Welcome to the Waste-to-Energy & the City Conference!

Policymakers | Industry | Citizens-First

14:00 to 17:30

A cocktail reception will follow.

Waste-to-Energy & the City

Opening speech

Mr. Siegfried Scholz – ESWET's President

ESWET

Hosted by European Committee of the Regions

Panel A - Policymakers

Committee of the Regions Members' position on WtE's role in waste management, circular economy, energy security, and serving societies

Moderator
Ella Stengler – MD, CEWEP

Eero Ailio – Adviser, DG Energy, European Commission

Andries Gryffroy – Flemish Parliament, ENVE Commission

Kata Tüttő – Deputy Mayor of Budapest, ENVE Commission

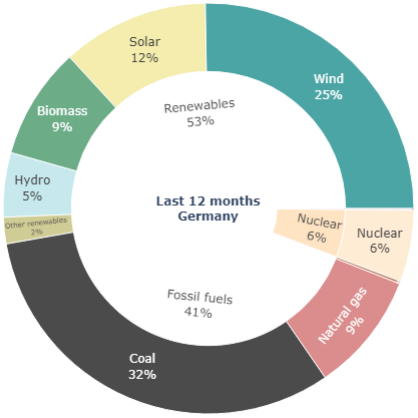
Energy Systems in European municipalities – renewables and Waste to Energy

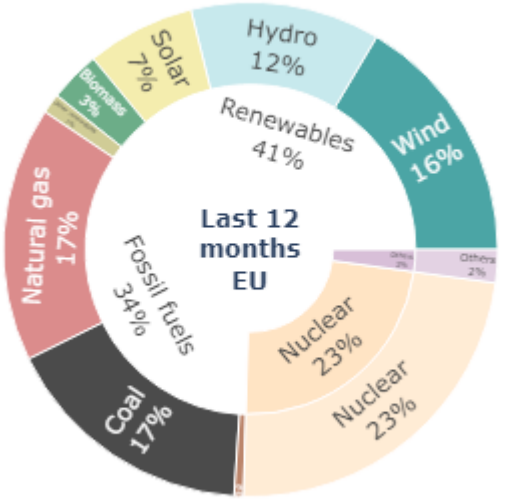
Eero Ailio, Policy Adviser on Energy Transition, European Commission DG Energy

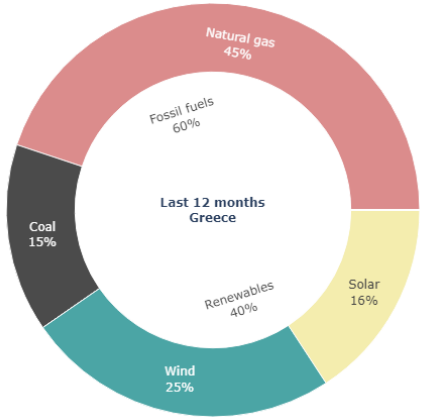
ESWET, Committee of Regions

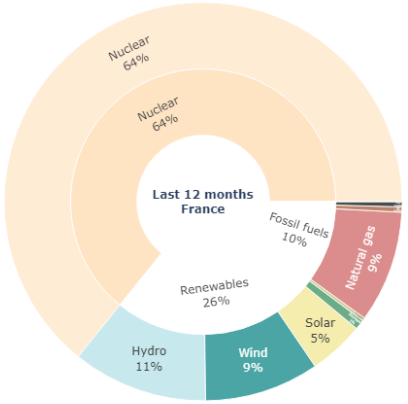
16.05.2022

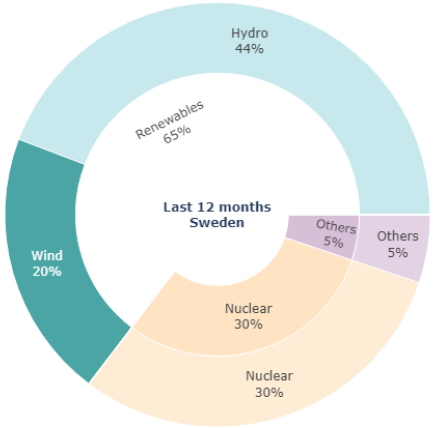
EU electricity mixes

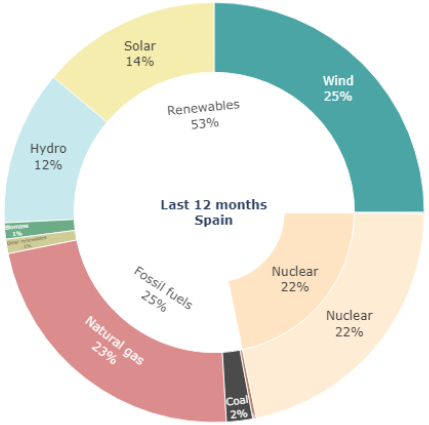






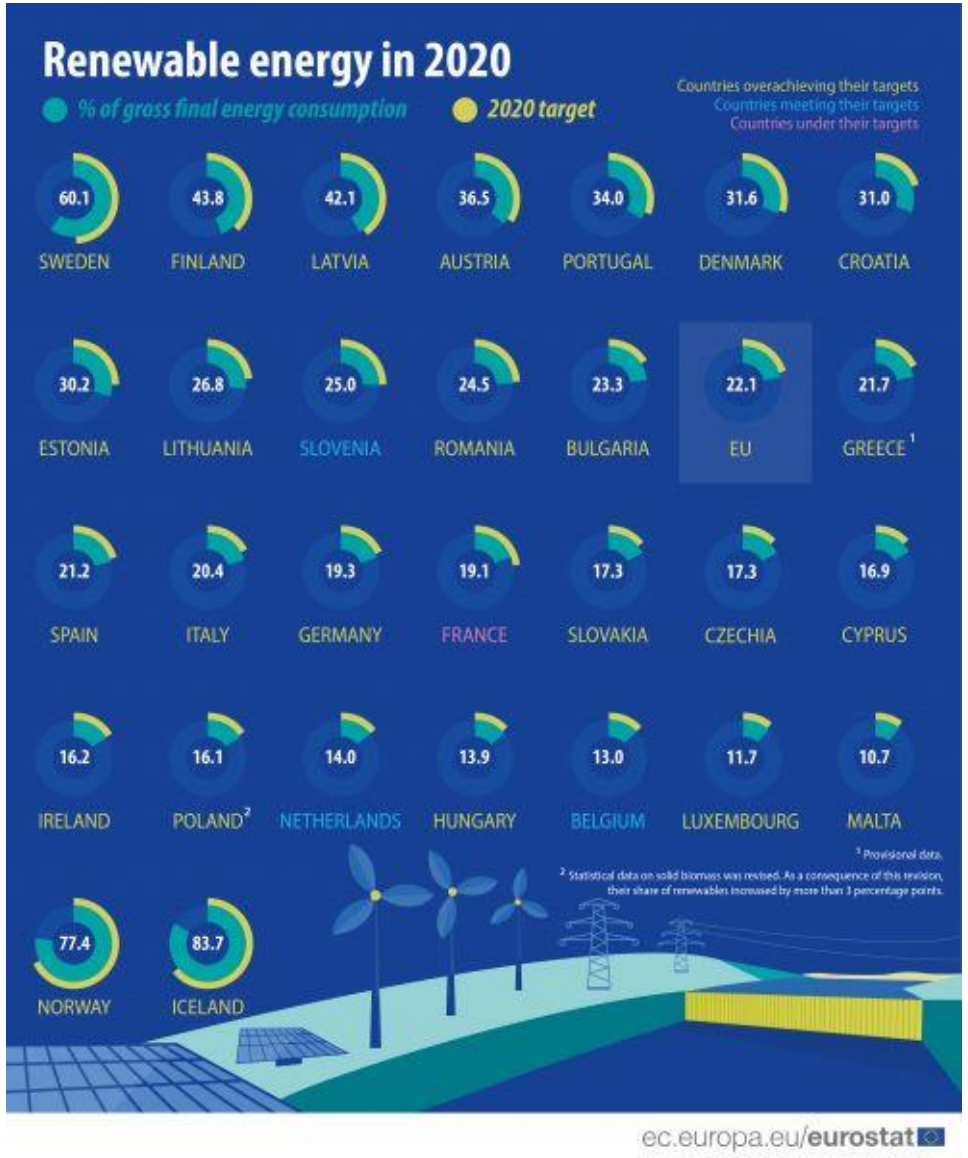






***Source**: Fraunhofer (based on ENTSO-E data)*

Good progress on renewables – acceleration needed

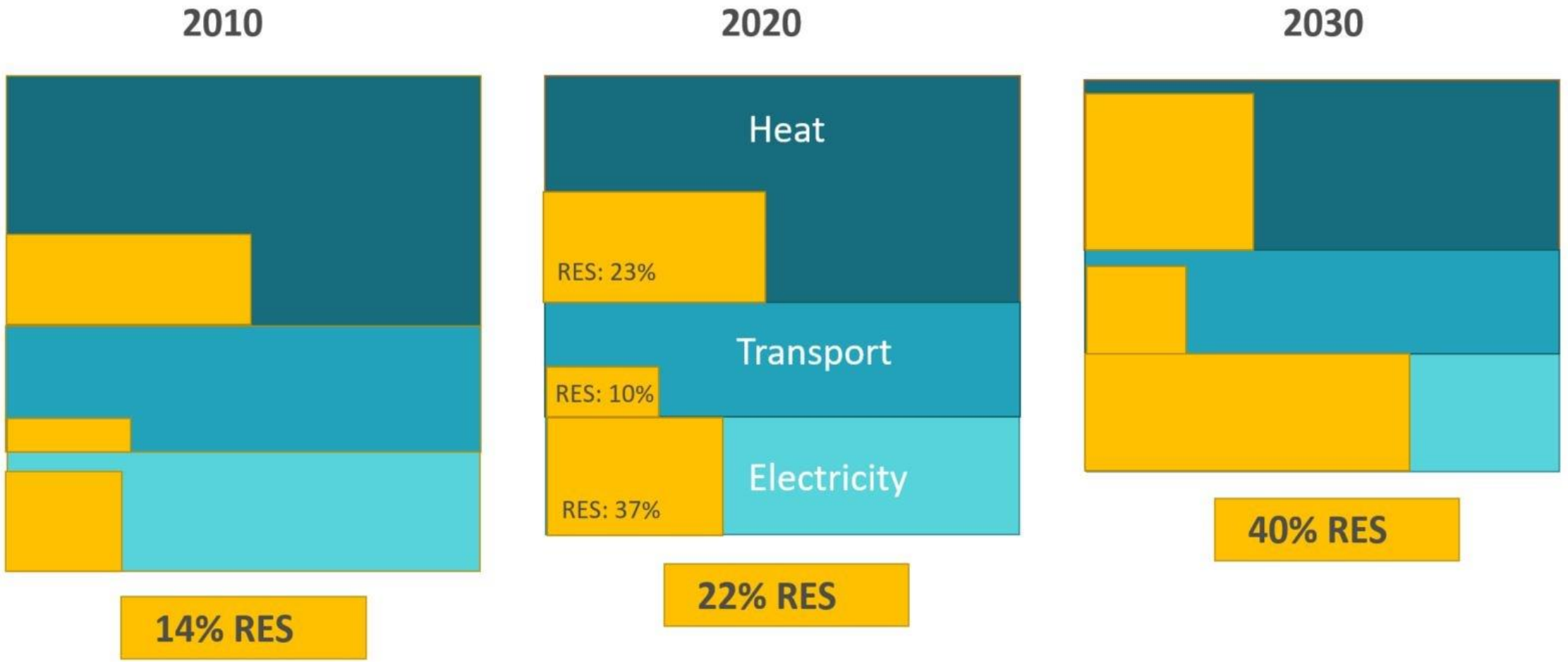


EU RES share 2020 – 22,1 %

- Electricity Sector – 37,5 %
- Heating and Cooling Sector- 23,1 %
- Transport Sector – 10,2 %
- Renewable energy already the cheapest energy to produce electricity

European Commission

Energy use in the EU – Renewables share



Source: T. Gould IEA

#EUGreenDeal

Energy use in the EU – Renewables share

THE REVISED **RENEWABLE ENERGY DIRECTIVE**:

- Make it easier to **integrate renewables** into the grid (e.g. developing new technologies, integrating storage facilities and improving cross-border cooperation)
- Provide **stronger incentives for electrification** (e.g. heat pumps and electric vehicles) and the incorporation of new fuels such as renewable hydrogen
- Encourage **energy efficiency** and **circularity** (e.g. facilitating the use of waste heat)

Set a new EU-level target of **40%** renewables in the energy mix

Set a benchmark of **49%** of renewables in buildings

Increase the use of renewable energy in heating and cooling by **1.1 percentage point** every year

Raise the use of renewable energy in district heating and cooling by **2.1 percentage points** every year

