



ARC

CEO, Ulla Röttger

arc
amberg resource
center

AGENDA

ARC and Waste to Energy
Amager Bakke

Business Areas



Recycling

30 minutes

10 minutes



Waste to energy



Sanitary landfill



Transfer station for hazardous waste

Location



30 minutes

20 minutes

10 minutes

Our unique location contribute to short waste transportation as well as good distribution opportunities for district heating.



ARC operates by a balancing principle where revenue and expenses have to balance on a long-term basis.



3 KG

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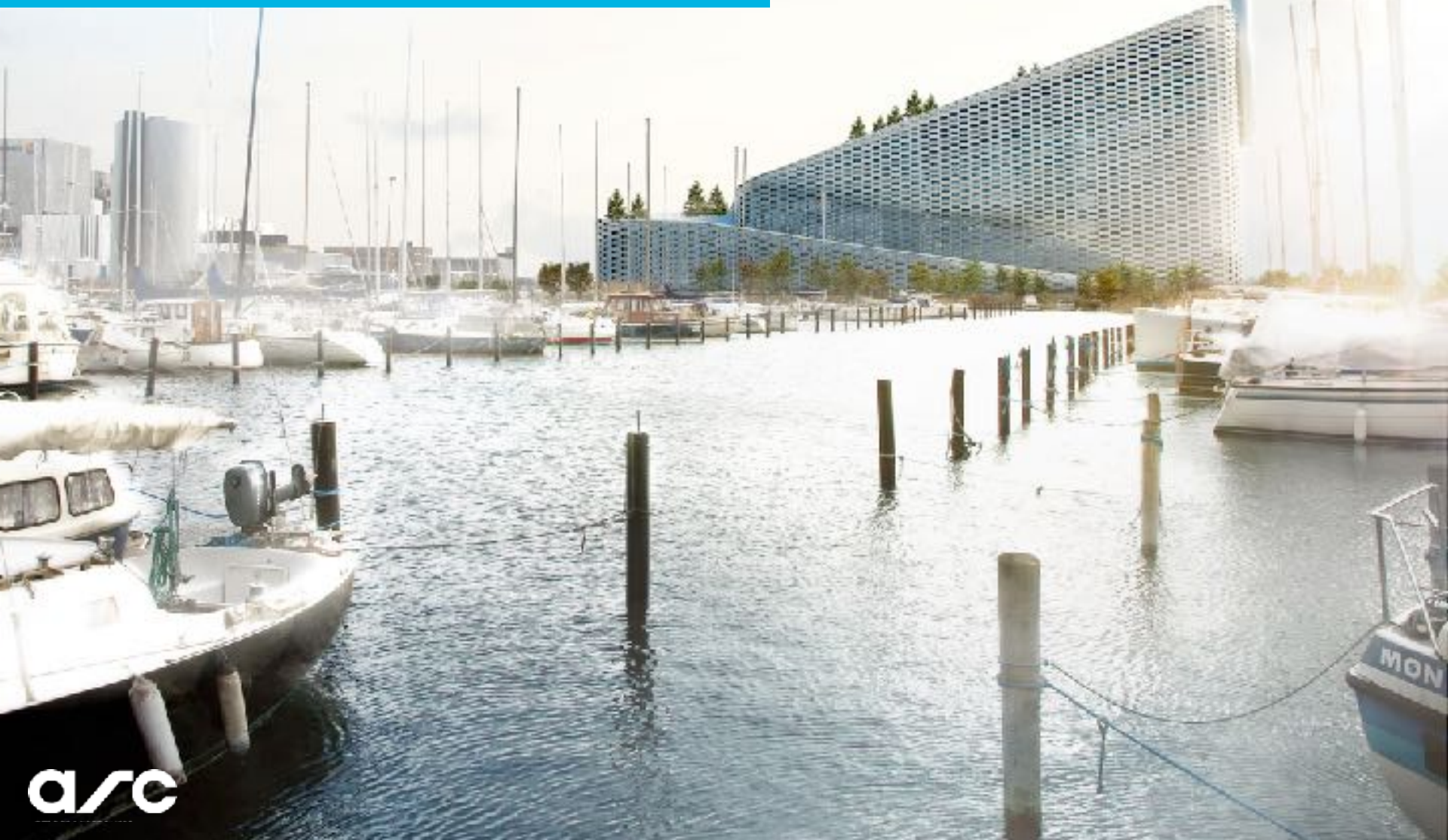
4 HR

+



5 HR

New waste-to-energy plant:
Amager Bakke 2017



Vision for Amager Bakke:

- SIGNIFICANT HIGH ENVIRONMENT AND ENERGY PROFILE
- MODERN AND FLEXIBLE
- INTEGRATED IN THE CITY
- SHOWCASE FOR WASTE TREATMENT



