RE-USING DIALYZERS & DIALYSATE

Two Technologies to Help Reduce the Eco-Footprint

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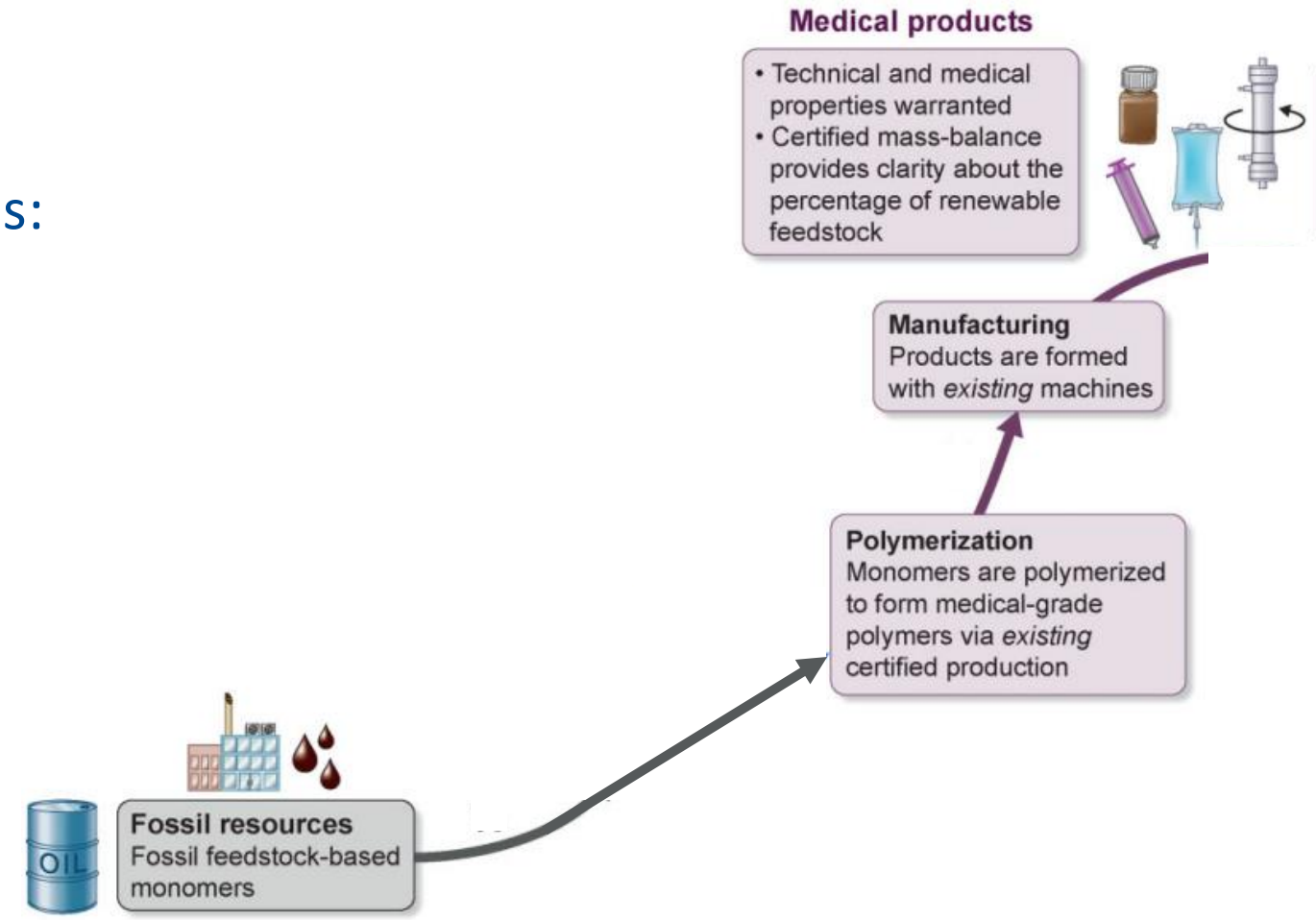
DISCLOSURES

- I am a Medical Technologist, not an MD or RN
- Co-Inventor (not owner) of several patents regarding chip-based hemodialysis filters
- Contracted Technology Advisor to NextKidney
- No Financial Interest in Clearflux Technologies, but via the KitNewCare Eu-project will work with their technology at UMC Utrecht

PLASTICS

Manufacturing takes:

- Feedstock
  - Fossil



Highest up in the chain has highest value

The European Green Deal and nephrology.
Vanholder *et al.* https://doi.org/10.1093/ndt/gfac160

PLASTICS

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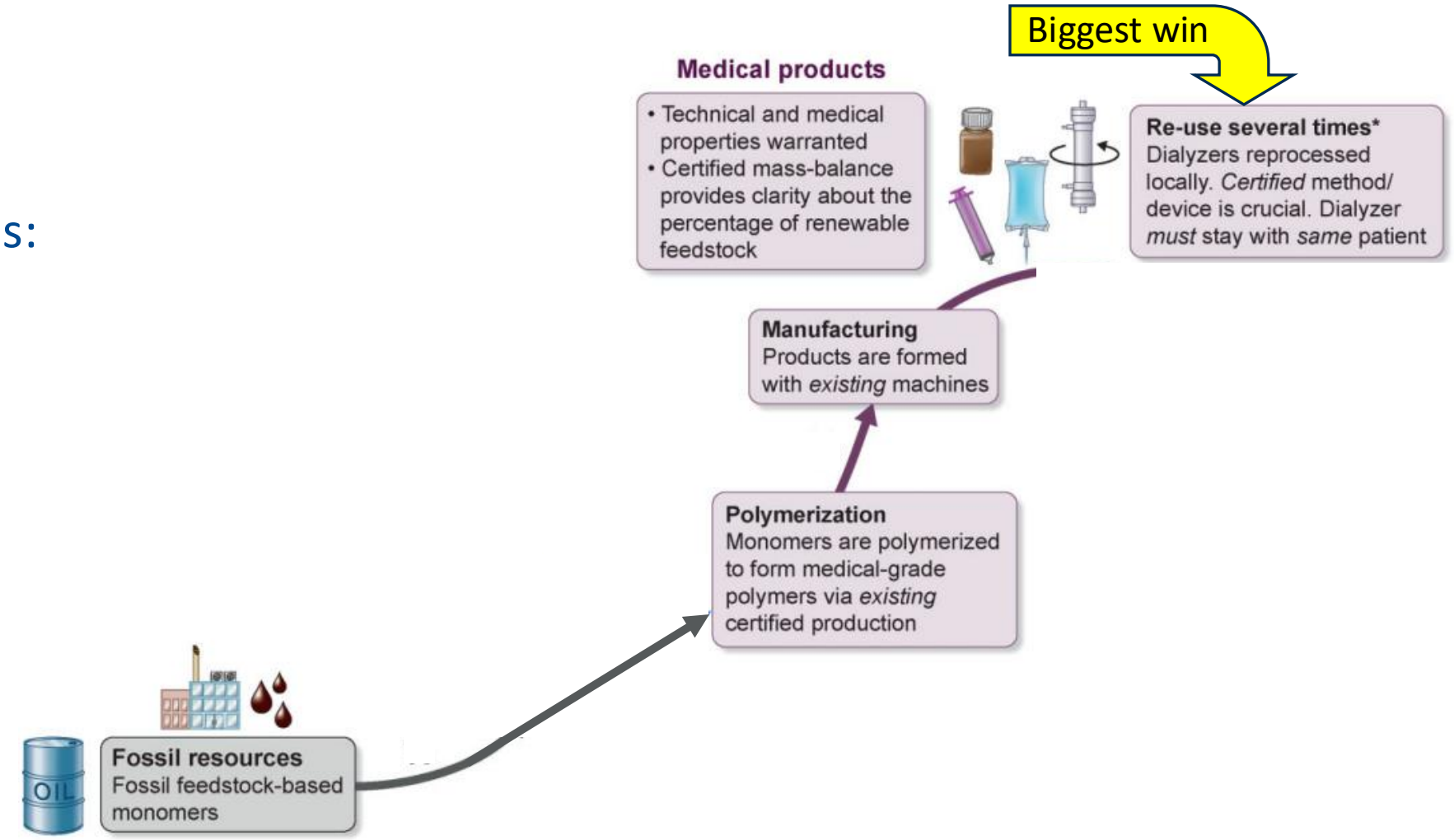

