



# POWERSTEP

YOUR FLUSH, OUR ENERGY

FULL SCALE DEMONSTRATION OF ENERGY  
POSITIVE SEWAGE TREATMENT PLANT  
CONCEPTS TOWARDS MARKET PENETRATION



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- **16/05/2018, POWERSTEP Conference, Munich**



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of the European Union

Grant agreement No. 641661



**POWERSTEP**

# Energetic evaluation of enhanced carbon extraction at small WWTP

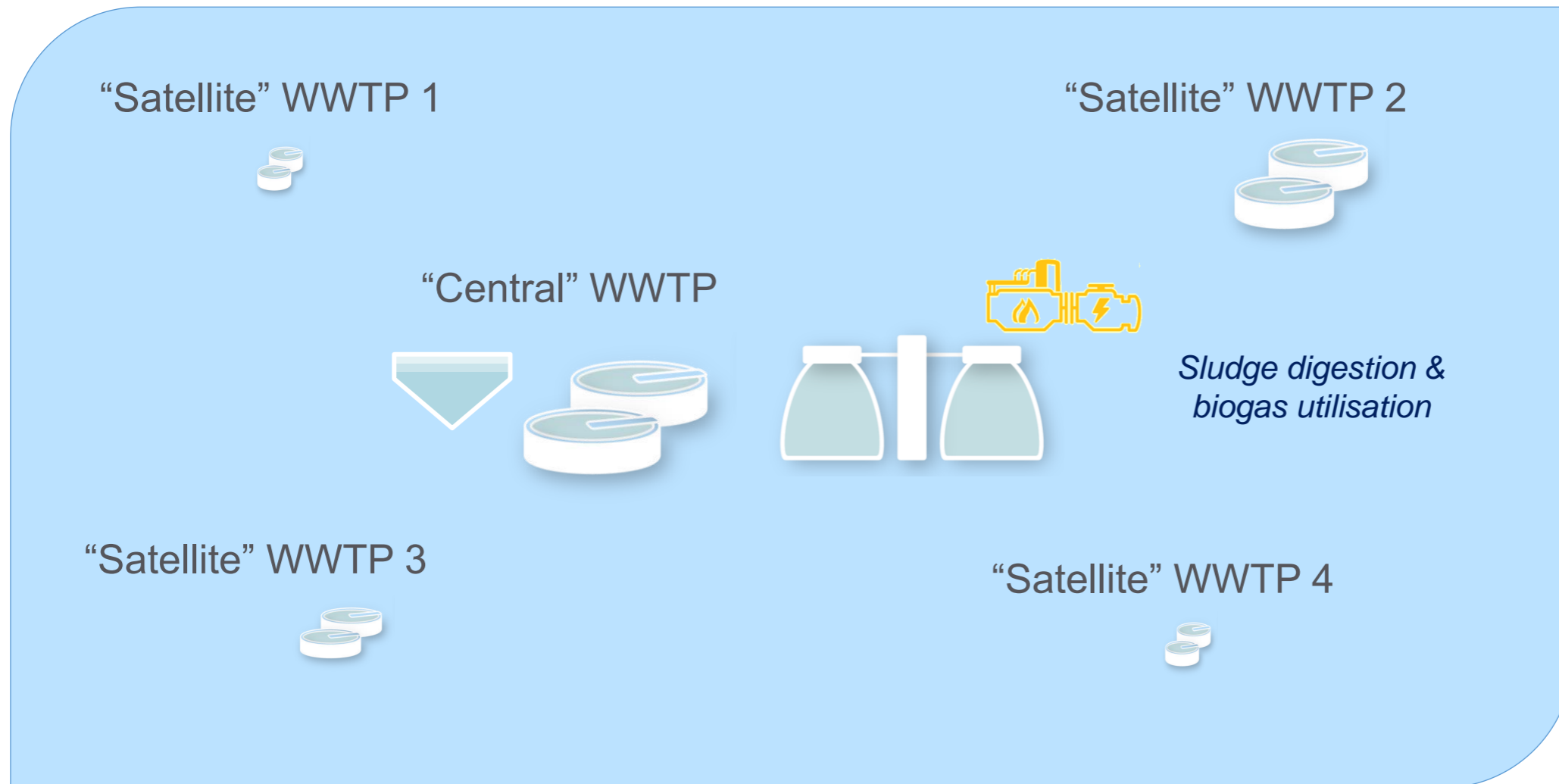




