The Project: Who? Why? What?

www.alpstore.info

Ludwig Karg
B.A.U.M. Consult GmbH (Leadpartner)

Future under construction

When is a good moment for the turn?

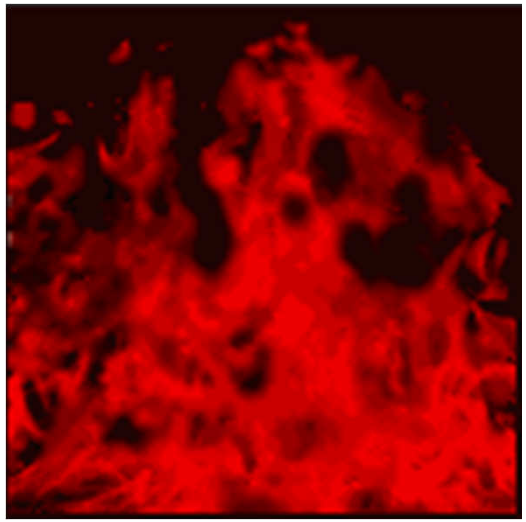
Goals are set

2°

2 t

2 m

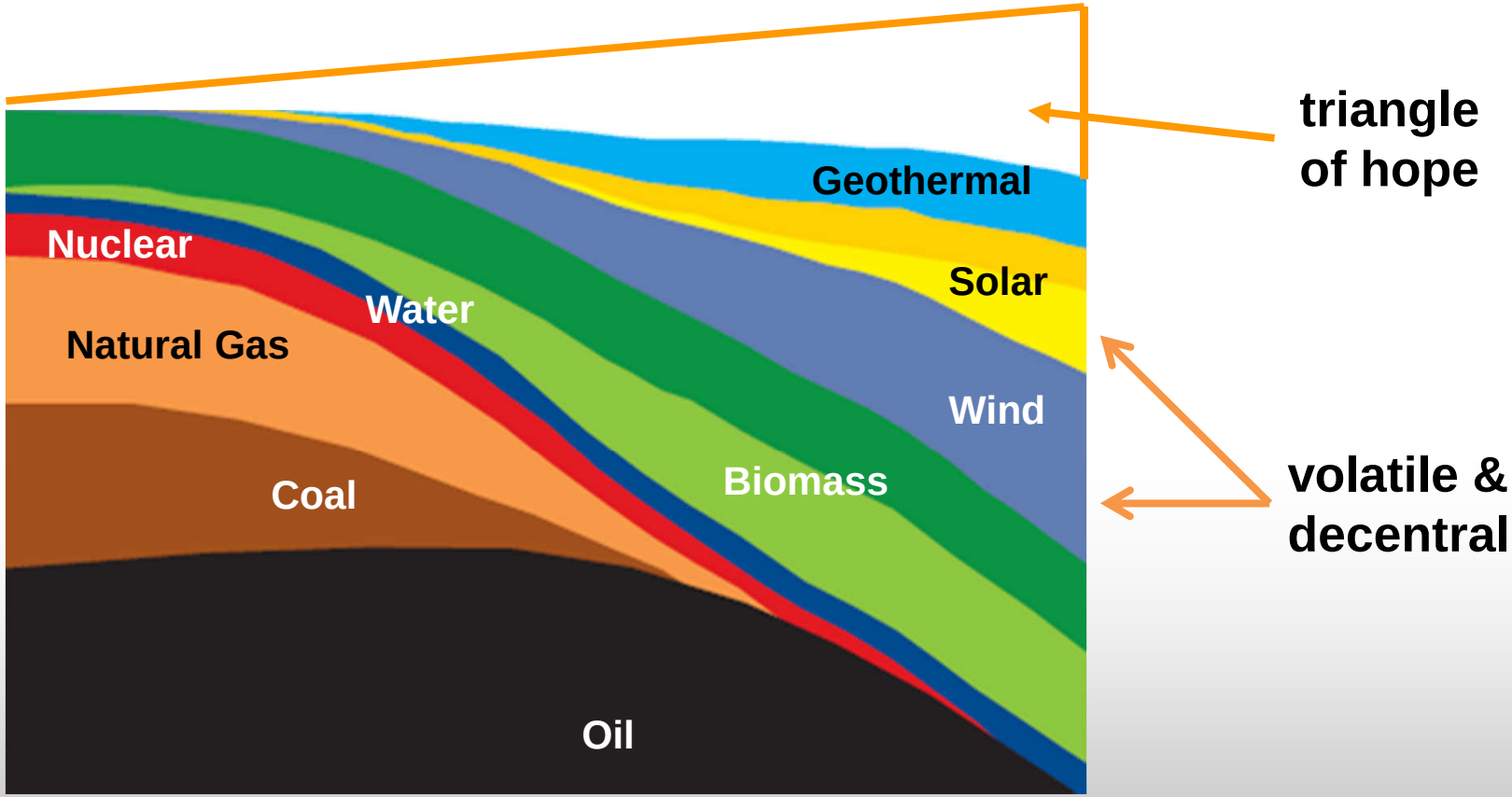
A new era of energies



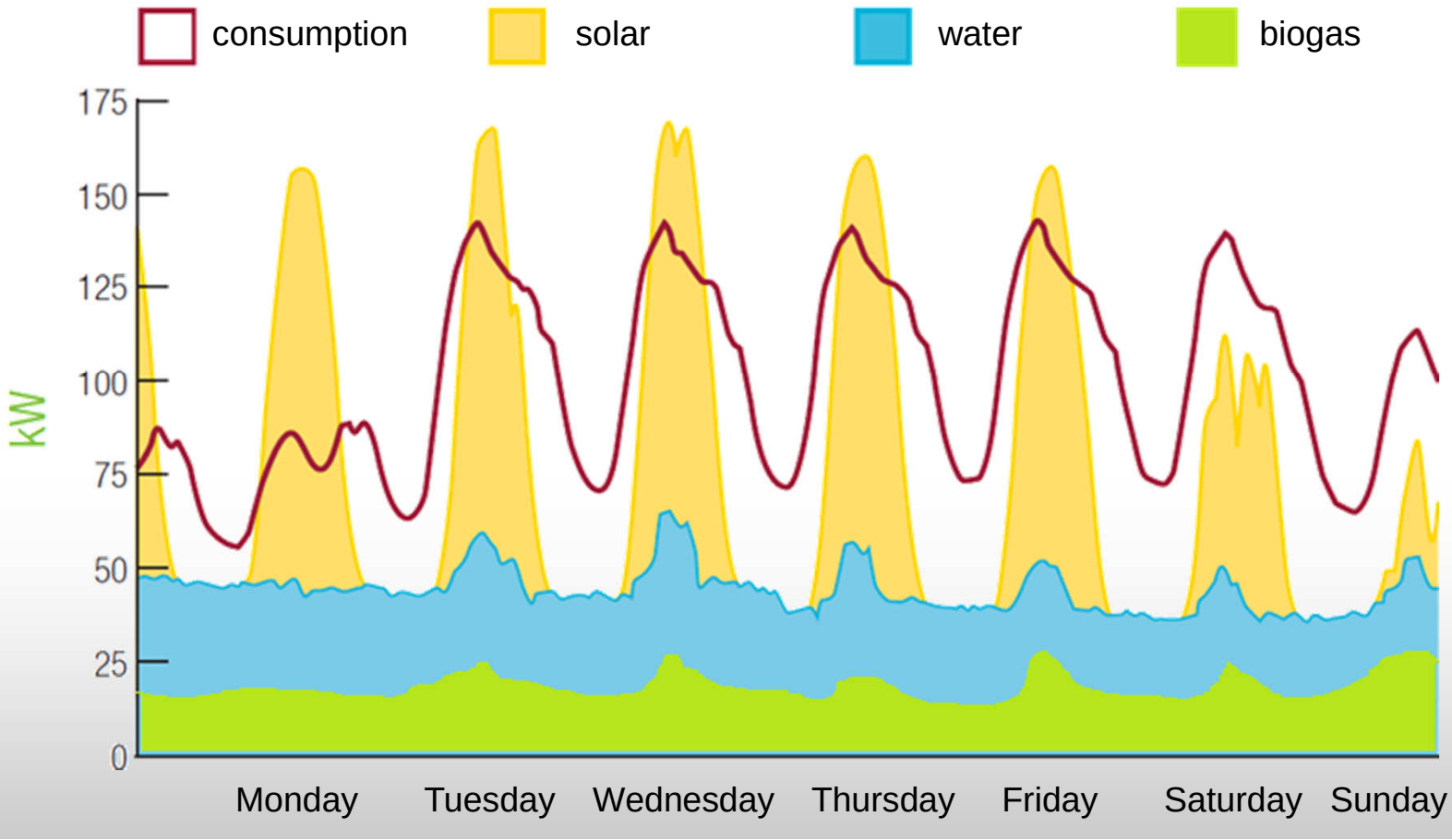
era of fire

era of power

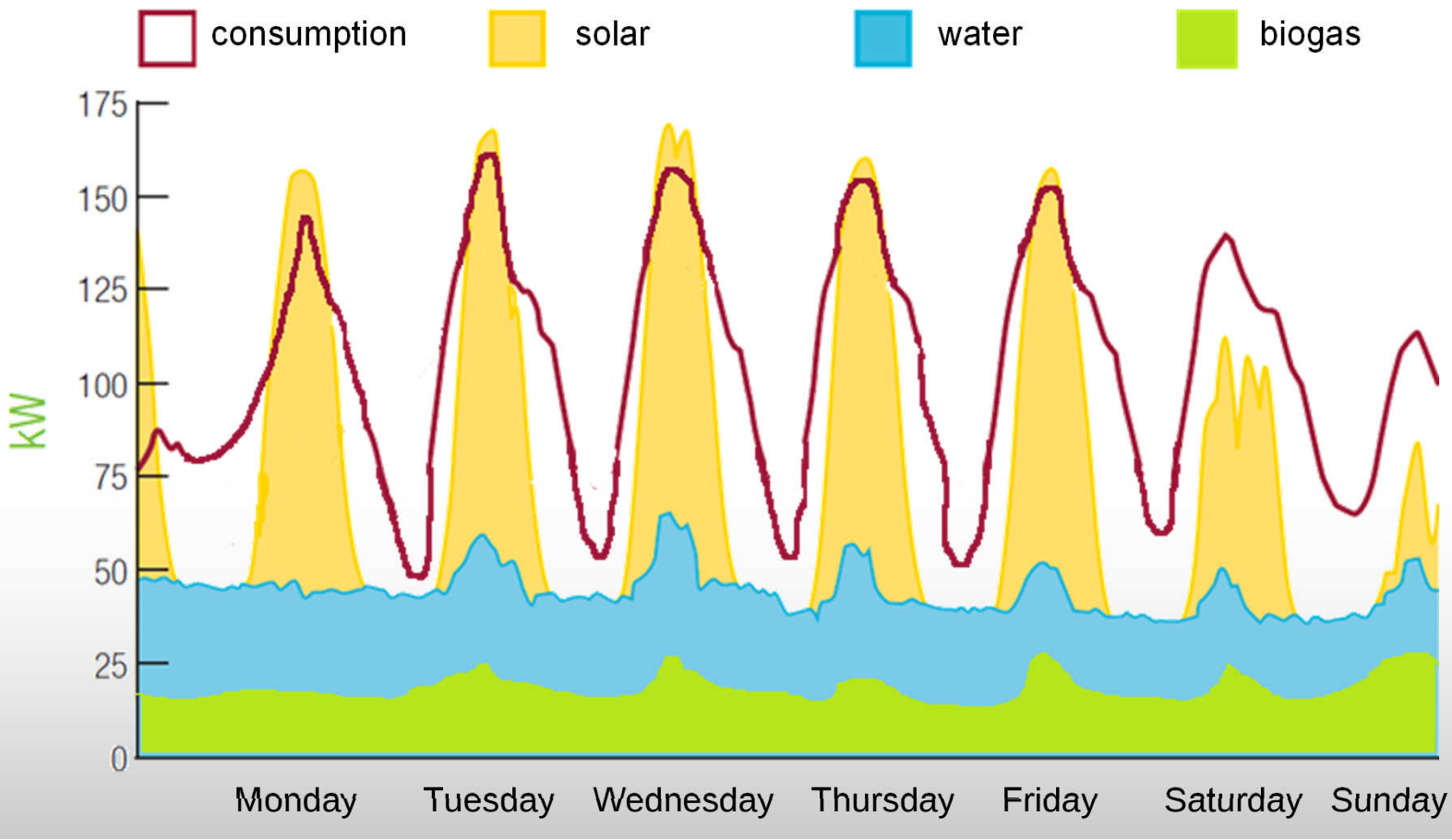
The Future of Energy Supply



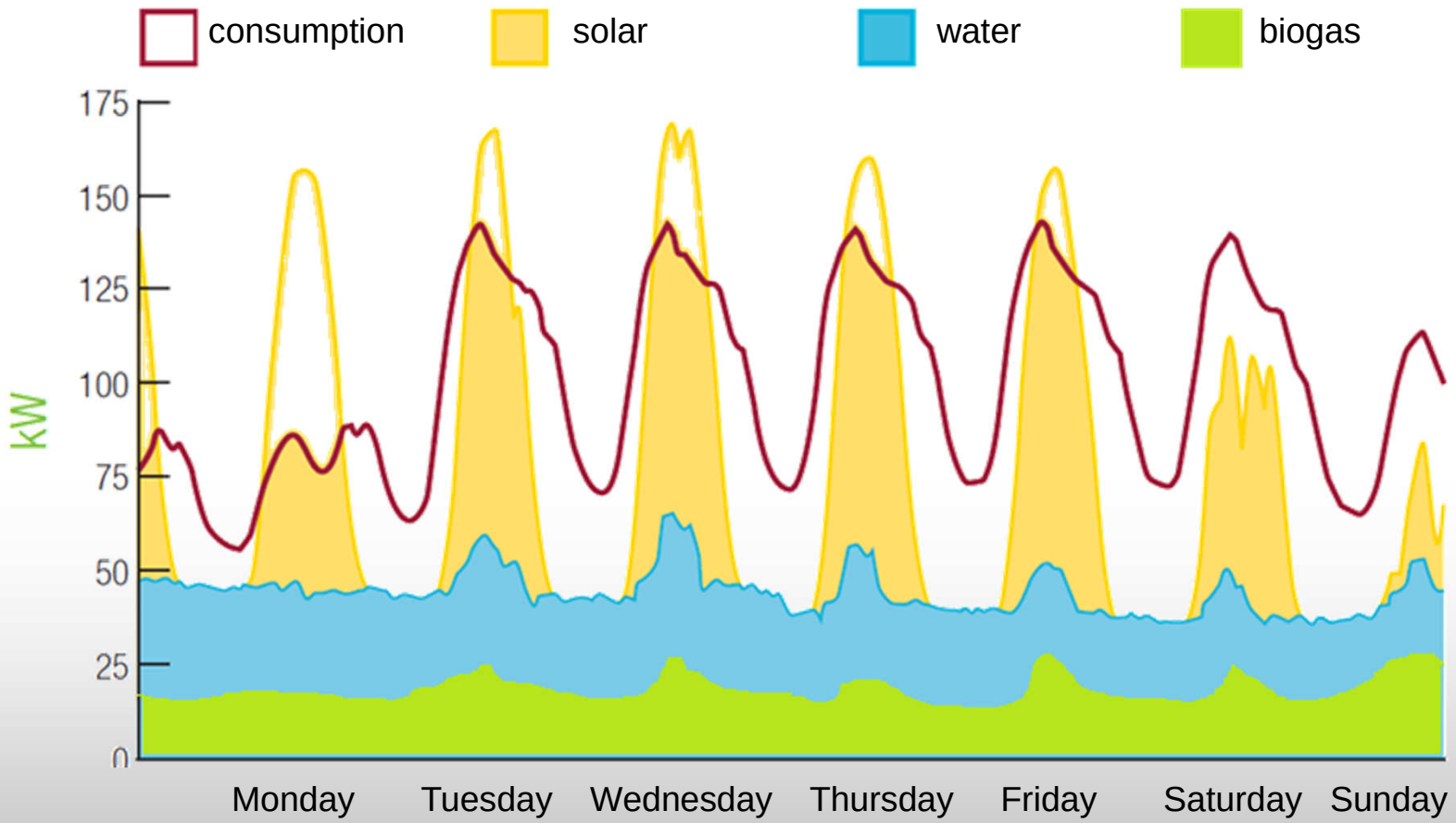
Generation exceeding Consumption



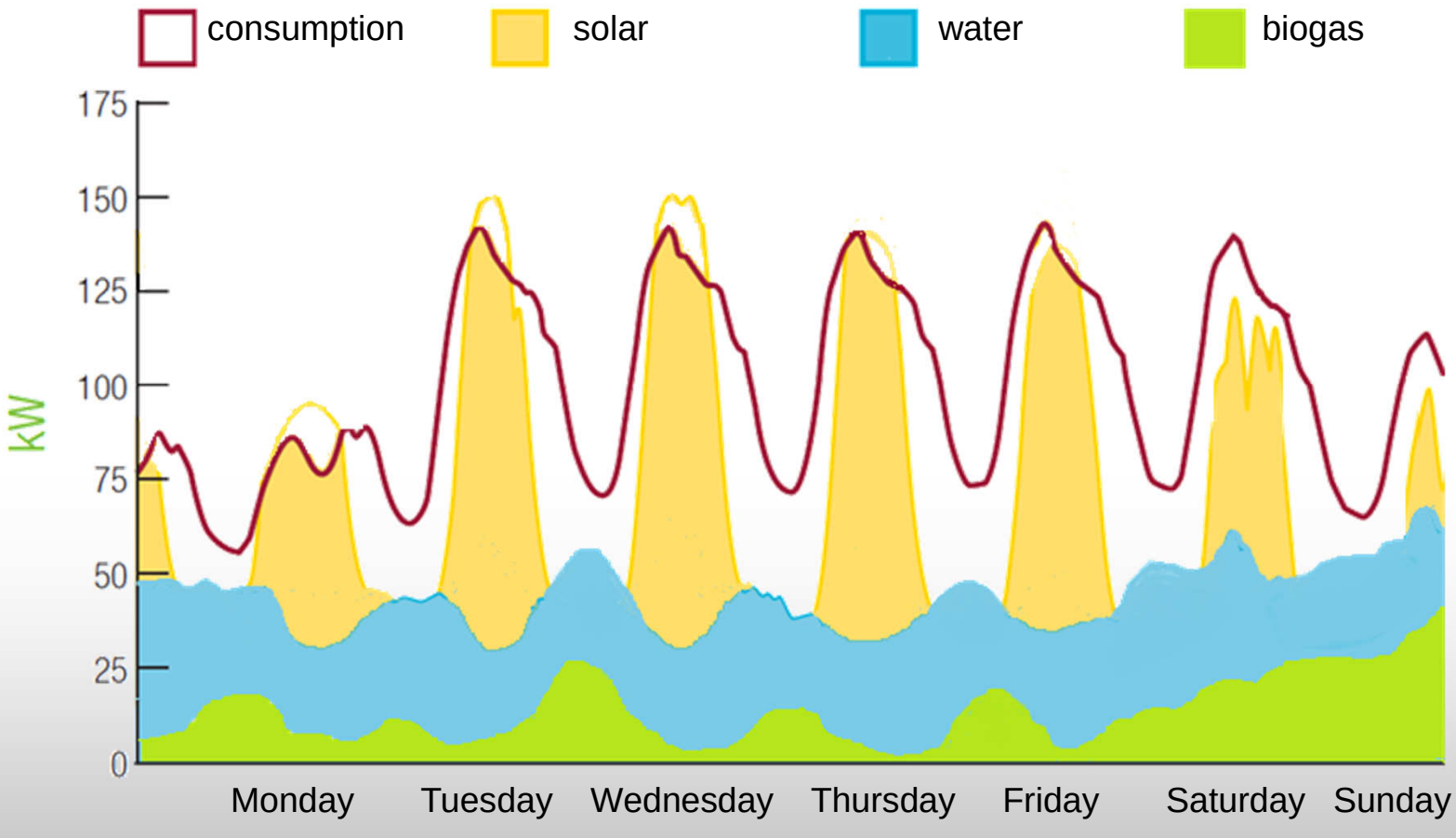