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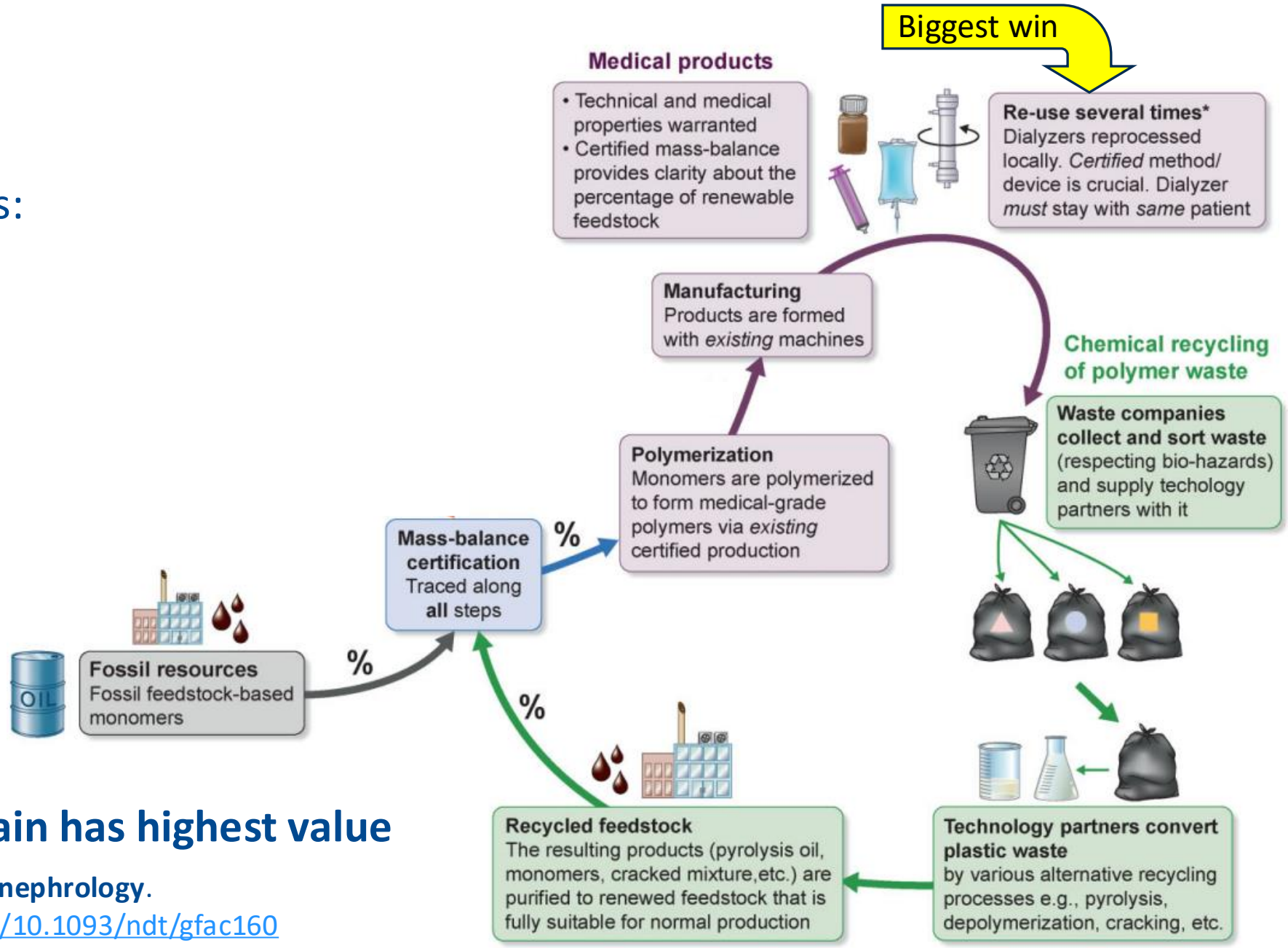
PLASTICS

Manufacturing takes:

- Feedstock
  - Fossil
  - Recycled



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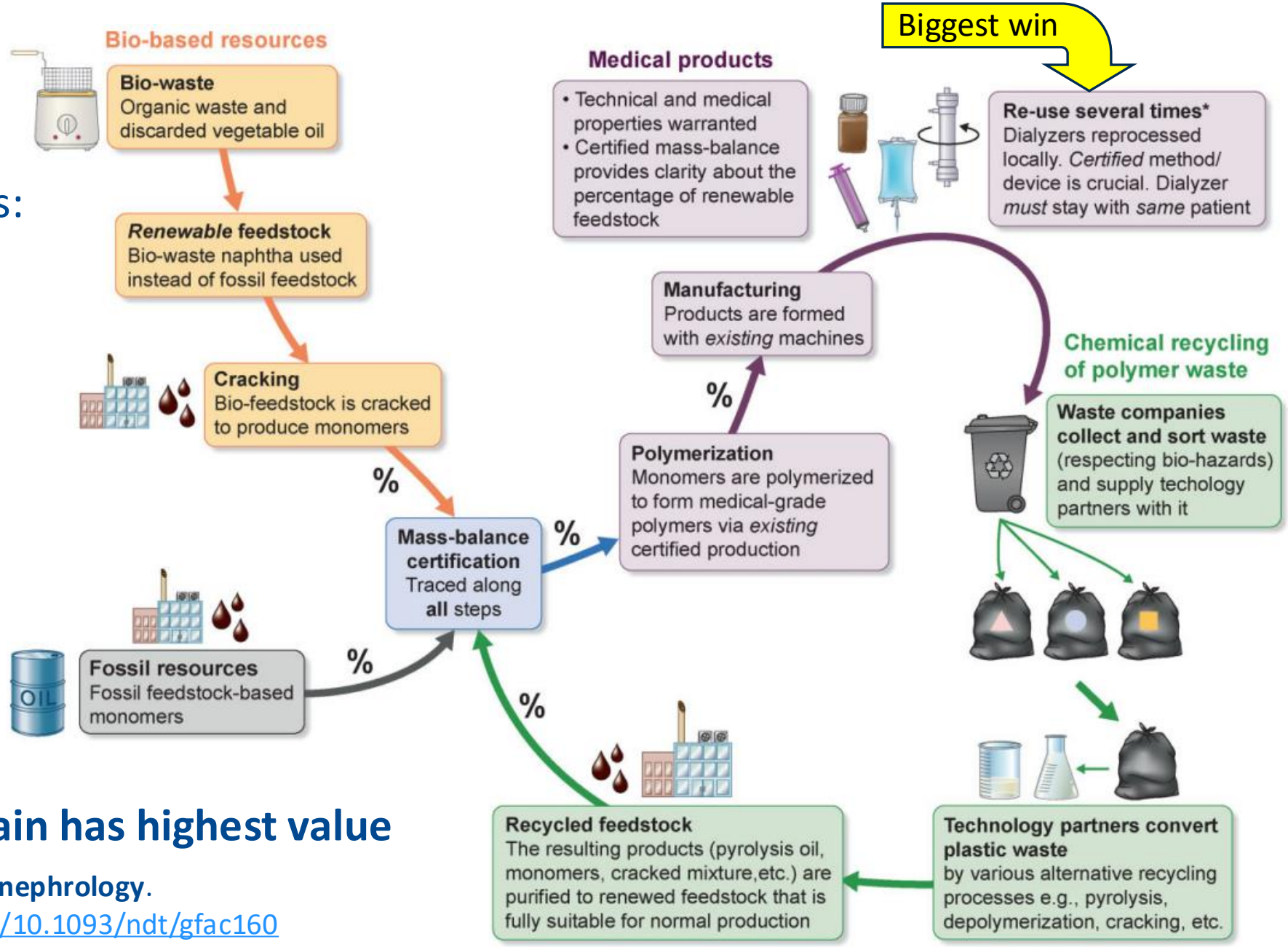
PLASTICS

