Thermodynamics of the Biological Energy System

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in cooperation with Dr. Walter Radebold

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Agenda:

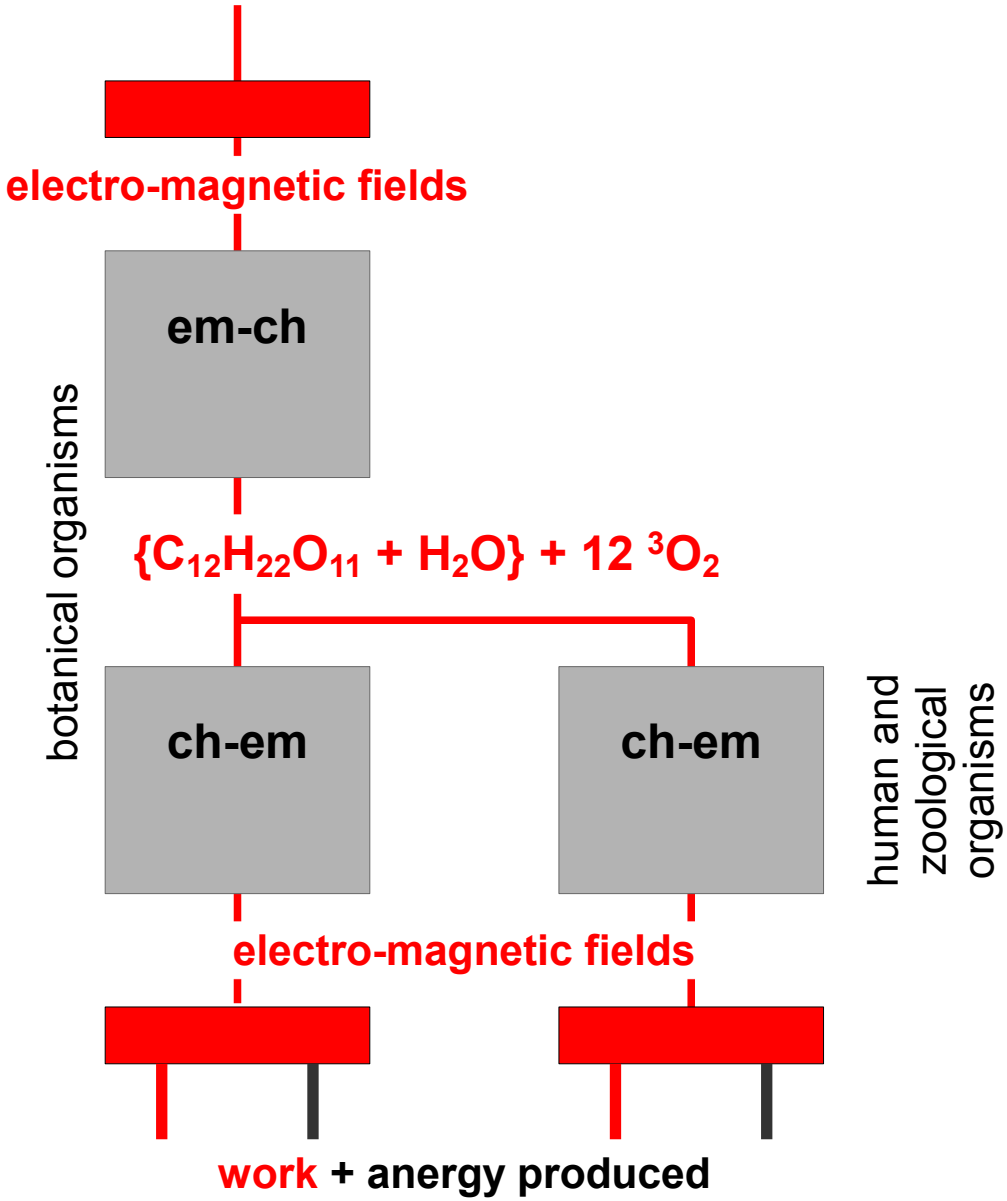
1. How does the biological energy system works in view of thermodynamics?
2. Why did we start to understand the biological energy system?
3. What are the conclusions for establishing a bionic energy system?

Thermodynamics of the Biological Energy System

BES (1) → TES → NES → ? → BES (2) → TBES

BES (1)	:	Biological Energy System - role for our life, now and in it`s past
TES	:	Technical Energy System - role for our life, thermodynamics
NES	:	Nuclear Energy System - terrestrial atoms for peace
?	:	Point of No Return
BES (2)	:	Biological Energy System - thermodynamic analysis
TBES	:	Technical - Biological Energy System - concept and results.

