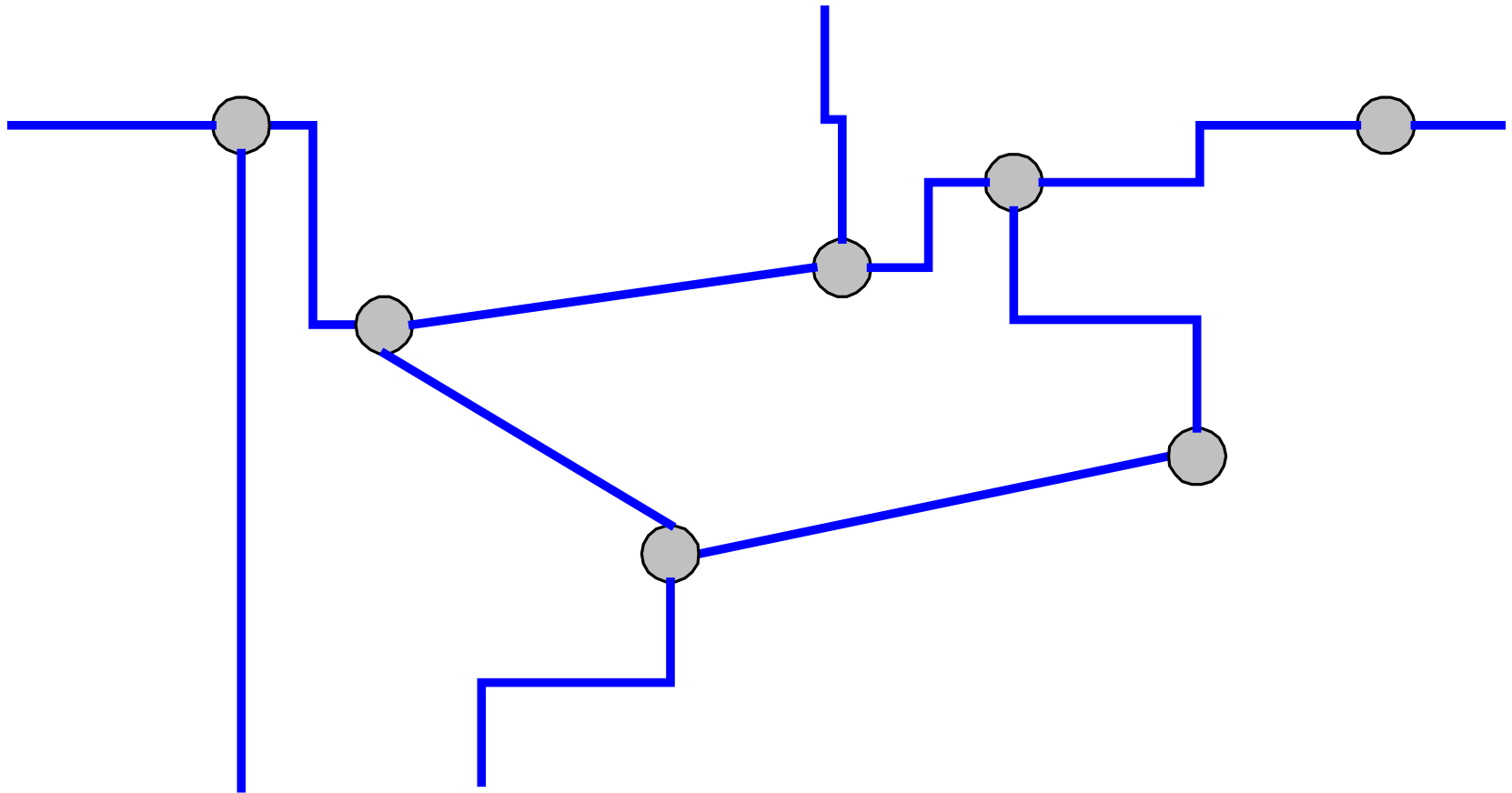
e: pipelines ...

