


Compliance costs for implementing the BAT conclusions for German waste incineration plants -two emission scenarios-

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Motivation and Background




On December 3, 2019, the WI BREF was published in the EU Official Journal

The implementation in national law takes place primarily via the 17th BImSchV, but also in an administrative regulation adapted to the TA Luft and the annexes to the Wastewater Ordinance

Since the presentation of compliance costs is a central point in communication with the Regulatory Control Council a determination of the possible follow-up costs should already be carried out in the run-up to the amendment process




The consequential costs resulting from the tightening of limit values for airborne emissions must be determined

Existing municipal waste (incl. RDF), sewage sludge, hazardous waste and biomass incineration plants (waste wood) are considered for two limit value scenarios.

The upper values of the BAT associated emission bandwidth are to be assumed for Scenario 1 and the medians of the ranges (daily mean values) for Scenario 2, with the respective exceptions for the parameter mercury

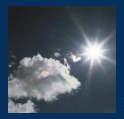



parameter	unit	existing emission limits 17. BImSchV	emission limits szenario 1	emission limits szenario 2	monitoring frequenz	kind of average values
dust	mg/m³STP dry	5	5	3,5	continually	DAV
HCl	mg/m³STP dry	10	8	5	continually	DAV
HF	mg/m³STP dry	1	0,9	0,9	continually	DAV
NO_x (SCR)	mg/m³STP dry	150	150	100	continually	DAV
SO_x as SO_2	mg/m³STP dry	50	40	22,5	continually	DAV
Hg	mg/m³STP dry	0,05	0,035	0,02	continually	HHAV
		0,03	0,01	0,01	continually	DAV
		0,01	0,005	0,005	continually	JAV
NH_3	mg/m³STP dry	10	10	6	continually	DAV
CO	mg/m³STP dry	50	50	30	continually	DAV
Cd + Tl	mg/m³STP dry	0,05	0,02	0,0125	every 6 month	DAV
∑Sb+As+Pb+Cr +Co+Cu+Mn+Ni +V + (Sn)	mg/m³STP dry	0,5	0,3	0,155	/	DAV
PCDD/F	ng I-TEQ /m³, STP dry	/	0,06	0,035	every 6 month	DAV
			0,08	0,045	monthly	DAV
PCDD/F + PCBs	ng WHO-TEQ /m³, STP dry	0,1	0,08	0,045	every 6 month	DAV
			0,1	0,055	monthly	DAV
TVOC / $C_{ges.}$	mg/m³STP dry	10	10	6,5	continually	DAV

method



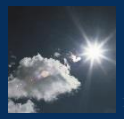

- Questionnaires were used to ask the operators for current emission data in the context of the plant technology
- 210 existing plants in Germany were considered, of which 96 were municipal waste (including RDF), 28 were sewage sludge and 30 were hazardous waste incineration plants and 56 were biomass plants
- In addition to available process schemes and published emission values, the following plant data was recorded:
  - Number of emission control lines
  - Waste mass flow
  - Amount of fluegas
  - The co-incineration of sewage sludge
  - Additives and processes for the separation of acidic pollutant gases
  - Additives and processes for removing heavy metals, dioxins and furans
  - Methods and auxiliary materials for denitrification
  - type of combustion
- Based on this data, an assessment of emissions compliance for the two specified scenarios was carried out




Investment costs for retrofit

Action	Costs and/or consumption	Unit
General process optimization	150.000	[€]
Retrofit residue recirculation	600.000	[€]
Retrofit "Police Scrubber"	1.000.000	[€ at 20.000 m³ / h]
Retrofit SNCR	600.000	[€]
Addition of MinPlus	400.000	[€]
Optimization of the wet scrubber (tray)	1.200.000	[€ at 100.000 m³ / h]
N_2O-Analyzer	80.000	[€]
New fabric filter	2.000.000	[€ at 190.000 m³ / h]
Optimizati	300.000	[€]
	400.000	[€]
	1.300.000	[€ bei 190.000 m³ / h]
	5.400.000	[€ bei 190.000 m³ / h]
ivated carbon (price	1.000	[€ / Mg]
	0,4	[g / m³]
Switch to sodium bicarbonate	600.000	[€]
Optimization of the activated carbon dosage	50.000	[€]
Additional dosage of sodium bicarbonate	400.000	[€]

