

# Sustainable Heating

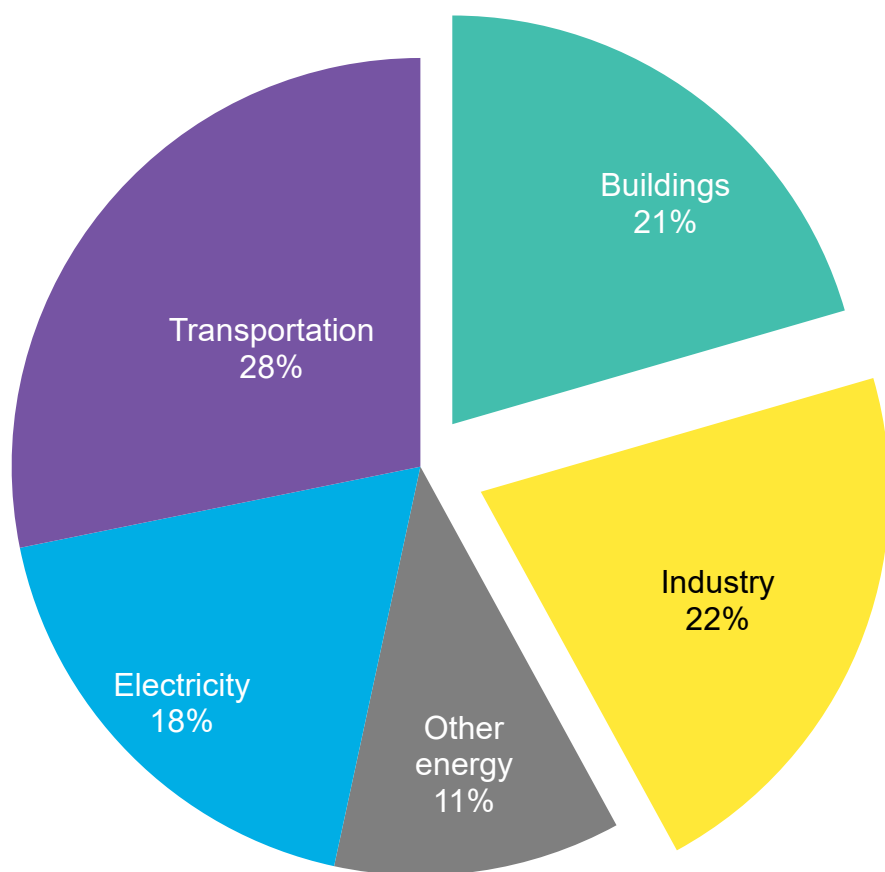
The status today

Meredith Annex

April 09, 2019

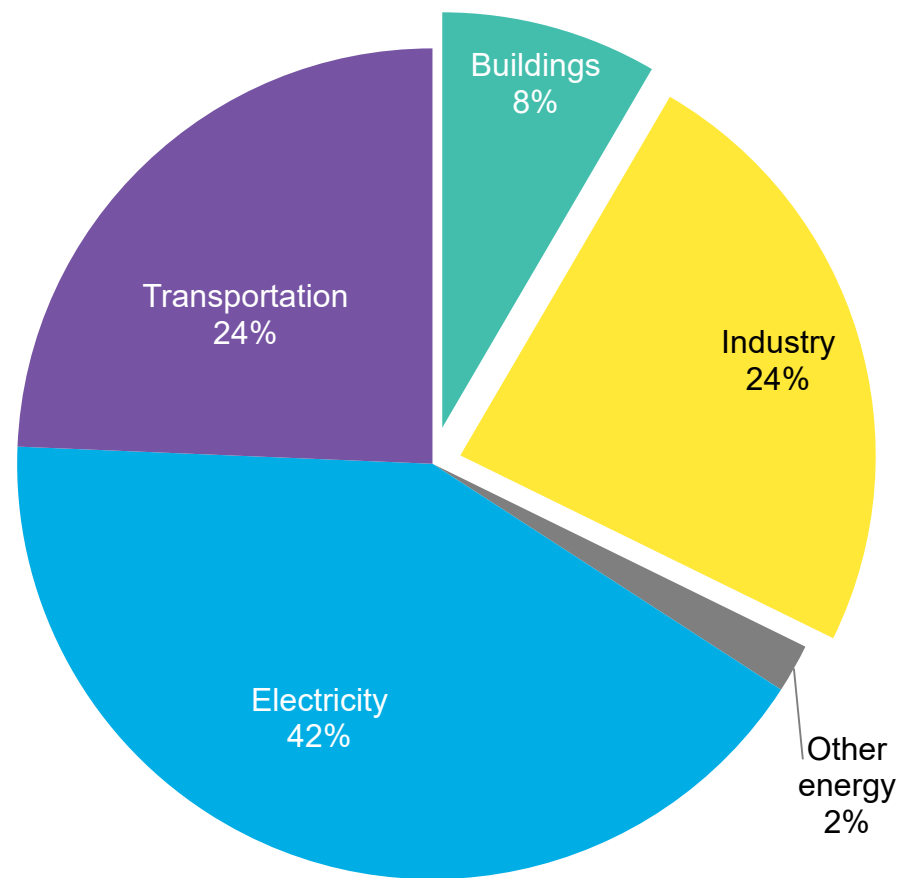
# Global energy consumption and emissions in 2016