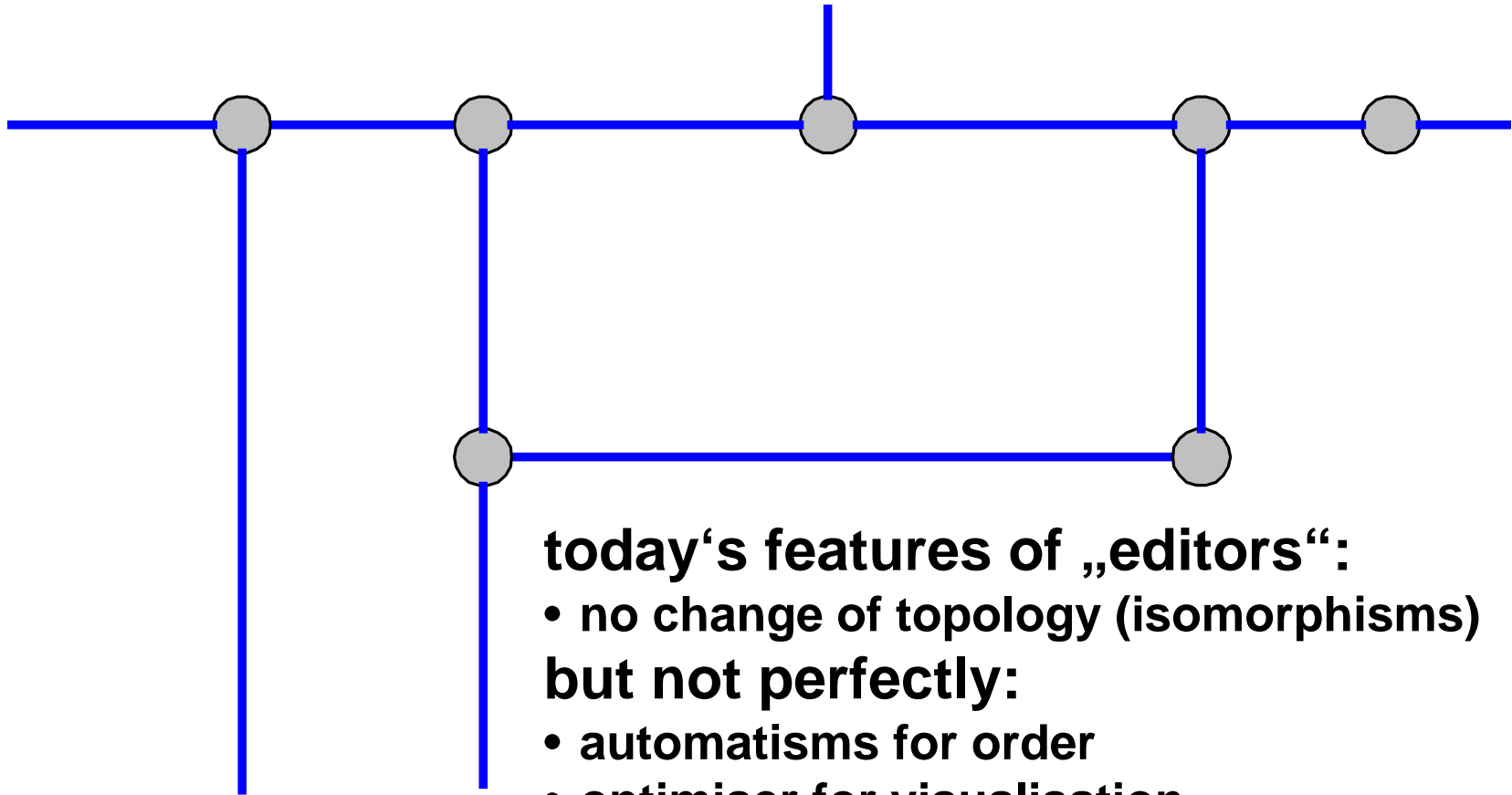




Newest Mathematics Applied in Energy Industry

e: pipelines ...





