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CHP/DHC Strategic Workshop
Linking heat and electricity systems

Paris, 27-28 May 2014

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Linking heat and electricity systems: Methodology

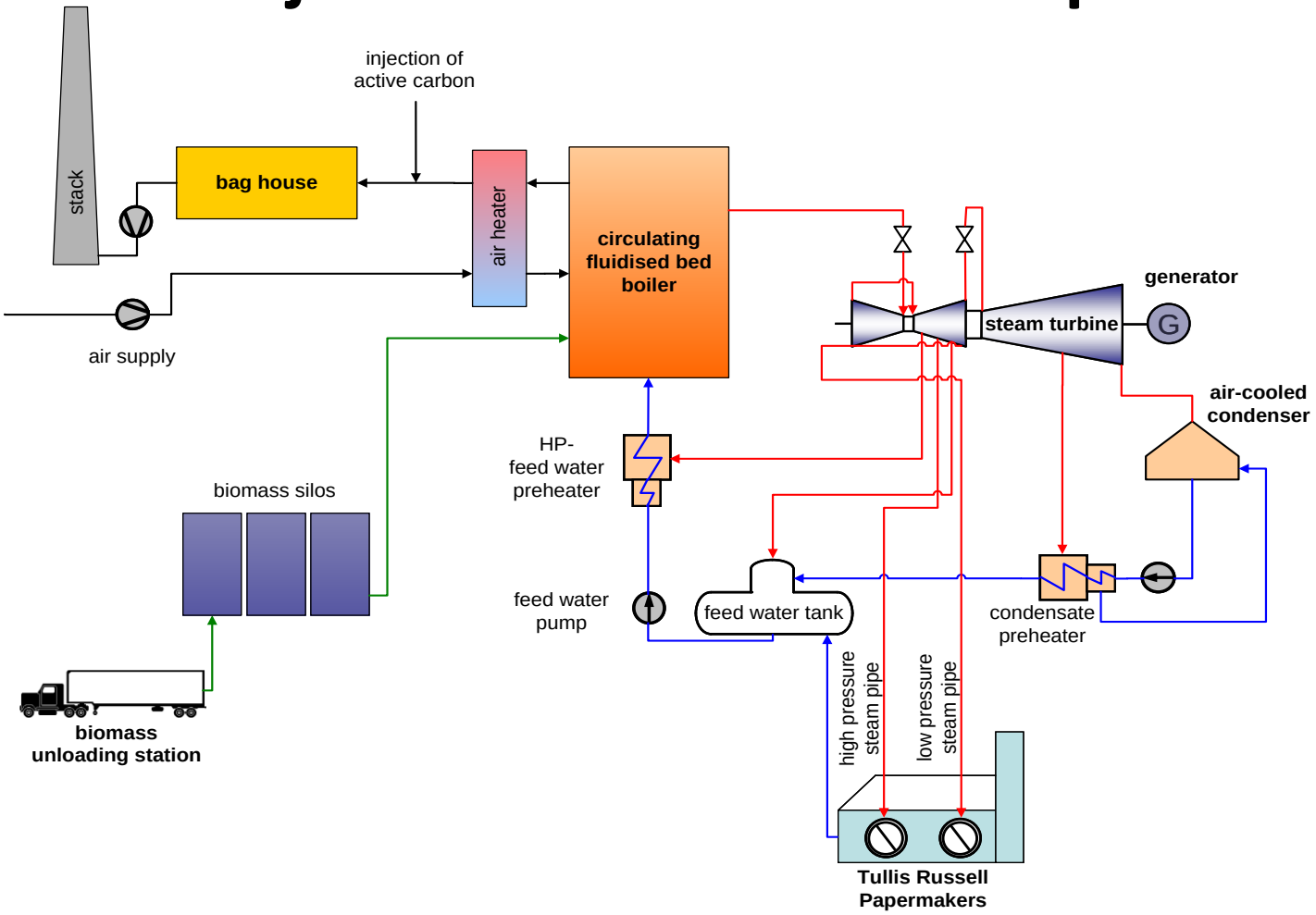
- ✓ Develop a compendium of case studies: industrial CHP and integrated approaches of CHP with DHC
- ✓ Distil lessons learned to assess impact on project development and operation

