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Interreg Baltic Sea Region

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Welcome

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Sustainable Heat Production Theory

Outlines

- What Are the Methods Of Producing Heat In Europe?
- What Is The Role Of District Heating?
- What Fuel Is Used To Produce Heat?
- So What???

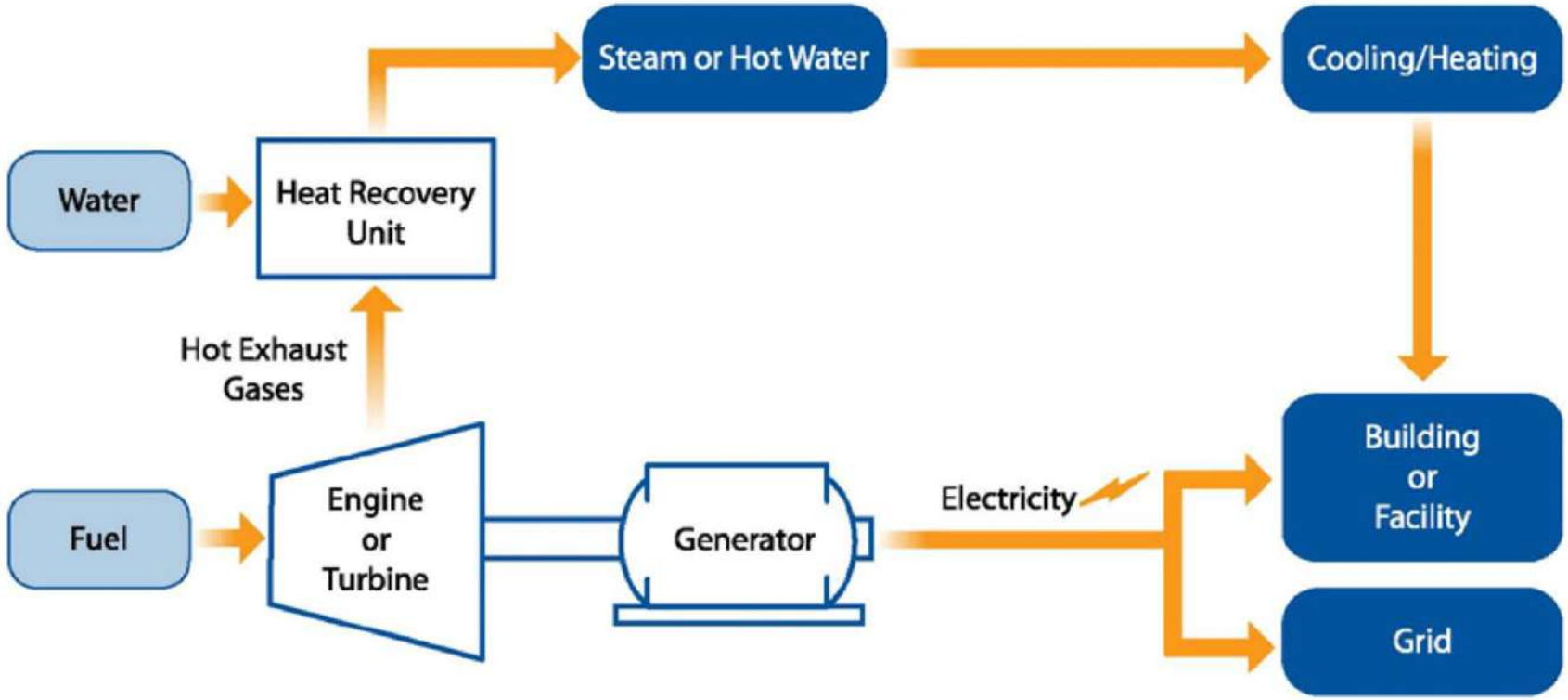
What Are the Methods Of Producing Heat In Europe?