today's features of „editors“:

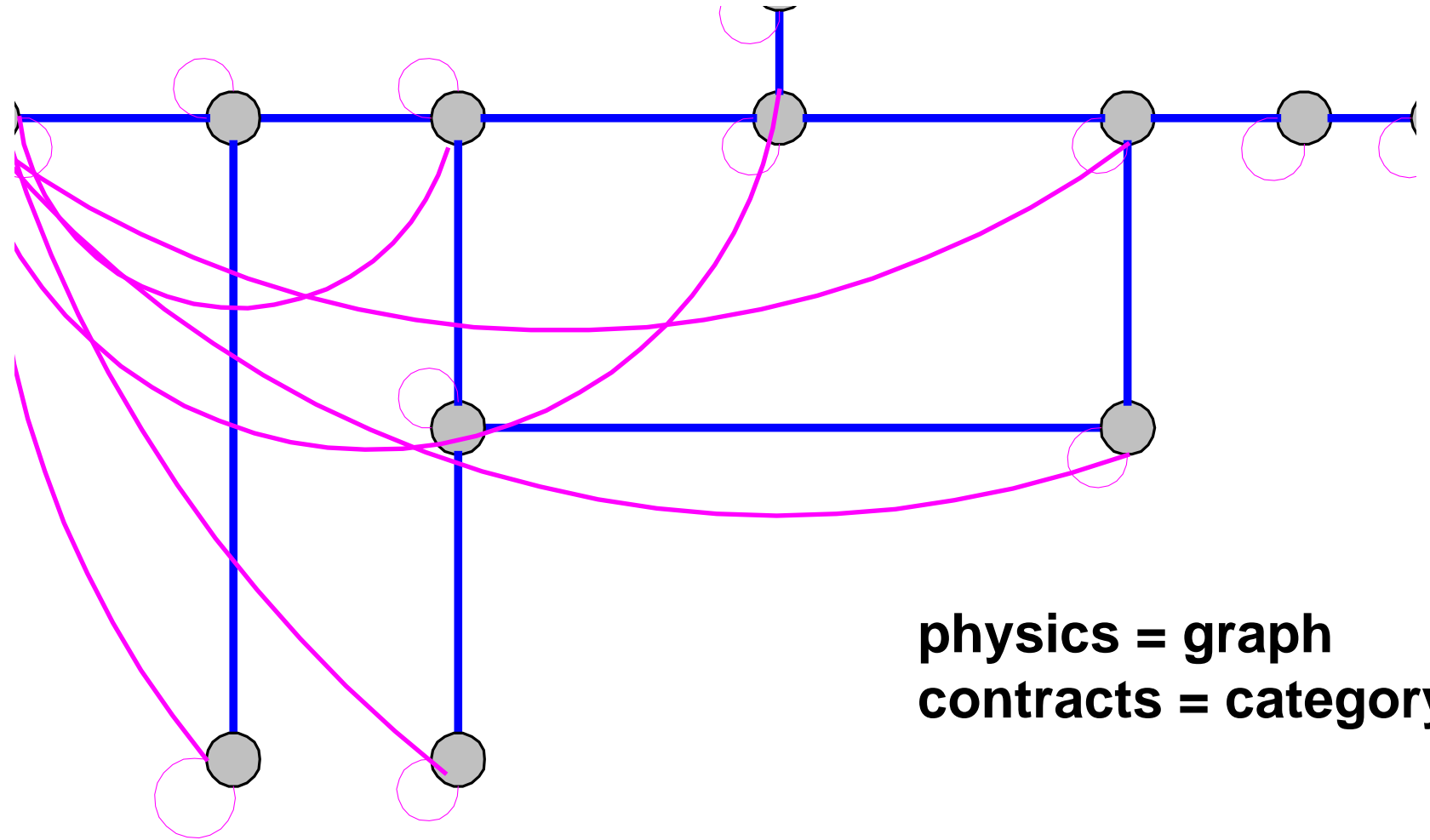
- no change of topology (isomorphisms)