Manufacturing takes:

- Feedstock
  - Fossil
  - Recycled
  - Renewable



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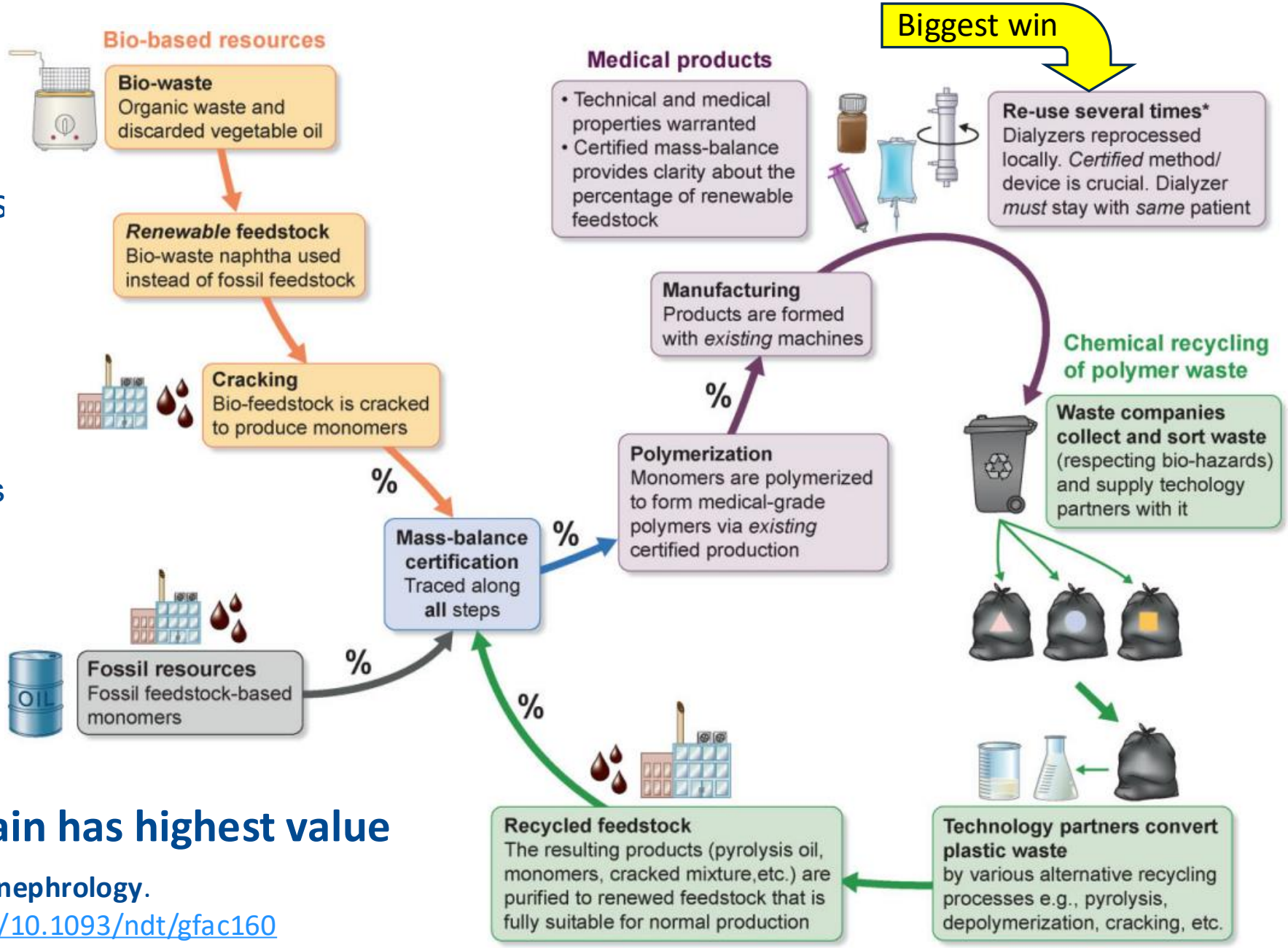
PLASTICS

Manufacturing takes

- Feedstock
  - Fossil
  - Recycled
  - Renewable
- Water

  Note: making plastics also costs water
- Energy
  - Making
  - Sterilization
  - Transportation



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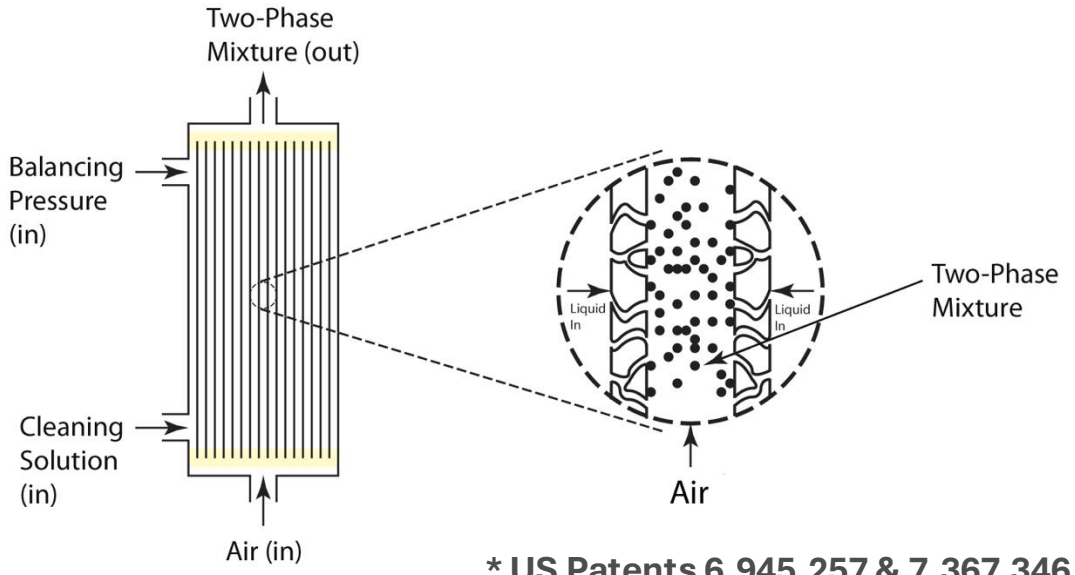
FDA-certified Dialyzer Reprocessing Already Exists Why Don't We Use It Then?