For measures that are specified with a volume flow reference, the system-specific costs are 60% absolute and 40% linear to the basic volume flow



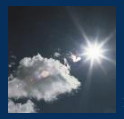

Recurring costs through the procurement and disposal of additives for the separation of acidic pollutant gases

Raw gas concentrations of the individual plant classes [mg/m³]

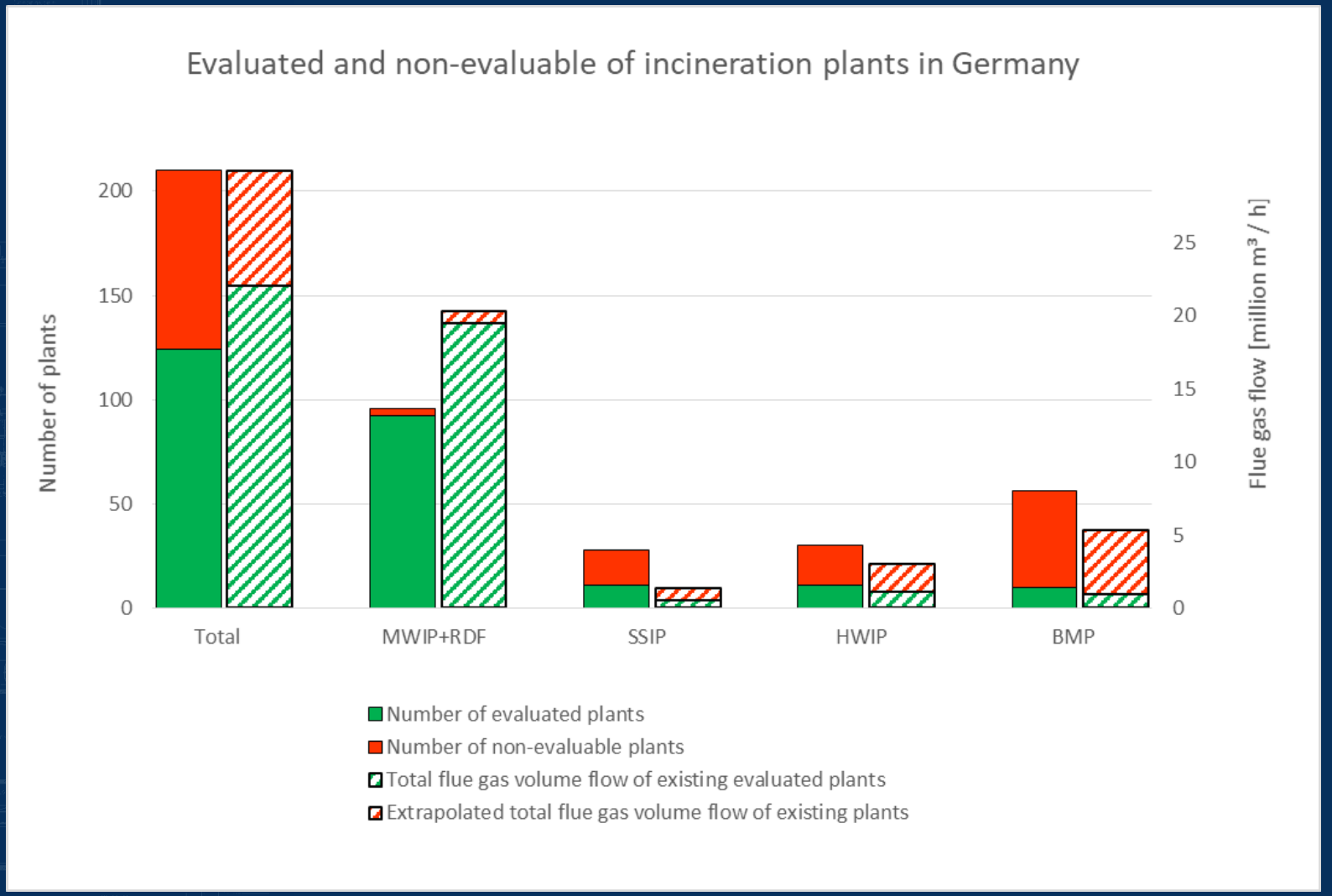
	SO_x	HCl	HF
Municipal waste	650	1.500	14
sewage sludge	3.000	150	10
hazardous waste	1.500	4.000	175
biomass	350	220	12