but not perfectly:

- automatisms for order
- optimiser for visualisation

but definitely not:

- limits and colimits ...



physics = graph
contracts = category

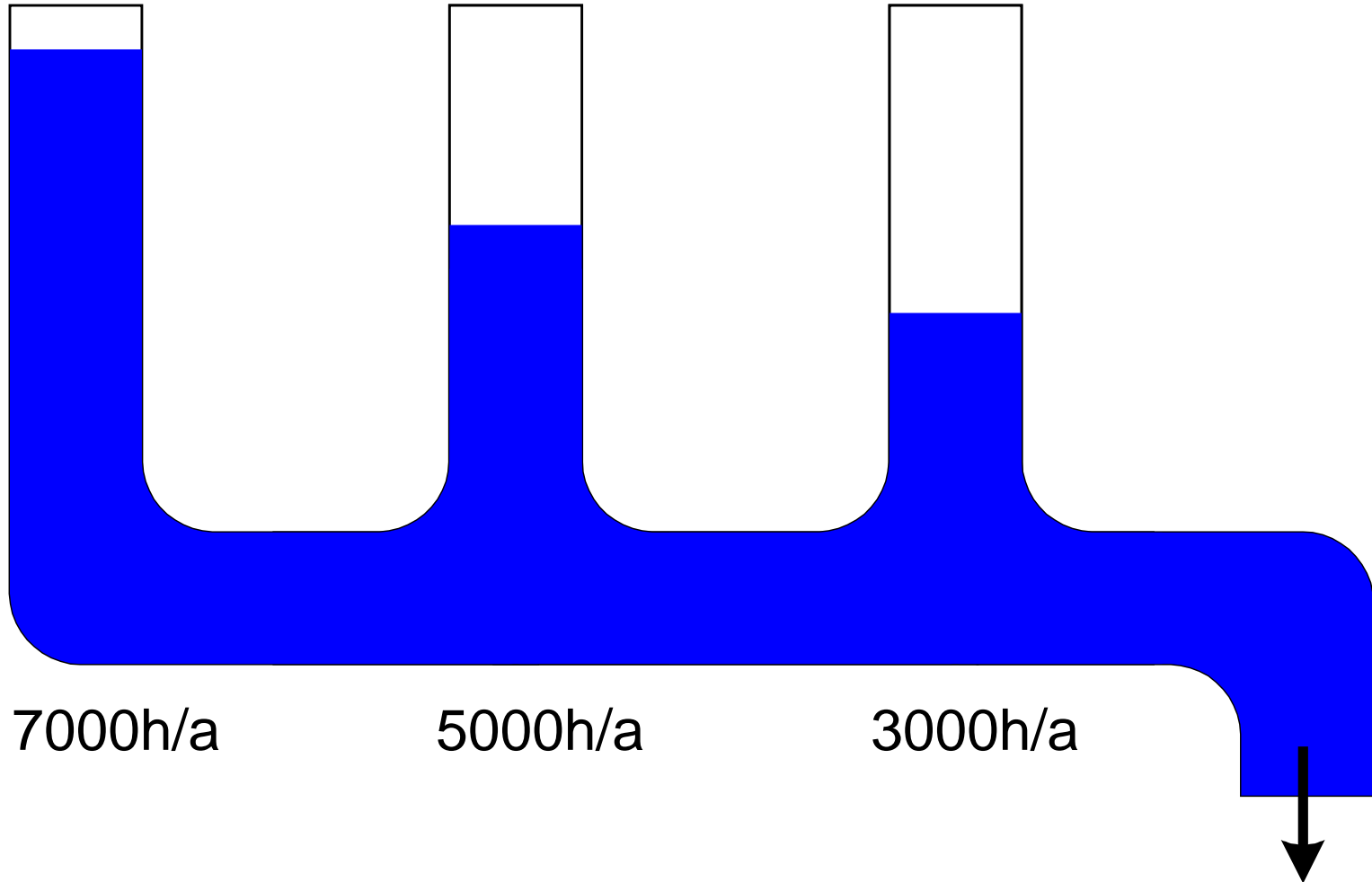


I: applications of bin packing

- ✌ wired circuit boards
- ✌ space technology
- ✌ logistics (“decide as late as possible ...”)
- ✌ balancing of energy grids
- ✌ pattern recognition
- ✌ ...



