Innovation Infrastructure Enabling Market Transformation

Caroline Haglund Stignor
RISE Research Institutes of Sweden

International perspective

RISE is a unique institution internationally in its commitment to cross-disciplinary research and innovation.

RISE is the 4th largest institute of its kind in Europe, after Fraunhofer (Germany), CEA (France) and TNO (Netherlands).

OUR MISSION

Increased competitiveness through sustainable transition

OUR OFFER

Competitiveness and transition based on research

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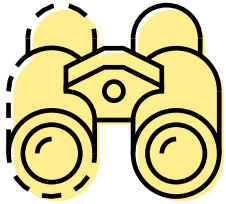
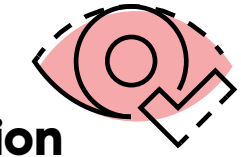
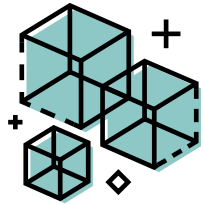
Our offer

Transition management



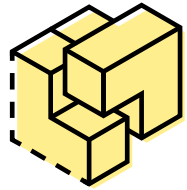
Testing, certification and calibration





Applied research and development

Lifelong learning



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Innovation infrastructure

Policy framework (CO2-tax, etc) and energy infrastructure

- Institutions for education – theoretical and practical
- **Institutions for research** and development – universities, research institutes, private sector

➢ **Research and innovation funding**

➢ **Test beds for R&D, accredited testing, certification, market surveillance etc.**

➢ **Certification bodies**

➢ **Standardization bodies**

➢ **Expertise to support policy development, regulatory sandboxes**

- Support to SME

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Resarch and Innovation funding

- 7 consecutive **R&I programmes** from the 1990's to today, financed by the Swedish Energy Agency

- **Funding model** which **encourage tight collaboration** between **academia**, **research institutes** and **private sector** (industry, real estate owners, etc)
  - ➢ Researchers explored areas **relevant** for industry
  - ➢ Knowledge and experience were immediately **transferred to industry**