Adapting Consumption to Generation



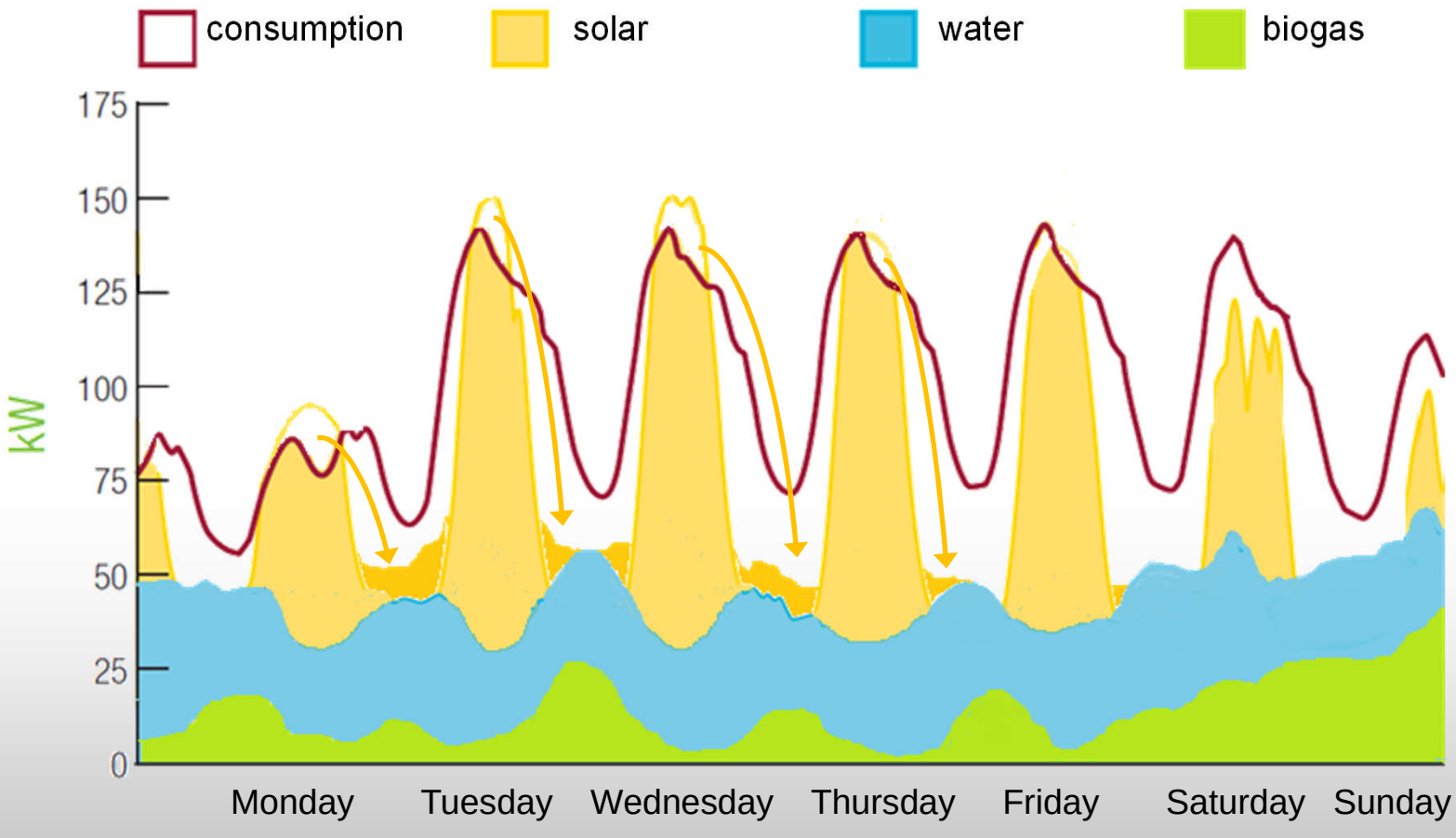
Curtailment



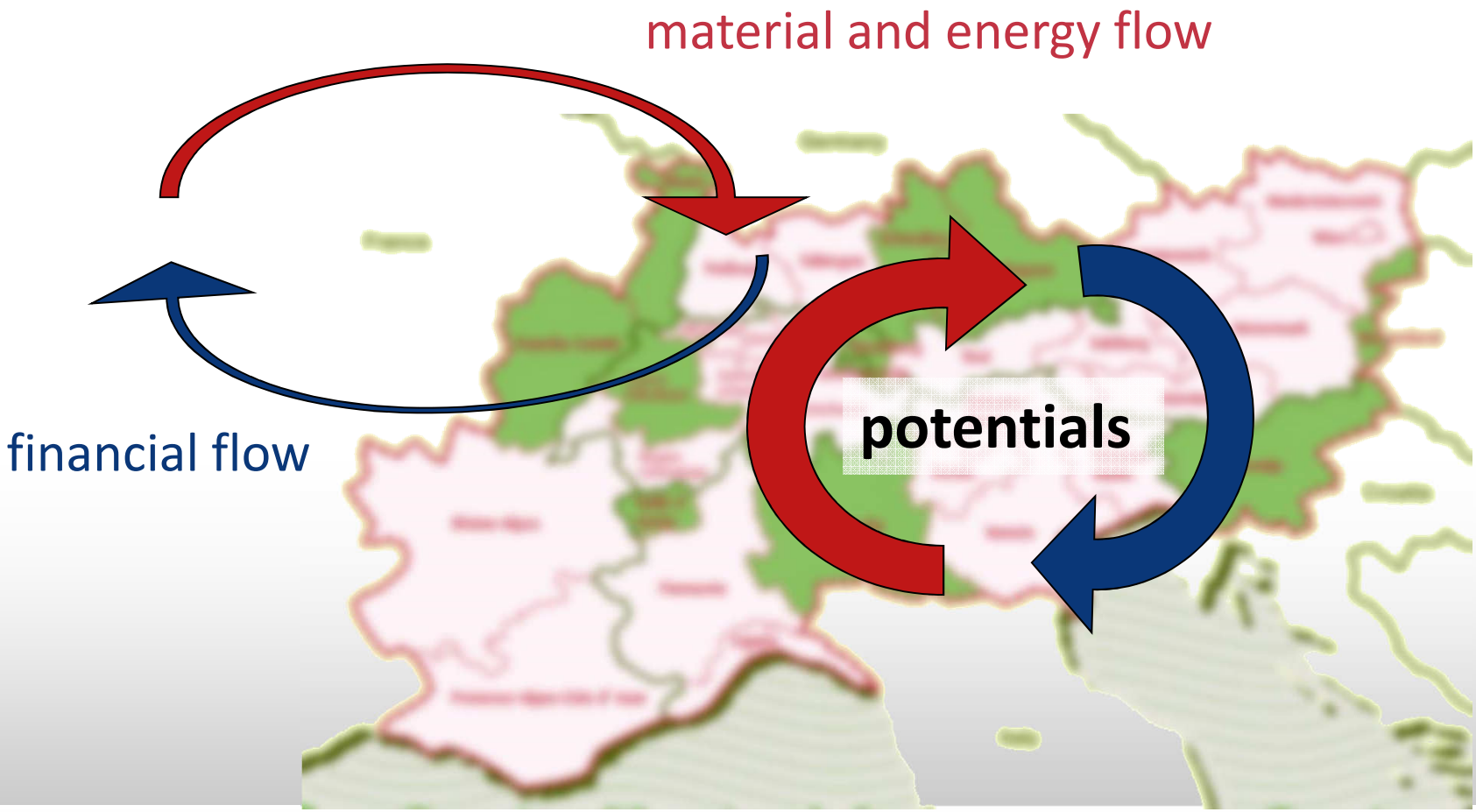
Flexible Production …



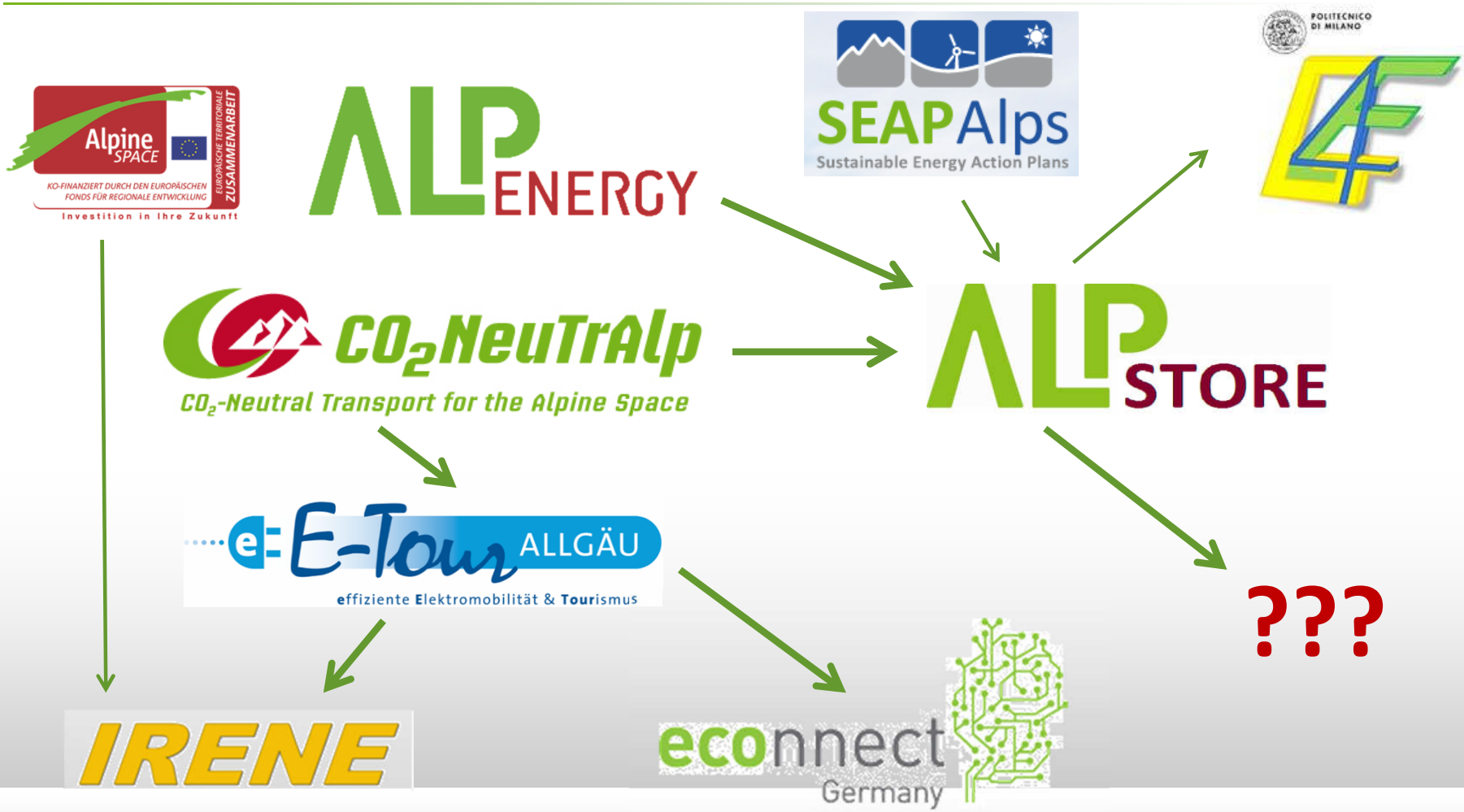
… plus Storage



Regional Value Added



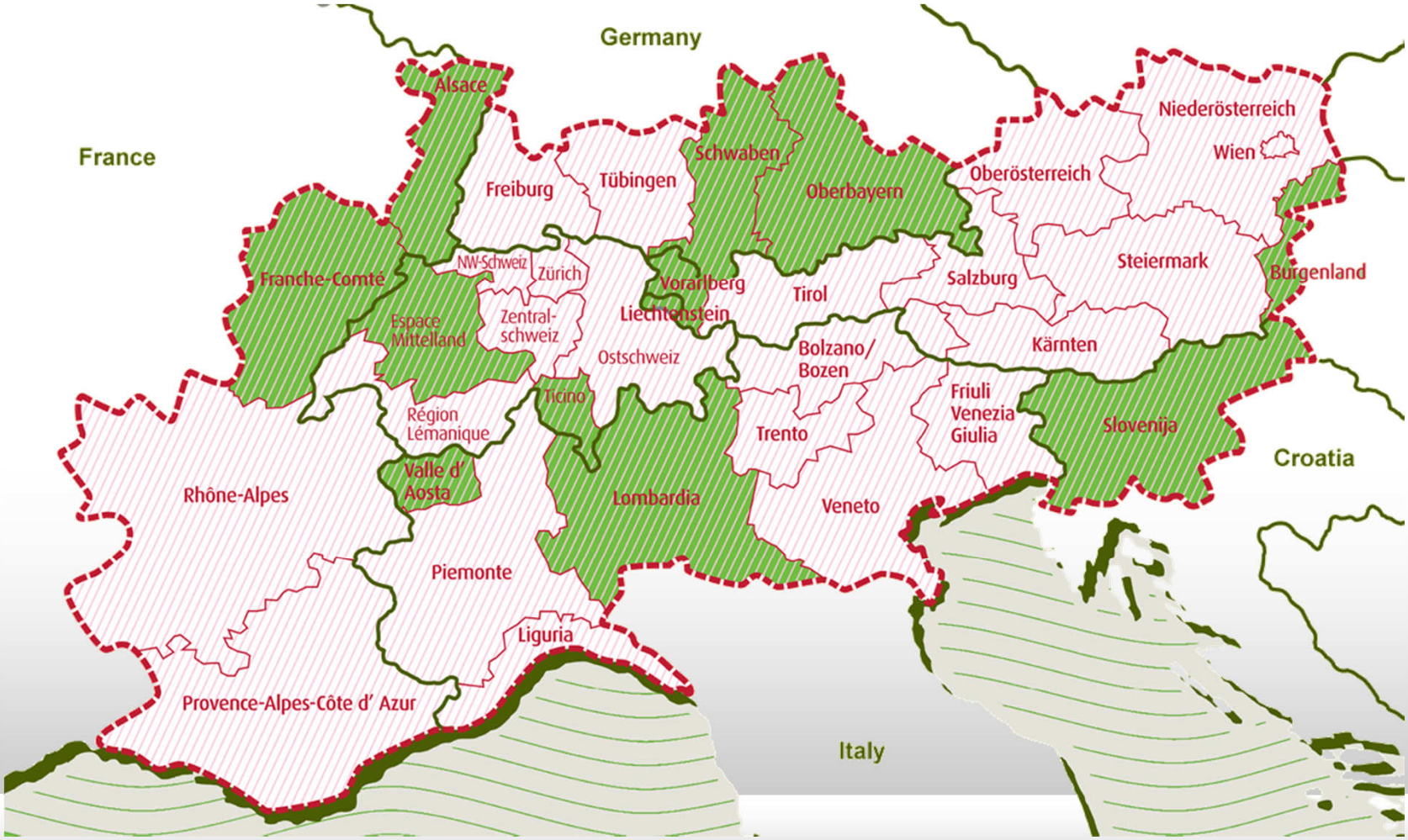
Ancestors and Successors



ALP STORE


Alpine SPACE
EUROPEAN TERRITORIAL COOPERATION
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND
investing in your future

AlpStore Project Regions



AlpStore Project Brief

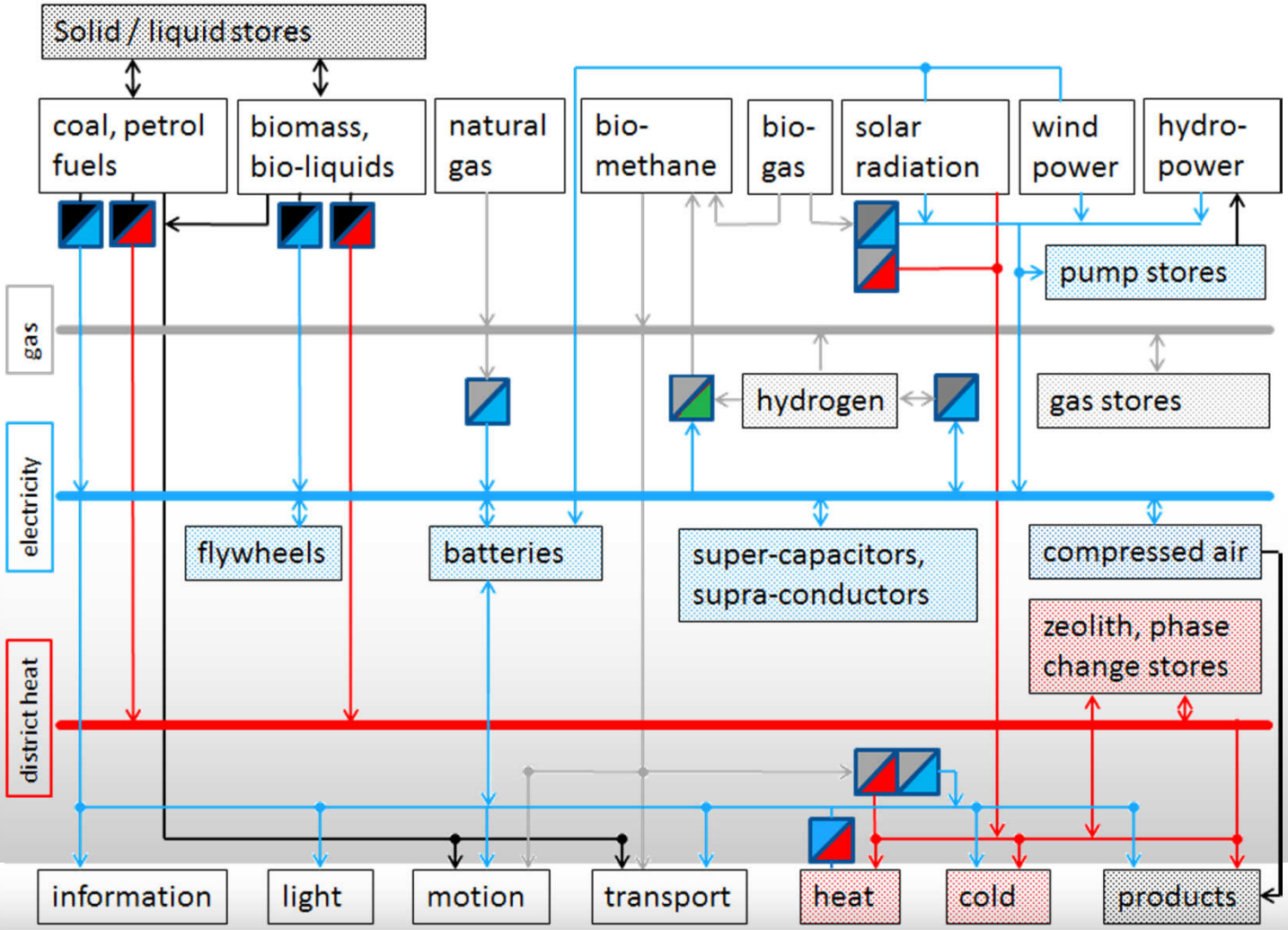
Topic:	Strategies to use a variety of mobile and stationary storages to allow for extended accessibility and the integration of renewable energies
Consortium:	20 partners and subcontractors in all 7 Alpine Countries (Germany, Austria, Switzerland, Italy, France, Slovenia and Liechtenstein)
Supporters:	over 70 formal observers
Budget:	3,3 Mio EUR
Funding:	76 % from ERDF/ Alpine Space Programme 24 % national funds
Runtime:	July 2012 through April 2015
Leadpartner:	B.A.U.M. Consult GmbH, München **alpstore@baumgroup.de**