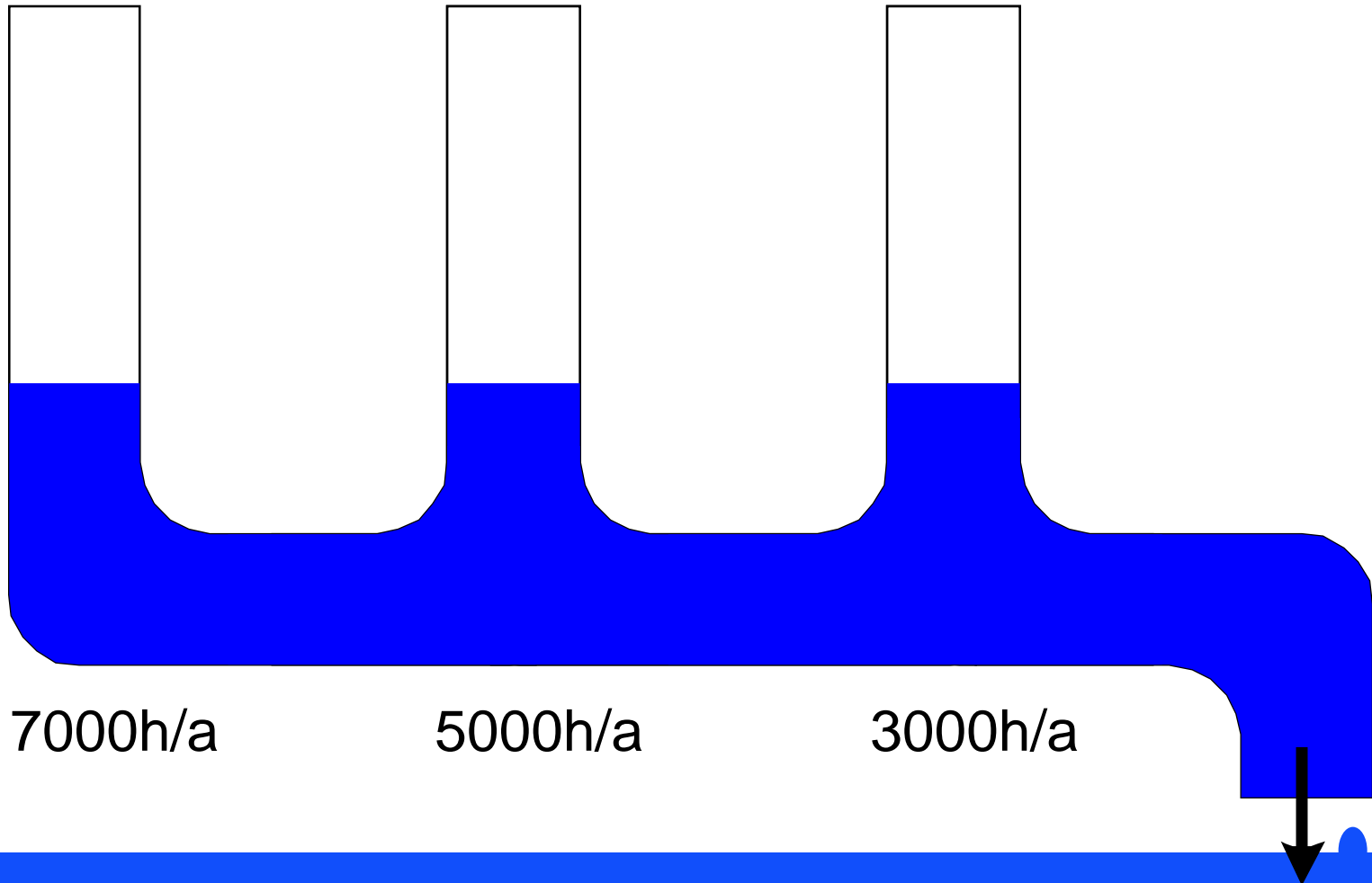
I: communicating tubes = bin packing





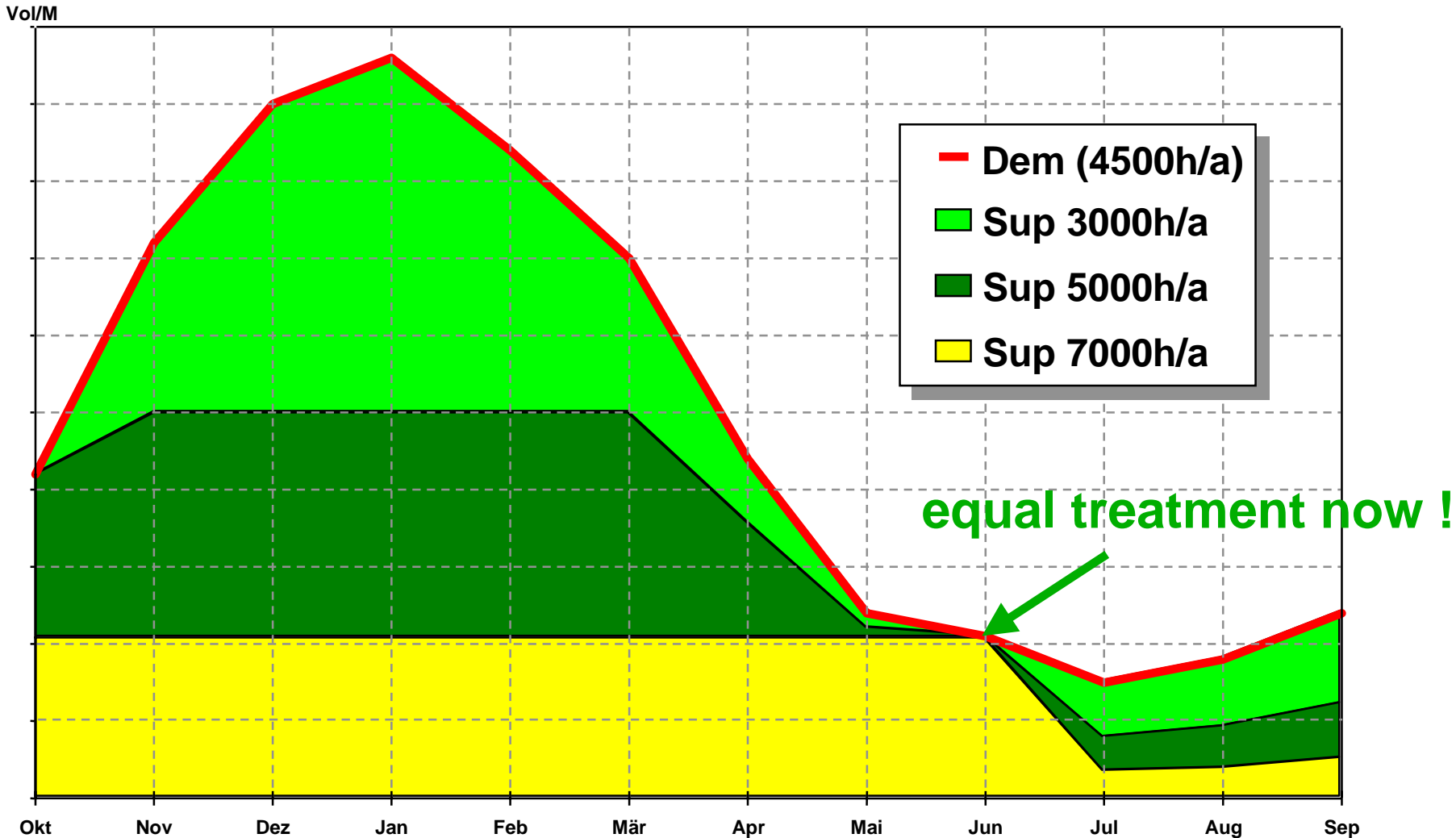
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I: communicating tubes = bin packing





