



IEA Technology Collaboration Programme

COUNTRY REPORT SWEDEN

*Emina Pasic IEA ES ExCo Delegate Sweden
Swedish Energy Agency*

ES TCP XC 95, Vienna, Austria, 01 June 2023

Sweden

450 000 km² - 1/5 biggest country in Europe

Mountains, forests 67%,
lakes and rivers 10%
8% arable land

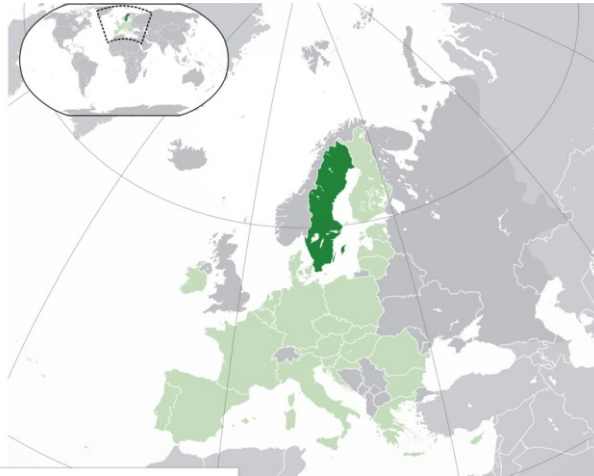
10,5 M inhabitants

41% urban systems (>50 000)

2,4 M in the greater Stockholm area

area

Part of EU and Nordpool



Swedish Energy Agency

- National authority for energy policy issues / Governmental Funding Agency on climate and energy issues
- Sorts under Ministry of Climate and Enterprise (2023-01-01)
- The Director-General is appointed by the Government
- Government funded
- Formed in 1998
- Around 450 employees
- 62 percent women and 90 percent academics
- ISO 14001 (environment) and ISO 50001 (energy)



Swedish Energy Agency

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[The Swedish Energy Agency International](#) | [LinkedIn](#)

- **Our Vision - Affordable and Clean Energy**
- **Our Mission-We are leading society's transition to sustainable energy system**

■ Tasks:



