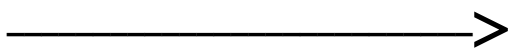
Molar balance of the reaction

$$HPO_4^{2-}{}_{(aq)} + 16NO_3^{-}{}_{(aq)} + 24Ca^{2+}{}_{(aq)} + 100\ H_3O^{+}{}_{(aq)} + 130HCO_3^{-}{}_{(aq)}$$

+ 1560 mol quanta = 14.7 mol quanta x (mol C organic) $^{-1}$

E = $H\nu$ x 1560 mol quanta = **3.5×10^{-7} kW**



+ 106 g mineral salt, 3% dry biomass

$$C_{106}H_{263}O_{110}N_{16}P_{(s)} + 24CaCO_{3(s)} + 84H_2O_{(aq)} + 138O_{2(g)}$$

Mass balance of the reaction

$0.096\ Kg\ HPO_4^{2-}{}_{(aq)} + 0.992Kg\ NO_3^{-}{}_{(aq)} + 0.960Kg\ Ca^{2+}{}_{(aq)} + 1.9Kg\ H_3O^{+}{}_{(aq)} + 7.93Kg\ HCO_3^{-}{}_{(aq)}$

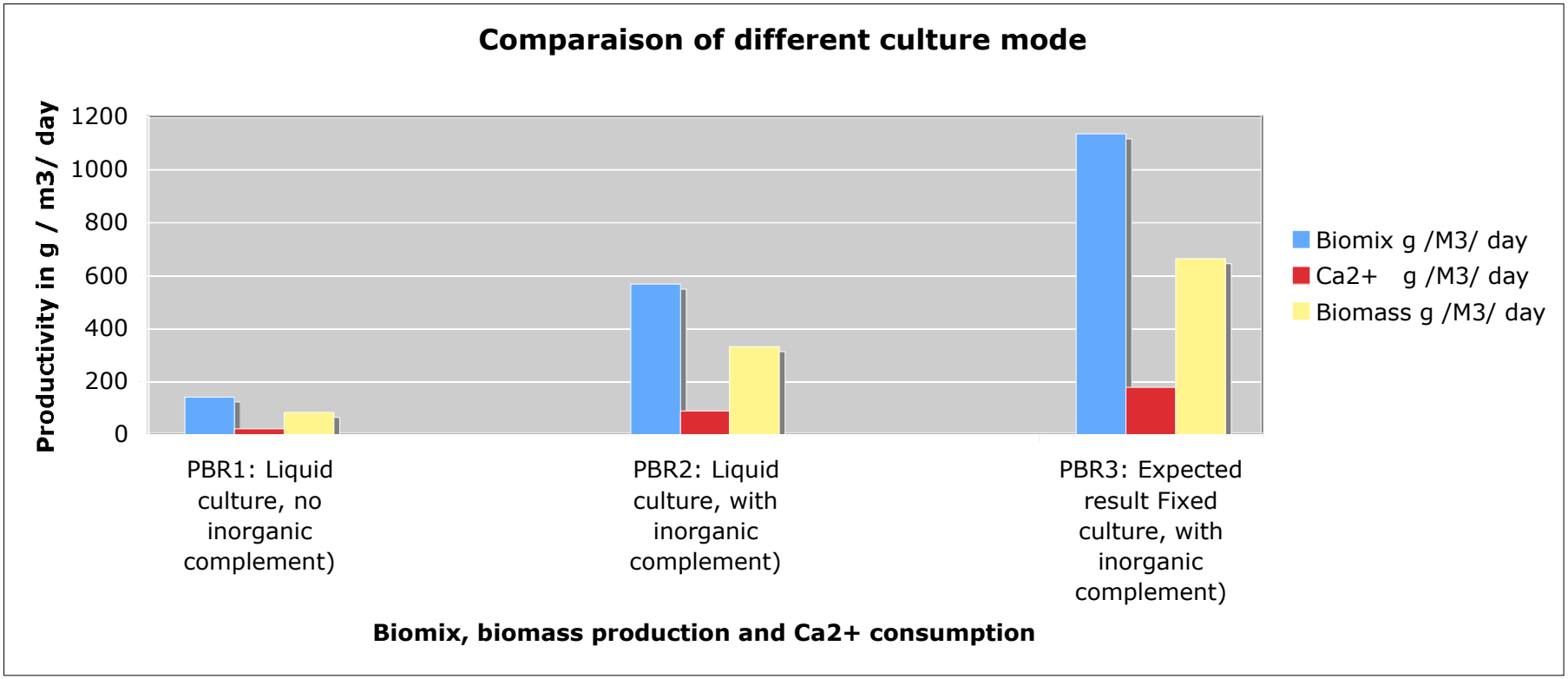
+ 1560 mol quanta = 14.7 mol quanta x (mol C organic) $^{-1}$

