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Energie. Wasser. Leben.

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Treatment of PFAS - theoretical cost estimate for possible PFAS limits in the new Drinking Water Ordinance (TrinkwVS)

Dear Doctor Mendel,

Based on the results of the DVGW-TZW study "Assessment of the impact of the introduction of a drinking water limit for PFAS on the German drinking water supply", we had agreed in our conversation of 26 October 2021 to carry out a cost estimate on the basis of the current price level for the additionally required water treatment on the basis of two scenarios with different limit values. Subsequently, you also asked us to carry out a cost estimate for a third scenario.

We have therefore added the estimate for a third scenario to our letter of 21 December 2021.

In principle, we would first like to point out the following aspects with regard to PFAS:

1. In principle, new drinking water limit values should be coupled with an emission limitation or ban of the substances concerned. The respective transitional periods for the implementation of new limit values must then be derived from this. Article 7, paragraph 3 of the EU Water Framework Directive requires Member States to prevent deterioration of the quality of water bodies and thus to reduce the extent of treatment necessary for the abstraction of drinking water. This clear wording coincides with Article 8 of the new EU Drinking Water Directive for risk management in the catchment areas of water abstraction plants. According to this, the only correct approach is to take measures to reduce emissions of substances in the catchment areas instead of maintaining a highly technical treatment of raw water.

2. In our opinion, it is necessary to obtain a ban on further PFAS substances at the European level in addition to the existing ban on PFOS and PFOA. Short-chain substances in particular are as long-lived as PFOA and can easily contaminate water bodies due to their mobility. Furthermore, the short-chain compounds are also technically uncontrollable in treatment with activated carbon. A consistent ban on PFAS substances would make the use of highly engineered treatment processes obsolete in the medium to long term.

3. From the point of view of climate protection, it is not expedient to continue to increase the technology used in treatment, because this would ultimately lead to a steady increase in the

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energy requirements of the plants with a significantly increasing CO2 footprint, as would also be the case, for example, with an increasing use of activated carbon.

4. At present, possible limit values of 2 ng/l for the four EFSA-PFAS discussed cannot be realised across the board for various reasons. In this respect, the cost estimate described in Table 1 is to be seen as a theoretical derivation based on the current state of knowledge and price level. It also assumes the availability of input materials at all times. In terms of risk management, the toxicological evaluation of the substances must be seen in connection with technical feasibility and, if necessary, with corresponding longer transition periods. The unilateral tightening of immission limits at the national level without limiting emissions via binding emission limits is not expedient. Furthermore, the transition periods must also be oriented to the remediation periods of the raw water resources in order not to jeopardise the safe drinking water supply.

5. In many cases, it will not be possible to simply expand an existing plant. Instead, an entire process stage including the complete structure may have to be replaced or supplemented, or hydraulic and structural constraints will have to be taken into account. This entails further additional costs for water treatment that cannot be assessed in monetary terms at present.

Theoretical cost estimation for PFAS scenarios (see appendix)

For the theoretical cost estimate, it is assumed that the treatment plants must be newly constructed to comply with these limits, which is why both operating and depreciation costs are taken into account. It can be assumed that in the future, with nationwide PFAS monitoring, the affected area could be even larger. In addition, the prices for activated carbon are likely to rise above the value assumed here in the near future, as the raw materials are more difficult to develop and the required product quantities will increase. Thus, the cost estimate made should be classified as conservative.

Scenario 1
The first scenario considers the introduction of a limit value that includes the 20 individual PFAS substances listed in the EU Drinking Water Directive and has a total concentration of 0.10 µg/l. The study showed that this would affect about 0.3 % of the raw or drinking water examined. The study showed that approx. 0.3 % of the raw or drinking water examined would be affected. Overall, it can be stated for this scenario that treatment with activated carbon can be classified as technically feasible.

Scenario 2
The second scenario refers to an assumed limit value of a sum concentration of the four EFSA-PFAS in the amount of 2.2 ng/l. Here, a concern of about 1.5 ng/l was determined. Here, an impact of about 20 % of the examined raw and drinking waters was derived. For this scenario, it should be noted that technical feasibility in treatment with activated carbon is currently not possible for various reasons. In this case, longer transition periods, such as those applied to the parameter lead in the new EU Drinking Water Directive, would have to be used to develop practical, climate- and environmentally-friendly treatment processes, which could then be transferred to actual practical operation over the necessary planning and approval periods.