**250 meters to nearest
Residential area**



Technology

INCINERATOR / BOILER

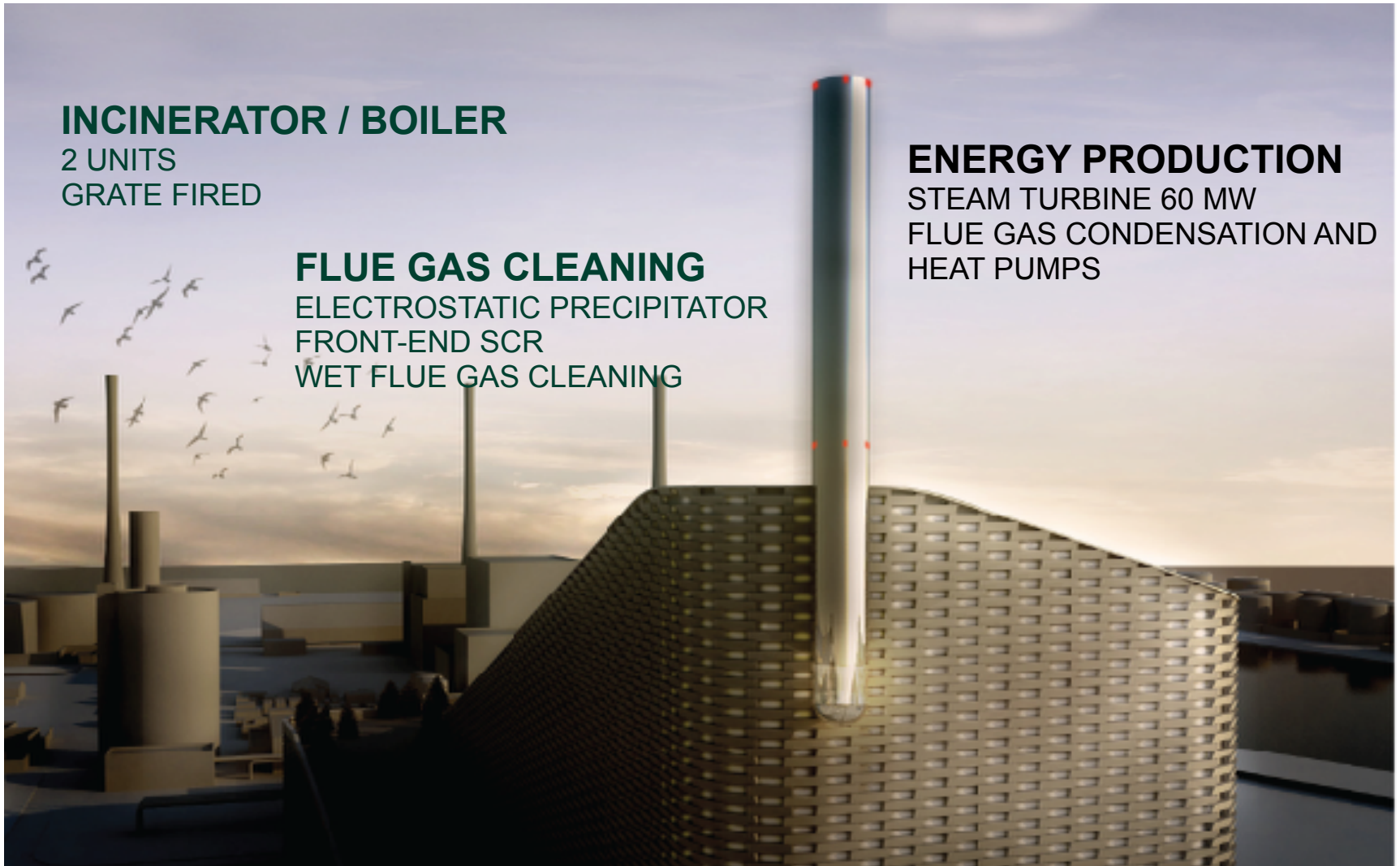
2 UNITS
GRATE FIRED

FLUE GAS CLEANING

ELECTROSTATIC PRECIPITATOR
FRONT-END SCR
WET FLUE GAS CLEANING

ENERGY PRODUCTION

STEAM TURBINE 60 MW
FLUE GAS CONDENSATION AND
HEAT PUMPS



Investment

Investment in Mechanical og Electrical equipment

Furnace/boiler	1.000 million DKR (150 million USD)
Flue gas treatment	400 million DKR (60 million USD)
Turbine/generator	150 million DKR (22 million USD)
Control and monitoring system	100 million DKR (15 million USD)
District heating and electrical connections	70 million DKR (10 million USD)

