ENERGETICS. AVAILABLE MATERIALS

by Sylwester Zdanowski

Subject of environment protection has become recently very fashionable. Many speak about necessary of recycling and usage of alternative energy sources like wind water and sun. However so general approach creates mixture in which all discussions become trivial. "Garbage and Recycling" book is excellent example for this. It shows opposing opinions of expert in subject of recycling. One of authors Alan Carubba states that recycling and statements about lack of place for garages is result of environmentalists cries and have no justification[1]. Certainly his grand-grandchildren would thanked their ancestor for world in which settlements were build on garbage dumps or next to new garbage mountains. Everyone can recall some basic discussions about garbage's in forest or energy-efficient bulbs. Discussions of this type are only serving to show "Future shock" written by Alvin Toffler. With emerging new problems, most trivial old ones are becoming separate reasons for unending discussions.

[1] A. Caruba, We Are Not Runnig Out of Room for Garbage, "Garbage and Recycling", Drake 2007, p. 13.

Degree of increase in energy consumption justifies calling it a shock. In primitive period humans needed two thousand calories in form of food. Industrial age increased overall energy usage to 77 thousands of calories. Even current technological period is connected with further increase to 2300 thousands[2]. This increase progressed trough ages without considering the side effects and long term consequences. Effectively decreasing resources and destroying environment. Demand for natural resources with time started to shape economy and countries policy. Importers and exporters became dependent on them. Some because of income from export and all because of technology demand for resources. As it stands creating problem as bad for exporters as for importers. However for exporters it creates problem of choice between income from export and local production. At the same time importers have to find a way to acquire resources or replace them.

Lets look at General Accounting Office and World Energy Council reports. How resources are used, what affect capabilities to extract resources and when we will run of them. Those are key issues, very well described but only in form of reports but rarely read and raven less understand. However it is enough to influence countries politic. Regardless of argumentation changes in energy politics influence political tools and possible actions. Changes can be even seen in military, American Navy costs connected width oil prices increased in 2008 by 7 billions[3]. Effectively ability to influence oil prices allow decreasing enemy military capabilities. Long term price increase gives the same effect. Increase is result of exploiting more expensive deposits. Because of this tendency alternative resources became important. Alternatives includes searching for new deposits and ways to substitute them. Information revolution also opened new possibilities. Technologies based on communication is one thing. But using communication technologies to find new solutions is completely new phenomenon.

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[2] J. R Fanchi, Energy: Technology and directions for future, London 2001, p. 4.

[3] Alternative Energy, US Navy plans Green Fleet, http://www.alternative-energy-newp.info/us-navy-green-fleet/ (updated: 30.10.2009).

I. FOSSIL FUEL CHARACTERISTIC

"It is not known with great precision what the recoverable quantities of oil and gas are, nor how demand will grow. Both depend on human actions. It is known that they are in great demand, and that they are finite"[4].

Fossil fuel can be ranked by their quality and accessibility. To easy accessible and good quality deposit we can include oil in Saudi Arabia or gas in Qatar. Those deposits create tip of fossil fuel pyramid. Lower in this pyramid we have deposits in deep waters of Mexican Gulf. Base of this pyramid is created by resources that can exist in large deposits but their extraction can be problematic. To this category we can include shale oil, shale gas and methane hydrates. Extracting those resources depends on market prices[5].

To determine amount of avible resources we have to distinguish discovered and undiscovered resources. In first case we have deposits which quantity have been confirmed, for example by wells. Those deposits are cost-effective for exploitation. Existence of undiscovered resources is known thanks to geological knowledge. Although they do not qualify for extraction. At this point it is important to distinguish resources that can and can not be extracted because of technical limitations[6].

In conventional deposits oil and gas are trapped in impermeable rocks. Because of density on the bottom water is accumulating then oil and at top gas. This kind of deposit have provided most of production[7]. Unconventional deposit in form of shale are lot more demanding to extract. Processing them into liquid form and gas requires temperature of 500 Celsius degrees. Deposits of this type were already expiated in XVII cen-

[4] World Energy Council, 2010 Survey of Energy Resources, http://www.worldenergy.org/documents/ser_2010_report_1.pdf (updated: 17.04.2011).

[5] Congresional Research Service, U.P. Fossil Fuel Resources Terminology, Reporting, and Summary, http://epw.senate.gov/public/index.cfm?FuseAction=Filep.view&FileStore_id=04212e22-c1b3–41f2-b0ba-0da5eaead952 (updated 16.04.2011).