**Energy consumption**  
110 thousand TWh



Source: IEA, BloombergNEF

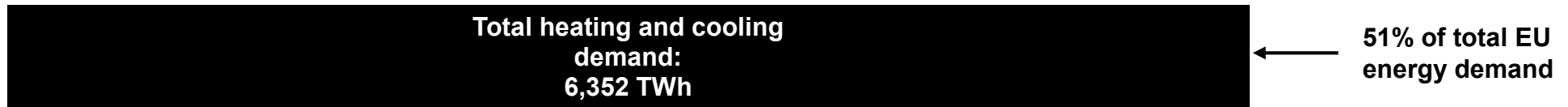
**Emissions from fuel combustion**  
32 billion metric tons CO2 equivalent



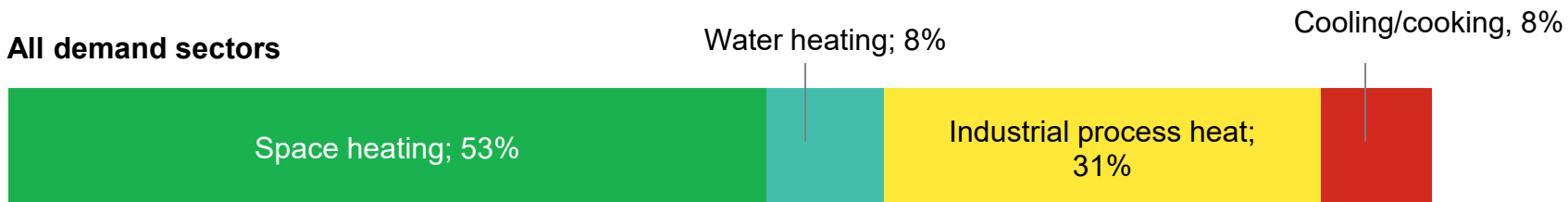
Source: IEA, BloombergNEF

# European heat demand by source in 2015

## All demand