Welcome to ARC

Nina Adelhardt Dalmasso

niad@a-r-c.dk

-alt med affald

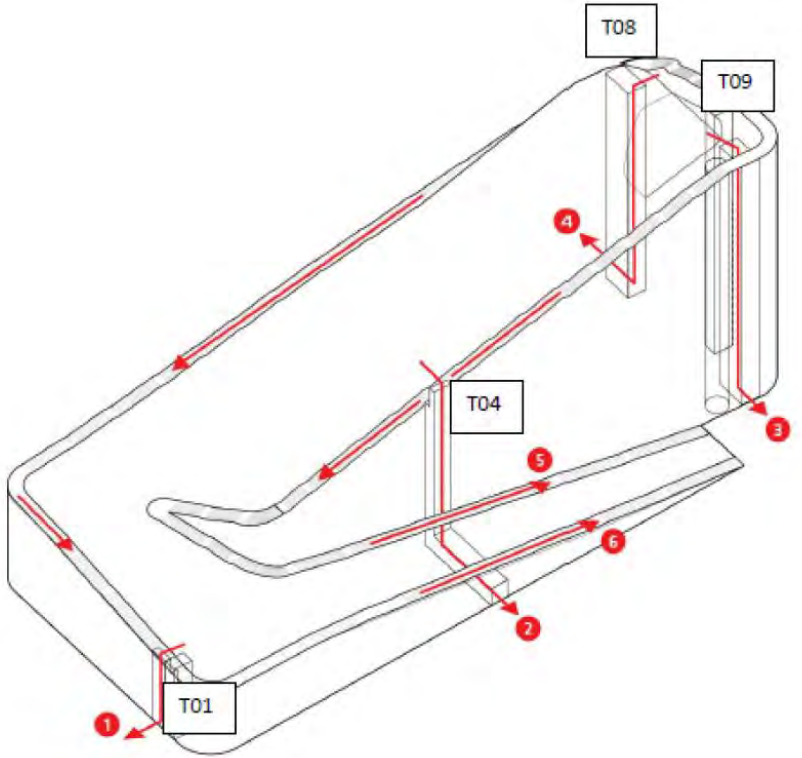
Program

- Safety
- ARC and circular economy
- Development projects
- Amager Bakke

Safety

How many guests are present?

- If the alarm goes off, it is important that you keep calm.
- Follow an ARC employee through the nearest emergency exit.
- Safety gear is necessary, when we are inside the plant. More info will follow.



Each Dane produces 842 kg of waste per year

Takes 1st place in the EU

Kilde: Muncipal Waste, 2019 (845 kg counts waste from households, services and construction)

A total of 5 mio./t of waste per year

”

What do we do with all that waste?

Ownership

- **§60 company**

The activities must balance over five years

- **We get waste from**

approx. 860,000 inhabitants

Organization

- Waste collection
- Waste to energy
- Recycling centres
- Local recycling points
- Transfer station
- Sorting plant
- Teaching and visits
- Hazardous waste, SMOKA
- Safe landfill, AV MIljø






ARC in numbers (2022)

Revenue: **1,179,477 dkr.**
(158 mio. EURO/USD)

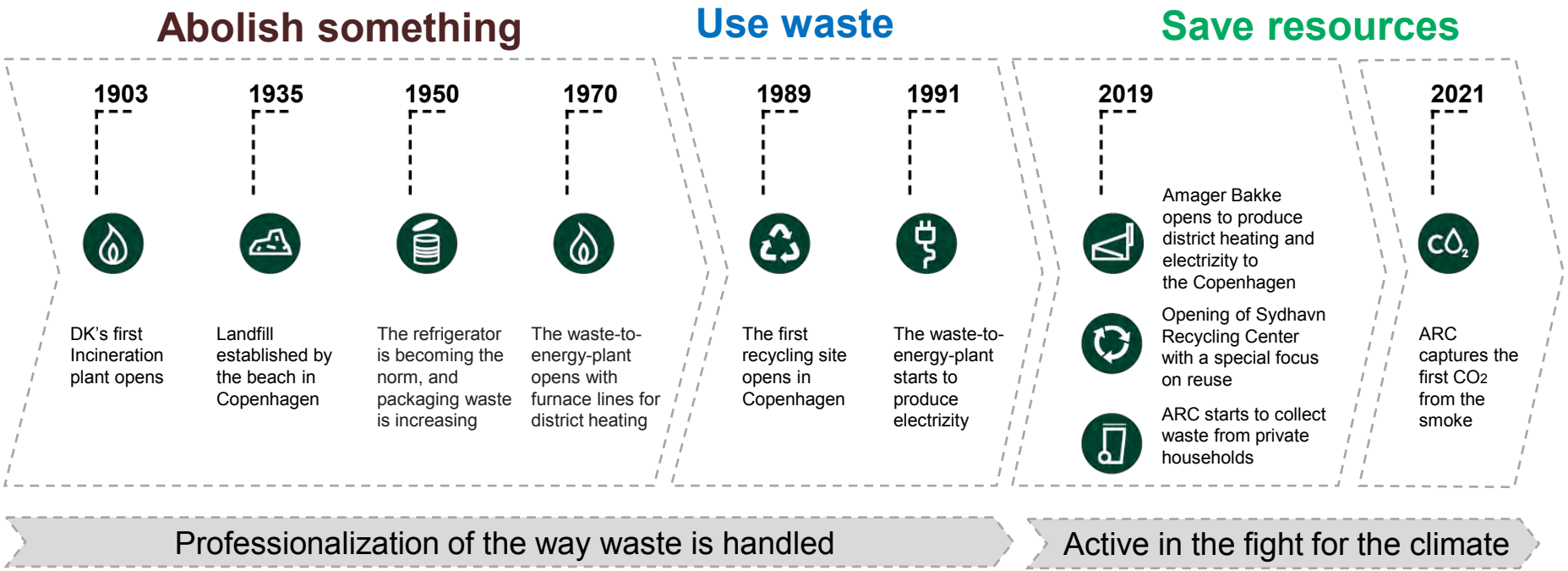
Waste quantities at the energy plant
approx.: 5**00,000** /t

