Futures Scanning Project
Conducted by Stacie Marinelli, Reference Librarian, ASRC
December 2005

Keywords:
"Futurism" terms:
Future
New
Green / sustainable / clean energy
Renewable energy / "Renewable Energy Technologies" (RET)
Trends
Creative
Innovative/innovation
Alternatives / Alternative fuels / Alternative technology

Alternative sources (Fuel / Energy)
-Wind power, photovoltaic solar power, hydropower, tidal power, solar thermal power, geothermal power, hydrogen fuel cells, hydrogen
-Bioenergy
    Biofuels, biogas, sludge gas, natural gas, biodiesel, fuel cell, fuel processor, bioethanol, biomass, biotechnology, e-diesel, hydrogen production

Alternative technology
    Acoustic Inertial Confinement Fusion or Sonofusion
Cogeneration (e.g., of heat and electricity) for energy efficiency
Green Power
biodiesel transesterification
Sustainable energy resources
Clean biomass
Bioproducts
    ethanol, biodiesel
Passive solar
concentrating electricity
Photovoltaic (solar cell)
solar hot water
solar process heat
space heating and cooling

Technologies:
Biomass pretreatment
Cellulose enzyme development
Strain development

Energy types:
power production, fuels, electricity
specific products (& alternatives)

Monitoring:
Inexpensive, Accurate Sensor Technologies for Community
Electricity tracking
Life cycle assessment
Life cycle cost accounting
energy efficiency
near-zero emissions
environmental impacts

Energy information sources:
Think Tanks & Advocacy Groups
American Council for an Energy-Efficient Economy: http://www.aceee.org/
DOE's Energy Information Administration
European Union: http://europa.eu.int/comm/energy_transport/atlas/htmlu/lbtech.html
Green Peace
National Renewable Energy Laboratory
National Resources Defense Council
Organization for Economic & Community Development (OECD)
Renewable Energy Policy Project (REPP) (part of CREST) http://www.crest.org/
Tyndall Centre for Climate Change Research
U.S. PIRG Education Fund
World Council for Renewable Energy

Books

Roberts, Paul. End of oil : on the edge of a perilous new world (2004). Houghton Mifflin.

Pfeiffer, DA. **End of the oil age**. (2004) Lulu Enterprises.

Websites / Online Documents

Cogeneration:
http://www.guascor-usa.com/pdfs/cogeneracion-ingles.pdf

Redirecting America's Energy: The Economic and Consumer Benefits of Clean Energy Policies U.S. PIRG Education Fund February 2005
http://newenergyfuture.com/newenergy.asp?id2=15905&id3=energy&

Goodstein, DL. Out of gas : the **end** of the age of **oil**. (2004) WW Norton.
http://www.nrdc.org/water/conservation/edrain/edrain.pdf

Car companies and new fuel technologies (news article):
http://www.atimes.com/japan-econ/CJ27Dh02.html

New fuels technology impact from NREL: http://www.nrel.gov/vehiclesandfuels/nfti/

Greene, Nathanael. Growing energy : how biofuels can help **end** America's **oil** dependence. Natural Resources Defense Council.
http://www.nrdc.org/air/energy/biofuels/contents.asp

Green Peace. Energy Revolution: a sustainable pathway to a clean **energy** future for Europe : a European **energy** scenario for EU-25. 2004
http://www.greenpeace.org/raw/content/international/press/reports/energy-revolution-a-sustainab.pdf

Tyndall Centre for Climate Change Research (also in EJB Collection) 2005
http://www.tyndall.ac.uk/publications/tech_reports/tech_reports.shtml
http://www.tyndall.ac.uk/media/news/tyndall_decarbonising_the_uk.pdf

Several quick searches were done using "futurisms" and energy (categories assigned for several articles):

Solar Energy

Solar energy in progress and future research trends
Sen, Zekai [Istanbul Technical Univ., Dept. of Meteorology, Istanbul (Turkey)]
Progress in Energy and Combustion Science
Source: Progress in Energy and Combustion Science ; VOL. 30 ; ISSUE: 4 ; PBD: 2004 , July 1, 2004
OSTI Number(s): DE20480929
Contract Number (Non-DOE): PECSDO; TRN GB0014775
Language: English
Medium/Dimensions: page(s) 367-416