It is important to understand that a significant portion of heat generation in Europe occurs as a by-product of electricity generation through Combined Heat and Power (CHP) systems. These systems are highly efficient as they capture and utilize the heat that would otherwise be wasted during electricity production. CHP plants can be found across Europe, particularly in countries with well-established district heating networks, such as Denmark, Sweden, and Finland.

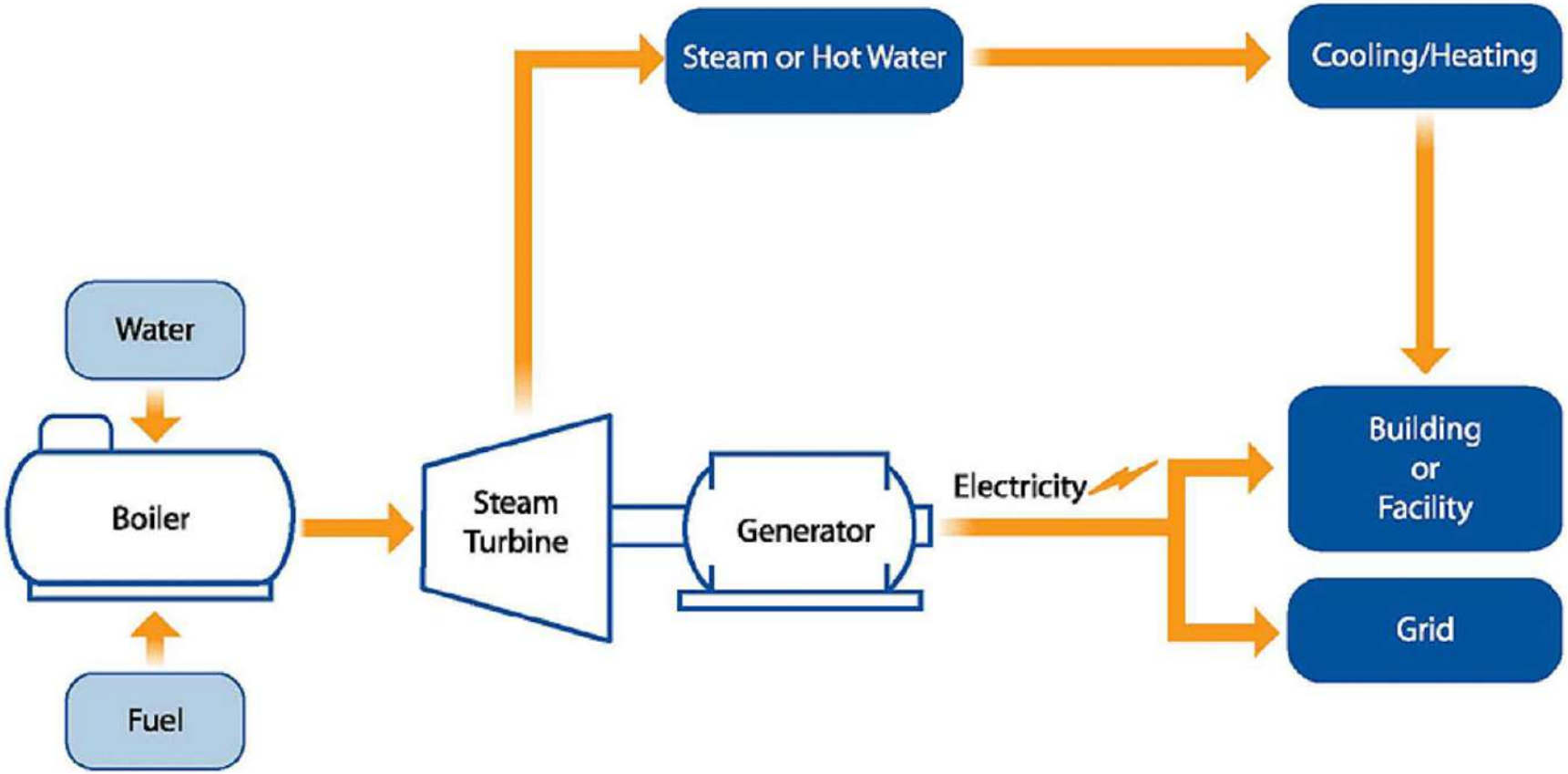
The two most common CHP system configurations are:

- Combustion turbine, or reciprocating engine, with heat recovery unit
- Steam boiler with steam turbine

- **Combustion Turbine, or Reciprocating Engine, with Heat Recovery Unit**

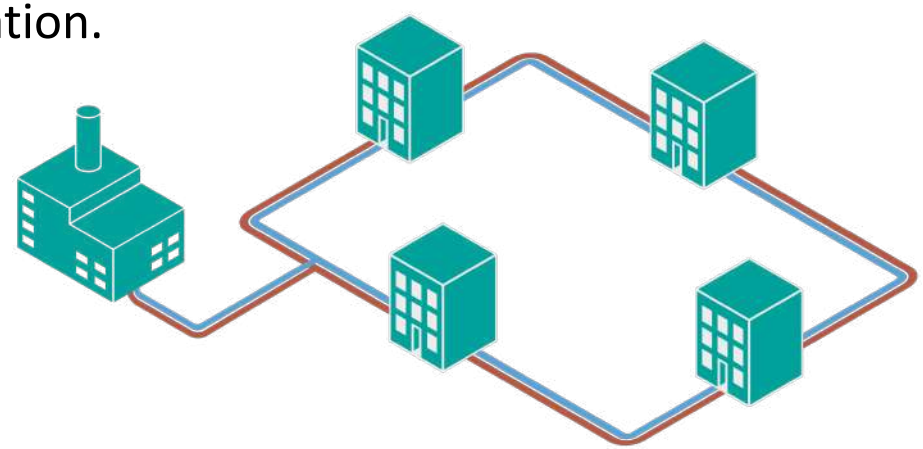


Steam Boiler with Steam Turbine



What Is The Role Of District Heating?

District heating systems, which distribute heat generated in centralized locations through a network of insulated pipes, often utilize the heat produced by CHP plants. The schematic below illustrates the mechanism of district heating in the simplest sense. We will go into more detail about the methods of generating heat and their pros and cons later in the presentation.



Primary Heat Generation

While CHP and district heating systems exemplify the by-product utilization of heat, there are also systems where heat generation is the primary goal.

Residential and Commercial Heating: In residential and commercial settings, heat is often generated directly using boilers fueled by natural gas, oil, biomass, or electricity. These systems are designed specifically to provide heat for space heating and hot water.

Renewable Heat Sources: Increasingly, renewable sources such as biomass boilers, geothermal heat pumps, and solar thermal systems are being used to generate heat primarily. These technologies are aimed at directly producing heat with minimal environmental impact.