NUTEKs utvecklingsprogram
ALTERNATIVA KÖLDMEDIER

Klimat 21
"Effektivare kylmaskiner och värmepumpar"
1997 – 2000

eff-Sys
Effektivare kyl- och värmepumpssystem

EFFSYS 2
Effektivare kyl- och värmepumpssystem

effsys

effsys EXPAND
Resurseffektiva kyl- och värmepumpssystem samt kyl- och värmelager

TERMO
FRAMTIDENS VÄRME OCH KYLA

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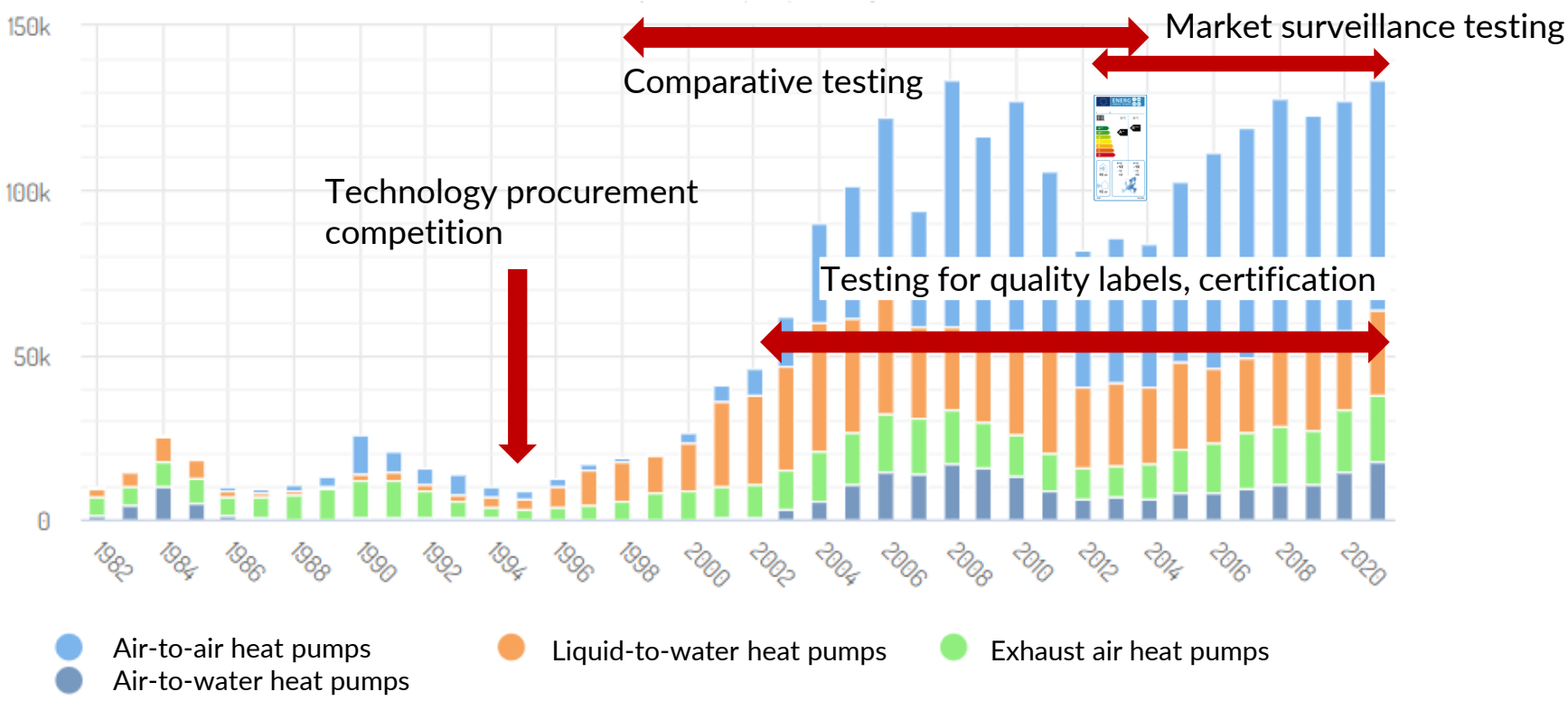
Testbeds

- Research and development
- Accredited testing
- Certification
- Market surveillance
- Development of new methods
- Calibration
- Field measurements
- Hardware-in-the loop
- Technology procurement competition

Heat pump sales in Sweden

About 1.5 million heat pumps



Source: www.skvp.se

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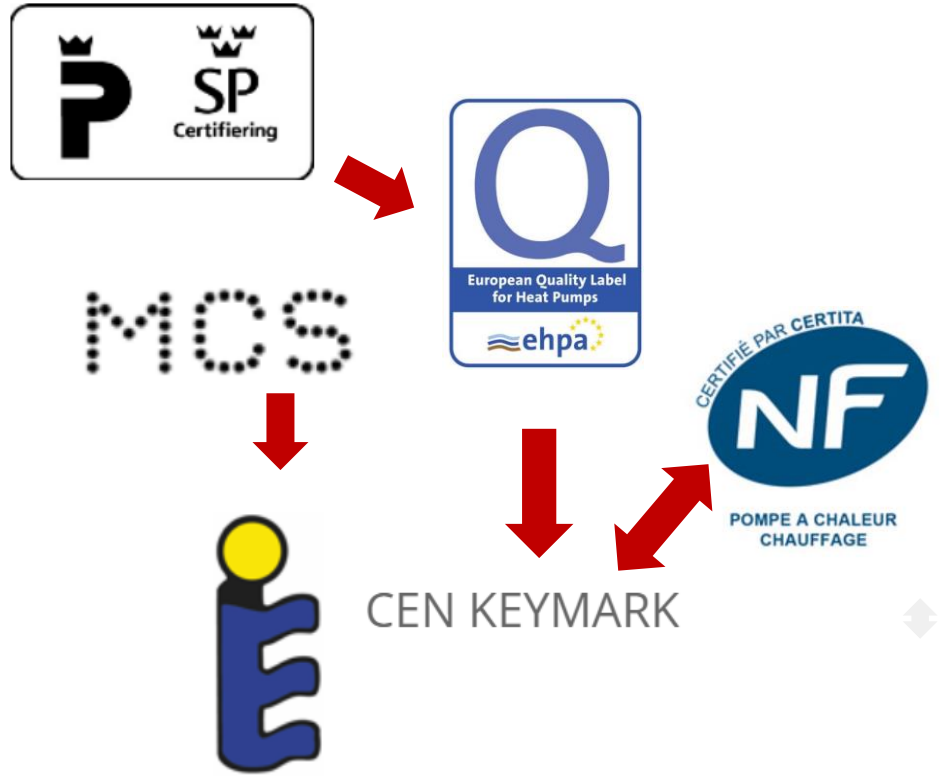
Quality labels and certification