Waste quantities at recycling centres
approx.: **100,000** /t

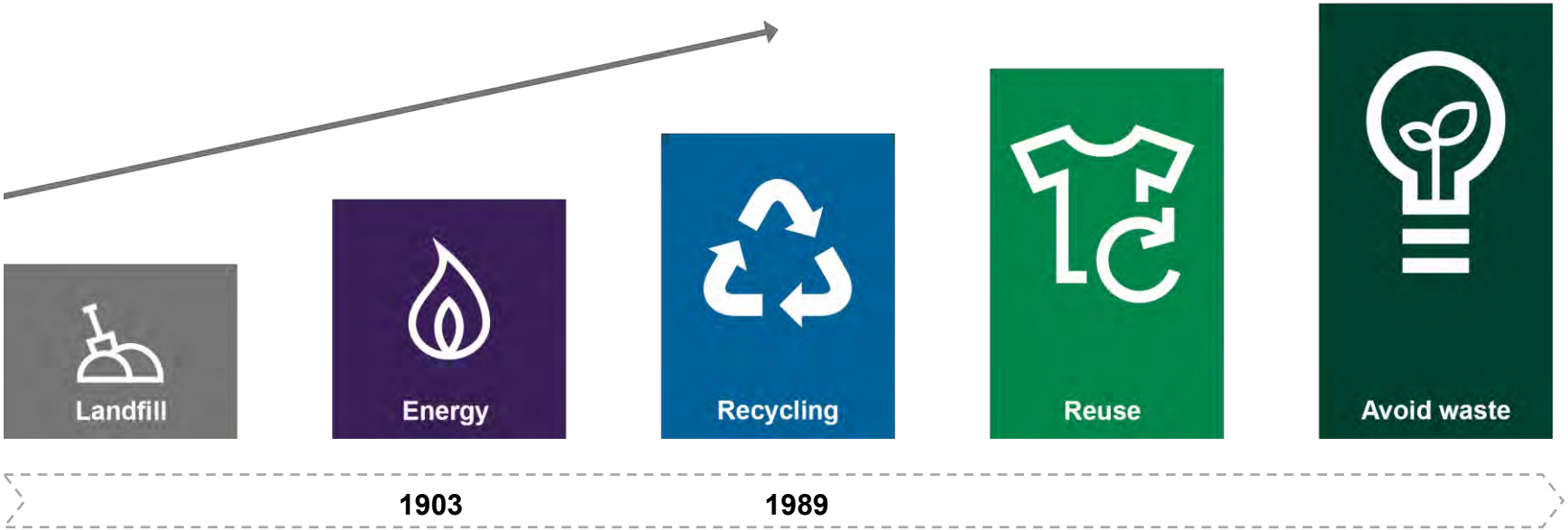
Recycling centres: **10**

Employees in 2022: **400+**

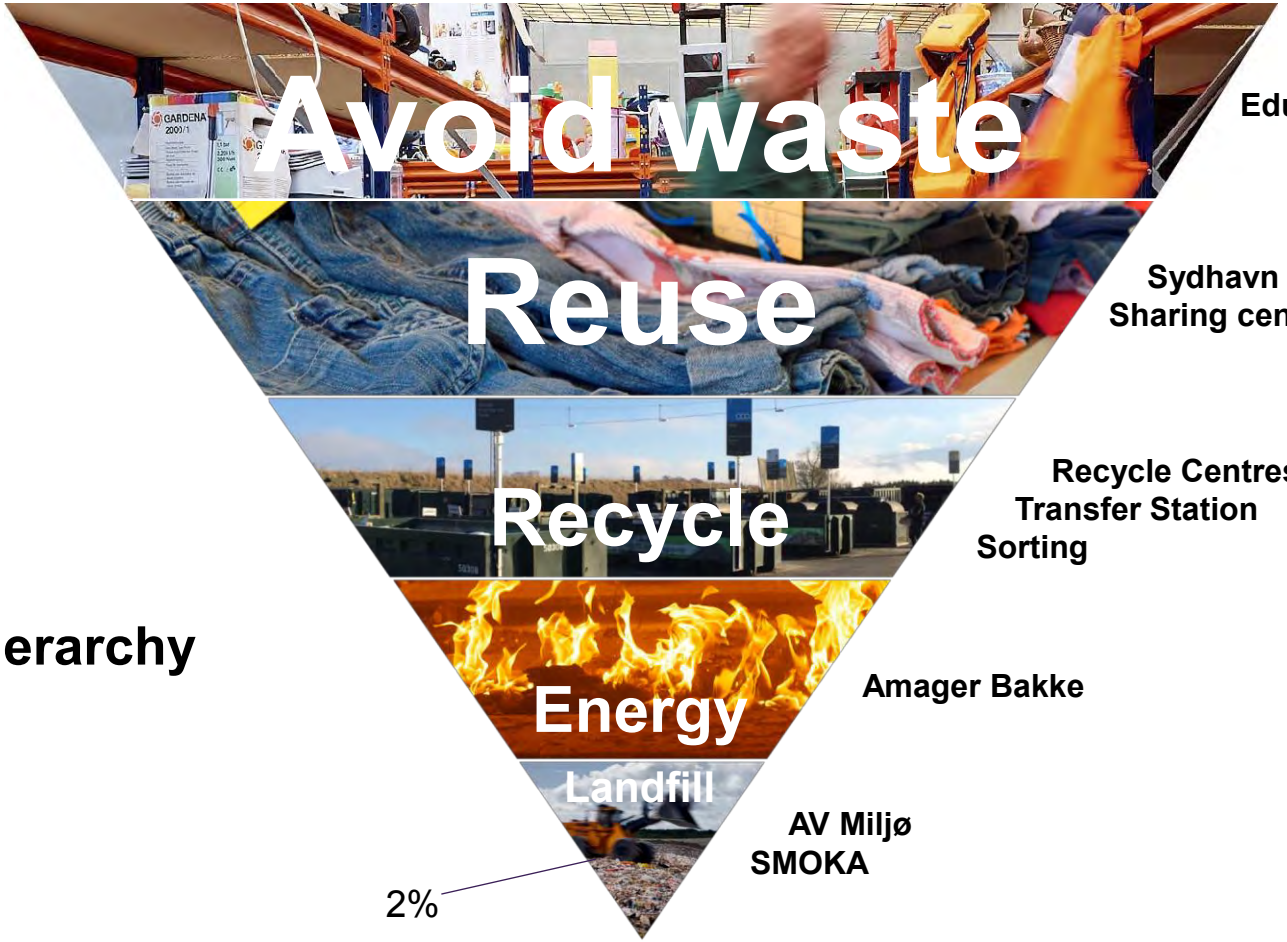
From waste to resource



We aim to move waste upwards in the waste hierarchy



The Waste Hierarchy

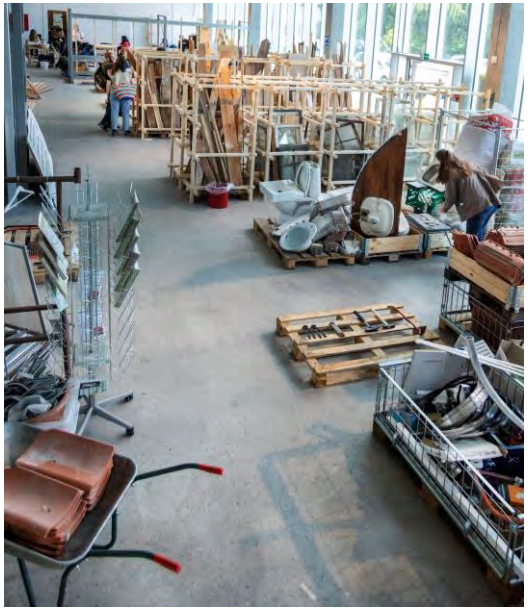


Recycling Centres

- 900,000 costumers every year
- 100,000 /t of waste
- Sorting in more than 35 fractions
- Increased focus on reuse

Sydhavn Recycling Center

- Won an award for using recycled concrete
- Shop with focus on longer use of good building materials and furniture
- TestLab and workshops
- Free education for schools on waste sorting



Longer use of good items

Copenhageners are sharing

- 3-dobling of longer use of good things
- Less waste for incineration
- Increased focus on reuse

Local Recycling hubs

- 10 small, local recycling hubs in the Municipality of Copenhagen
- Increased focus on reuse of everything that is ‘just’ suitable for recycling but is not salable.