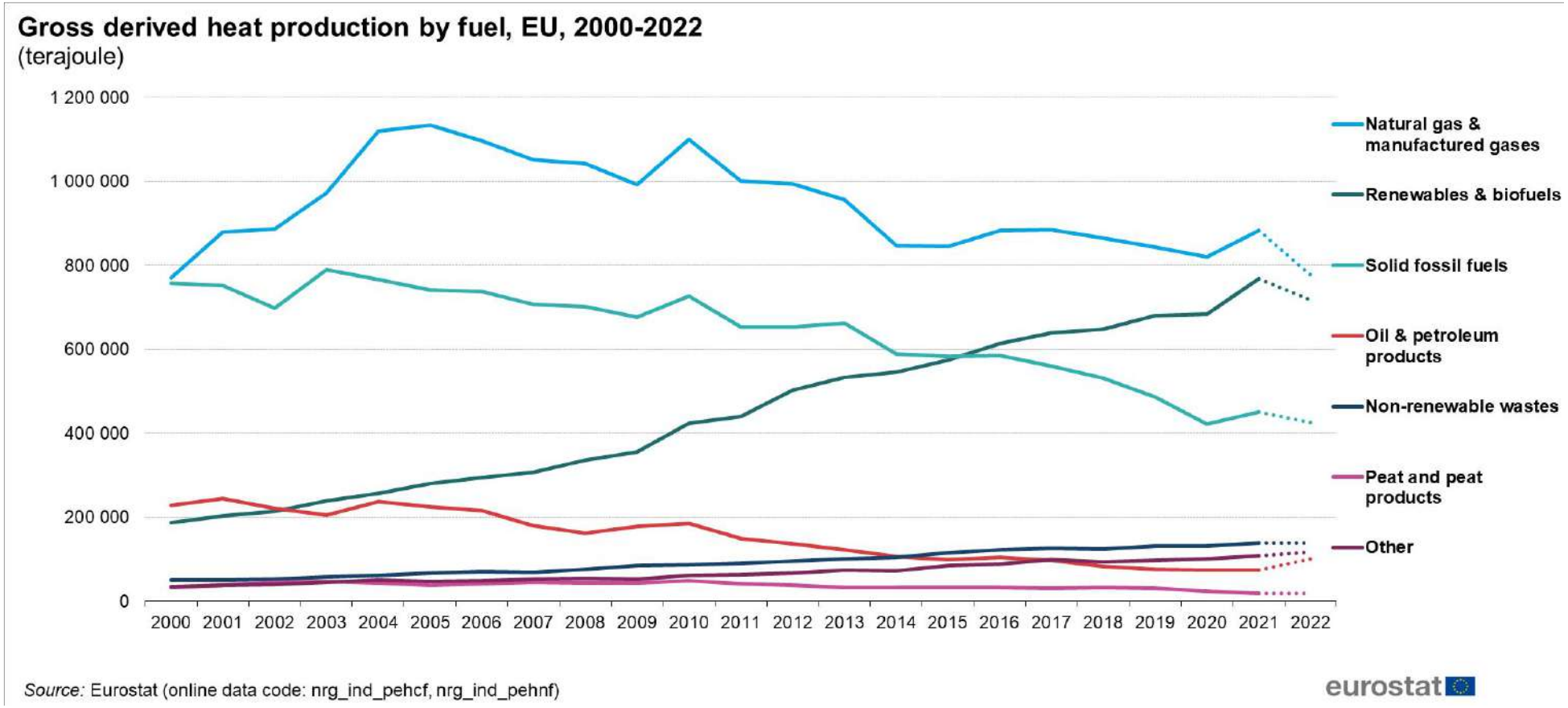
We get into all of that in more detail later!

What Fuel Is Used To Produce Heat?