[6] Ibidem.

[7] Congresional Research Service, U.P. Fossil Fuel Resources Terminology, Reporting, and Summary…

tury. But cheaper oil from Middle East after II World War stopped this process[8].

In year 2008 oil resources were estimate to last 41 years, gas for 54 years, coal for 128[9]. Unconventional resources are harder to estimate. Some of them is to deep, other because of close geothermal sources may be destroyed. Although rising oil prices serves to accelerate research and investments directed at extracting them. At the same time technological progress works in oposit direction. Technology progress allows resources extraction without rising prices.

II. COAL

Coal found many applications in economy, first of all as source of electric energy. It's also used in production of steal, aluminum,cement, plastic, synthetic fibers or drugs. In many countries lot of coal is used to generate electricity, in Poland it's 93%. Until year 2030 cola usage is expected to increase by 60%[10]. Burning coal have two problems,impact on environment and irreversibility. In perspective coal deposit the cheapest energy source – will radically decrease. Metal or plastic after appropriate technology process can be reused. However lack of coal would mean necessary to recycle 100% of production or changing material. Presently thanks to high availability in many countries it's prices are lot more stable than oil. As a result it's still most economic energy source[11].

When this changes, there will be widespread surprise, price increase and search for alternatives. Only fashion for environment protection resulted in building power plant with carbon emission close to non. Development of Carbon Capture and Storage to year 2100 should provide 55% of total emission decrease[12]. Interesting is

[8] World Energy Council, 2010 Survey of Energy Resources…
[9] Ibidem.
[10] Ibidem.
[11] Ibidem.
[12] Ibidem.

comparison of those estimates with time for which coal will last. When CCS reaches significant level coal will last 36 years more! We need to remember that given earlier estimates about coal deposit for 128 years are from year 2008. Nothing happens just in one day, question is how CCS usage looks today. American non-profit organization FutureGen Alliance is planing to end its investment to year 2015. It informs about huge investments and used technology, known from 1930 years. What it does not say is how much electricity it can generate[13]. Loot more significant is situation of SaskPower's. Realization of CCS project government had subsidize project with 240 millions. Because whole project was thriftless. Mostly because of drop in electricity generation capabilities. CCS full usage means CO2 drop almost to non at the same time power generation drops from 149MW to 100MW[14]. It is somehow ironic, decreasing carbon-dioxide requires increase in resource usage to compensate efficiency drop.

Disposing captured carbon-dioxide is another matter. It can be used in oil improved extraction method. This method requires pumping CO2 to oil reservoir to increase pressure. Again its ironic that using CO2 requires lot more energy to extract one barrel of oil than thermal method. As a result CO2 usage decreases profitability.

Metallurgical Coking Coal transformed into metallurgical coke is used directly in steal production. As such it can not be replaced. Only comparatively rear anthracite have higher quality. In the same process coal often serves as energy source. Steal that requires coal in production process is the basic building block for most constructions. Cities, railroads and again ironically in the energy sector. It is needed to build transport infrastructure as well as power plants. Although steal can be 100% recycled thanks to electric arc furnaces, currently only about

[13] FuterGen Alliance, FuturGenFacts, http://www.futuregenalliance.org/FutureGenFactp.pdf (updated: 17.04.2011).

[14] SaskPower's, Clean coal project lacks money from oil industry, http://www.canada.com/reginaleaderpost/news/story.html?id=0f955b38–2fd1–4f36–9d99–02f304eee553 (updated: 17.04.2011).

43% comes from recycling[15]. The reason for this is difference in steal quality produced by oxygen furnaces that can use 30% of resources from recycling and mentioned electric furnace[16]. Despite of this difference electric arc furnace also requires coal.

Having coal deposits for 100 years may sound calming. In such long time we will surly find a way to replace it or at least find new deposits. Because of that burning lower quality coal to produce electricity without possibility to recycle is not a problem. Also fact that recycling metal requires cola is not important, we have over 100 years. At the same time plans to decrease carbon-dioxide emission will result in faster coal consumption. Positive assumptions have ended badly many times in the past. However time span between them seams to prevent people from reaching conclusions. For example it lead to subprime crisis. Building nuclear power plant in tectonically active area also ended badly. Little further in past Freanch confidence in their fortified defense lines before II WW ended in equally interesting way. The question is how current environment protection activities will end?