Kickoff in Jezersko in Slovenia

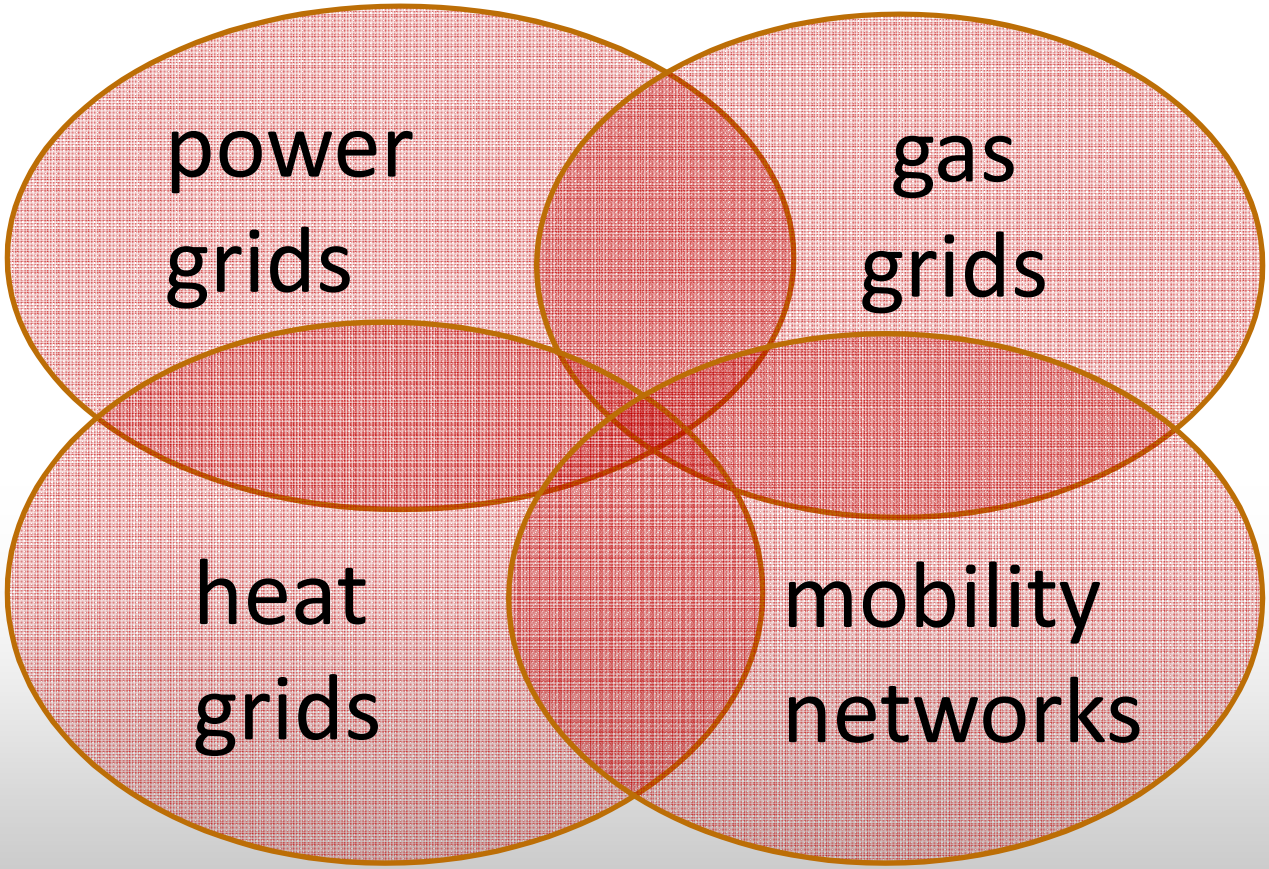
A dynamic team with lots of energy

A dynamic team with lots of energy

Energy Pathways and Storage



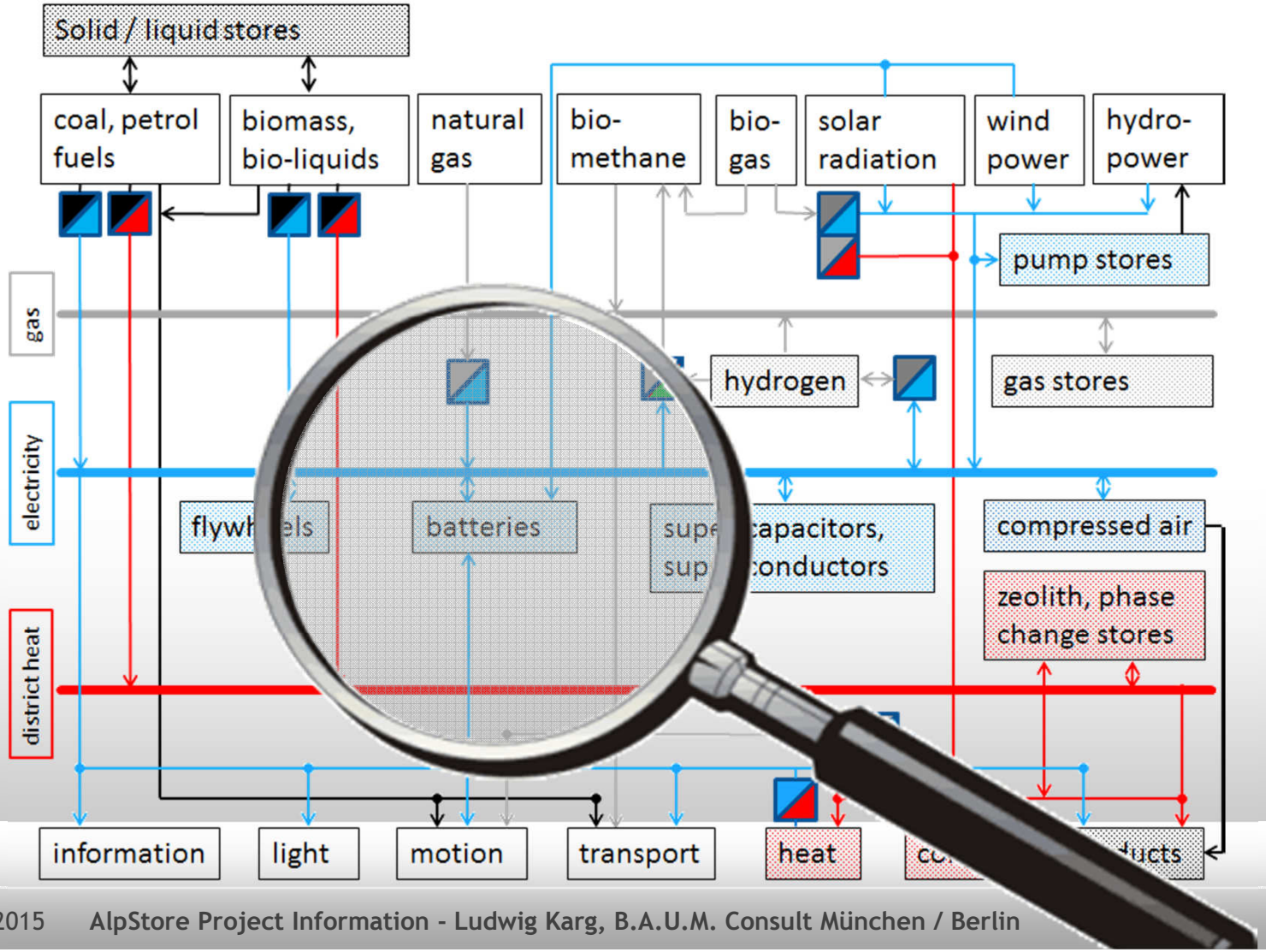
Cross Energy Carrier Synergies



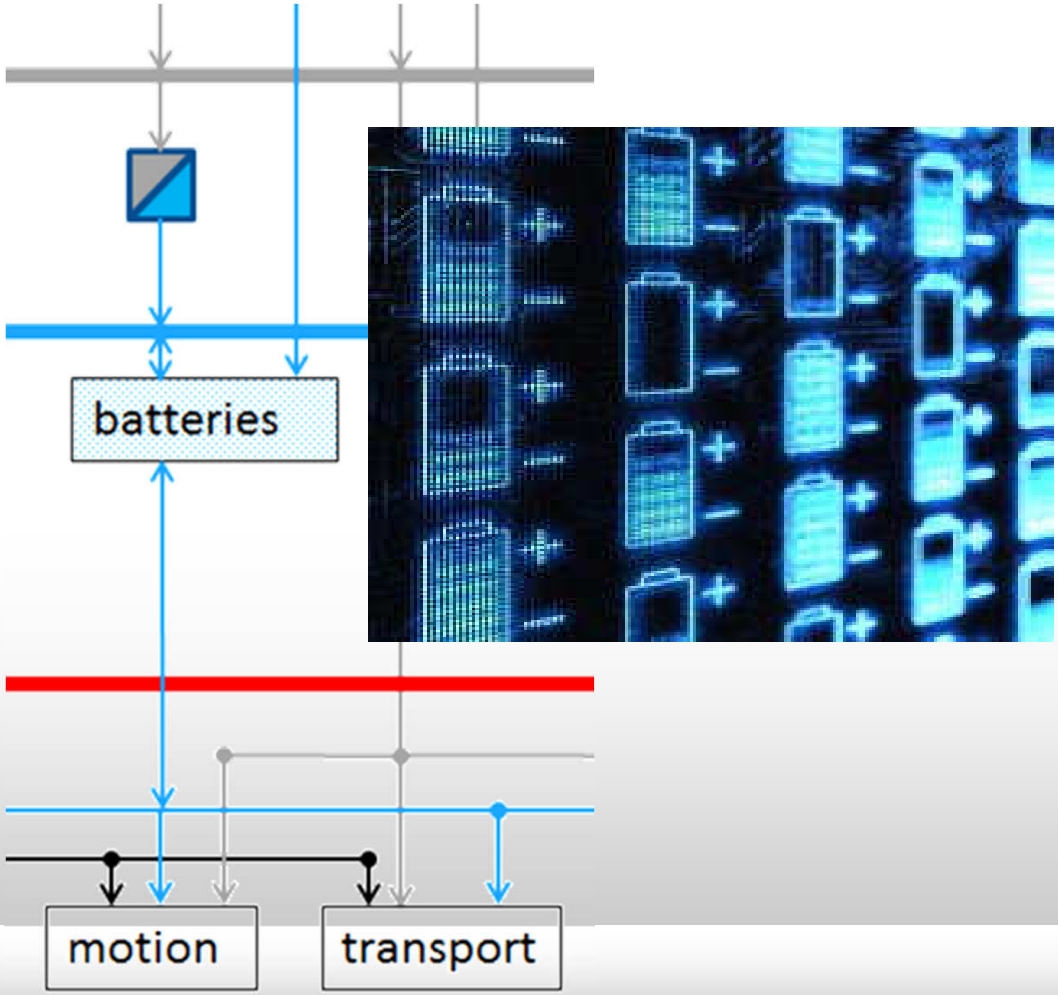
Use Cases for Storage

- Storage as part of energy management on properties (home, enterprise, district)
- Storage as a means to better manage regional energy supply
- Mobile storage (electric vehicles) as a means of balancing the elctricity grid