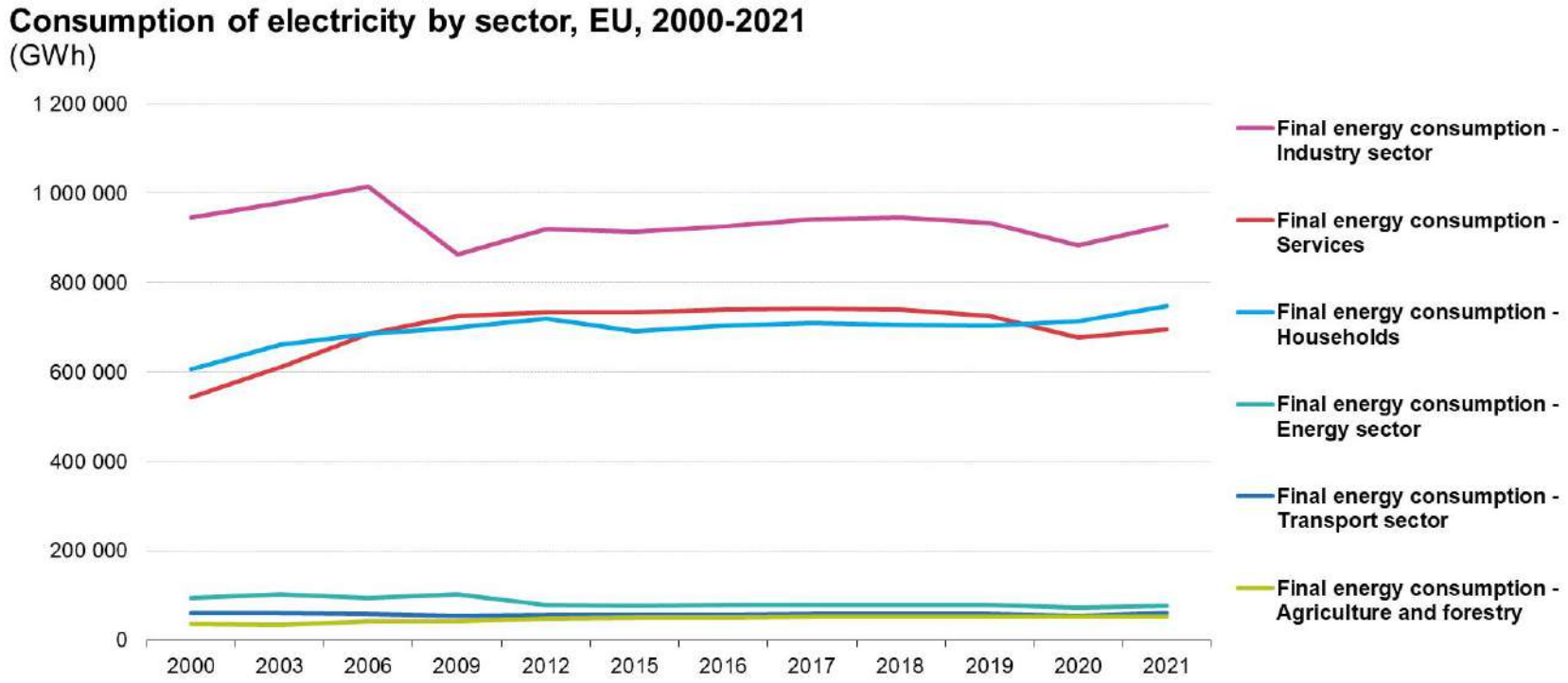
Now that we know heat is primarily produced as a by-product of electricity production, we need to know what are the fuel sources for derived heat production.

EU total gross production of derived heat in 2021 amounted to 651 TWh or 8.4 % more than in 2020. The highest share of heat was produced from natural gas and manufactured gases (37.6 %), followed by renewable energies (32.8 %) and solid fossil fuels (19.2 %).

What Fuel Is Used To Produce Heat?



But Does It Really Matter?

