



POWERSTEP

YOUR FLUSH, OUR ENERGY

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



- *Damien Cazalet*
- *Veolia Germany*
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POWERSTEP

Energetic evaluation of enhanced carbon extraction at small WWTP

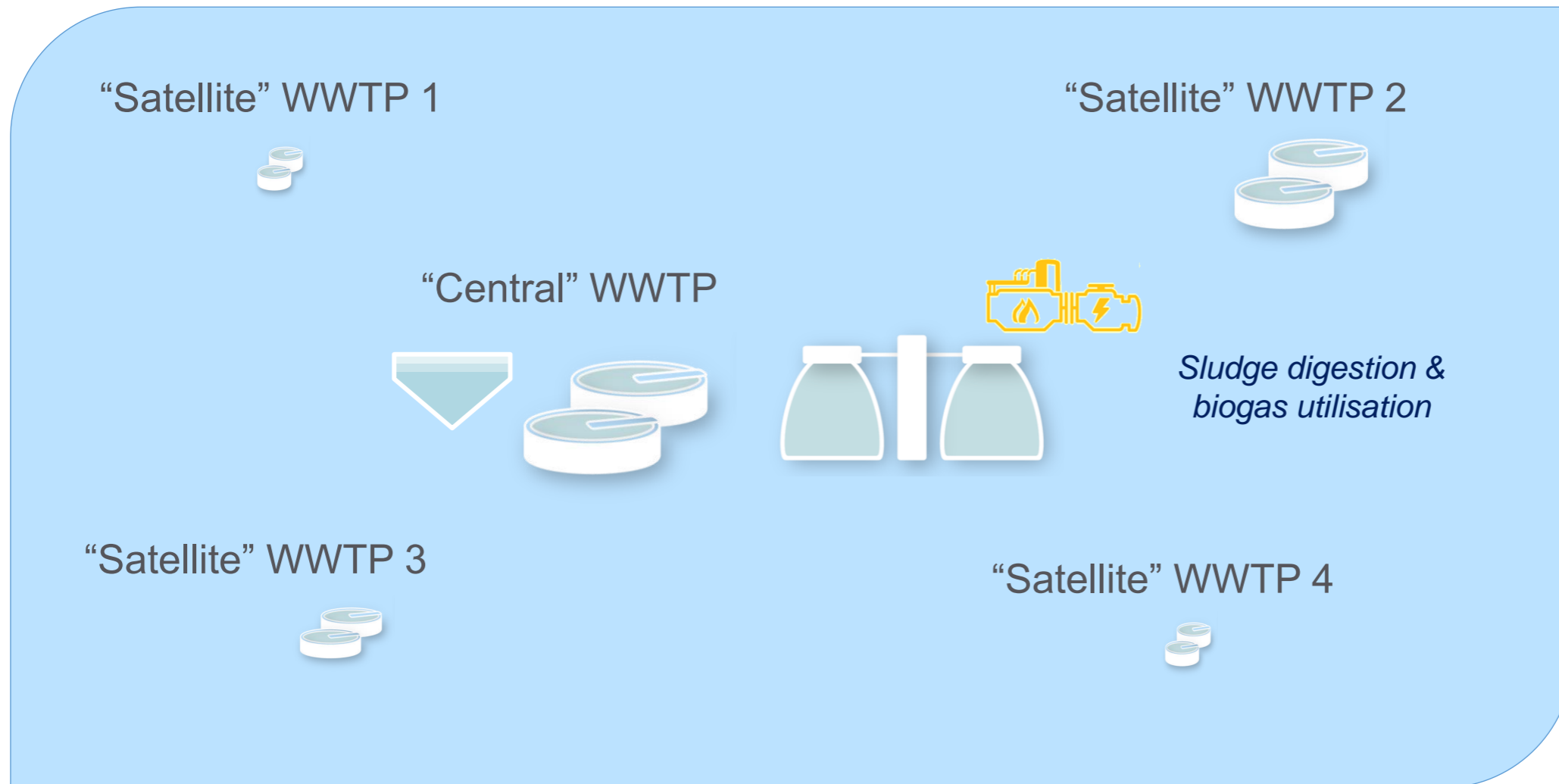




Current situation in rural areas



“Conventional” association for sewage treatment in rural area



Energy potential of wastewater is not fully tapped!