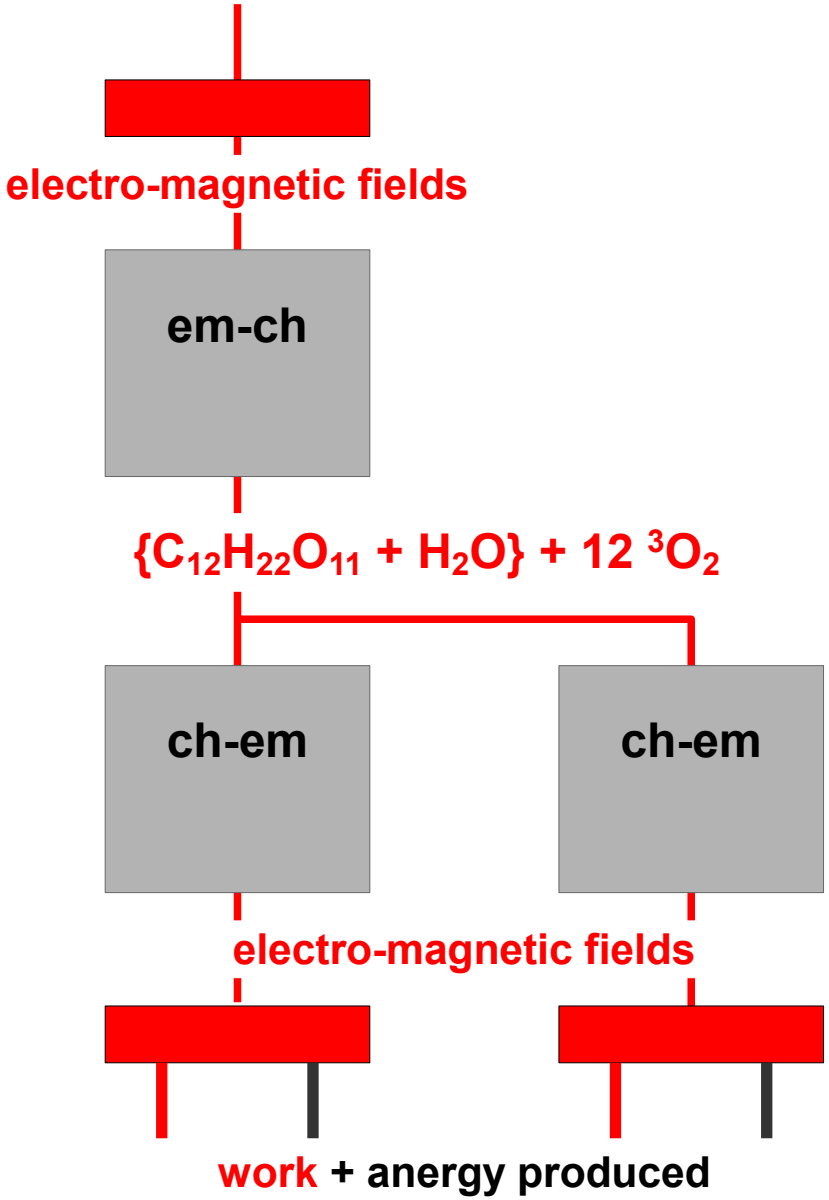
Thermodynamics of the Biological Energy System



sources for exergy:
solar nuclear fusion-reactions

sinks for exergy:
organelles and organs

Thermodynamics of the Biological Energy System



sources for exergy:
solar nuclear fusion-reactions

photosynthesis:
= storage of electro-magnetic field exergy
in **e**lectro-**m**agnetic-to-**ch**emical converters

surcrose = final product of field exergy storage

respiration:
= release of electromagnetic field exergy in
chemo-to-**e**lectro-**m**agnetical converters

sinks for exergy:
organelles and organs

Thermodynamics of the Biological Energy System

Energy		energy	
Thermal energy of the ambience	$T_{work} = T_{amb}$	anergy	= 0% exergy
Thermal energy of a working fluid	$T_{work} = 2.5 * T_{amb}$	exergy	= 60% exergy
Chemical energy of fossil reactants (average)	$\Delta G\text{-}T\Delta S$		= 90% exergy
Electro-magnetic field energy	$h*\nu$, $U*I$		= 100% exergy

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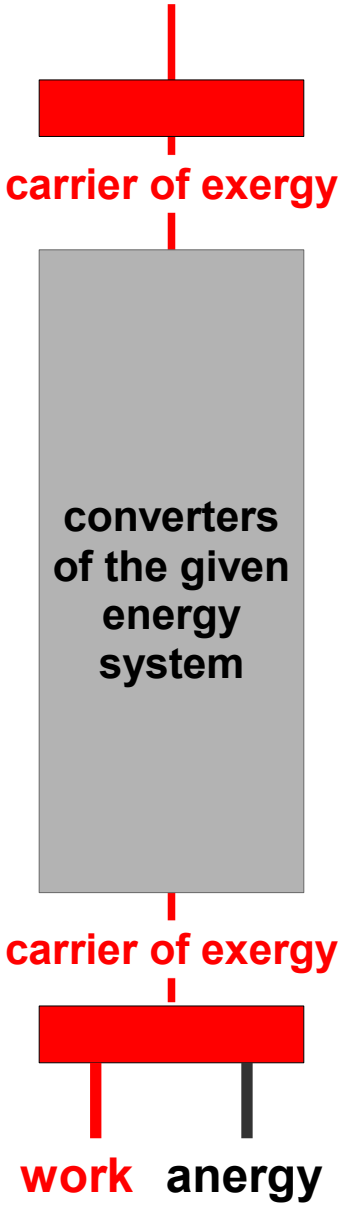

sources for exergy

acquisition of carriers of exergy from sources

internal distribution of exergy

conversion of exergy into forms as required

storage of carriers of exergy if possible

transfer of carriers of exergy to customers

sinks for exergy (converters of customers)