Additive costs for the separation of acidic pollutant gases [€/Mg]

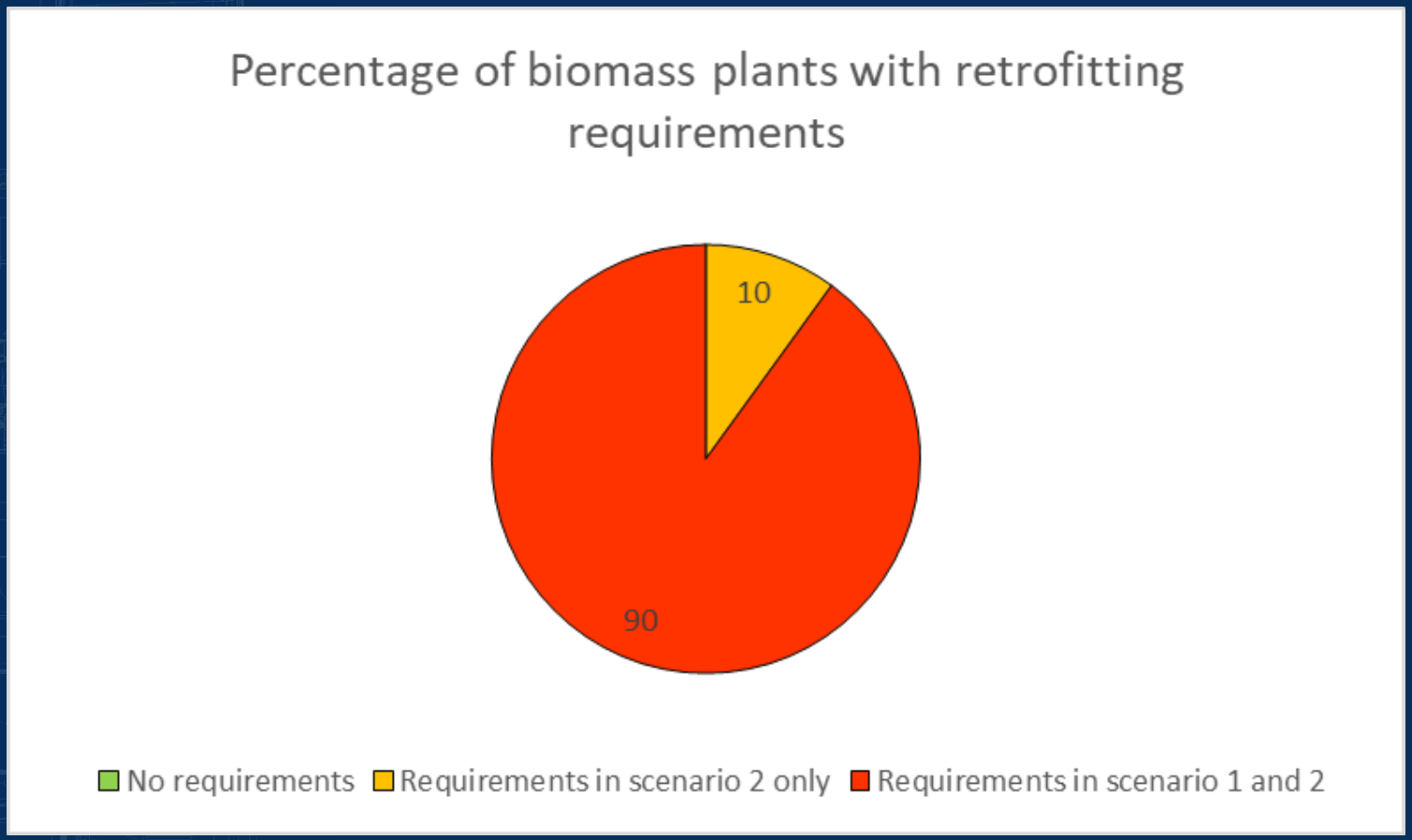
Sodiumbicarbonat	**280**
Calciumhydroxid	120
Sodium (50 %)	560