III. GAS

Natural gas resources should last next 54 years. Gas demand is mostly created by private sector for heating and cocking. For gas industry it is relatively efficient and clean fuel[17]. Especially now when we can see new wave of paranoia against nuclear power plants and shale gas received attention. Gas became very interesting fuel. In USA about 23.5% of produced energy comes from natural gas[18]. However it is also used in produc-

[15] World Coal Institute, Coal And Steel, http://www.worldcoal.org/bin/pdf/original_pdf_file/coal_steel_report(03_06_2009).pdf (updated: 17.04.2011).

[16] Ibidem.

[17] World Energy Council, 2010 Survey of Energy Resources…

[18] NEED, Natural gas, http://www.need.org/needpdf/infobook_activities/SecInfo/NGasP. pdf (updated: 17.04.2011).

tion of nitrogen fertilizer. Increase in gas prices would also mean increase in cultivation costs, that means food prices rise[19].

In year 2001 fertilizers price increase forced USA federal agency to start investigation on possible fraud. Energy and Tread commissions stated that several companies raised power and gas prices in contradiction to free market rules[20]. GAO stated obvious fact that gas prices increase translates into fertilizer prices, it also praises Agriculture Department for prices guarantees. However it does not point to any long term solutions. At the end energy companies take benefits. Someone have to pay for election campaigns.

At the same time we know for a long time bio-gas. Created from organic matter in anaerobic destilation gas contains 50–80% methane, 20–50% carbon-dioxide and trace amounts of hydrogen. Carbon-oxidize and nitrogen[21]. The possibilities for its utilization were presented in BBC audition from 25 March 2011. Thanks to micro-credits in rural areas farmers could bought installations allowing biogas utilization. Thanks to swine manure fermentation farmers received coking gas and fertilizer. This installation allowed to increase presented farmer annual income from 300 dollars to 3000 dollars[22]. What more it decreased amount of CO2 emitted by burning other fuels.

In liquid form gas found appliance as car fuel. USA Department of Energy stressed gas as clean fuel improves environment ad health. Gas powered cars are also solution for need to import 60% of crud oil. At the same time DoE sees that on the market there is available only one car factory-equipped in proper installation[23].

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[19] General Accountin Office, Natural Gas Domestic Nitrogen Fertilizer Production Depends on Natural Gas Avability and Prices, http://www.gao.gov/new.items/d031148.pdf (updated: 17.04.2011).

[20] Ibidem.

[21] U. S Department of Energy, What is biogas?, http://www.afdc.energy.gov/afdc/fuels/emerging_biogas_what_ip.html (updated: 17.04.2011).

[22] BBC, BizDail: China's green revolution 25 Mar 11, http://www.bbc.co.uk/podcasts/series/bizdaily (updated: 25.03.2011).

[23] U. S Department of Energy, Natural Gas Benefits, http://www.afdc.energy.gov/afdc/fuels/natural_gas_benefitp.html (aktualizacja 17 kwietnia 2011).

Gas can be used in cars and power plants. Its burning process emits lat less pollutions than other fuels, without using additional technology solutions. In combine with ability to create it in small farms it becomes perfect fuel for distributed energy generation. Although small scale gas turbines generating electricity require efficency improvement, gas can eliminate other fuels to provide heating or coking. Without problem of limited resources.

IV. CRUDE OIL

Crude oil is mostly used to produce usable fuels. However eawen car powered 100% by solar energy wont go far without crud oil. It is used to product tires! This situation is similar to recycling steal. For its production coal is required, theoretically steal can be recycled. However without coal even this becomes impossible. Concept of "peak Oil" from 70's, it means maximum possible oil production. After reaching this point production will only drop. Important problem hear is to distinguish amount of extracted oil from actual energy income. Increase in gross production may be possible, however extraction energy requirements will decreases net energy worth. IN 2007 GAO publicized report analyzing Peakoil:

"Most studies estimate that oil production will peak sometime between now and 2040, although many of these projections cover a wide range of time, including two studies for which the range extends into the next century. The timing of the peak depends on multiple, uncertain factors that will influence how quickly the remaining oil is used, including the amount of oil still in the ground, how much of the remaining oil can be ultimately produced, and future oil demand.[…] There is also great uncertainty about the amount of oil that will ultimately be produced, given the technological, cost, and environmental challenges.[…] For example, more than 60 percent of world oil reserves, on the basis of Oil and Gas Journal estimates, are in countries where relatively unstable political"[24].