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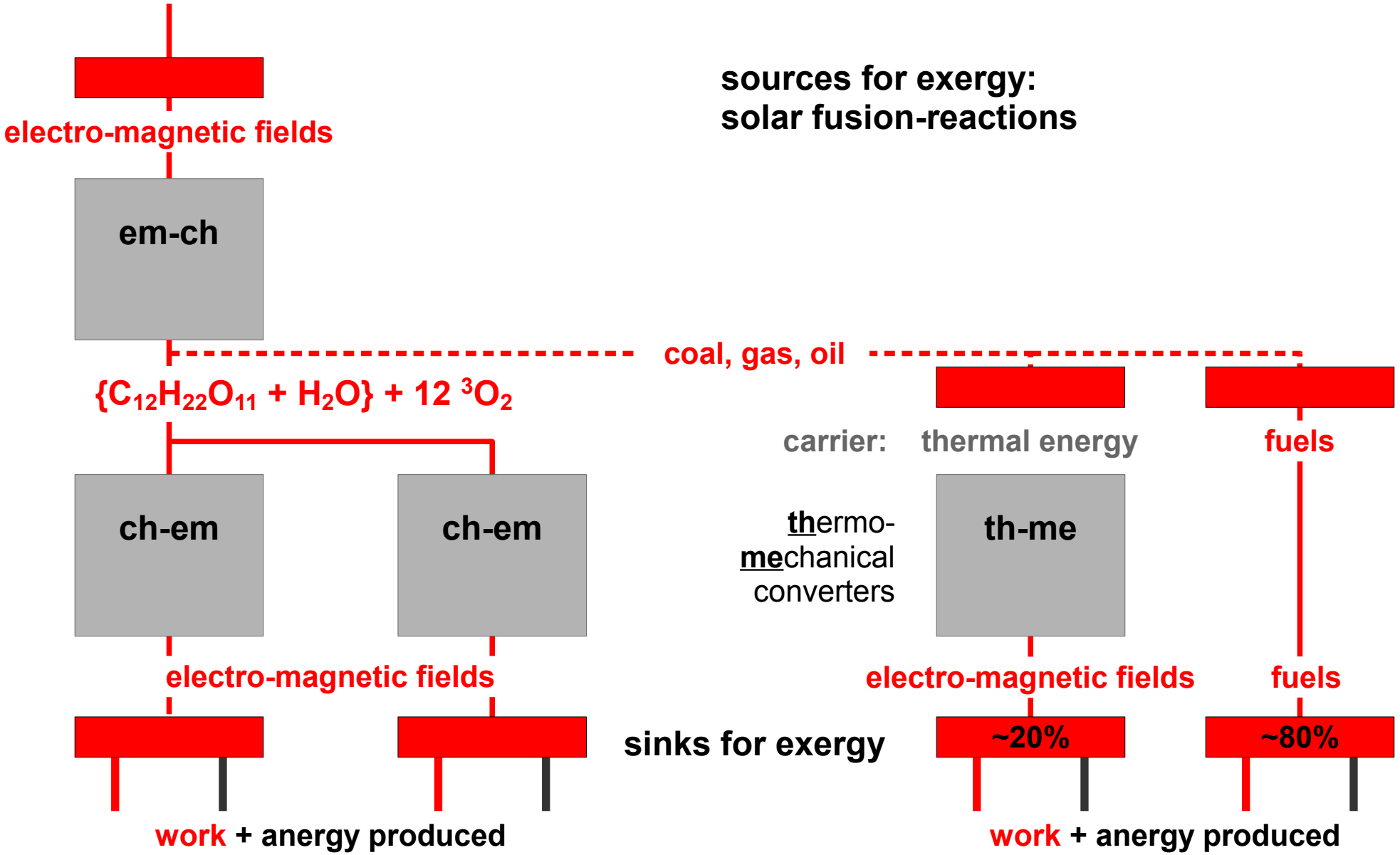