- Usually no digestion for WWTP < 50,000 PE

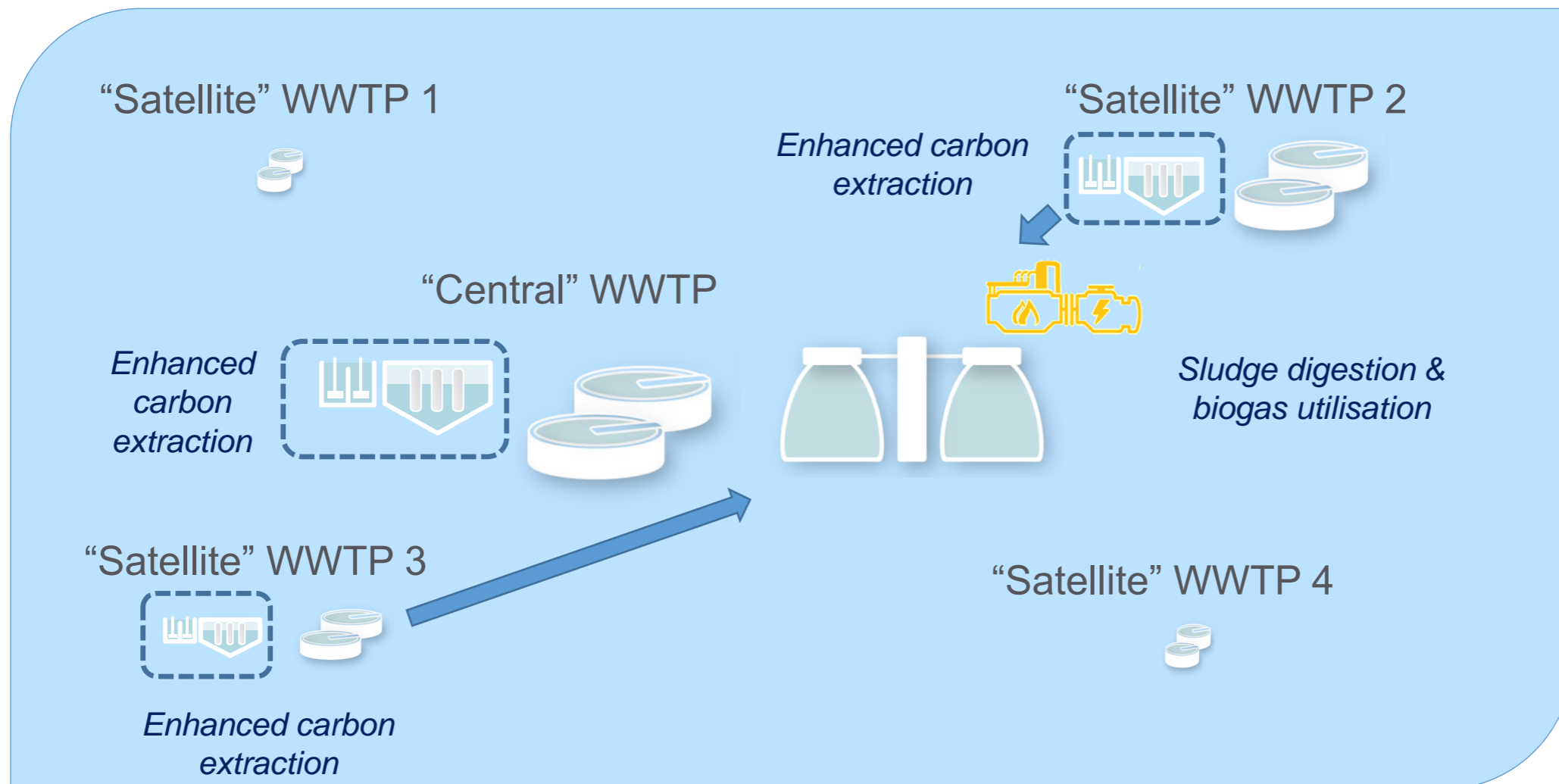




Powerstep concept



“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



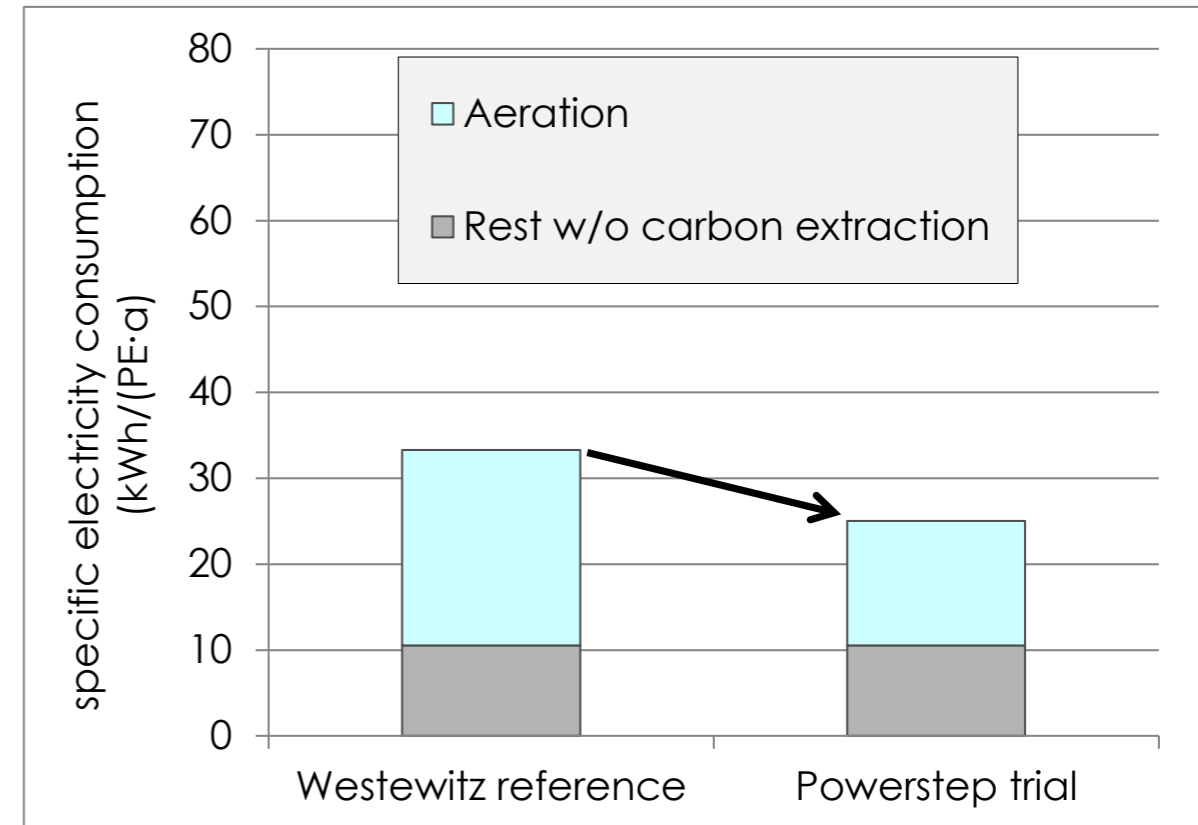