# Current situation in rural areas



*“Conventional” association for sewage treatment in rural area*



**Energy potential of wastewater is not fully tapped!**

- Usually no digestion for WWTP < 50,000 PE

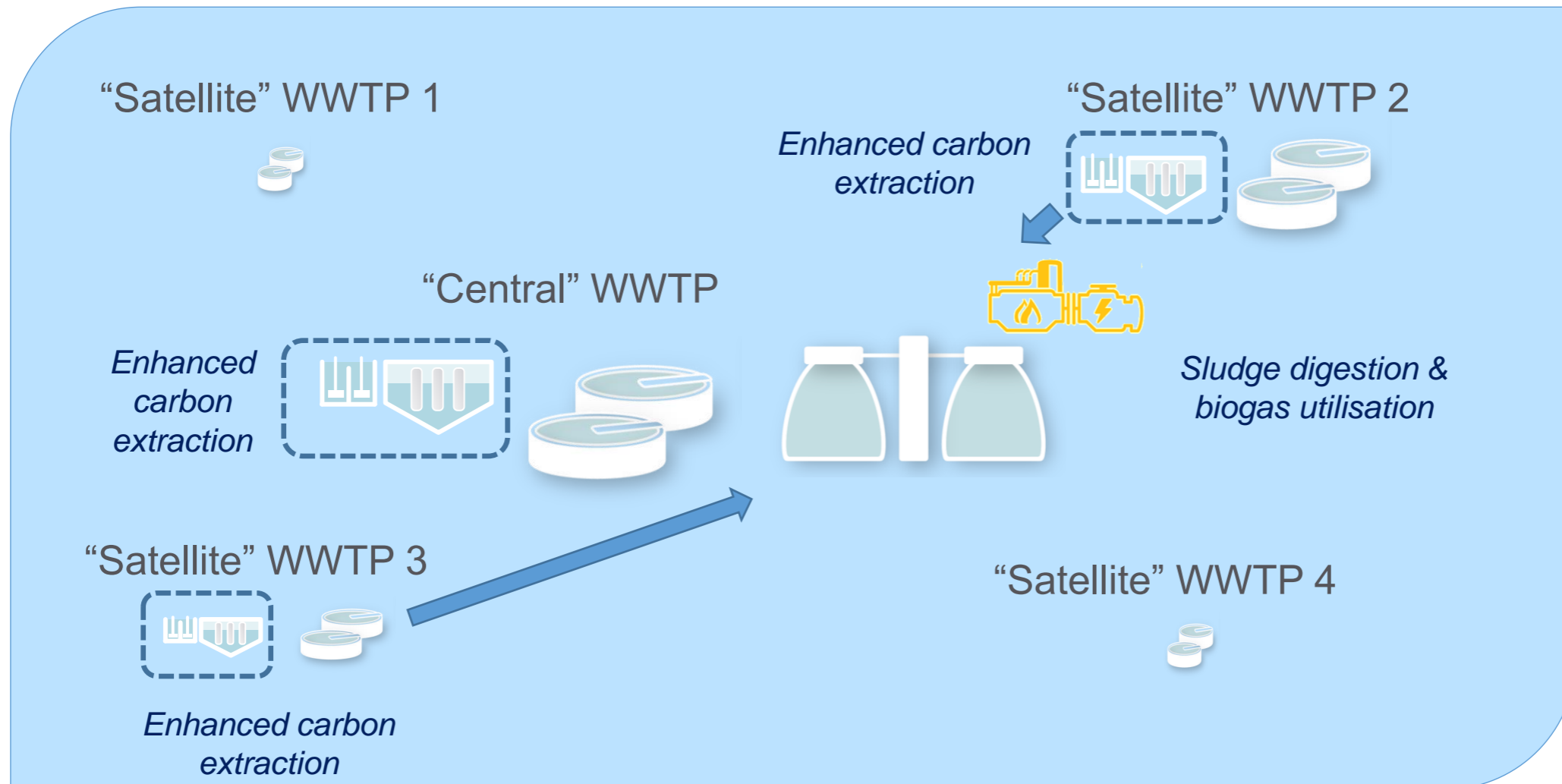




# Powerstep concept



*“Conventional” association for sewage treatment in rural area*



**Extend carbon recovery to smaller plants to produce more energy!**

- Developing global concepts within associations for sewage treatment



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# Electricity consumption at Westewitz WWTP