Cost and Revenue

Maintenance cost

Years in operation	Maintenance cost in percentage of investment
0-2	1,5 %
2-5	1,8 %
5-10	2,2 %
10-	3,0 %

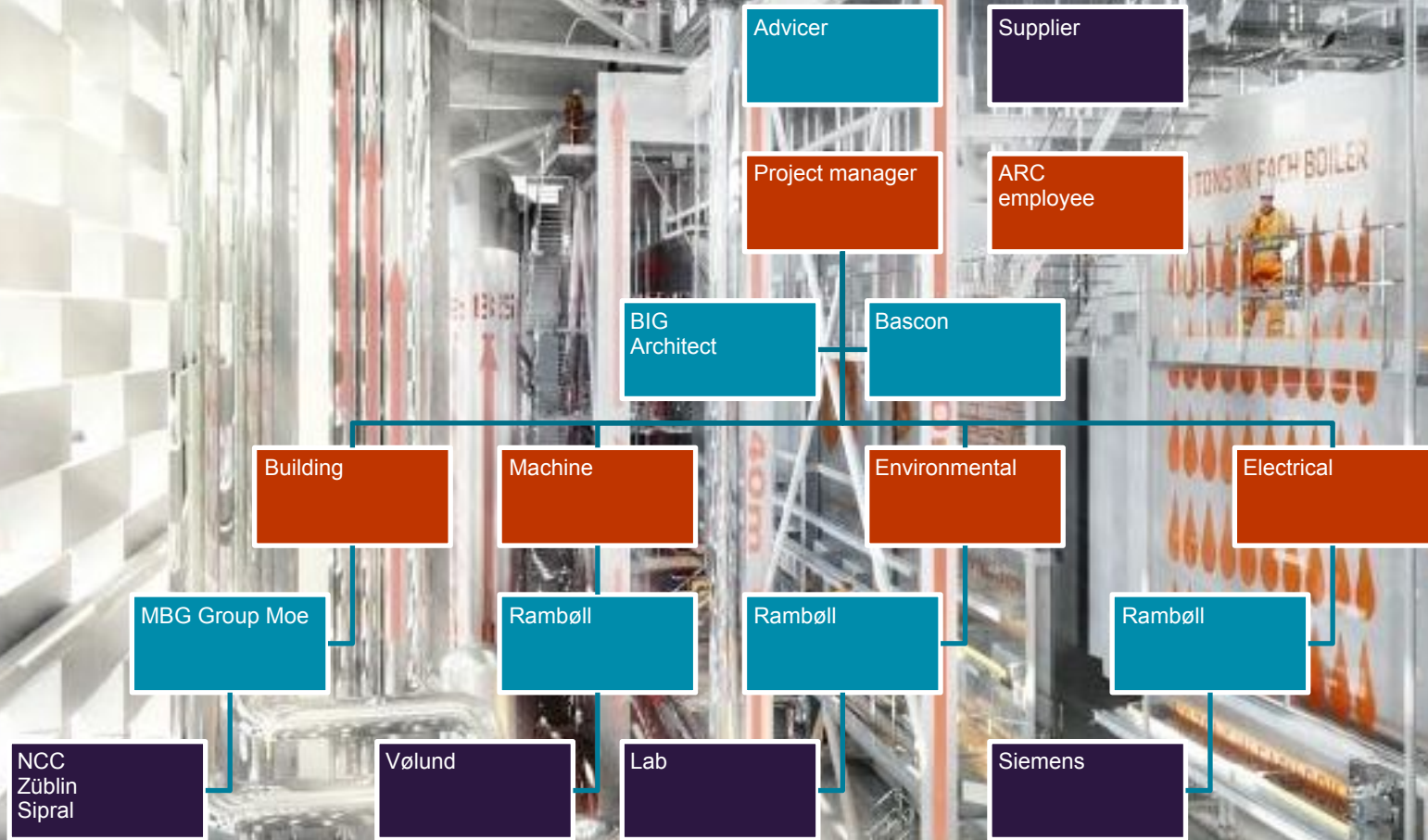
Operational cost

Operational cost	210 DKR/ton waste (30 USD)
Manpower	50 FTE (engineers and craftsmen)

Revenue from sale of energy as well as gate fee

Electricity	140 DKR/ton waste (20 USD)
Heating	500 DKR/ton waste (75 USD)
Gate fee	200 DKR/ton waste (30 USD)

Project organisation



2017

Full operation

2013

Construction started
Designing and planning
Piling
Digging out waste bunker
Planning future organization

2014

Ongoing planning
Casting concrete elements
Construction is visible
Designing machinery
Establishing new organization

