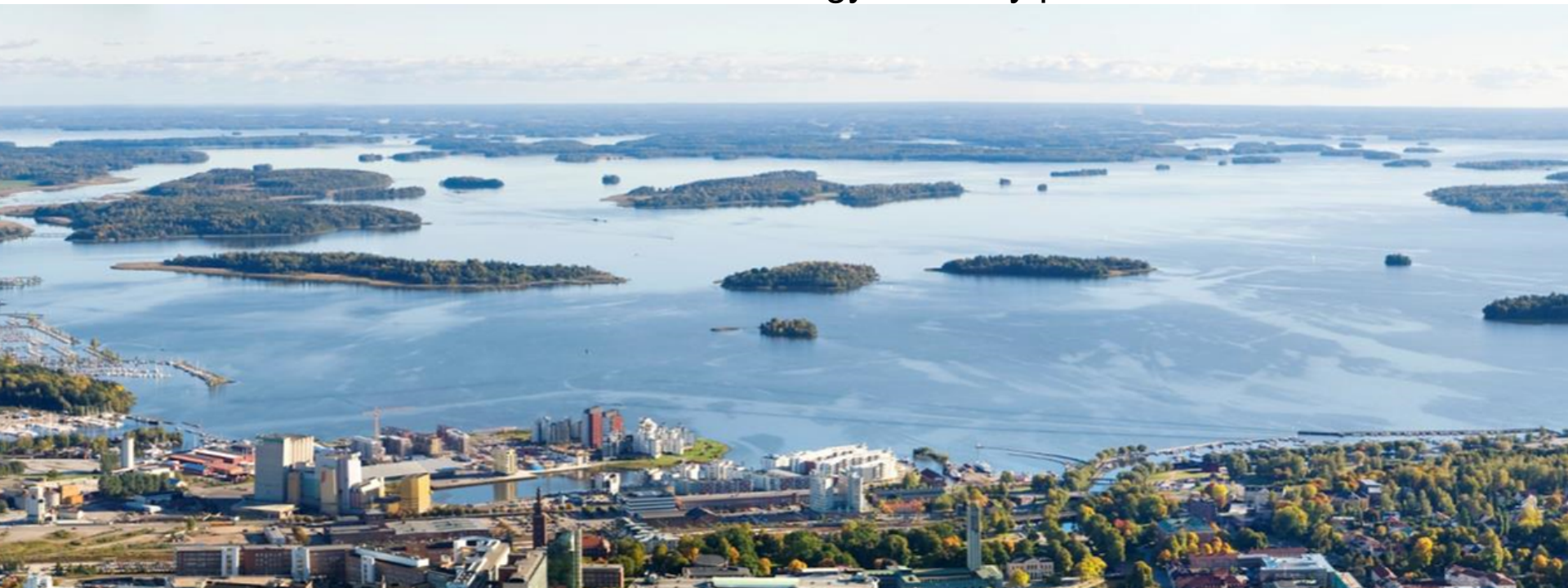


A Sustainable SRF - Waste to Energy Technology for Russia

How waste becomes an environmentally friendly key resource for a sustainable society and why Solid Recovered Fuel provides the most efficient energy recovery process



Moscow 22nd October in 2014 - The Conference of the Association of Interregional Socio-Economic Interaction of the Central Federal District of Russia



October 24th in 2014 – The Signing of Collaboration Agreement with ANO – International Centre for the Best Environmental Technologies during the St.Petersburg Initiative Conference



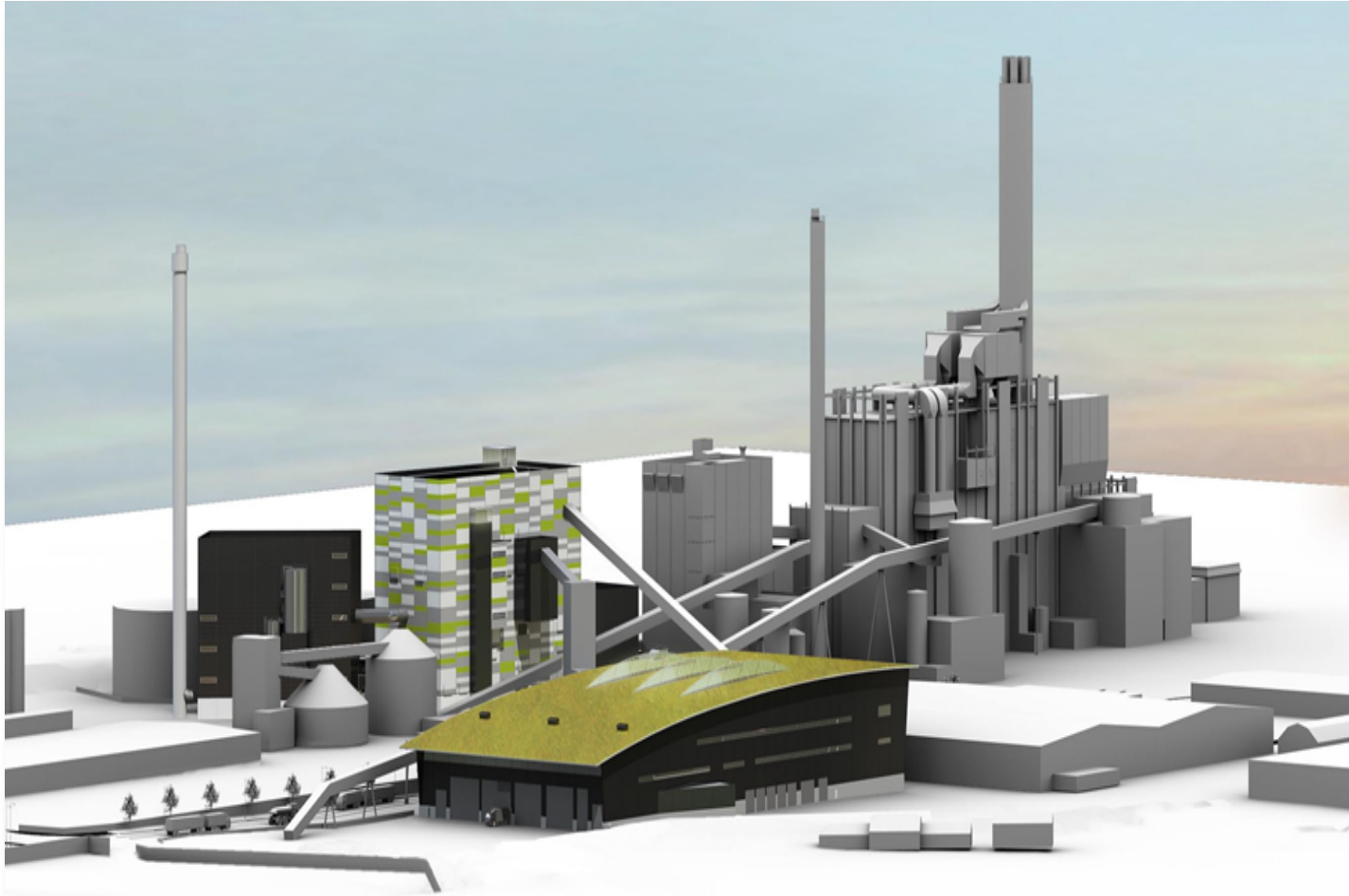
May 15th 2015 in Moscow
Signing of the Collaboration Agreement with Association of
Interregional Socio-Economic Interaction of the Central Federal
District of Russia



