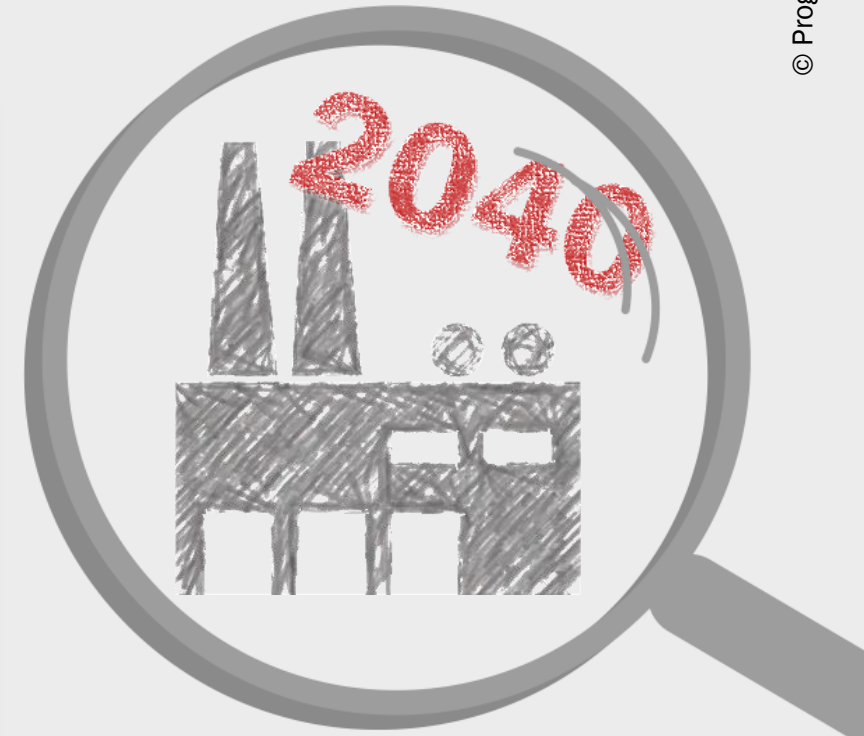


Perspectives of Waste-to-Energy - Roadmap 2040 -

On behalf of ITAD
(German Association of Waste-to-Energy Plants)



Background and task

Data and fact base for the discussion of the perspectives of Waste-to-Energy*

- In the coming years, many municipal and private owners of thermal waste treatment plants (TAB) will have to make decisions on the replacement or modernization of individual incineration lines or entire plants.
- Against the background of the high investment costs and the long-term nature of the decisions, discussions have been going on for some time now about how many capacities or plants will be necessary in Germany in the future,
- therefore ITAD has commissioned Prognos AG in cooperation with Prof. Dr. Martin Faulstich to prepare the study "Perspectives for Waste-to-Energy - Roadmap 2040".
- The roadmap describes the development of plant utilization up to the year 2040 and considers the foreseeable changes in the range of tasks in the thermal waste treatment sector from various perspectives.
- The results of the study are presented in the form of 9 theses.

*) Waste-to-Energy = Municipal solid and similar commercial waste incineration

Key messages

Waste-to-Energy (WtE)

- 1 ... will continue to be fully utilized until 2040
- 2 ... guarantee safe disposal
- 3 ... ensure security in energy supply
- 4 ... are continuously modernized
- 5 ... support the recycling of household and commercial waste
- 6 ... make a contribution to climate protection
- 7 ... expand the municipal scope of action
- 8 ... is an important part of the Green Deal in the EU recycling industry...
- 9 ... support the path to a climate-neutral Germany



Bildquelle: AVG Köln



Waste-to-Energy 2040

... focus on some details

Bildquelle: AVG Köln

1

Waste-to-Energy

... will continue to be fully utilized until 2040

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1 WtE-plants will continue to be fully utilized until 2040.

- **WtE primary competitive market:**
 - WtE-plants (MSWI + RDF power plants)
 - Cement plants (pro rata for comparable types of waste)
 - Coal-fired power plants (pro rata for comparable types of waste)
 - M(B)T with contracts for residual waste treatment
- **Factors influencing the amount of waste to be thermally treated:**
 - economic and demographic development
 - waste avoidance and/or recycling measures
 - changed legal classification, shifting of material flows from other disposal channels, new and additional waste flows