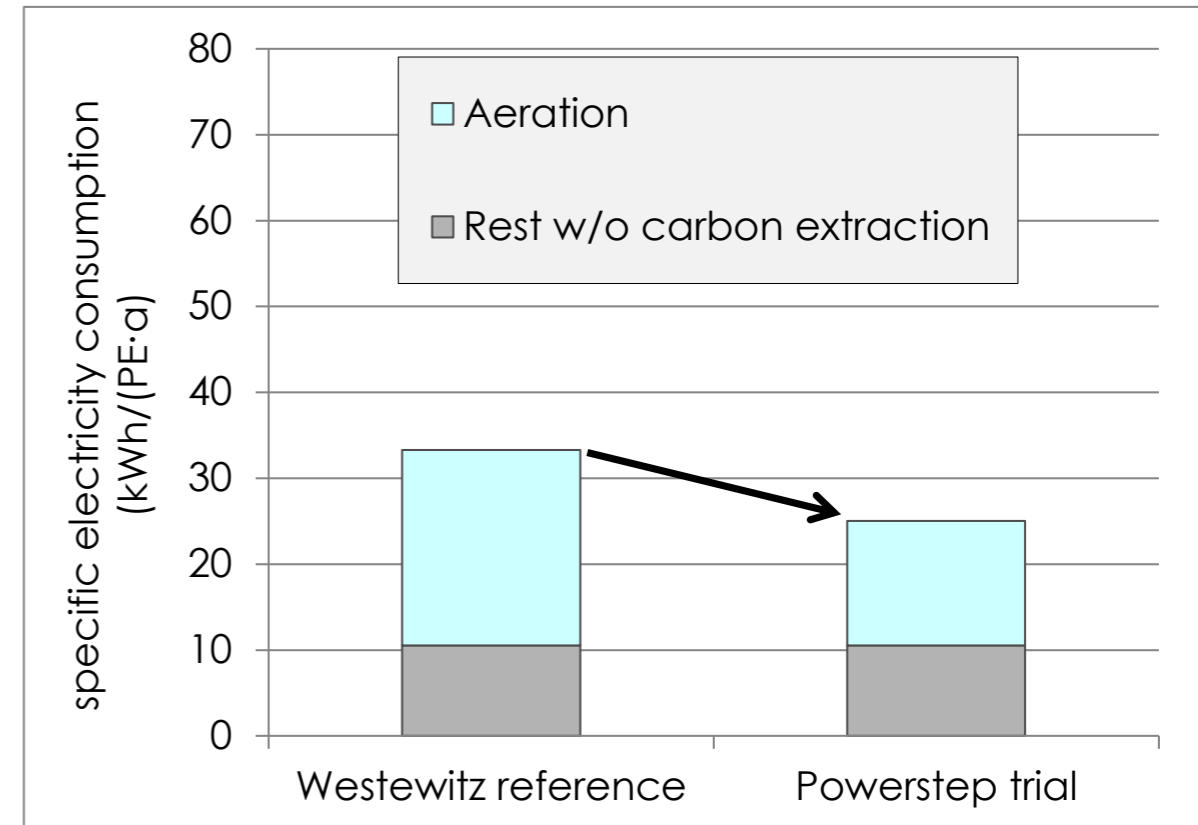
2,000 PE capacity

35 to 40% electricity savings for aeration at 50% COD removal

- *air diffusers renewal in one tank*

Potential is actually higher!