[24] General Accounting Office, Crude Oil: Uncertainty about Furure Oil Supply Makes It Important to Develop a Strategy for Addressing a Peak and Decline in Oil Production, http://www.gao.gov/new.items/d07283.pdf (updated: 19.04.2011).

Refering to International Energy Agency report states that most of countries besides Middle East already reached maximum production[25]. Only in USA it took place about 1970. Eawen in world scale demand reached almost highest possible extraction. It caused price increase which resulted in slowing demand increase for crud oil. Higher prices creates favorable conditions for investitions in previously uneconomic regions. GAO report notes poorly checked areas like Antarctica, north Canada, Russia or parts of Barents Sea. Even 7 trillions balers of crud oil can be in unconventional-sources. They include Canadian oil shale, heavy crud oil in Venezuela and bituminous shale in USA[26].

However those deposit require higher expenditure and offer lower income. Solution for them can be usage of improved extraction methods. They can increase amount of extracted resources from 30 to 50% of whole deposit. However this technology requires improvements in area of seismic monitoring. Costs are also increased by required equipment and process of introducing hot water or even more expensive carbon-dioxide into deposit. Even with crud oil high prices, environmental considerations may limit this methods usage[27].

It is not clear what role unconventional deposits will play. They may delay time of reaching oil peak or only slow down extraction descend. Undoubtedly their usage will depend on oil prices. Because of this expectations that oil will again cost 70 dollar per barrel can be put on shelf described as cuted head dreams

It does not mean that oil prices wont fall. Rapid prices increac can be only another speculative bubble. Similar to .com and sub prime. When after credit crunch investors started to search alternatives they found oil. Investment portfolio diversification resulted in rapid prices increase.

[25] Ibidem.
[26] Ibidem.
[27] Ibidem.

V. BITUMINOUS SHALE AND SHALE GAS

Bituminous shale is a term for sedimentary rocks containing organic material, from which using destructive distillation oil and gas can be obtained. Shale deposit in 33 countries are estimated at 409 billion tons, it means 2.8 trillion barrels. Shale have different mineral content than coal, they contain even 60–90% of other minerals. While coal can not contain more than 40% of other minerals[28].

Possibilities of using oil from shales were in USE were considerate by RAND in 2005: "Assuming that low Environmental impact extraction methods can be developed over the next hundred or so years […] At best, about 75 percent of the accessible resource can be extracted and converted to useful fuels, […]Whether the actual amount is 1.1 trillion barrels or 500 billion does not matter for policy deliberations over the foreseeable future. Any number in this range is very large. For example, the midpoint of this range is 800 billion barrels of recoverable oil. To better grasp the magnitude of this midpoint estimate, consider that current U.S. demand for petroleum products is 20 million barrels per day. If U.S. oil shale resources could be used to meet a quarter of that demand, 5 million barrels per day, the recoverable resource would last over 400 years!"[29]. Authors states that extraction above 50 thousands barbells per day may be possible in 6–8 years, above 1 million after 20 years[30].

To obtain distillate similar to oil it is necessary to perform pyrolysis. This process may be performed at surface or underground. At surface process require a lot of water and underground extraction. Second option creates problem of removing residues after distillation[31].

Shale gas extraction requires fracturing process. Which means breaking rocks with liquid at pressure up to 8.000 psi. This liquid must have appro-

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[28] J.R. Dyni, Geology and Resources of Some World Oil-Shale Deposits, http://pubp.usgp.gov/sir/2005/5294/pdf/sir5294_508.pdf (updated: 19.04.2011).

[29] RAND, Oil Shale Development in the United States, http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG414.pdf (updated: 19.04.2011).

[30] Ibidem.

[31] Congressional Research Service, Developments in Oil Shale, http://www.fap.org/sgp/crs/misc/RL34748.pdf (updated: 19.04.2011).

priate density, mostly it is based on water. Depending on deposit type, sometime instead of water acids are used. On time fracturing process can consume as much as 5000.000 gallons (almost 2 millions liters). Washington uses annually only little more water[32].

Normal drilling procedure requires sealing borehole at water level. Properly projected and created borehole prevents liquids from penetrating into ground water. Just fractionating process can lead to ground water contamination. Although most of water is pumped out to wastewater treatment plant, just a surface leak may contaminate ground water[33].