- ✓ Policy measures and market mechanisms to overcome existing barriers to further deployment

Compendium of CHP/DHC case studies

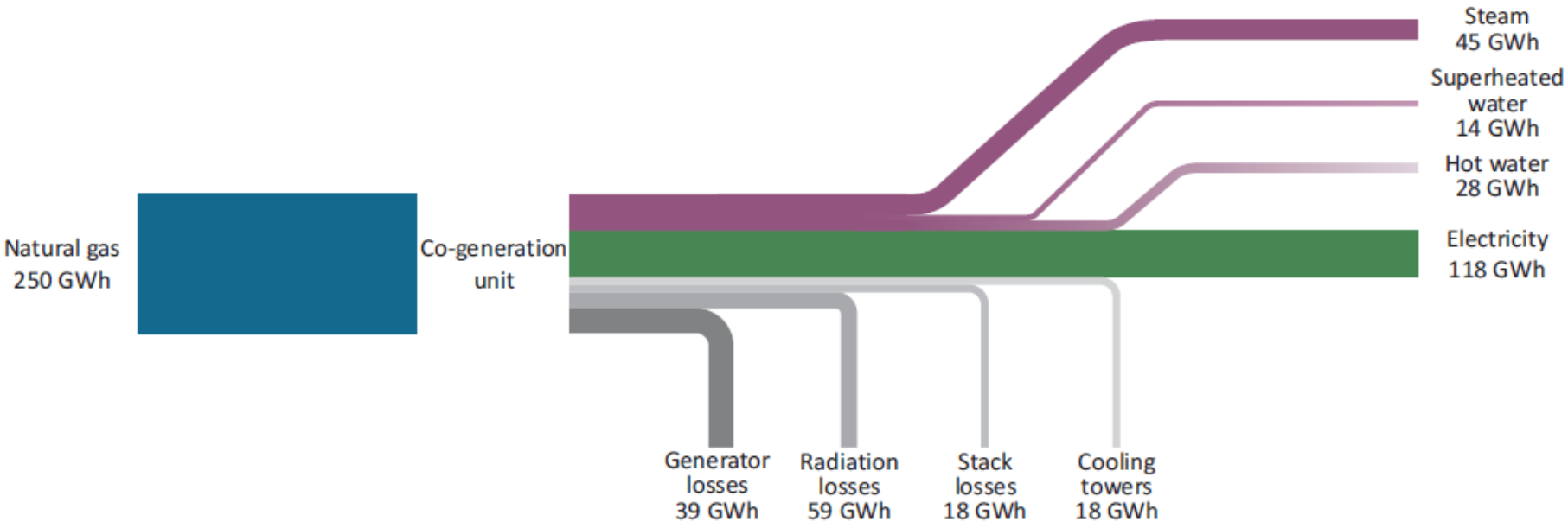
Project name	Type of application	Location	Capacity (MW)	Energy input	CO_2 savings compared to conventional generation technologies (kt/year)
Markinch project	Industrial CHP - Paper sector	UK	127	Biomass	250
Eresma project	Industrial CHP - Beverage sector	Spain	23	Gas	16
Nuevo Pemex project	Industrial CHP - Gas processing and Refining sector	Mexico	730	Gas	430
Marstal project	Biomass CHP and solar thermal DH with storage and heat pump	Denmark	6	100% renewable	11
Bercy project	DC network – assisted with natural cooling	France	44	Natural cooling assisted	7
PNUW project	DH network – solar thermal with storage	Saudi Arabia	25	Solar, diesel (aux. boilers)	5