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In relation to the national average drinking water tariff level, this corresponds to a price increase of around 12% for the affected supply areas. Since the charges vary greatly from region to region, in some cases there may also be price increases of well over 25 %.

Scenario 3

The third scenario refers to an assumed value of a sum concentration of the four EFSA-PFAS in the amount of 20 ng/l. In this case, the affected areas can be affected by a total concentration of 20 ng/l. The third scenario is based on the assumption of a total concentration of 20 ng/l. In this case, 0.9 % of the raw and drinking water analysed would be affected. Overall, it can be stated for this scenario that treatment with activated carbon for long-chain compounds can be classified as technically feasible to a certain extent, although in specific individual cases the necessary upgrading of the treatment plants may prove to be unfeasible.

Reverse osmosis

In the DVGW-TZW study, reverse osmosis was also considered in addition to treatment using activated carbon. This method cannot be considered, especially due to a process-related higher raw water extraction volume of 20 % under the current developments of climate change and the resulting higher water demand. Today, many water suppliers are already using up more than 90 % or more of their existing water abstraction rights. Furthermore, it can be observed that the approval authorities are increasingly limiting the withdrawal quantities for water extraction within the framework of water law approvals. Due to the expected higher demand, the public water supply needs a climate change surcharge of up to 20 % in order to be able to guarantee the level of supply security in the future. A further surcharge of 20 % for additionally required raw water for the removal of PFAS from the raw water by means of reverse osmosis is not even possible in many cases due to the high utilisation rates of the water law permits, the increasing restrictions of the licensing authorities and the expected higher demands, so that reverse osmosis is ruled out as a possible treatment process for PFAS for these reasons alone.

We are at your disposal for an in-depth discussion on the PFAS topic.

Kind regards,

Berthold Niehues
DVGW Head of Department Water Supply

Martin Weyand
BDEW Chief Executive Water/Waste Water

Appendix

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Appendix – Scenarios of additional costs for PFAS treatment

	Scenario 1 PFAS total value of 0.1 µg/l	**Scenario 2** 4 EFSA PFAS value of 0.0022 µg/l	**Szenario 3** 4 EFSA PFAS value of 0.020 µg/l	Contextual information
Affected raw water volume in m³	approx. 16 Million (0,3 %)*	approx. 1.071 Million (20 %)*	approx. 48.2 Million (0,9 %)*	Basis: Water extraction volume in 2019 of approx. 5.355 billion m³ in Germany
Activated carbon required in t/year	868	57,839	2,603	Assumption: A-coal dosage of 30 g/m³ and reduction of the running time of the A-coal by 80%
Acquisition costs activated carbon in €/year	approx. 1.74 Million	approx. 115.68 Million	approx. 5.2 Million	Assumption: gross purchase price of €2,000 per tonne of A-coal
Additional personnel costs in €/year	approx. 0.32 Million	approx. 21.42 Million	approx. 0.96 Million	Assumption: additional specific personnel costs of 2 cents/m³ raw water
Additional analytical effort to monitor the breakthrough of PFAS in €/year	approx. 0.48 Million	approx. 32.13 Million	approx. 1.45 Million	Assumption: additional specific analysis costs of 3 cents/m³ raw water
Depreciation of processing technology and buildings in €/year	approx. 1.12 Million	approx. 74.98 Million	approx. 3.37 Million	Assumption: additional specific depreciation costs of 7 cents/m³ raw water
Total costs in €/year	**approx. 3.66 Million**	**approx. 244.21 Million**	**approx. 10.98 Million**	
Total costs over a depreciation period of 20 years in €	**approx. 98.35 Million**	**Approx. 6.562 Million**	**approx. 295.04 Million**	Assumption: increase in costs of 3 % per year

* The available data of the study do not allow an allocation of the affected analyses to the actual raw or drinking water output quantities of the participating water suppliers. Therefore, the approach chosen was to extrapolate the number of affected raw or drinking waters to the water extraction volume in Germany. This is also consistent with the comparison of PFAS values from the Baden-Württemberg groundwater database.

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