2,000 PE capacity

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



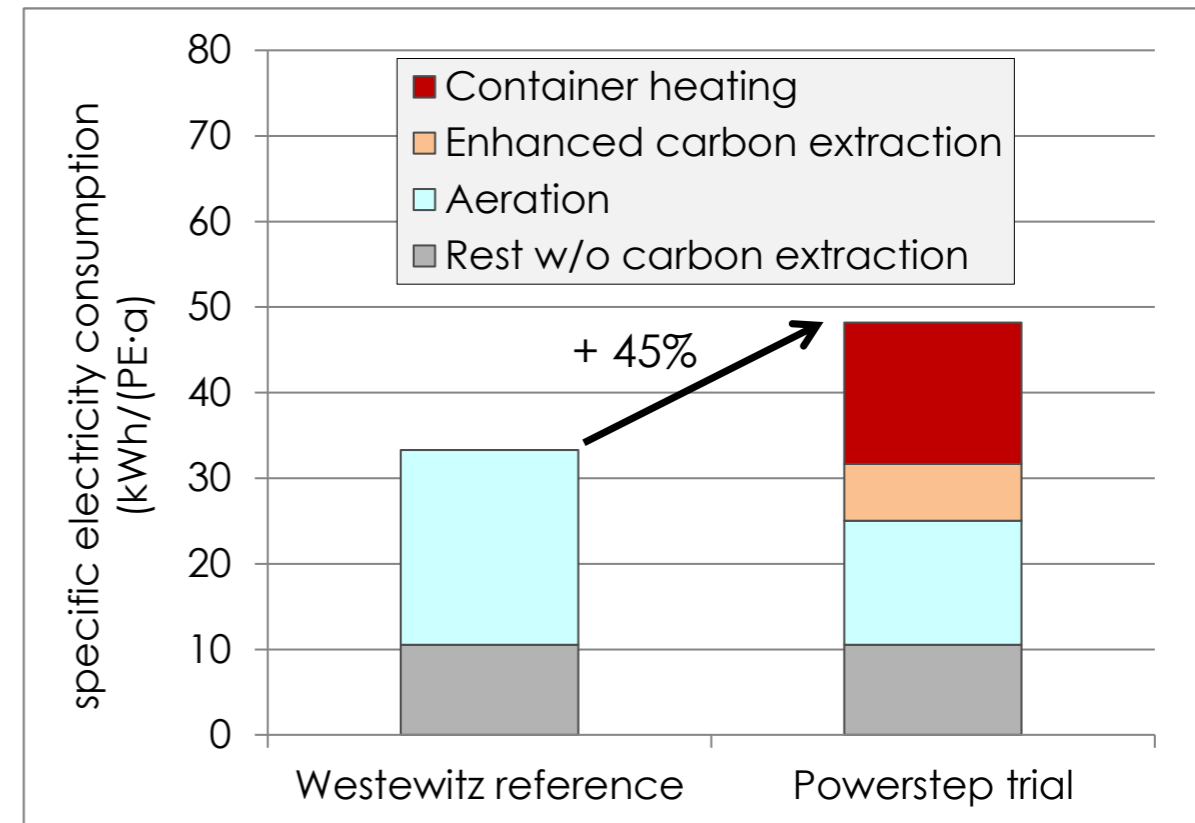
2,000 PE capacity

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 μm)*