- Up to 40x reprocessing of Dialyzers
- In Situ Two-Phase-Flow ("active foam") cleaning inside Fiber Lumens

ClearFlux Machine
Source: https://www.novaflux.com/clearflux-1

Water consumption per cycle: 10L
Last step peracetic acid & water flush



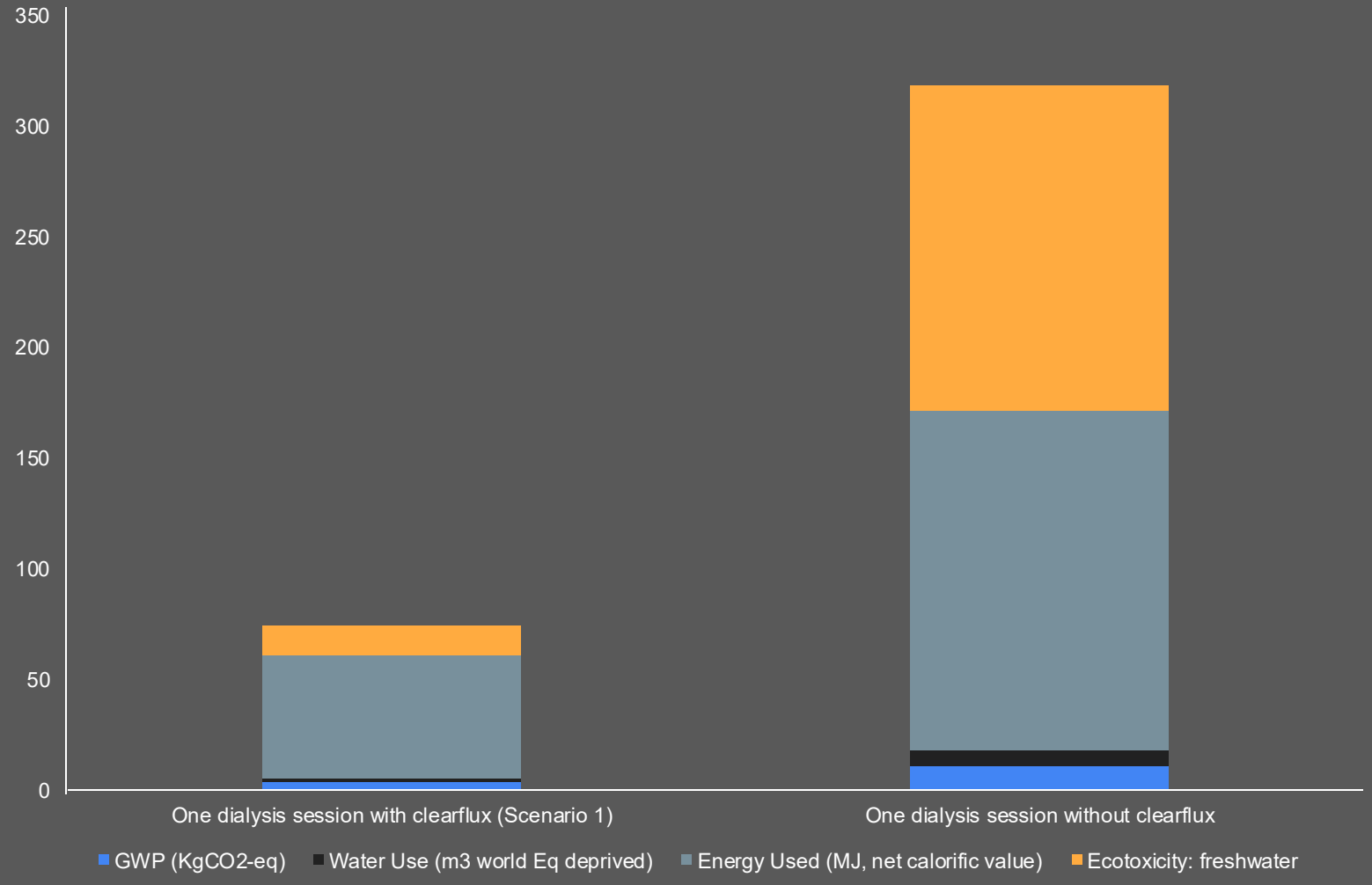
*** US Patents 6,945,257 & 7,367,346**

LCA

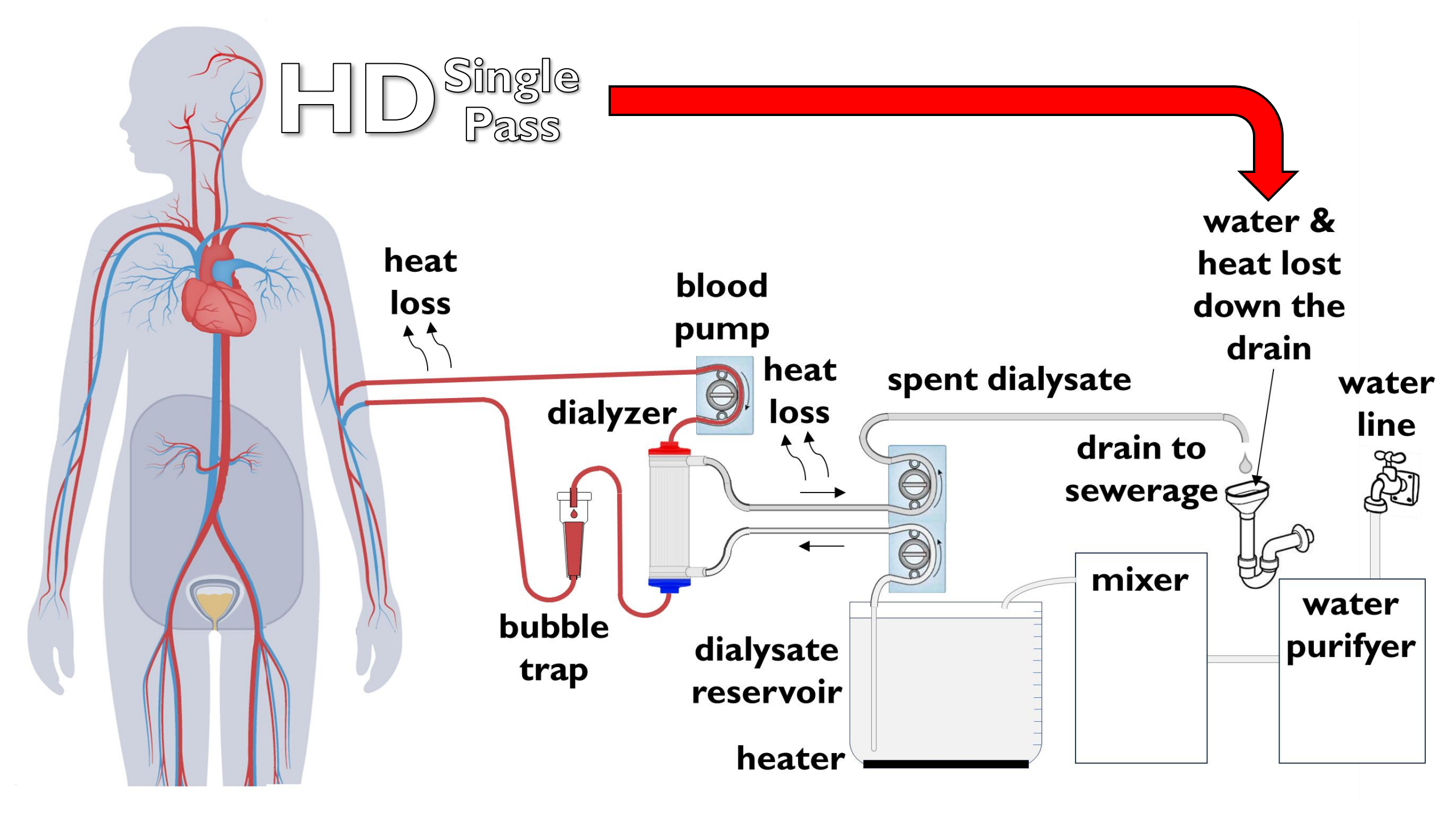
Dr. Hafsah Hachad
Physician/ PhD candidate