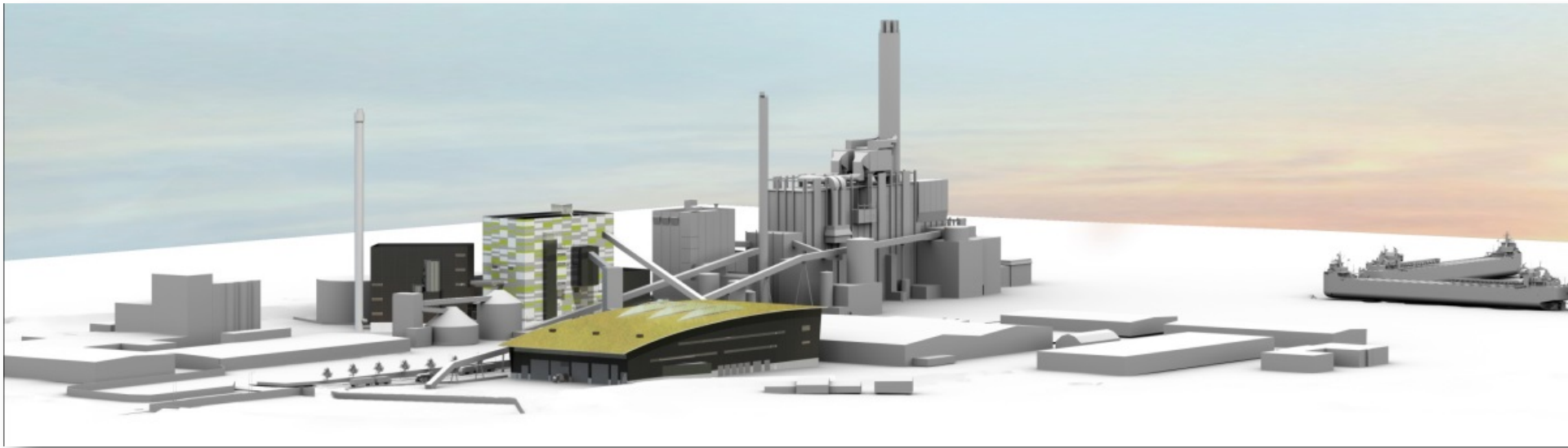
June 9th in 2015 - Chamber of Commerce of Moscow Technological and Economic Aspects of RDF as Alternative Fuel Source for the Cement Industry of Russia



A World Unique Waste to Energy Plant - MälarEnergi AB commissioned the New Combined Heat and Power Plant in 2014



- Picture 2 - A World Unique Waste to Energy Plant
- MälarEnergi AB commissioned the New Combined Heat and Power Plant in 2014
 - British and Irish Municipal Waste to Västerås



Fuel

- Motivational Power for Renovation



1960

1970

1980

1990

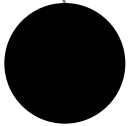
2000

2010

2014

2020

Oil 1963



Coal 1981



Bio 2000



Peat 2002



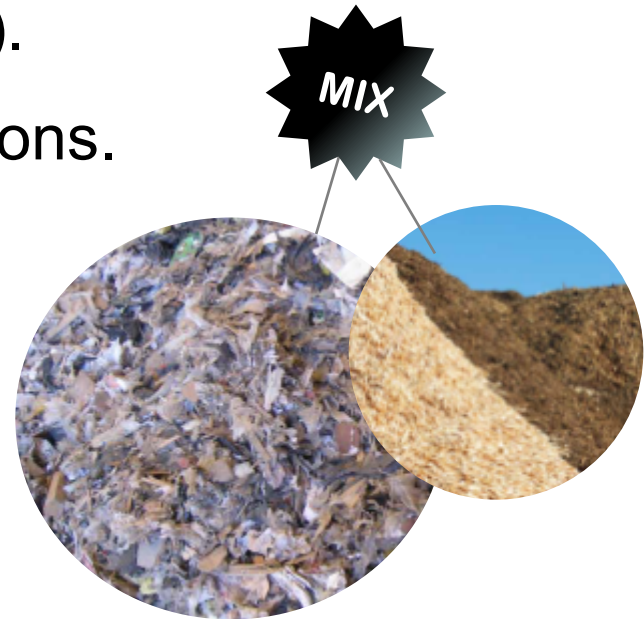
Waste + bio
2014



Investment goal

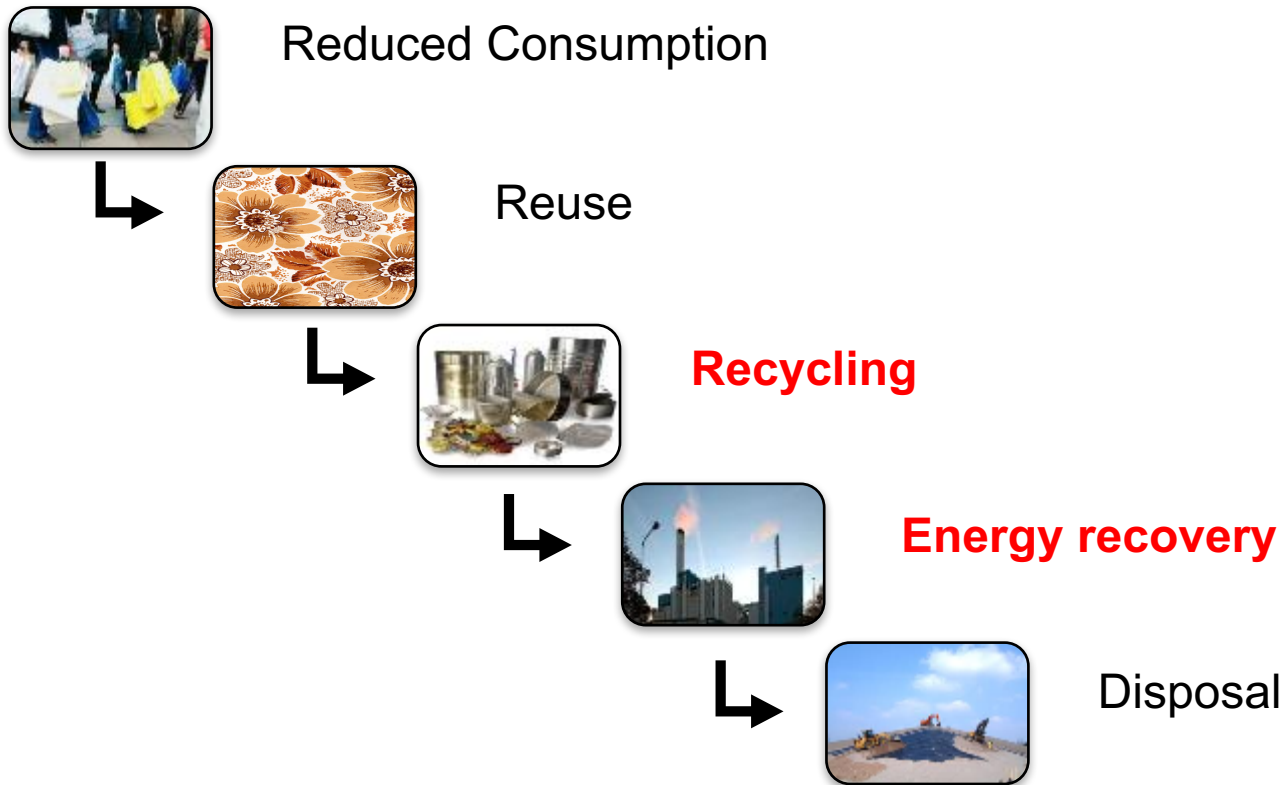
- Fuel questions are the main focus
- No oil and gas in energy production