- *70% COD extraction reached*
  - *Denitrification w/o external carbon needs*
    - *Optimised SBR feeding & aeration control*
    - *High flexibility of the microsieve operation*
- *up to 45% electricity savings for aeration could be reached*





# Electricity consumption at Westewitz WWTP



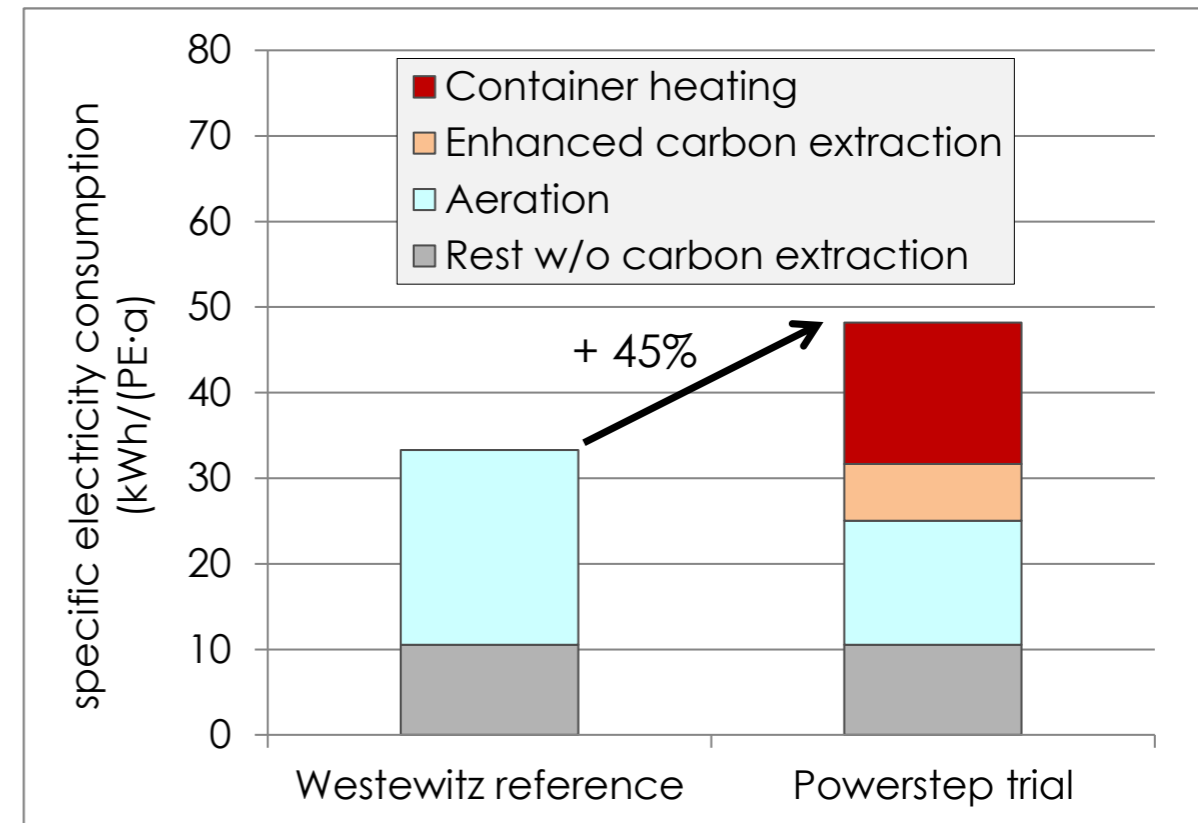
2,000 PE capacity

35 to 40% electricity savings for aeration at 50% COD removal

- *air diffusers renewal in one tank*

Electricity consumption for microsieve & chemical dosing offsets approx. 80% of the savings for aeration

- *Small mesh size (40  $\mu\text{m}$ )*
- *Only 2 chemical cleanings performed in 18 months trials*  
→ *Higher consumption for backwash*
- *Scale effect for fixed electricity consumptions (chemicals mixing)*  
→ *Higher specific electricity consumption for small WWTP*