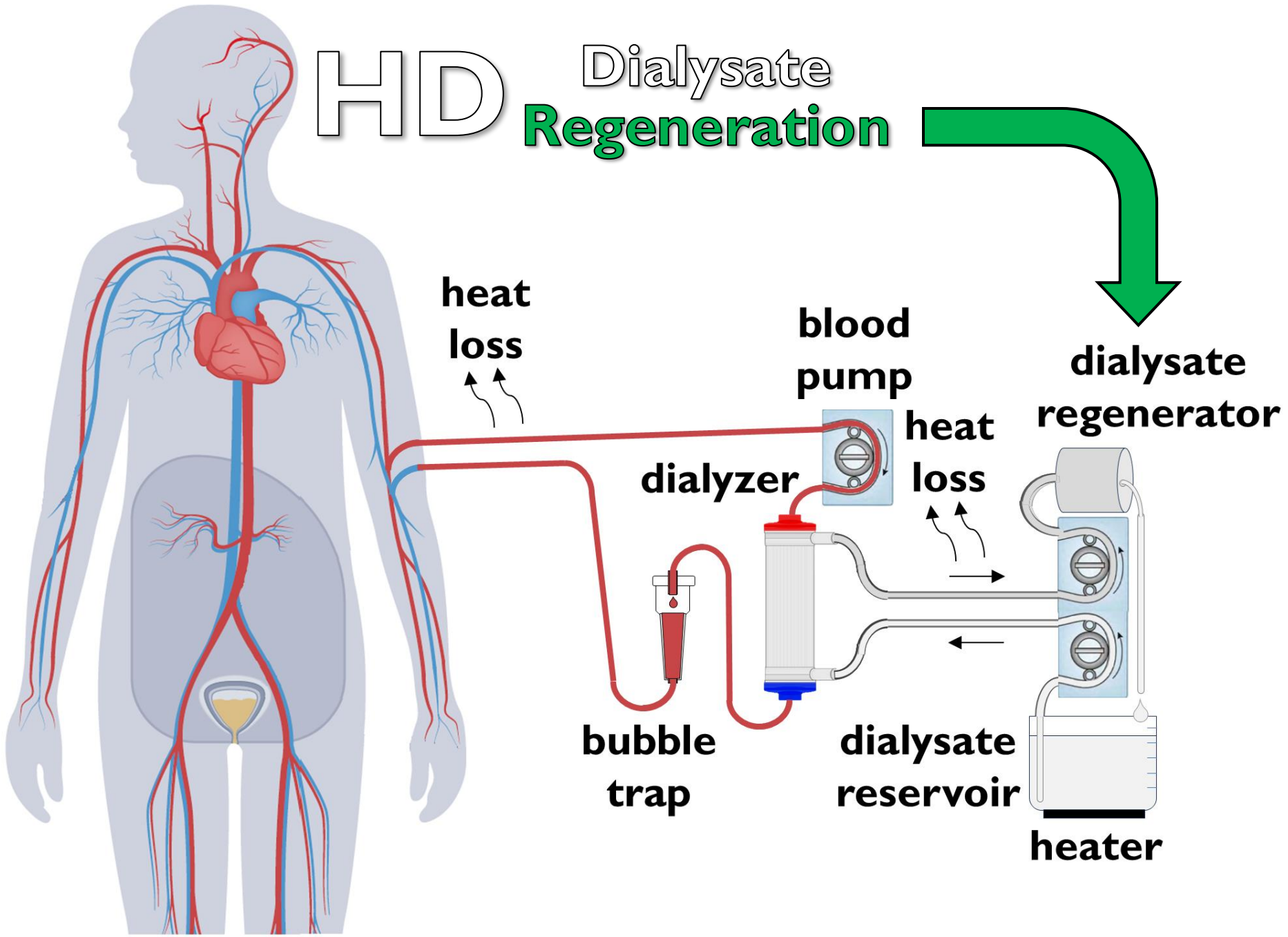
Abass Fehintola
PhD student

Impact assessment Result of One dialysis session with ClearFlux (Scenario 1) and without ClearFlux



- **Global Warming Potential (GWP, kgCO2-eq): ↓69.3%**
- **Water Use (m³ world Eq deprived): ↓ 77.8%**
- **Energy Used (MJ, net calorific value): ↓ 63.6%** savings
- **Ecotoxicity: Freshwater ↓ 91.1**