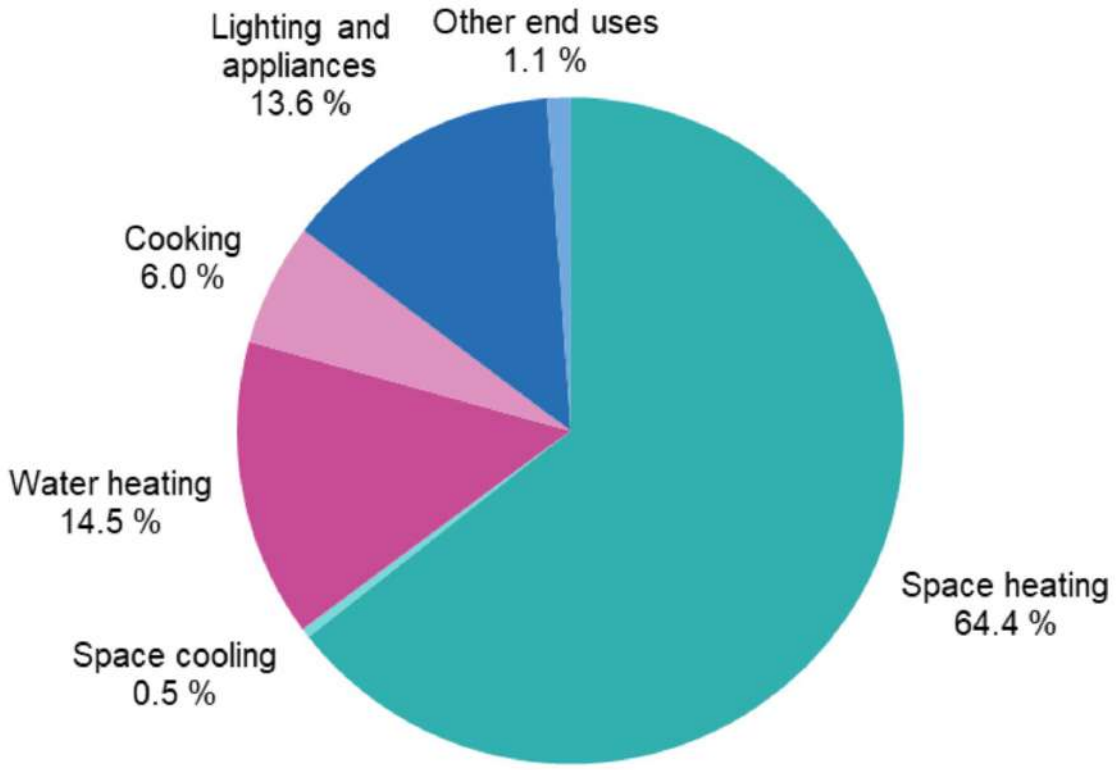


Source: Eurostat (online data code: nrg_cb_e)

eurostat

But Does It Really Matter?

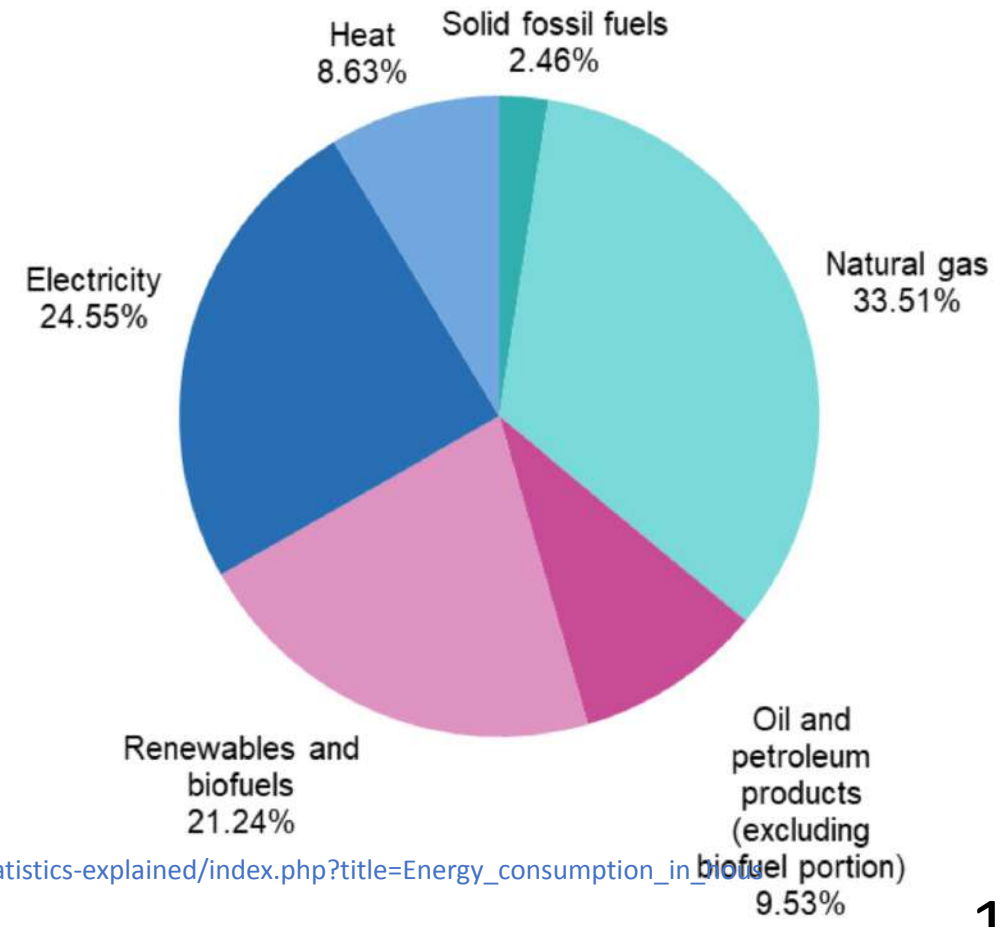
The pie chart on the right shows the final energy consumption in the residential sector by use, EU, 2021. Households are the largest consumers of heat energy in Europe. Approximately 64.4% of the energy used in households is for space heating, followed by 14.5% for water heating. Cooking and lighting account for smaller shares of 6.0% and 13.6%, respectively.