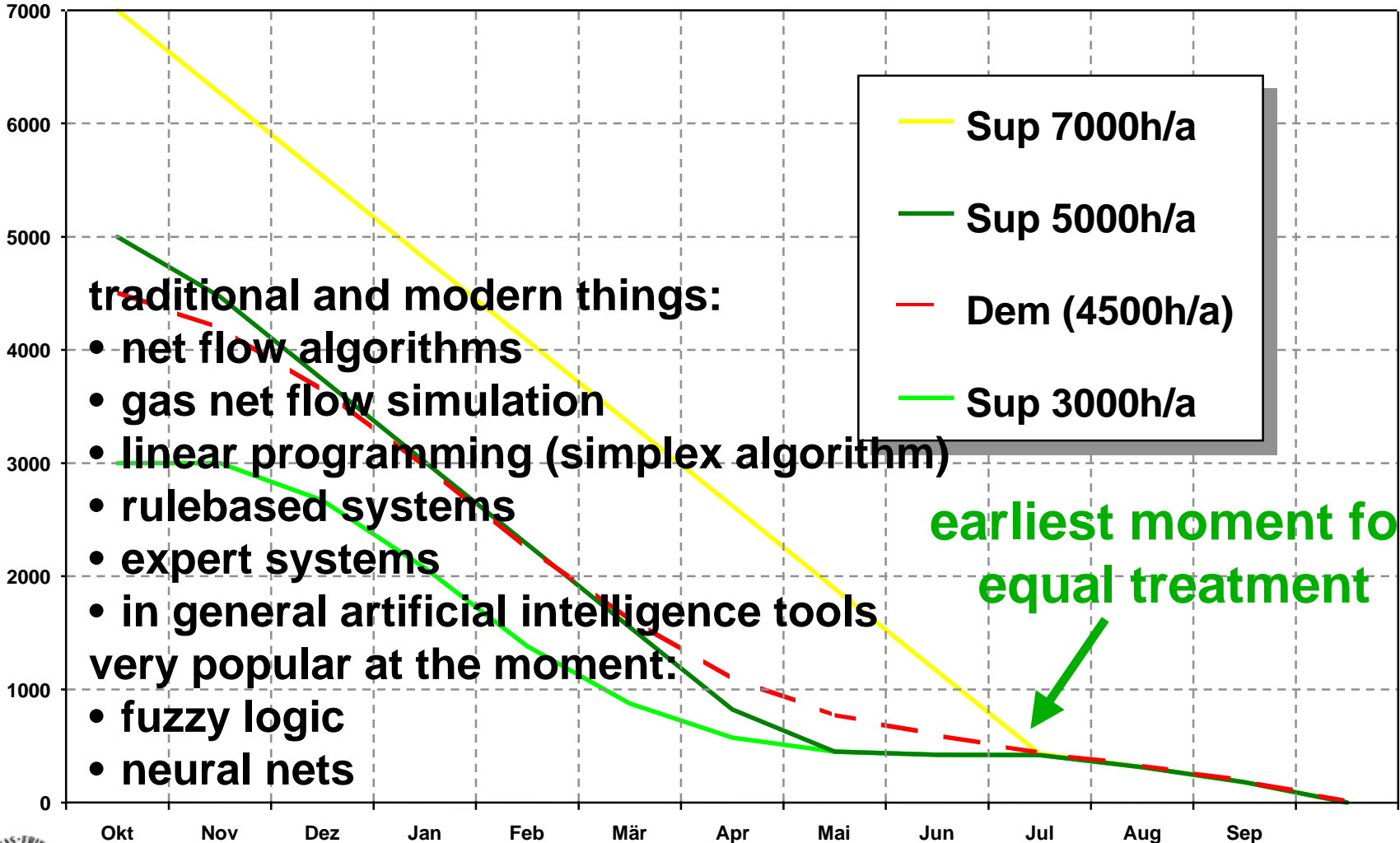
I: demand/supply balancing





I: equal treatment as soon as possible

Rest Bh (Monatsbeginn)



traditional and modern things:

- net flow algorithms
- gas net flow simulation
- linear programming (simplex algorithm)
- rulebased systems
- expert systems
- in general artificial intelligence tools very popular at the moment:
- fuzzy logic
- neural nets

earliest moment for equal treatment

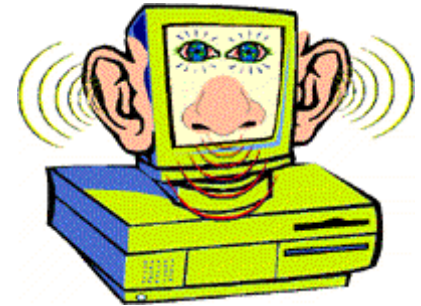


Human Interface Supervision System

Seeing



- External influences due to unauthorised persons/ fire/storm damage
- Formation of ice on parts of plants (leaks)
- Accumulations of liquids



Smelling



- Detection of small leaks
- Detection of the key substances benzene and hydrogen sulphide
- Separation of plant-specific smells from external smells (e.g. sour gas/liquid manure)

Hearing

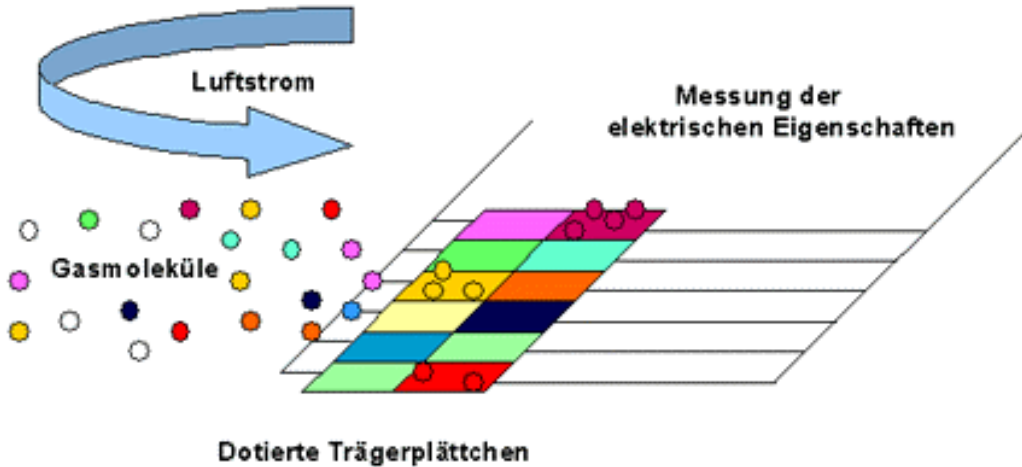


- Detection of small leaks (emissions of gases)
- Detection of faults (e.g. damage to pumps, bearings, etc.)
- Detection of malfunctions from the prevailing ambient noises