sectors



## All demand sectors



## Buildings only

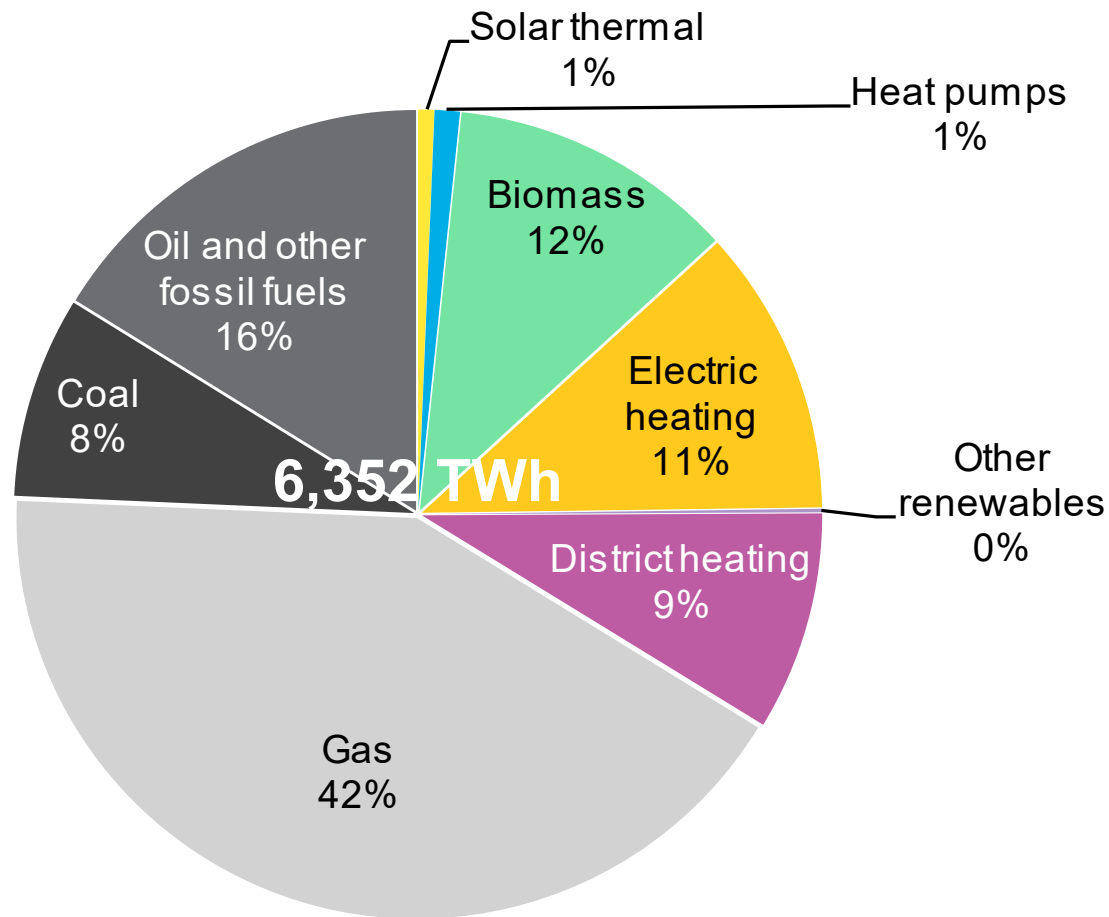


Source: Heat Roadmap Europe, BloombergNEF

# Heating supply by “energy carrier”

## 2015 European heat supply

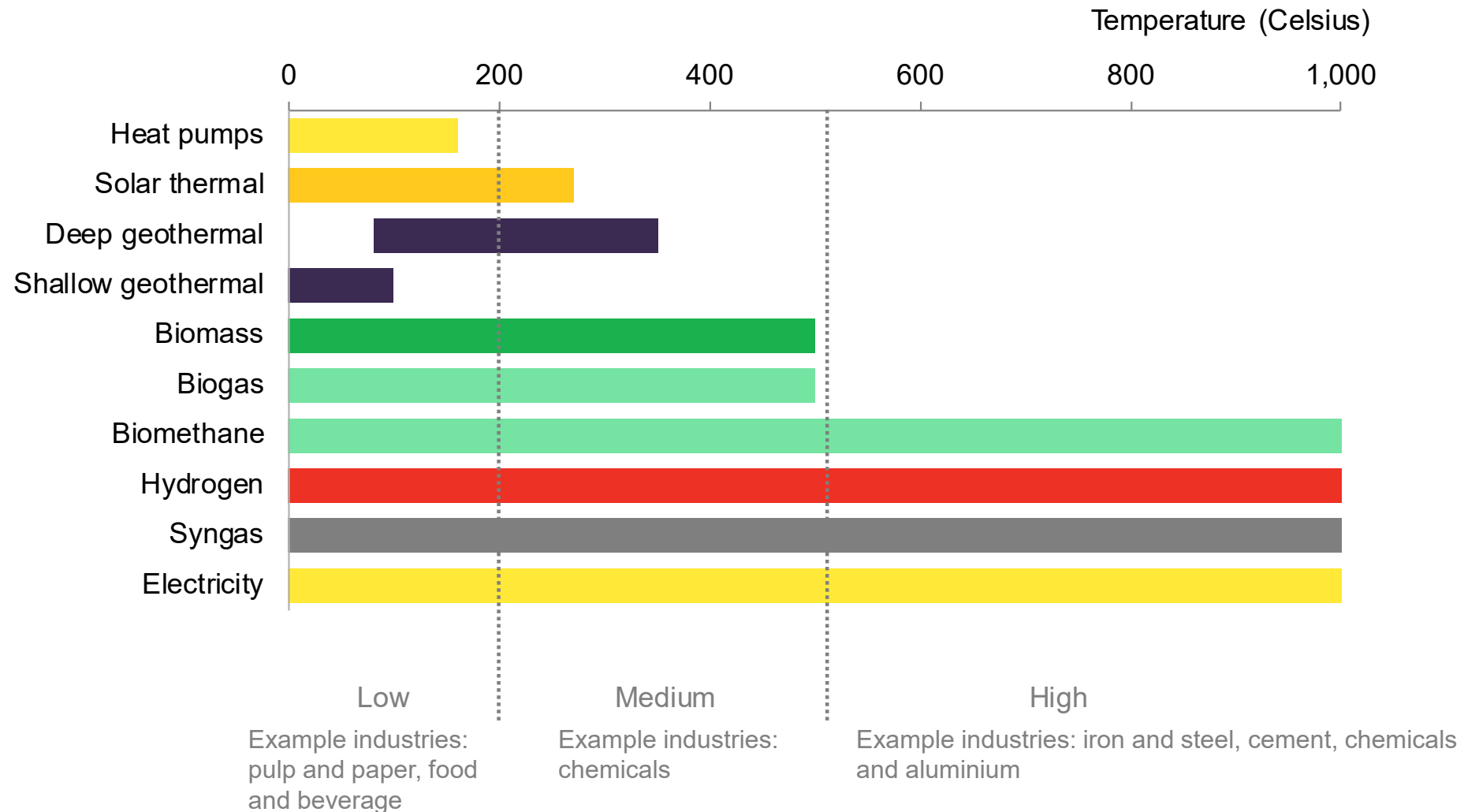
25% from “clean” sources, 33% when including district heating