- *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

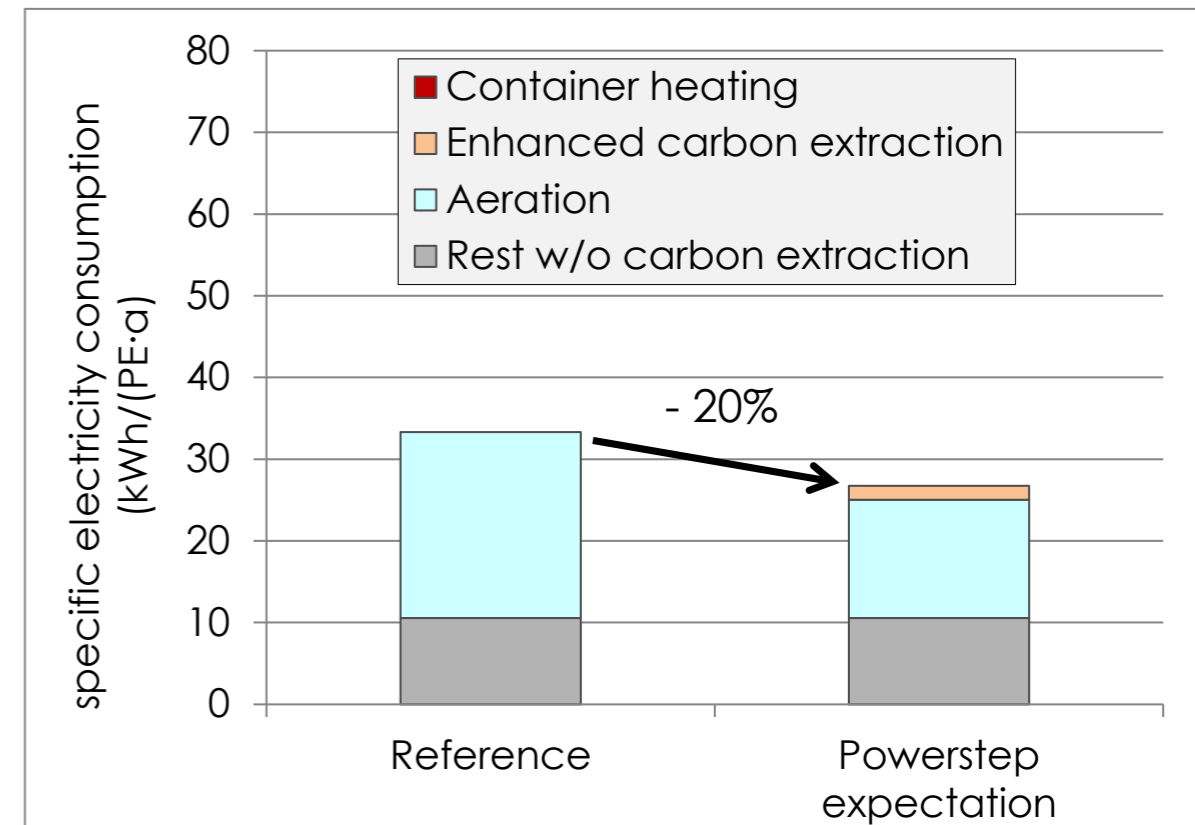
- *Lower temperature set point*
- *Normal operation with closed doors*
- *Insulation of backwash line*