VI. ENERGY POLICY

Changes in available energy resources directly influence economy and politics. Renewable energy can not be storage and transported as easily as coal or oil. It production must be distributed close to customers. Because of that exporters are losing their political tool. At the same time it increases energy security. However it becomes difficult to provide enough of energy in time of highest demand. Regardless countries policy are based at carbon-dioxide decreasing and so called environment protection.

United States of America energy policy after 1985 was changed by president Obama administration. Between 2011 and 2025 this program supposedly will allow American families save 1.7 trillion dollars in fuel costs. Decreasing oil usage by 2.2 mln oil barrels per day in 2025. Trough 14 years decreasing oil usage by 12 billions of barrels[34]. Presidential program focuses at savings in transport. At the same time Institute of Electrical and Electronics proposed more changes. Most of all increasing power usage efficiency by:

- Promoting education and user awareness of energy efficiency opportunities

[32] Ibidem.

[33] Ibidem.

[34] White House, Driving Efficiency: Cutting Costs for Families at the Pump and Slashing Dependence on Oil, http://www.whitehouse.gov/sites/default/files/fuel_economy_report.pdf, (updated: 16.01.2012).

- Promoting capital investment in energy-efficient technologies and processes for residential, commercial, transportation and industrial sectors
- Promulgating minimum efficiency standards for products and buildings consistent with life cycle analysis
- Developing, commercializing and using efficient electric technologies in transportation systems
- Adopting intelligent transportation systems to reduce energy consumption
- Developing system design and technologies to further reduce energy losses in electric power generation, transmission and distribution
- Promoting the use of secure high-speed communications networks and information technologies to substantially improve access to information, controls and efficiencies[35].

Documents notes importance of renewable energy that haven't been yet used on larger scale. Because of that IEEE gives few recommendations:

- Supporting funding for R&D activities in renewable electric power technologies to accelerate their adoption
- Promoting the use of renewable energy because of its security of supply, distributed and modular nature, and reduced greenhouse gas emissions
- Supporting programs for education on, and early deployment of, emerging renewable power technologies[36].

Document also recommends nuclear power plant and carbon-dioxide capturing technology.

Their are also few special solutions. Thanks to special sensors Smart Grid allows decreasing maksimal power consumption. Consequently older power blocks used to provide peek power can be shut down. Additionally equal energy consumption distribution trough day time makes it easier to use alternative sources. Without this technology part of energy without equal demand at the same time would be lost.

[35] IEE-USA, Position Statement national energy policy recomendations, http://www.ieeeusa.org/policy/positions/energypolicy0211.pdf (updated: 16.01.2012).

[36] Ibidem.

Key element for EU external energy policy are places where energy resources deposits can be found. Especially when they are in unstable non-democratic countries. Meanwhile energy requirement in time of 25 years will increase by 50%. Whats more countries with crucial deposits are supposedly nine times more likely to experience internal unrest. Although demand for oil give them 7% economy increase in first five years next 10 will result in 17% decrease[42]. At the same time Europe wont be able met her own energy needs without import.

Turkey is good example for external energy policy. It can enable the EU to increase its political influence in the Caspian and Russia. It also provides a bridge to the Persian Gulf. This in turn may improve the conditions of access to resources in North Africa[43]. Turkey's location gives it influence on transport costs of energy from the east. It can help maintain lower oil prices and competition with the Caspian oil supplies Russian and OPEC[44].

Importance of this issue can be seen looking at Russian policy. According to energy policy adopted in 2003 it should strength Rusian positon on the market. At the same time it schould guaranti acces to other countries markets, technologies and finances. To achive it infrascricture need to alove export in all directions[45]. In 2004 EU imported from Rusian 29% of gas and 26% of oil. In 2008 it was 40% of gas and 33% of oil an those values will increase as deposits in North Sea become depleated. Rusian

[42] Javier Solana, EU High Representative for the Common Foreign and Security Policy, http://www.google.com/url?q=http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/EN/discours/91788.pdf&sa=U&ei=FqQVT9HjCZGE-wbzmMXzAg&ved=0CBIQFjAH&client=internal-uds-cse&usg=AFQjCNGhXQ7h42IJnctc4FUjsshisq-wWg (updated: 17.01.2012).

[43] A. Tekin, P.A. Williams, Europe's External Energy Policy and Turkey's Access on Process, http://aei.pitt.edu/11786/1/CES_170.pdf (updated: 17.01.2012).