Source: *Heat Roadmap Europe* Note: “Clean” includes biomass, solar thermal, other renewables, heat pumps and electric heating

# Industry is hard to decarbonize

## Example technologies for low-carbon heating by output temperature



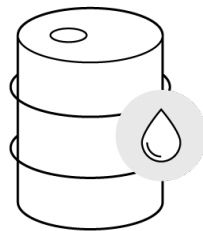
Source: Oxford Energy Institute, BloombergNEF, EHPA

# Buildings have more low-carbon options

## Fossil fuels



Natural gas



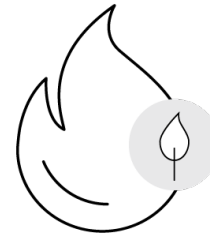
Petroleum



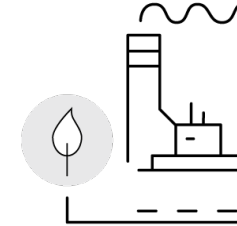
Coal

## Low-carbon options

## “Green” gas and fuels



Biogas

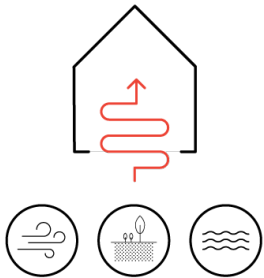


Biomass / waste-to-energy

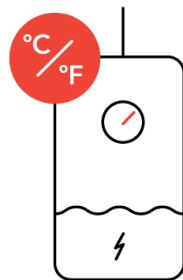


Hydrogen

## Electrification



Heat pumps  
(Air-, ground- or water-sourced)