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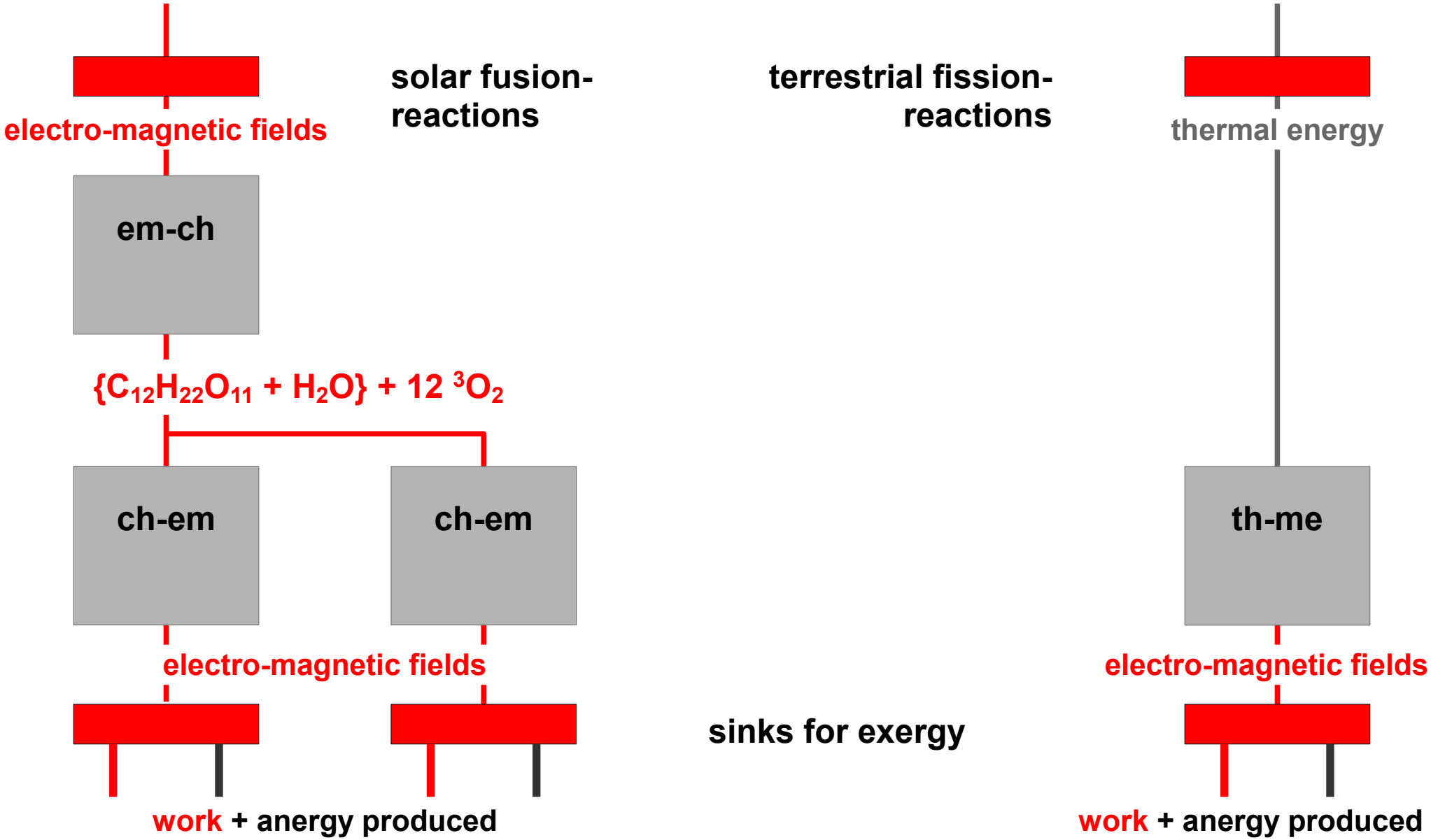
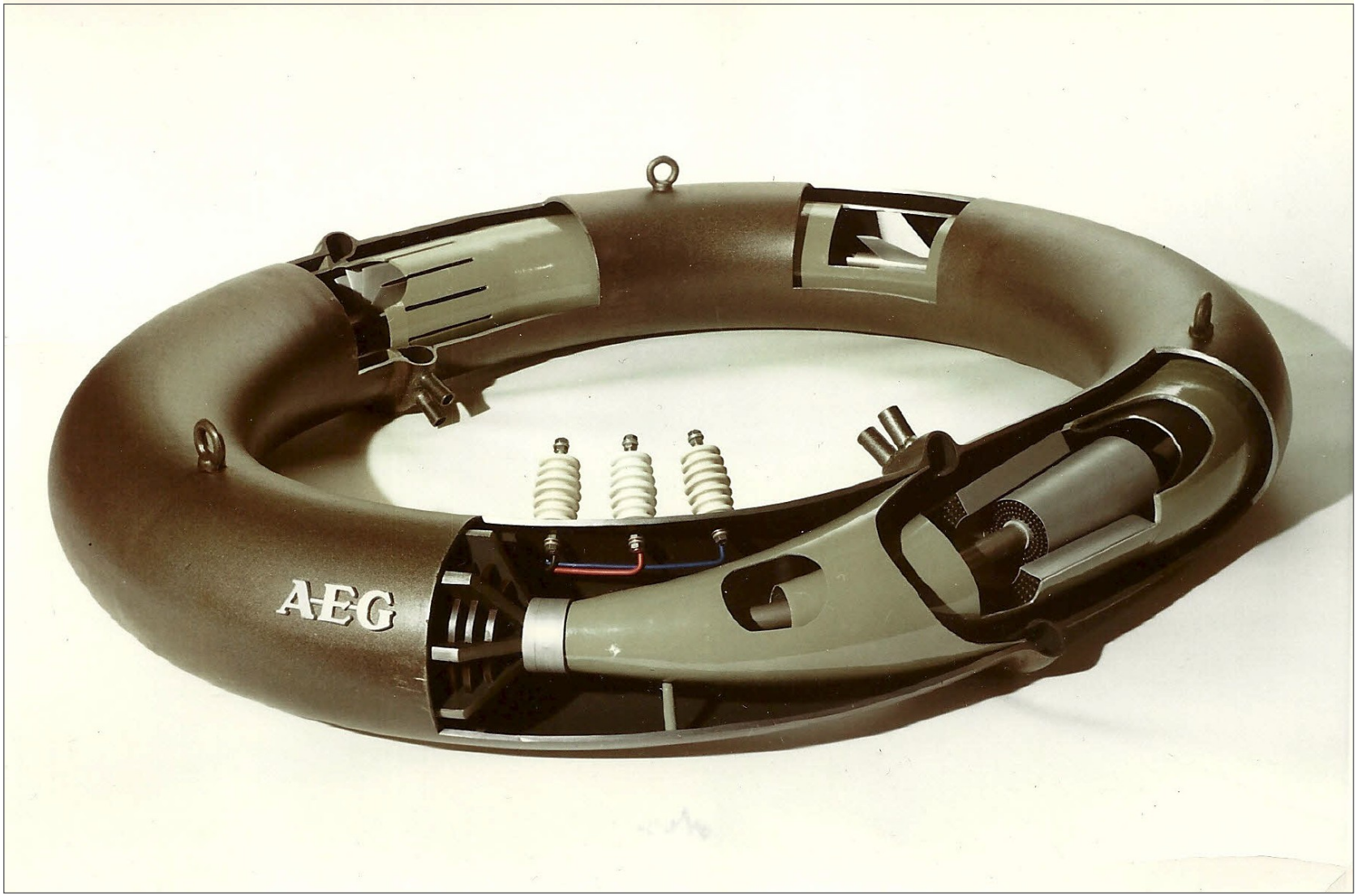