2015

Mounting machinery
Fitting steel constructions
Building roof
Mounting façade
Adjusting Organization

2016

Mounting and coupling
production to network
Starting production
New organization is in place

Regulating an incineration plant

External environment

Environmental permit = license to operate

The Permit regulates:

- Waste (input)
- Operation
- Storage of auxiliary material
- Emissions
- Reporting

99,9 %
reduction of
Hydrochloric acid

Reduction in CO₂
emissions by more
than 100,000 tonnes

25%
more energy
from the
waste

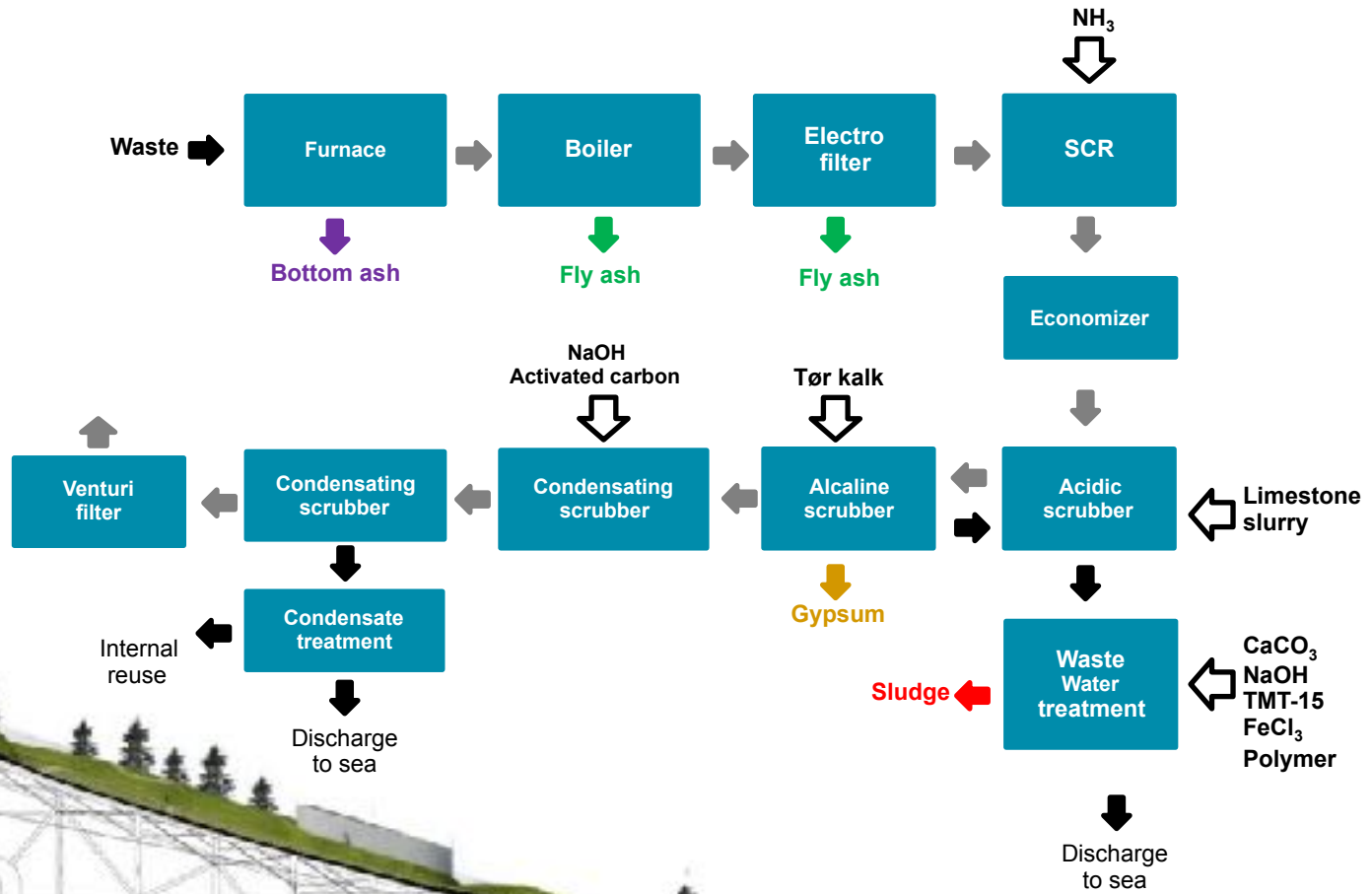
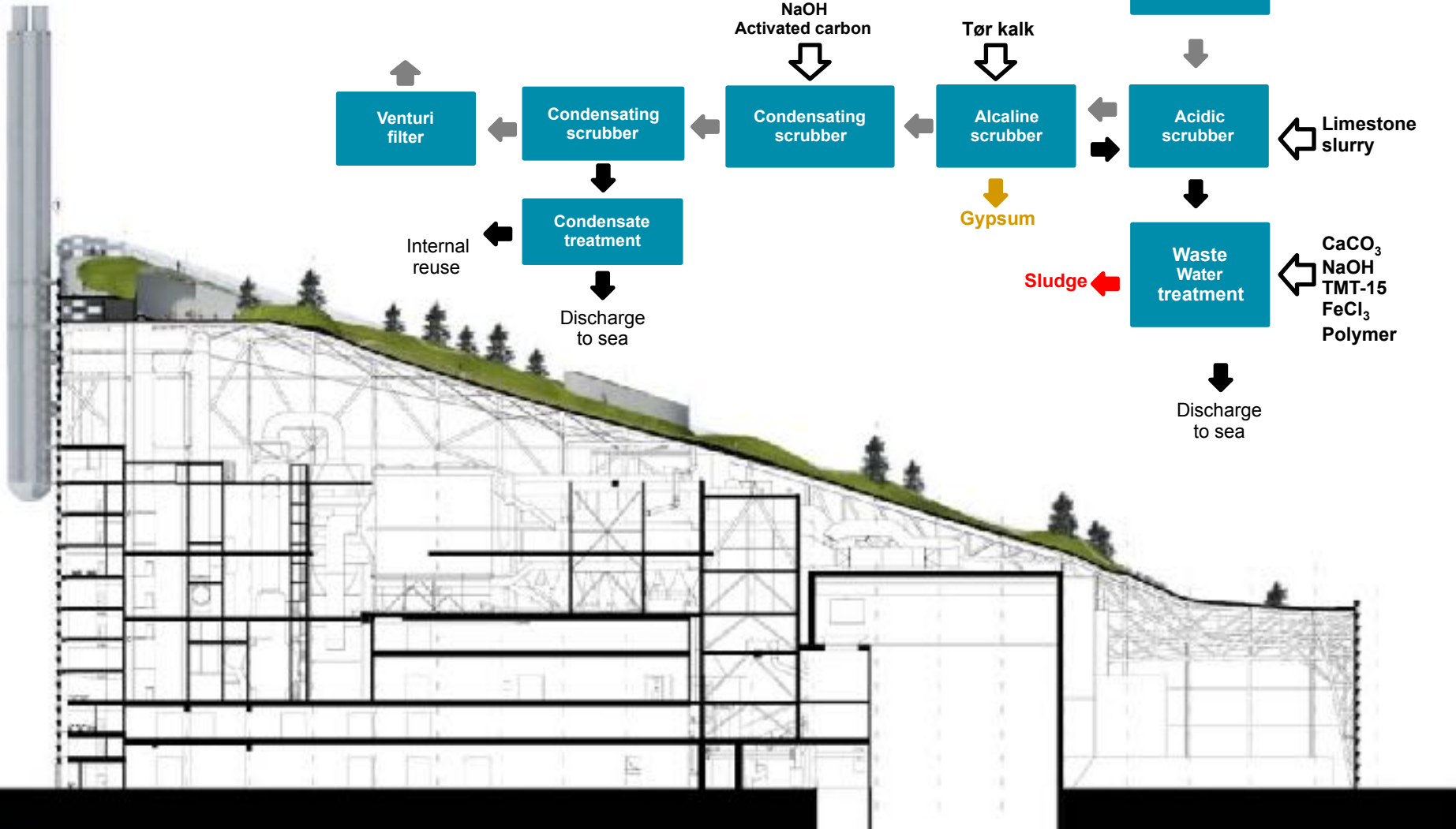
Dioxin is
removed