Sorting plant

- Digital water marks
- Ensures better recycling
- Producer responsibility on packaging from 2025

Partnership for Circular Food Trays

- Seven tonnes of collected PET-plastic will be converted into 400,000 of new plastic trays
- Experiment to close the cycle of food trays
- Cooperation with partners from different parts of the recycling chain

Transfer Station

Each year approx. 11,250 tonnes of municipal waste is sent for recycling, such as:

- Plastic
- Appliances
- Electronics

Compressed plastic

Approx. 6,000 tonnes of plastic are compressed into bales to optimize transportation of platic for recycling

SMOKA

Handles 10,000 tons of hazardous waste annually from:

- 1,5 mio. citizens
- 90,000 companies
- 23.000 red boxes

Adviser on hazardous waste such as:

- Chemicals
- Paint
- Batteries

AV Miljø

2% of the waste ARC handles, ends up at a safe landfill* with less environmental impact

- No organic materials
- Bacteria in the top layer converts 95% of the methane to CO_2
- Polluted concrete, soil, asbestos and other non-hazardous materials, that cannot be recycled or used for energy
- Membranes at the bottom protecs the groundwater

*until we find safe methods to treat waste

Waste collection

From private households in the municipalities

- Copenhagen
- Dragør
- Tårnby

Amager Bakke

One of the best waste-to-energy plants in the world

- High environment and energy profile
- Modern and flexible energy production

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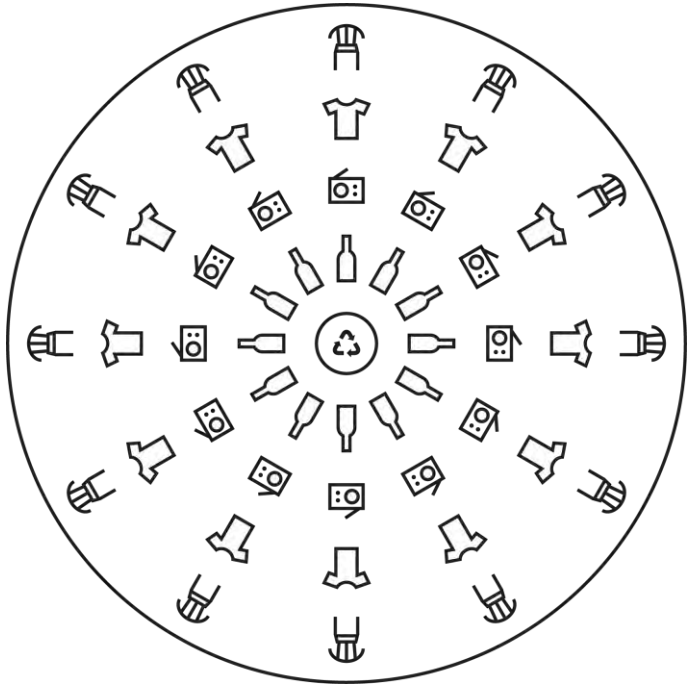
Why do we talk about waste-to-energy in the circular economy?



Waste not suitable for reuse or recycling needs to end up somewhere

- We avoid big landfills and in terms of green house gas-emissions combustion is better than landfill
- Combustion is hygienic
- Diapers, waste from hospitals, cat litter and pizza trays cannot be recycled
- Produces electricity and heat
- **Replaces fossil fuels!**

From waste to energy

Every day 200 waste trucks deposits residual waste from the five owner municipalities

Two grappers mix the waste before lifting it into the funnel.
They can lift 6 tonnes of waste

The silo has a capacity of 22,000 tonnes of waste

The two ovens burn each 35 tonnes of waste per hour

Funnel

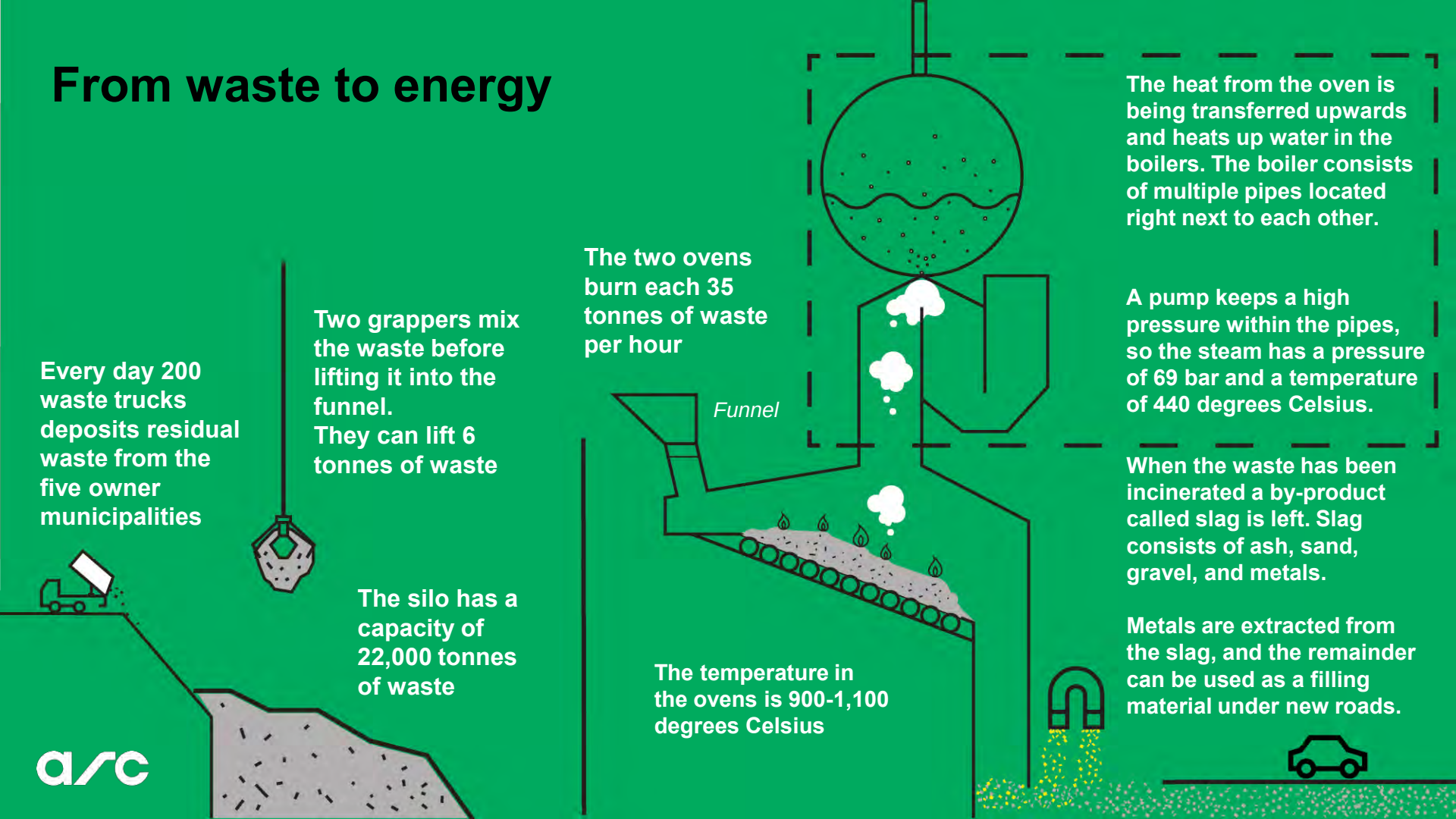
The temperature in the ovens is 900-1,100 degrees Celsius