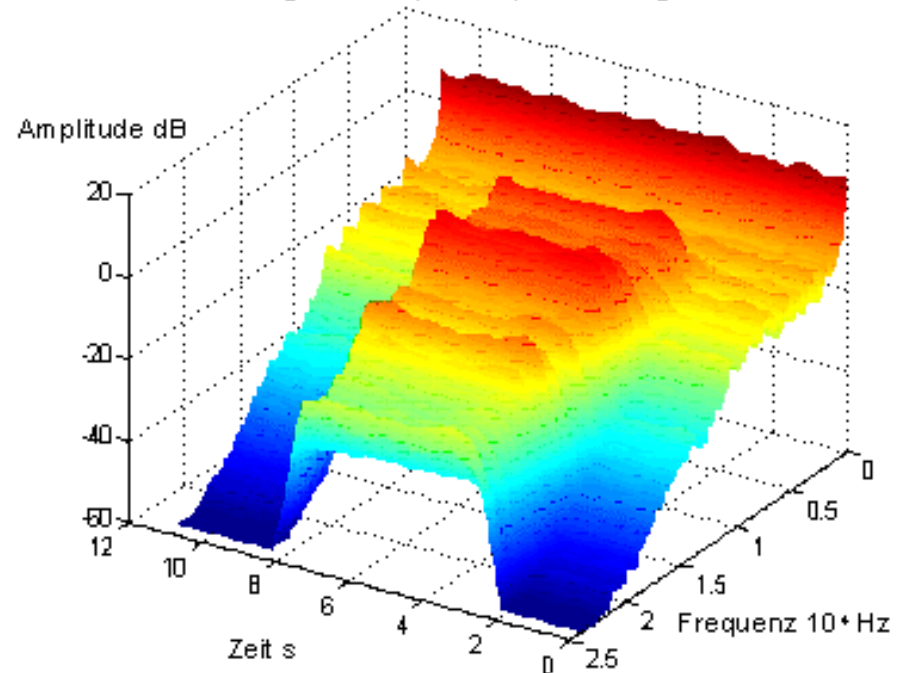
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s: HISS



pattern recognition:
fuzzy logic & neural nets
better => PreTOPs

Ausströmgeräusch (5Nm³/h) mit Grundgeräusch



<http://www.beb.de>



Intelligente Erdgasförderung

EXPO2000 HANNOVER

Registriertes Projekt der Weltausstellung



CATOP 2000

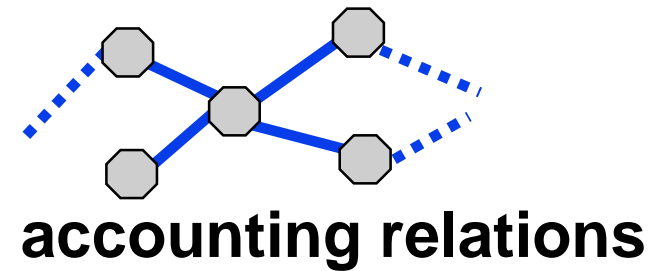
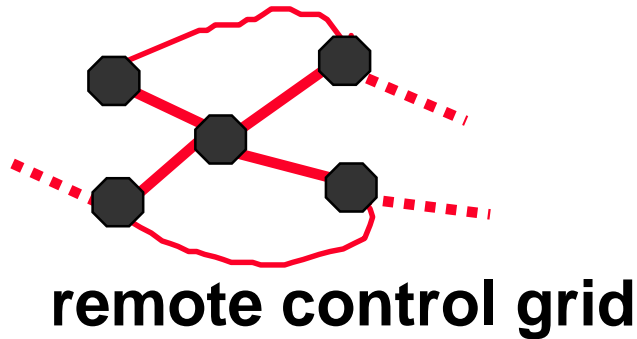
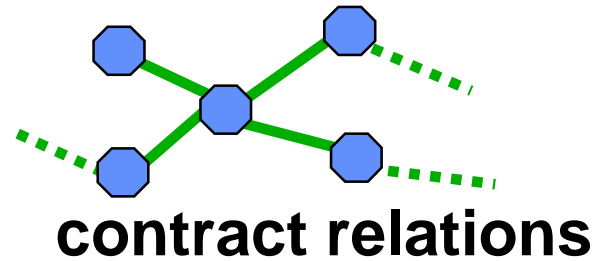
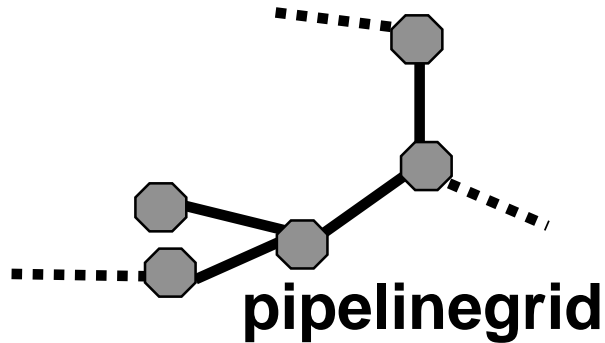
Uni Fribourg, July 4-6, 2000

rolf.brandt@beb.de - cattopinenergy.ppt - 04.07.2000





I: urgent help from cat top ?