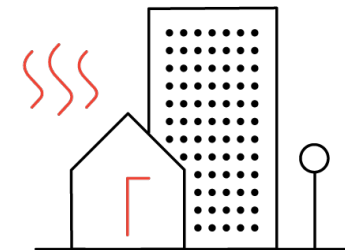


Electric boiler



Electric heaters / radiators

## District heat

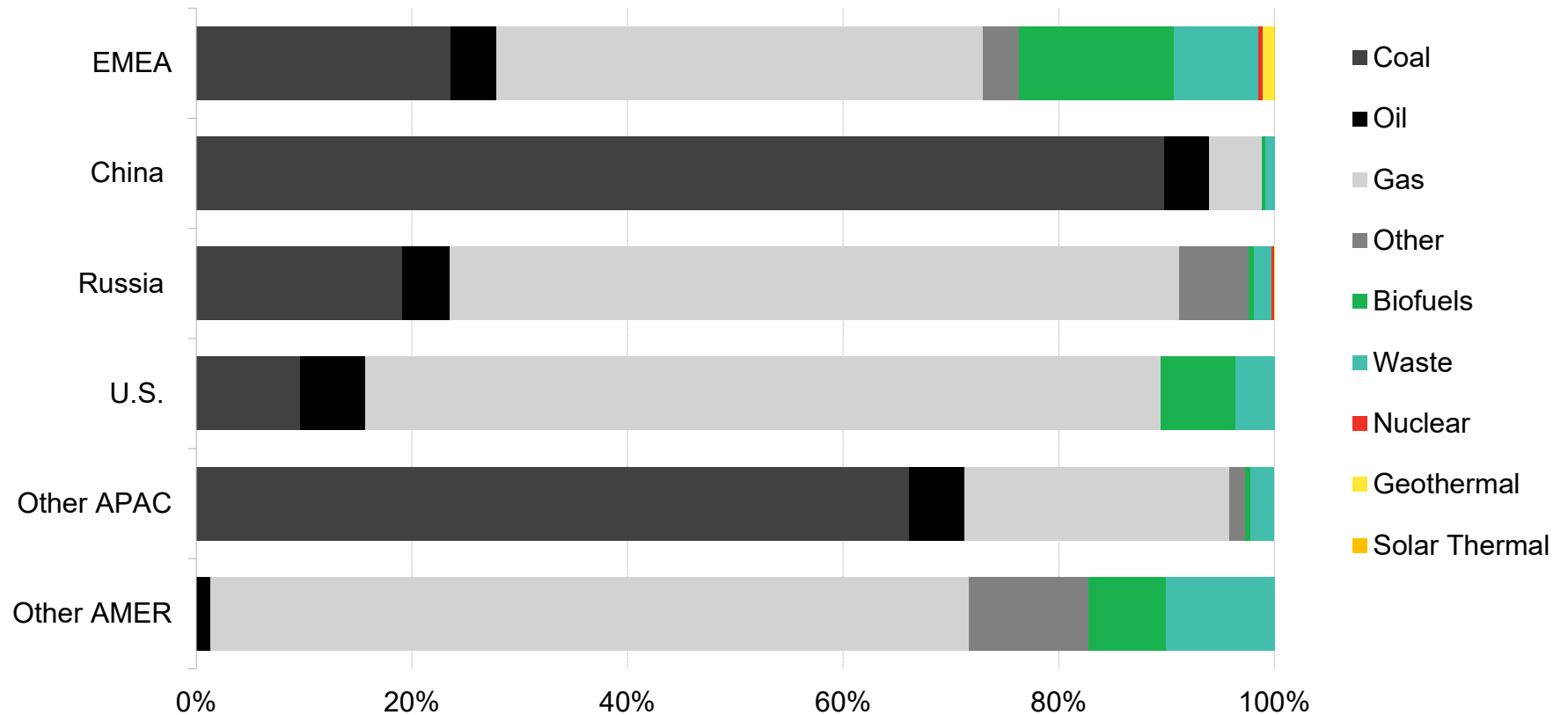


District Heating

Source: BloombergNEF Note: List is non-exhaustive.

# District heating isn't clean...yet

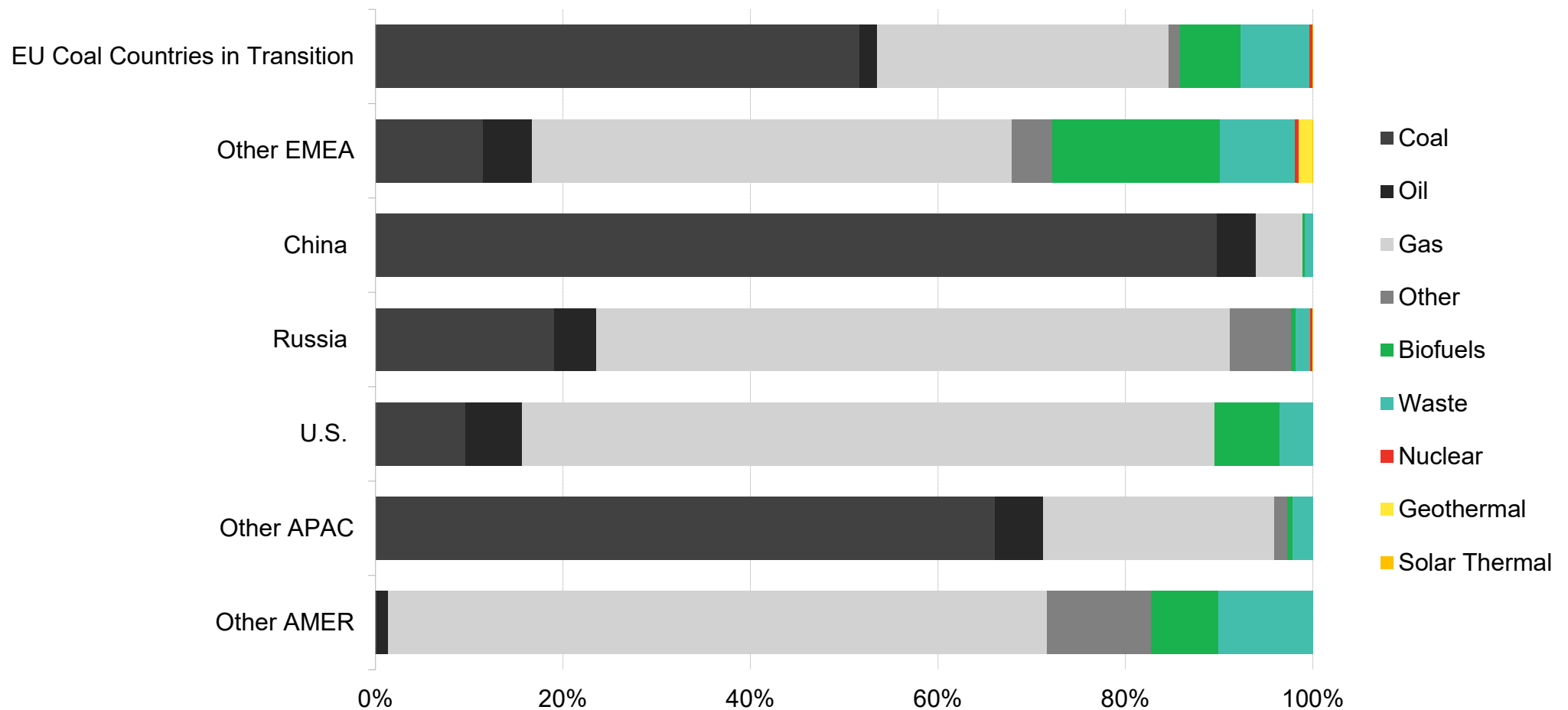
## Heat supply sources for district heating



Source: IEA, BloombergNEF Note: IEA district heating includes any heat that is sold to a third-party in the form of steam/hot water. This includes district heating networks and campus heat networks where the supplier and consumer are different entities. It excludes on-site generation owned by a building/campus/industrial site.