- ~~P-mark~~
- ~~DACH label~~
- MCS
- **EHPA Quality Label**
- **NF PAC**
- **HP Keymark**



Active in standardization

- Swedish Technical Committee SIS TK 467 mirror: **CEN TC 113 Heat Pumps and Air-conditioners**
- Sweden and RISE are active in
  - WG7: Heat Pumps, air conditioners and chilling liquid packages - testing and rating at part load conditions
  - WG8: Rating and testing for performance
  - WG9: Sound rating of heat pumps, air conditioners and liquid chilling packages
  - WG10: Heat pumps for domestic hot water production and revision of EN 16147

- Swedish Technical Committee SIS TK 243 mirror: **CEN TC 182 Refrigeration System Safety and Environmental Requirements**
- Sweden and RISE active in
  - WG 6: Revision of EN 378 Refrigerating systems and heat pumps - Safety and environmental requirements

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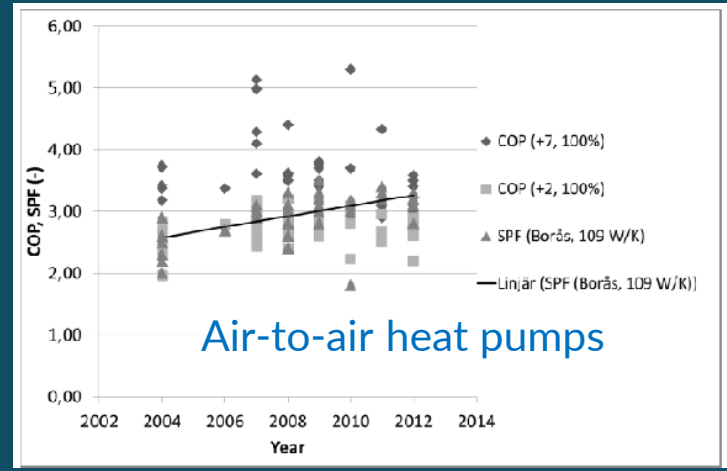
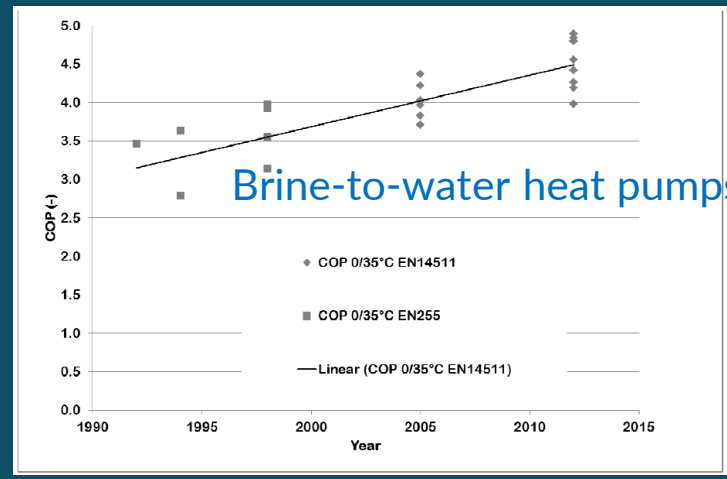
Comparative testing