- Needed to renew the production.
- Maintain low district heating prices.
- Secure fuel availability (flexibility).
- Reduce fossil-based CO2 emissions.



Waste Hierarchy

- A Sustainable Society for Recycling and Energy Recovery



SRF Fuel Preparation Plant

- Facts

Building

- 130 metres long, 70 metres wide, 32 metres high
- Green roof/Sedum

Operations

- Reception, preparation, handling
- 480,000 tonnes of industrial and household waste annually.
- Weighing-in, inspection and crushing
- Separation of unwanted material
- Bunkering
- Transportation to the incinerator

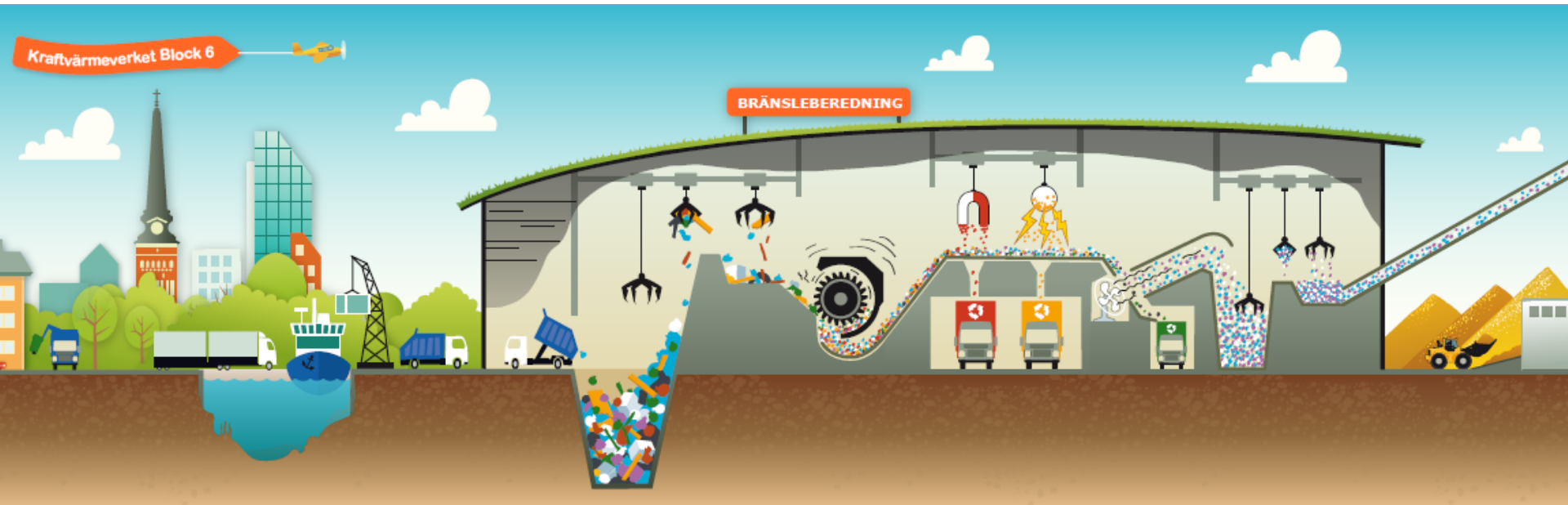
Capacity

- Bunker for 5 – 6 days' full operation
- Indoor storage for baled fuel



SRF Fuel Preparation

- Smart Plan with Crushing and Sorting



Reception, preparation, handling

480,000 tonnes of industrial and household waste annually.