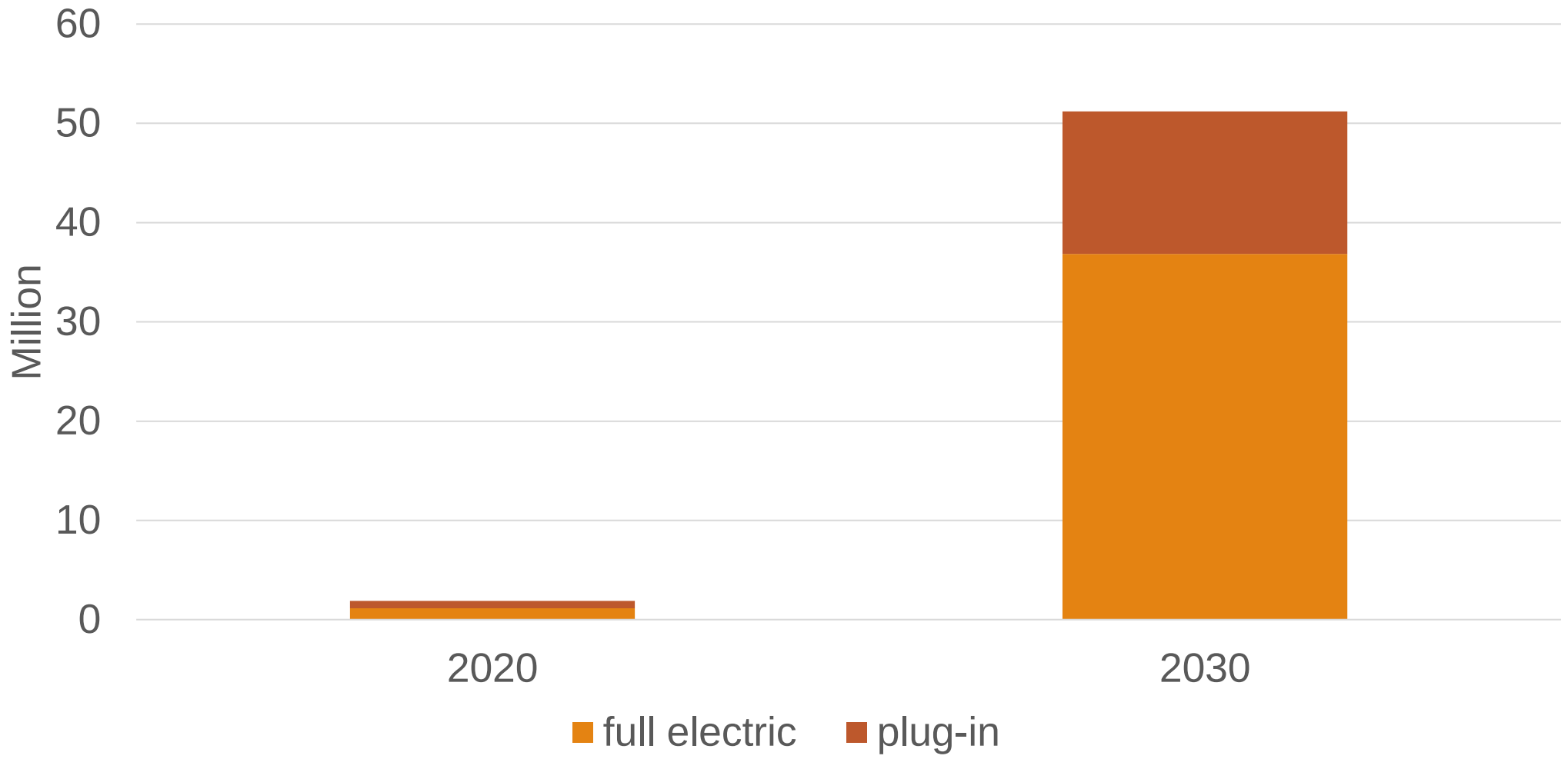
REPowerEU:	45%	60% *	2.3% *	2.3% *

+ Doubling bio methane production from 18 to 35 bcm by 2030

European Commission

#EUGreenDeal

EV on the road in the EU

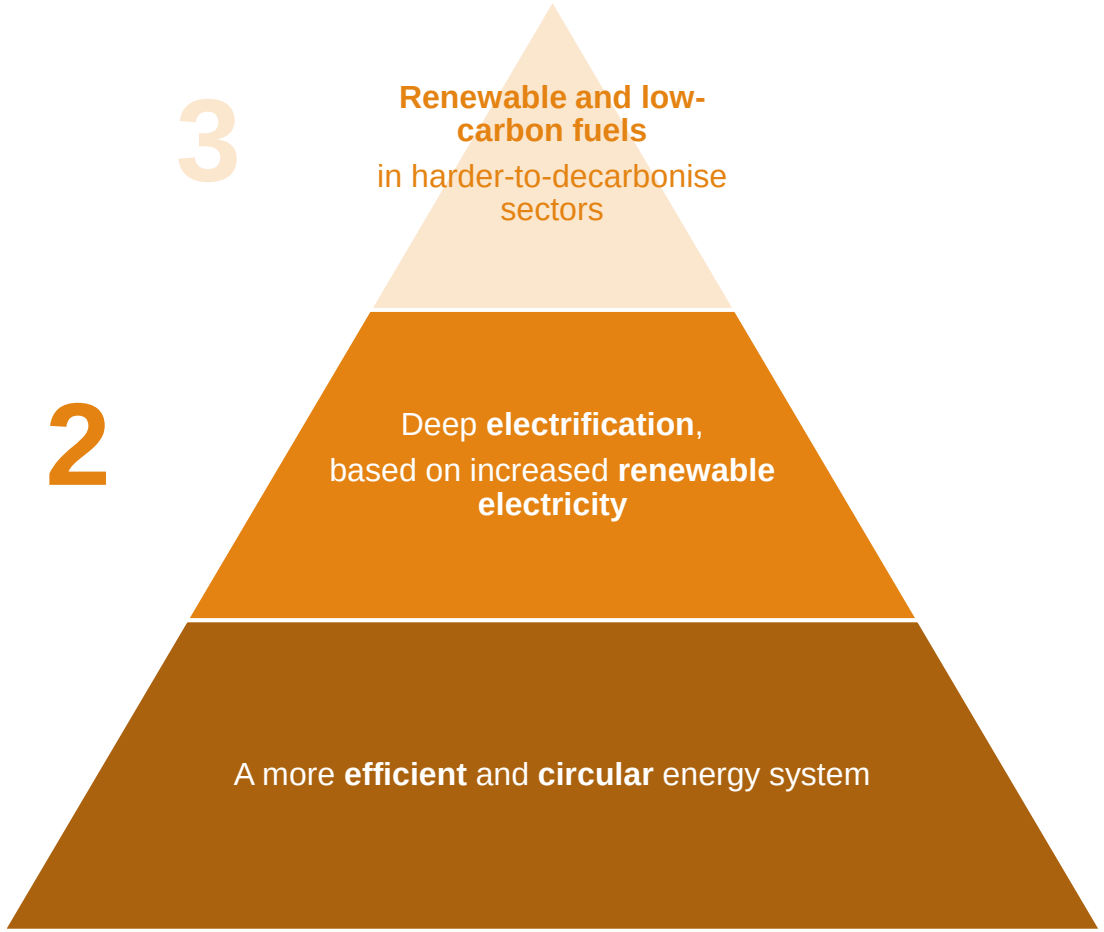


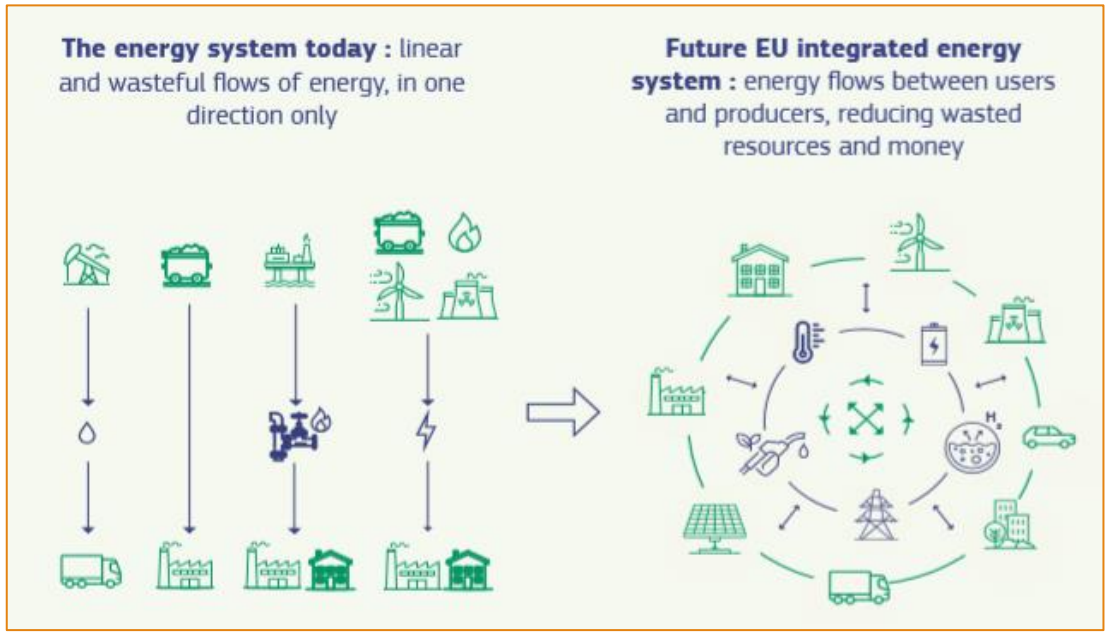
Source: PRIMES modelling (2021)

European Commission

#EUGreenDeal

Transforming our energy system - the vision





€

Investment needs
up to EUR 400 bn per annum
to deliver on 55%

Energy supply and use responsible for 75% of emissions

European Commission

#EUGreenDeal

A more circular and energy efficient energy system

A system in which:
- unavoidable **waste streams** are reused for energy (circularity)
- the **least energy-intensive options** are prioritised

Energy efficiency

- EC guidance to MS on the energy efficiency first principle (non-legisl.)
- Review of the “Primary Energy Factor” (EED)

A more circular energy system

- Regulatory framework for the reuse of waste heat from industry and data centres (RED / EED)
- Funding for mobilization of agriculture waste and residues and “circular” rural energy communities (CAP, structural funds, LIFE)

European Commission

Going top down and bottom up

+

Covenant of Mayors in Europe

11,000+
European local governments

340+ mio
inhabitants covered

10 NECPs
refer to Covenant

Committed to meet or exceed EU climate and energy targets from 2020 to 2030 and 2050 climate neutrality.

Largest initiative of its kind in the world and delivering results.


Thank you

RES barriers to overcome (study)

- **Bureaucratic burden, non-transparent processes, incoherent legislation, vague framework** and guidelines -> different interpretations by competent authorities.
- **Conflicting public goods** for the deployment of wind power, geothermal, hydropower as well as solar photovoltaics. Most prominent: environmental protection, other land uses and military/ defence issues.
- **Lack of support from policy decision-makers, opposition** from public or private institutions or the public.
- **Grid connections**, operation procedures

Flanking measures to enable cost-effective RES deployment

Permitting

Guidance to MS in 2022, review clause (one year after entry into force), remove barriers through enabling framework and enhanced reporting through EU Governance

Offshore

Joint planning of offshore RES generation (complementing TEN-E)

Power Purchase Agreements

Additional facilitative elements

Guarantees of Origin

Removing exemptions for the issuance of GOs for supported electricity

Cross-border cooperation

Cross-border pilot project (including use of RES Financing Mechanism)

Industrial products

Common EU methodology for claiming / labelling the renewable quality of industrial products

European Commission

A deep electrification of consumption, based on renewable electricity

A system in which:
- consumption is **increasingly electrified**, in particular buildings, transport and some industrial processes
- electricity is largely produced from **renewables**
- **new loads** (electric vehicles, heat pumps) are integrated and contribute to system flexibility

Ensure continued growth in renewable electricity supply	• Offshore renewable strategy • Explore green public procurement for renewable electricity (RED) • Tackle remaining barriers and ensure high ambition through RED review
Accelerate electrification of energy consumption	• Renovation Wave • Additional measures for electrification of heating and cooling and transport in RED revision • Electrification of industry through Industrial Emissions Directive review and funding of pilots • Revise CO2 emission standards for cars
Accelerate roll-out of electric vehicles infra and their integration	• Support 1 million charging points by 2025 through InvestEU and CEF • Revision of the AFID • Revision of TEN-E and TEN-T • Network code on Demand Side flexibility

Renewable and low carbon fuels for hard-to-abate sectors (incl. hydrogen)

A system in which:
- the potential for **sustainable biogas and biofuels** is fully exploited
- **renewable and low carbon hydrogen** increasingly plays a role in industry and transport
- **carbon capture** is used to produce synthetic fuels, as a last option

A greater uptake of renewable and low carbon fuels

- Terminology and certification framework for all renewable and low carbon fuels
- Additional demand-side measures to “pull” RES and low carbon fuels (RED, MOVE initiatives)
- Financing of flagship carbon-neutral industrial clusters
- Financing for fertilisers based on renewable hydrogen
- Scale up carbon capture and use for the production of synthetic fuels
- Certification of carbon removals

+

Actions under the **Hydrogen Strategy**

European Commission

Russian war accelerates transition

EU targets for 2030 under 'Fit for 55' and REPOWER EU

	Existing law (agreed in 2018)	'Fit for 55' proposal (July 2021)	REPOWER EU proposal (May 2022)
Renewable energy target	32%	40% (1 067 GW)	45% (1 236 GW)
Energy efficiency target – Primary consumption	-32.5%* (956 Mtoe)	-39%* / -9%** (787 Mtoe)	-13%** (750 Mtoe)
- Final consumption	-32.5%* (1 273 Mtoe)	- 36%* / -9% **(1 023 Mtoe)	-13%** (980 Mtoe)

*relative to 2007 reference scenario;
** relative to 2020 reference scenario

Panel B - Industry

What technologies and services does Waste-to-Energy offer for the benefit of cities and regions?

Moderator
Siegfried Scholz– President, ESWET

Alexander Kirchner – Division Manager Asset Operations, Wien Energie

Ella Stengler – Managing Director, CEWEP

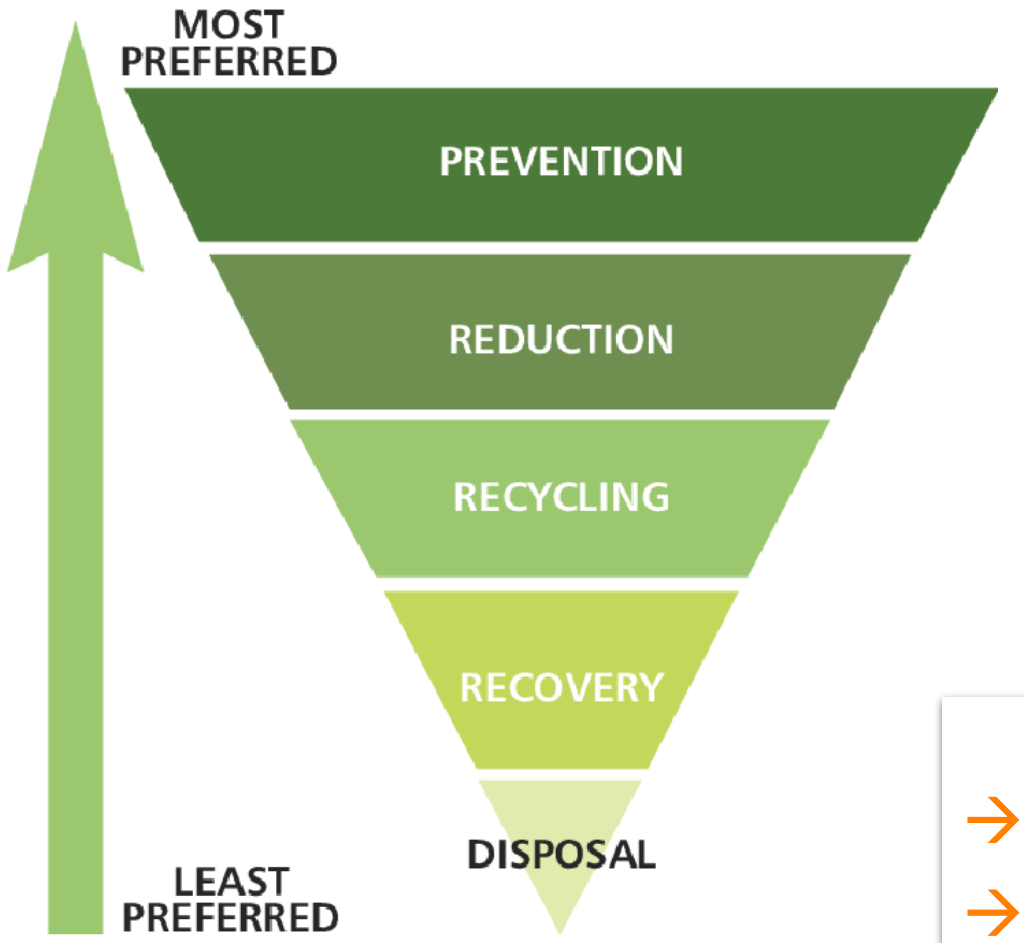
Vanessa Fakra– Senior Project Manager, HZI and Member of ESWET

Powering Vienna‘s Sustainable Future: The Waste-to-Energy Plant Spittelau

ESWET Waste-to-Energy & the City
Dipl.-Ing. Alexander Kirchner MBA,16.05.2023

WIEN ENERGIE

Municipal Waste Management: Approach of the City of Vienna



① Fostering waste prevention and reuse

② Separated Collection

- Recyclables separate from residual waste
- Focus on high quality for recycling material

③ Waste-to-Energy for non-recycable waste

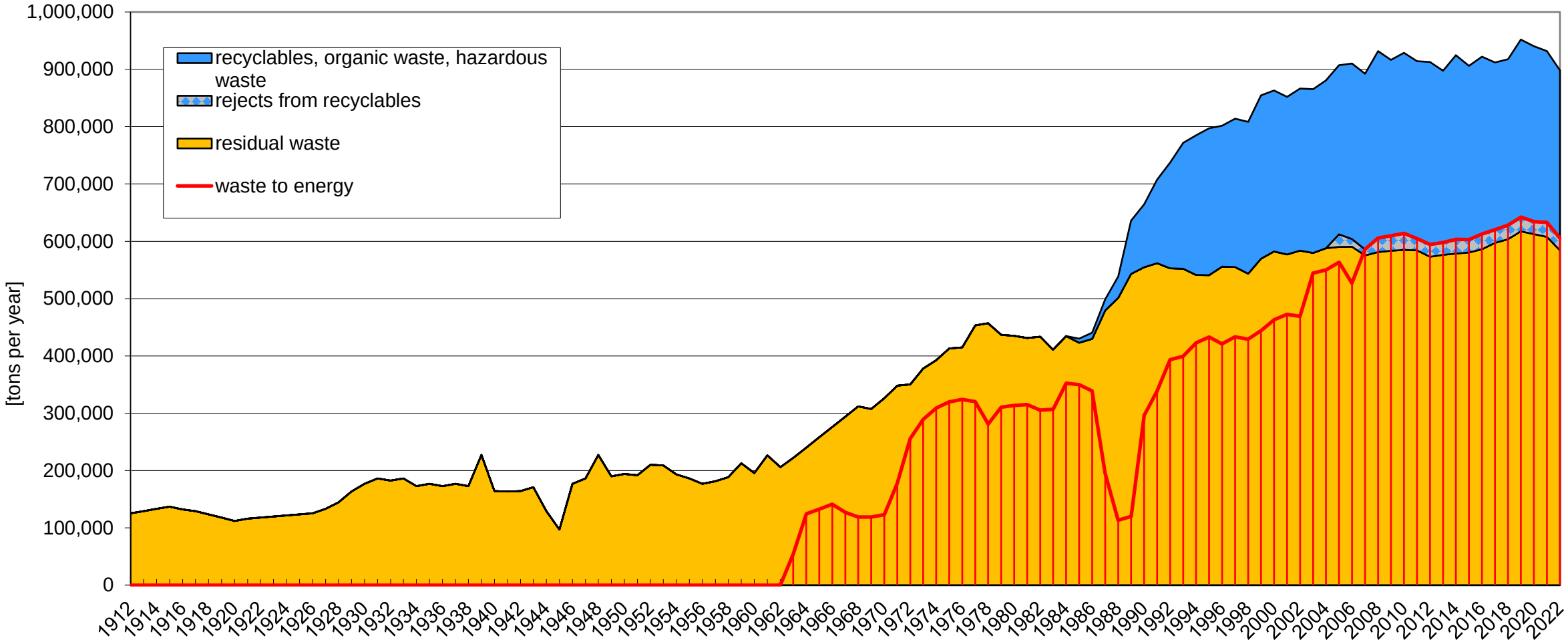
- Energy recovery for district heating and cooling

→ No municipal waste goes directly to landfill

→ Best environmental technology

WIEN ENERGIE

Development of municipal waste generated and treated in Vienna

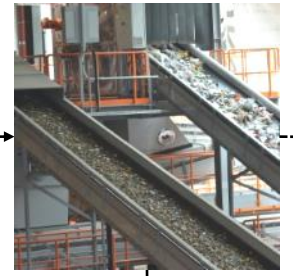


Waste-to-Energy – Material Flow

Other non-recycable waste
~ 180,000 t/a

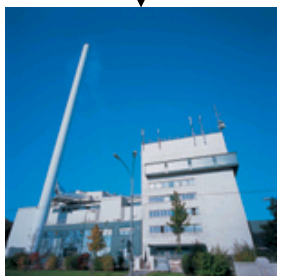
~ 600,000 t/a

Residual waste, bulky waste etc.