E = $H\nu$ x 1560 mol quanta = **3.5×10^{-7} kW**

+ 106 g mineral salt, 3% dry biomass

$1.512Kg\ H_2O_{(aq)} + 2.4Kg\ CaCO_{3(s)} + 3.55Kg\ C_{106}H_{263}O_{110}N_{16}P_{(s)} + 4.416Kg\ O_{2(g)}$

Known and expected productivity

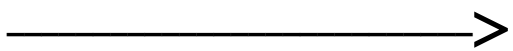


Mass balance of the reaction

5.72Kg CO_2 (g) + 2.196Kg H_2O (aq) + 0.992Kg NO_3^-(aq) + 0.960Kg Ca^{2+} (aq)
+ 0.384Kg O^{2-} (aq)+0.096Kg HPO_4^{2-} (aq) +0.018Kg H^+(aq)

+ 1911 mol quanta = 14.7 mol quanta x (mol C) $^{-1}$

E = Hv x 1911 mol quanta = **4.38×10^{-7} kW**



+ 106 g mineral salt, 3% dry biomass

3.55Kg $C_{106}H_{263}O_{110}N_{16}P$ (s) + 4.416Kg O_2 (g) + 2.4Kg CaCO3 (s)

Mass balance of continuous system PBR1

Total CO_2 Absorbed in g / M^3/ day
133.04

CO_2 in biomass in g / M^3/ day
109.04
H_2O in biomass in g / M^3/ day
51.34
CO_2 fossilized in g / M^3/ day
24
NO_3^- in biomass in g / M^3/ day
23.19
Ca^{2+} in carbonate in g / M^3/ day
22.26
O^{2-} used for carbonate in g / M^3/ day
9.74
HPO_4^{2-} in biomass in g / M^3/ day
2.24
Ions in biomass in g / M^3/ day
2.5
H^+ in biomass in g / M^3/ day
0.42