Statistics
and policy
analysis



Energy
security



Research and
innovation



Business
development



Policy
instruments



International
collaboration

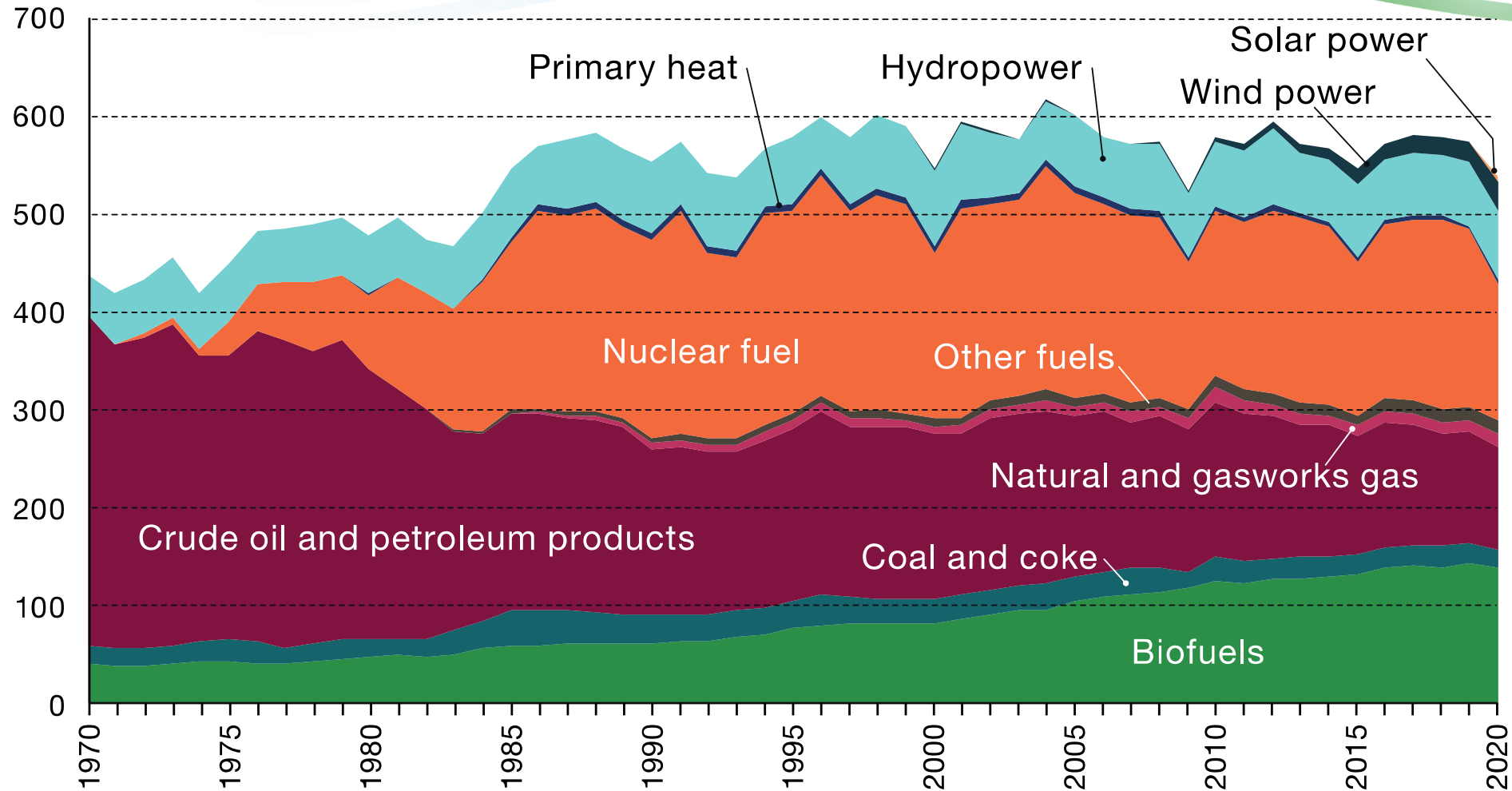


Energy
efficiency
measures

■ Roles:

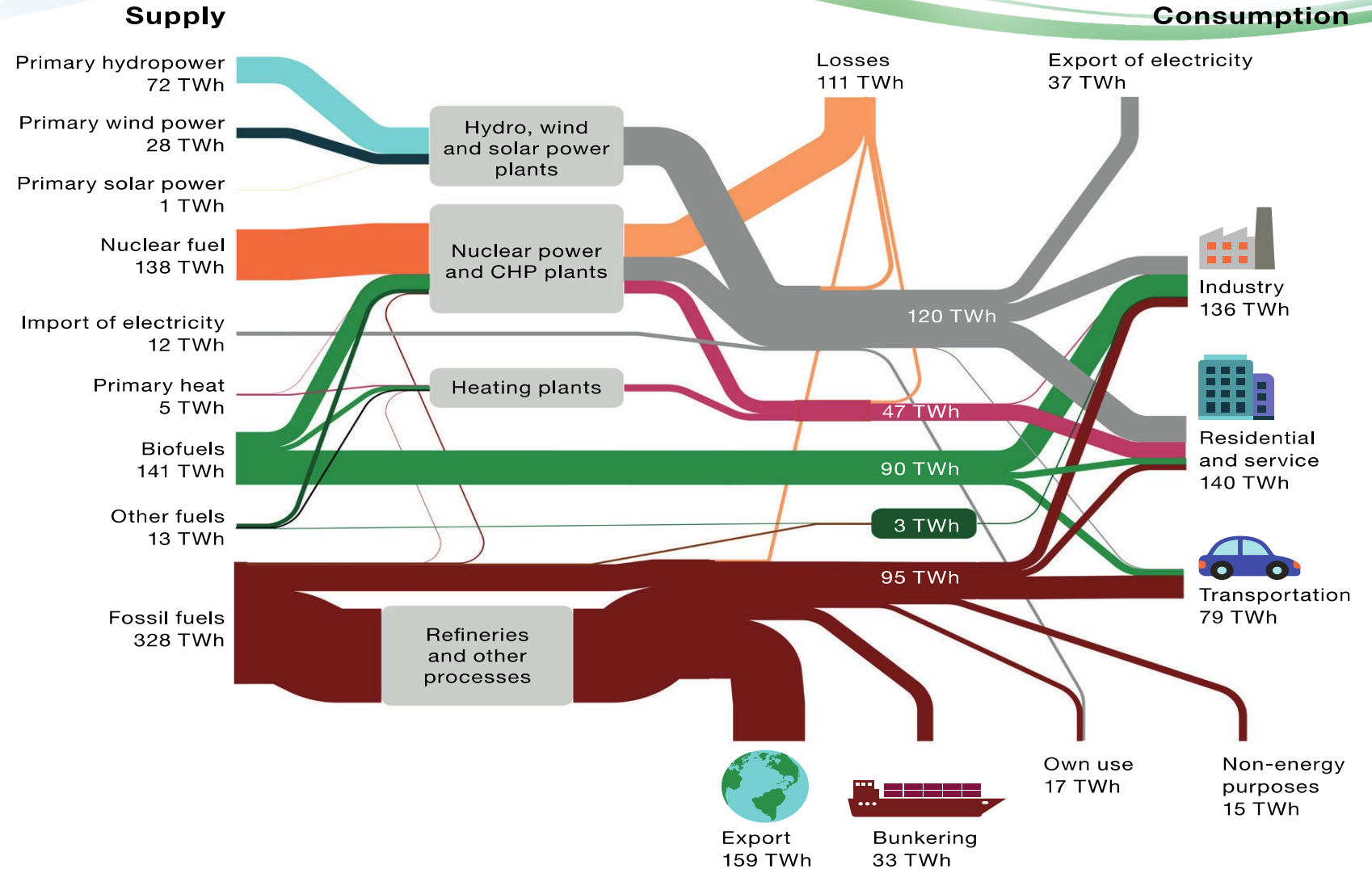
- **Steering** – enforces governmental and parliamentary decisions
- **Supporting** – disseminates information within the energy and climate area and grants financial support to research and innovation
- **Expert** – provides the public, the Government and the research domain with data (statistics, analyses, scenarios and forecasts) and represents the Government according to mission