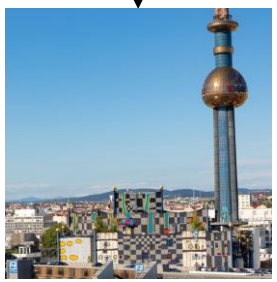


Mechanical treatment

Interim storage



WtE plant Flötzersteig



WtE plant Spittelau

WtE plant Pfaffenau

Fluidized bed incinerator 4

Treatment of bottom ash with separation of metals

~ 25,000 t/a

Metals

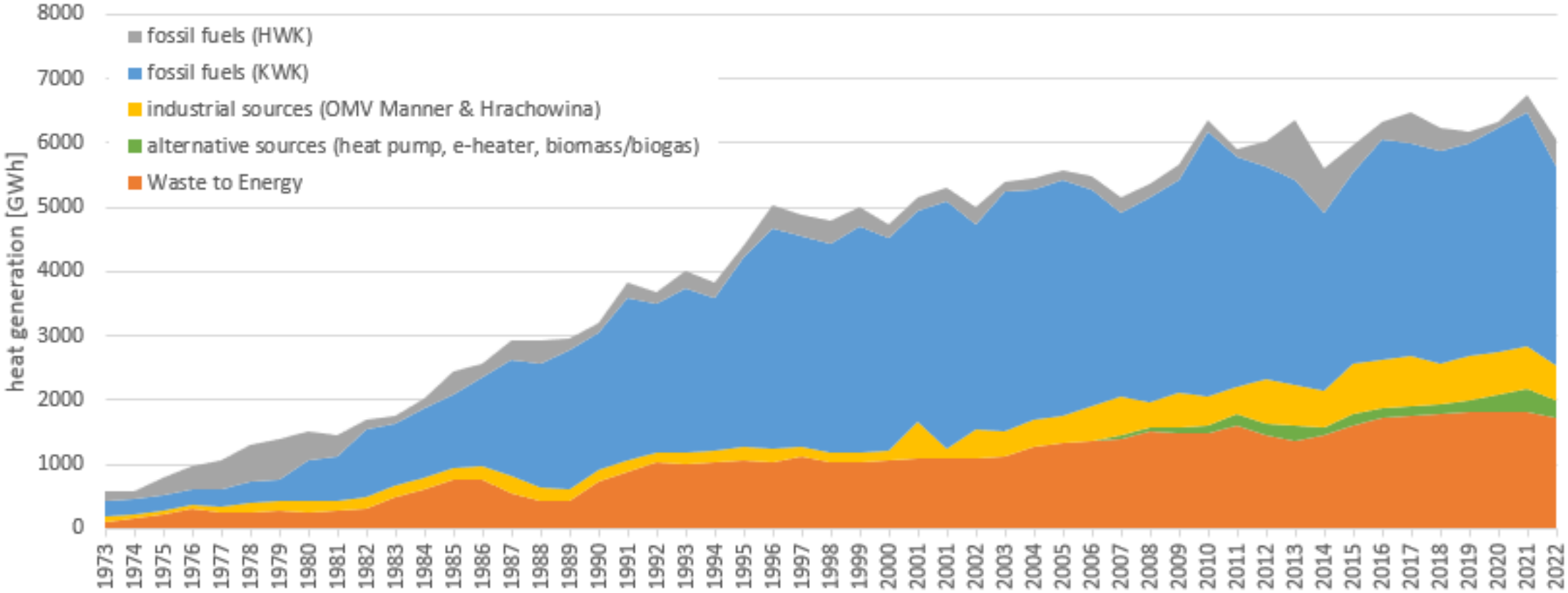
~ 170,000 t/a

Stabilised fly/bottom ash (with concrete)

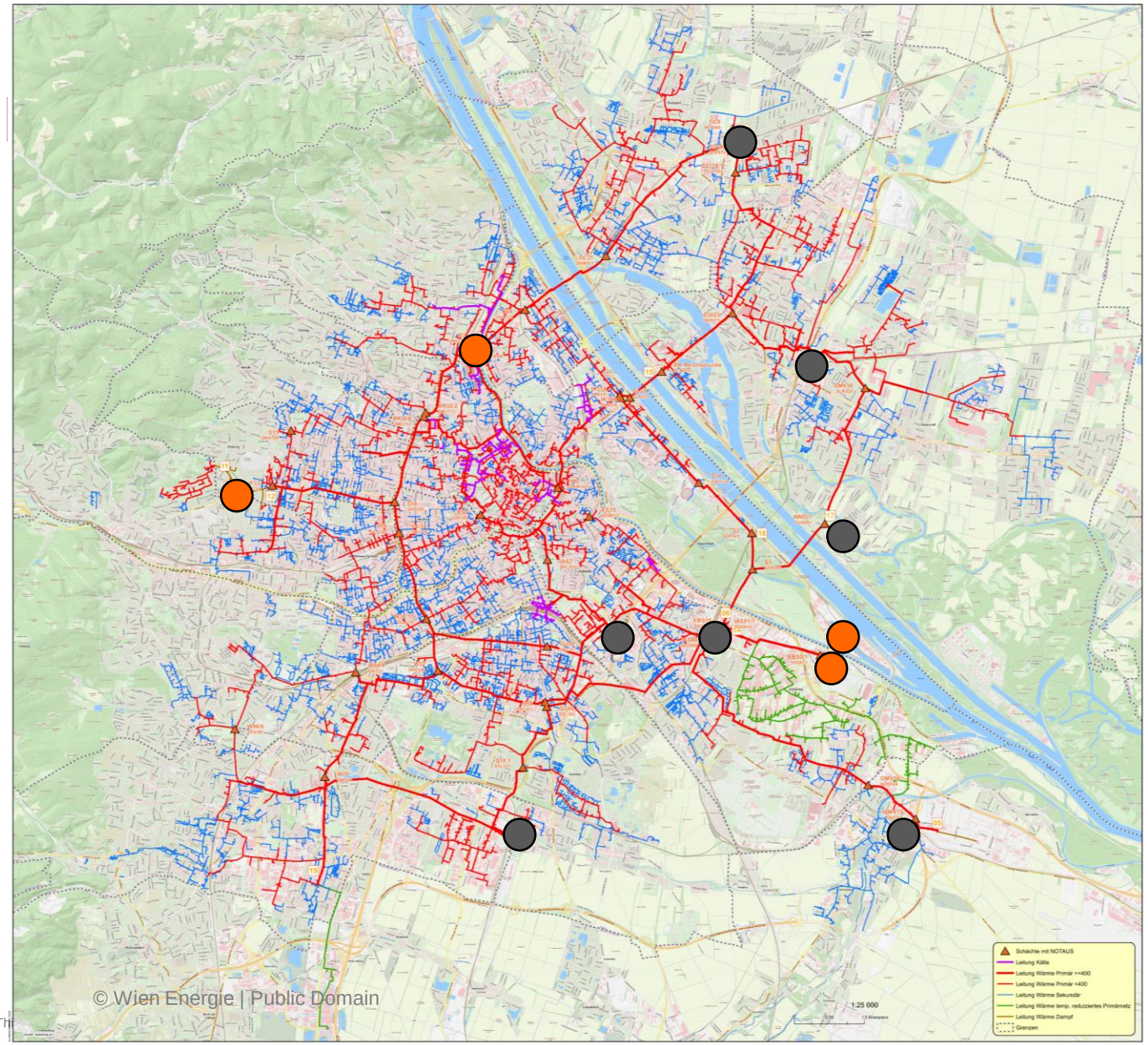
Landfill site Rautenweg

WIEN ENERGIE

Development of District Heating in Vienna



District Heating Network of Vienna



District Heating Network

- Primary (145°C)
- Primary (95°C)
- Secondary (60-90°C)

Market Share: Space Heating ~36%

- **WtE plant**
- **CHP/HP plant**

Waste-to-Energy plant Spittelau


HBW

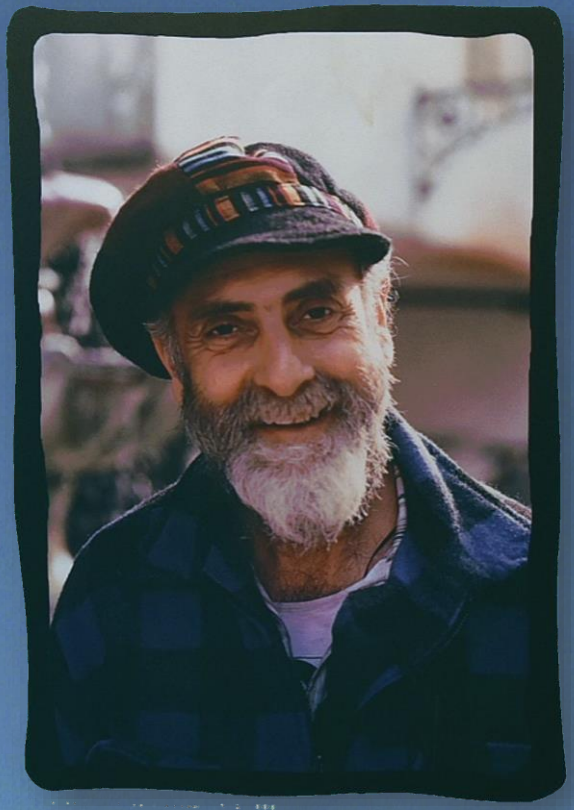
May 15, 1987:

Spittelau is burning!

Substantial damage has occured to the plant

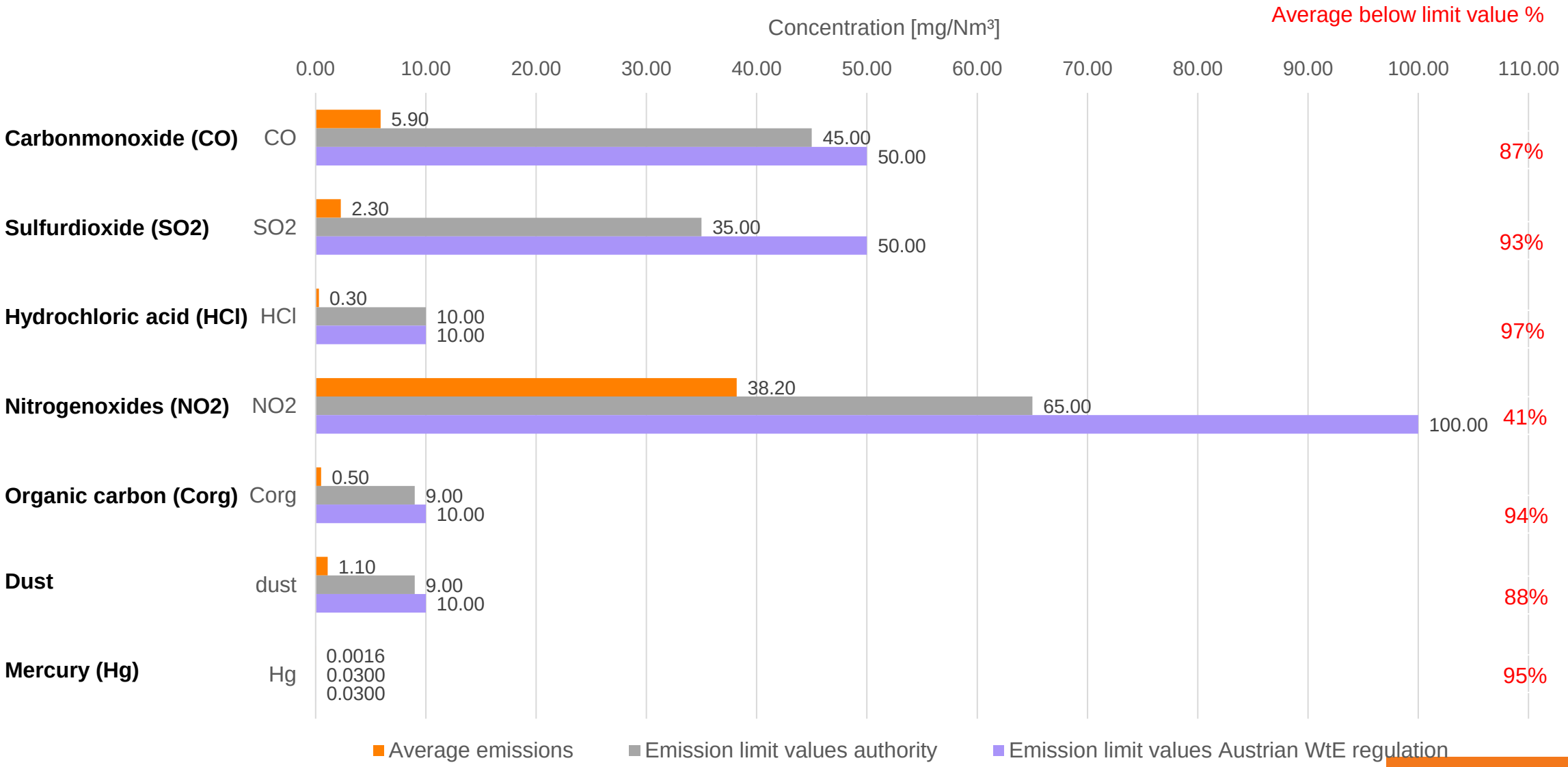
Until
May
1987

As of
December
1992



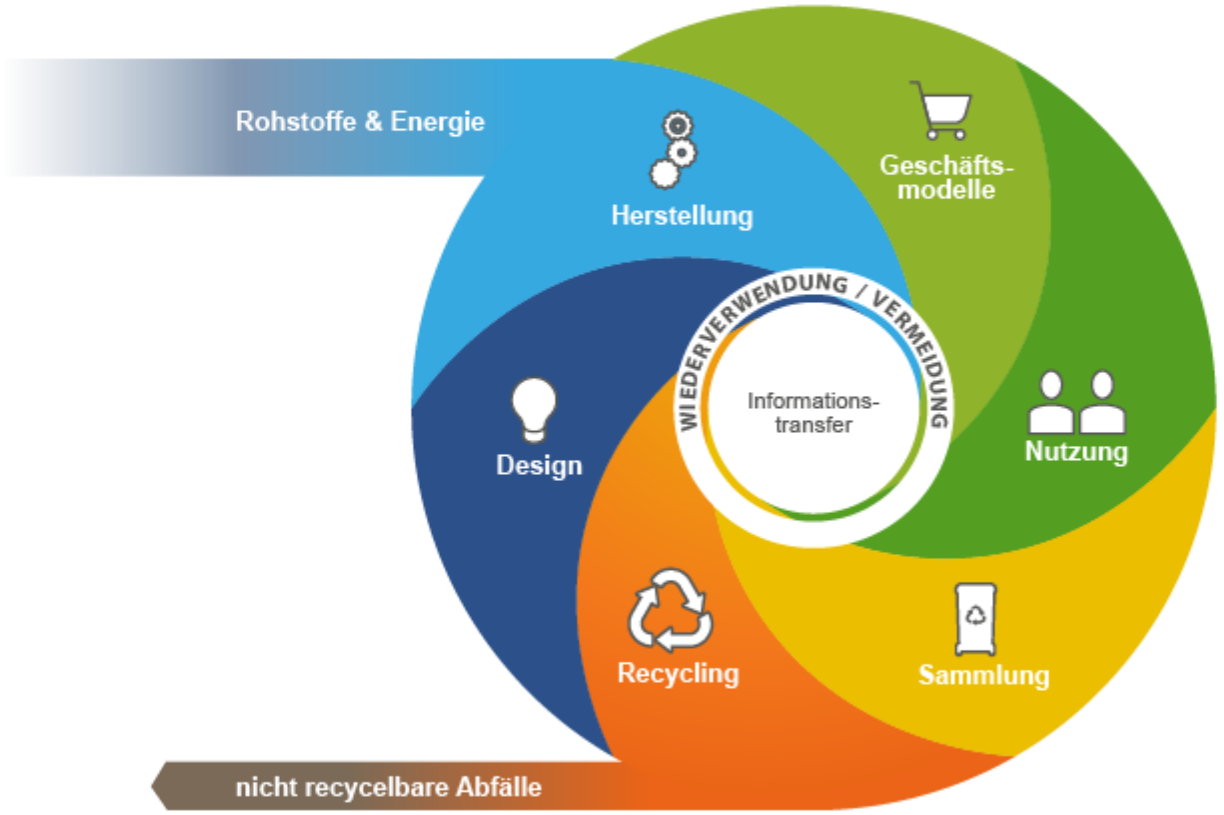
Waste-to-energy plant Spittelau uses best available technology for environmental protection

Emissions from the WtE plant Spittelau are well below limit values!