# District heating isn't clean...yet

## Heat supply sources for district heating

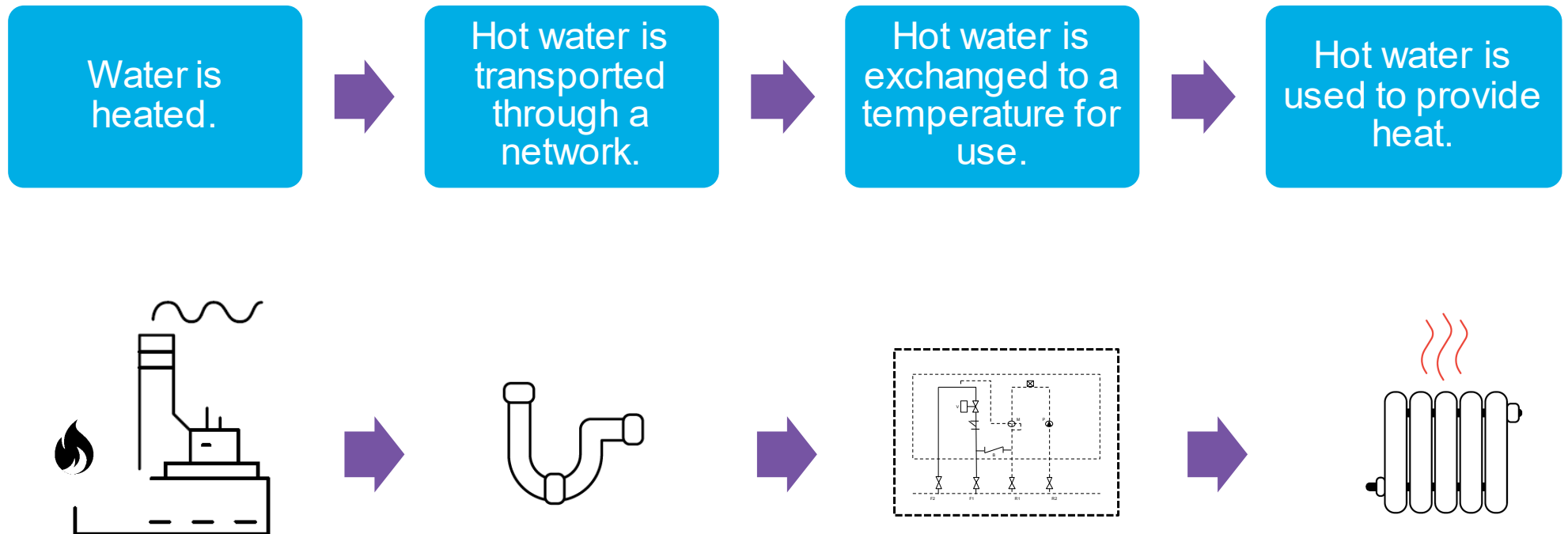


Source: IEA, BloombergNEF Note: IEA district heating includes any heat that is sold to a third-party in the form of steam/hot water. This includes district heating networks and campus heat networks where the supplier and consumer are different entities. It excludes on-site generation owned by a building/campus/industrial site. EU Coal Countries in Transition include Poland, Greece, Slovakia, Czechia, Romania, Spain and Germany.



# Cleaning up the district heating network

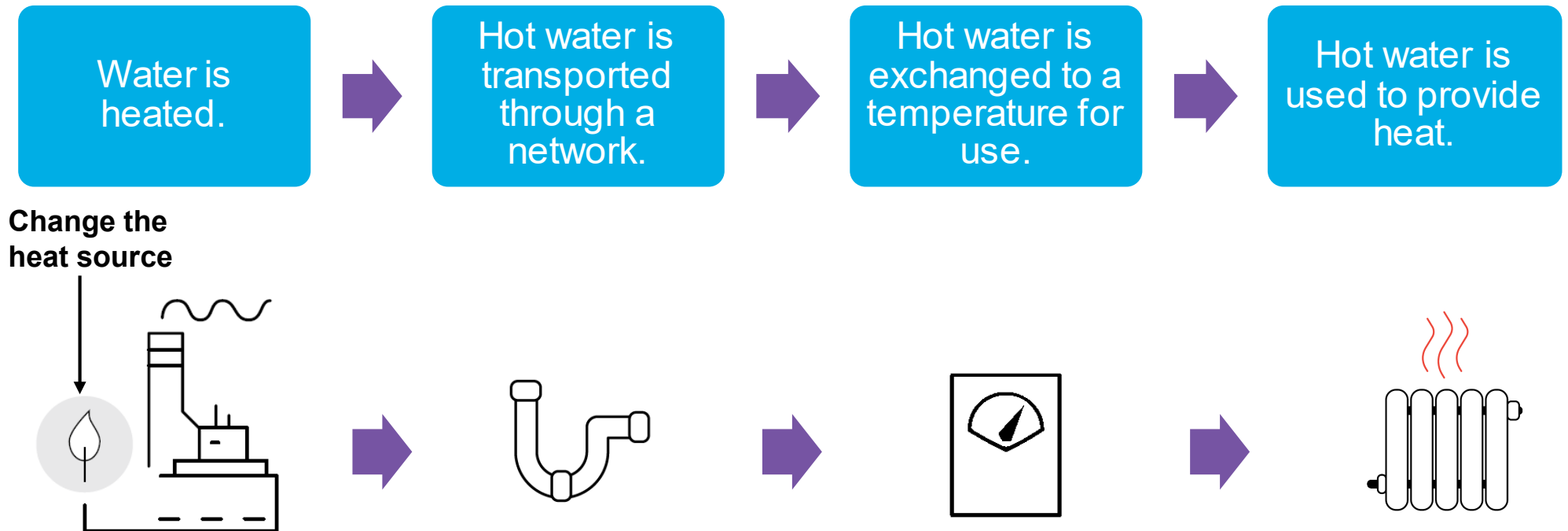
## Simplified stages of a district heating network