Total supplied energy 1970–2020, TWh

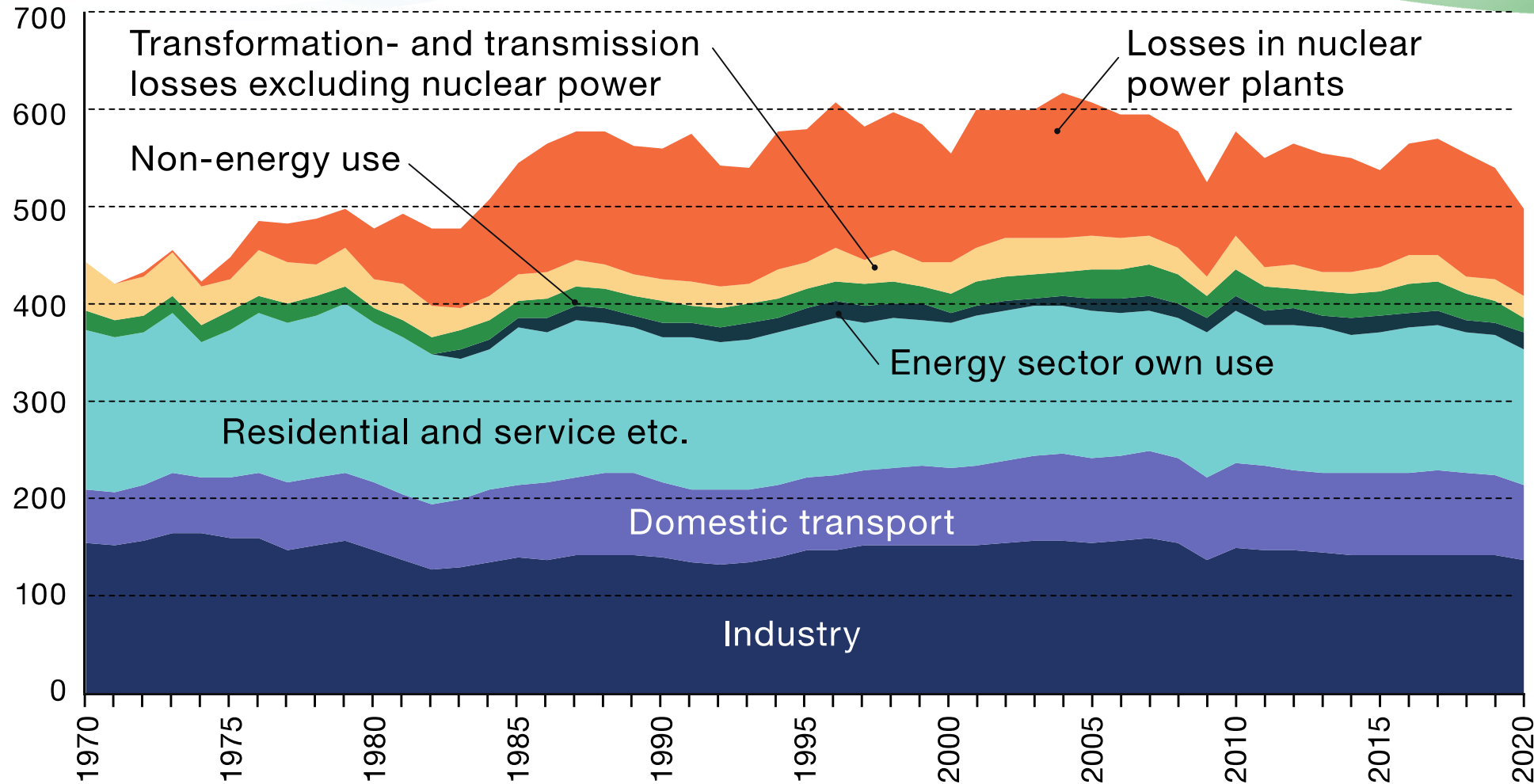


A balanced energy system-Energy flows for 2020

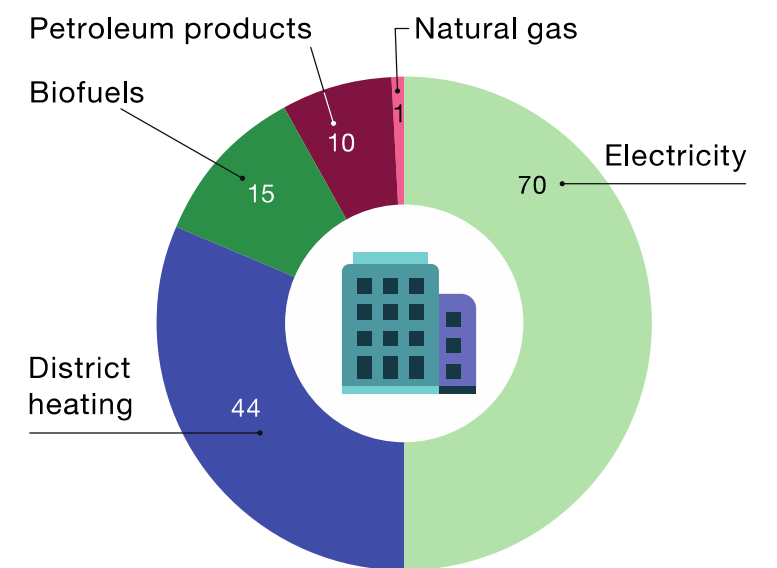
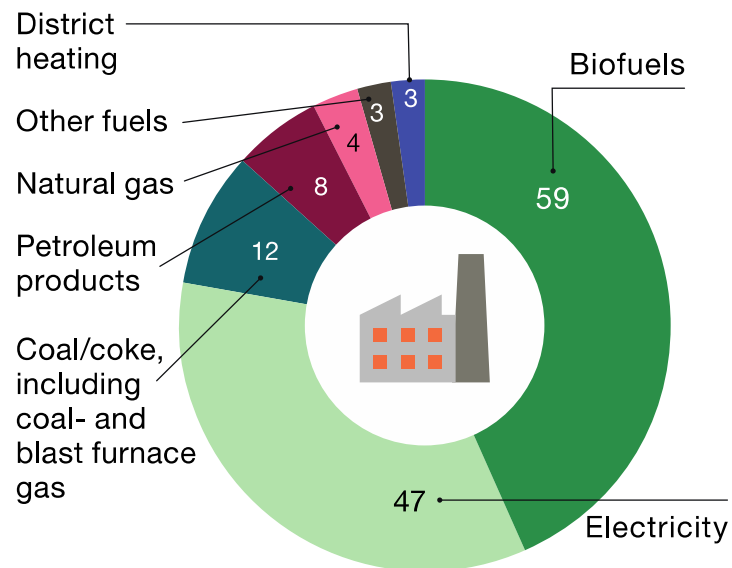
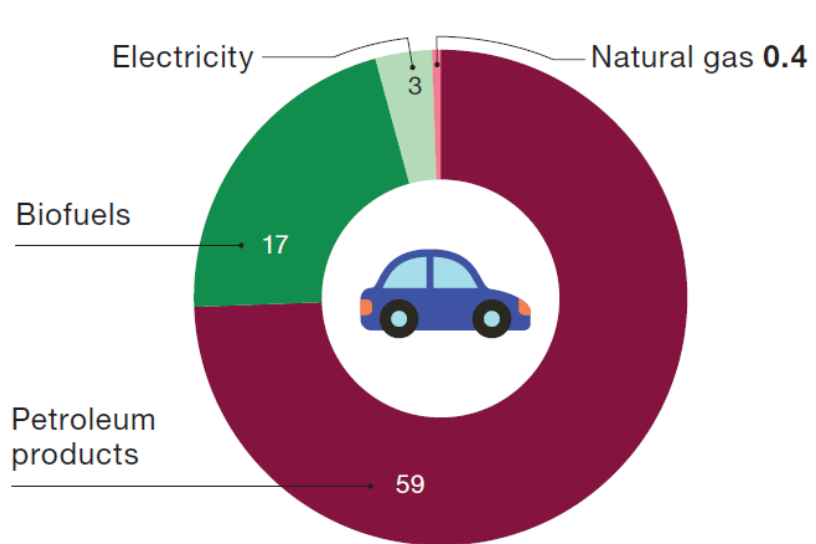
- The diagram includes the total quantity of fossil fuels supplied to the Swedish energy system, 328 TWh.
- Of these, 159 TWh are exported and 33 TWh go to bunkers in international maritime transport, leaving 136 TWh of fossil fuels for final use in Sweden



