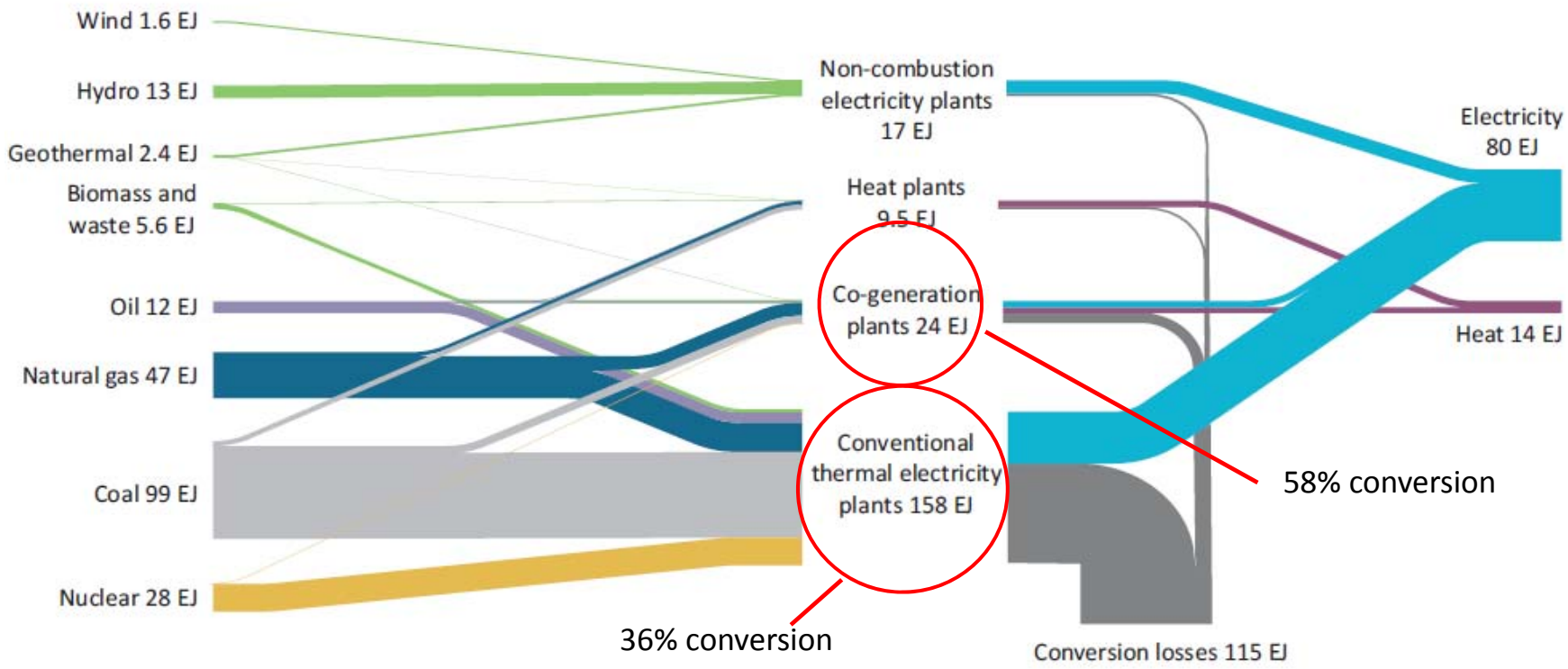
International Energy Agency
1974•2014

# Linking heat and electricity systems

*5 June 2014*

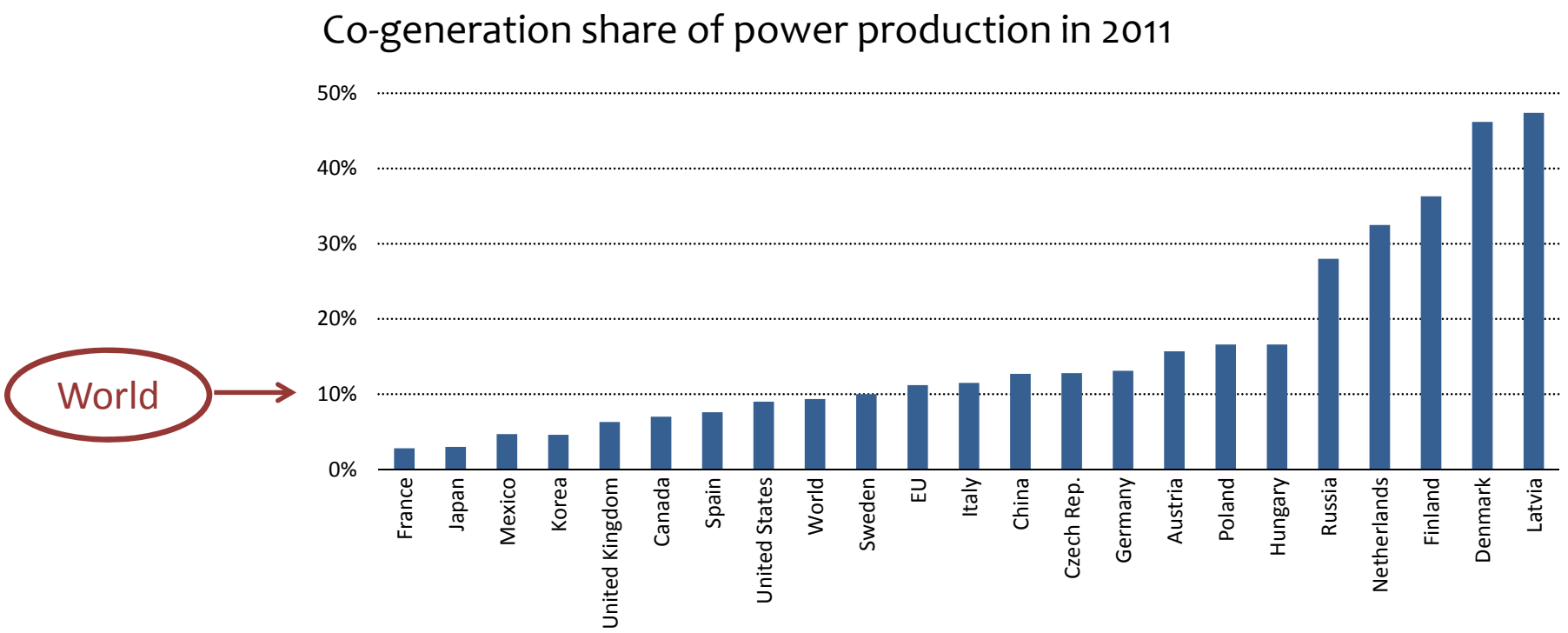
www.iea.org

# Co-generation and efficient DHC can be part of a sustainable solution




Energy flow in the global power and heat sector. Source: IEA Statistics, 2013

# …but existing barriers prevent extensive deployment




✓ Global electricity generation stagnant at 10% since 2000