Markinch Project – Industrial CHP: Paper



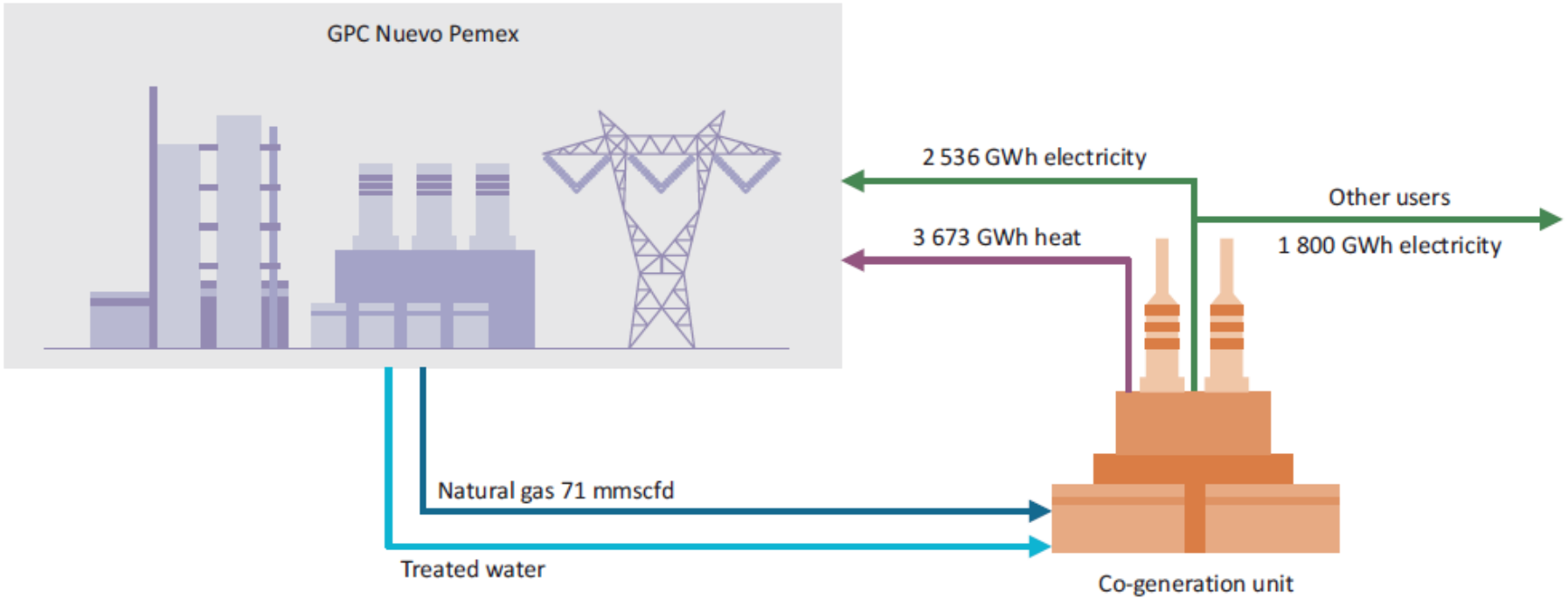
Sources: CHPA representatives (2013), Personal communication; RWE Innogy representatives (2013), Personal communication.