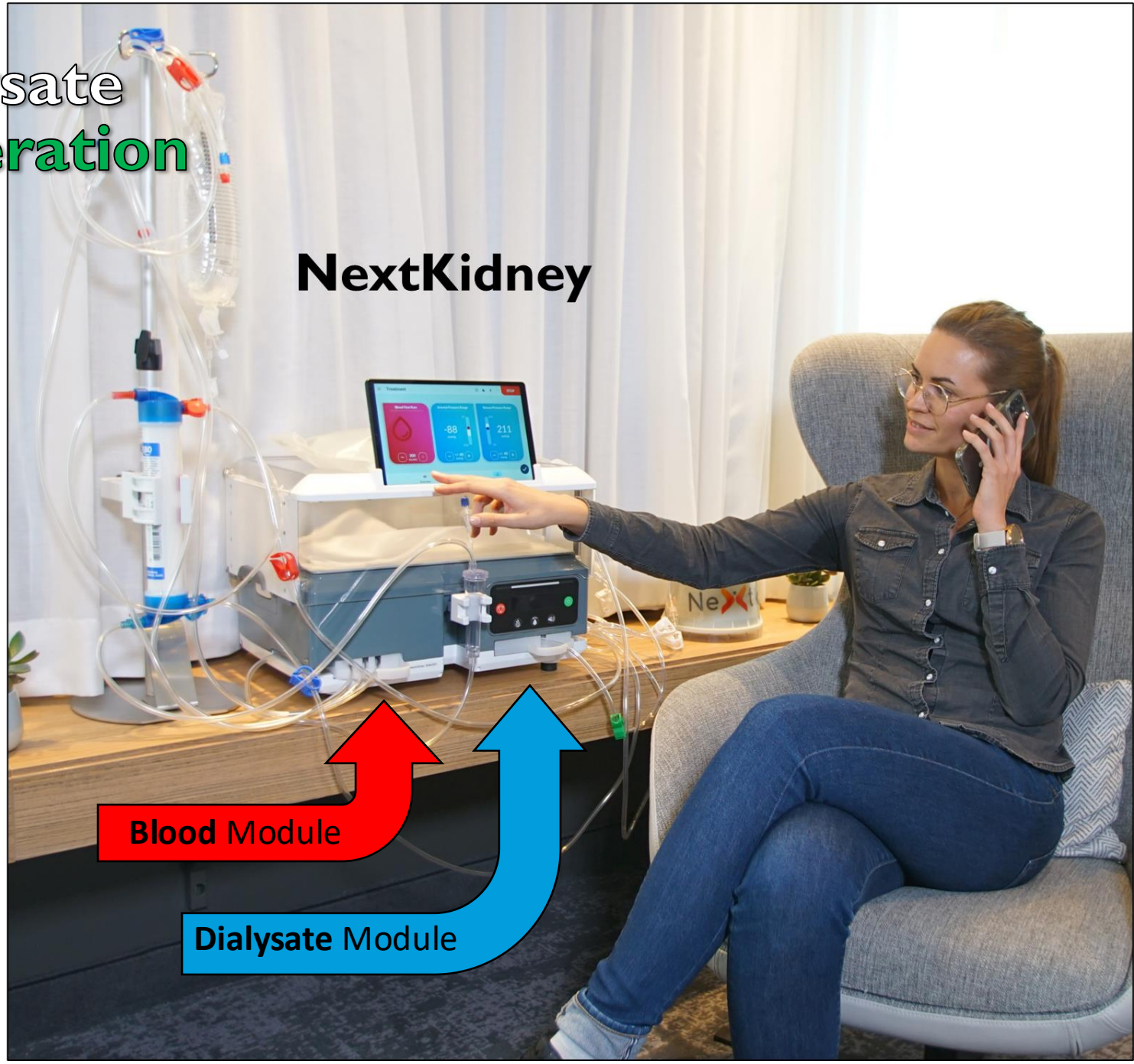

HD
Single Pass
heat loss
blood pump
heat loss
dialyzer
spent dialysate
water & heat lost down the drain
water line
drain to sewerage
mixer
water purifyer
bubble trap
dialysate reservoir
heater

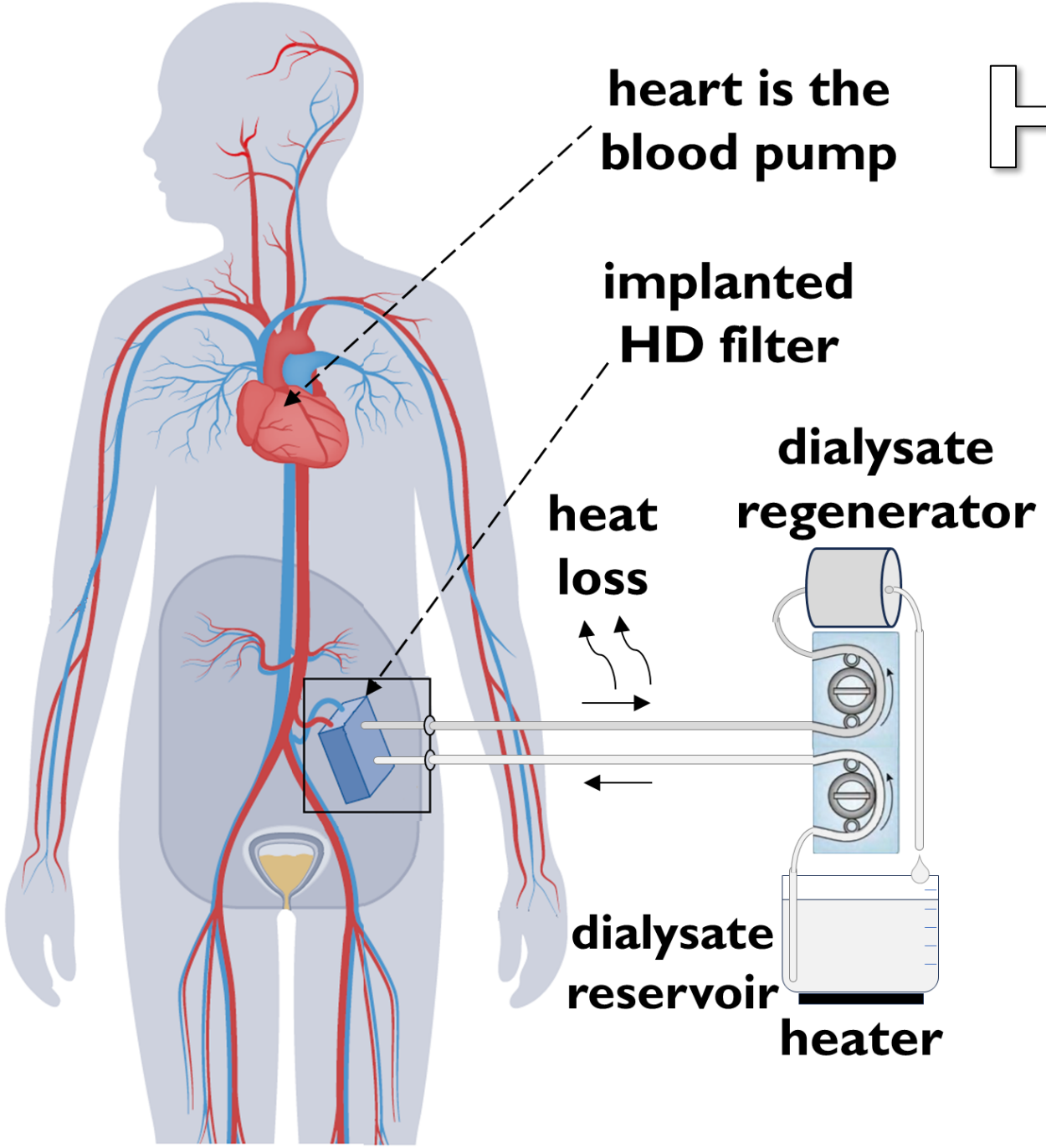

HD
Dialysate
Regeneration
heat
loss
blood
pump
dialysate
regenerator
heat
loss
dialyzer
bubble
trap
dialysate
reservoir
heater