Weighing-in, inspection and crushing

Separation of unwanted material

Bunkering

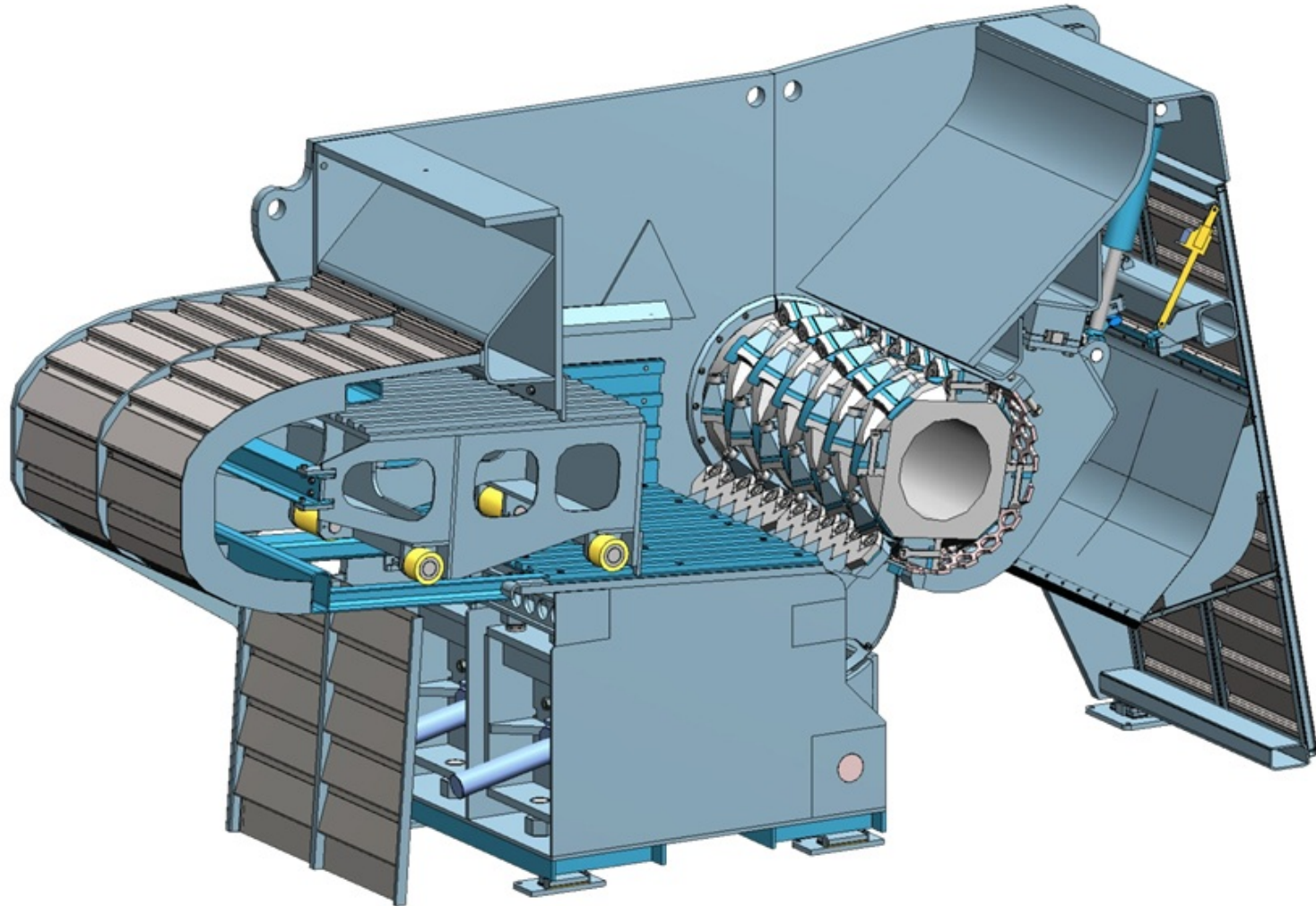
Transportation to the incinerator

Bunker for 5 – 6 days' full operation

Indoor storage for baled fuel

SRF Fuel Preparation Plant

- The Importance of Tyrannosaurus Technology



SRF Fuel Preparation Plant

- The Air Classifier Secures the SRF Fuel Quality



SRF Fuel Preparation Plant

- Inside of the RDF Bunker and the Process Lines



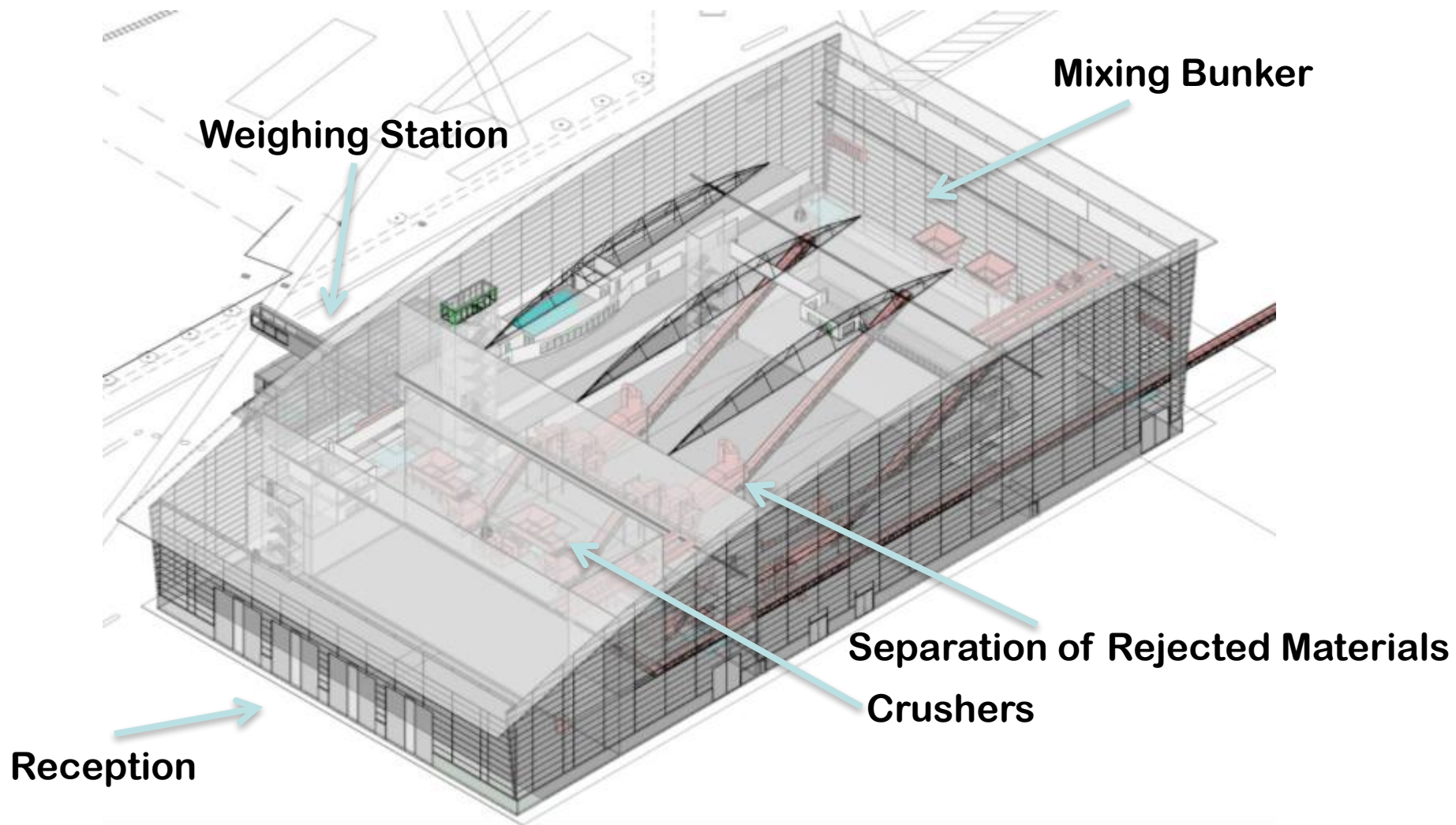
SRF Fuel Preparation Plant