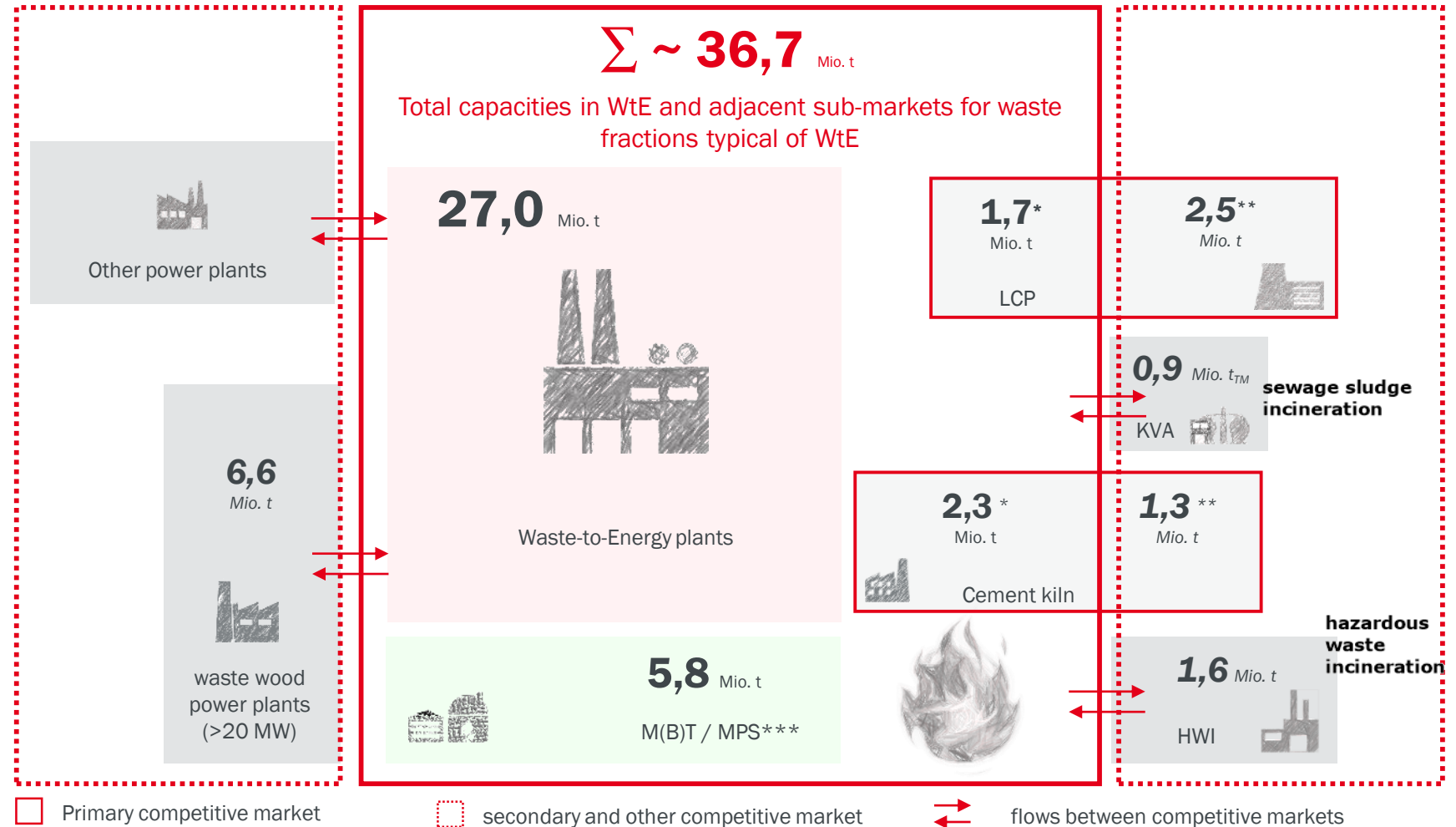


Bildquelle: Ralf Breer

1 Data and facts

Market definition Waste-to-Energy

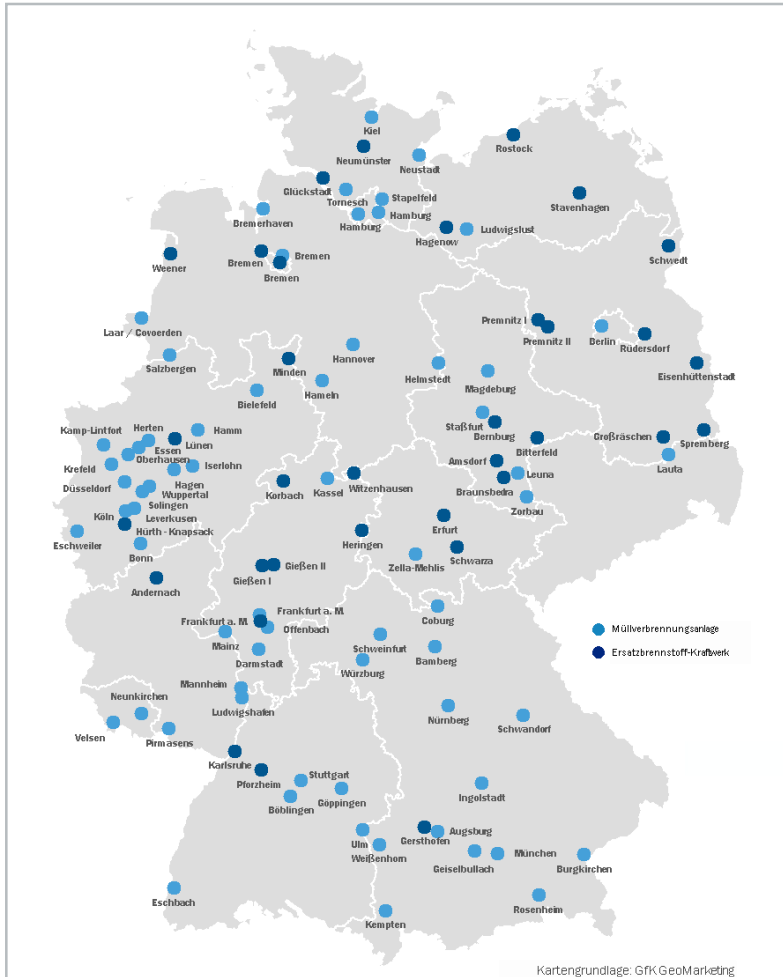
- WtE-plants are related to and interact with other (sub)markets
- Primary competitive market 36.7 million tons:
 - (pro-rata) capacities for comparable waste fractions in TAB
 - M(B)T/MPS that have residual waste contracts