Dry Biomix in g / M^3/ day
141.5

O_2 produced in g / M^3/ day
103.24

Dry Biomass in g / M^3/ day
85.5

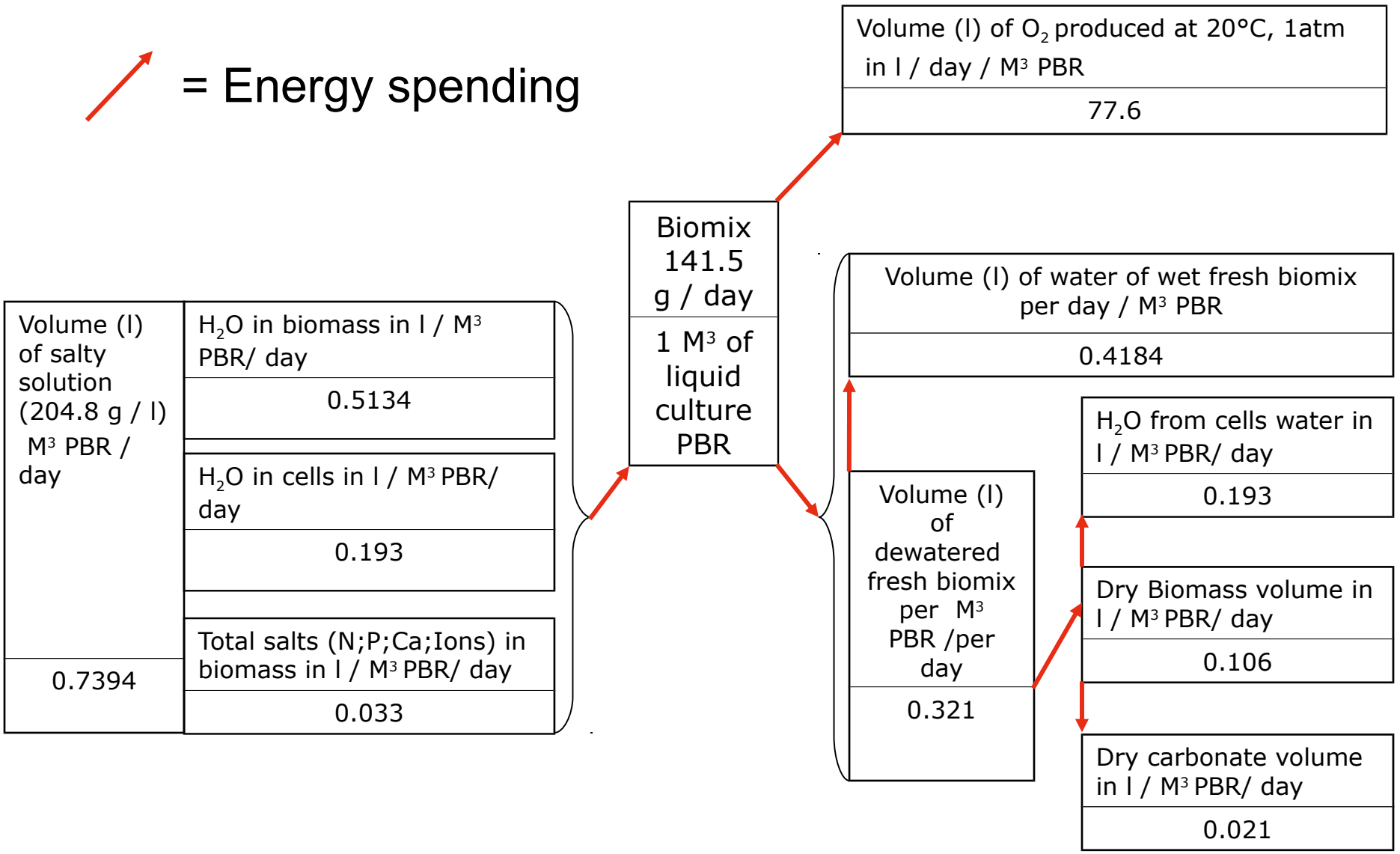
Carbonate in g / M^3/ day
56

Example of proportions

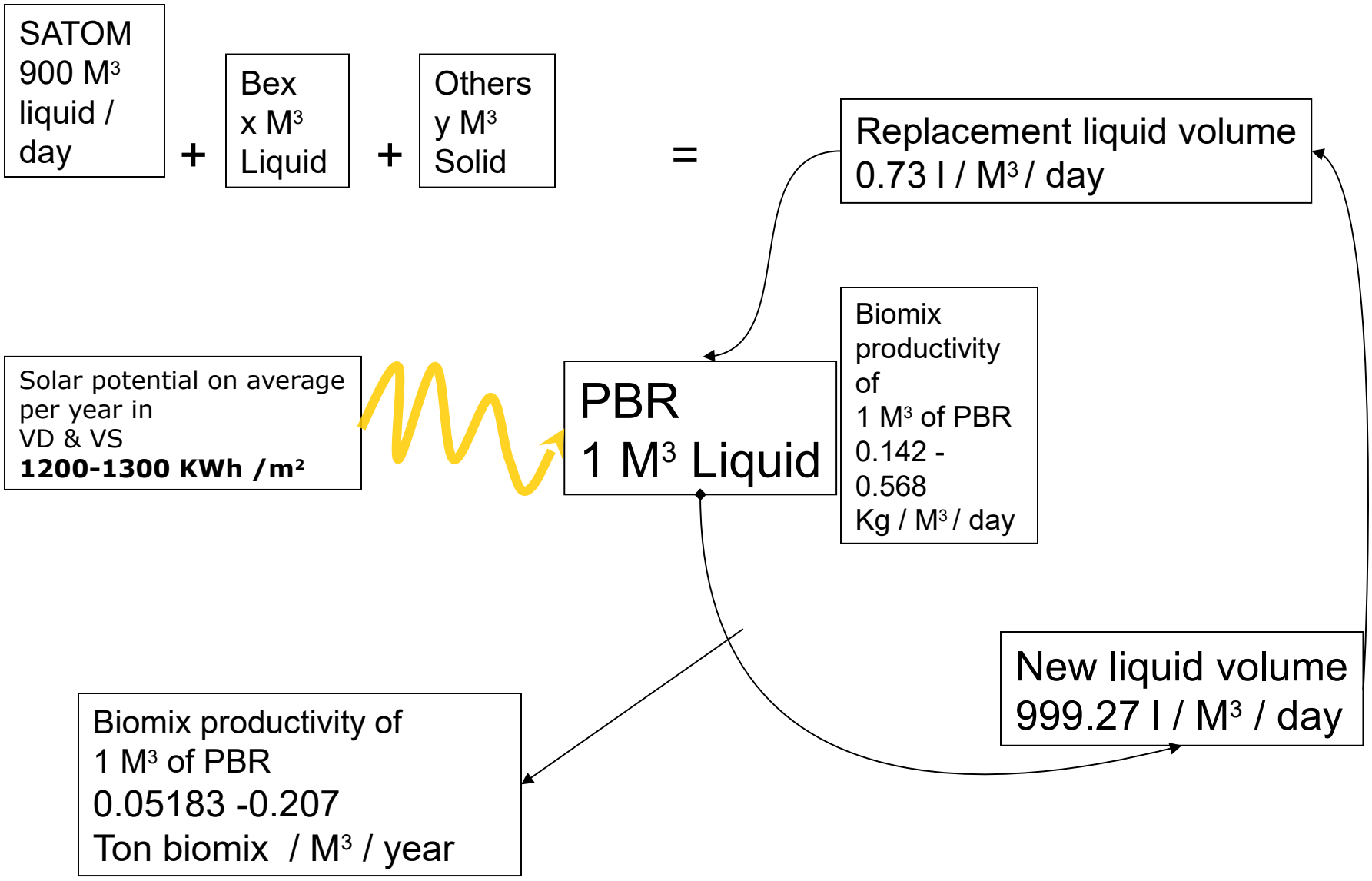
Proteins in g / M^3/ day
42.7
Nucleic acids in g / M^3/ day
12.8
Polysaccharides in g / M^3/ day
10.5
Lipid in g / M^3/ day
11
Metabolites in g / M^3/ day
6
Ions in g / M^3/ day
2.5