Eresma Project – Industrial CHP: Beverage



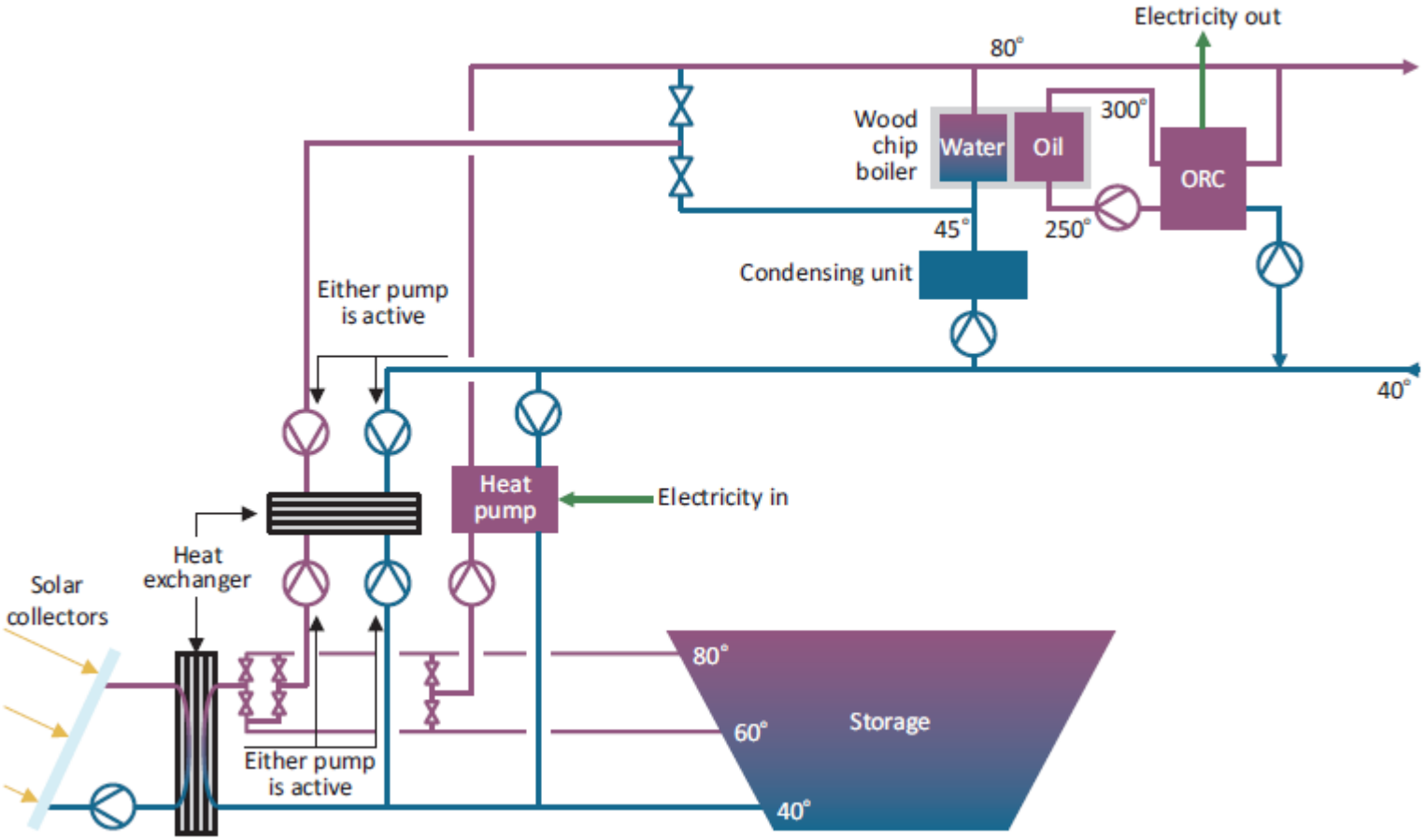
Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