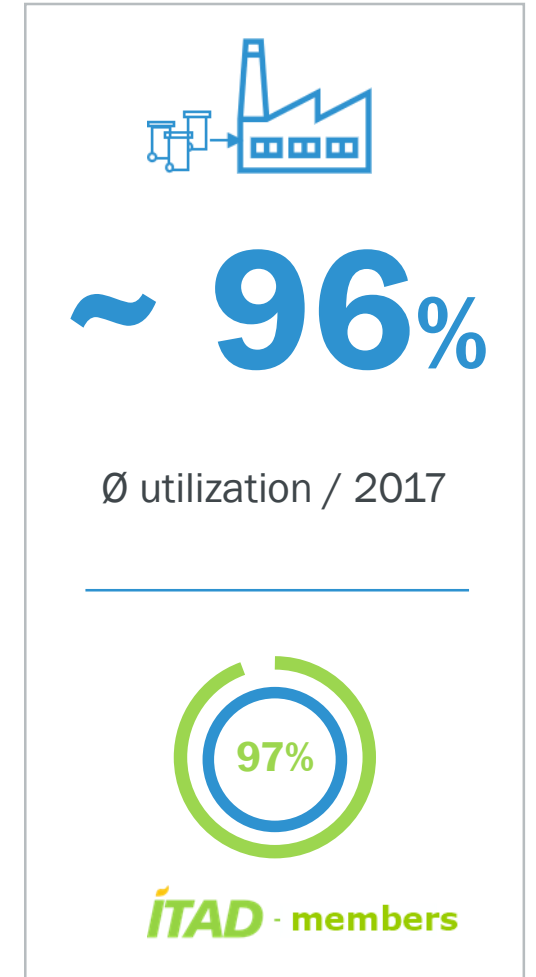
Quelle: Darstellung Prognos AG 2020

1 Data and facts

Facilities, capacities and utilization of TAB



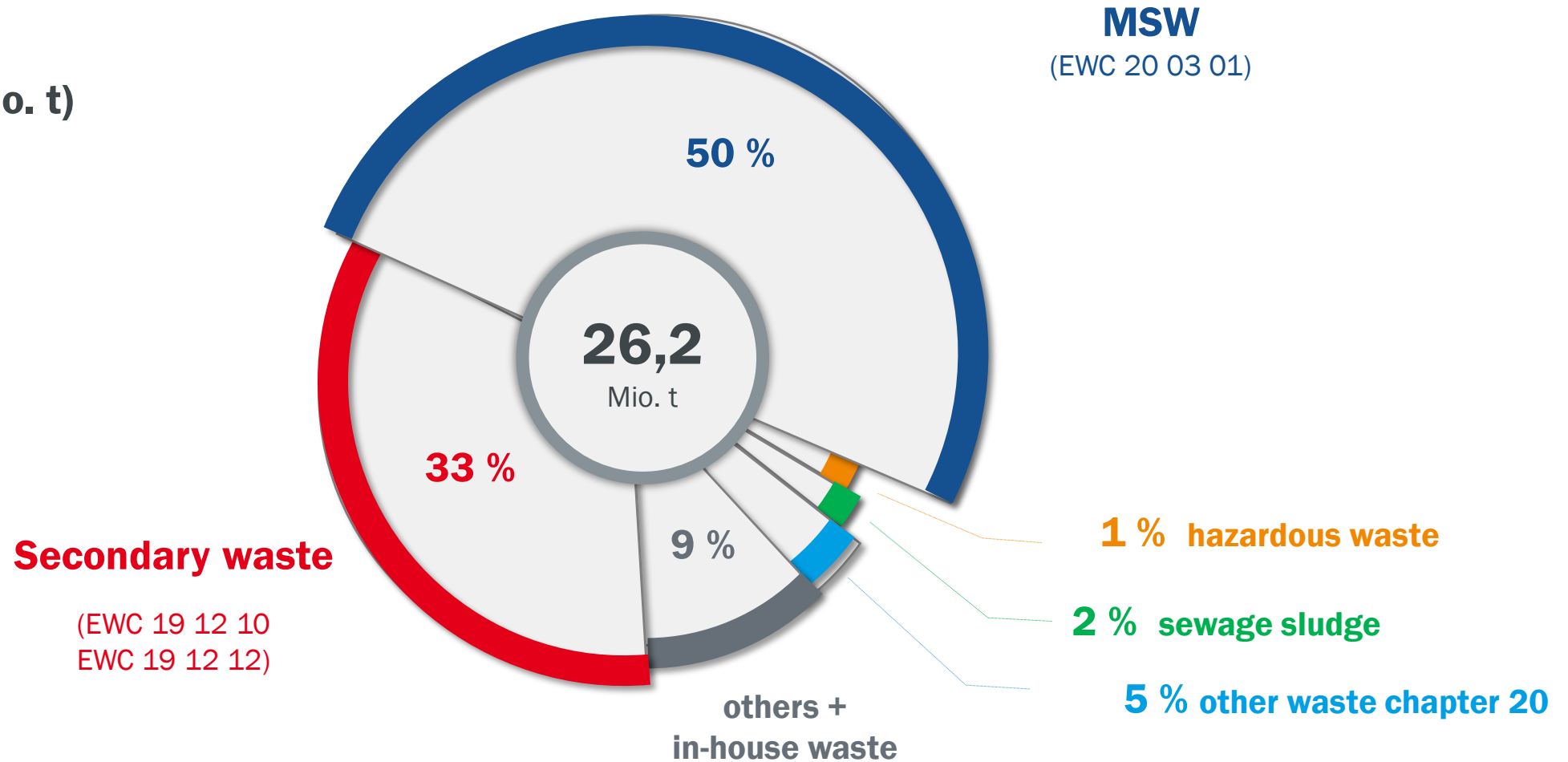
Quellen: ITAD, Eigenrecherchen Prognos AG



1 Data and facts

Waste composition WtE 2017

Import :
5,7 % (1,5 Mio. t)



Quellen: ITAD Jahresbericht 2018, Destatis Fachserie 19, Reihe 1, ergänzende Eigenrecherchen und Hochrechnungen Prognos AG

1 Daten & Fakten

basis for calculating future capacity utilization

status quo-scenario

Updating 2017 revenue only under consideration

- sector-specific development of gross value added,
- population development, age structure and household size
- private consumer spending
- constant waste management framework conditions



scenario comprehensive recycling

Individual and overall scenario for implementation

- ordinance on commercial waste
- packaging waste act
- separate collection of bio-waste and greens (according to German waste act)