Daily electricity consumption doubled in winter for containers heating

- *2 containers*





# Expected electricity consumption



## Avoid electricity consumption for heating

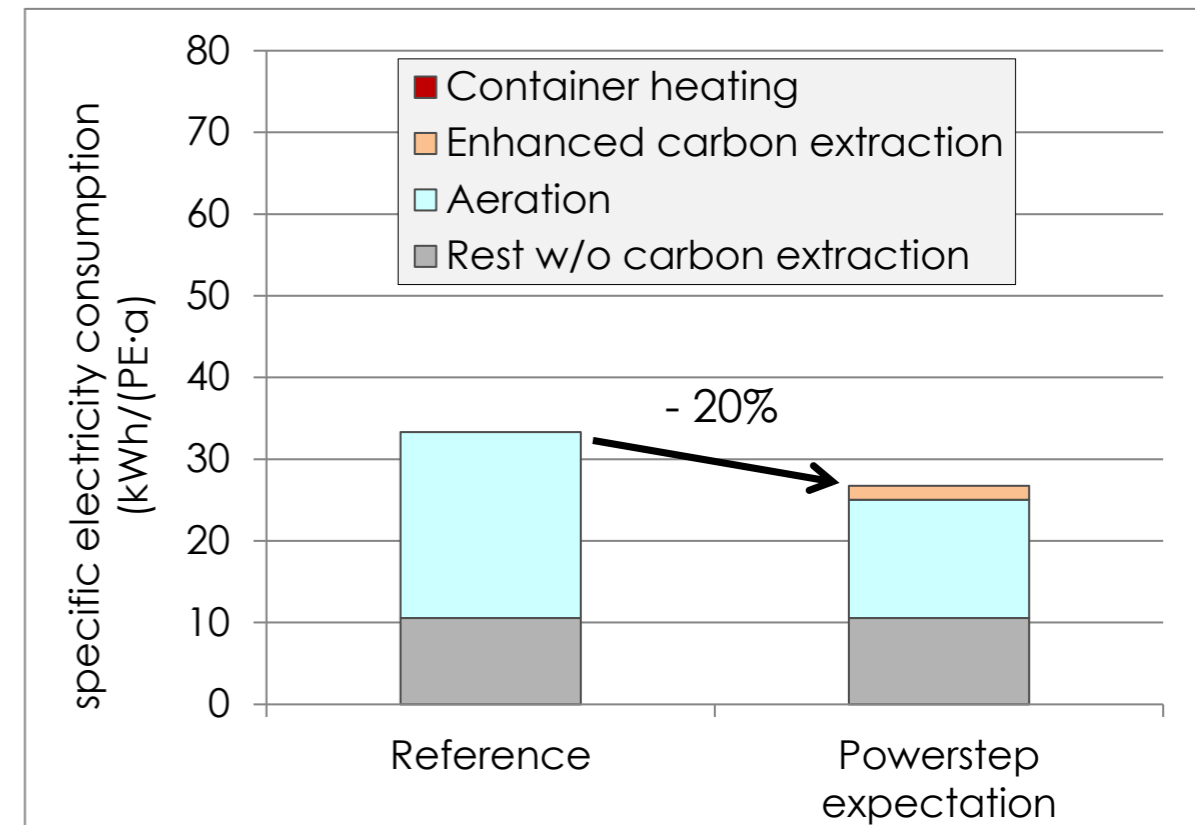
- *Lower temperature set point*
- *Normal operation with closed doors*
- *Insulation of backwash line*

## Reduce the electricity consumption for backwash

- *Operation with 100  $\mu\text{m}$  instead of 40  $\mu\text{m}$  w/ similar carbon extraction performances*
- *Regular chemical cleaning*

## Targeted WWTP > 10,000 PE capacity & low distance to central WWTP

- *Limit scale effect for fix consumers  $\rightarrow$  lower specific electricity consumption*
- *Limit sludge transport costs*