The heat from the oven is being transferred upwards and heats up water in the boilers. The boiler consists of multiple pipes located right next to each other.

A pump keeps a high pressure within the pipes, so the steam has a pressure of 69 bar and a temperature of 440 degrees Celsius.

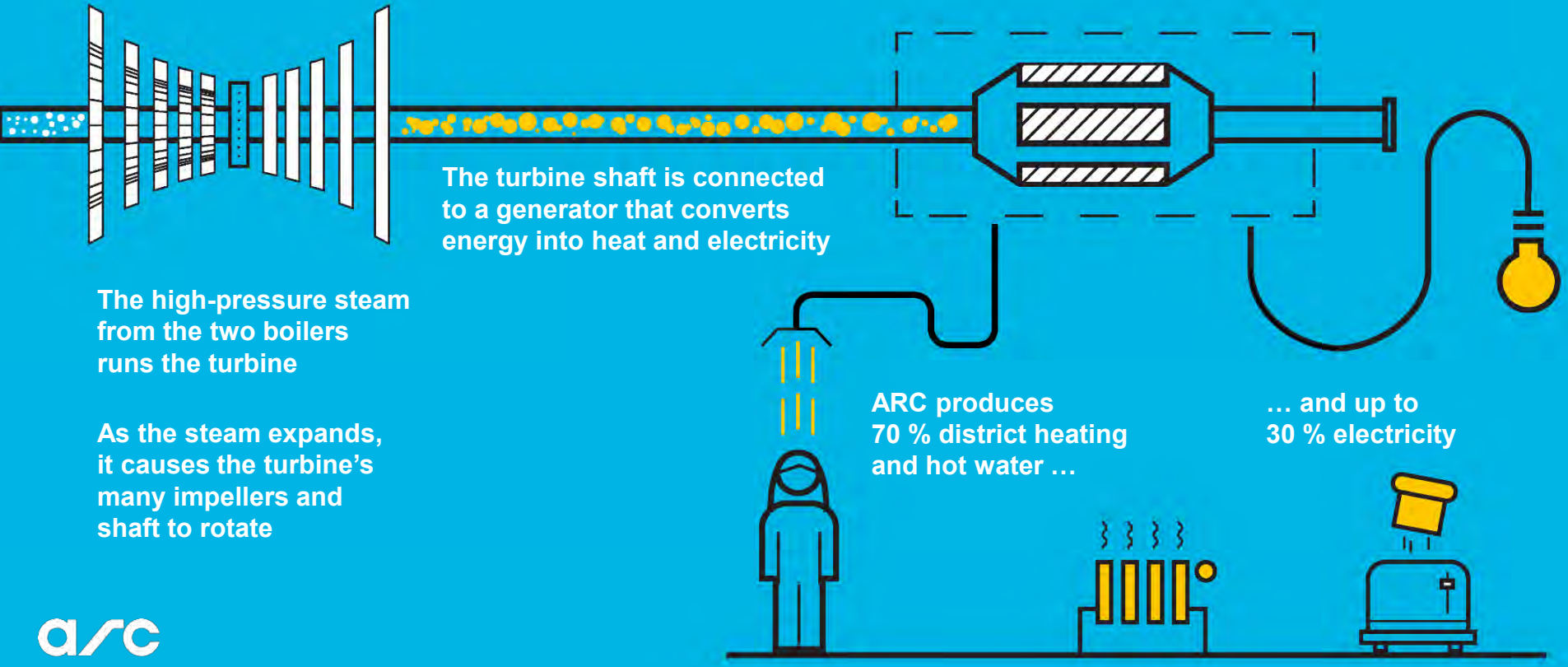
When the waste has been incinerated a by-product called slag is left. Slag consists of ash, sand, gravel, and metals.

Metals are extracted from the slag, and the remainder can be used as a filling material under new roads.