scenario relocation from other disposal options

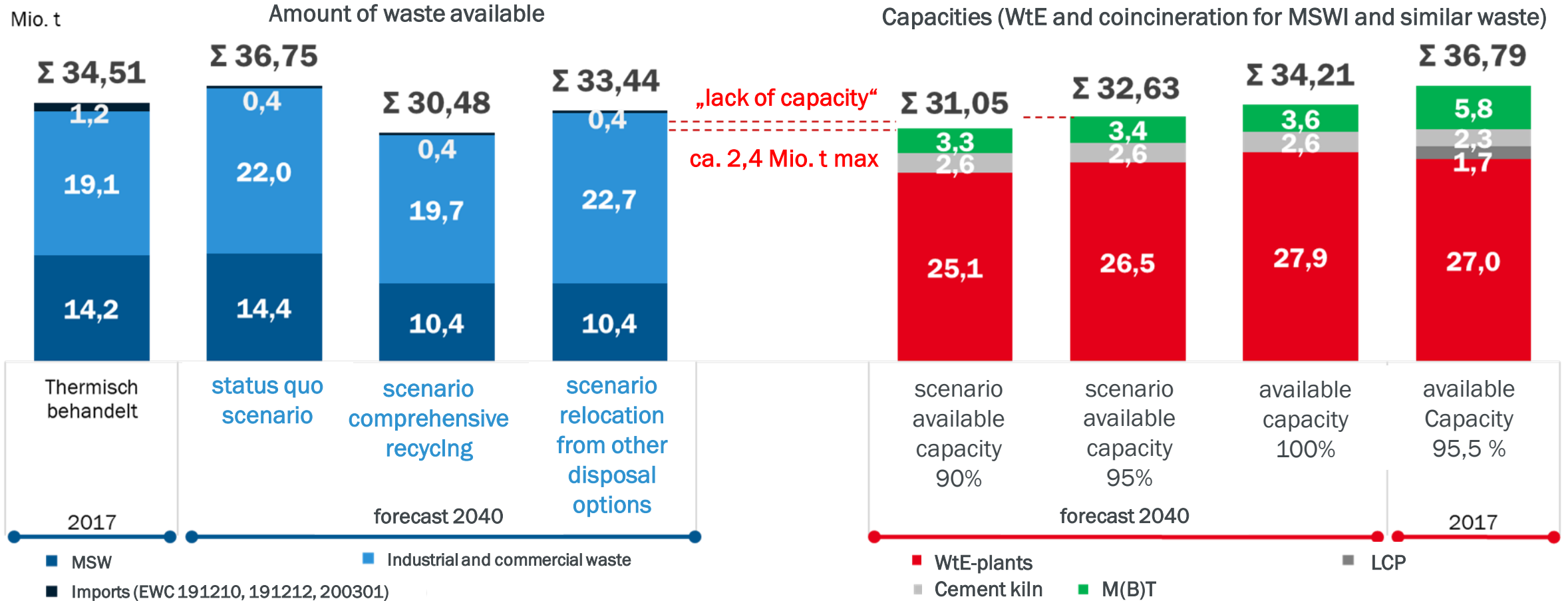
Evaluation of potentials through

- decommissioning of coal-fired power plants
- Partial reclassification/closure of M(B)T
- additional proportional material flows (e.g. sewage sludge, light shredder fractions, fine fractions of construction/demolition waste, waste containing POPs, European "division of labour")
- effects of an output-based recycling rate