$\rightarrow$  Only 10 Wh/m<sup>3</sup> electricity consumption for microsieve

- *calculated according to backwash estimations*





# Global electricity balance at association level



## Required conditions at the central WWTP

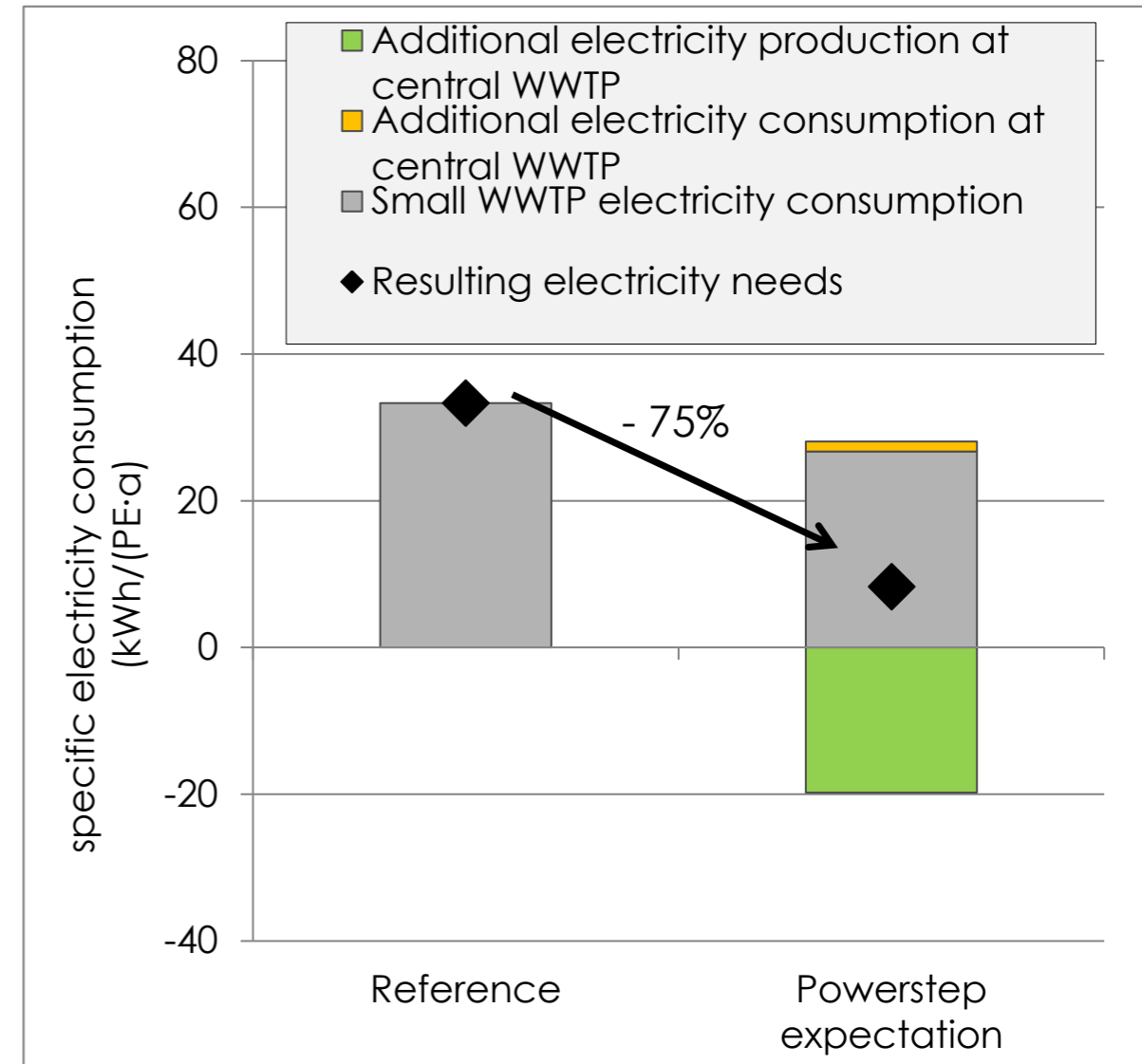
- *Sufficient digestion volume*
- *Sufficient biogas utilisation capacity*
- *Sufficient wastewater treatment capacity for the additional sludge water*