[44] Ibidem.

[45] M. Fredholm, The Russian Energy Strategy & Energy Policy: Pipeline Diplomacy or Mutual Dependence, http://www.google.com/url?q=http://www.da.mod.uk/CSRC/documents/Russian/05(41)-MF. pdf&sa=U&ei=W6oWT-HCLIak-gaqkYCPBA&ved=0CAoQFjAD&client=internal-uds-cse&usg=AFQjCNGtAFjdTEkymVX04IToJJde_uKjPg (updated: 17.01.2012).

From 1997 European Union have a policy concerning renewable energy sources. In 2009 EU adopted proper directive. Setting a goal to 2020 archiving 20% of energy from renewable sources and 32.6% – 36% until 2030. Also until 2050 greenhouse gases emission should be decreased by 80 to 95%[37]. From 1971 to 2008 energy sources in 27 EU countries have changed. Energy recived from coal decreased from 49% to 28%, oil from 23% to 3%, water from 7% to 10%. At the same time nuclear power increased from 4% to 28%, biomass from 0 to 3%, wind sun and geothermal from 0 to 4%[38].

Policy resulted increasing speed of building new energy installations utilizing renewable sources. In 1995 14% of new energy production capabilities was renewable. In 2010 it was 41% of new power generation capabilities[39]. Between 2000 and 2010 energy production from gas increased by 118.2 GW, wind by 75.2 GW, photo voltanic by 26.4 GW. At the same time from oil doped by 13.2 GW, coal by 9.5 GW[40]. Until 2020 34% of energy should came from renevable resources, in it:

- 14% – wind
- 10.5% – water
- 6.7% – biomass
- 2.4% – photo voltanic
- 0.5% – concentrated solar power
- 0.3% – geothermal
- 0.2% – tidal, wave and ocean[41]

In 2006 Javier Solana outlined external energy policy. He pointed that days of easily obtainable energy have came to an end. All around the world from Sudan to Venezuela it becomes part of everyday politics disputes.

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[37] EWEA, EU Energy Policy to 2050, http://www.google.com/url?q=http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/EWEA_EU_Energy_Policy_to_2050.pdf&sa=U&ei=F2oVT9OoI9G4hAfe2dCzAg&ved=0CBQQFjAI&client=internal-uds-cse&usg=AFQjCNENs8r04bT__jTgo0OC9ChL5foK9Q (updated: 17.01.2012).

[38] Ibidem.

[39] Ibidem.

[40] Ibidem.

[41] Ibidem.

position is guarantied by 30% of world gas deposits and 10% of oil[46]. Political meaning of resources is empazied by ex-FSB agents controling them. What is more Gazprom provides 25% of tax incomes. In return for subsiding internal recipients to alleviate social frictions this company have export monopoly[47]. In 1990 didnt have any influence on oil sector. After removing Mikhail Khodorkovski goverment bought tok concrol over Youkos trough national Rosneft. Gazprom also bougth Sibneft and have majority action package of Caspian pipline . In relation to western firms participating in oil extraction in Kazachstan Rusian government have special financial demands. Threatning them with trials for suposedly not paid taxes[48].

Rusian governmant tried to take control over transport infrastructure in europe. At the same time closing internal market. Although Rusian export could be directed to Asia or eaven USA , European coutries take care to ensure mutual dependencies. About two third od Rusian incomes came from export and half of budget from oil and gas export. Gas transport infrastructure and long term contracts permamentlu connect Rusia with Europ[49].

Only Chinas that could be Rusian resurces recipient in their five years plan take as a goal increasing energy efficiency. To increas efficiency their ale closing low efficient power plants generating under 100 MW. In 2007 after closing 23.4GW powe in small power plants efficiency increased from 356 to 345 grams coal equivalent on kWh. It is also preferable to build combined heat and power instead ow pure power plant. Also in stell

[46] Congressional Reserch Service, Russian Energy Policy Toward Neighbouring Countries, http://www.google.com/url?q=http://www.fap.org/sgp/crs/row/RL34261.pdf&sa=U&ei=W6oWT-HCLIak-gaqkYCPBA&ved=0CAYQFjAB&client=internal-uds-cse&usg=AFQjCNHc9yjAidBp17pTzyFHMapIKbErfA p. 1 (updated: 19.04.2011).