- The Entrance of the Weighing House



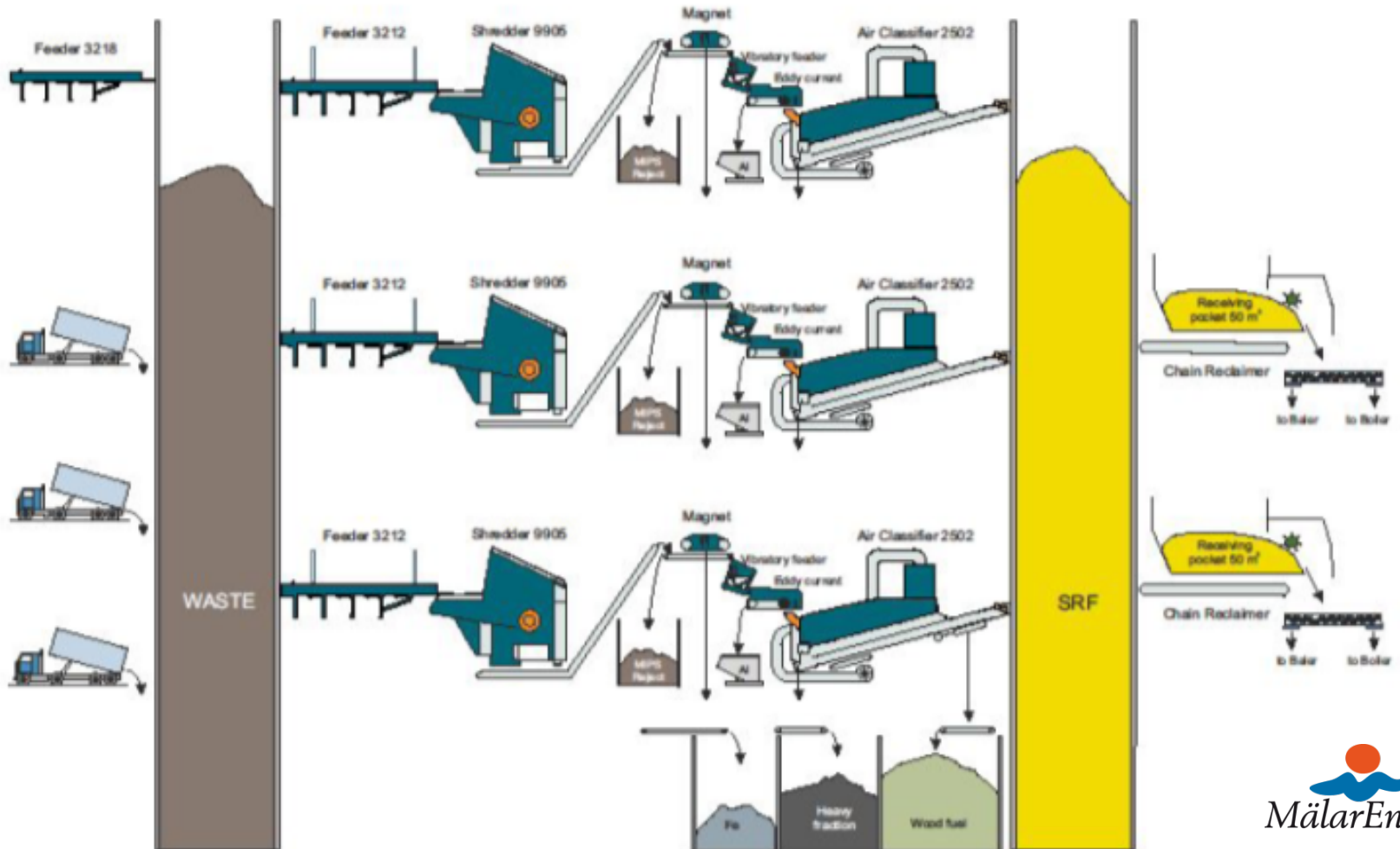
SRF Fuel Preparation Plant

- SRF/RDF Processing Lines



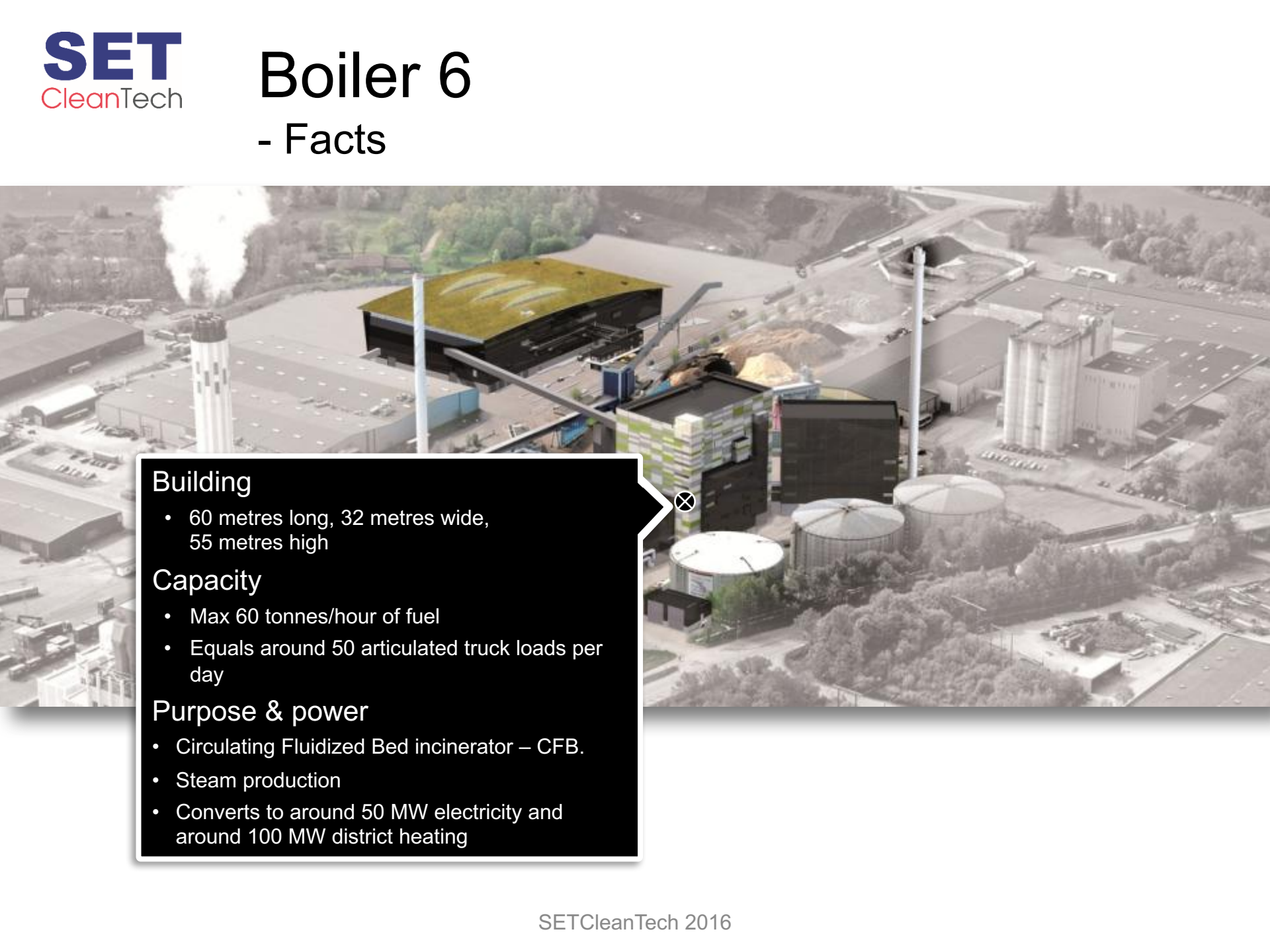
SRF Fuel Preparation Process

- Bunker to Bunker Solution



Boiler 6

- Facts

An aerial photograph of an industrial complex. In the center, a large building with a green roof is visible. To the left, a tall smokestack emits a plume of white smoke. To the right, there are several large cylindrical storage tanks and other industrial structures. The background shows some trees and a road.