NO_x emissions
will be removed
by 96 %

99,5 %
reduction of
Sulphuric acid

Examples of Limit values and expected emission levels

Parameters	Unit	Limit values (24h averages)	Expected levels (annual averages)
Particles	mg/Nm ³	5	0,5
HCl	mg/Nm ³	5	0,5
SO ₂	mg/Nm ³	30	2
NH ₃	mg/Nm ³	3	1
HF	mg/Nm ³	1	0,05
Hg	mg/Nm ³	0,025	0,002
Σ Cd+Tl	mg/Nm ³	0,025	0,005
Σ Sb+As+Pb+Cr+Co+Mn+Ni+V	mg/Nm ³	0,25	0,01
Σ Cd+Ni+As+Cr	mg/Nm ³	0,005	0,003
PAH's	mg/Nm ³	0,0025	0,001
Dioxins + furanes	ng/Nm ³	0,08	0,01



Residual Products



Bottom Ash (170 kg/ton waste)

- Iron and ferrous metals is extracted (10 kg/ton waste)
- Can be is used for road construction.

Fly Ash (15 kg/ton waste)

- can be deposited under controlled conditions

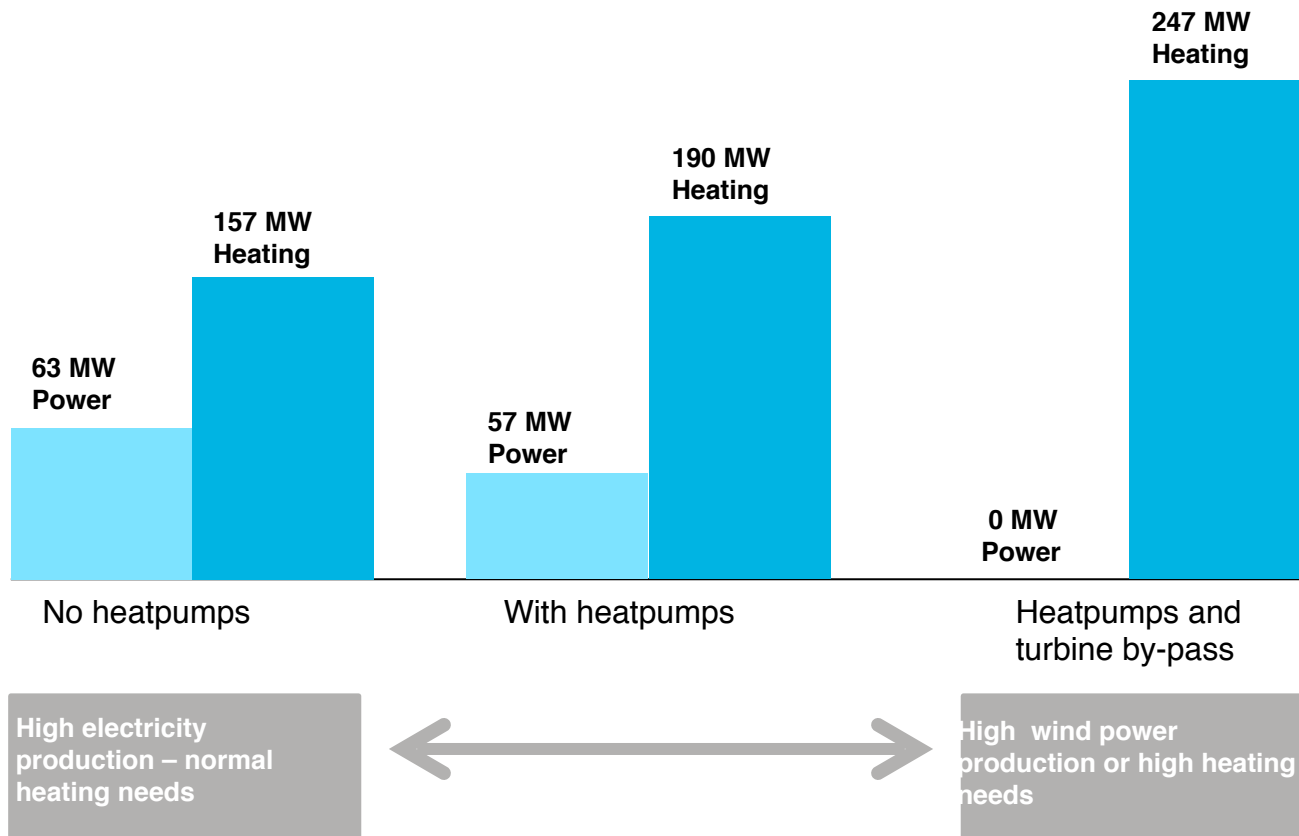
Gypsum (6 kg/ton waste)

- maybe recycled

Sludge from waste vater treatment (5 kg/ton waste)

- can be utilized to neutralize acidic waste

Output ratios



Operating

A photograph of a large industrial facility, possibly a waste treatment plant. In the foreground, a large, dark, multi-armed crane hook is suspended. The ground is covered with a large pile of debris, including what appears to be crushed metal and other industrial waste. In the background, there are large, light-colored concrete structures and a bright light source, possibly a lamp or a window, casting a glow on the scene.