District heating and electricity

At Amager Bakke we produce energy to 150,000 households



The high-pressure steam from the two boilers runs the turbine

As the steam expands, it causes the turbine's many impellers and shaft to rotate

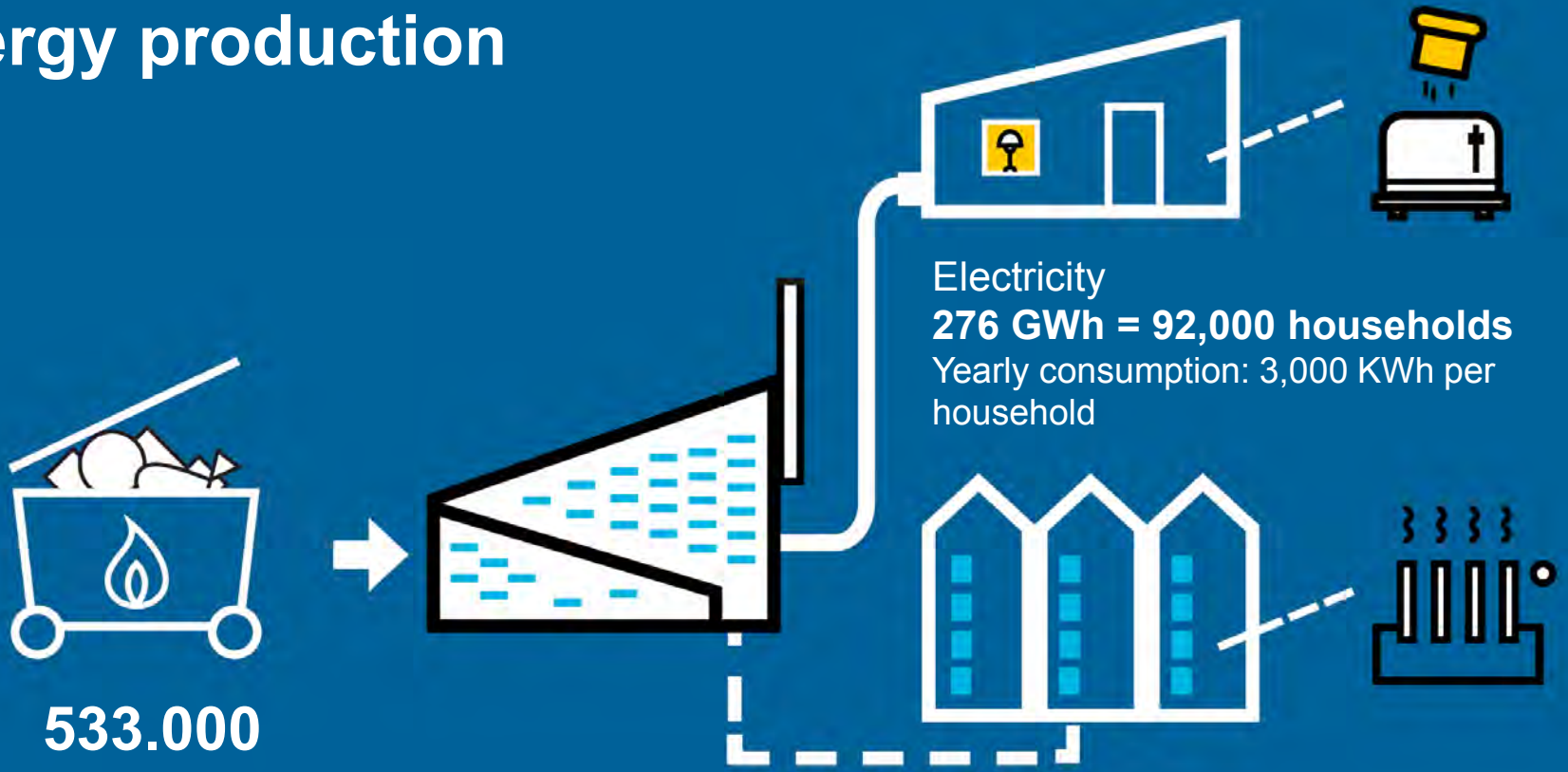
The turbine shaft is connected to a generator that converts energy into heat and electricity

ARC produces 70 % district heating and hot water …

… and up to 30 % electricity

Energy production

2022



533.000
tonnes of waste

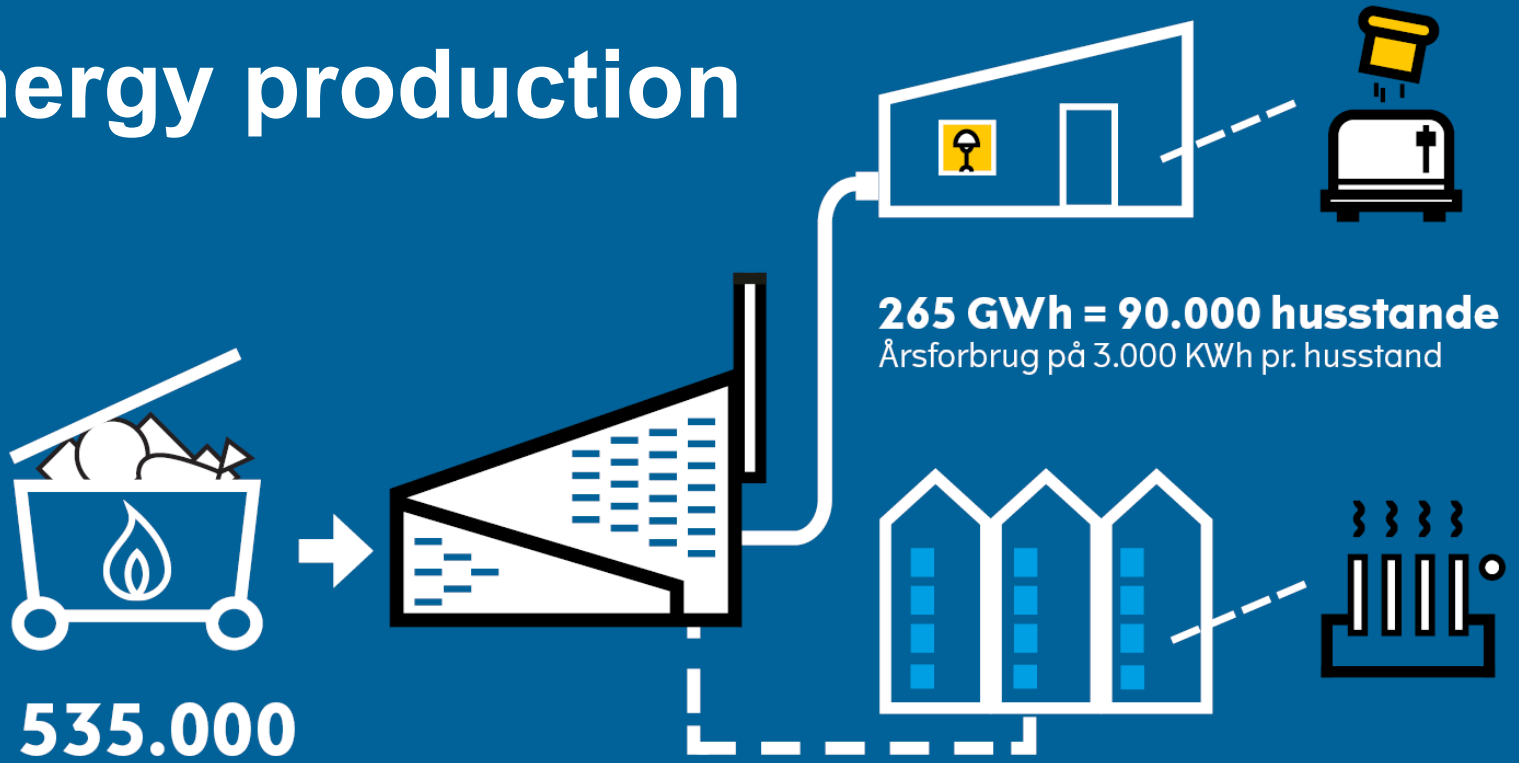
Electricity
276 GWh = 92,000 households
Yearly consumption: 3,000 KWh per household

Heatproduction
1,163 GWh = 78,000 appartments
Yearly consumption: 15 MWh (75m2 appartm.)