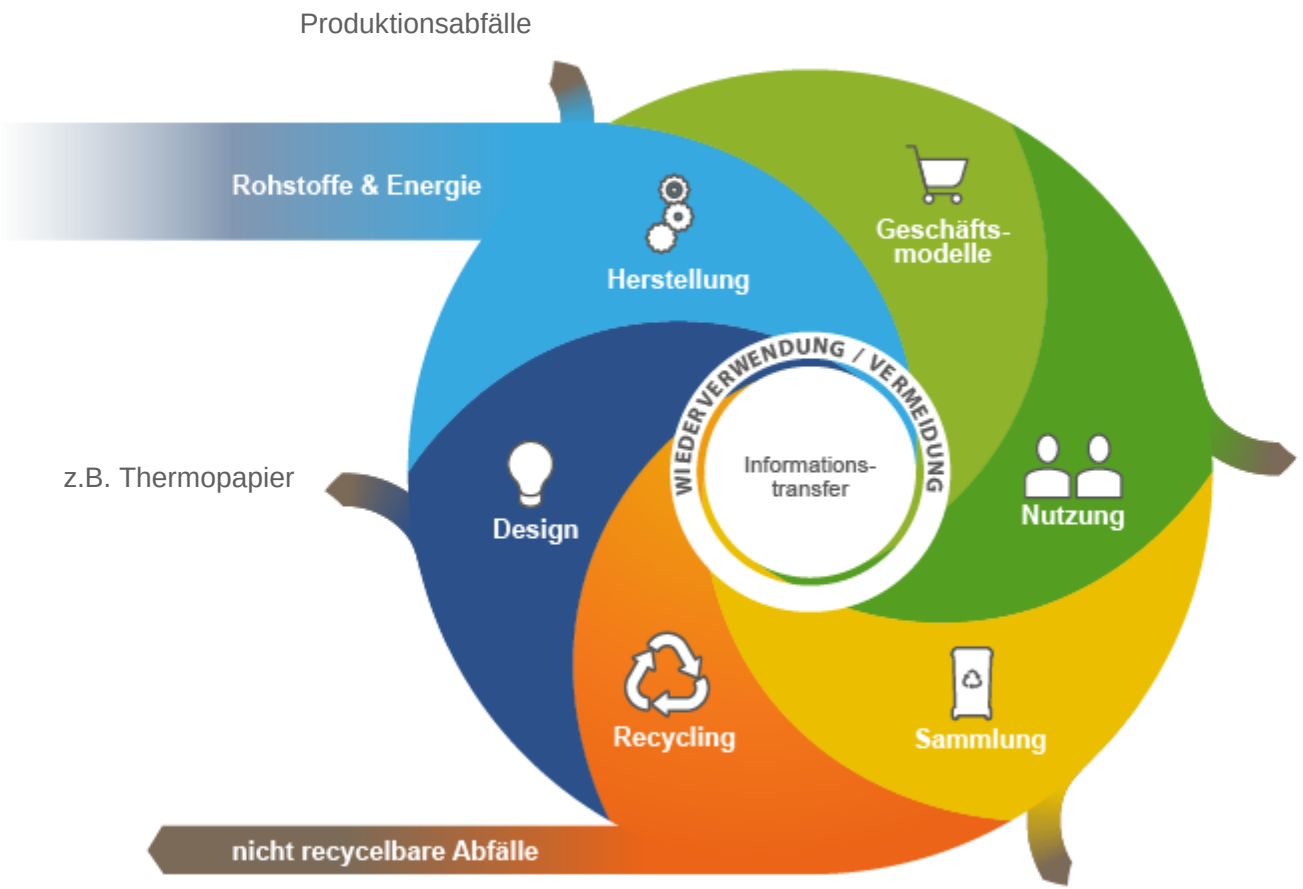
Waste-to-Energy as an integral part of the circular economy

Schematic representation of the circular economy model



WIEN ENERGIE

The „REST of the REST“: non-recyclable wastes in the life cycle of products



z.B. Thermopapier

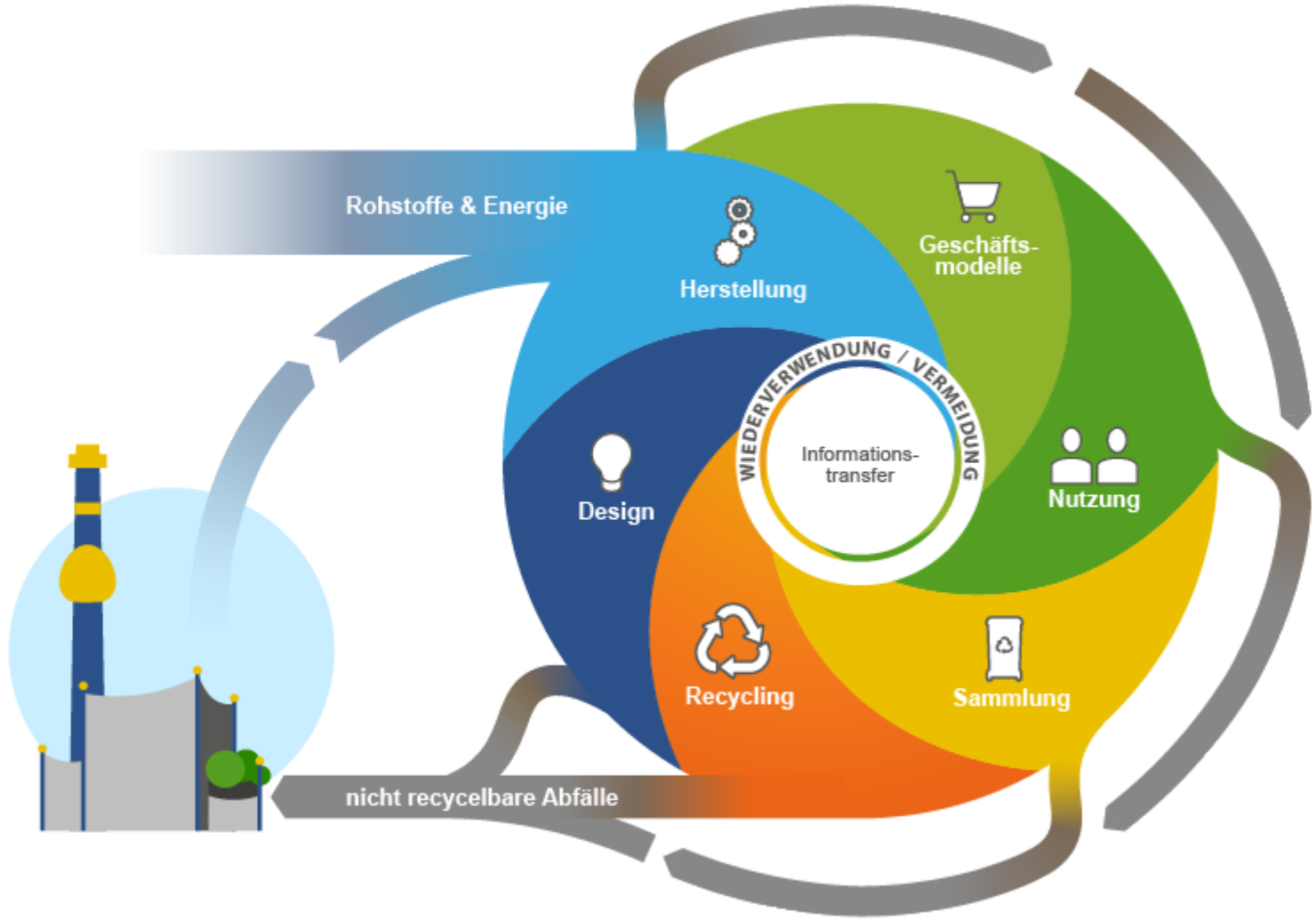
Infektiöse Abfälle, Spitalmüll, Staubsaugerbeutel, Windeln etc.

Downcycling / Sortierreste

Faktor Mensch (Trennqualität)

WIEN ENERGIE

Waste-to-Energy is an integral part of circular economy!



Integrating WtE into circular economy provides resources and energy. More circularity can be achieved!

WIEN ENERGIE

Municipal waste sorting and residues recovery: waste becomes products!

Municipal waste

Paper, cardboards

Polymers

Metals

Residues

Glass

Building materials

Metals

WIEN ENERGIE

Waste-to-Energy: moving from waste management to a circular economy!

Waste
- reduce volume
- hygienisation
- reduce mass

Energy
- power
- steam
- heating
- cooling

Resources
- metals
- minerals
- CO_2
- water
- and many others

WIEN ENERGIE

Let‘s close the loop together!

Dipl.-Ing. Alexander Kirchner, MBA
Wien Energie GmbH
General Manager, Division Manager Asset Operations

Mobile: +43 664 6235151
Mail: alexander.kirchner@wienenergie.at

CEWEP – Confederation of European WtE Plants

CEWEP is the umbrella association of the operators and owners of Waste-to-Energy (WtE) Plants across Europe.

They thermally treat household and similar commercial & industrial waste that remains after waste prevention, reuse and recycling and generate energy and materials out of it.

Amager Bakke WtE plant, Denmark

CEWEP Members:

81 M tonnes/year

410 plants

majority operates through Public-Private Partnerships

Pollution prevention: Waste-to-Energy treats non-recyclable waste

- hygienic service = destruction of polluants
- volume reduction

Waste-to-Energy can provide multiple outputs

CO_2
- CCU: Horticulture, new materials, synthetic fuels
- CCS: Permanent storage

Export
Hydrogen production

Electricity

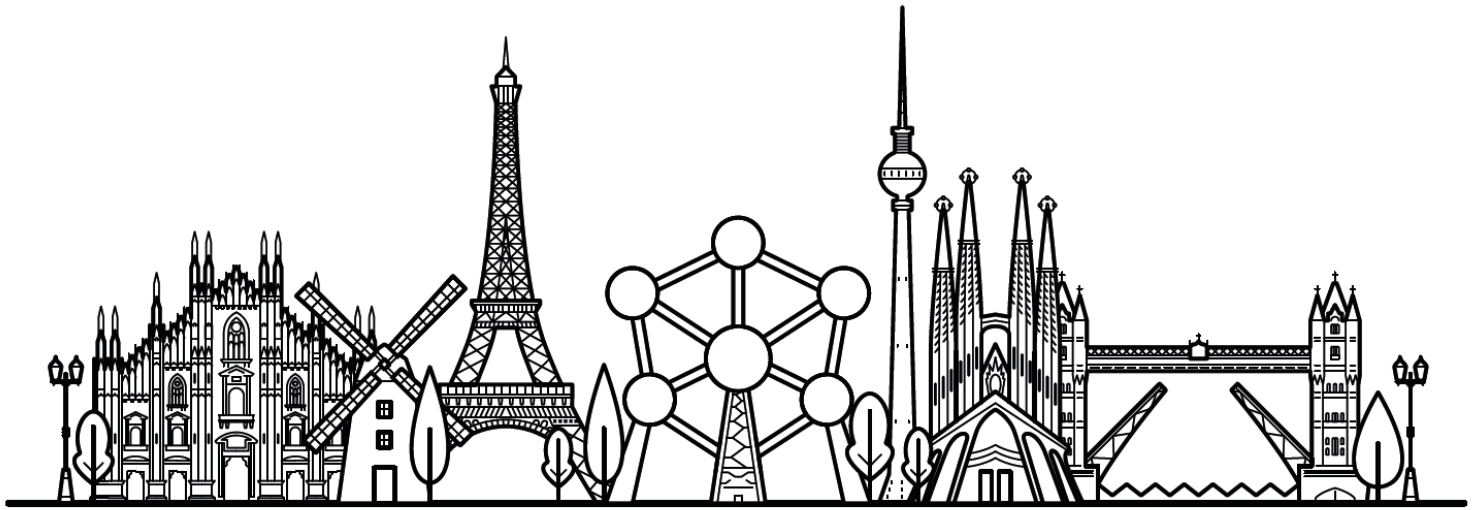
Bottom ash
- Metal recovery
- Aggregates

Heat
- **District heating**
- **District cooling**
- **Steam to industry**

Other material recovery
- Flue Gas Cleaning residues (Zinc, salts)
- …

Waste-to-Energy turns non-recyclable waste into energy

In some cities **Waste-to-Energy covers more than 50% of population's heat demand** and **helps to reach climate neutrality goals!**



cewep

Brescia Waste-to-Energy plant

730,000 tonnes of waste treated

Electricity for 200,000 families

70% of the heat in the district heating network

Project: Flue Gas Condensation & Heat Pump for further heat recovery

cewep

Krakow Waste-to-Energy plant

220,000 tonnes of waste treated

Electricity sufficient for the whole tram system

12% of the heat in the district heating network

Project: Flue Gas Condensation & Heat Pump for further heat recovery

Brussels Waste-to-Energy plant

500,000 tonnes of waste treated

Electricity for 65.000 households

District heating for shopping mall & greenhouses of the king (reduction of 2,300 tonnes of CO2/year)

cewep

Waste-to-Energy can help municipalities, cities, regions on their way towards carbon neutrality.

And what about the CO2 emissions from Waste-to-Energy?