1 Data and facts

Results of the balancing of waste quantities and WtE capacities



Quelle: Prognosen der Prognos AG

3

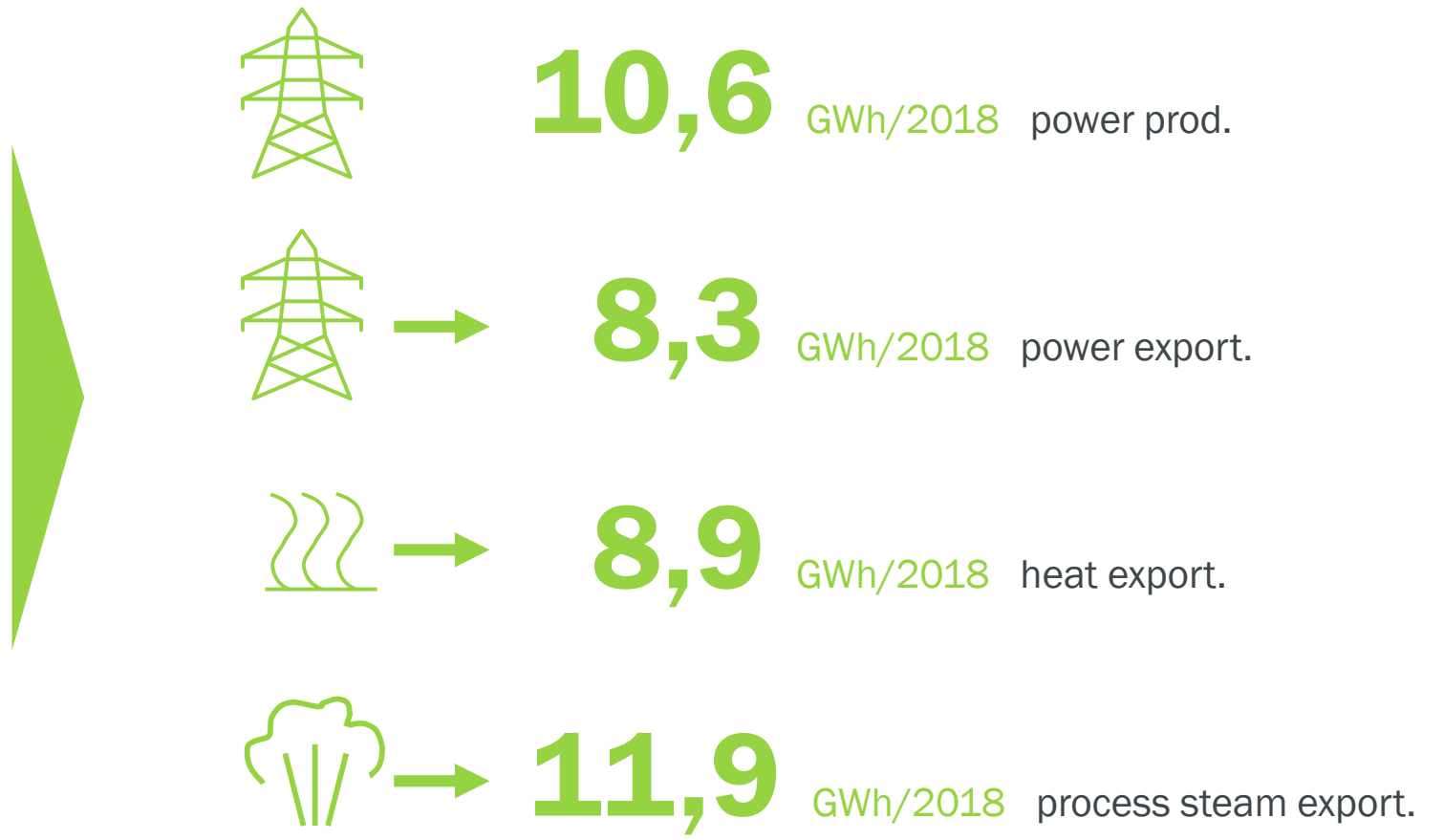
Waste-to-Energy-plants

... ensure security in the energy supply

Bildquelle: AVG Köln

3 Data and facts

Energy production ITAD-members



Quelle: ITAD

4

Waste-to-Energy-plants

... are continuously modernized.

Bildquelle: AVG Köln

4 Data and facts

Incineration lines and age and investment requirements up to 2040



> 200

incineration lines



23

MSWI

11

RDFI

Ø age of lines (years)
(basis: last furnace retrofit)



35 years

Ø assumed need for modernization



75 Mio. €

Ø modernization costs per WtE-capacity
of 100.000 t/a



11 billion €

cumulative investment requirement until
2040



135 €/capita

cumulative investment requirements up
to 2040 per capita - or just under 7 € per
capita and year