Building

- 60 metres long, 32 metres wide, 55 metres high

Capacity

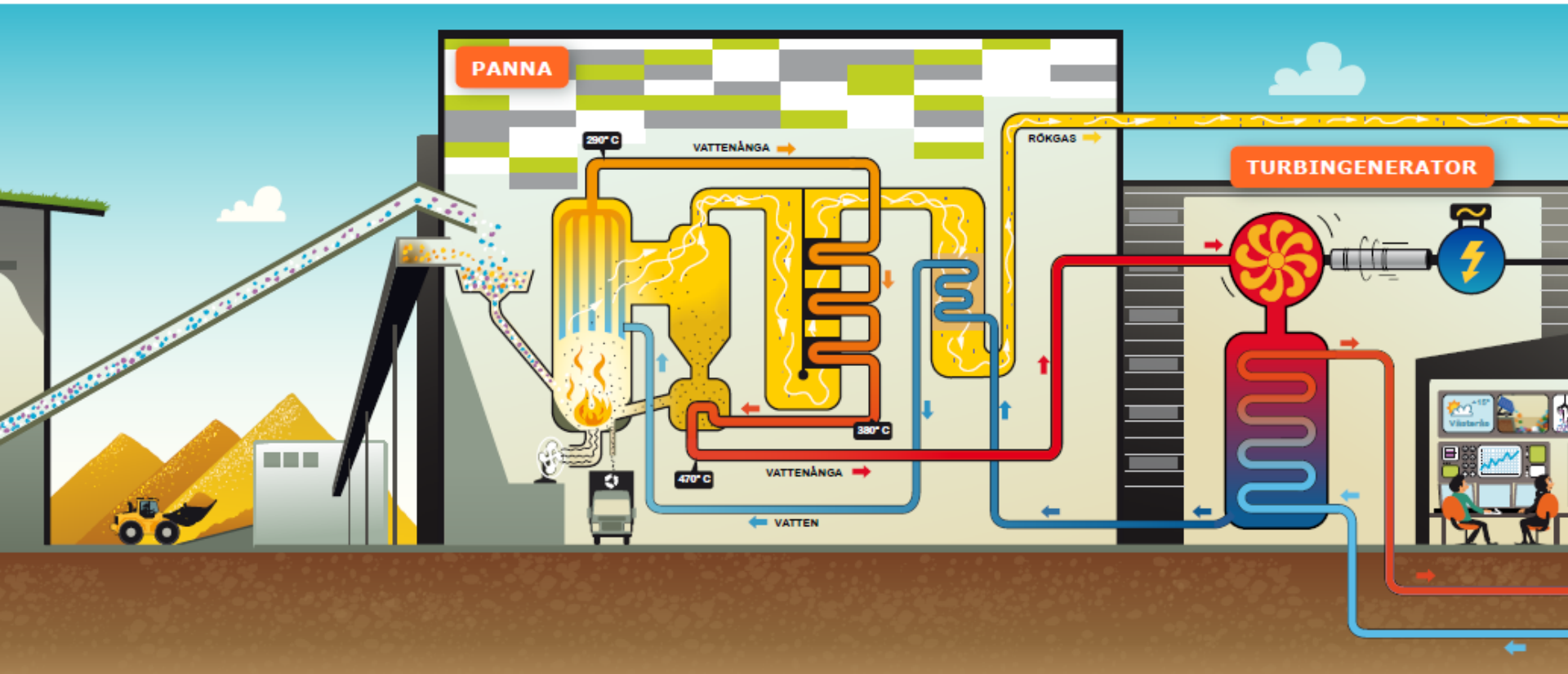
- Max 60 tonnes/hour of fuel
- Equals around 50 articulated truck loads per day

Purpose & power

- Circulating Fluidized Bed incinerator – CFB.
- Steam production
- Converts to around 50 MW electricity and around 100 MW district heating

Boiler

- Large, Robust and Efficient



Max 60 tonnes/hour of fuel

Equals around 50 articulated truck loads per day

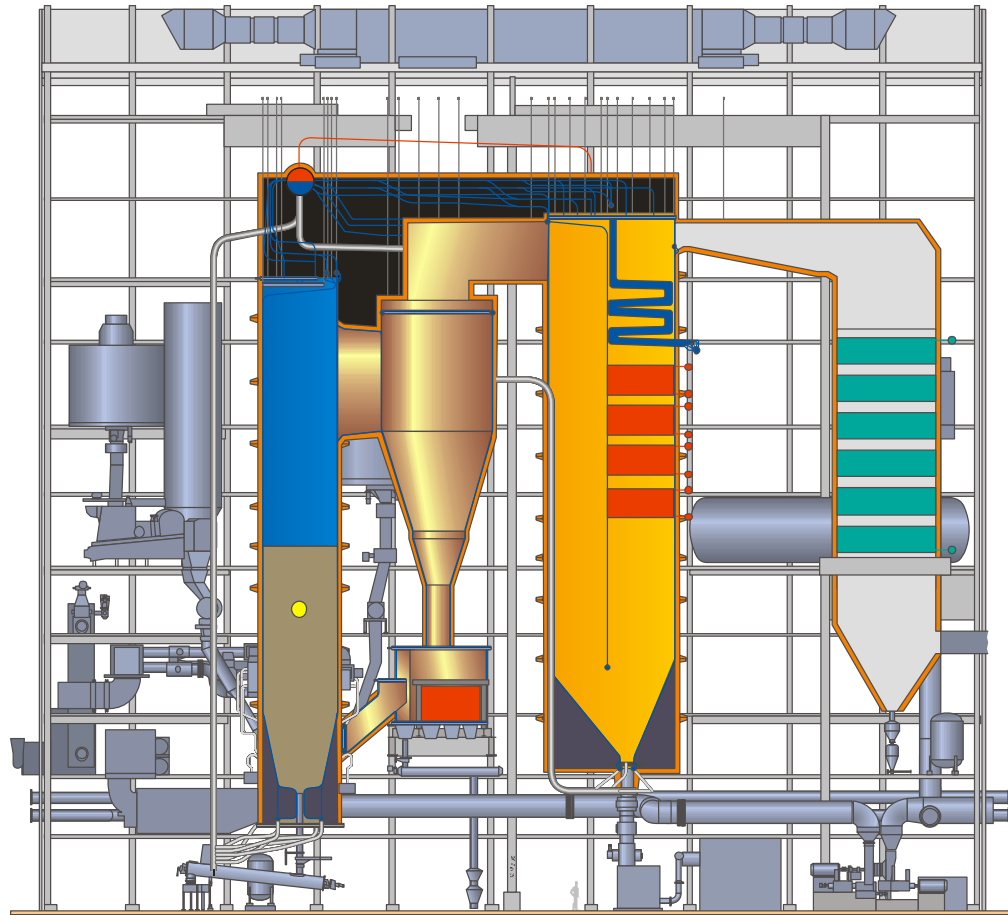
Circulating Fluidized Bed incinerator – CFB.