Volume balance of continuous system PBR1

= Energy spending



Volume flow diagram



BALANCE

SATOM
900 M^3 liquid / day

- Ca^{2+} 2.8 ton /day
- HCO_3^- 8.7 ton /day
- NO_3^- 0.012 ton /day

PBR mass balance
M^3 liquid

- Ca^{2+} 1 ton /day
- HCO_3^- 8.26 ton /day
- H_3O^+ 1.979 ton / day
- NO_3^- 1.03 ton /day
- HPO_4^{2-} 0.1 ton /day

Medium BALANCE

SATOM ,pH 7.6
900 M^3 liquid / day

- HCO_3^- 8.7 ton / day
- Ca^{2+} 2.8 ton / day
- NO_3^- 0.012 ton / day

+

Medium complementation 1
ton / day

- HCO_3^- 15.66 ton /day
- H_3O^+ 5.54 ton / day
- NO_3^- 2.88 ton /day
- HPO_4^{2-} 0.28 ton /day

=

PBR medium requirements
M^3 liquid

- HCO_3^- 24.36 ton /day
- Ca^{2+} 2.8 ton /day
- H_3O^+ 5.54 ton / day
- NO_3^- 2.89 ton /day
- HPO_4^{2-} 0.28 ton /day

Medium BALANCE

Medium complementation ton / day		+	Medium complementation ton / day		=	SATOM Medium complementation ton / day	
• CO_2	11.3 ton /day		• H_3O^+	1.18 ton / day		• HCO_3^-	15.66 ton /day
• H_2O	9.44 ton / day					• H_3O^+	5.54 ton / day

Medium BALANCE

SATOM ,pH 7.6
900 M^3 liquid / day

- $HCO_3^-{}_{(aq)}$ 8.7 ton / day
- $Ca^{2+}{}_{(aq)}$ 2.8 ton / day
- $NO_3^-{}_{(aq)}$ 0.012 ton / day

+

Medium complementation
C:N:P:H^+
ton / day

- $CO_{2\,(g)}$ 11.3 ton /day
- $H_2O_{\,(aq)}$ 9.44 ton / day
- $NO_3^-{}_{(aq)}$ 2.88 ton /day
- $H_3O^+{}_{(aq)}$ 1.18 ton / day
- $HPO_4^{2-}{}_{(aq)}$ 0.28 ton /day

=

Medium requirements for:
- 125'786 M^3 liquid PBR1
(22.26. g $Ca^{2+}{}_{(aq)}$ / M^3/ day)
- 31'446 M^3 liquid PBR2
(89 g $Ca^{2+}{}_{(aq)}$ / M^3/ day)
- 15'723 M^3 liquid PBR3
(178 g $Ca^{2+}{}_{(aq)}$ / M^3/ day)
- $HCO_3^-{}_{(aq)}$ 24.36 ton /day
- $Ca^{2+}{}_{(aq)}$ 2.8 ton /day
- $H_3O^+{}_{(aq)}$ 5.54 ton / day
- $NO_3^-{}_{(aq)}$ 2.89 ton /day
- $HPO_4^{2-}{}_{(aq)}$ 0.28 ton /day