4 Data and facts

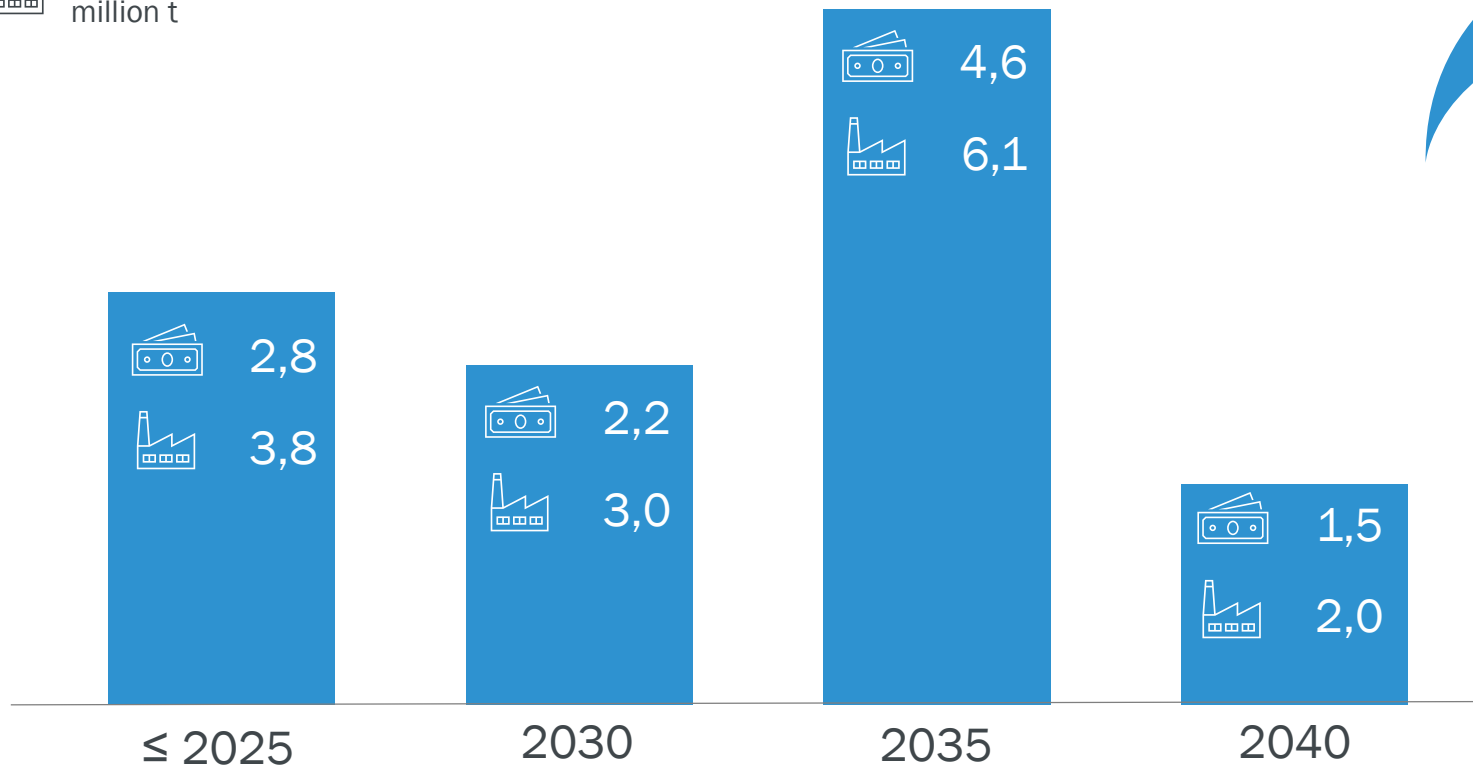
Modernization needs up to the year 2040



Modernization costs in € billion



Modernization requirements - capacities in million t