## Assumptions for calculation of the additional electricity production

- *95% biogas utilisation in CHP*
- *35% electricity efficiency*

## Assumptions for the calculation of the additional electricity consumption

- *Sludge dewatering*
- *Sludge water treatment*



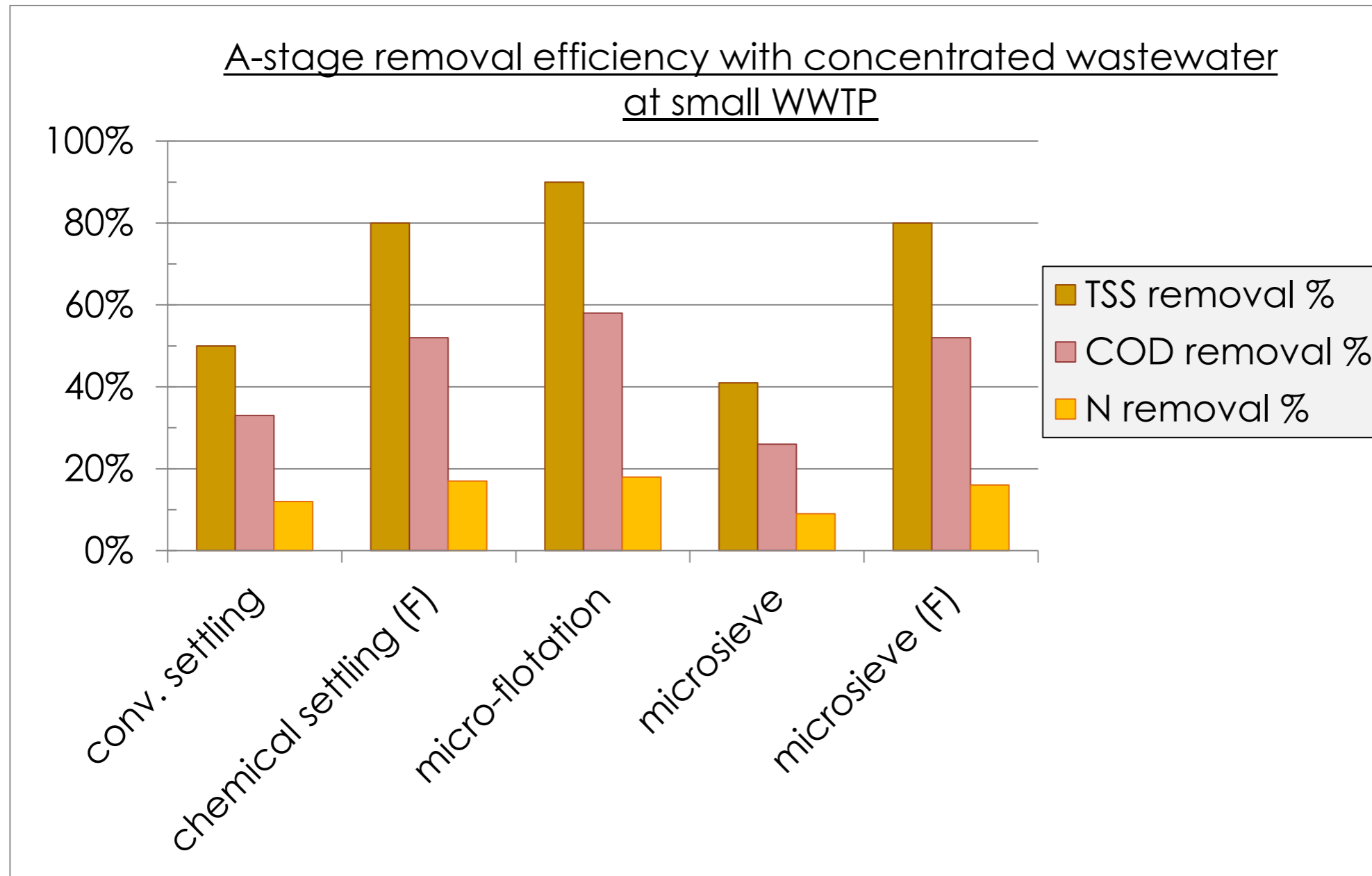
**75% electricity savings!**







# Comparison with other technologies



(F): flocculation (polymer dosing)