Steam production

Converts to around 50 MW electricity and around 100 MW district heating

The Boiler

- Circulating Fluidized Bed (CFB) technology



Turbine

- Facts

Building

- 30 metres long, 25 metres wide, 30 metres high
- Two levels.

Capacity

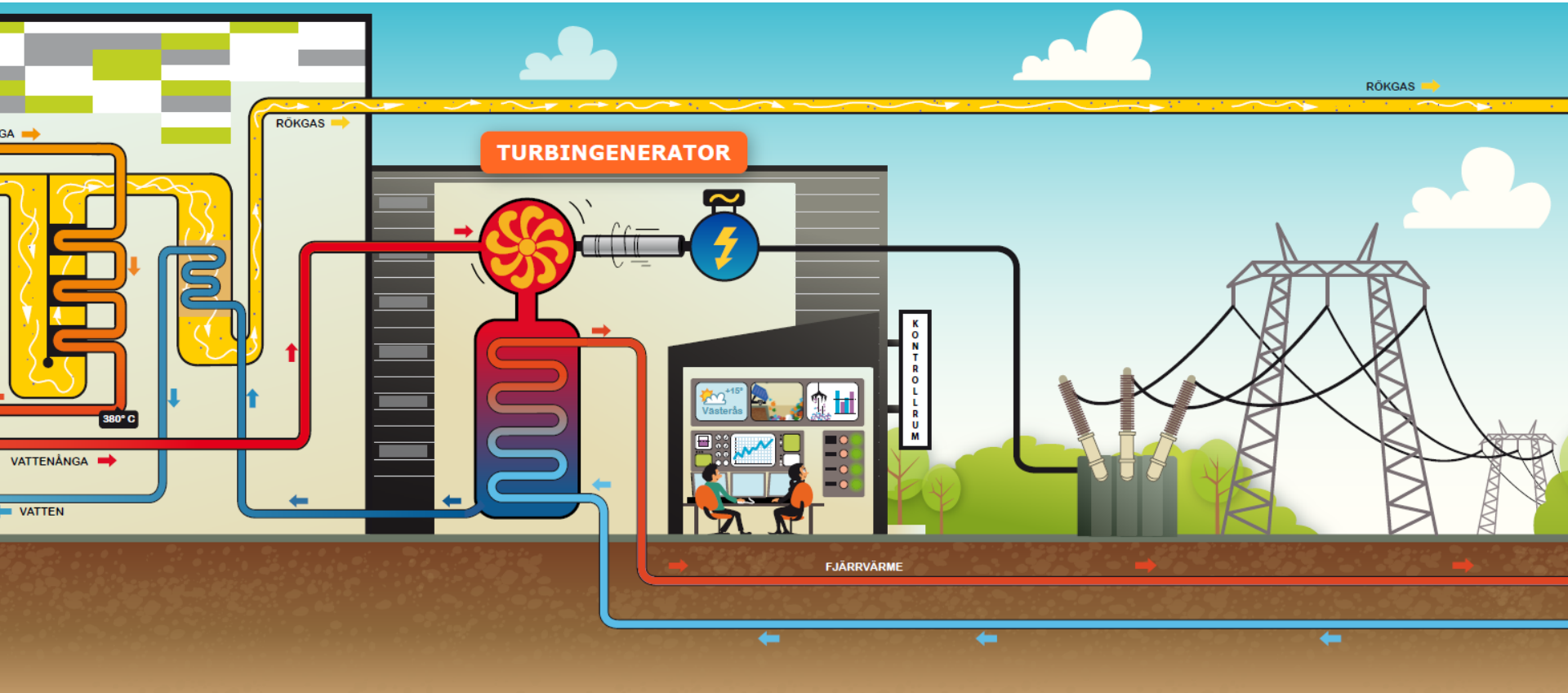
- Generates 46-51 MW electrical energy.
- Remaining energy utilised in the turbine condensers as district heating.

Purpose & effect

- Transforms 150 MW energy from the incinerator into electricity and district heating.
- Influenced by the district heating system's temperature.

Turbine

- Powerful Machine



Generates 46-51 MW electrical energy.

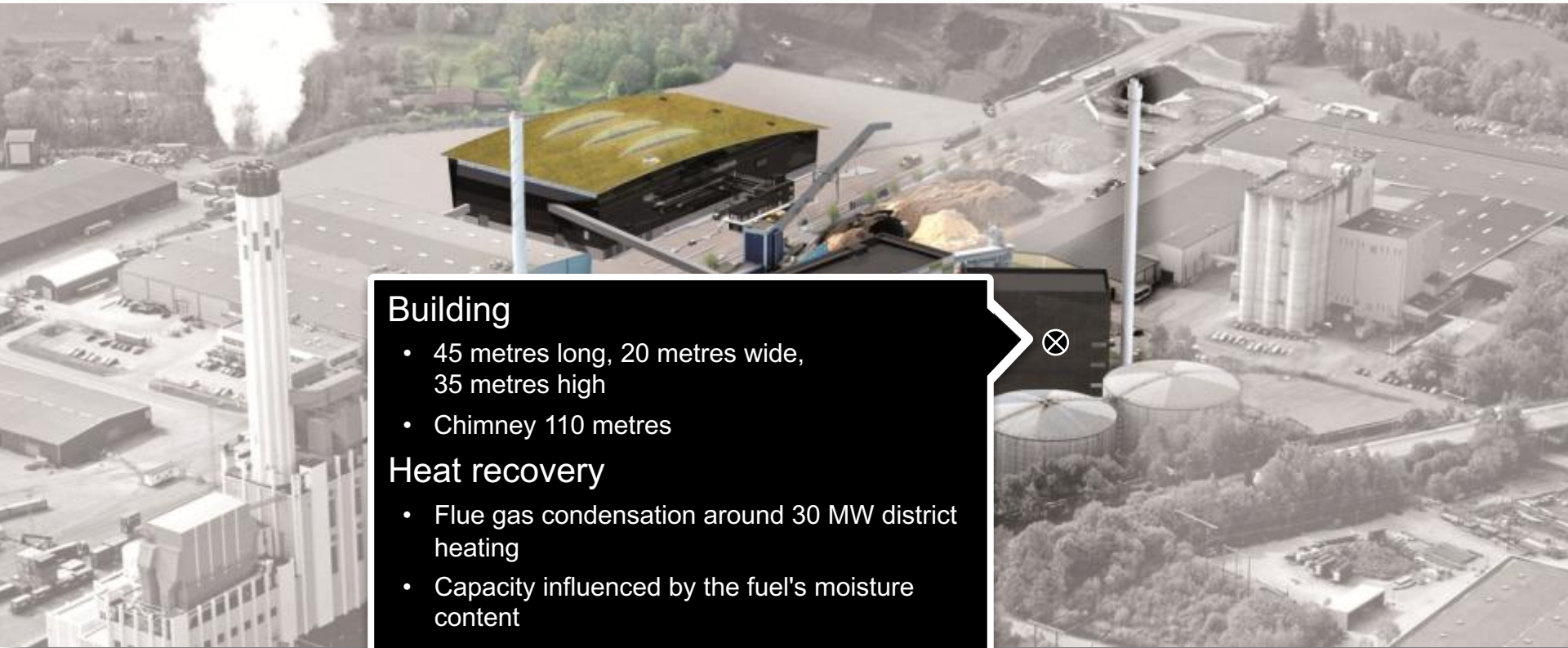
Remaining energy utilised in the turbine condensers as district heating.