Reduce the electricity consumption for backwash

- *Operation with 100 μm instead of 40 μm 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/m³ electricity consumption for microsieve

- *calculated according to backwash estimations*





Global electricity balance at association level



Required conditions at the central WWTP

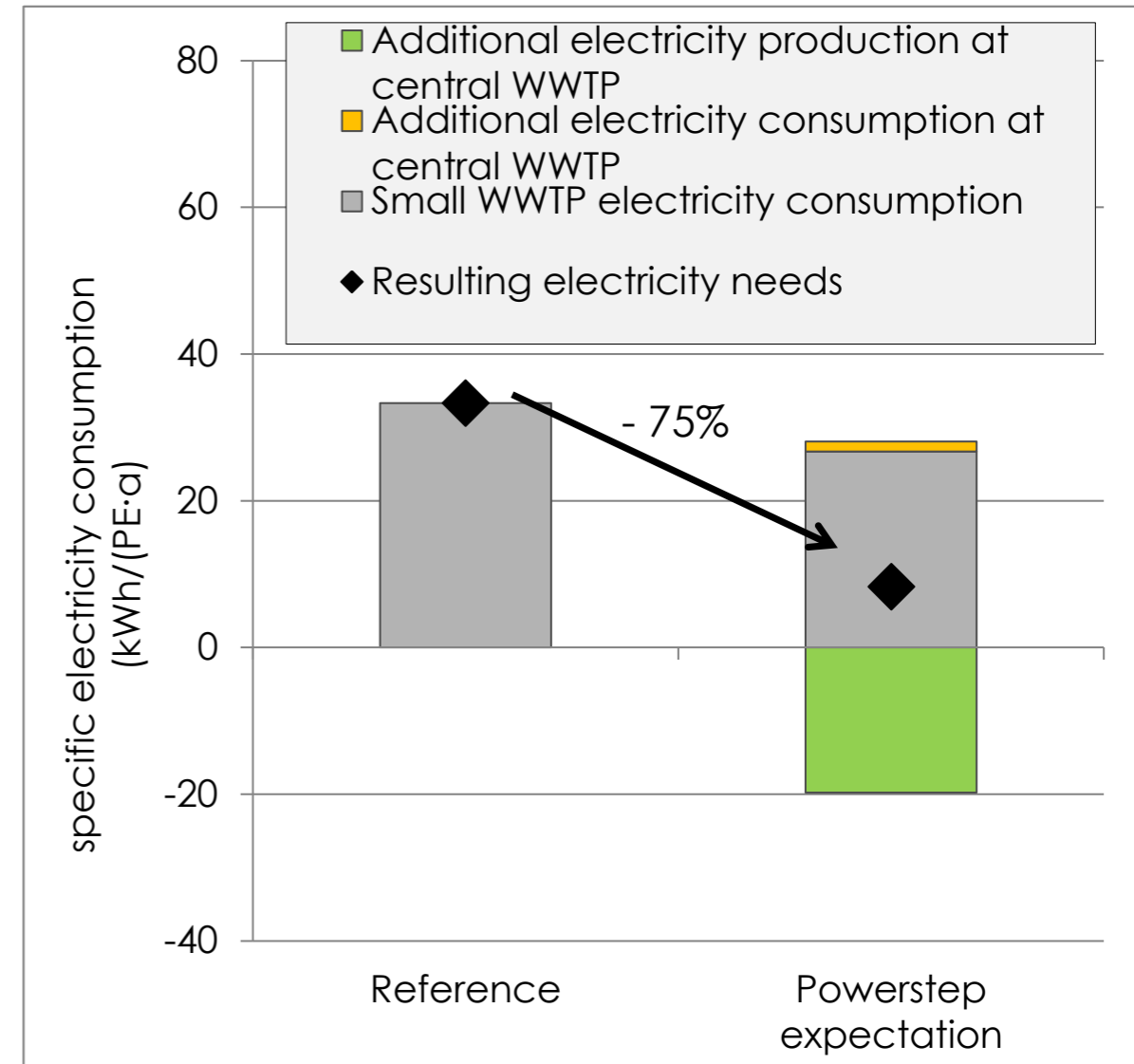
- *Sufficient digestion volume*
- *Sufficient biogas utilisation capacity*
- *Sufficient wastewater treatment capacity for the additional sludge water*