Gren WtE plant in Klaipėda, Lithuania

Waste-to-Energy and CO2 emissions

Reduce fossil input (mainly plastics) in WtE:
Source separation to enable quality recycling

WASTE-TO-ENERGY CLIMATE ROADMAP

The path to carbon negative

WtE offsets its fossil CO2 emissions:

- Energy recovery replaces fossil fuels
- Metal recycling from bottom ash

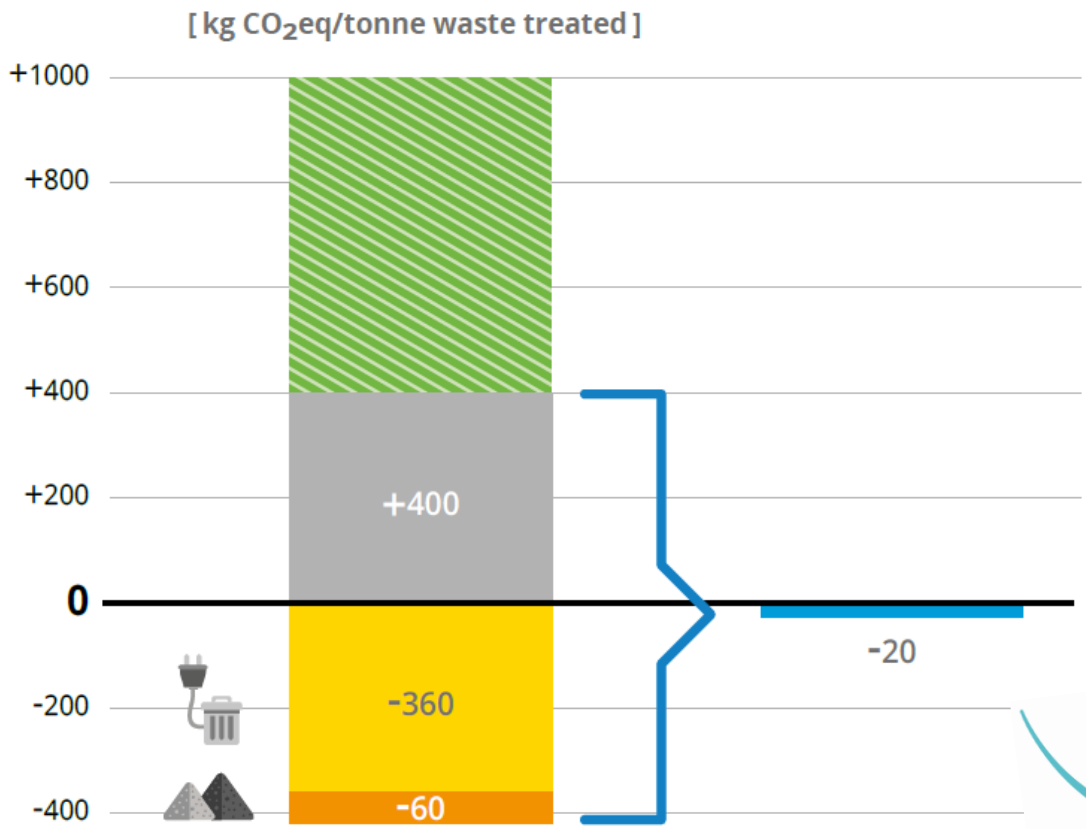
  -> makes WtE climate neutral

Furthermore it helps to divert waste from landfills (reduction of methane emissions)!

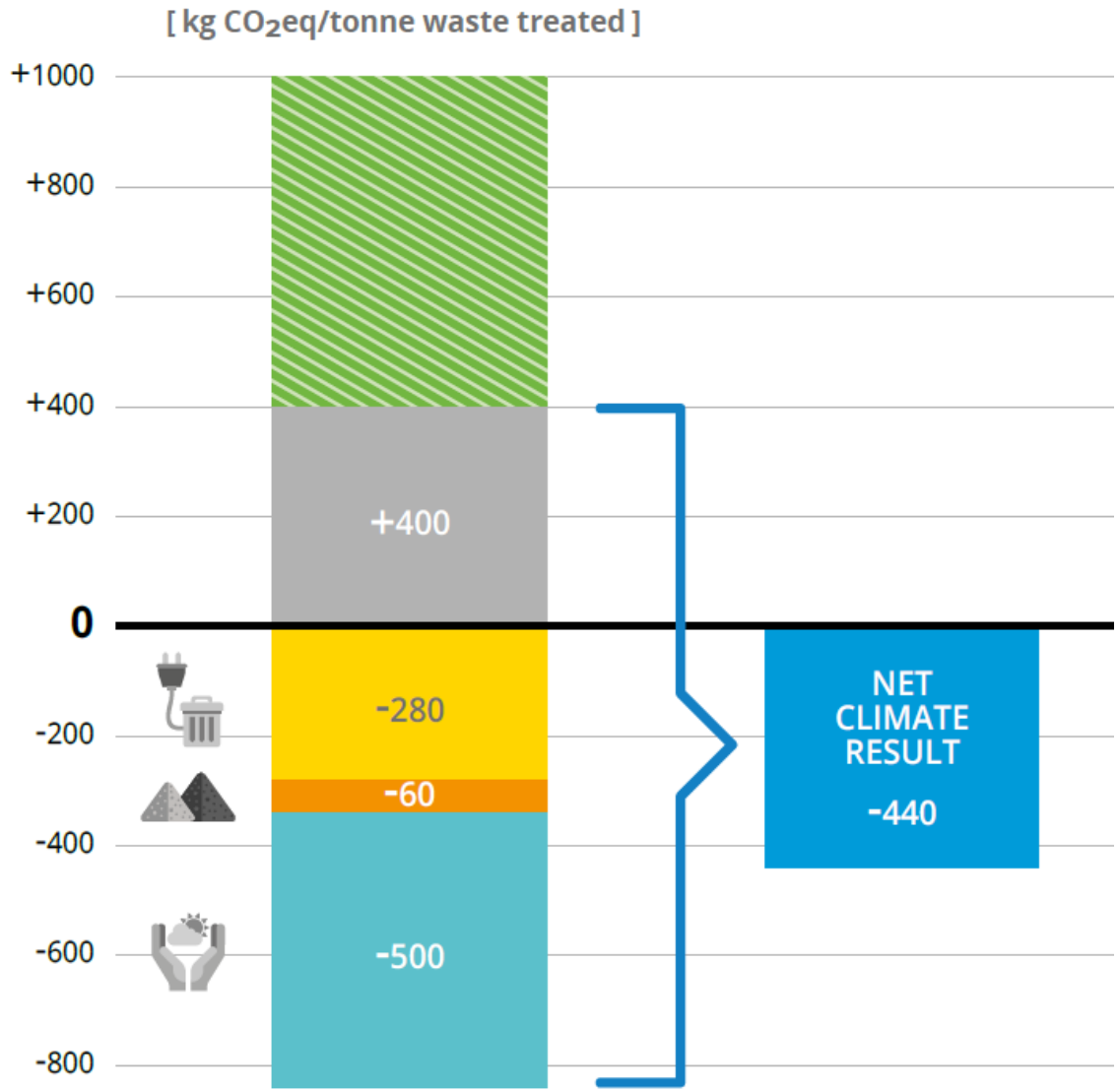
CEWEP Climate Roadmap

cewep

From Carbon Neutral Today



to Carbon Negative Tomorrow



Considering also **Landfill Diversion** the climate savings would be much higher!

From carbon neutral to carbon negative

Carbon Capture Use/Storage projects kick-off across Europe
-> make WtE carbon negative

…. needs policy support!

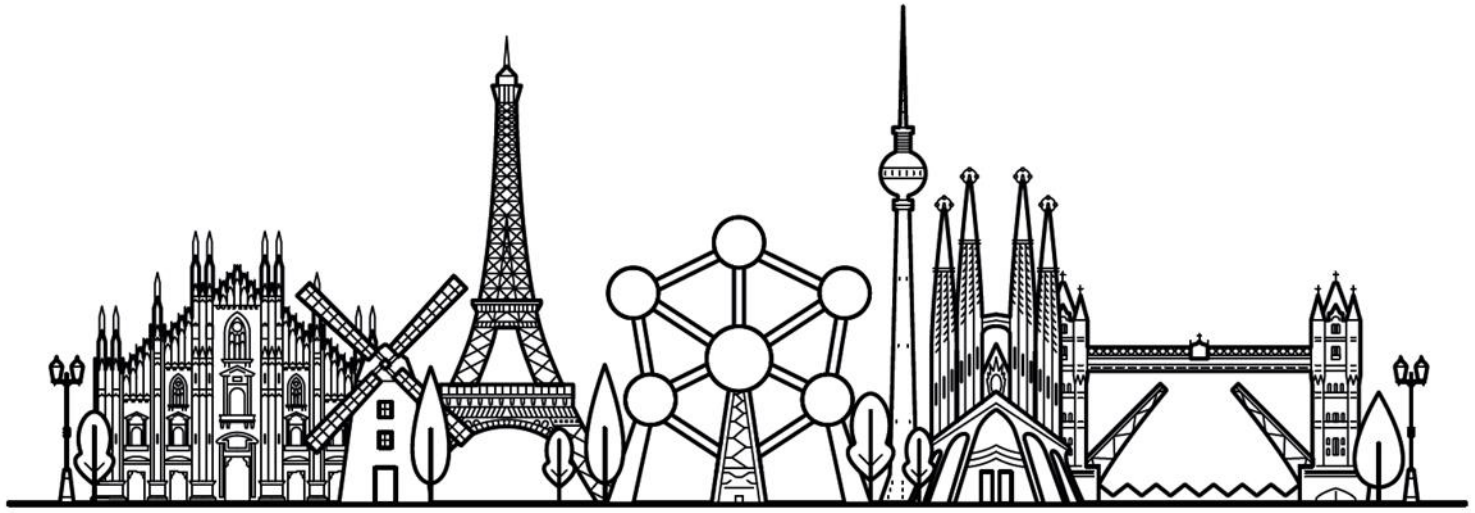
AVR's Carbon Capture facility, Duiven

Waste-to-Energy: ready for Carbon Capture Utilisation/Storage?

- High costs
- Additional space required for carbon capture installation
- Transport infrastructure
- Barrier for countries needing investment (Landfill countries?)
- Policy barriers:
  - Who gets the CO_2 credit?
  - Does it count towards ETS?

How can Waste-to-Energy deal with CO2 emissions?

- **EU ETS?**
  - What happens with the plastic waste? (Exports? Landfills? Illegal routes?)
  - Higher cost for municipalities?
  - Barrier for countries needing investment? (Landfill countries?)



Ella Stengler
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Confederation of European Waste-to-Energy Plants
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Hitachi Zosen INOVA

Waste-to-Energy & the City

ESWET

Panel B: Industry

Offering the technological state-of-the-art to meet the regional needs

Speaker: Vanessa Fakra

Member of the ESWET Technical Committee.

Senior Project Manager Strategy and Public Affairs, Hitachi Zosen Inova.

Hosted by European Committee of the Regions

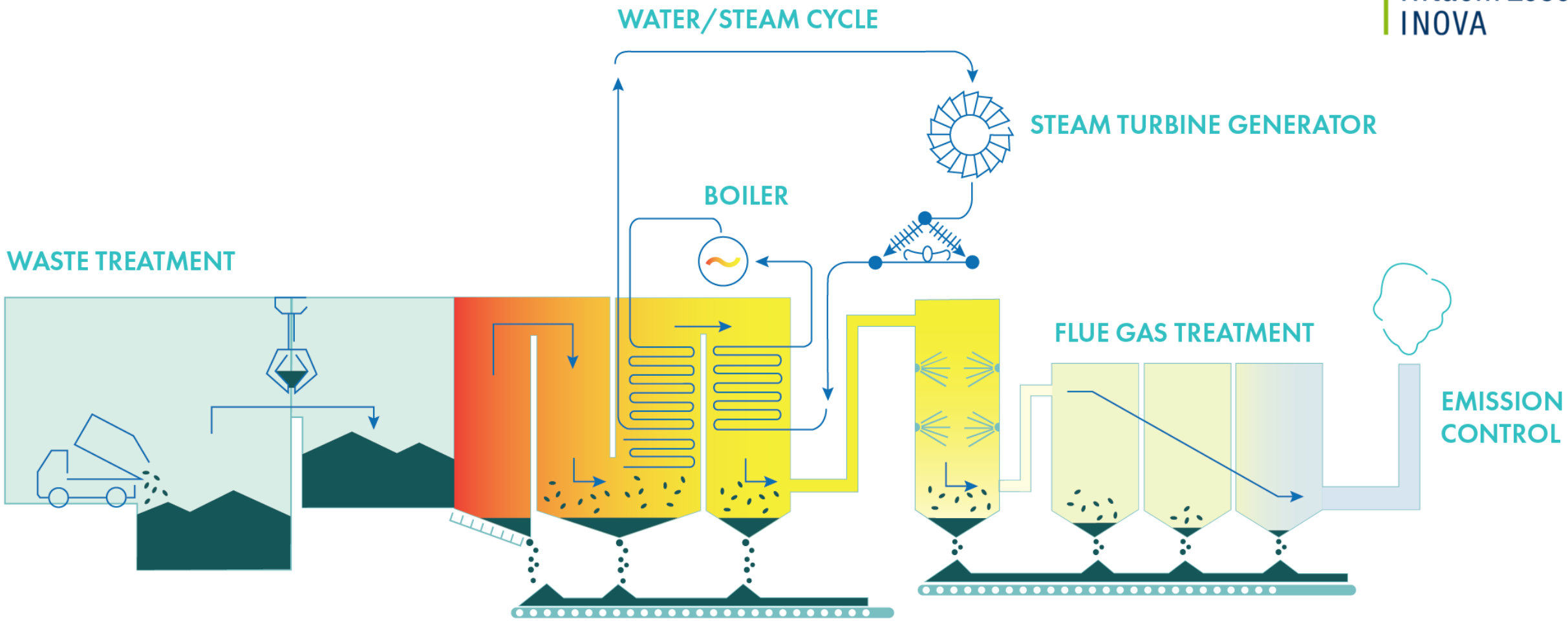
Hitachi Zosen INOVA

Waste is our Energy.

Engineering is our Business.

Sustainable Solutions are our Mission.

Inside a Waste-to-Energy plant



Role of Waste-to-Energy

- ✓ Diverting non-recyclable waste from landfills
- ✓ Providing a **hygienisation service** to the community freeing land for life
- ✓ Supplying **local, partly renewable, base load energy**

Integrating new technologies

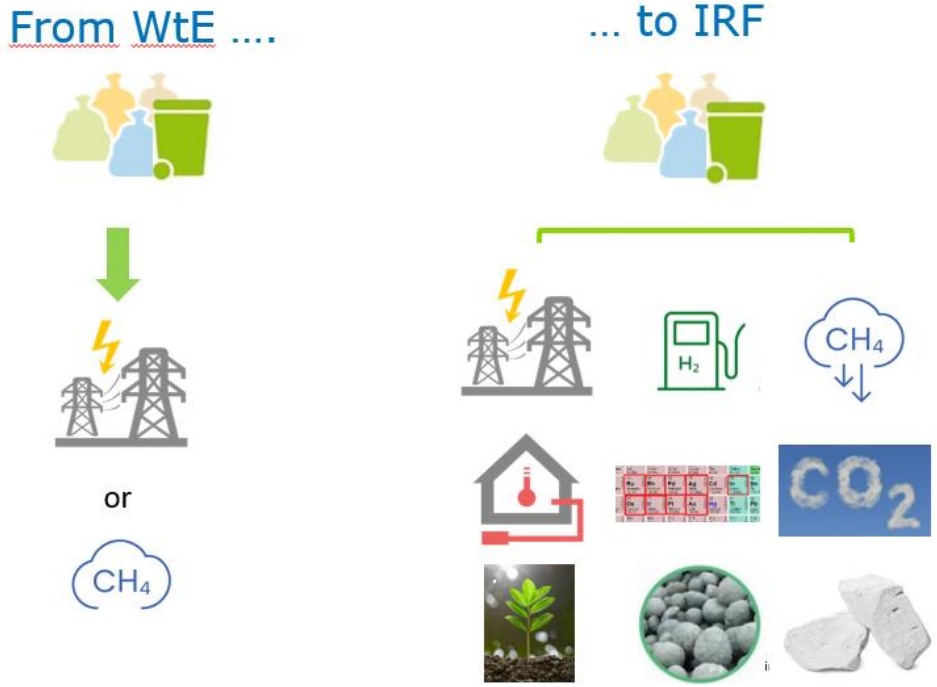
to answer a triple challenge:

- ✓ Support the Circular Economy
- ✓ Increase Decarbonisation efforts
- ✓ Suppport Energy Security


INTEGRATED RESOURCE RECOVERY FACILITY
CARBON CAPTURE UTILISATION AND STORAGE
CCUS
HEATING AND COOLING
RESIDUES
METHANOL AND AMMONIA
NON-RECYCLABLE WASTE
MATERIAL RECOVERY
WASTE-TO-HYDROGEN
CAR REPAIR

A new approach

Adopting a **holistic** approach to go from **carbon neutral** to **carbon negative**



The **Integrated Resource-Recovery Facility (IRF)** is a step-change evolution

From the standard WtE plant

To a new generation of infrastructure incorporating innovative technologies

European Energy security

From 142 TWh of electricity and heat produced **in 2020**

⇨ To enhance energy efficiency technologies to **significantly increase the energy generation**

⇨ And support **District Heating and Cooling (DHC)** & **synthetic fuel applications**

Royal Greenhouse in Brussels is heated by the local WtE plant.