HD Dialysate Regeneration

V2.0

V3.0

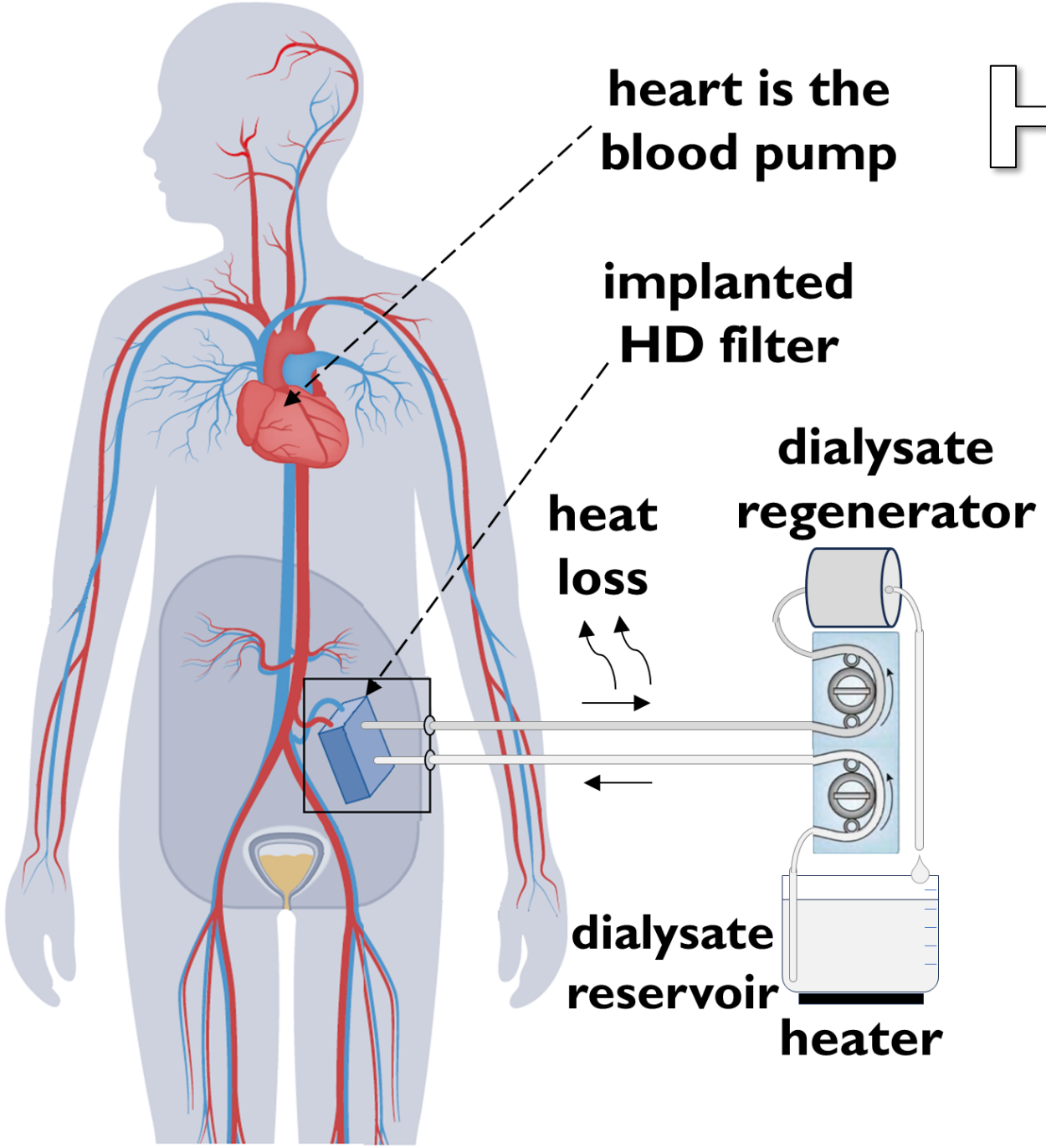




HD Without Needles !!

Implanted Dialyzer

Only Dialysate Circuit
is Extracorporeal ...



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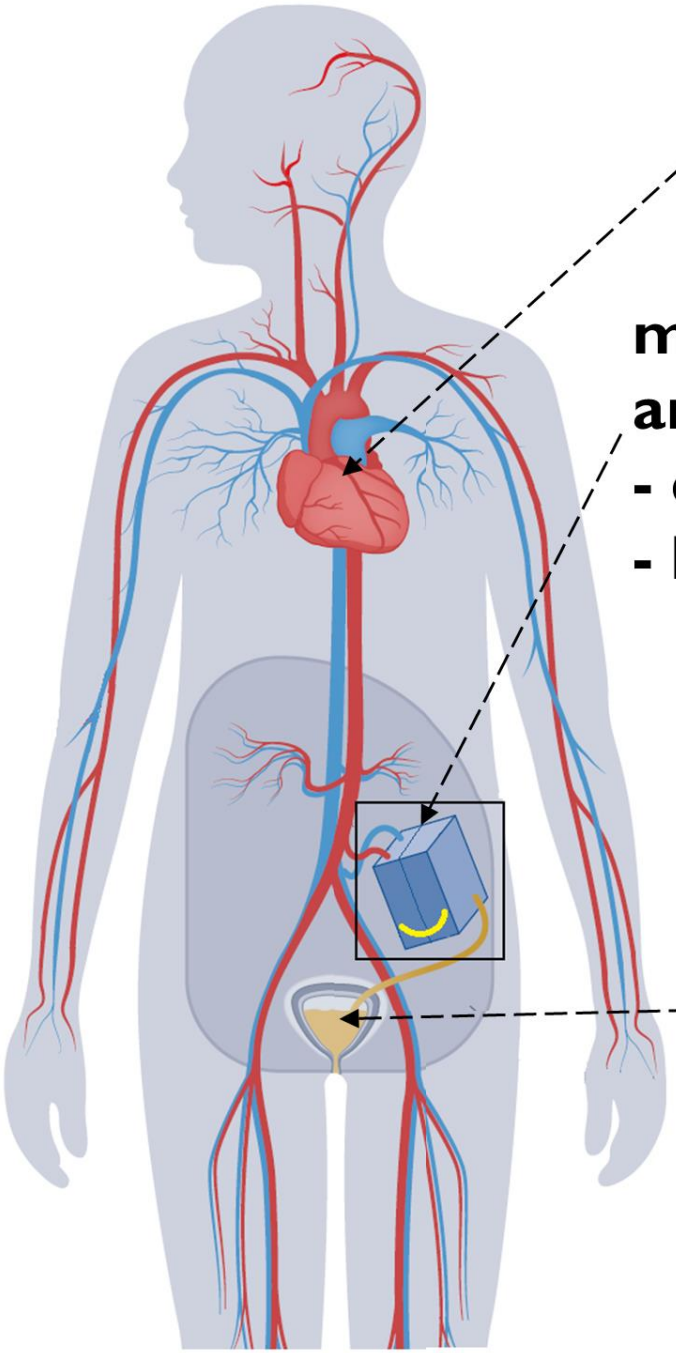
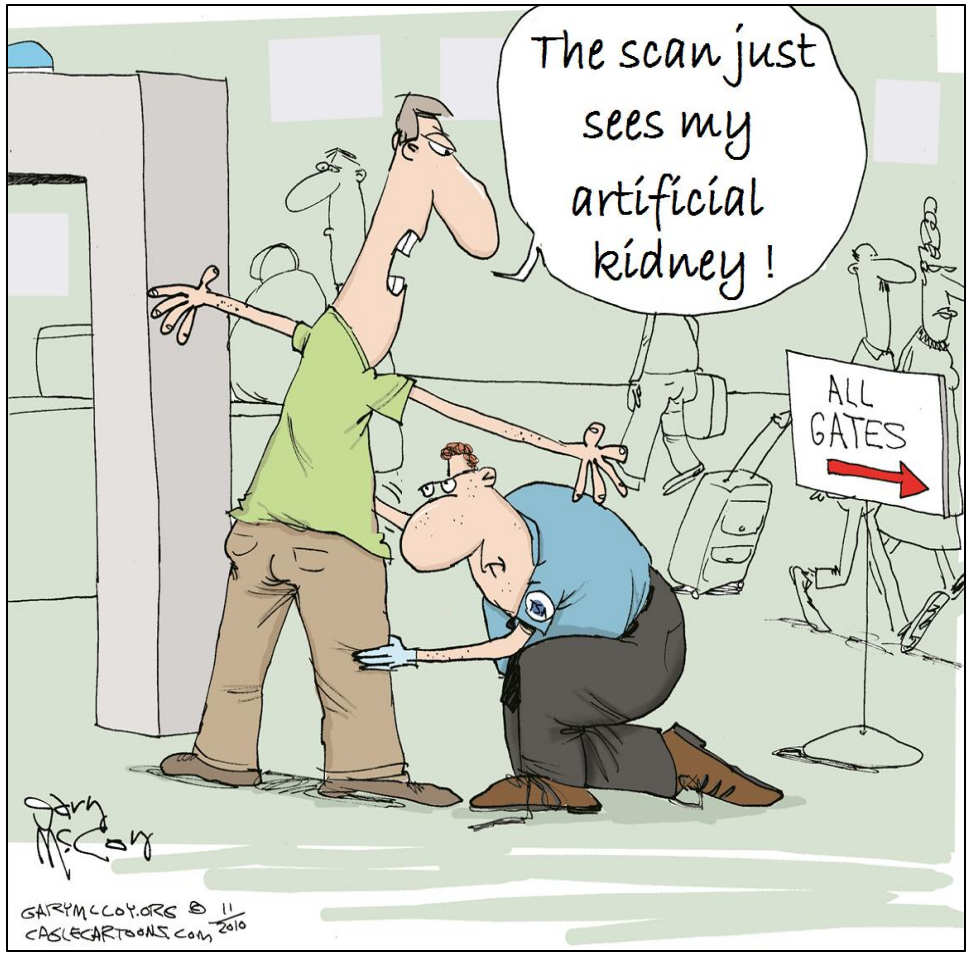