Source: IEA, BloombergNEF Note: IEA district heating includes any heat that is sold to a third-party in the form of steam/hot water. This includes district heating networks and campus heat networks where the supplier and consumer are different entities. It excludes on-site generation owned by a building/campus/industrial site.

# Cleaning up the district heating network

## Simplified stages of a district heating network



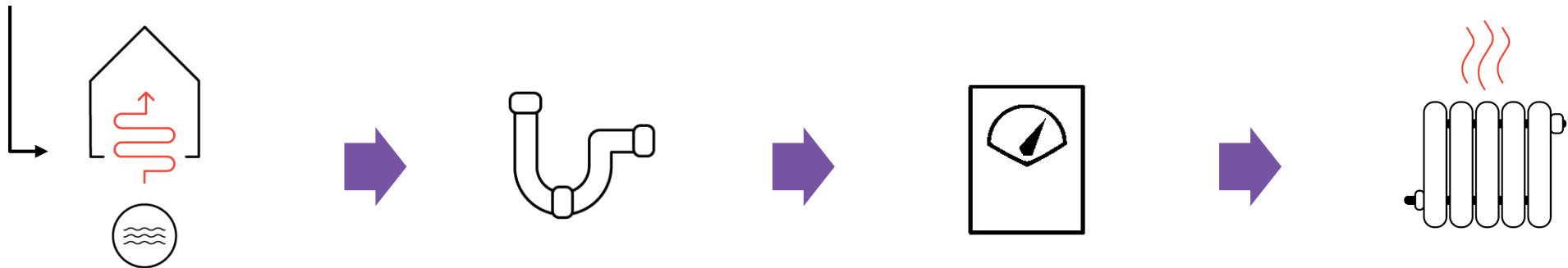
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## Simplified stages of a district heating network