Σ 11,1 billion €
cumulative modernization costs until 2040

6

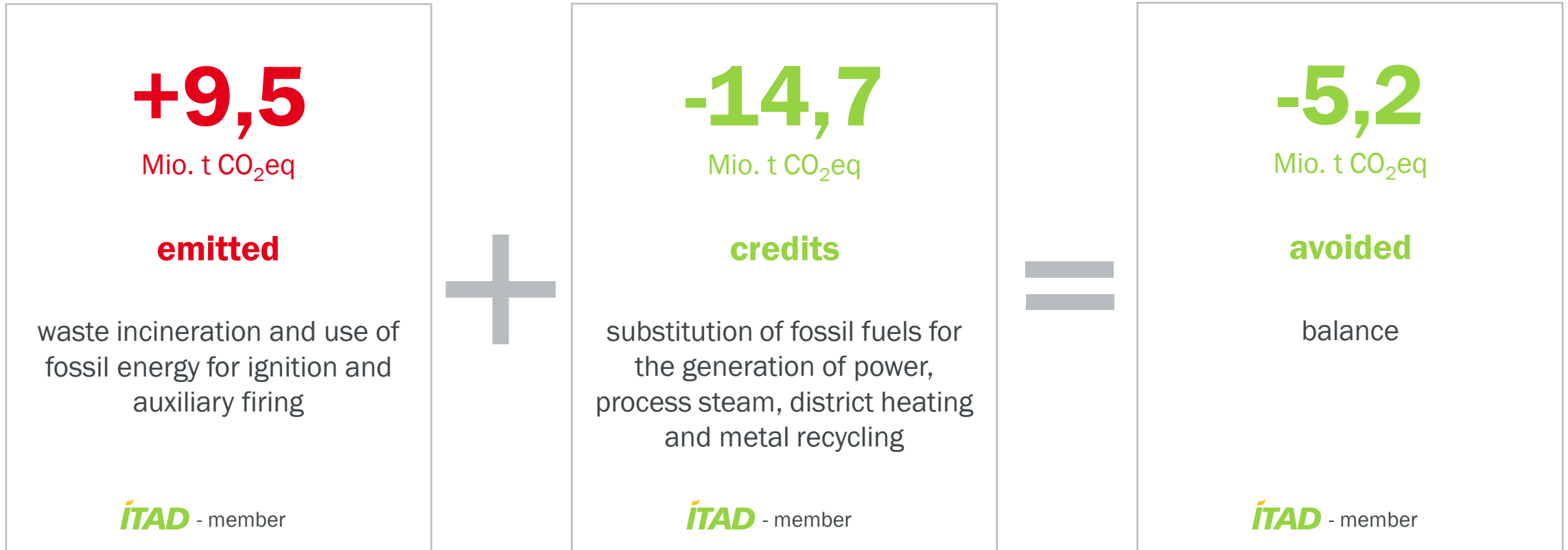
Waste-to-Energy-plants

... make a contribution to climate protection.