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*

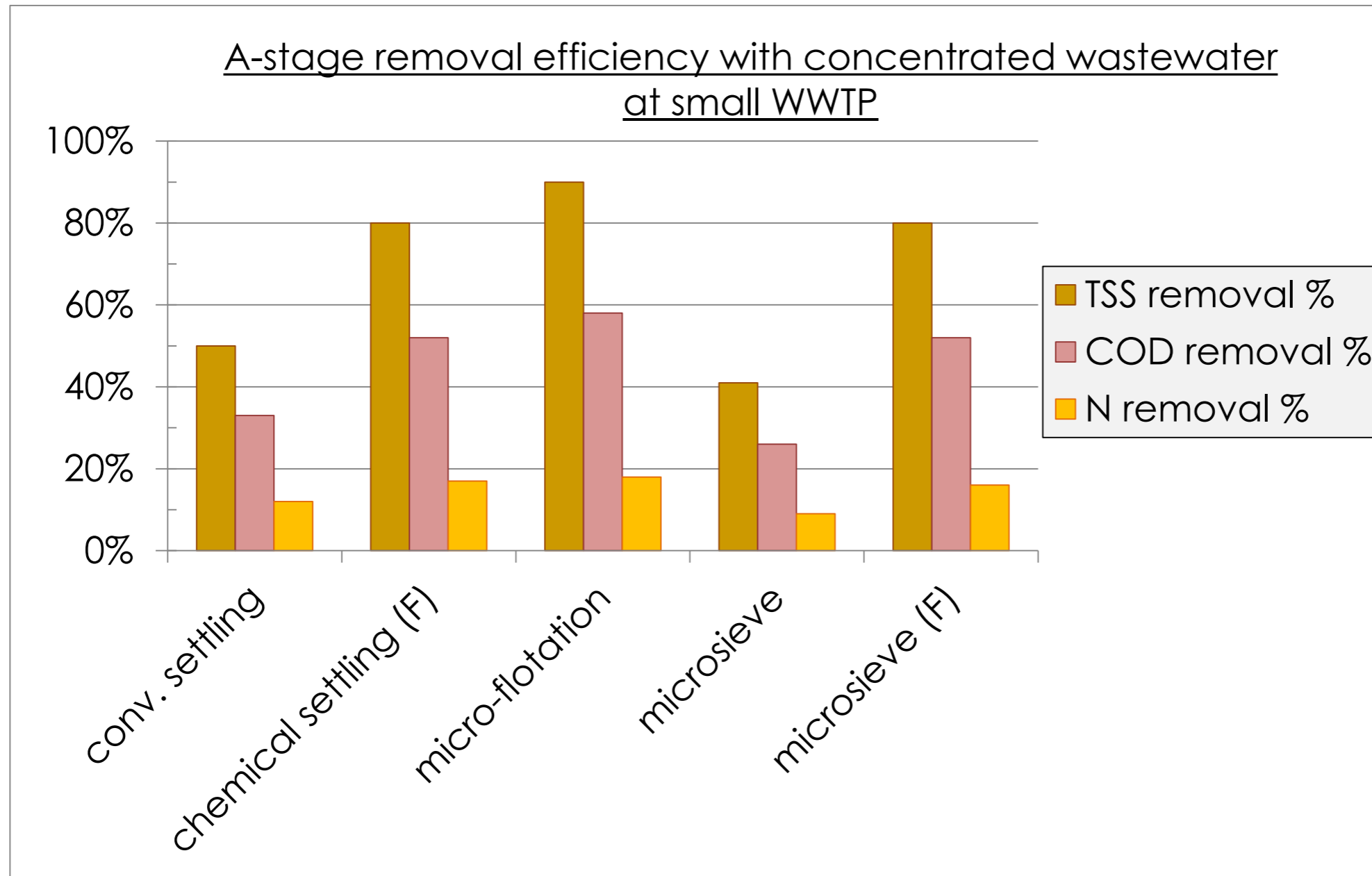


75% electricity savings!