https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households

But Does It Really Matter?

In 2021, most of the EU final energy consumption in the residential sector is covered by natural gas (33.5 %) and electricity (24.6 %). Renewables account for 21.2 %, followed by petroleum products (9.5 %) and derived heat (8.6 %). A small proportion is still covered by coal products (solid fuels) (2.5 %),



https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households

But Does It Really Matter?

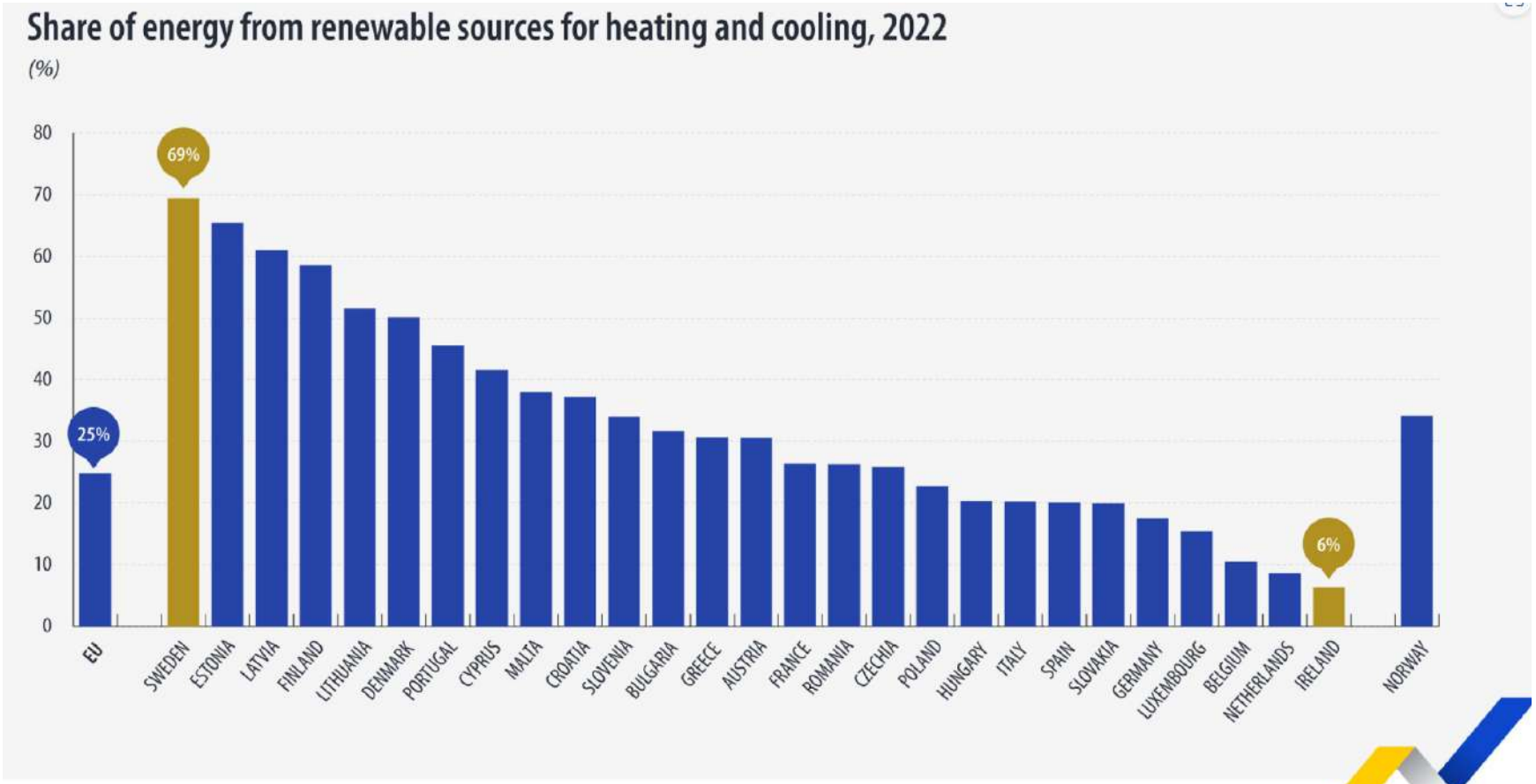
Energy for heating and cooling makes up around half of the EU's total gross final energy consumption. In 2022, the share of energy from renewables in heating and cooling continued to rise, with the EU average standing at 24.8%, up 1.8 percentage points (pp) from 2021 (23.0%).