Transforms 150 MW energy from the incinerator into electricity and district heating.

Influenced by the district heating system's temperature.

Flue Gas Treatment

- Facts



Building

- 45 metres long, 20 metres wide, 35 metres high
- Chimney 110 metres

Heat recovery

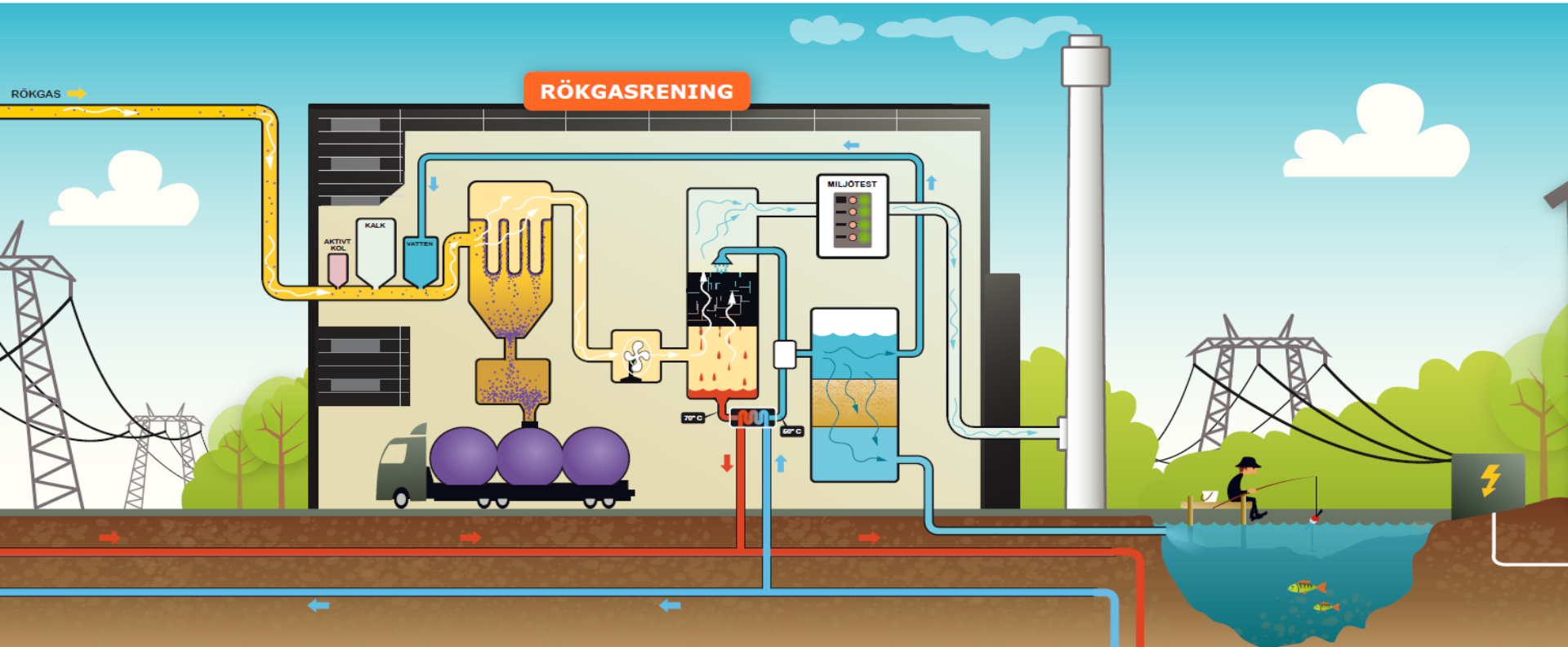
- Flue gas condensation around 30 MW district heating
- Capacity influenced by the fuel's moisture content

Description

- Flue gas purification in two stages
- Semi-dry purification from heavy metals and dioxins
- Condensing purification in stage two
- Purified excess water can be released into Lake Mälaren

Flue Gas Treatment

- Combined technologies makes it brilliant



- Flue gas condensation around 30 MW district heating
- Capacity influenced by the fuel's moisture content
- Flue gas purification in two stages
- Semi-dry purification from heavy metals and dioxins
- Condensing purification in stage two
- Purified excess water can be released into Lake Mälaren

Flue Gas Treatment

- Technology Overview

- Semi-dry filtration technique with preceding addition of lime and activated carbon, followed by wet cleaning with flue gas condensation and heat recovery.
- Only one residual product remains from the process – the dry residue from the semi-dry filtration stage.
- Great flexibility and buffer effect in the system.
- High environmental goals with good margins against limit values.
- Recovery of up to 30 MW heat for the district heating network.
- Purified condensed water for re-use in the plant or to recipient (lake)

Summary

- Experience of Mälarenergi Investment

- New base load plant with high efficiency
- The Waste to energy Plant is a good environmental investment and reduce fossil-based CO2 emissions
- Block 6 provides Mälarenergi with an opportunity to prepare its own fuel and a flexibility to use both bio fuel and waste fuel
- Good economical operating results due to gate fees for the fuel

Advantages with RDF Fuel and CFB Technology

- Suitable for large scale boilers, - over 200 MW Reduces capital cost.
- Fuel flexibility makes it possible to mix RDF, Bio mass and Coal in the same boiler.
- High steam parameters is possible compared to other RDF combustion techniques. Higher electric efficiency is possible in the turbine.
- Low emission values and high utilization of the fuel.
- In house RDF preparation makes it possible to separate non combustible fractions e.g. metals.

Comparison the Energy Content

- SRF/RDF fuel is fully comparable to other commercial fuels on the market such biomass and coal

Fuel comparison: *)

- Bio fuel 10 – 12 MJ/kg
- SRF/RDF Fuel 9 -18 MJ/kg
- Coal fuel 11- 28 MJ/kg

*) typical values of variation

Solid Environmental Technologies Oy (SETCleanTech) cooperates with



Thank You for Your Attention!