[47] Congressional Reserch Service, Russian Energy Policy Toward Neighbouring Countries, http://www.google.com/url?q=http://www.fap.org/sgp/crs/row/RL34261.pdf&sa=U&ei=W6oWT-HCLIak-gaqkYCPBA&ved=0CAYQFjAB&client=internal-uds-cse&usg=AFQjCNHc9yjAidBp17pTzyFHMapIKbErfA (updated: 17.01.2012).

[48] Ibidem.

[49] Ibidem.

industry Chinas elimineted low eficiency production powers[50]. Those steps are necessary because of Chiness limited resources. In 2004 their have 12.6% discovered resources of coal and 1.4% of oil[51]. This gives chose betwean own resources giving high polution and cleaner imported oil. This choice must take in to account factors created by all countries. In it availability, prices and supplay line security. Chinese policy is significantly different from American. To provide security United States use military bases aroud the world. At the same time Chines invest in infrastrucre in Africa and Rusia. Importing into countrie extracted resources[52].

North Africa may be another example for diferences in energy policy. Coal as a basic energy source is responsible for generating 93% of electric energy and 70% of energy in general. 33% of extracted resources is exported, 55% used by power plants, 21% to produce fuel, 4% to produce gas and 20% in extracted form[53]. During the apartheid energy policy was consistent with the nature of the system. It provided access to modern energy forms to 11% of the population. Giving priority to industry in 1950, the government owned company Sasol has started production of synthetic fuels from coal. At the same time it was decided locally refined oil. Since 1954, imports of refined products began to be replaced by local processing. After 1994 it became a priority equalization of access to basic services for the majority of the population. This meant the need for rapid electrification program reaching 80% of the population[54]. With focus on equalizing access daily demand for oil reaches 450 thousends barrels of

[50] Asia Pacific Energy Research Center, Understanding Energy in China, http://www.google.com/url?q=http://www.ieej.or.jp/aperc/2009pdf/APERC_China_2009_rev.pdf&sa=U&ei=I-wWT92qLtCi-gbD1vGkBA&ved=0CBAQFjAG&client=internal-uds-cse&usg=AFQjCNFF43nKRay5Lucttx7Pj9qq9pJSWw (updated: 17.01.2012).

[51] Fan He, Donghai Qin, China's Energy Strategy in the Twenty-first Century, http://www.google.com/url?q=http://en.iwep.org.cn/download/download.asp%3Ffile_id%3D196&sa=U&ei=7nIYT6KiD4rz-gam58ilCg&ved=0CBIQFjAH&client=internal-uds-cse&usg=AFQjCNFeKId9xNmPuxkTAJDnLlgC3fQLWw (updated: 17.01.2012).

[52] Ibidem.

[53] Energy Research Center Uniwersity of Cape Town, Energy policies for sustainable development in South Africa, http://www.iaea.org/OurWork/ST/NE/Pess/assets/South_Africa_Report_May06.pdf (updated: 19.01.2012).

[54] Ibidem, p. 6–7.

liquid fuel. Import is responsible for 225 thousend barrels, rest cames from synthetic production. To increas efficiency and decrease polutions policy recommends using disel fuel[55]. This shows lack of scientific background allowing real problem solution. Renewable energy sources and are regarded only as a solution for poor households where grid supply is not viable[56]. Ipso facto bringing long term energy issue to short term economc issue.

Each countrie have its own energy policy. Influenced by localy avible resources, technology and buisnes interest. All democratic countries policy are depandand from curent situation and politics aspirations to keep their positions. While people want to live reachly. Those elements o system prevents us from acting in coordinated and effective way. But outside of old political and economy system ther exist new public domain. Begining of neew society created by people searching for wew solutios to many problems. In the context of energy "The Clean Energy Project" runing by Harvard University with World Community Grid is the best example. Supported by volontiers it utilizes free computer power to solowe one smal problem in terms of energy sources. Its goal is to "find new materials for the next generation of solar cells and later, energy storage devices"[57]. Another example is Hydrogen(at)home project that has private sponsor. But its using the same method in research – volontiers free computing powers. Especialy in case of Harvard such cooperation on new solutions brings new element into all policies. In times when patent rights became important source of incomme for companies an by that also taxes. New way to generate knowlage is emerging. Researchmade by university with help from computer userscan bypase economy motivations for soloving many issues. Unfortunatly the gratest strength of this aproache is also its limitation at least for now. Because World communiti grid at the end of March 20121 has only 93 thousend of active users[58]. How fast research

[55] Ibidem, p. 11.