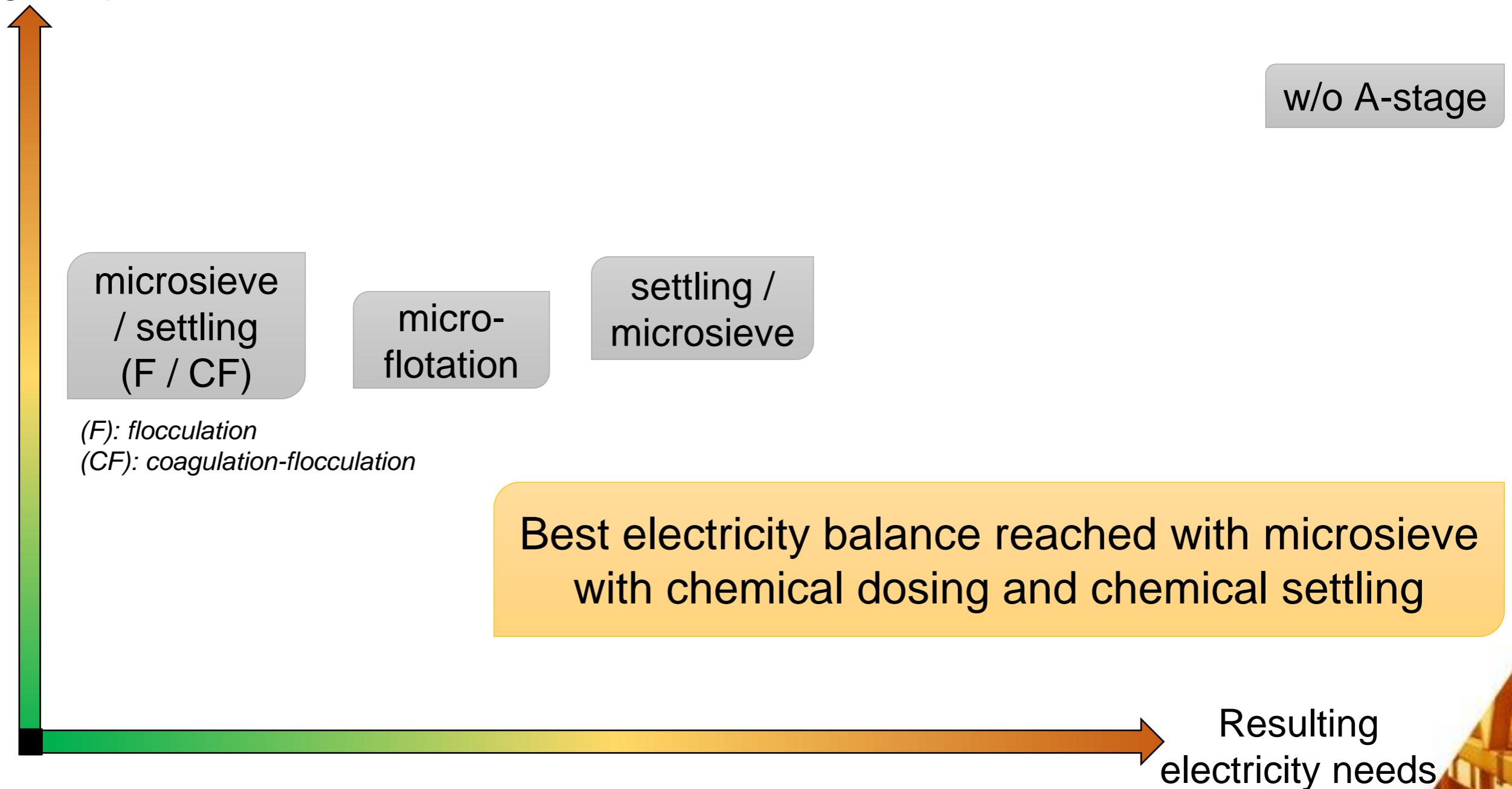




# Comparison with other technologies



Consumables &  
sludge disposal costs





# Take home messages



✓ WWTP capacity > 10,000 PE

✓ Short distance to central WWTP

✓ “Central” WWTP with digestion and free capacity (volume, biogas utilisation, sludge water treatment)



## **POWERSTEP** can be an option for small WWTP!

Significant electricity production potential for the association  
*Up to 75% of the electricity consumption at the small WWTP*

Selection of the carbon extraction technology:

- ✓ Cost-benefit analysis
- ✓ Footprint constraints
- ✓ Flexible performances

Recommendations for microsieve use

- ✓ 100 µm microsieve
- ✓ Regular chemical cleaning
- ✓ Insulate backwash line
- ✓ avoid heat consumption for chemical dosing





# Acknowledgement



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