Production of energy
(2022)

- Amount of waste received:
  533,000 tonnes
- Total energy production:
  1,439 GWh

Energy production



535.000
tons affald

265 GWh = 90.000 husstande
Årsforbrug på 3.000 KWh pr. husstand

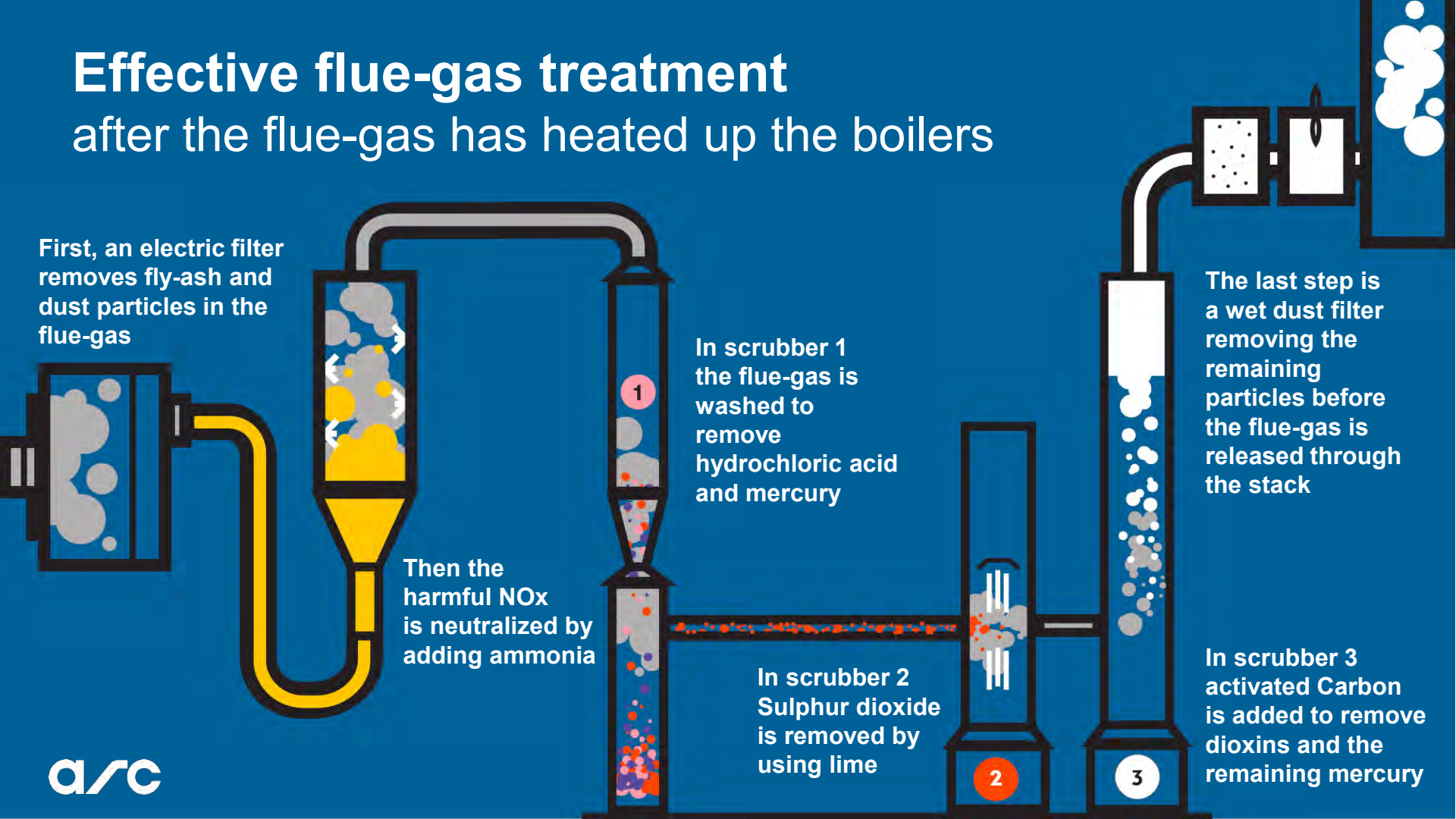
Fjernvarmesalg
1.197 GWh = 80.000 lejligheder
Lejlighed på 75 m2 med et årsforbrug på 15 MWh

Bottom Ash

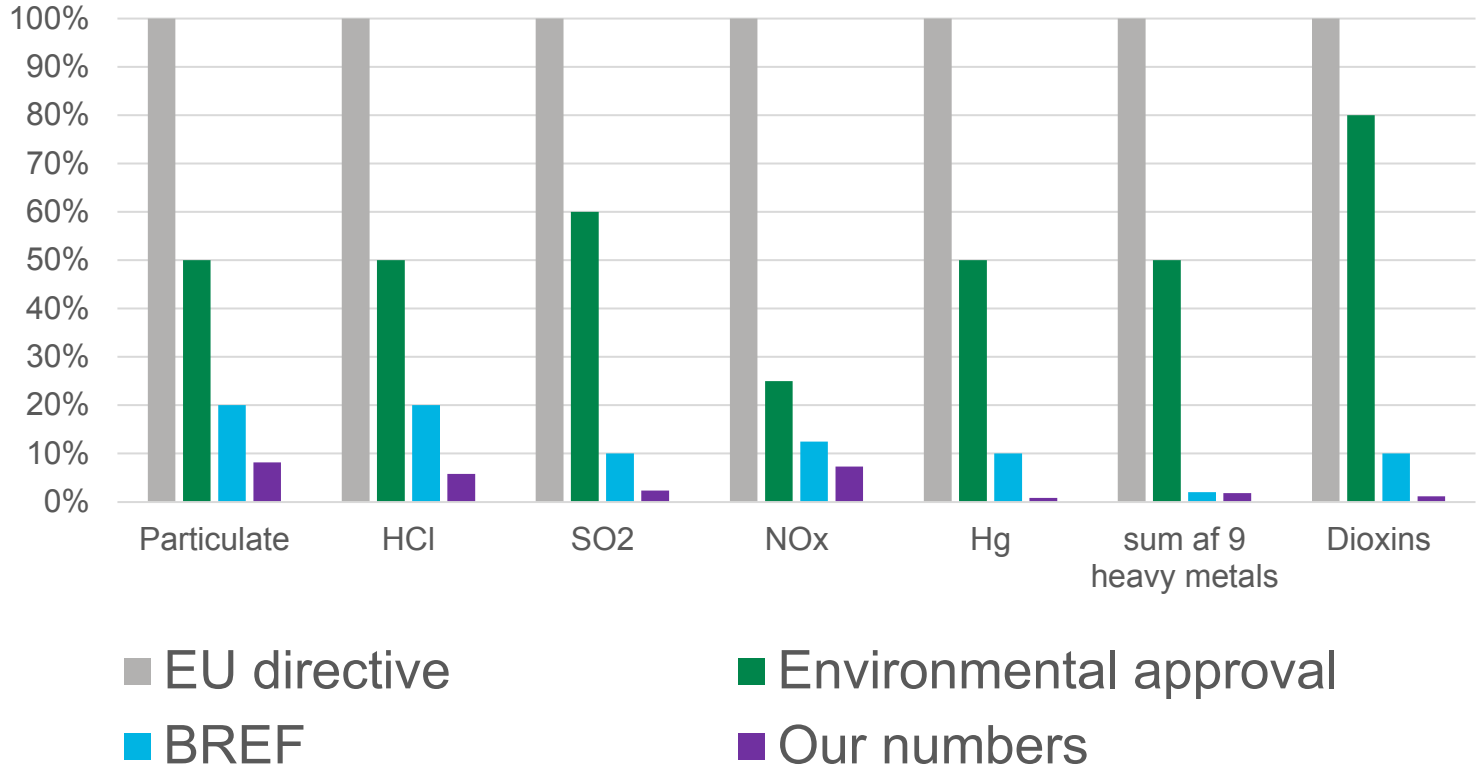
- 17-20% of waste cannot burn
- Amounts to 80,000 tonnes of bottom ash each year
- 5,500 tonnes of metal is extracted per year
- 27 kg of gold per year
- The rest of the bottom ash is left for treatment and is used for road filling underneath asphalt