Comparison with other technologies



(F): flocculation (polymer dosing)

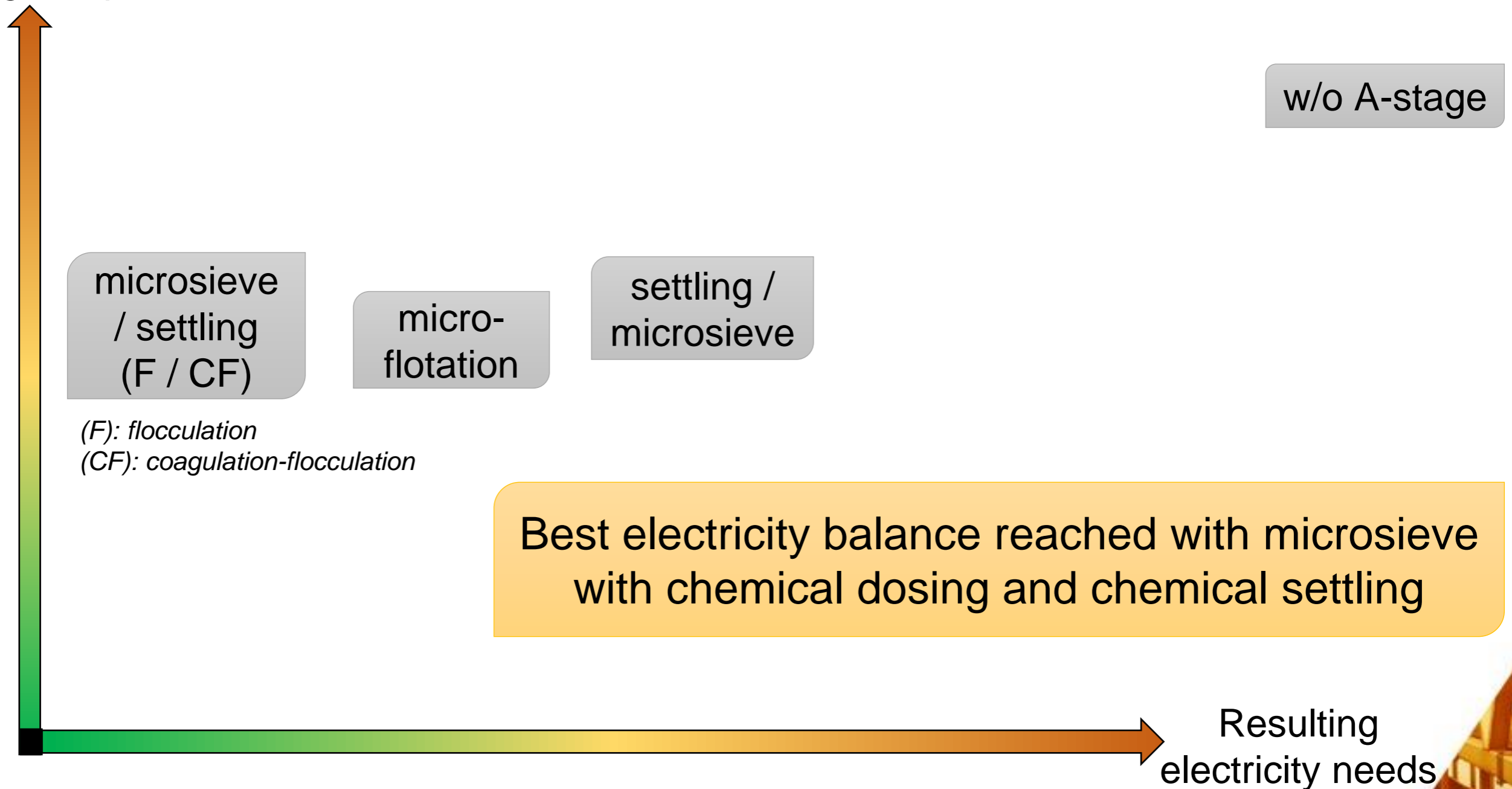




Comparison with other technologies



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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www.powerstep.eu



- Damien Cazalet
- *Veolia Germany*
- damien.cazalet@veolia.com



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