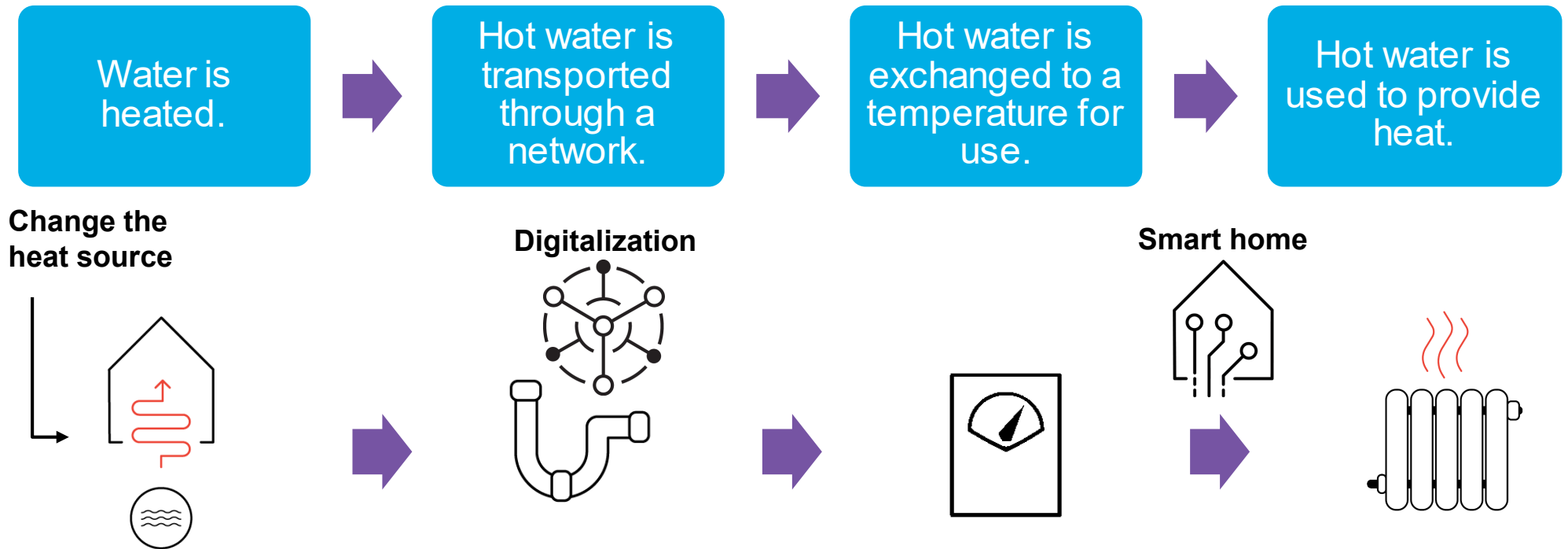
Change the heat source



Source: IEA, BloombergNEF Note: IEA district heating includes any heat that is sold to a third-party in the form of steam/hot water. This includes district heating networks and campus heat networks where the supplier and consumer are different entities. It excludes on-site generation owned by a building/campus/industrial site.

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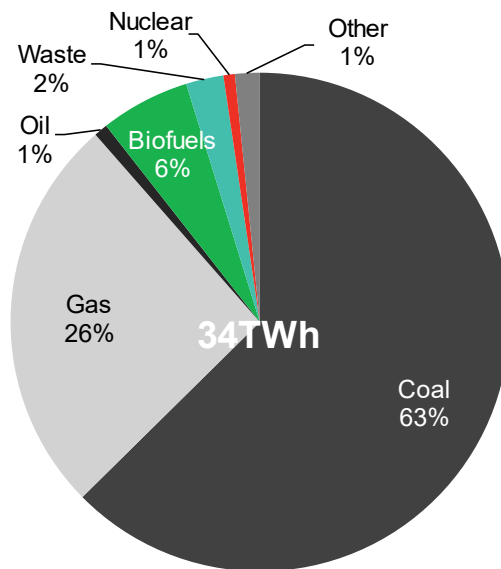
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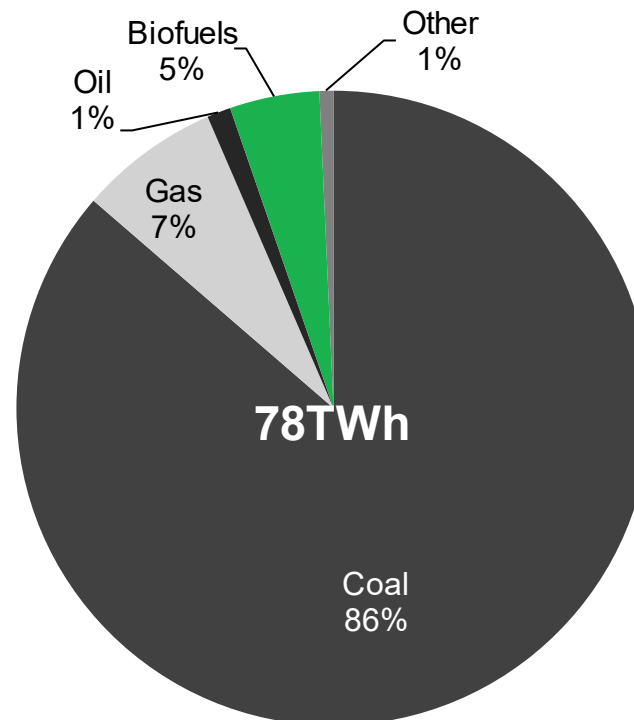
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# District heating by supply source

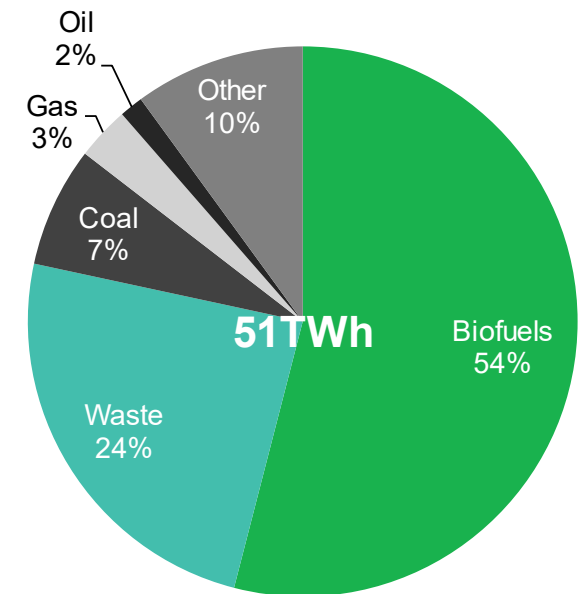
## Czechia



## Poland



## Sweden



Source: IEA, BloombergNEF Note: IEA district heating includes any heat that is sold to a third-party in the form of steam/hot water. This includes district heating networks and campus heat networks where the supplier and consumer are different entities. It excludes on-site generation owned by a building/campus/industrial site.

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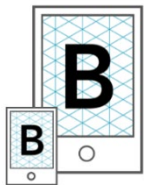
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