heart is the
blood pump

modular implanted
artificial kidney:
- dialysis filter
- bioreactor

urine drains
into bladder

24/7 (bio)artificial kidney



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PLASTICS WITH SMALLER ECO-FOOTPRINT (SLIDE 1)

Bio-circular Resources	
PC - Makrolon® RE	Up to 89 % Sustainable share
PC/ABS - Bayblend® RE	Up to 74 % Sustainable share
PC-HT - Apec® RE	Up to 67 % Sustainable share
PP & PE Purell (Circulen Renew)	Up to 100 % Sustainable share
SBC - Styrolux® ECO BC	Up to 100 % Sustainable share
S-TPE - Styroflex® ECO BC	Up to 100 % Sustainable share
PS - Styrolution® PS ECO BC	Up to 100 % Sustainable share
SMMA - NAS® ECO BC	Up to 70 % Sustainable share
ABS - Novodur® ECO HD M203FC BC50	Up to 50 % Sustainable share
ASA - Luran® S ECO MED 797S SPF30 BC40	Up to 50 % Sustainable share
MBS - Zylar® ECO BC	Up to 90 % Sustainable share
MABS - Terlux® ECO HD BC	Up to 25 % Sustainable share

PLASTICS WITH SMALLER ECO-FOOTPRINT (SLIDE 2)

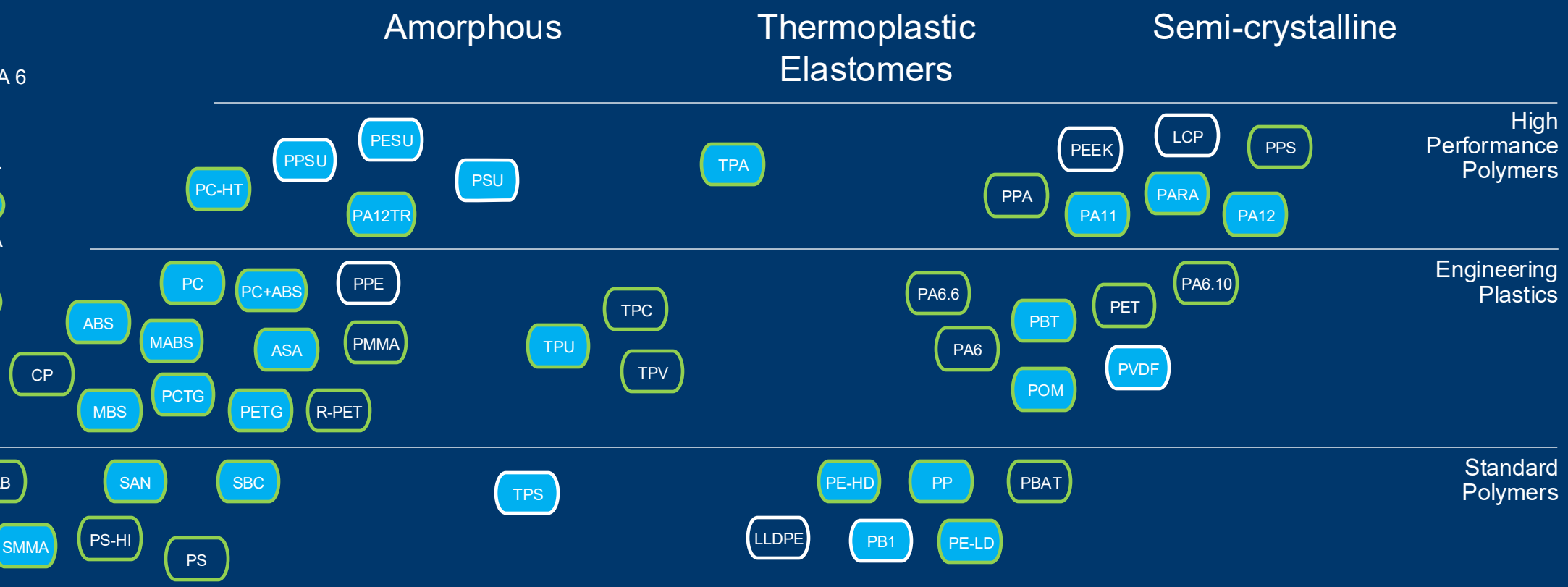
Renewable Resources		
SK chemicals	PCTG - ECOZEN®	Up to 18 % Sustainable share
ARKEMA	RILSAN® PA11 MED	Up to 98 % bio-based carbons (according to ASTM 6866)
Chemical Recycling		
SK chemicals	SKYPET CR BL®	Up to 100 % Sustainable share
Mechanical Recycling		
INEOS Styrolution	PS - Styrolution® ECO 440 FC	100 % Sustainable share
aloxe	rPET ORIGO® Crystal (Recycled PET)	Up to 100 % Sustainable share

PLASTICS WITH SMALLER ECO-FOOTPRINT (SLIDE 3)

Blends, Purging Agents, Color and Functional Batches also available

Blends

PA 6.6 + PA 6
PA + ABS
PA + ASA
PBT + PET
PBT + PC
PBT + ASA
PC + PET
PC + ABS
PC + ASA



Available as a sustainable solution, e.g. mechanically recycled, chemically recycled, bio-circular polymer or bio-polymer

Medical grade products available

PLASTICS WITH SMALLER ECO-FOOTPRINT (SLIDE 4)

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- **NO COMPETITION WITH FOOD / FEED**
- **NO DEFORESTATION**
- **HIGHLY PROFITABLE FOR THE FARMERS (THE MAIN REASON THEY GROW CASTOR)**
- **GROWN MAINLY IN INDIA ONLY IN THE POOREST SOIL**
- **THE BEANS ARE CRUSHED TO MAKE ~45% OIL AND 55% CAKE (SOLD AS FERTILIZER)**