WtE connection to DH/DC systems

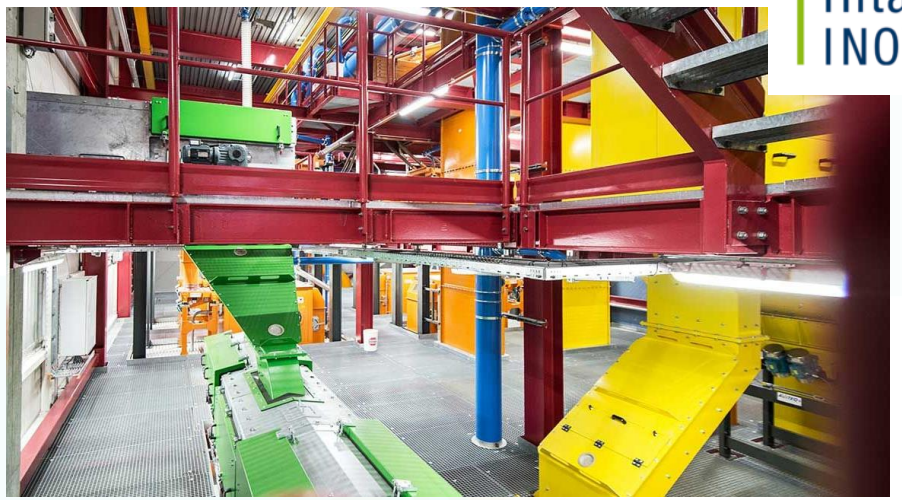
District heating & cooling networks and Waste-to-Energy combined:

- ✓ Make a perfect match to use the heat produced by waste all year long in both **cold and warm climates**
- ✓ Are energy efficient and participate in the EU energy security
- ✓ Contribute to the **circular economy** by using non-recyclable waste
- ✓ Provide **CO_2 emissions savings**
- ✓ Are affordable for citizens

Increasing material recovery

- **Bottom Ashes** : Both metals and minerals are valuable resources -

Addition of new technologies such as **dry processing of dry-discharged bottom ash**



With systematic implementation of current technologies, **up to an additional 50-60 kg of $CO2_{eq}$** can be saved per tonne of treated waste!

- **From Fly Ashes**
  - ✓ Recovering silicates, potassium chlorides, sodium chloride or other components
  - ✓ Recovering zinc and heavy metals
  - ✓ Using the ash as a base for aggregates

Raw material supply security

The recovery of metals only, represents a potential market of over 2 billion € annually, and a potential of reduction of CO_{2eq} emissions of 14.5 million tonnes!

The full potential with enhanced recovery is of:

✓ **0.7 million tons of Aluminium**

→ 11% of European imports

✓ **2.4 million tons of ferrous metals**

→ 27% of European imports from Russia

Source: Meldgaard

Increase the **security of raw material supply** and boost the European economy circularity

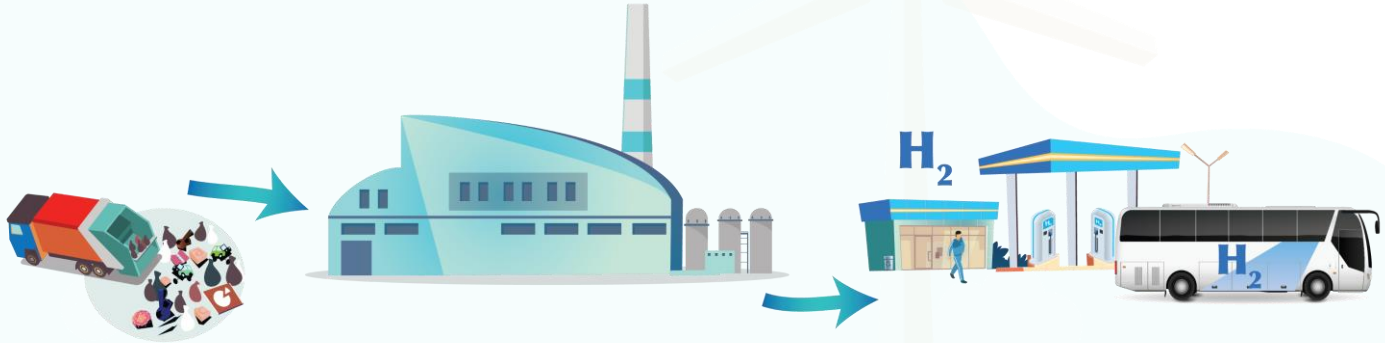
Waste-to-X

Waste-to-Hydrogen & Waste-to-Fuels

- The technologies: partly renewable hydrogen can be produced through electrolysis, or specific gasification processes
- Waste-to-fuels are synthetic fuels, either liquid or gaseous, produced from the combination of hydrogen and carbon utilisation

= methanol, ethanol

= methane



✓ Uses in transport, fertilisers (ammonia), blending with natural gas, energy storage and industry

Carbon capture

Integrating carbon capture, storage, and utilisation technologies to waste thermal treatment

- ✓ **Fully decarbonised plants**
- ✓ **Contribute to the circular economy** by capturing and using recycled CO_2

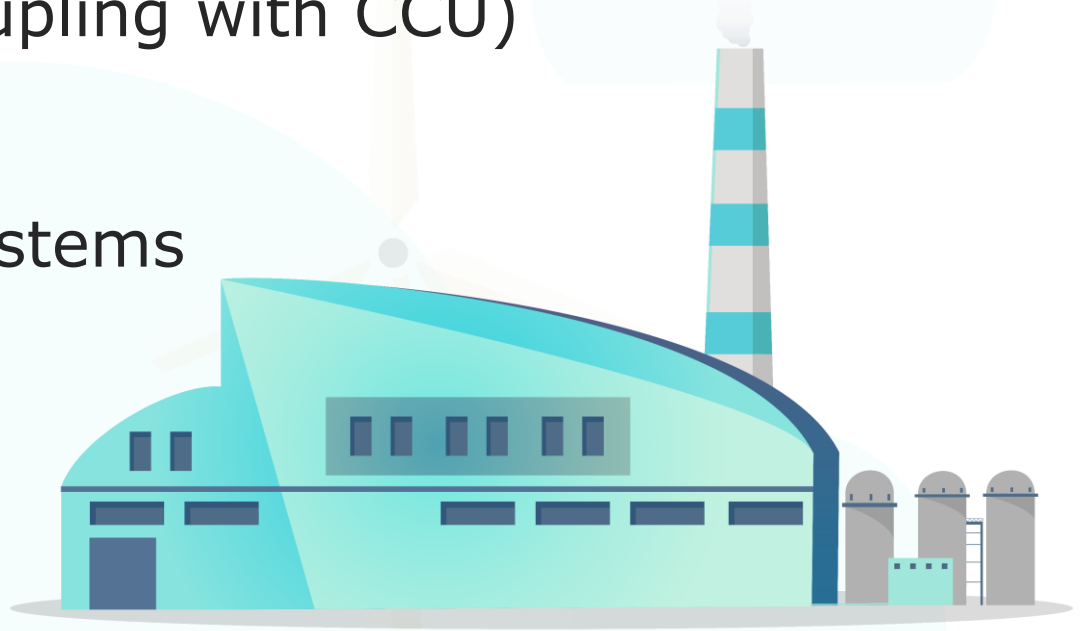
Post combustion capture technology: most mature one being amine based, but other technologies are developing at a fast pace such as enzyme based

- ✓ Already implemented in the Netherlands and taking off around Europe

Source; Duiven plant with carbon capture unit, AVR.

Serving new urban needs

- Hygienic role
- Decarbonisation though:
  - ✓ Hydrogen and fuels for transport (coupling with CCU)
  - ✓ Carbon capture
  - ✓ Increased efficiencies
  - ✓ Connection to and support of DHC systems
- Serving the circular economy
  - ✓ Material recovery
  - ✓ Energy recovery
  - ✓ Hydrogen for waste trucks
  - ✓ Captured carbon used in products
- Support of Energy Security in Europe
- Overall, maximising the potential of non-recyclable waste



European Suppliers of Waste-to-Energy Technology

Avenue Adolphe Lacomblé 59
BE -1030 Brussels

Tel.: +32 2 743 29 88

www.eswet.eu info@eswet.eu @ESWET_EU

Panel C
Citizens-First

Involving communities and answering their needs when it comes to the design and function of WtE plants

Moderator
Aurélie Beauvais – Managing Director, Euroheat & Power

Thanos Bourtsalas – EEC Acting Director, Columbia University

Ana Šerdoner – Senior Manager Industry & Energy Systems, BELLONA

Inger Anette Søndergaard– Head of department WtE, Ramboll Engineering

ESWET- WtE and the City

A.C. (Thanos) Bourtsalas
Earth and Environmental Engineering Department,
Earth Engineering Center
Columbia University, New York, NY 10027, USA e-mail:
ab3129@columbia.edu

UN Guidelines on PPPs for the SDGs

The WTE Guidelines discuss and propose three sine qua non conditions to ensure that WTE contributes to the CE through PPPs:

(i) WTE facilities should only process non-recyclable waste;

(ii) State-of-the-art technologies must be embedded in WTE plants to ensure compliance with stringent pollution standards; and,

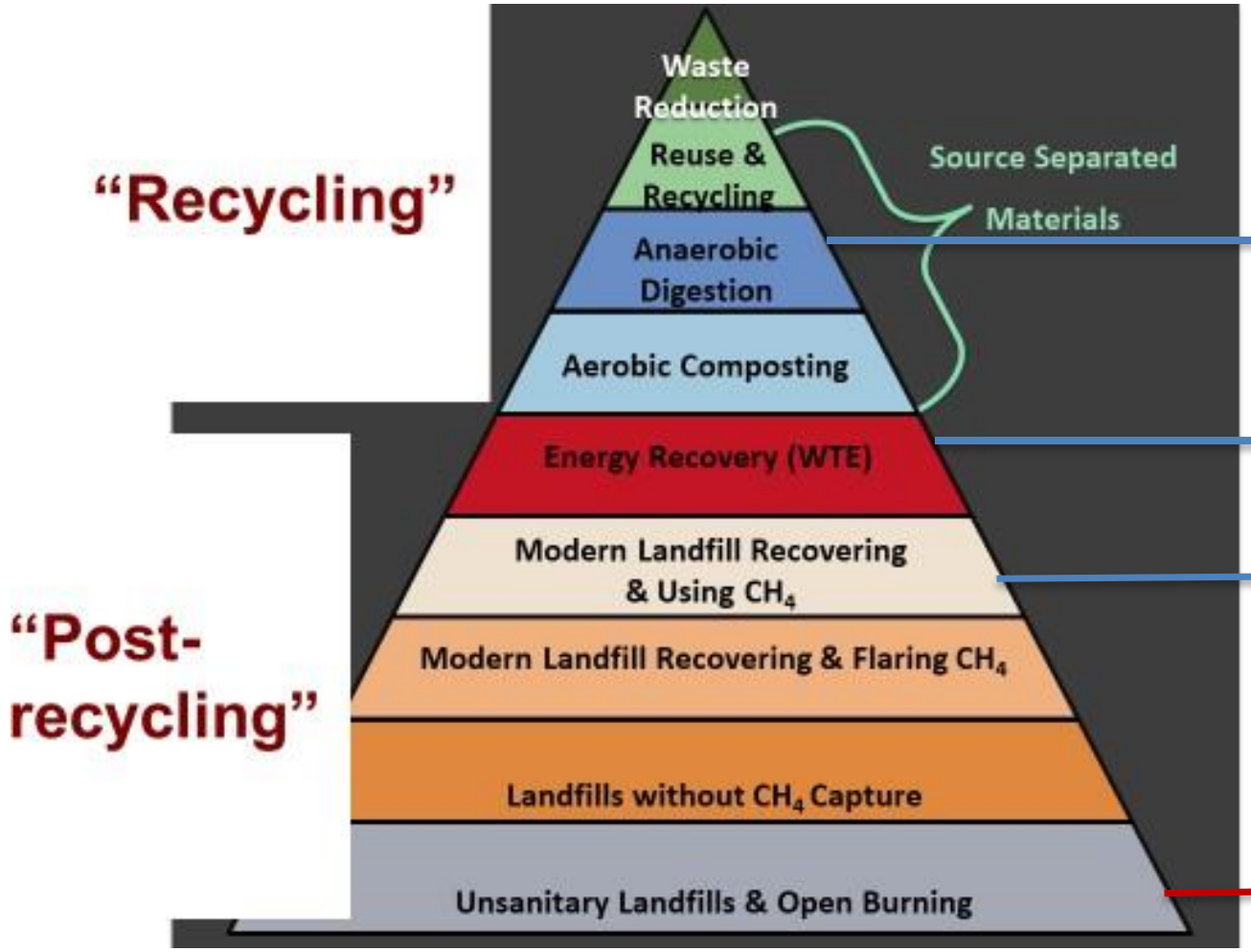
(iii) Adopting the five desirable outcomes of PPPs for the SDGs could help governments and the industry adopt better legal and policy frameworks to ensure best governance practices in WTE projects.

Effective governance: People-first outcomes and benchmarks

Outcomes	*Benchmarks*
Access and equity	Provide essential services
	Advance affordability and universal access
	Improve equity and social justice
	Plan for long-term access and equity
Economic effectiveness and fiscal sustainability	Avoid corruption and encourage transparent procurement
	Maximise economic viability and fiscal sustainability
	Maximise long-term financial viability
	Enhance employment and economic opportunities
Environmental sustainability and resilience	Reduce GHG emissions and improve energy efficiency
	Reduce waste and restore degraded land
	Reduce water consumption and wastewater discharge
	Protect biodiversity
	Assess risk and resilience for disaster management
	Allocate funds for resilience and disaster management
	Advance community-driven development
Replicability	Encourage replicability and scalability
	Enhance government, industry and community capacity
	Support innovation and technology transfer
Stakeholder engagement	Plan for stakeholder engagement and public participation
	Maximise stakeholder engagement and public participation
	Provide transparent and quality project information
	Manage public grievances and end user feedback

https://unece.org/sites/default/files/2021-11/ECE_CECI_WP_PPP_2021_03_0.pdf

Methods of managing wastes



Biological WTE for source separated organics (TRL: 4- 9)

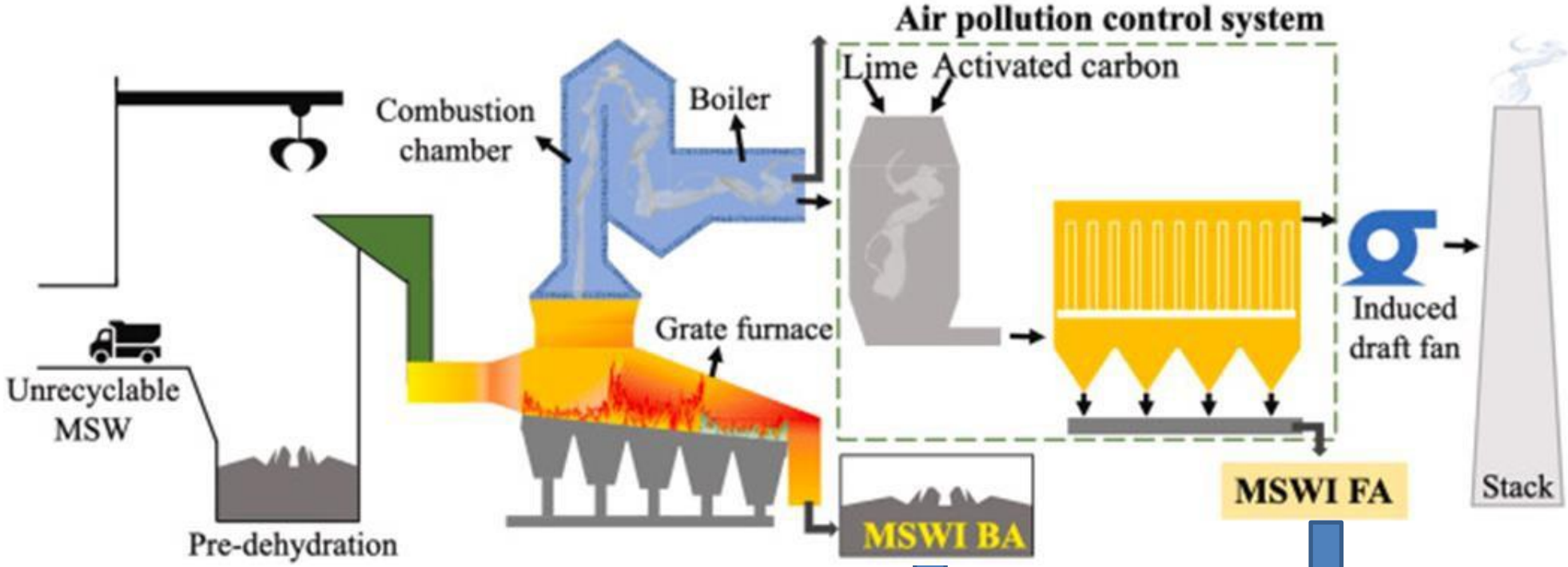
Thermal (TRL: sophisticated incineration: 9; gasification: 3-4) and chemical (TRL: 2-4) WTE

Biological WTE (TRL: 9)

Open incineration

TRL: Technology Readiness Level

Beneficial use and safe disposal of WTE residues (bottom and fly ash)



20-25wt.%: Metals and construction materials

1-3wt.%: Contains precious metals, but also hazardous components, thus it needs special treatment.