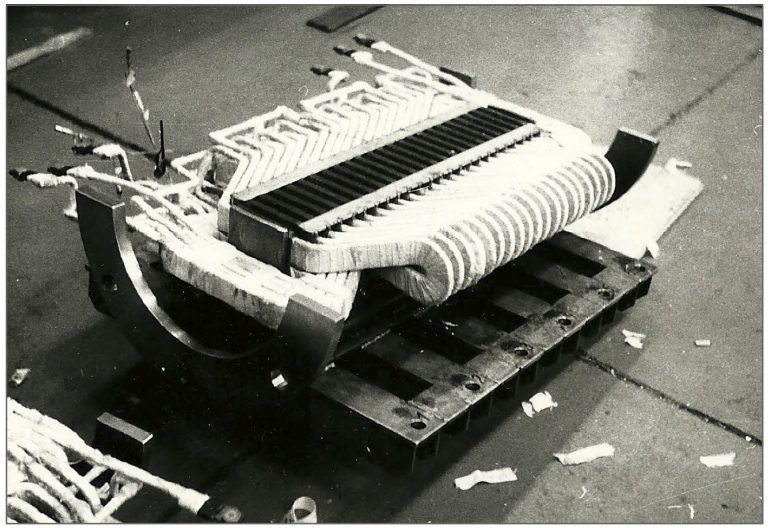
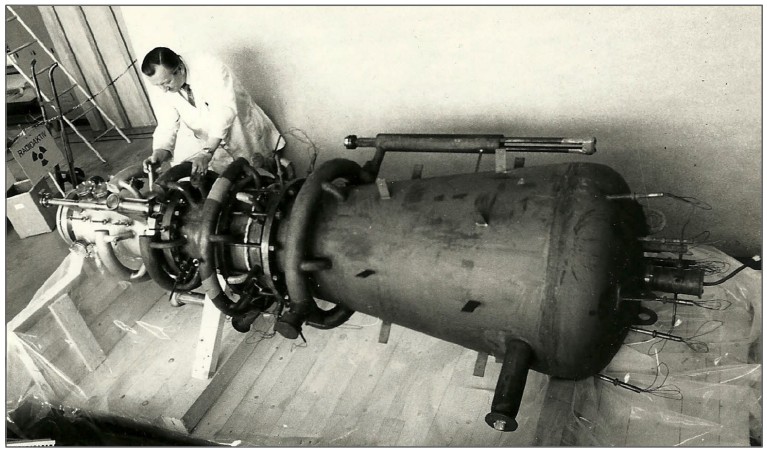
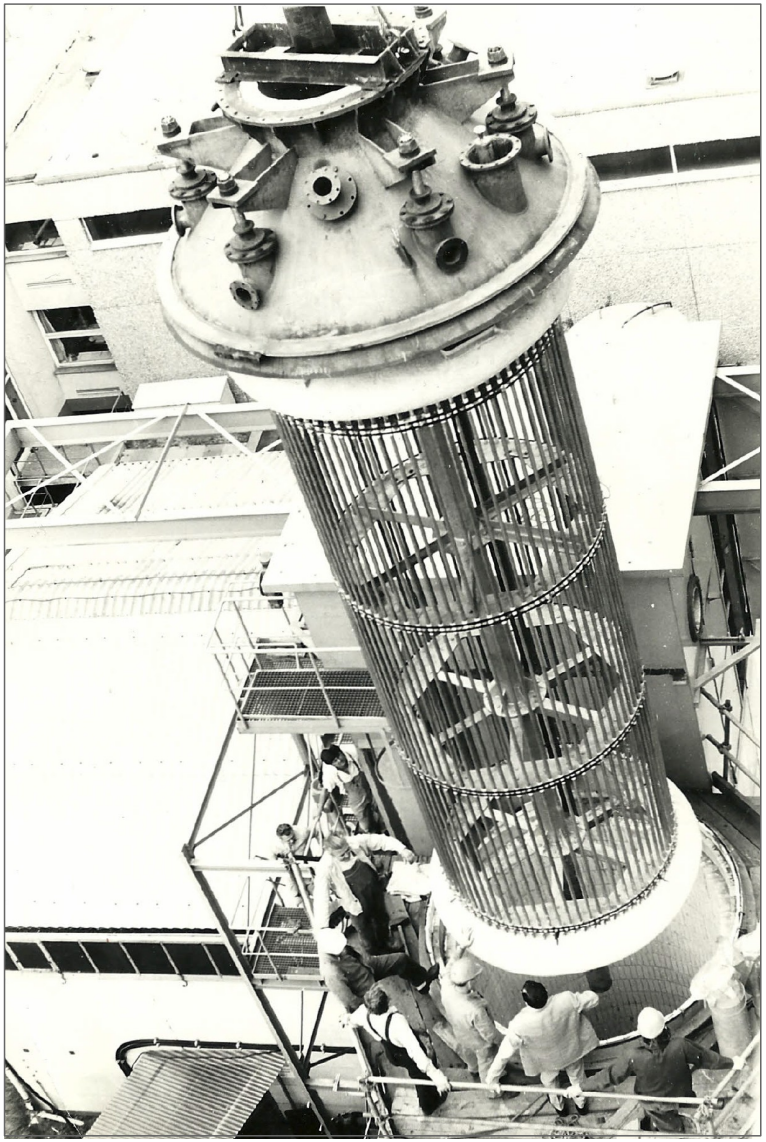