# 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 |

# 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**

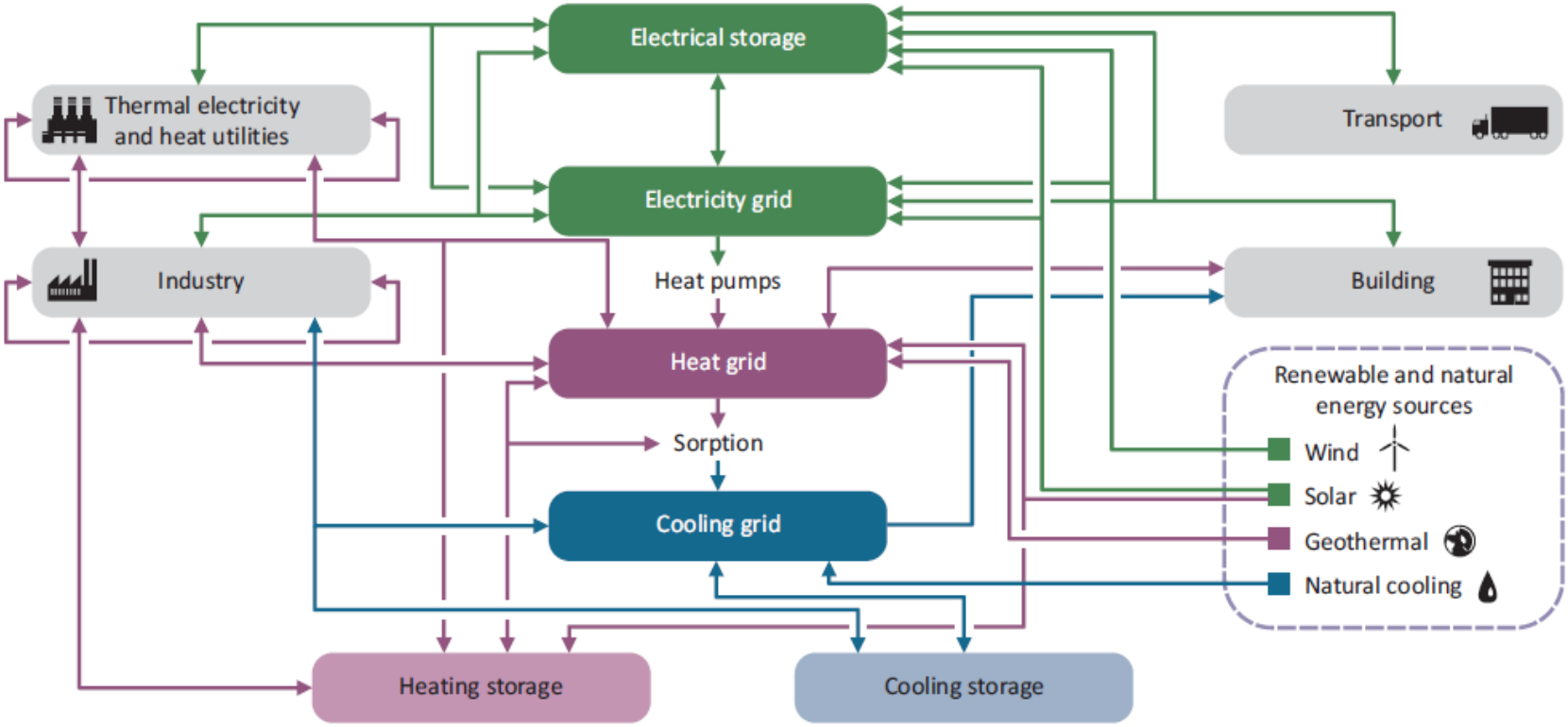
# What matters at the technology selection phase?

- ✓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

International Energy Agency
1974•2014

# Thanks

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

www.iea.org