I: where we have to go ... ?

my 5-point-program: computer assistance for
 \cong better isos e.g. automatisms for order, optimiser
for visualisation, ...

 part of grid (sub spaces)

 gluing together of grids (coproducts)

 simplifying grids (quotients)

 product of grids (products)



=> New topological features required !!!

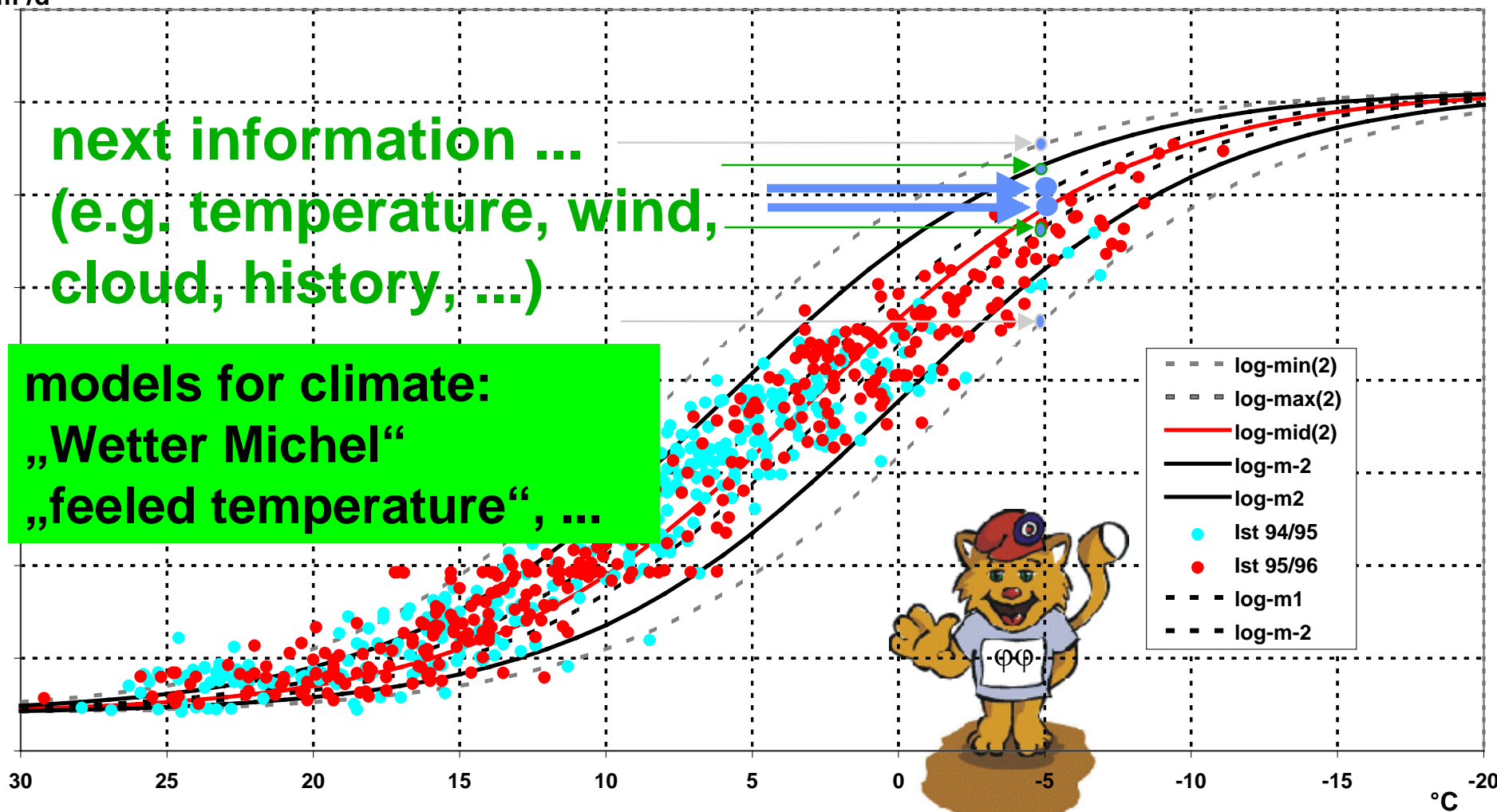


i: forecasting energy over temperature

m³/d

next information ...
(e.g. temperature, wind,
cloud, history, ...)

models for climate:
„Wetter Michel“
„feeled temperature“, ...



- - - log-min(2)
- - - log-max(2)
- log-mid(2)
- log-m-2
- log-m2
- Ist 94/95
- Ist 95/96
- - - log-m1
- - - log-m-2



... thank you
for your
kind
attention ...