Energy Pathways and Storage

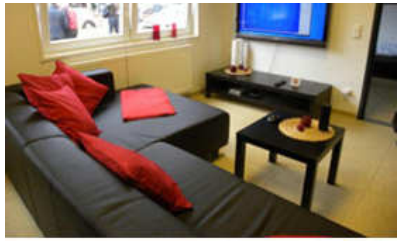


Stationary and Mobile Batteries



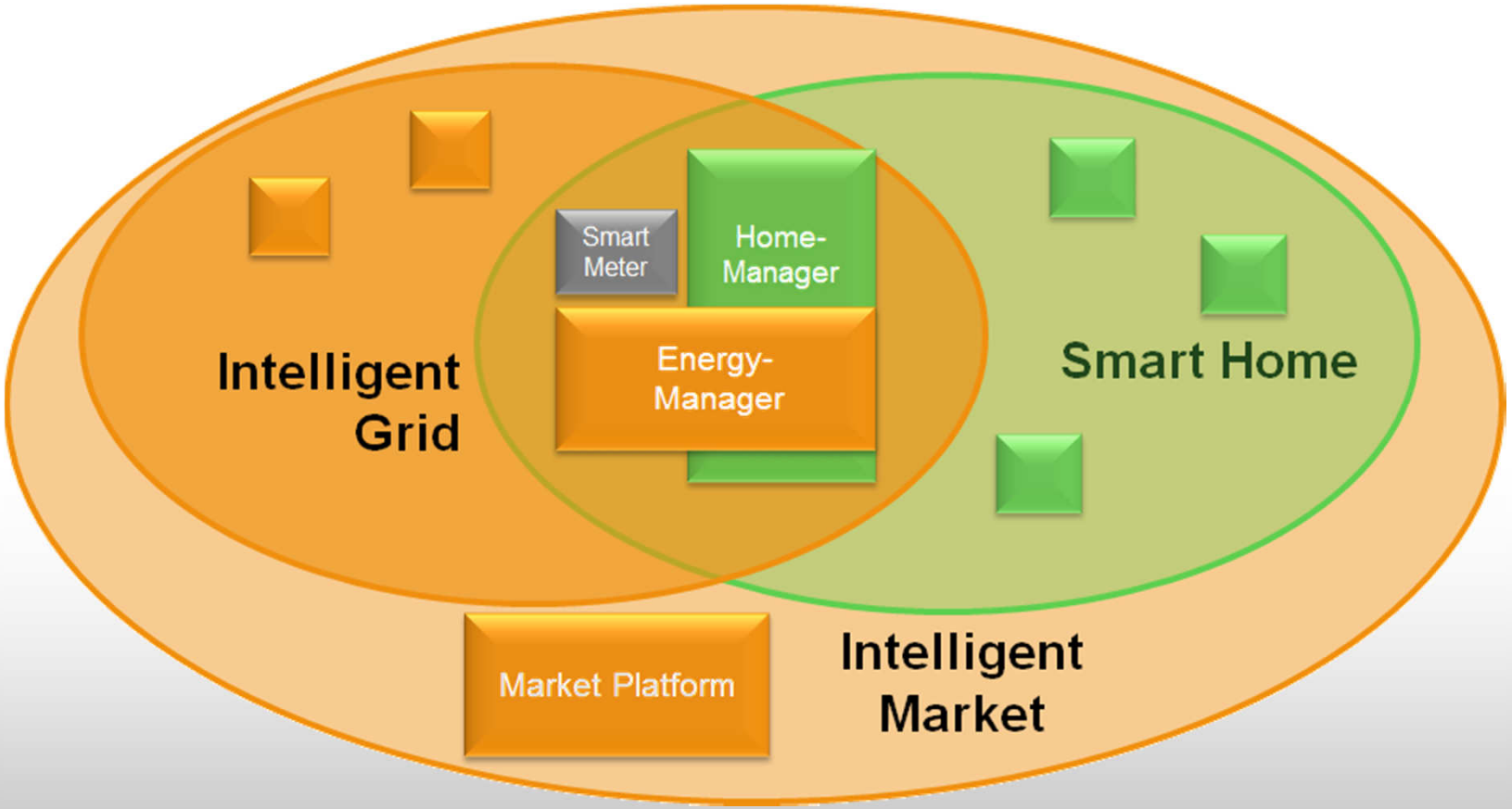
- Smart Homes
- Smart Factories
- Smart Mobility
- Smart Grids

My Home – My Energy System?



- grid parity of PV!
- decentral energy management …
- energy autarky?

Smart Buildings on Smart Grids



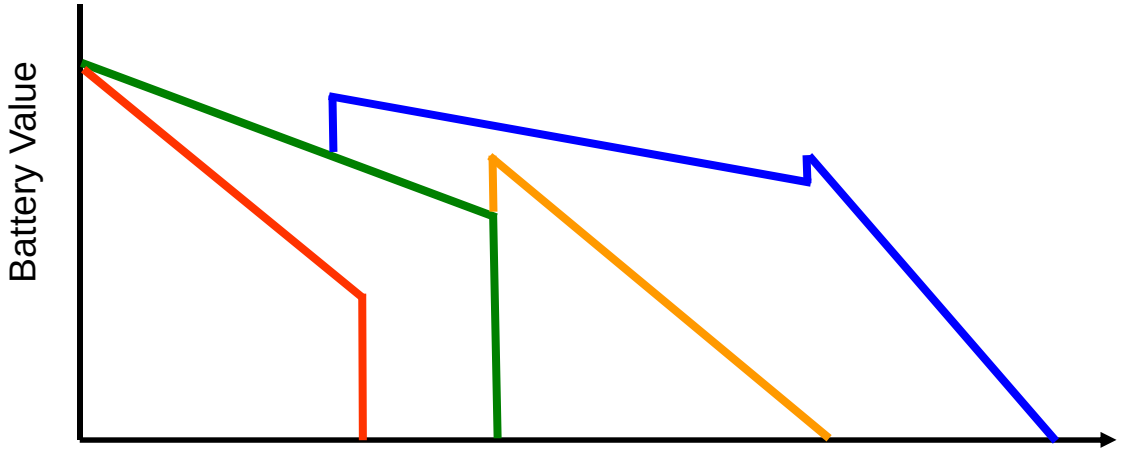
Electric Mobility

G2V

+ V2G

= V4G

Second Live Batteries from Electric Vehicles

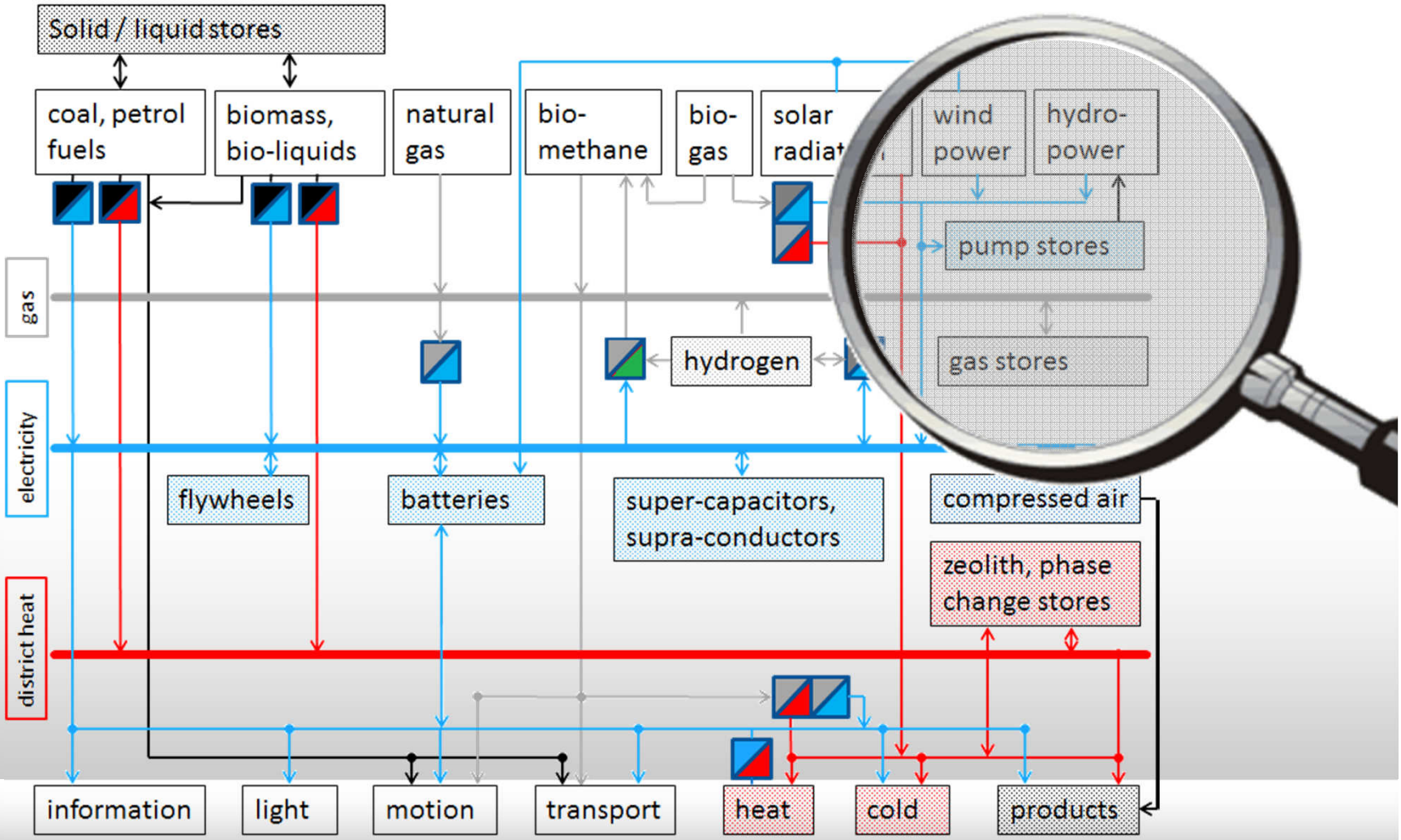


electric vehicle batteries

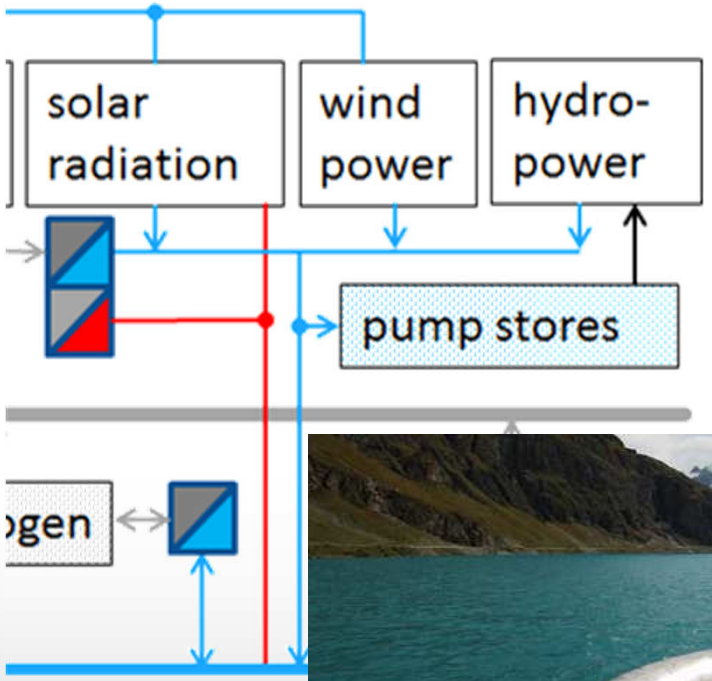
stationary batteries:

- home solutions
- E-bike charge spots

Energy Pathways

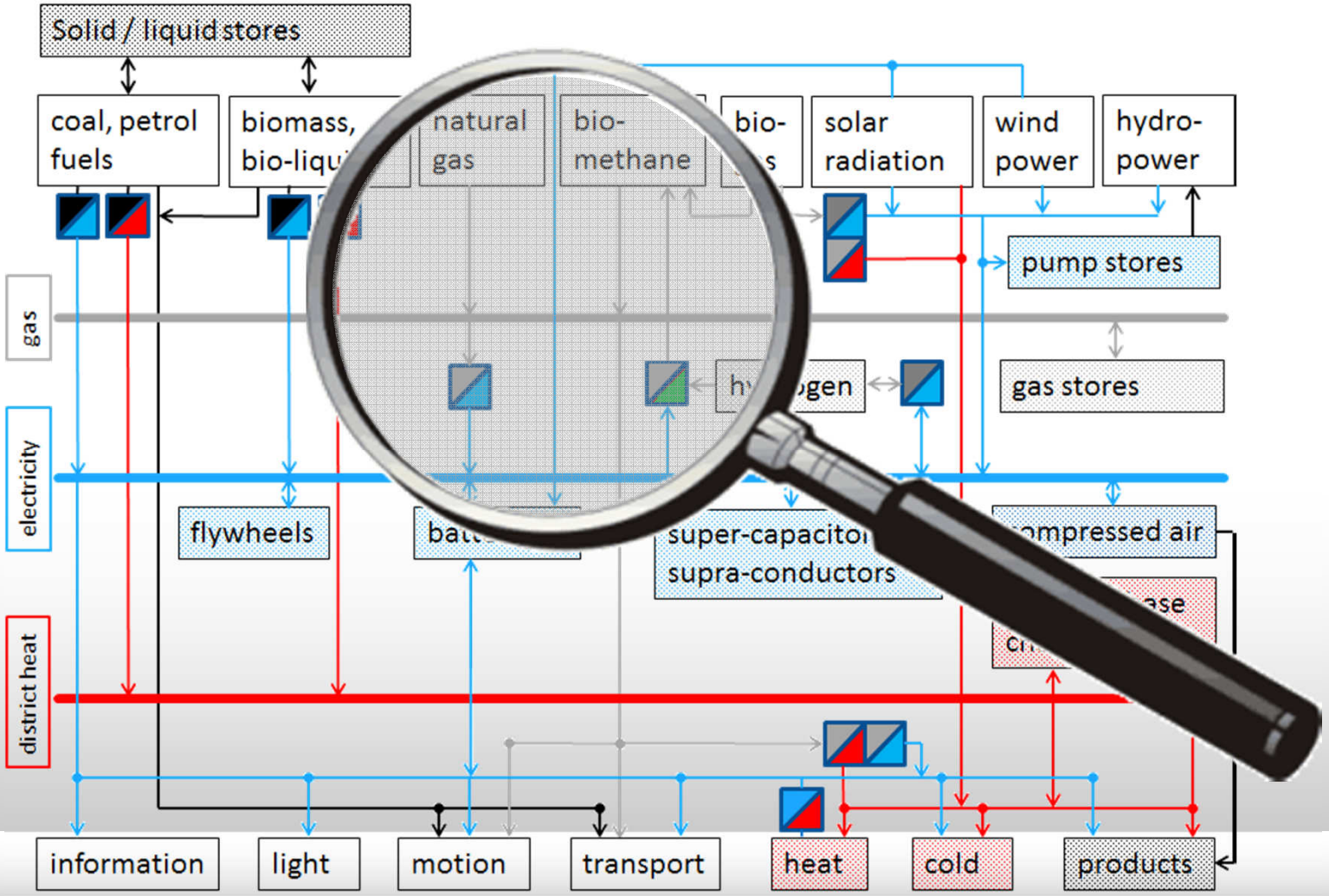


Pump Stores and Hydropower

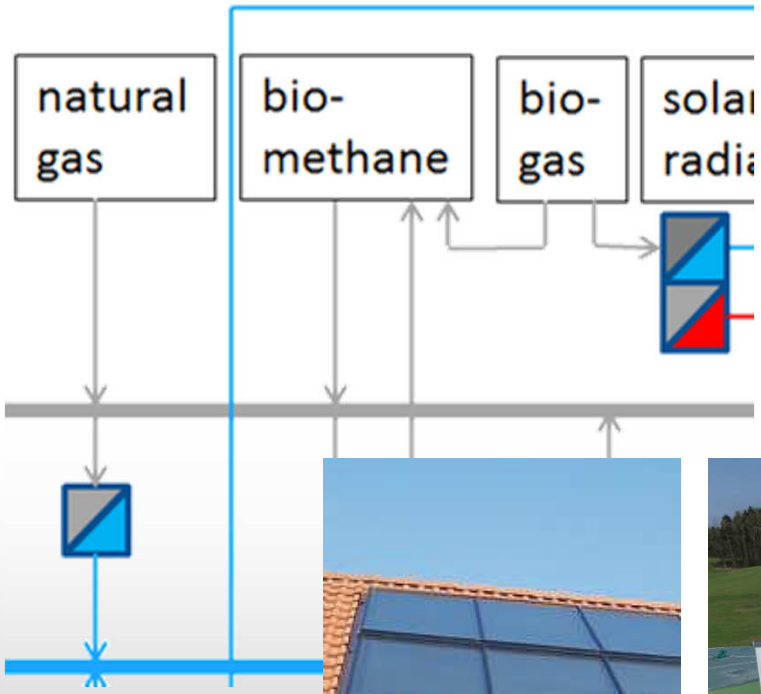


- Local balancing of renewable generation
- Transnational solutions
- Compatibility with nature and tourism aspects

Energy Pathways

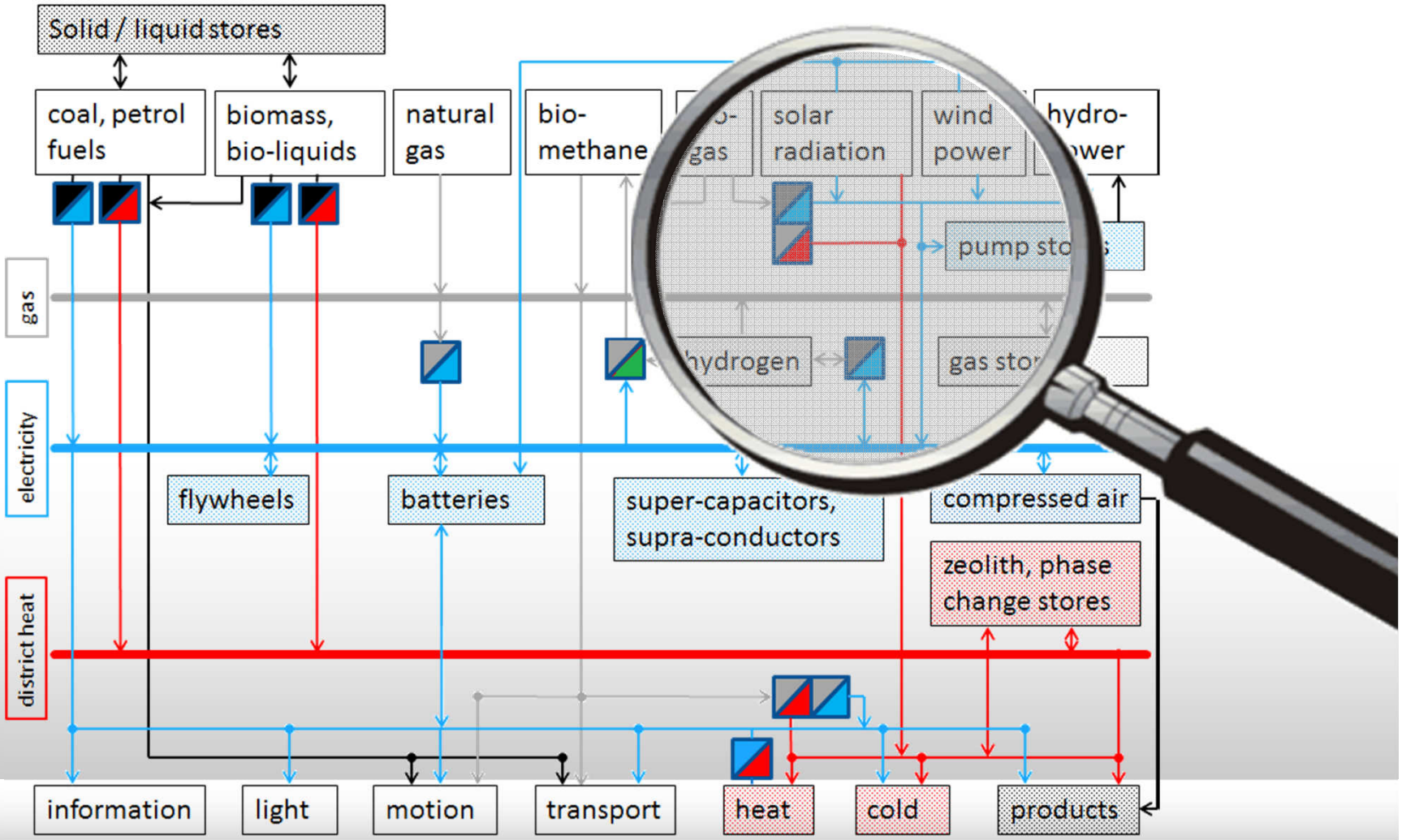


Biogas

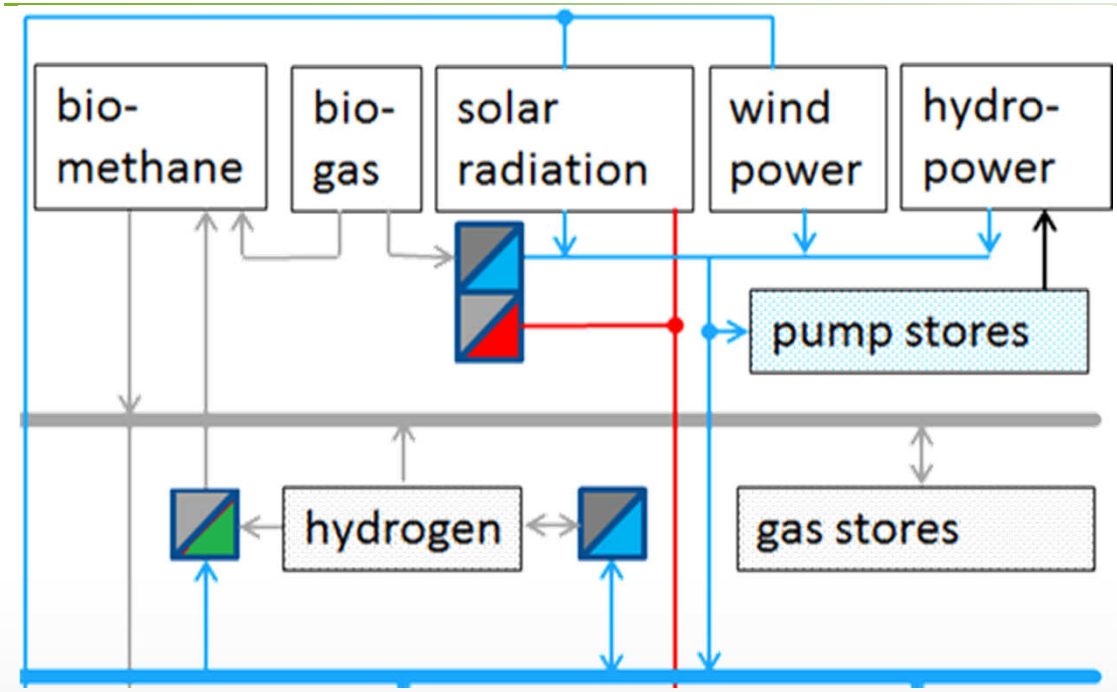


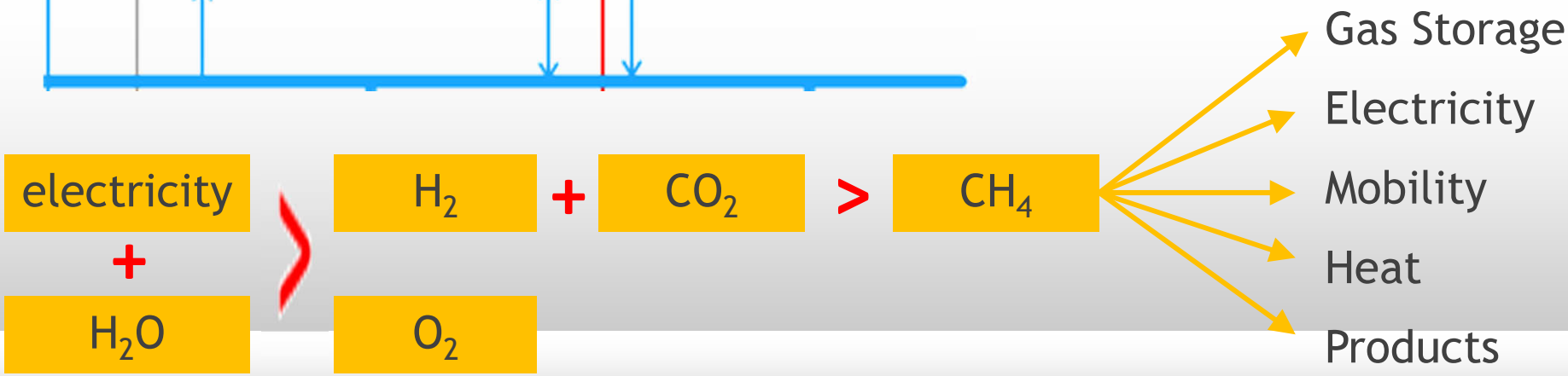
- Balancing fluctuating generation with biogas CHPs?
  - Optimal capacity of gas store?
  - Additional heat store?
- Raw biogas for heating?
- Biogas in vehicles?