Effective flue-gas treatment

after the flue-gas has heated up the boilers



Our perfomance in flue-gas treatment



Emissions from the stag

Parameter	Unit	EU Directive	Environmental approval	BREF-dokument	Our numbers
Dust particles	mg/m^3	10	5	2-5	0.82
Hydrochloric acid (HCl)	mg/m^3	10	5	2-6	0.58
Sulfur dioxide (SO_2)	mg/m^3	50	30	5-20	1.16
NOx	mg/m^3	400	100	50-120	14.65
Mercury (Hg)	mg/m^3	0.05	0.025	0.005-0.020	0.0004
Sum of 9 metals	mg/m^3	0.5	0.25	0.01-0.03	0.009
Dioxins	ng/m^3	0.1	0.08	0.01-0.06	0.0015

Carbon capture at Amager Bakke

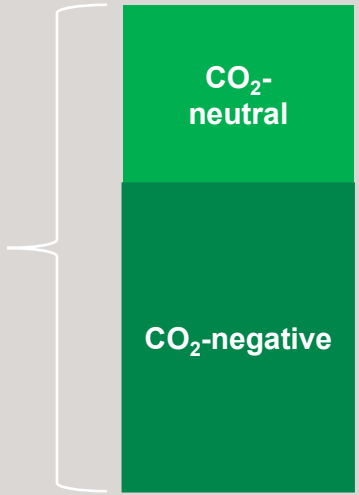
Carbon capture på Amager Bakke

- Carbon capture is crucial to accomplish national and international goals
- Financing: High CO_2-fee and/or support
- Possibility of success in Denmark:
  - Research and innovation
  - Green initiatives
  - CO_2 reductions

The potential of carbon capture

500,000

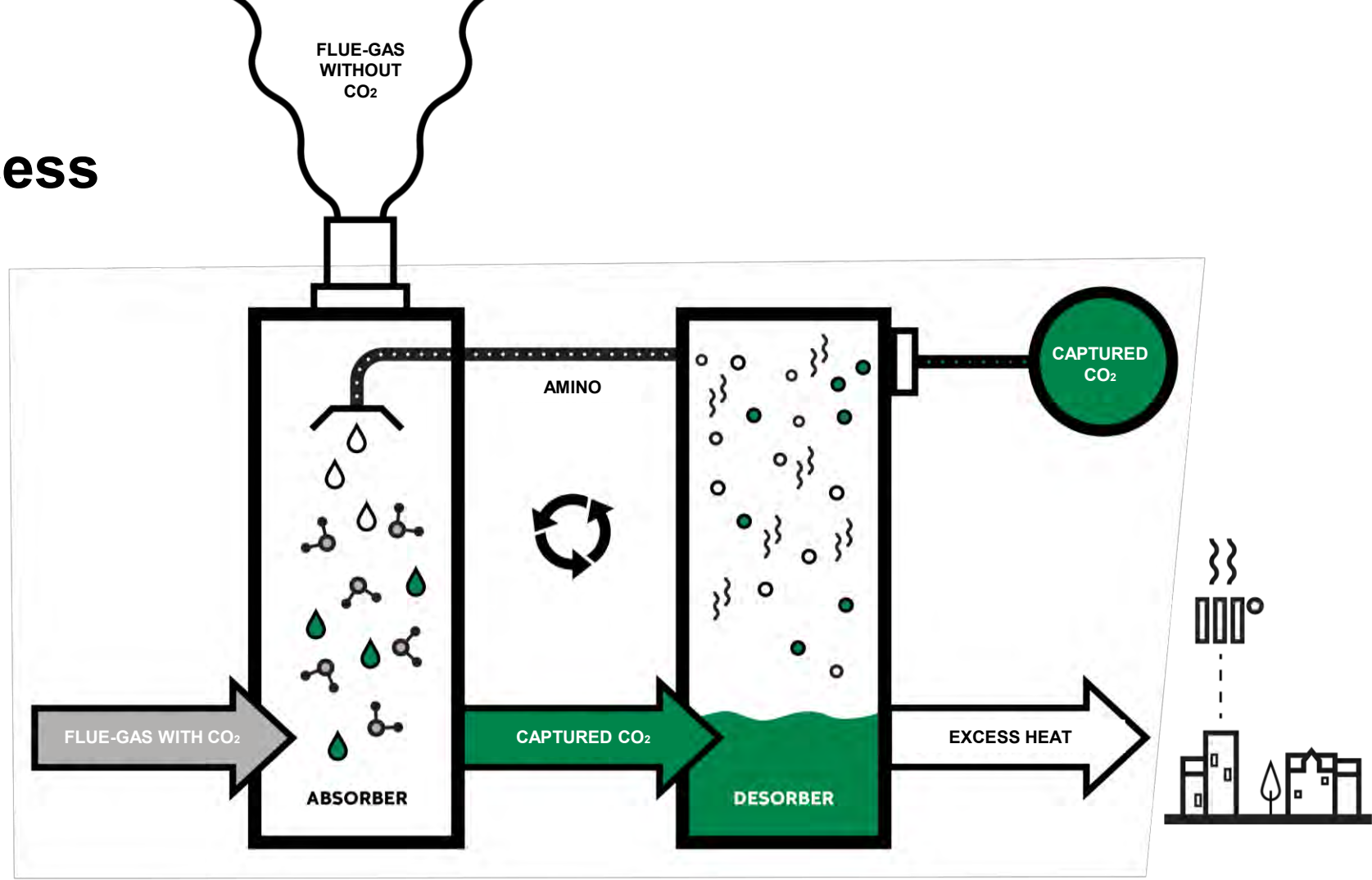
CO_2 t/year



Fossil CO_2
(167,000 t/year)