Nuevo Pemex Project – Industrial CHP: Gas processing



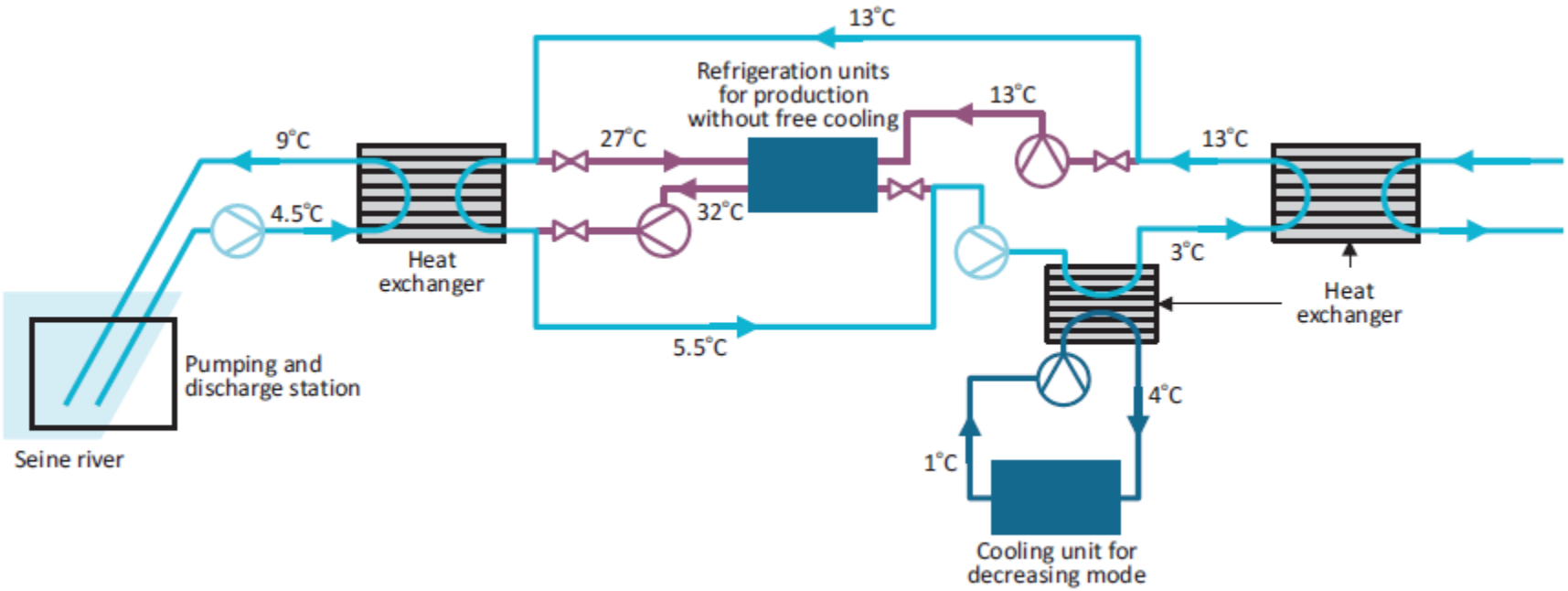
Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