- Performed on behalf of the **Swedish Energy Agency** on **different types of heat pumps** during designated campaigns, results published on **website**
  - **Information** to end consumers
  - **State-of-the-art** assessment by authorities and policy makers
- **”Cleaned”** market from low/non performing products
  - **Spurred** industry **improve** the products
    - **More and more efficient** products were developed and sold



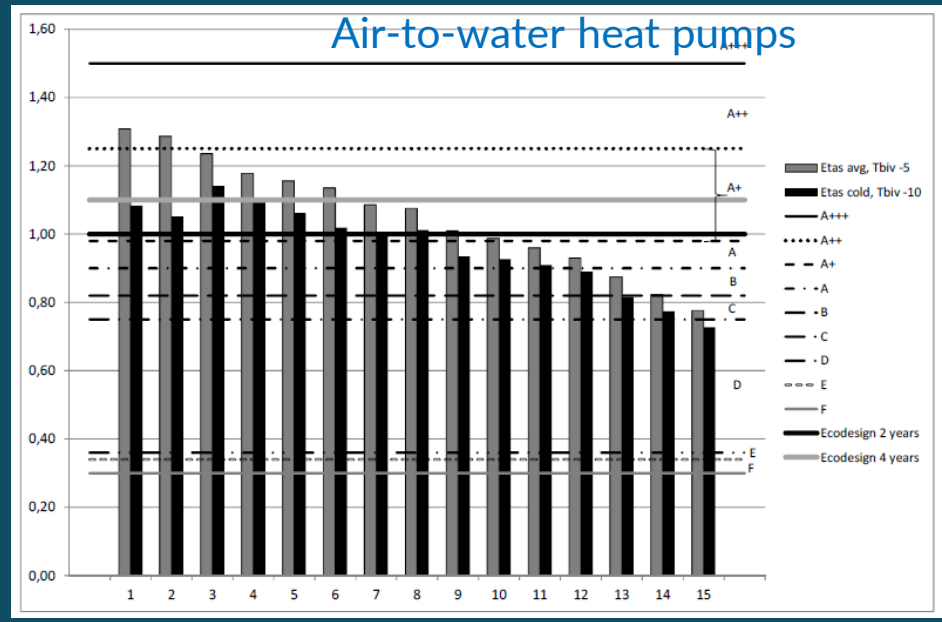


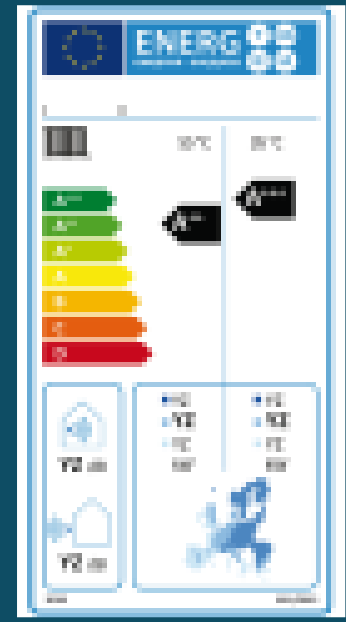
Sources: Nakos et al. (2014) https://heatpumpingtechnologies.org/publications/air-to-air-heat-pumps-evaluated-for-nordic-climates-trendsand-standards/
Lindqvist et al. (2014) https://heatpumpingtechnologies.org/publications/brine-to-water-heat-pumps-evaluated-for-nordic-climateand-the-swedish-market/

Expertise to support policy development

EC Energy Label and Ecodesign

- Knowledge and experience available
- Performance data available
- Sweden could impact on treshold levels
- Ensured/ contributed to regulations aligned with Swedish conditions, market and industry.