Energy Pathways

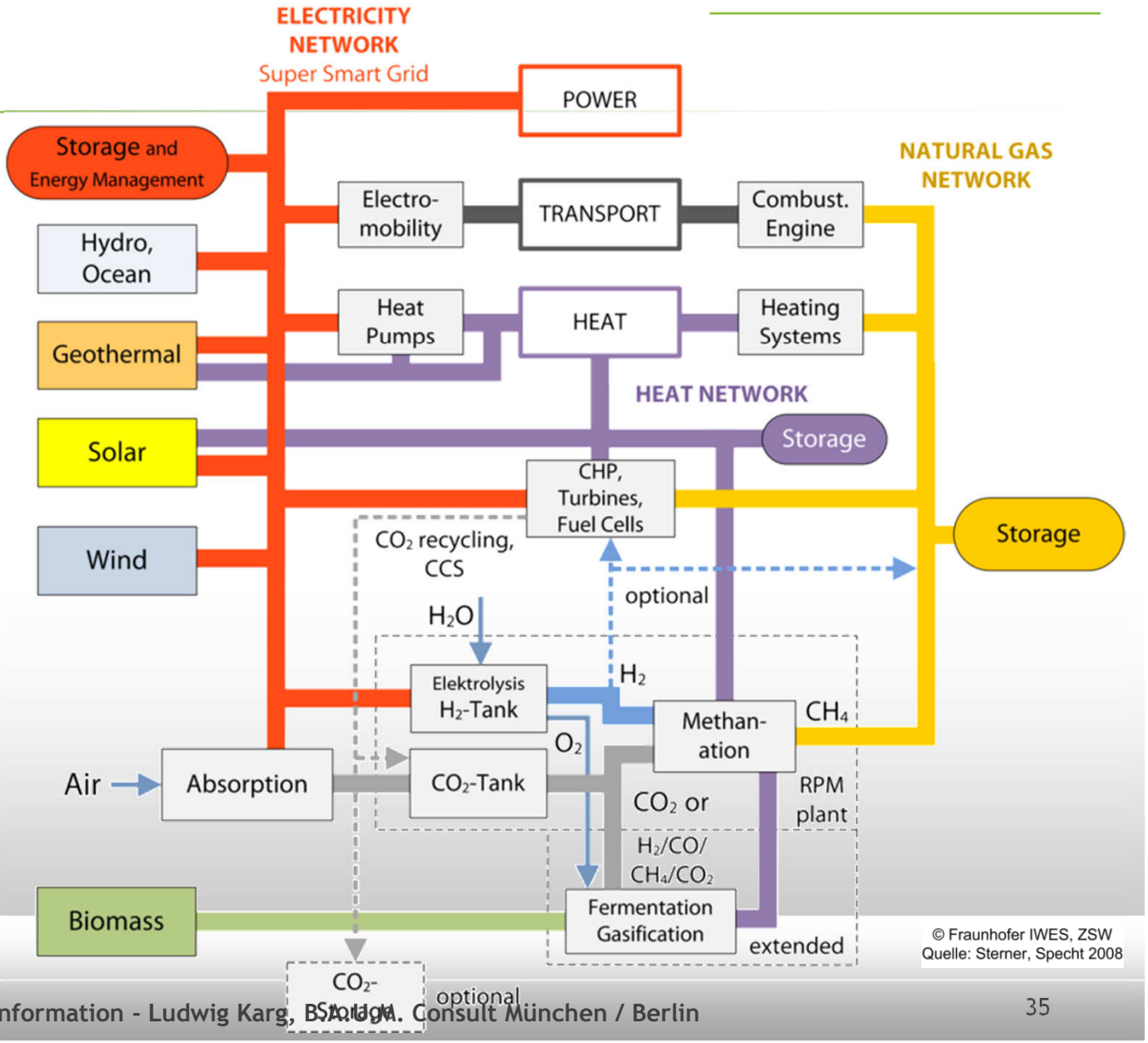


Power to Gas: Hydrogen and Methane

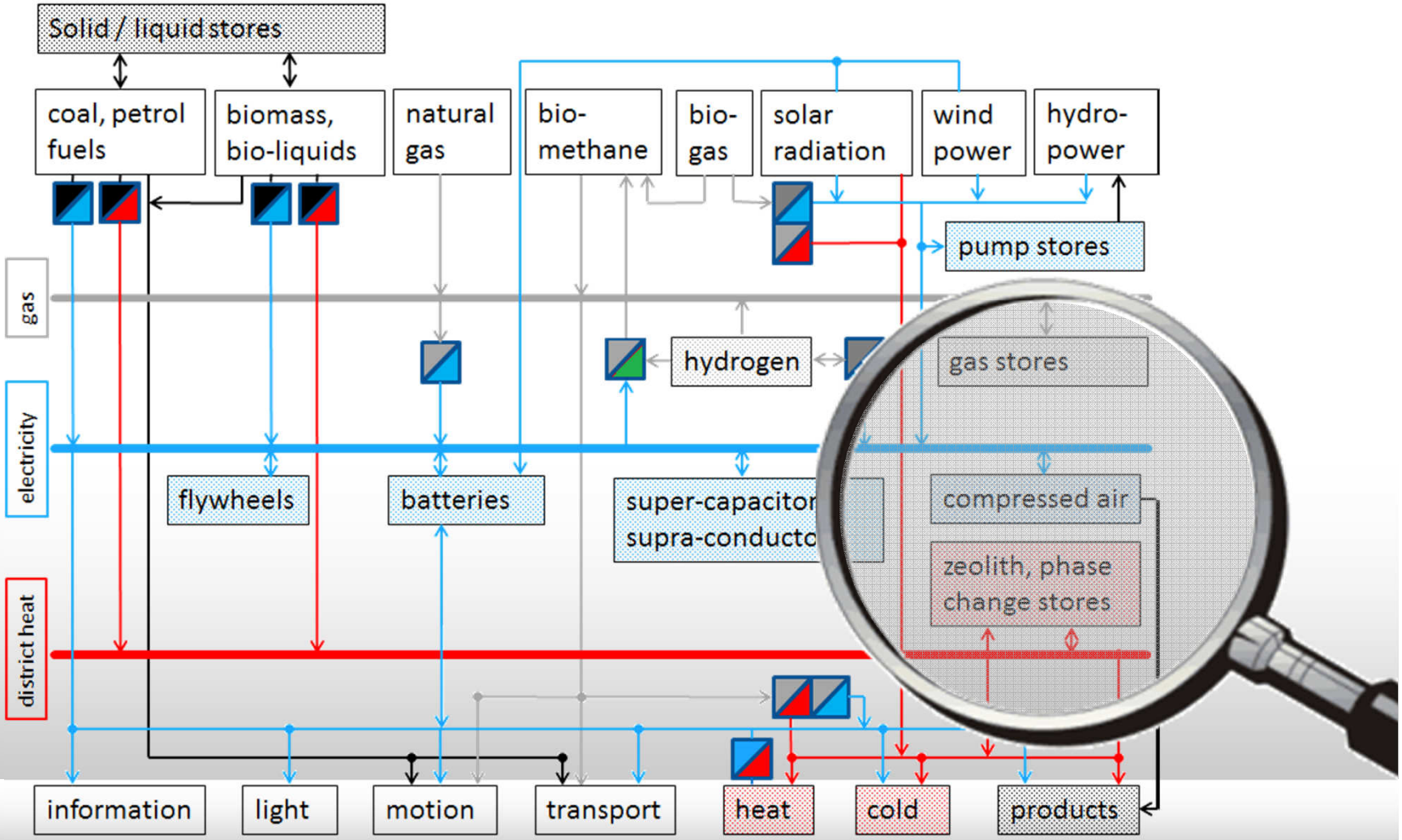




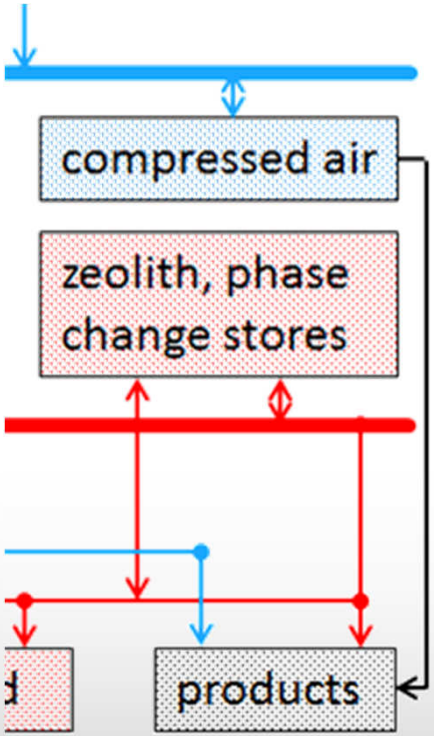
Storing in the gas grid



Energy Pathways



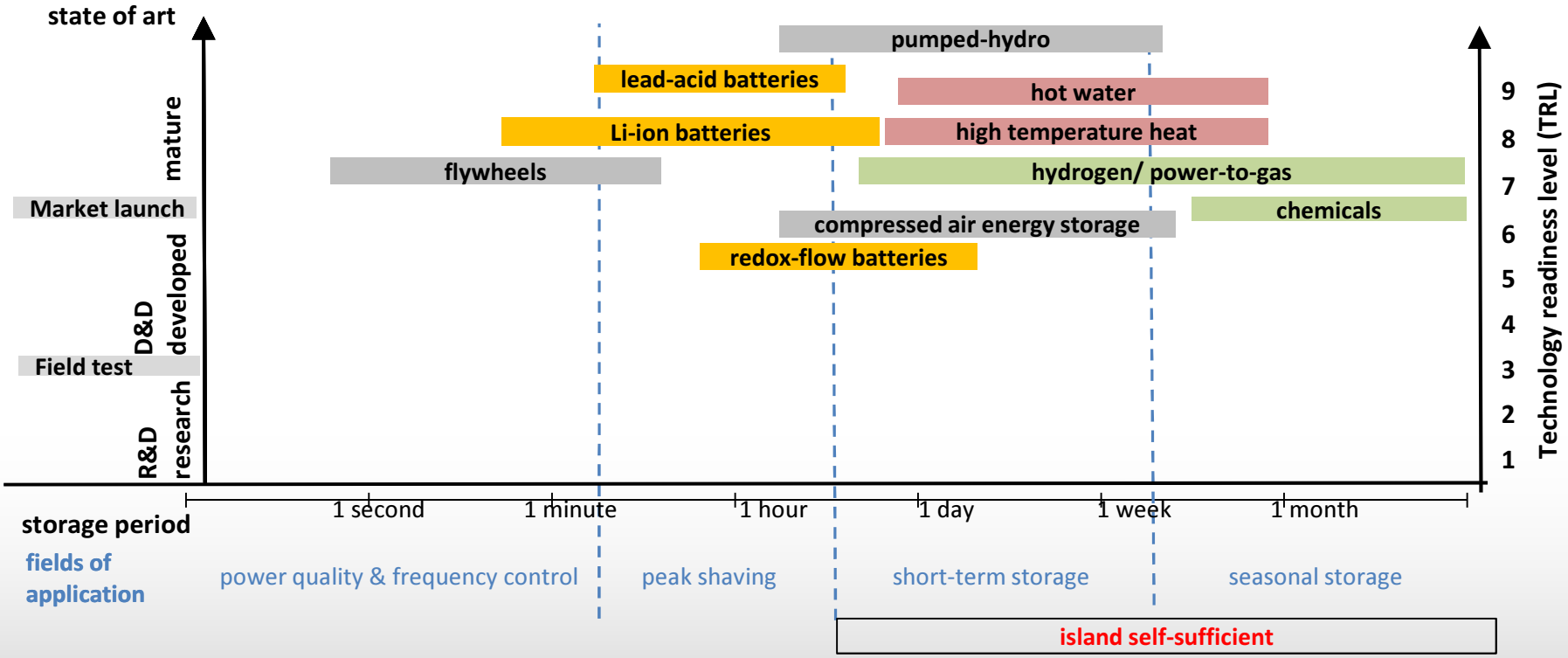
Compressed Air



- Availability of technology?
- Storage in salt dome caverns?
- Flexibility of compressed air in production facilities?

Storage periods and market availability

(revised version M. Stöhr)



thermal storage system
batteries
mechanical energy storage
chemical energy storage

Opportunities for the Suppliers of Today and Tomorrow

Energy Supplier

Energy Supplier

plus

Service Provider

Storage needs and options

- Do we need storage for using renewable energies?
- Do we rather need short-term or long-term storage?
- Since storing creates losses: does it make sense at all?
- Can pumped hydropower meet long-term storage needs?
- Is power-to-heat a solution for the near future?
- Can storage optimize energy management in buildings?
- What could reasons be to deploy storage today?
- To what extent can batteries foster local energy autarky?

Storage needs and options

- Do we need storage for using renewable energies?
- Do we rather need short-term or long-term storage?
- Since stor
- Can pump
- Is power-t
- Can stora
- What coul
- To what e

- the more intelligence in the grid the less demand for storage
- empasis on demand side management for < 40 % renewable energy in the grid
- long term storage need with > 80 % renewables

Don‘t stop renewables until more and cheaper storage storage technology will be availaible.

Storage needs and options

- Do
- Do
- Sin
- Car
- Is p
- Car

- increased supply security
- more cost effective electricity supply
- renewables with storage below electricity purchase tariffs
- cutting power peaks, thus saving electricity purchase costs
- stabilization of electric grid
- postponing grid reinforcement and deferral of investments
- obtaining experience with new storage technology

- What could reasons be to deploy storage today?
- To what extent can batteries foster local energy autarky?