Sweden led the way when it came to renewables in heating and cooling, with a 69.3% share, followed by Estonia (65.4%). Both countries use mostly biomass and heat pumps. They are followed by Latvia (61.0%), which relies mostly on biomass.

In contrast, the lowest shares of renewable sources for heating and cooling were recorded in Ireland (6.3%), the Netherlands (8.6%) and Belgium (10.4%).

Compared with 2021, the largest increases were recorded by Malta (+5.2 pp), Luxembourg (+2.5 pp), and Ireland (+1.4 pp). On the other end of the scale, decreases were registered in Austria (-2.4 pp), Slovenia (-1.2 pp), and Cyprus (-1.0 pp).

But Does It Really Matter?



https://www.eea.europa.eu/en/analysis/indicators/share-of-energy-consumption-from

But Does It Really Matter?

In absolute terms, the gross final consumption of renewable energy for heating and cooling purposes in the EU has gradually increased over time, mostly due to the contribution of biomass and heat pumps. In the span of 10 years, the average share of energy from renewables for heating and cooling grew from 18.6% to 24.8% (+6.2pp). However, a major push is required to meet the new targets introduced by the EU Directive 2023/2413 of 18 October 2023 on the promotion of the use of energy from renewable sources. This Directive requires EU countries to increase their annual average share of renewables in heating and cooling by at least 0.8 pp from 2021 to 2025 and by at least 1.1 pp from 2026 to 2030.

But Does It Really Matter?

I know you're wondering "But why are you telling us all of this?". And to answer that, we need to have the last piece of the puzzle, which is ...

According to Nordic Energy Research, in Scandinavian countries and the Baltic region, a significant portion of households still rely on local heat production rather than district heating. In Lithuania, district heating is more predominant, especially in urban areas. However, around 50% of households in rural areas still use local heat sources, such as wood and other biomass. Latvia and Estonia have a somewhat higher reliance on district heating systems in urban centers, but local heat production remains common in rural and less densely populated areas. Specifically, in Estonia, about 40% of households utilize local heat sources, while in Latvia, the figure is slightly higher at around 45%.

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Here is the answer! Opportunity & Potential

In Denmark, district heating is the primary method of heat production, covering about 65% of households, while the remaining 35% use local heating solutions. In Sweden, approximately 50-60% of households are connected to district heating networks. This figure can be even higher in urban areas, reaching up to 90% in some cities like Stockholm. Norway also has a growing district heating network, particularly in urban areas. However, many rural households still rely on local heat production, with district heating accounting for around 30% of the total heat supply.

Even in countries where their share of energy from renewable sources for heating and cooling is more than 50%, such as Sweden, Estonia, Latvia, and Lithuania, a significant portion of the household still relies on local heat production using mostly natural gas and other nonrenewable energy sources. That means opportunity and potential for growth!

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Thank You for your attention!

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