Abstract: Extensive fossil fuel consumption in almost all human activities led to some undesirable phenomena such as atmospheric and environmental pollutions, which have not been experienced before in known human history. Consequently, global warming, greenhouse affect, climate change, ozone layer depletion and acid rain terminologies started to appear in the literature frequently. Since 1970, it has been understood scientifically by experiments and researches that these phenomena are closely related to fossil fuel uses because they emit greenhouse gases such as carbon dioxide (CO[sub 2]) and methane (CH[sub 4]) which hinder the long wave terrestrial radiation to escape into space, and consequently, the earth troposphere becomes warmer. In order to avoid further impacts of these phenomena, the two concentrative alternatives are either to improve the fossil fuel quality with reductions in their harmful emissions into the atmosphere or more significantly to replace fossil fuel usage as much as possible with environmentally friendly, clean and renewable energy sources. Among these sources, solar energy comes at the top of the list due to its abundance, and more evenly distribution in nature than any other renewable energy types such as wind, geothermal, hydro, wave and tidal energies. It must be the main and common purpose of humanity to sustain environment for the betterment of future generations with sustainable energy developments. On the other hand, the known limits of fossil fuels compel the societies of the world in the long run to work jointly for their gradual replacement by renewable energy alternatives rather than the quality improvement of fossil sources. Solar radiation is an integral part of different renewable energy resources. It is the main and continuous input variable from practically inexhaustible sun. Solar energy is expected to play a very significant role in the future especially in developing countries, but it has also potential prospects for developed countries. The material presented in this paper is chosen to provide a comprehensive account of solar energy sources and conversion methods. For this purpose, explanatory background material has been introduced with the intention that engineers and scientists can have introductory preliminaries on the subject both from application and research points of view. Applications of solar energy in terms of low and high temperature collectors are given with future research directions. Furthermore, photovoltaic devices are discussed for future electric energy generations based on solar power site-exploitation and transmission by different means over long distances such as fiber-optic cables.

Another future perspective use of solar energy is its combination with water and as a consequent electrolysis analysis generation of hydrogen gas, which is expected to be another form of clean energy sources. Combination of solar energy and water for hydrogen gas production is called solar-hydrogen energy. Necessary research potentials and application possibilities are presented with sufficient background. Possible future new methodologies are mentioned and finally recommendations and suggestions for future research and application directions are presented with relevant literature review.

New technologies

Alternative energy and power technology : a strategy for BC : growing the economy by providing alternative energy and environmental solutions for domestic and international customers
Not Available
British Columbia Ministry of Energy and Mines, Victoria, BC (Canada)
Publisher: British Columbia Ministry of Energy and Mines, Victoria, BC (Canada)
Source: Other Information: PBD: 5 Apr 2005
Published: April 5, 2005
OSTI Number(s): DE20604555
Contract Number (Non-DOE): TRN CA0501411
Language: English
Medium/Dimensions: Size: 4 pages **Abstract:** This document presents an alternative energy and power technology strategy that will enhance British Columbia's economy through better delivery and use of energy resources. The strategy offers improved environmental and social benefits and build's on the province's status as a clean energy provider. British Columbia's Technology Council states that the province can be a world leader in alternative energy by promoting wind, tidal, solar and run-of-the-river power projects. Industries and companies that adopt sustainable power solutions can become leaders in sustainable business practices while being more efficient and competitive. The total market size of the power technology industry worldwide is more than CAN$200B. In British Columbia alone, the industry comprises more than 60 companies employing more than 3,000 people and generating CAN$700 million in revenue annually. British Columbia's Energy for the Future plan promotes the use and development of integrated solutions for the following 5 market opportunities: (1) remote power solutions for rural communities, including off-grid distributed generation from renewable energy sources, (2) sustainable urban practices such as green building designs that reduce energy consumption, (3) sustainable urban transport such as the use of natural gas, electric-hybrid, fuel cell and hydrogen-fuelled vehicles, (4) sustainable grid solutions which increase efficiency of the power grid, and (5) large-scale clean power production to generate and deliver electricity

Lekic, A. **New Fossil Fuel Energy Technologies. A Possibility of Improving Energy Efficiency in Developing Countries** [Mechanical Engineering Faculty, University of Sarajevo, Sarajevo (Bosnia and Herzegowina)]
Conference: Conference on Sustainable Development of Energy , Croatia
Publisher: A.A. Balkema, Rotterdam (Netherlands)