Marstal Project – Flexible and renewable DH system



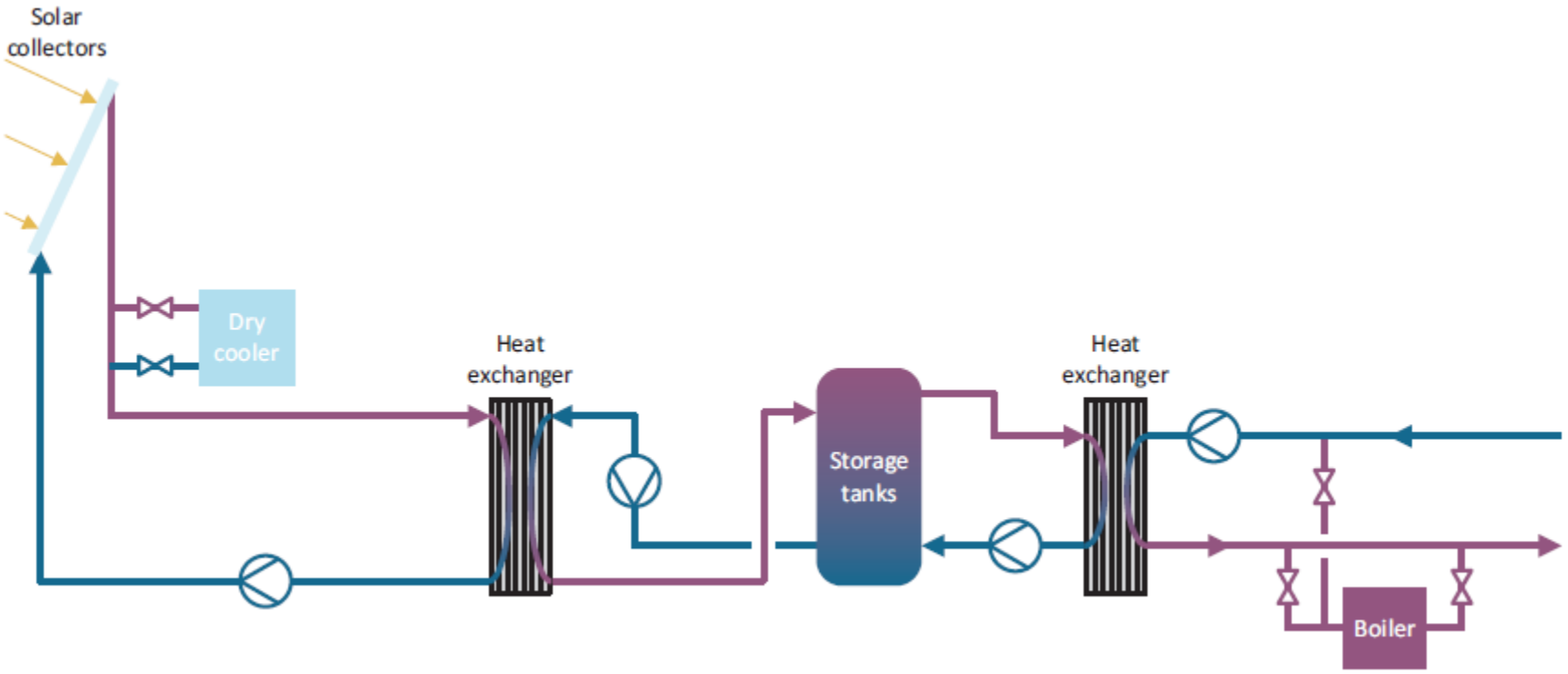
Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

Bercy Project – DC assisted with natural cooling



Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

PNUW Project – DH with solar thermal and storage



Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

Key factors impacting CHP/DHC projects' development & operation

Technology selection:

- ✓Energy efficiency
- ✓Technology flexibility
- ✓Energy prices and availability
- ✓Thermal/electricity loads
- ✓Existing local infrastructure
- ✓Grid interconnection possibilities

Financing mechanisms:

- ✓Company self-financed
- ✓Loans
- ✓Third party
- ✓Joint venture
- ✓Publicly financed
- ✓Any combination of these

Business structure:

- ✓Generator / end-user
- ✓Generator/ market operator
- ✓End-user/distribution

PROJECT DEVELOMENT

SYSTEM OPERATION

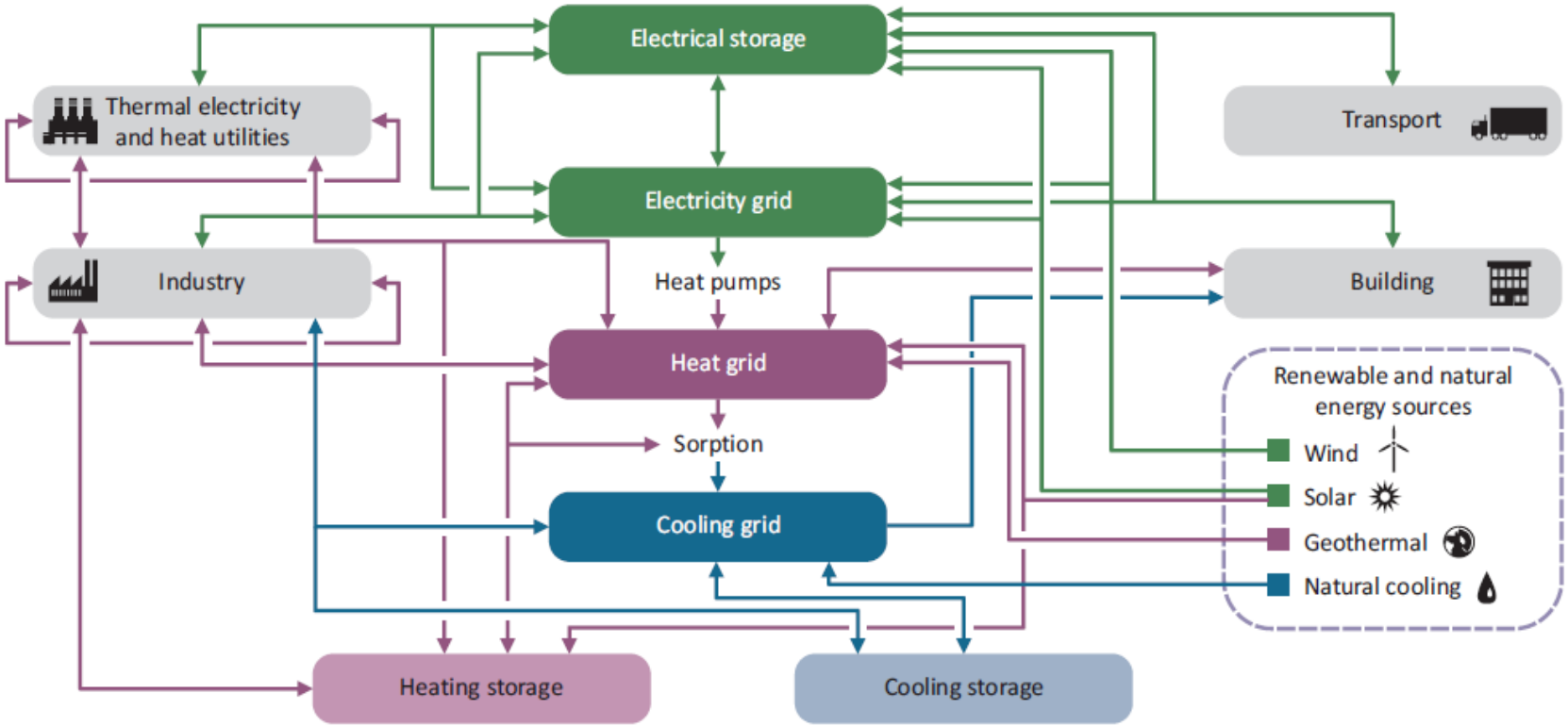
What matters at the technology selection phase?

- ✓End-use efficiency goes first: get the right generation capacity size
- ✓Temperature is important: compatibility of local heat sources and sinks, and minimise return temperature on DH systems
- ✓Heat / electricity ratio: assess heat / electricity demand patterns over time
- ✓Existing possibilities to locally bridge energy demand with generation
- ✓Value flexibility

How to make energy efficiency and flexibility economically visible?

- ✓CHP technologies typically require higher upfront investments
- ✓DHC networks infrastructure are high capital intensive
- ✓A detailed economic feasibility assessment is key…
  - ✓Environmental and flexibility benefits in economics terms
  - ✓Maximum integration of heat/electricity users and producers to be analyzed
  - ✓Long-term view of energy market conditions

Business structure to cope with a deep level of integration



Source: Linking heat and electricity systems: Co-generation and DHC solutions for a clean energy future. IEA, 2014.

How can policy and market conditions help CHP/DHC projects?

REGULATORY FRAMEWORK LONG-TERM STABILITY

TECHNOLOGY SELECTION INCENTIVES

–Energy efficiency rewarding policies

–Complementary policies rewarding efficient use of renewable energy sources

–Interconnection measures

–Local infrastructure and heating/cooling planning

FINANCIAL AND FISCAL INCENTIVES

–Low interest loans

–Capacity grants

–Feed-in tariffs

–Fiscal incentives

Can help mitigate markets failing to effectively reward energy efficiency

SMART BUSINESS MODELS SUPPORT

–Support related R&D and international collaboration

–Promote pilot models

–Integrate lessons learned from pilots and existing models into infrastructure development plans

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Thanks

Don't miss: *http://www.iea.org/chp/*