Total final energy use, 1970–2020, TWh



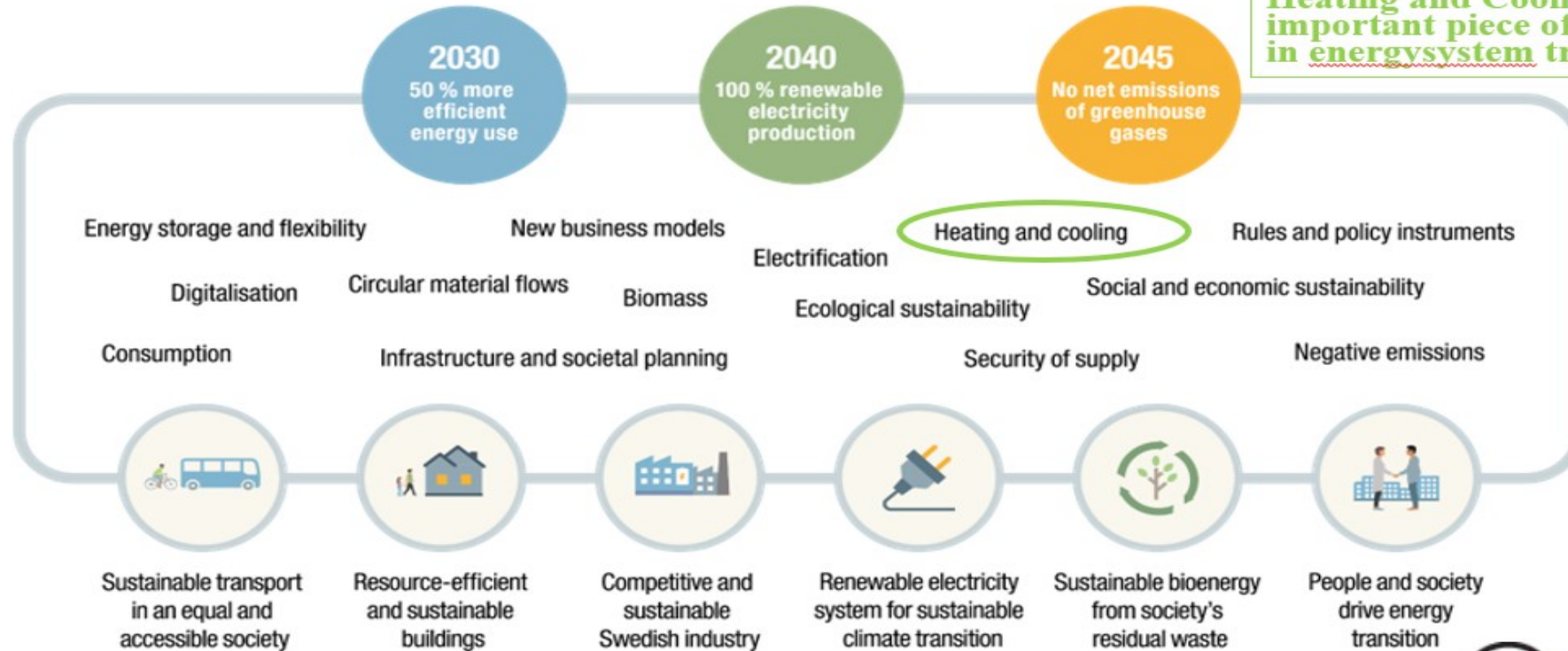
Final energy use in the different sectors 2020, TWh





Sweden shall be the world's first fossil-free welfare state

Heating and Cooling is an important piece of the puzzle in energysystem transition



Policy measures in support of energy storage

- R&D-support since at least 1980s
- Beneficial electrical pricing for electricity to heat in District heating plants (1980s).
- Energy and carbon taxation (since 1991), making oil heating expensive
- Grants for conversion from oil and direct electric heating (last period 2006-2010)
- ROT-deduction (Building/renovation deduction) for energy storage-installations allowing you to cut 30 % of the labour cost (Currently in place)

Objectives for 2030 – R&I Strategy for Heating and cooling

Vision 2050: A sustainable Energy System (Swedish Energy Agency)

Energy resources

Energy for heat and cooling consists of recycled and renewable energy. Excess heat from different sectors is used and benefits society.

Interaction in the energy system

Interaction between heat and cooling and other energy carriers contributes to a resource- and cost-effective energy system.