Nuclear „MHD-Staustrahlrohr“ (MHD ram jet) for space applications (AEG)







Liquid-metal MHD-System (AEG):

above: stator of inductive MHD-generator
below: thermodynamic drive for MHD-generator

Heater to replace nuclear fission reactor

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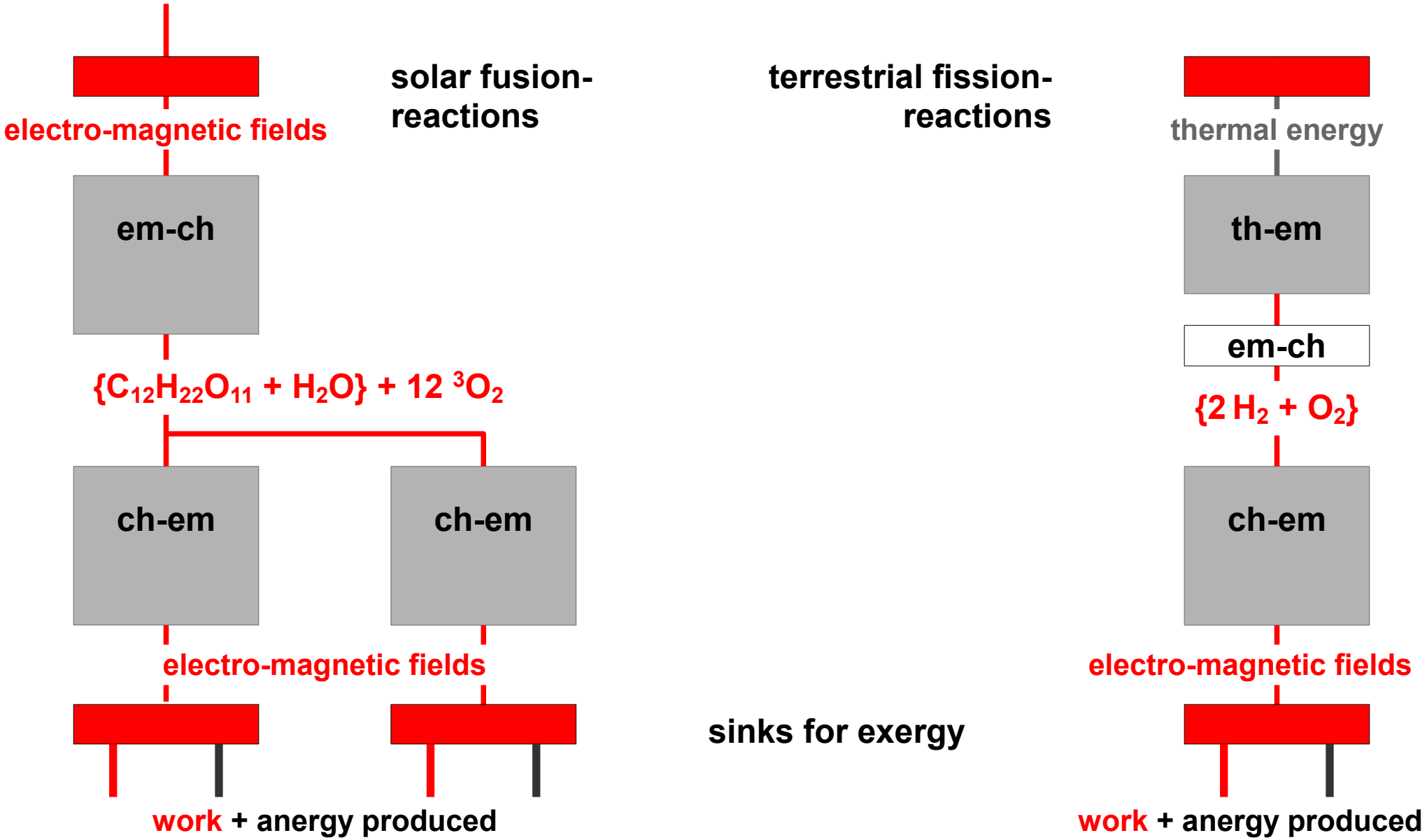

Thermodynamics of the Biological Energy System

Assumptions :

Efficiency of nuclear power plant = 0,35

Efficiency of electrolysis = 0,65

Efficiency of 2 H_2/O_2 fuel cells = 0,65

Overall efficiency of a full nuclear thermal-electric system (without radio-active waste management and H_2-logistics)

= 0,15

“Power and water from sun and sea“, Sinai (Red Sea) (own Company)