Results


Evaluated and non-evaluable of incineration plants in Germany
Number of plants
Flue gas flow [million m³ / h]
200
150
100
50
0
25
20
15
10
5
0
Total
MWIP+RDF
SSIP
HWIP
BMP
Number of evaluated plants
Number of non-evaluable plants
Total flue gas volume flow of existing evaluated plants
Extrapolated total flue gas volume flow of existing plants

General retrofit requirements

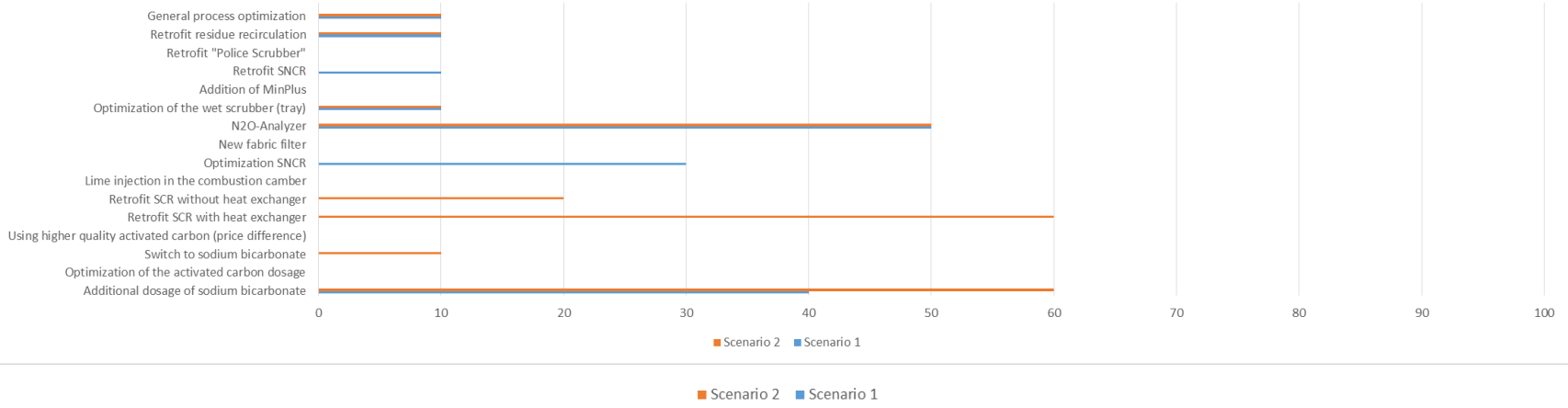


Need for retrofitting according to individual measures

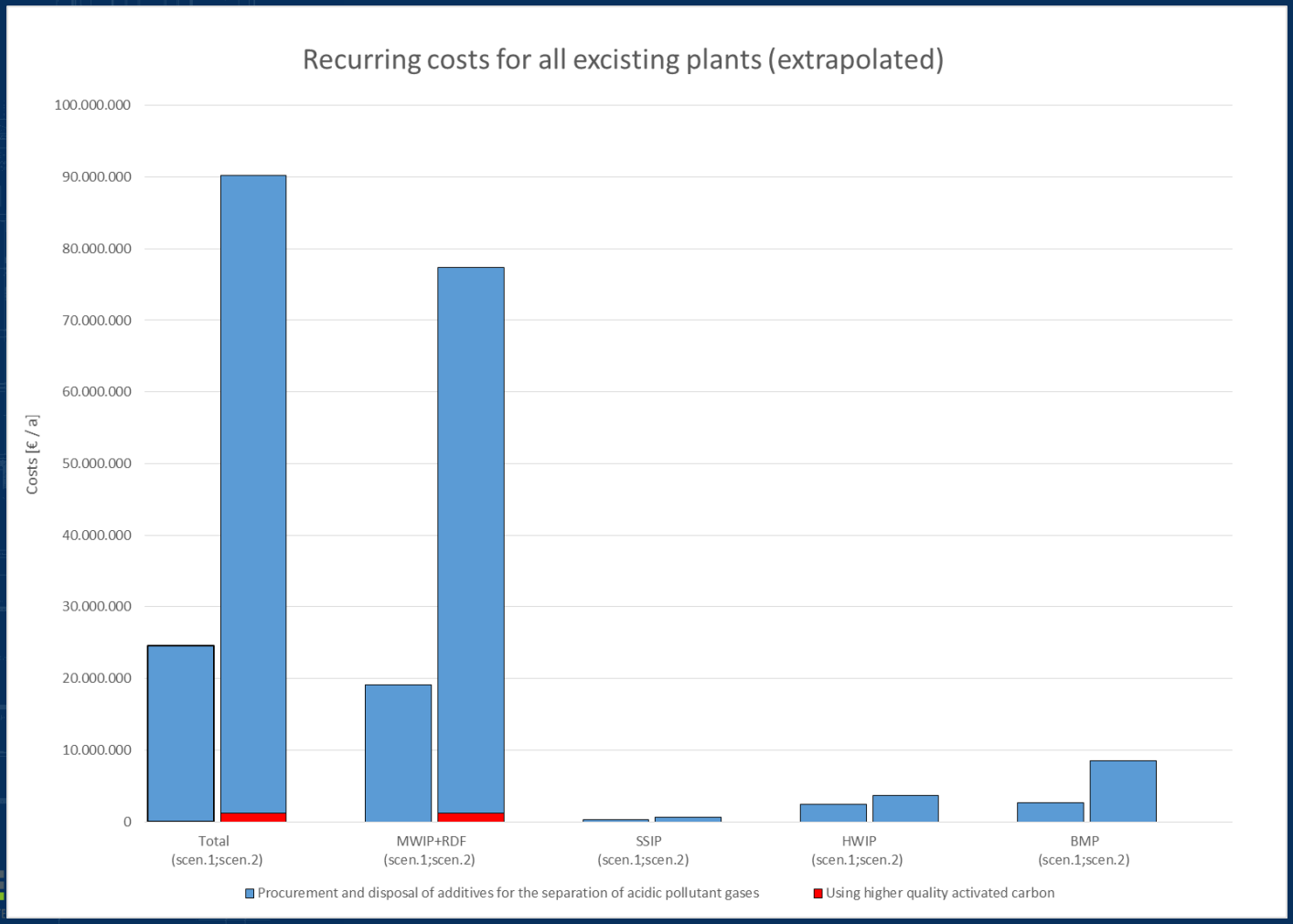
Percentage of sewage sludge incineration plants with respective retrofitting requirements

Percentage of municipal waste incineration plants (incl. RDF) with respective retrofitting requirements