Storage needs and options

- Do we need
- Do we rathe
- Since storin
- Can pumpe
- Is power-to-
- Can storage
- What could

- absolute or relative energy autarky?
- full autarky desirable in cases of emergency

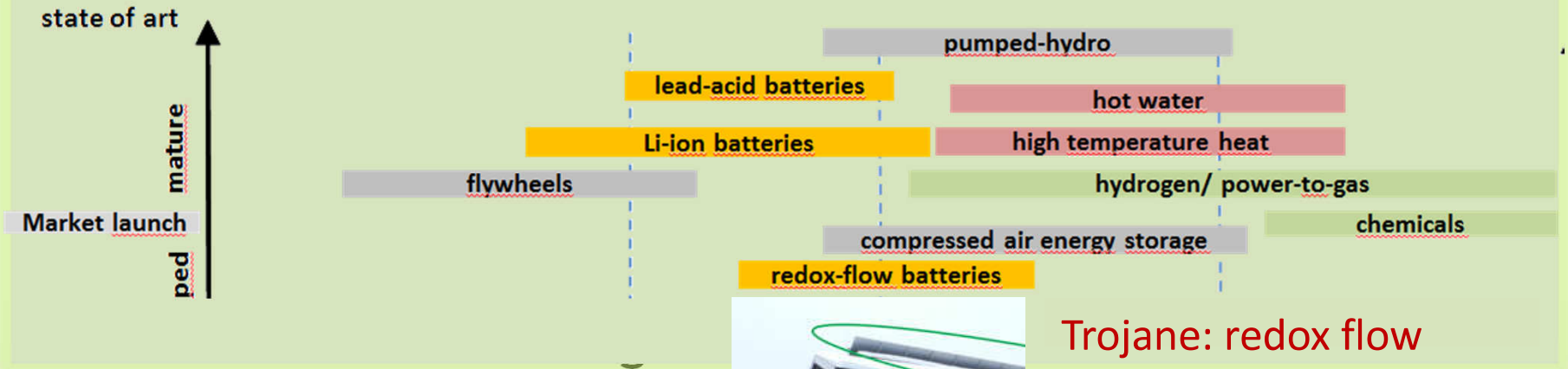
- To what extent can batteries foster local energy autarky?

Readiness of technology

- Which technologies are mature and cost-effective?
- What is the price perspective of batteries?
- Could flywheels provide options for medium and long-term storage?
- To what extent can biogas meet the regional energy demand?
- When will be power-to-gas an option?

Readiness of technology

- Which technologies are mature and cost-effective?



regional energy demand?

- When will be power-to-gas

Trojane: redox flow

Readiness of technology

- Which technologies are mature and cost-effective?
- What is the price perspective of batteries?

- further significant cost decrease expected
  (for self-supply: 10 ct/kWh in 2020 and 5 ct/kWh in 2030)

Allgäu: batteries in private homes

Readiness of technology

- few percent in total, locally significantly higher
- equip with gas and heat stores!

- To what extent can biogas meet the regional energy demand?
- When will be power-to-gas an option?

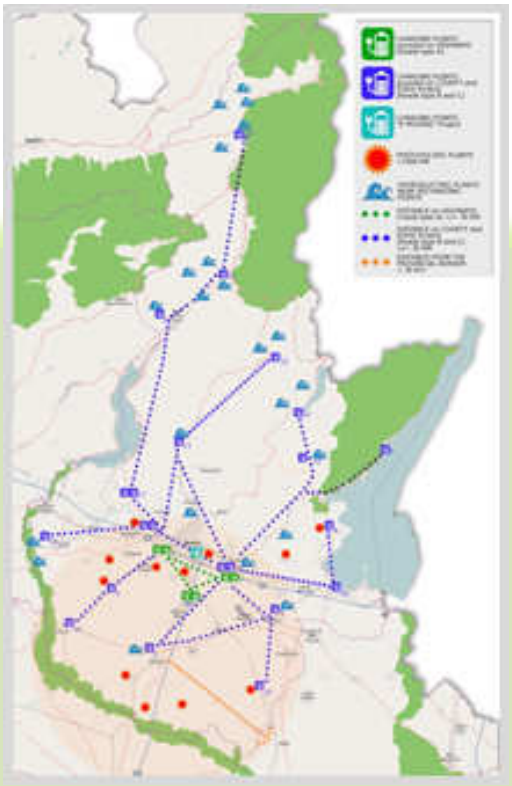
Mobility and storage

- Are fully electric and hybrid vehicles an option for sustainable mobility?
- Which actions will drive the take up of an electric mobility plan?
- Can batteries of electric vehicles be used to store excess power from wind and PV?
- Will charging electric vehicles jeopardize grid stability and energy supply?
- Are there long-term sustainable alternatives to electric mobility?

Mobility and storage

- Are fully electric and hybrid vehicles an option for sustainable mobility?
- Which actions will drive the take up of an electric mobility plan?

  - introduce in vehicle fleets!
  - offer advantages such as free parking at electric vehicle charging stations



Brescia: network of charging stations

Mobility and storage

- same as any household appliance
- no fast charging on private sites!
- controlled charging!

Mantova: extra storage with fast chargers!

- Will charging electric vehicles jeopardize grid stability and energy supply?
- Are there long-term sustainable alternatives to electric mobility?

Mobility and storage

- Are fully elect
  option for sust
- Which actions
  electric mobili
- Will charging e
  grid stability a
- Can batteries
  store excess p
- Are there long-term sustainable alternatives to electric mobility?

- gas driven cars an option with power-to-gas
- hydrogen mobility quickly evolving

Belfort: getting out of lab with hydrogen!

Environmental impacts

- Is there a recycling option for batteries?
- Will there be enough natural resources to build batteries?
- Can batteries receive a second life?
- Does biogas storage smell and inadvertently hassle its neighbourhood?
- Is there a danger for natural or biogas stores to explode?

Environmental impacts

- Is there a recyc
- Will there be er
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- Does biogas storage smell and inadvertently hassle its neighbourhood?
- Is there a danger for natural or biogas stores to explode?

- only in cases of malfunction
- better handling and storage of the substrate strongly reduces the problem

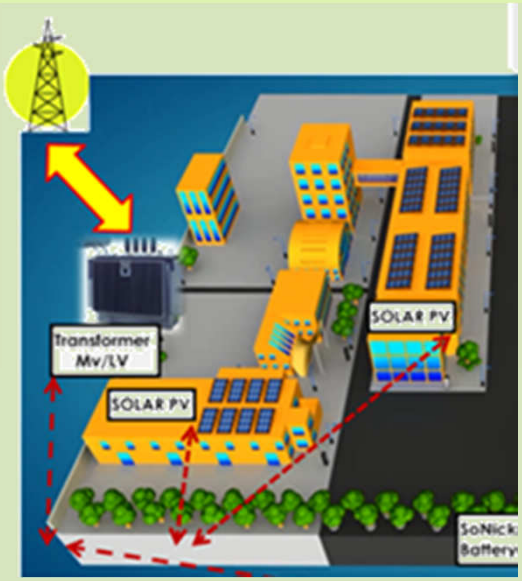
Regional benefits

- To what extent can renewable energies and local storage foster the economy in a region?
- How can local SME`s benefit from storage development and deployment?
- Are there specific relations between energy storage and tourism?
- Which links exist between energy storage and health?

Regional benefits

- To what extent can renewable energies and local storage foster the economy in a region?

- value creation relocated into the region
- enterprises to optimise their energy purchase
- SME to benefit from storage development and deployment



EuroImpresa: TechnoCity Energy Area Manager

Regional benefits

- underlining the sustainability of touristic offerings
- Baedeker: travel guide to RE installations

Oberstdorf Tourism: support for PVStore^{plus} E-bike

- Are there specific relations between energy storage and tourism?
- Which links exist between energy storage and health?

Communication aspects

- How can I motivate fellow politicians to support the local energy transition?
- How can we make energy storage attractive for energy suppliers and grid operators?
- What are means to make consumers interested in storage technologies?
- Where do I find latest information on storage topics?

Communication aspects

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Communication aspects

- How car
  support
- How car
  attracti
  operato
- What are means to make consumers interested in storage technologies?
- Where do I find latest information on storage topics?

- "Self-supply with RE maximised by storage saves electricity purchase costs."
- make storage visible!

Grafing: visible power-to-heat tank

Decision process

- How can we change the framework conditions on a local or regional level?
- Can a self-sufficient regional energy system be implemented without subsidies?

Decision process

- How can we change the framework conditions on a local or regional level?
- Can a self-sufficient regional energy system be implemented without subsidies?

- Yes, it can …
- … with citizen involvement

Joining Forces

citizens

local government

public administration

STORM

Smart Storage and Mobility

A model to develop and decide upon holistic solutions to increase regional RES supply and outbalance volatility with appropriate buffering means.

Who shall use STORM?

- Local and regional power suppliers and grid operators
- Planning departments in local and regional administrations
- Investors and regional business entities
- Scientific institutes

STORM Workflow

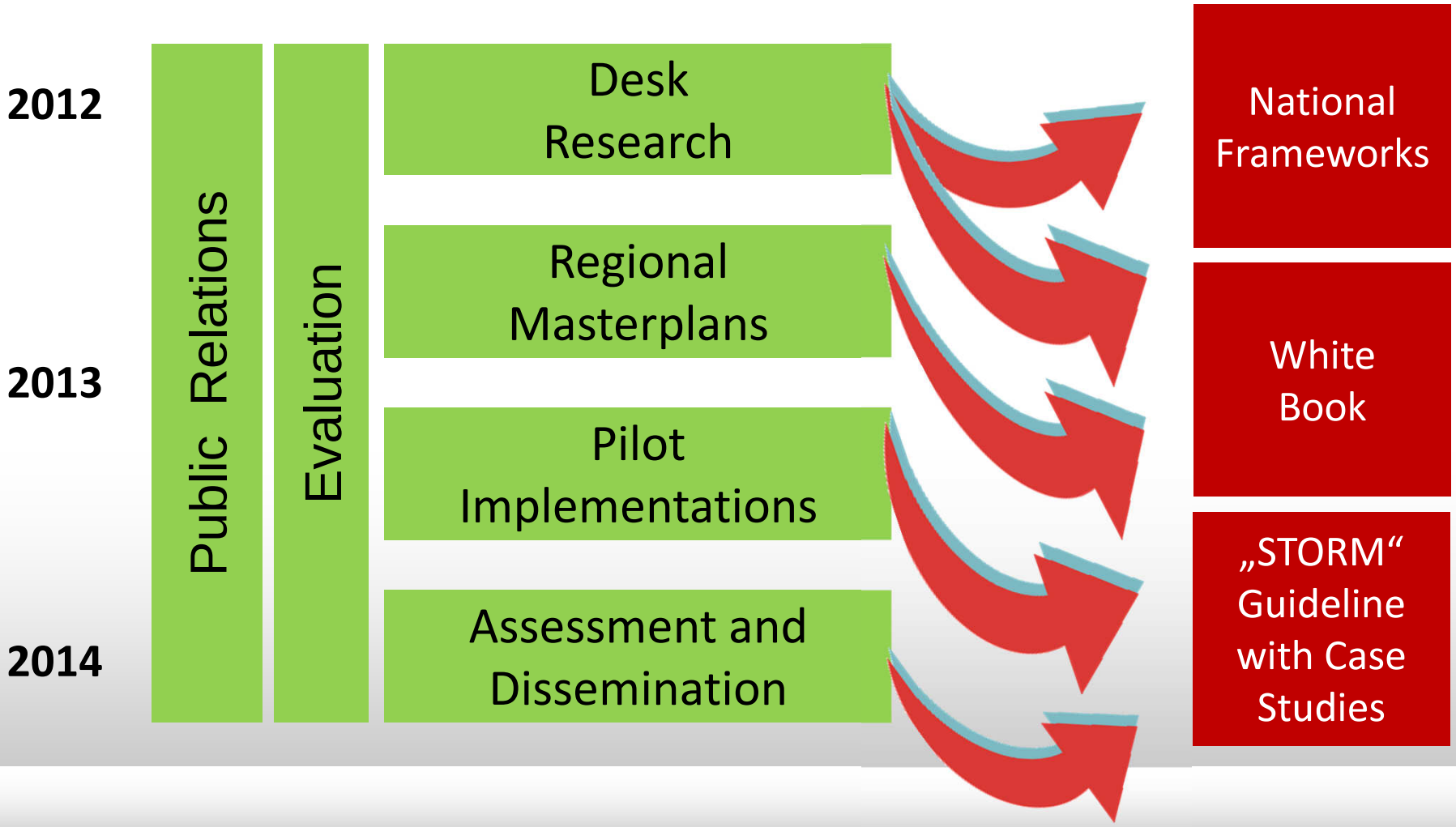
investigate future regional generation and consumption patterns

investigate storage needs and assess regional storage potential

create a master plan for RES use and storage until 2030

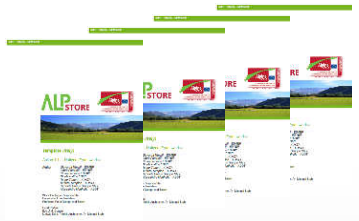
develop a pilot installation to start implementation of master plan

Work Process and Key Deliverables



Results of AlpStore

- White Book
- Guidelines for Decision Makers
- Guidelines for Planners and Practitioners
- Case Studies on Pilot Implementations (local language)
- Regional Storage Masterplans
- Videos on Regional and Technological Approaches (local language)
- Study for Academia



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