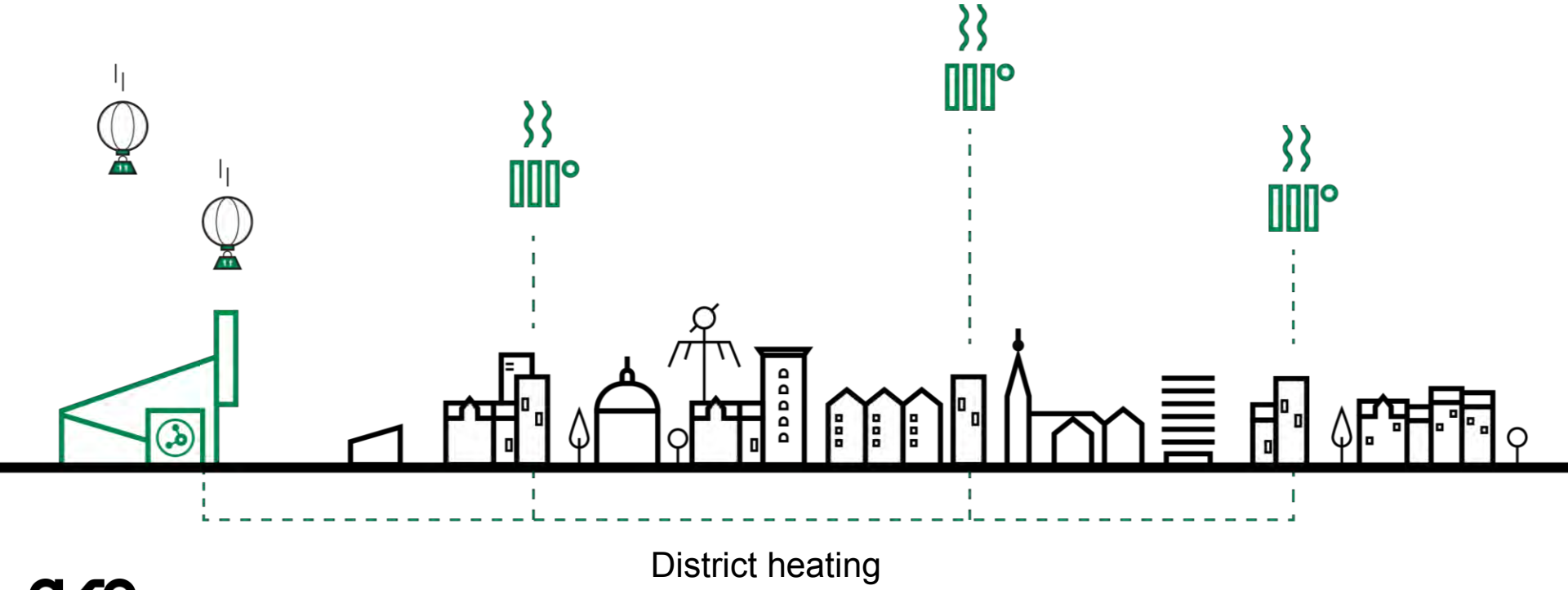
Biogenic CO_2
(333,000 t/year)

The process

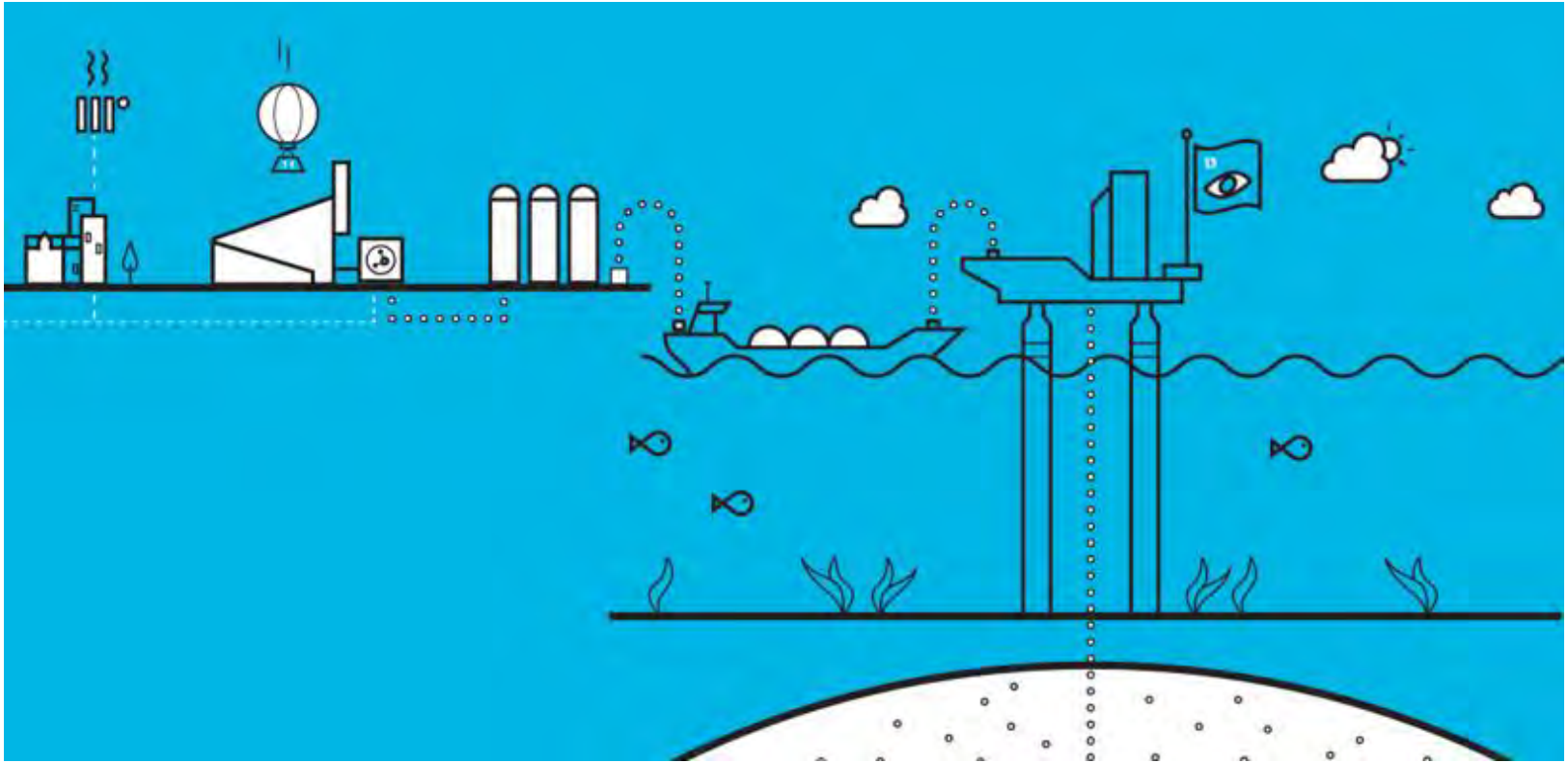

FLUE-GAS WITHOUT CO_2
AMINO
CAPTURED CO_2
FLUE-GAS WITH CO_2
ABSORBER
CAPTURED CO_2
DESORBER
EXCESS HEAT

Excess heating used in the district heating system

… becomes energy neutral



The Value Chain



Thank you for your attention!

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