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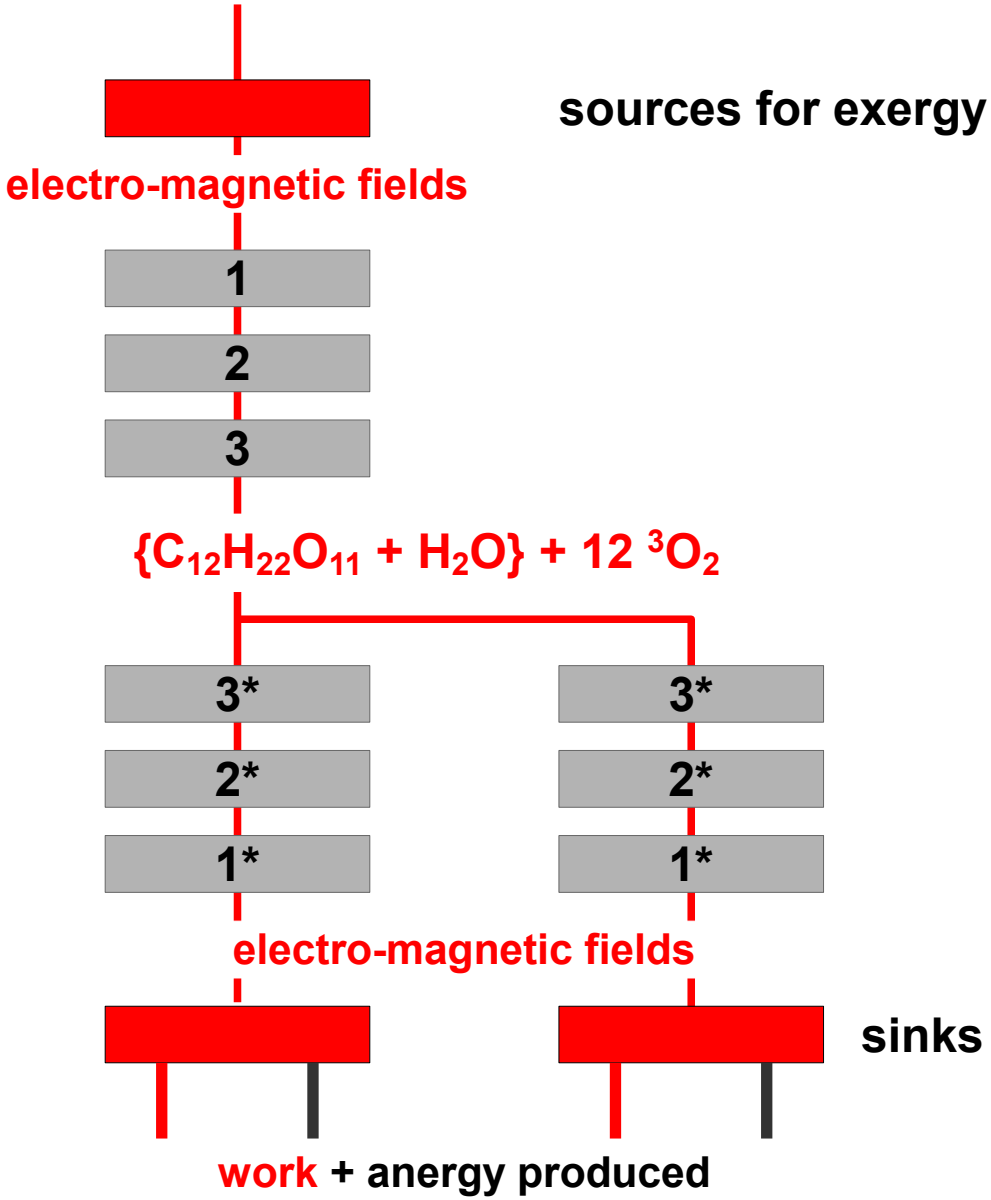

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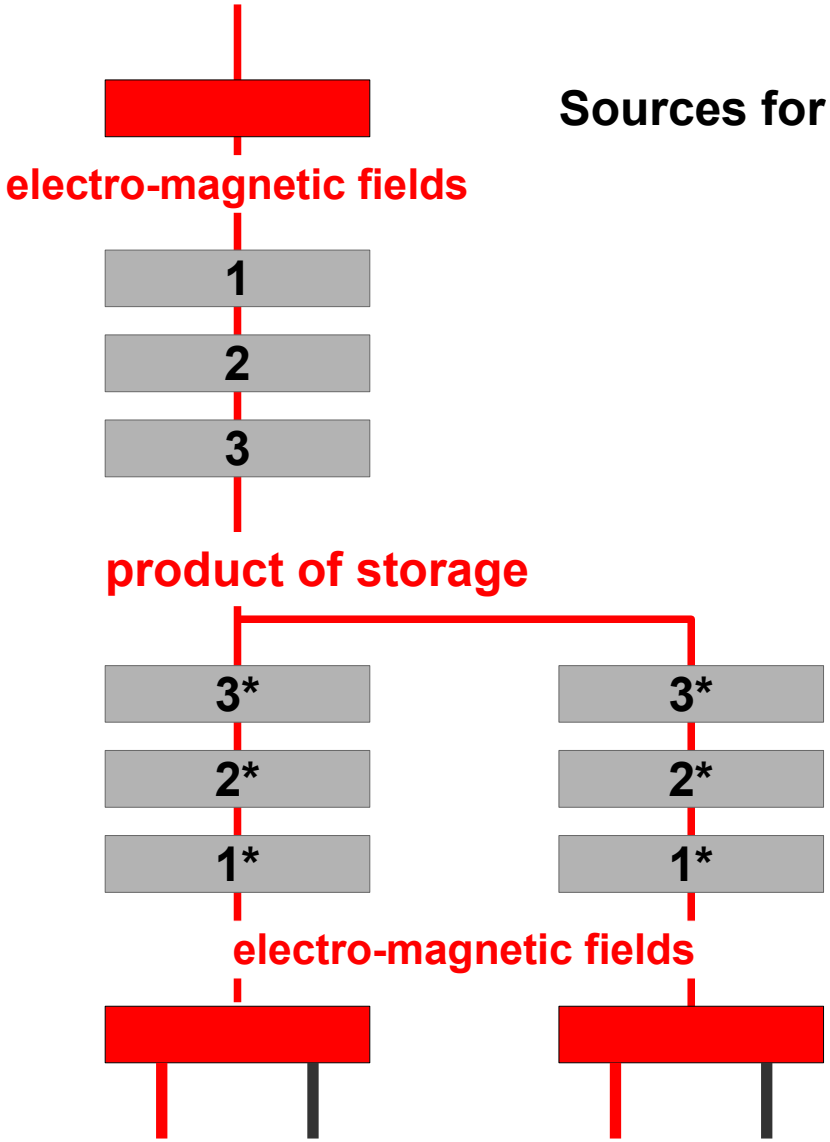
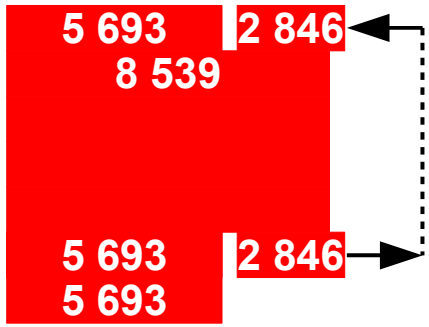