- Waste treatment
(stable operation)
- Energy production
(demand and supply)
- Environmental permit
(monitoring and reporting)
- Economy
(monitoring and reporting)





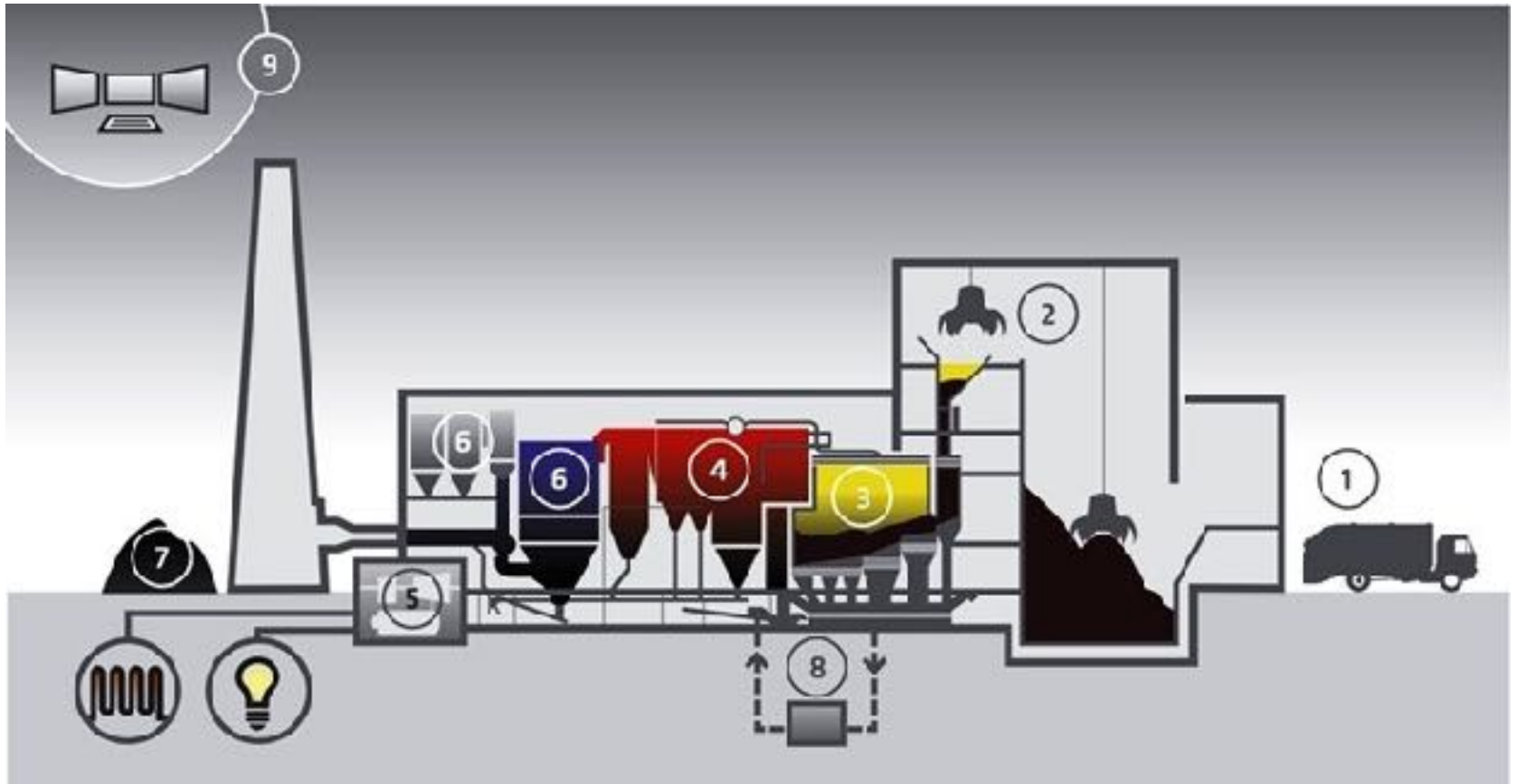


THANK YOU

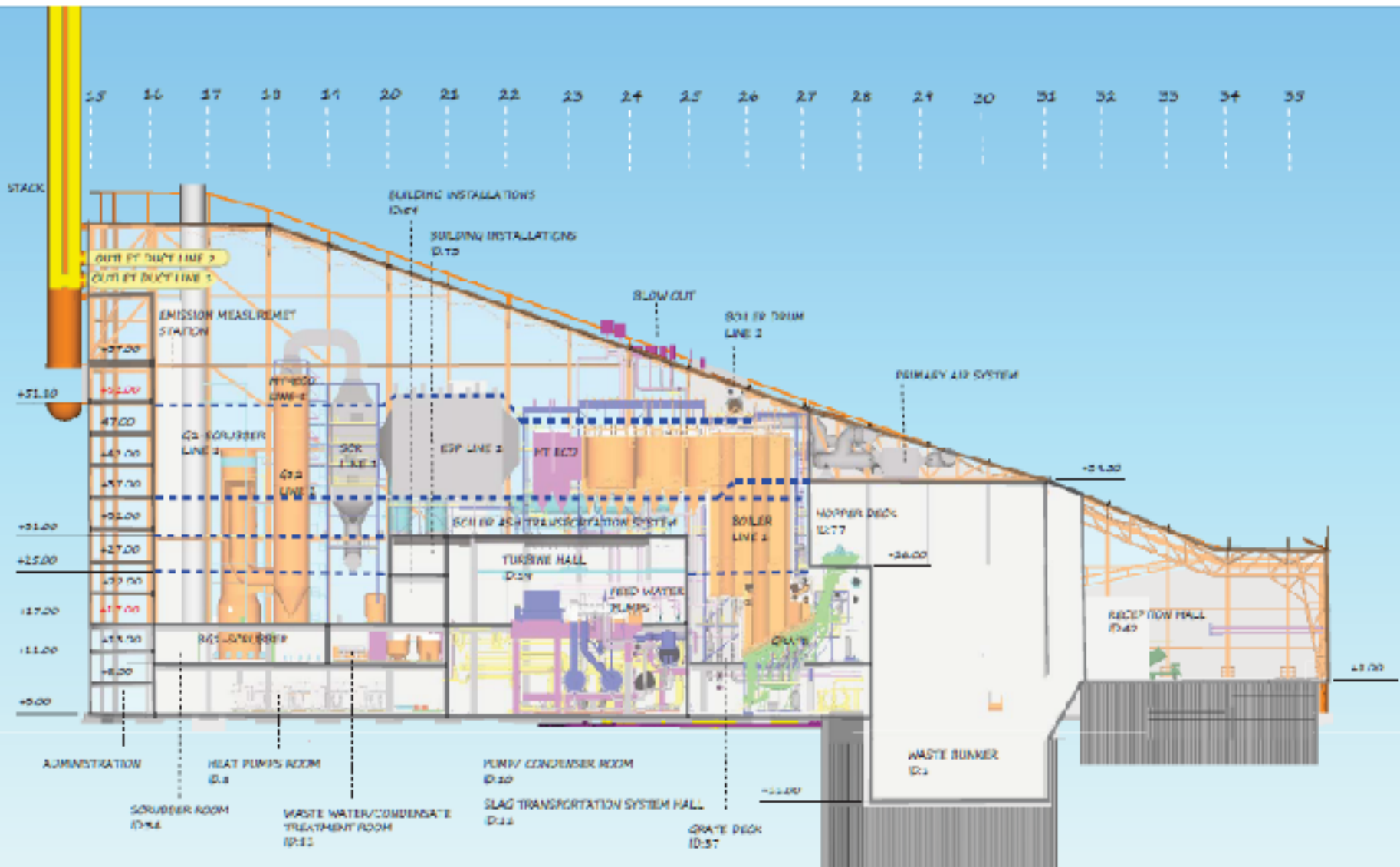


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ARC – Waste to Energy



LONGITUDINAL SECTION MODULES L-M (LINE 2)



Environmental permit

A close-up photograph of a lizard, possibly a gecko, resting on a dark, textured surface of rocks and debris. The lizard is positioned on the right side of the frame, facing towards the left. The background is a mix of dark grey and black rocks with some lighter, yellowish-brown spots.

Waste (input)

- Which and how much waste can be received.
- How and how often must the waste be inspected, prior to incineration.
- How much unhygienic waste can be received.

Environmental permit

A close-up photograph of a lizard, possibly a gecko, resting on dark, jagged, and porous volcanic rock. The lizard is positioned in the upper right quadrant of the image, facing towards the right. The background is filled with similar dark, textured rock formations, creating a natural, rugged environment.

Storage of auxiliary materials

- Maximum storage and safety (alarms, double walled tanks and more).

Emissions

- Limit values and control program and frequency. Analyses must be carried out by approved laboratory.

Reporting

- How, when and what to report. Exceeding's of limit values and violations of regulations must be reported no later than the following day. Quarterly report of other results from environmental control.

Environmental permit

A close-up photograph of a lizard, possibly a gecko, resting on dark, jagged, and porous volcanic rock. The lizard is positioned in the upper right quadrant of the image, facing towards the right. The rock has a rough, crystalline texture with various shades of grey and black. The background is slightly blurred, emphasizing the lizard and the rock in the foreground.

Operation

- Operation must be continuous and stable – reduces emissions.
- Bunker area must have under pressure – prevents ordure.
- The plant must have automatic auxiliary burners to prevent drop in temperature.
- Air pollution control systems must be in operation, when waste is on the grades or the auxiliary burners are in operation.
- The incineration plant must have emergency power supply.