Source: Conference on Sustainable Development of Energy, Water and Environment Systems, Dubrovnik (Croatia), 2-7 Jun 2002 ; PBD: 2004 ; In: Sustainable Development of Energy, Water and Environment Systems, by Afgan, N.H.[UNESCO Chair Holder, Instituto Superior Tecnico, Lisbon (Portugal)]; Bogdan, Z.; Duic, N.[Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb (Croatia)] (eds.), 376 pages.
Published: July 1, 2004
OSTI Number(s): DE20456500
Contract Number (Non-DOE): TRN NL04E0811
Language: English
Medium/Dimensions: page(s) 337-345 **Abstract:** The energy intensity in developing countries, especially in Eastern Europe and Former Soviet Union countries, is considerably higher than in industrialized countries. The development of new fossil fuel energy technologies might be a possibility to improve the energy efficiency and that way reduce the energy intensity in developing countries. Some of these new energy technologies: combustion in the pressurized fluidized bed, integrated combined cycle with coal gasification, combined cycle with natural gas as a fuel and fuel cell are shortly described. The principle of work for the facilities based on the above-mentioned technologies is described, and the basic characteristics and state of development are given. It has been emphasized that the facilities with those technologies have higher efficiency compared to classic thermal power plants, and that they pollute considerably less the environment. The short overview of primary energy consumption, the share of different resources and the estimation of saving which might be realized by using new technologies are given.

Hydrogen cycling by enzymes: electrocatalysis and implications for future energy technology
Vincent KA; Cracknell JA; Parkin A; Armstrong FA (REPRINT) (E-Mail: fraser.armstrong@chem.ox.ac.uk)
Univ Oxford, Dept Chem, S Parks Rd, Oxford OX1 3QR, England, (REPRINT); Univ Oxford, Dept Chem, , Oxford OX1 3QR, England,
DALTON TRANSACTIONS , 2005 , Number: 21 , Page: 3397-3403
Language: English **Abstract:** Hydrogenases provide an inspiration for future energy technologies. The active sites of these microbial enzymes contain Fe or Ni and Fe coordinated by CO and CN ligands: yet they have activities for hydrogen cycling that compare with Pt catalysts. Is there a future for enzymes in technological H-2 cycling? There are obviously going to be disadvantages, perhaps overwhelming, as enzymes are notoriously fragile; yet what are the positive aspects and can we learn any chemistry that might be applied to produce the electrolytic and fuel cell catalysts of the future? We have developed a suite of novel electrochemical experiments to probe the chemistry of hydrogenases. The reactions are controlled and monitored at the surface of a small electrode, and characteristic catalytic properties are discernible from tiny amounts of sample material, so this approach can be used to search the microbial world for the best catalysts. Although electrochemistry does not provide structural information directly, it does give a "roadmap" by which to navigate the pathways and conditions that lead to particular states of the enzymes. This has prompted many interdisciplinary collaborations

with other scientists who have provided microbiological, spectroscopic and structural contexts for this work. This article describes how these electrochemical experiments are set up, the data are analysed, and the results interpreted. We have determined mechanisms of catalysis, electron transfer, activation and inactivation, and defined important properties such as O-2 tolerance and CO resistance in physical terms. Using an O-2-tolerant hydrogenase, we have demonstrated a "proof of concept" miniature fuel cell that will run on a mixed H-2/O-2 feed in aqueous solution. (28 References)

Subjects:

CATALYTIC ELECTRON-TRANSPORT
ACTIVE-SITE
ALLOCHROMATIUM-VINOSUM
CHROMATIUM-VINOSUM
DESULFOVIBRIO-GIGAS
CARBON-MONOXIDE
IRON HYDROGENASE
NIFE HYDROGENASE
INACTIVE STATES
ACTIVATION

Constructing the future - Advocating energy technologies in the Cold War
Laird FN (REPRINT)
Univ Denver, Grad Sch Int Studies, , Denver, CO, (REPRINT); Univ Denver, Grad Sch Int Studies, , Denver, CO,
TECHNOLOGY AND CULTURE , 2003 , Volume: 44 , Number: 1 (JAN) , Page: 27-49
Language: English

Subjects:

UNITED-STATES

DOE to host International Conference on the Future of Energy Transportation Technologies

ANONYMOUS
MRS BULLETIN , 2002 , Volume: 27 , Number: 6 (JUN) , Page: 438-438
Language: English
Document Type: NEWS ITEM

Fuel cells: the future of energy technology?
Hinton A (REPRINT) (E-Mail: info@solartronanalytical.com)
Solartron Analyt, Southwood Business Pk, Farnborough, Hants, England, (REPRINT);
Solartron Analyt, , Farnborough, Hants, England,
CHEMISTRY & INDUSTRY , 2002 , Number: 4 (FEB 18) , Page: 22-22
Language: English