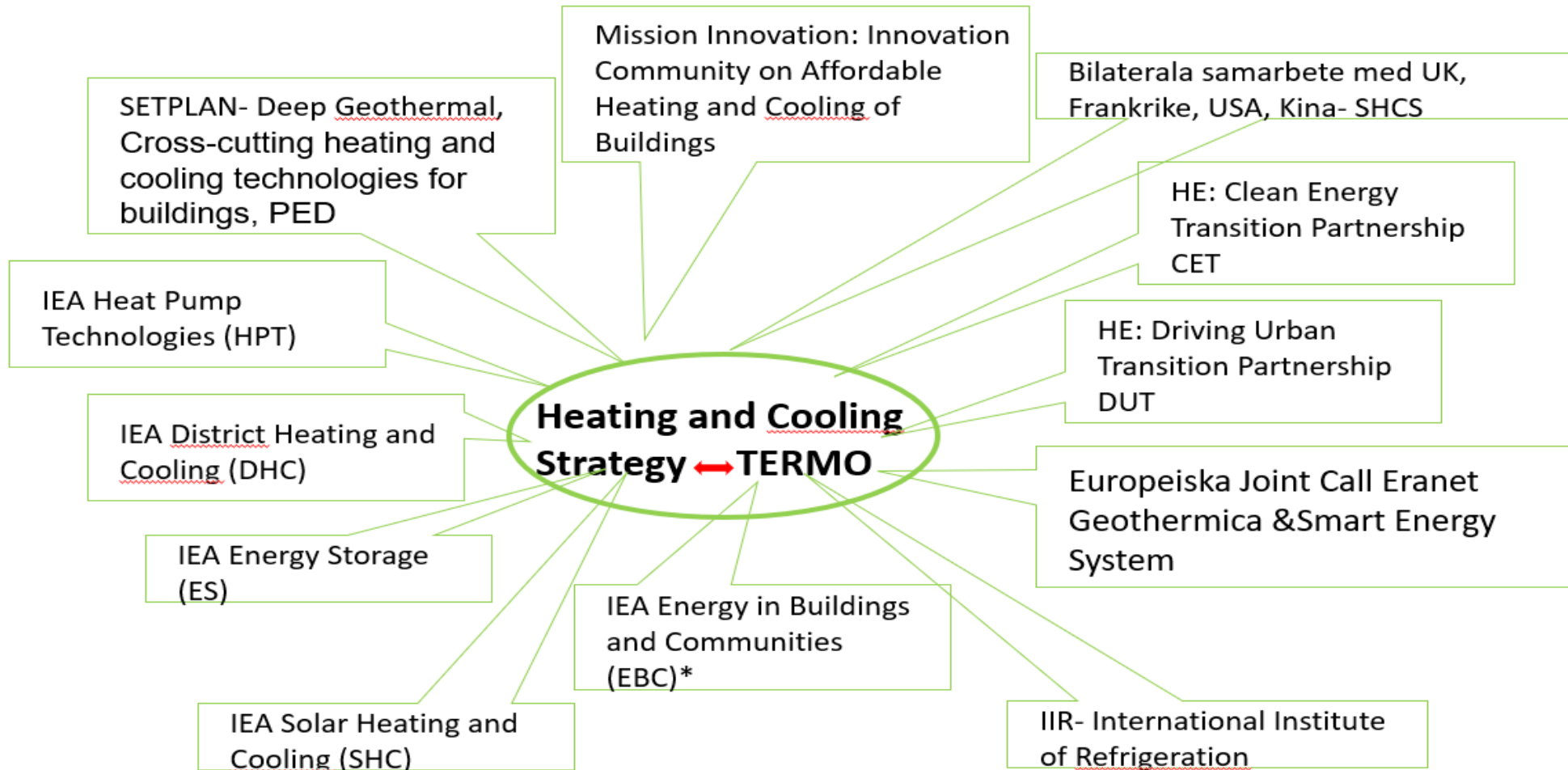
Resource effective use

Heat and cooling are used in a resource-efficient manner. Users benefit from competitive prices in local markets.

Innovation for jobs and climate

The business community, public actors and research actors are world-leading in heating and cooling innovations. Products, system solutions and services are competitive in a global market.

International Collaboration- Heating and cooling



*Funding by E2B2 Program

Research, Innovation and “making a difference”

The Swedish Energy Agency has:

- Annual budget approx. 160 million €
- Equal amount of industrial co-funding (tot. 320 m€)
- ~ 90 programmes and 1200 projects running
- Scientific advisory boards, systematic evaluation and long term governing thematic strategies
- Closed the gaps from basic research to demonstration, implementation and commercialisation and internationalisation
- Increased cooperation/co-creation with others