Sources for exergy: solar fusion-reactions

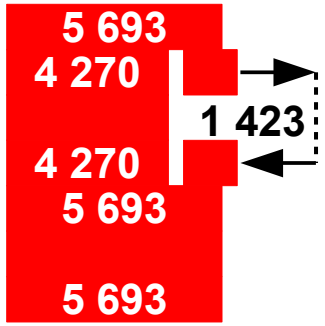


absorption

storage

logistics

$\{C_{12}H_{22}O_{11} + H_2O\} + 12\ {}^3O_2$



logistics

release

absorption

sinks: organs + organelles

fluxes of exergy in kJ/mol formula conversion

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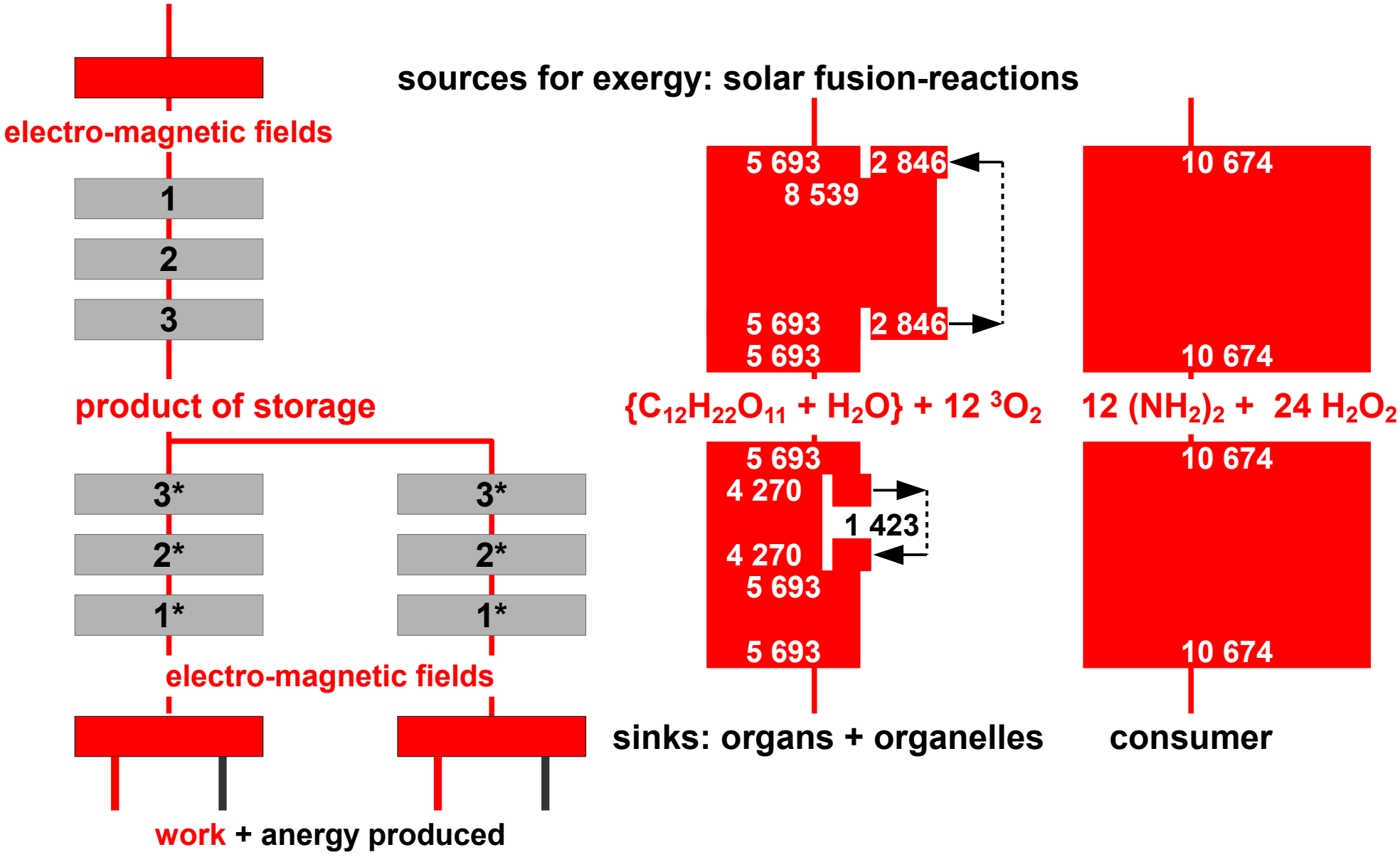

Summary:

1. A bionic energy system does not need to transfer and distribute oxygen O in the gaseous state of O_2 via the atmosphere like the biological energy system : In the contrary H_2O_2 as a primary liquid product of redox-reactions transfers electro-magnetic field exergy in combination with 2H.

2. Calculation of reaction data for the bionic system confirm the much higher flux of exergy, combined with an exergetic efficiency $\varphi = 1{,}0$.

3. The bionic systems technical construction including $(NH_2)_2$ / 2 H_2O_2-chemo-electric converters (fuel cells) will lower the exergetic efficiency to about 0,7 (much higher than any the terrestrial nuclear system because of its limitations by the Carnot-factor).

4.The bionic energy system will be a modular, decentralized system, solving the CO_2-problem as well as that of radio-active waste management.

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Thank You for Your Attention!