Link here

Regulation must ensure sustainable disposal or use of WtE residues.
Examples of utilization: Concrete tiles produced from WTE bottom ash

Link here

Examples of utilization: Construction of noise barrier along the A12 highway in The Netherlands using WTE bottom ash

Link here

Concrete blocks made from WTE bottom and fly ash used for shore protection and land reclamation in Bermuda.

Stabilized fly ash in Switzerland

Emphasis on emissions: EU IED and US MACT limits

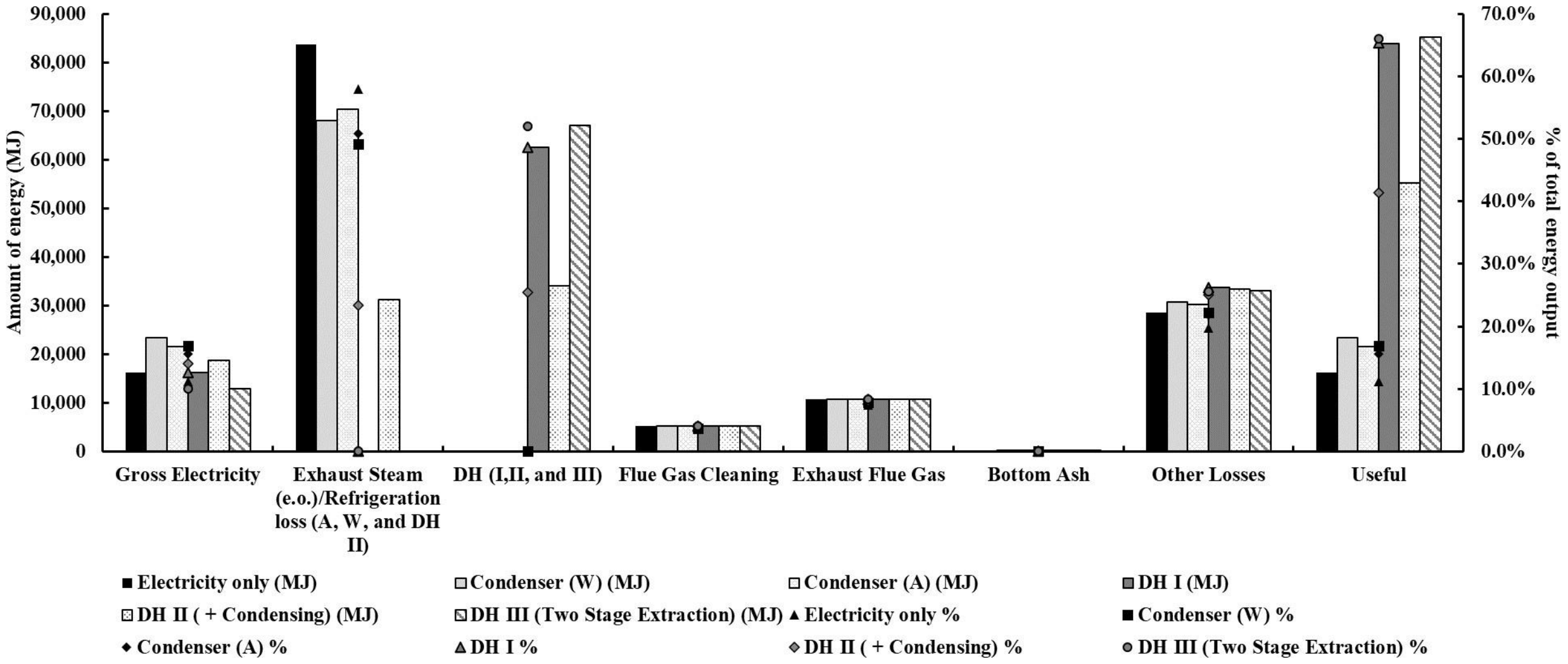
Pollutant	E.U. IED limits (mg/Nm^3)	BAT-AEL (Best Available Technology- Associated Emission Levels) (mg/Nm^3)	U.S.A. MACT limits *
Total Suspended Particulates	10 (24-hr average)	2-5 (daily average)	20 mg/dscm
Sulfur Dioxide (SO_2)	50 (24-hr average)	5-30 (new plant) 5-40 (existing plant) (daily average)	30 ppmv (or 80% reduction)
Oxides of Nitrogen (NO_x)	200 (24-hr average)	50-120 (new plant) [a] 50-150 (existing plant) [a, b] (daily average)	150 ppmv (24-hr. average)
Hydrochloric Acid (HCl)	10	<2-6 (new plant) < 2-8 (existing plant) [c] (daily average)	25 ppmv (or 95% reduction) [f]
Dioxins and Furans	0.1 ng TEQ/Nm^3 (6-8 hr. average)	<0.01-0.06 (new plant) <0.01-0.08 (existing plant) (average over sampling period) [d]	13 ng/dscm (total mass)
Cadmium (Cd)	0.05-0.1 (0.5-8 hr. average) (Cd and Ti)	0.005-0.02 (average over sampling period) (Cd and Ti)	0.01 mg/dscm
Carbon Monoxide (CO)	50-150	10-50 (daily average)	50-150 ppmv [g]
Lead (Pb)	Included in total metals below	Included in total metals below	0.140 mg/dscm
Mercury (Hg)	0.05-0.1 (0.5-8 hr. average)	< 5- 20 $\mu g/Nm^3$(daily average) [e]	0.05 mg/dscm (or 85% reduction) [f]
Total metals	<0.5 (0.5-8 hr. average)	0.01-0.3 (average over the sampling period)	N/A
Hydrogen Fluoride (HF)	1	<1 (daily average or average over sampling period)	N/A

Effective governance

Key elements of effective governance to advocate sustainable infrastructure, transparency of processes and stakeholder engagement:

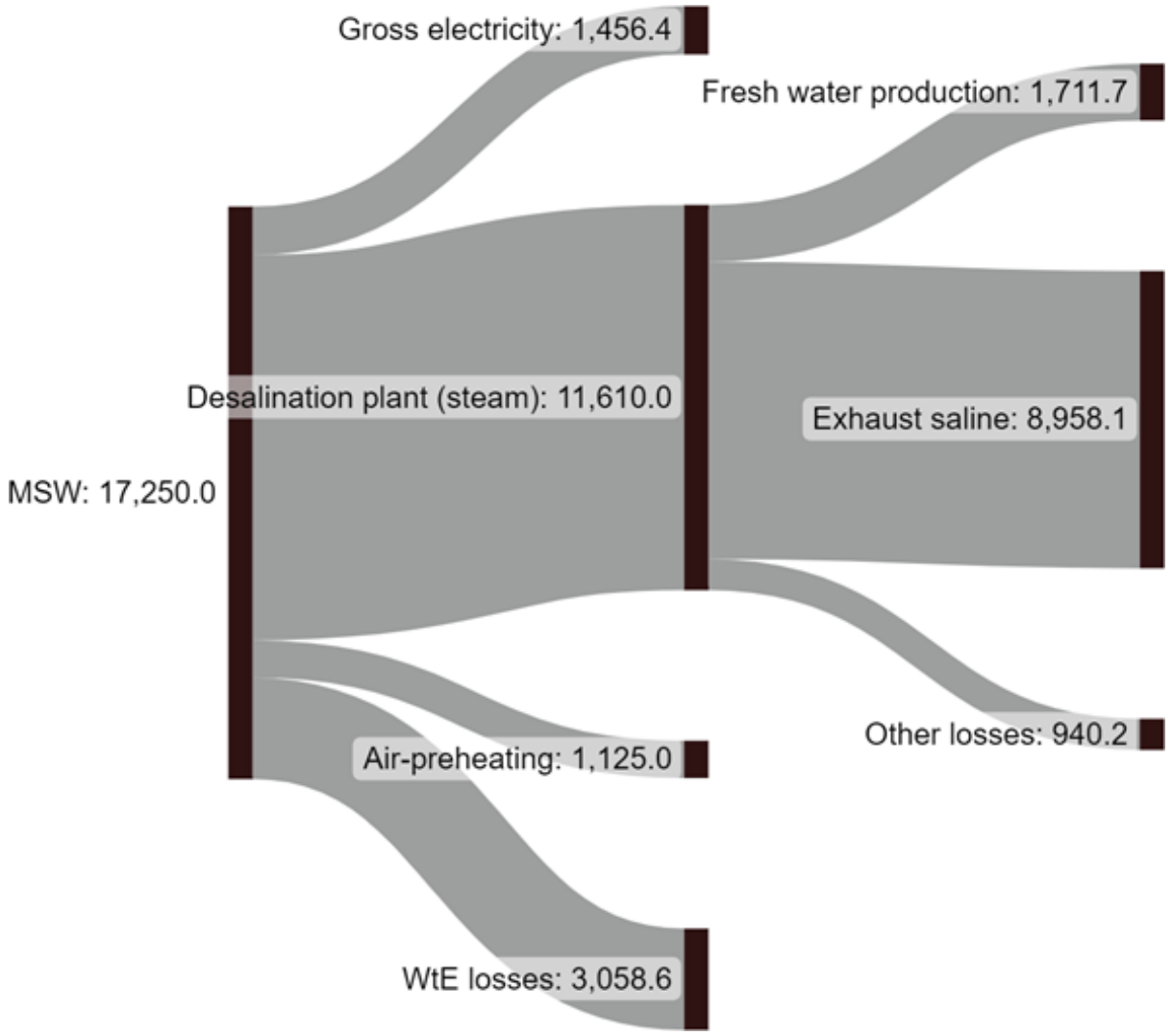
- Strong regulations, incl. fiscal incentives, regular inspections, zero tolerance on corruption
- Conduct surveys and map stakeholders
- Education, and public outreach programs
- No discrimination, women empowerment
- Fiscal sustainability of projects
- Replicability and scalability of projects in other regions and countries
- Capacity-building and knowledge transfer from the private sector to the public sector (so that governments will build their capacity to develop better projects)
- Result-based financing can reduce risks associated with WtE investments

Best practices: use of exhaust heat for DH increases efficiency



Bourtsalas, 2023, Energy, Waste-to-Energy Utilization Strategies: From District Heating to Thermal Desalination

Best practices: use of exhaust heat for desalination, St. Barth's

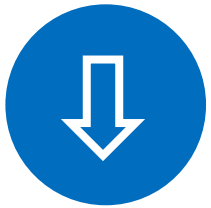


Thank you very much for your attention!

Thanos Bourtsalas: ab3129@columbia.edu

Climate action in the waste sector

Many elements need to work together to ensure effective climate action



Waste reduction targets urgently need to be tackled

High recycling targets need to complement reductions

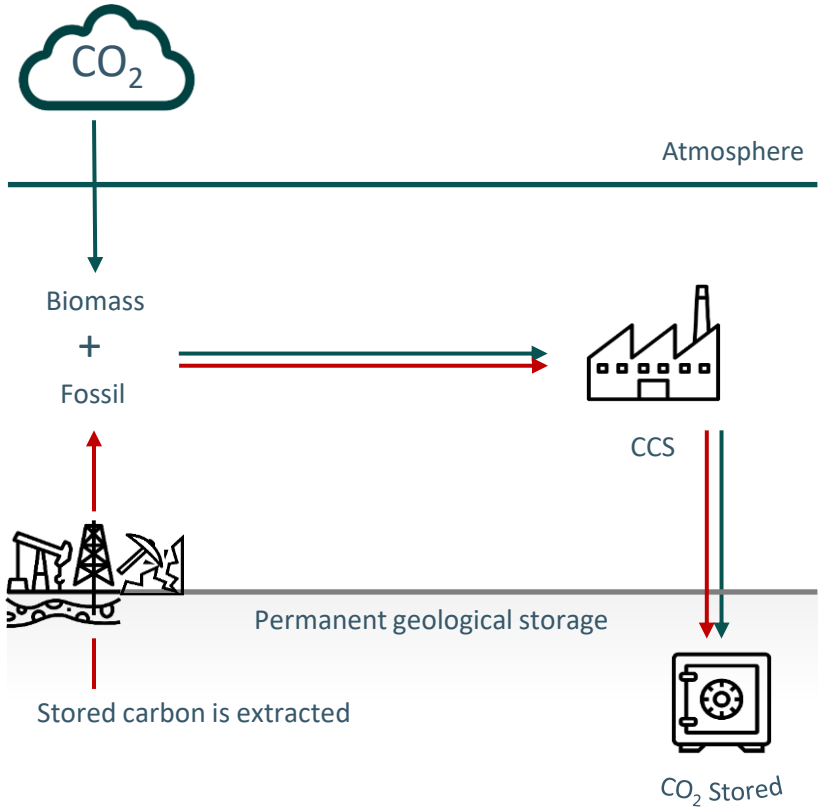
CCS is needed, but must not affect other targets

All environmental and climate impacts need to be accounted for

Waste incineration cannot keep emitting

Reduction and recycling should be prioritised, but preventing short term climate effects is also important

- While waste incineration should decrease over time, **its damaging effects**, including greenhouse gas emissions to the atmosphere, **need to be mitigated as soon as possible.** The inclusion of the sector into the EU ETS is a welcome signal to initiate that transition.
- Both parallel development of CCS on some waste incinerators and waste reduction are needed. **CCS should be the only way waste incinerators are allowed to operate.**



Cleaning up the waste management system

Focusing on reduction targets, increasing product lifespans, reusing and recycling should be prioritized, but residual emissions also need to be tackled

- **Focusing on reduction and recycling is key to optimising waste management.**
  A greater focus on waste reduction targets is needed because the EU is not on track to met them. Increased biogenic waste separation is needed to reduce the contamination of recyclable waste. Residual waste sorting should also be added to ensure that recyclable materials are not being incinerated.

- **Waste incineration emissions need to be tackled.**
  Existing waste incinerators that will operate in the coming decades need to reduce their greenhouse gas emissions and cannot continue to release greenhouse gases into the atmosphere.

- **CCS should be a requirement for operation, where applicable.**
  CCS can reduce emissions in the waste incinerators that will be operational in the decades to come and should be a requirement for their operation.

Thank you!

Ana Serdoner
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Energy Systems
ana@bellona.org

RAMBØLL

Bright ideas.
Sustainable change.