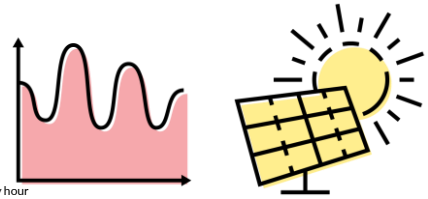




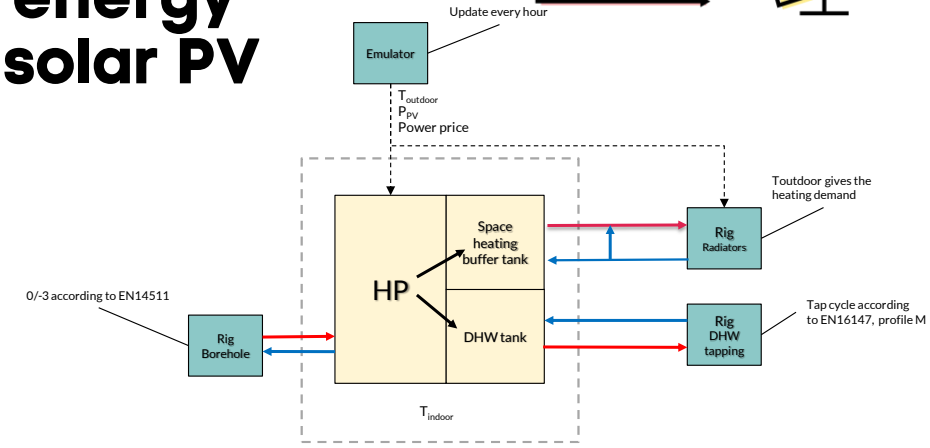
Source: Haglund Stignor et al. (2014) https://heatpumpingtechnologies.org/publications/air-to-water-heat-pumps-evaluated-for-nordic-circumstances/

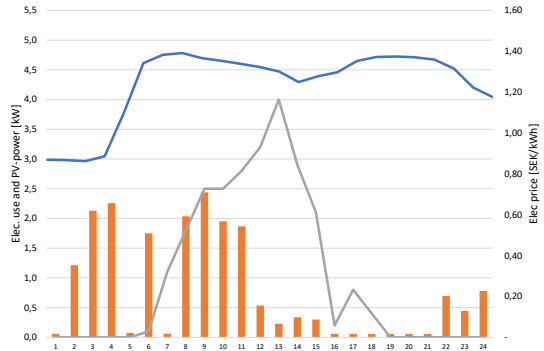
R&D Comfort and Climate Box

combination of heat pump, energy storage, smart control and solar PV



- **Prototype developed** within research project
- **Method for evaluation** developed (6 days, all seasons) – hardware-in the-loop – ”field measurements in the lab”
- **Prototype evaluated, applying the method,** experiences shared with industry
- **Two “Smart control functions“**
  - Price: Minimize the electricity cost
  - Sun: Maximizing self-consumption of PV-power
  - **Combination of above - RESULTS:**





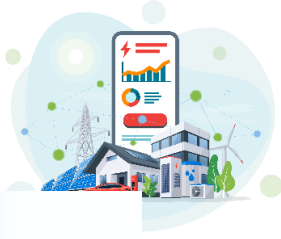
Summing up

Innovation infrastructure for market transformation

Further development

… of the technology and market transformation is needed

- **Smart, flexible, integrated** solutions
- **Extended operating range** (lower and higher temperatures)
- Products and systems for **refrigerants** with **reduced environmental impact**
- Products adapted to a **circular economy**



➢ **Important** to ensure availability to appropriate **Innovation Infrastructure**

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Thanks for your attention!

Caroline Haglund Stignor
Caroline.haglundstignor@ri.se