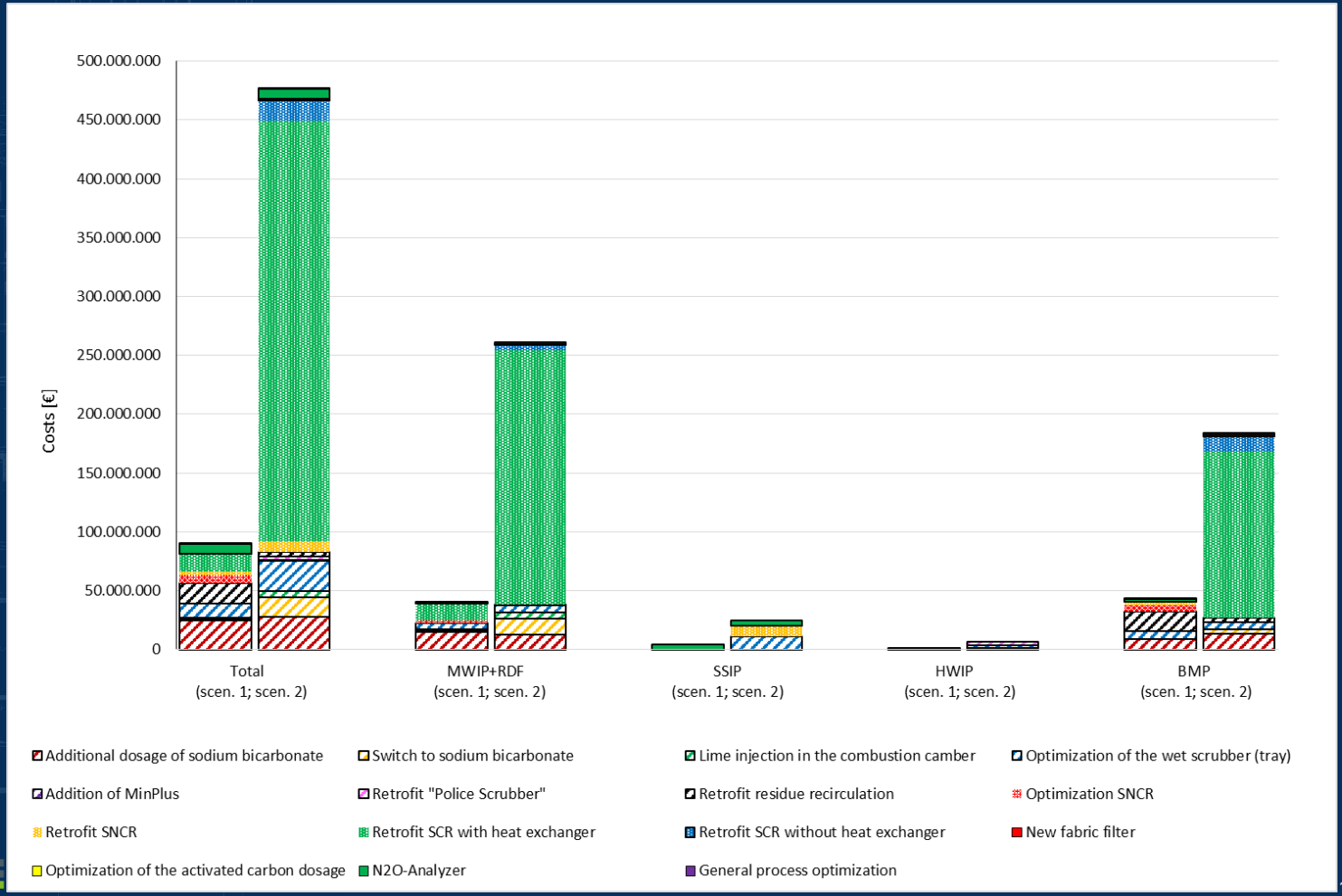
Percentage of biomass plants with respective retrofitting requirements



Recurring follow-up costs (extrapolated) of the system stock for the respective scenarios [€/a]

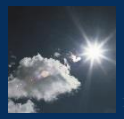


One-off follow-up costs (extrapolated) of the system stock for the respective scenarios [€]






Conclusion




The recognized recurring follow-up costs amount to 24.6 Mio. €/a in scenario 1 and increase by a factor of 3.7 to 91.5 Mio. €/a in scenario 2.

➡ These costs are mainly caused by the additional procurement and disposal of additives, which become necessary due to stricter emission limit for the acidic pollutant gases HCl, SOx and HF

The one-time investment costs are 84.9 Mio. € in Scenario 1 and 488.4 Mio. € in Scenario 2, which corresponds to an increase by a factor of 4.7.

➡ While retrofitting measures with regard to acidic pollutant gases are the biggest cost drivers in the first scenario, in the second scenario it is the retrofitting for catalytic reduction of NOx.

Since the almost five-fold increase in costs between Scenario 1 and Scenario 2 is due to the retrofitting of denitrification measures, the political discussion on the emission limits according to Scenario 2 in the context of the NOx emissions from 17th BImSchV systems (0.04%) are managed.

Thank you for your attention!