Amager Bakke
- a plant for the citizens

Inger Anette Søndergaard
Head of Department, WtE Consultancy (Copenhagen)

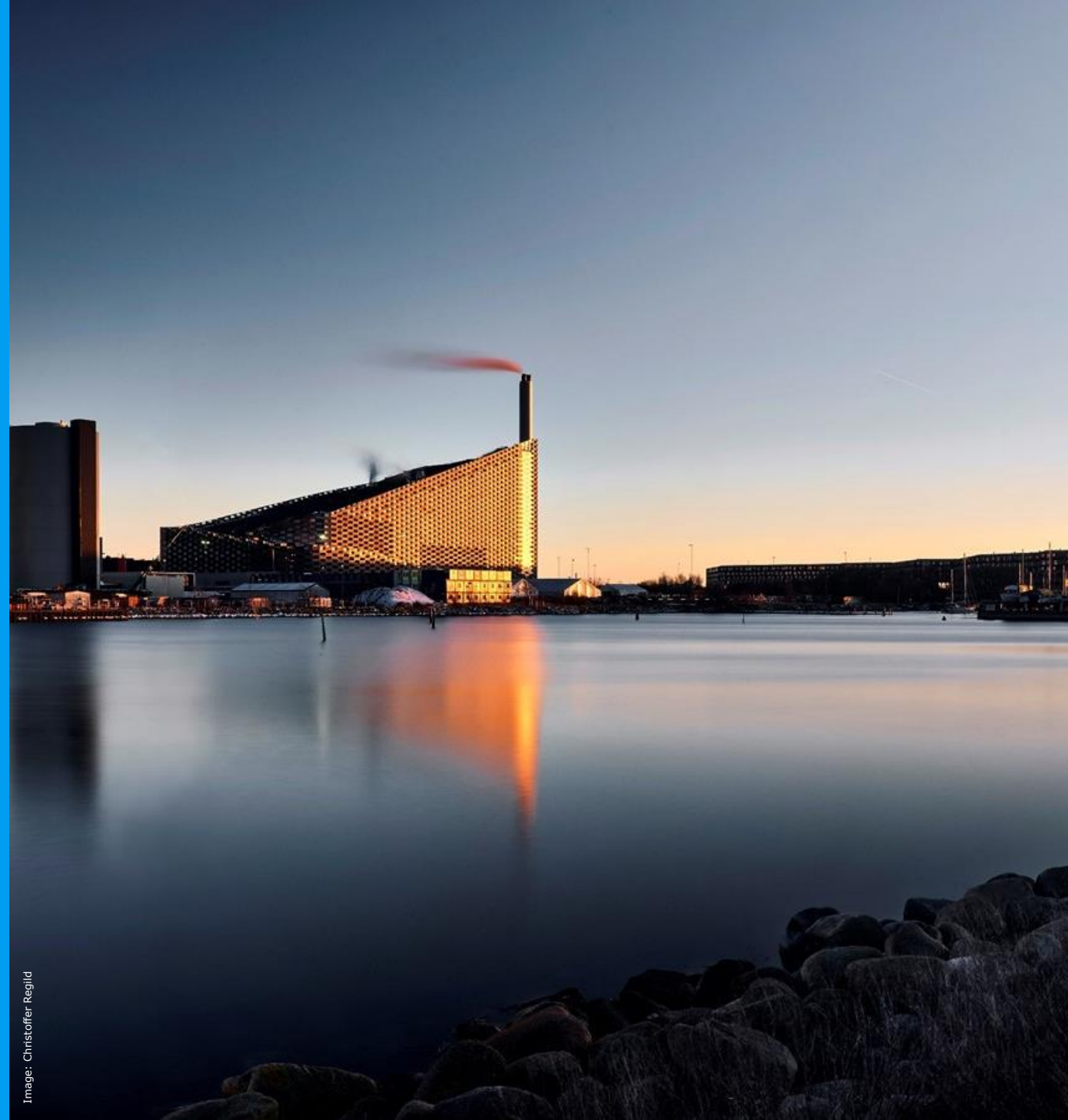


Image: Christoffer Regild

Copenhagen is expanding!
Residential areas move into industrial areas

VISION QUOTE

"We want to show the world that it is actually possible to produce energy for the city and that it is **possible to do this in the middle of the city** … It is important that the waste-to-energy plant is integrated into to environment … the architecture should be a **gift to the city**!"

Managing Director for ARC

Stakeholders in WtE projects

Architecture competition

A beacon for Copenhagen

Recreational facilities (hiking, skiing, climbing and view over centre of Copenhagen)

Visitor centre /Education centre

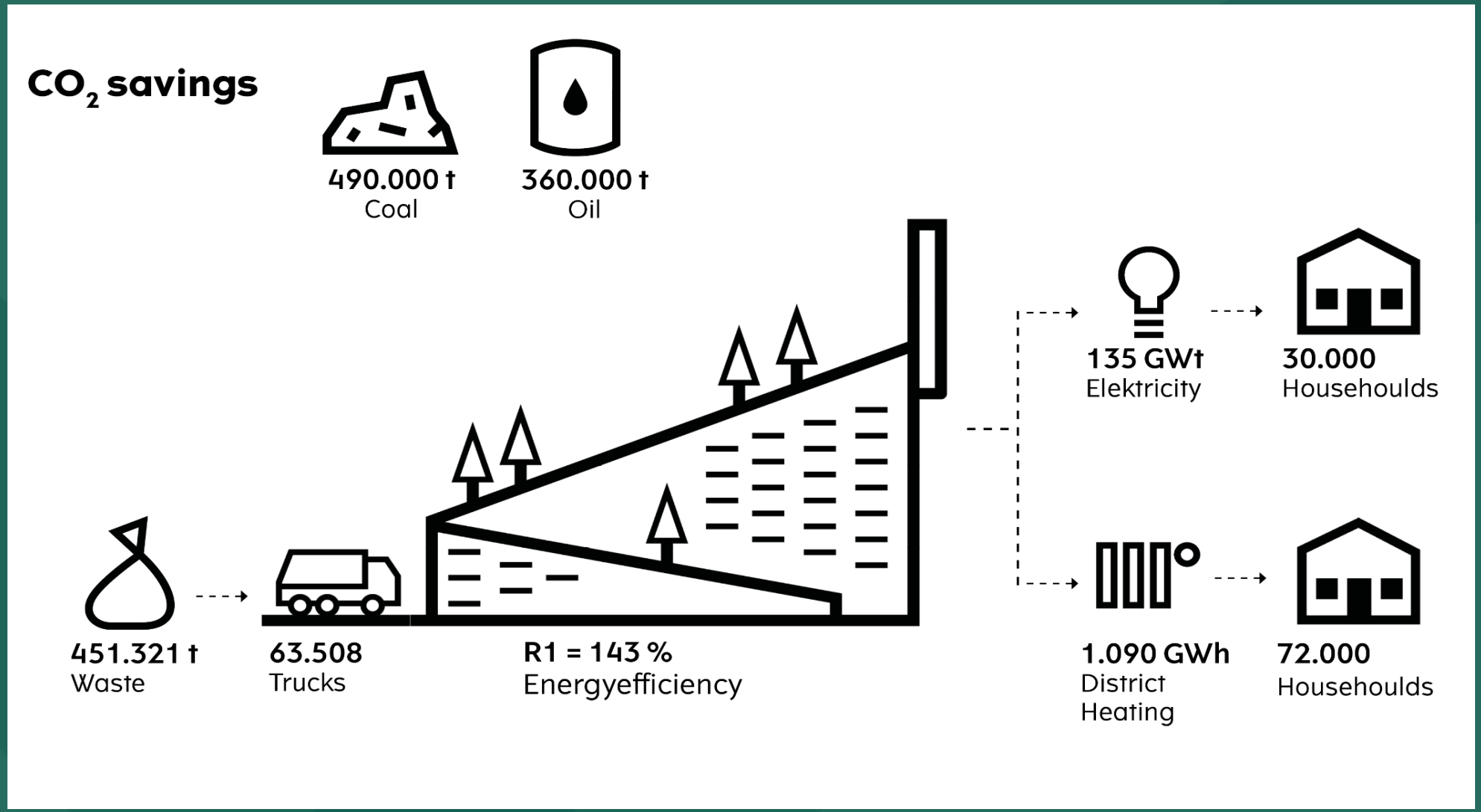
Process Design

Very high Energy Performance
Very high Environmental Performance
Visitors inside plant and on rooftop

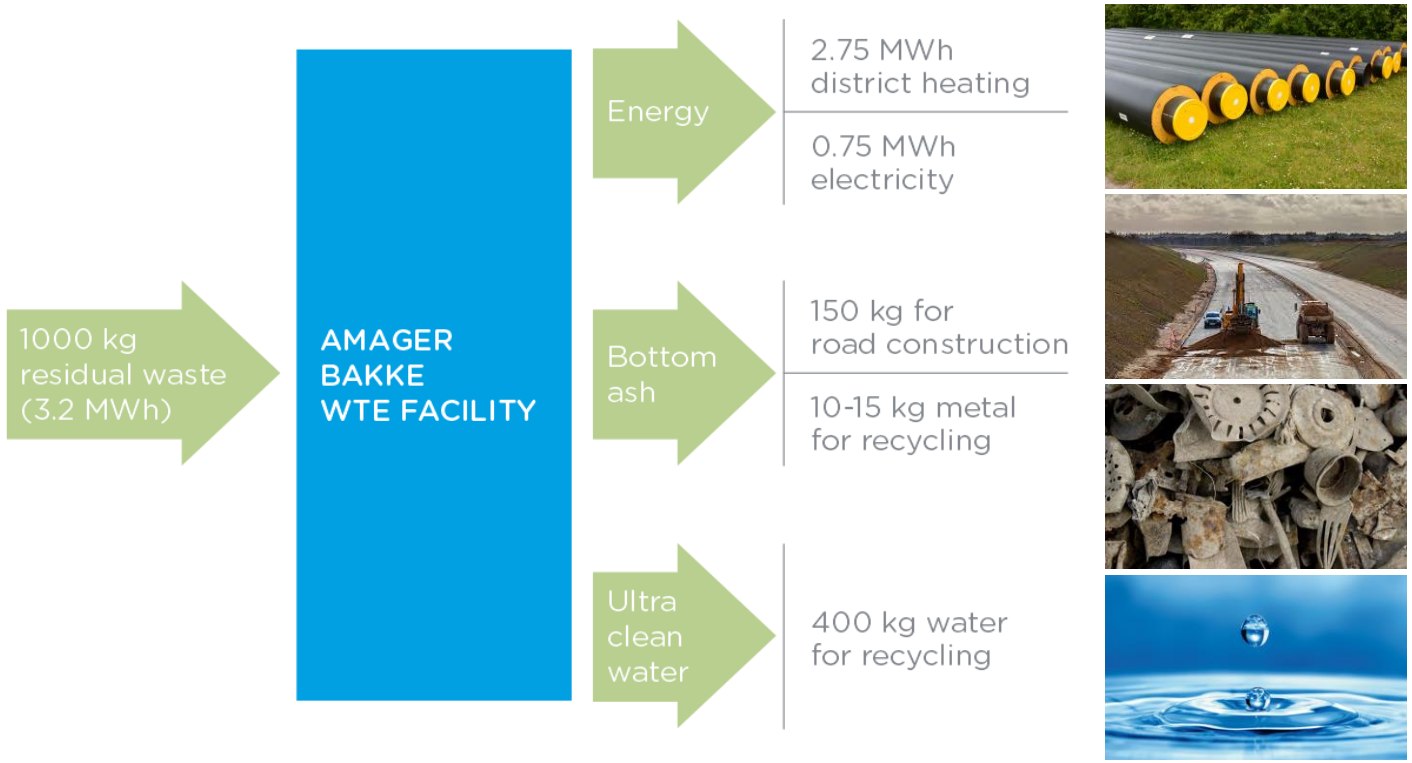
Framework conditions
- Long term planning – 20 years
- Large district heating network
- Possible to discharge cleaned wastewater
- Municipal guaranteed loan/low interest rate

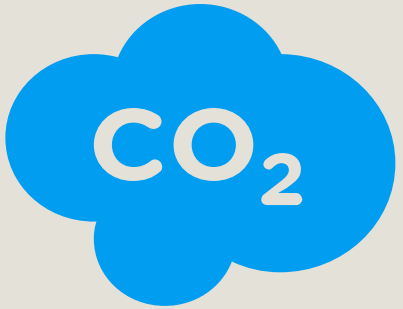
Life cycle analysis approach for design

Energy balance and efficiency (2018)



Recovery from residual waste

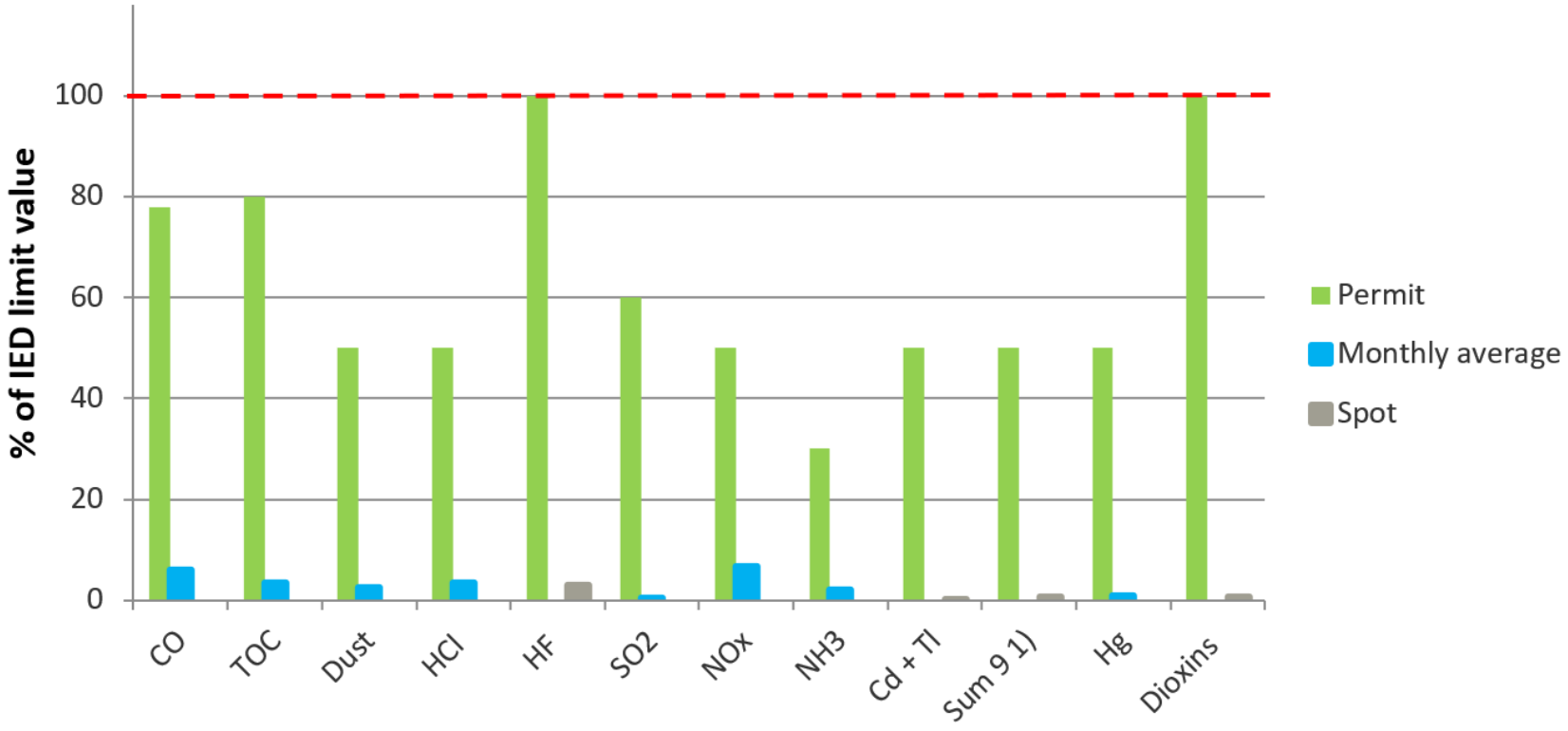




Potentially

500,000 tons per year

Emissions to air



Flue Gas Treatment

Electrostatic Precipitator, ESP
Selective Catalytic Reduction, SCR
Scrubber system
Flue gas condensation (<30°C)

Wastewater treatment
Condensate water treatment

Bright
ideas.
Sustainable
change.

RAMBØLL

Waste-to-Energy & the City

THANK YOU FOR YOUR PARTICIPATION!

You are invited to join us at the Cocktail reception!

Atrium 5

ESWET

Hosted by European Committee of the Regions