

From Fossil Fuels to Energies-of-Light

Prof. Dr.-Ing. Carl-Jochen Winter
University of Stuttgart and
ENERGON Carl-Jochen Winter GmbH

Historically, we distinguish three phases of the energy supply system of mankind: The 1st phase saw exclusively renewable energies like muscle power of men and animals, wood, wind, solar or water power and lasted until well into the 18th century; then, at the start of the 2nd phase, coal mines were industrially exploited in England and marked the beginning industrialisation of the world; the fossil energy era had begun: Coal, and, later, oil, natural gas and fissionable material stand for the replacement of renewability with exhaustibility. Finiteness and, perhaps even more urgent, non-sustainability came into play. Now, on the verge of the 21st century, obvious and convincing plausibilities hint at a 3rd phase, the 2nd solar civilisation. It allows for the utilization of all sorts of modern renewable energy conversion technologies, along with an aggressive striving for energy and, above all, exergy efficiency, and the introduction of the clean secondary chemical energy carrier hydrogen for storability and transportability and, thus, for the perpetuation of the world energy trade system beyond the fossil era.

Never in the history of energy utilization has only one type of energy served mankind, and never did an incoming energy fully replace its predecessors, the energy hunger of a growing world population needed them all. Versatility is typical and increasing. An ongoing shift of the center of gravity can be observed from the energy (raw material) supply at the highly professionalized beginning of the energy conversion chain to the utilization of energy services at its end where billions of lay people try to handle energy. By necessity, it is urgent to professionalize the end of the conversion chain.

The characterization of the 1st solar civilisation was, and that of the 2nd will again be, the complete lack of operational primary energy raw material. Trivial to say, no care has to be taken of a lacking energy raw material, not technologically, not ecologically, and not economically; only conversion technologies were and will be the key! Truly a challenge for energy poor, but highly industrialized countries whose energy efficiency potential is huge. As an indication, after a period of 250 years of industrialisation, Germany's national energy efficiency is only about 30%, and its exergy efficiency is even lower, c. 15-20%. (The world's figures are 10 % and a few %, respectively). Consequently, energy policy becomes increasingly technology

policy, technology for the conversion, storage, distribution and transport of energy. In particular, for the first time after more than 150 years of undoubtedly successful Carnotian energy conversion, hydrogen energy offers to the non-Carnotian fuel cell a tremendous chance in stationary or automotive applications. For the time being, hundreds of millions of central heating systems or hundreds of millions of automobiles in the world wait for a clean, quiet, compact, and highly efficient converter. Solar hydrogen (hydrogen from renewable energies) even guarantees cleanliness over the entire length of the conversion chain.

In the last 120 years, the ongoing shift from coal to oil to natural gas has meant a decarbonization of the energy mix by about 35%, along with its hydrogenation and, since the atomic weights of C = 12 and H = 1, its dematerialisation. Entering the 2nd solar civilisation, the lack of carbonaceous operational primary energy raw material is expected to accelerate this trend.

Retrospectively, the fossil energy era with its entire duration of a few hundred years will have to be seen as an interim, a “blink of an eye”, between the 1st and the 2nd solar civilisations. Renewability is the law, exhaustability the exception. Finally, the development will end up utilizing energies-of-light: They are of light weight, they use the light of the sun (and derived renewable energies), they lighten the burden on environment and climate, and they shed light into the emerging 2nd solar civilisation.

To close, "HYFORUM 2000, The International Hydrogen Energy Forum 2000, Policy - Business - Technology, 11-15 September 2000, in Munich, Germany" is planned to bring together those players traditionally working together in the energy field: Politicians, entrepreneurs, and technologists. HYFORUM 2000 follows the line indicated above. So, hydrogenists of the world, mark your calendars!

University of Stuttgart and
ENERGON Carl-Jochen Winter GmbH
Obere St. Leonhardstraße 9
D-88662 Ueberlingen, Germany
Tel/Fax ++49 7551 68124; Email CJWinter.ENERGON@t-online.de