Long and successful collaboration since 1994

Program	Budget (MSEK)
Alternative <u>refrigerants</u> 1995-1996	N/A
<u>Climate 21</u> (1997-2000)	54
<u>Efficient refrigeration</u> and heatpump systems - <u>Effsys</u> (2001-2004)	54
<u>Effsys 2</u> (2006-2010)	70
<u>Effsys +</u> (2010-2014)	88
<u>Effsys expand</u> (2014-2018)	96
<u>Termo</u> , including <u>GE</u> and innovation clusters (2017-2021)	160
Total:	<u>Approx 50 M€ (excl co-funding from industry)</u>



TERMO-R&I Program Heating and Cooling Sweden

National GHSP and TES projects SWEDEN

Projects on GHSP and TES systems:

- IEA ES Task 38 – Geothermal de-icing and snow melting of infrastructure
- Novel tool and guidelines for designing ground source heat pumps (GSHPs) in densely populated areas
- Optimal flow in GSHPs
- Combined TES HEX for PCM with air as heat carrier
- Circular techno-economic analysis of TES (Swedish part in IEA ES EcoEneSto)

TES projects associated with thermal grids/district heating:

- Hydroc High Temperature TES for district heating in Linköping
- Test drilling for deep geothermal
- GeoCoHorT
- Optimal integration of large BTES in thermal networks
- Solar driven district heating with PTES in Swedish conditions
- Heating and cooling with TES
- Local energy system for energy resource exchange

European Projects



COOLGEOHEAT
- Shallow geothermal energy

The Change

Modelling of optimal borehole field
for thermal networks

LTH+VIA College+SGC+Skanska
Norway+OSU+ORNL+NRL

CoolGeoHeat 1 closed 2022
CoolGeoHeat 2 – application ongoing

5GDHC with integrated TES – technical
modelling & business models

LTH+VIA College+SGC

Swedish Geoenenergy Center activities

Country updates for
EGC 2022
WGC 2023



EUROPEAN
GEOTHERMAL
CONGRESS
2022

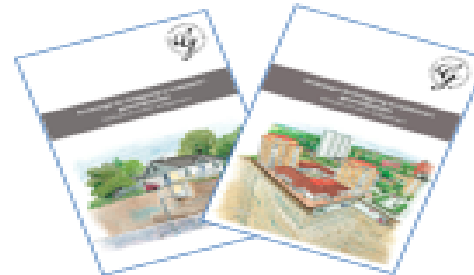


WORLD
GEOTHERMAL
CONGRESS
2023 Beijing China

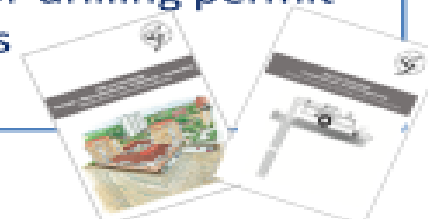
Geoenenergy statistics for
EGEC Market Report 2022



Published guideline documents:
Collector piping for small and large
GSHP/BTES systems (2022)



Ongoing guideline documents:
Update of TRT + test boreholes
Guideline for pre-studies, on-site
investigation, project planning &
procurement (based on IEA ES Annex 27)
Guide to geoenenergy for drilling permit
officers

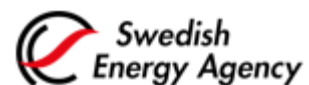


Other Relevant Information

- [Swedish Energy Agency \(energimyndigheten.se\)](https://energimyndigheten.se)
- <https://termoinnovation.se/projekt/>
- [Varmt & Kallt – ett innovationskluster \(varmtochkallt.se\)](https://varmtochkallt.se)
- [Välkommen till Svenskt Geoenergicentrum | Svenskt Geoenergicentrum](#)
- [Anmälningssformulär Geoenergidagen 2023 | Svenskt Geoenergicentrum](#)
- [Så kan energilagring bidra till mer förnybar energi \(ungpd.com\)](https://ungpd.com)

Thank you !

emina.pasic@energimyndigheten.se





IEA Technology Collaboration Programme

The Energy Storage TCP

*Country reports are an informative contribution of the ExCo delegates of the ES TCP member countries.
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