Bildquelle: AVG Köln

6 Data and facts

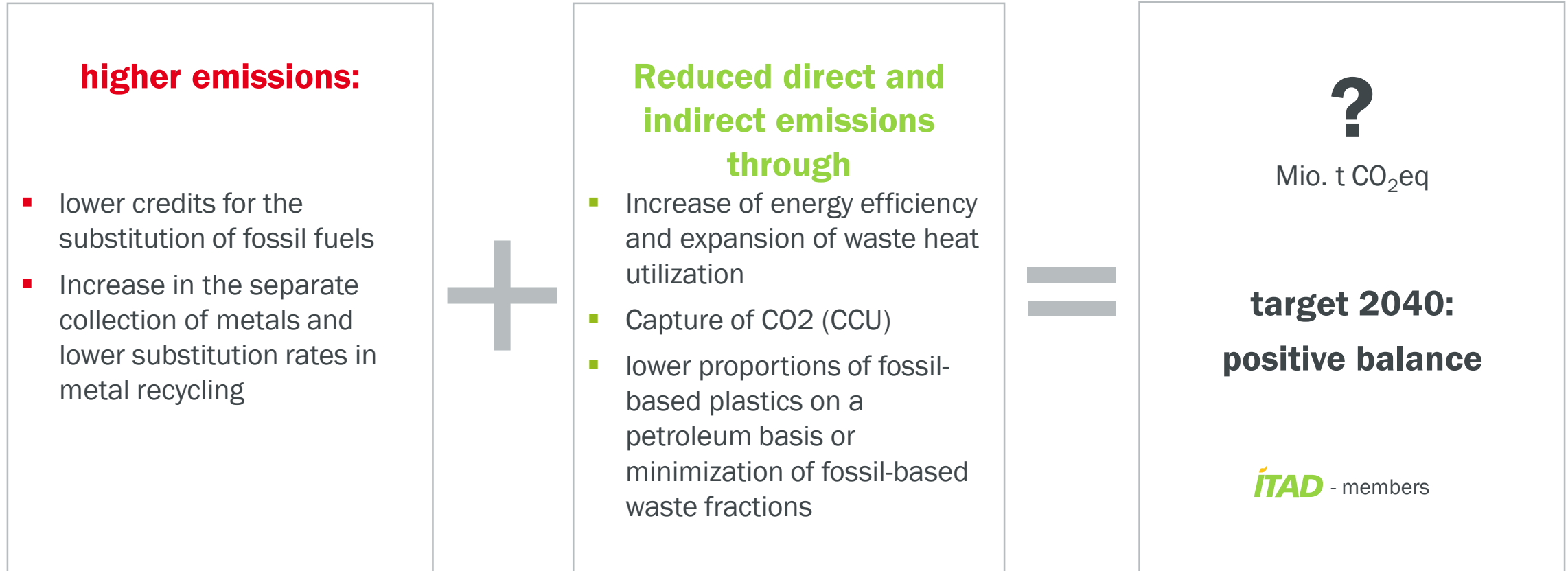
WtE climate protection potential: burdens and savings 2019



Quelle: ITAD e.V.

6 Daten & Fakten

WtE climate protection potential : changes until 2040



8

Waste-to-Energy-plants

... are an important part of the Green Deal in the European recycling industry.

Bildquelle: AVG Köln

8 WtE is an important part of the Green Deal.

"Green Deal"

- New initiatives within the framework of the "Green Deal" to close landfills earlier, to establish recycling structures and to increase waste heat utilization are necessary in Europe to further reduce greenhouse gases

European "division of labor"

- Availability of German TABs until the establishment of orderly material and energy recycling structures, especially in Eastern and Southern Europe
Prerequisite: free capacities at home and viable, sustainable agreements
- Export also leads to the responsibility for taking back waste



Bildquelle: © Europäische Union, 2019 - CORDIS, cordis.europa.eu

9

Waste-to-Energy-plants

... support the path to a climate neutral
Germany.

Bildquelle: AVG Köln

9 WtE-plants support the path to climate neutrality

Circular Economy - Model of environmental and economic policy

- Integration of TAB into complex systems of recycling and resource conservation is an important step towards future climate neutrality.
- A circular economy cannot function without TAB. TABs make an important contribution to climate protection by avoiding CO₂ emissions.
- The generation and feed-in of hydrogen will become economically interesting under changed conditions.
- TAB develops and provides new system services for the energy systems of the future.
- TABs are developing into "multi-output plants". In addition to the existing metal recovery from slags and CHP operation (electricity and heat), hydrogen and chemical raw materials (e.g. methanol synthesis from CO₂ and H₂, naphta) are produced.



Bildquelle: © shutterstock – artjazz

Roadmap 2040

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