[56] Ibidem, p. 12.

[57] WCG, The Clean Energy Project – Phase 2, http://www.worldcommunitygrid.org/research/cep2/overview.do (updated: 30.03.2012).

[58] Grid Republic, Statistics, http://www.gridrepublic.org/index.php?page=stats (updated: 30.03.2012).

can progres is directly linked to this number and computing power thay can offer. It is somehow ironic that increasing speed of such research requires increase in direct power consumption or change in equipment. Second option also means usage of resources. Som limited gain could be achived troug knowlage and changes in habits. For example some web pages use a lot of computing power to display animations and adverst. By this they increases computer power consumption wchich goes unnoticed for most users. The same energy could be saved or used in favor of research.

VII. "WHAT SHOE IS"

There are many different scenarios about results of fossil fuel usage. Currently even from GAO reports conclusion is obvious, gas and oil usage will rise. Connection between them is a consequence of occurring them together in deposits. Both of them are used in fertilizer production. Food and Agriculture Organization of the United Nations stated that in year 2008 oil prices have not affected fertilizer prices[59]. At the same time gas prices influence at fertilizes become concern to GAO, which drawn less optimistic conclusion. Although oil may be economy foundations for decades, we cannot expect that difficulties in extraction wont influence basic products prices.

Every year of economy working with current energy principles leads to burning giant amount of resources, that could be used better than by powering light bubble. Rising prices will eventually effect in search for alternatives. However this mean search will began after the fact when resources are already near depletion. Meanwhile new policy are based at climate changes issue. This leads to promoting solutions that decreases greenhouse gas emission increasing energy demand. In the background we can find issue of dependency from other countries. Slowing this by

[59] Food and Agriculture Organization of the United Nations, Current world fertilizer trends and outlook to 2011/12, ftp://ftp.fao.org/agl/agll/docs/cwfto11.pdf (updated: 19.01.2012).

diversifying energy sources is not a permanent solution. It is impossible to diversify sources of something that have bean exploated completely. What is more policy supporting new technology does not take int account resources used directly in production process. While finding ways to substitute them would give the same effect. Decreasing pollutions and dependence, at the same making problem of limited resources obsolete. Thus relegating the time of their absence for the production of fertilizers, among others. Which translates into long-term protection of food markets. However, the development of solutions allows private distributed energy production would have unintended consequences. The subject does not void the sale by levy. Thus depriving policy makers of the tax revenue.

According to pessimistic predictions, we already crossed point without no return, which will lead to current system fall. Rising prices or oil and gas will lead whole economy into troubles. In face of a crisis lake in Greek or Portuguese government will collapse.

Little more optimistic predictions state that prices will rise. How fast depends from resource supplies. To slow it down we have to forget about using X% of sun energy in 50 years. Solutions decreasing oil usage in power plants and transport wont eliminate it complicity but will allow to buy time necessary to replace oil in other branches of economy. Otherwise agrarian revolution which made T. Malthus predictions ridiculous will have to bow before his vision. Today we have chance to see this problem before global peak oil thanks to speculative bobble, which lead many to bankruptcy. Future depends on biggest countries policy and research in public domain. Especially those with every day knowledge can influence our future. For one by voting for best representatives that will improve politic. Next by supporting public domain in search for solutions. Finally and most importantly by every day actions. Decisions that create energy usage like turning on computer or choosing private car instead of public transport. But many every day things requires a lot of knowledge to notice. This fact alone brings issue of energy like many others back to education process.

ABSTRACT

Little more optimistic predictions state that prices will rise. How fast depends from resource supplies. To slow it down we have to forget about using X% of sun energy in 50 years. Solutions decreasing oil usage in power plants and transport wont eliminate it complicity but will allow to buy time necessary to replace oil in other branches of economy. Otherwise agrarian revolution which made T. Malthus predictions ridiculous will have to bow before his vision. Today we have chance to see this problem before global peak oil thanks to speculative bobble, which lead many to bankruptcy. Future depends on biggest countries policy and research in public domain. Especially those with every day knowledge can influence our future. For one by voting for best representatives that will improve politic. Next by supporting public domain in search for solutions. Finally and most importantly by every day actions. Decisions that create energy usage like turning on computer or choosing private car instead of public transport. But many every day things requires a lot of knowledge to notice. This fact alone brings issue of energy like many others back to education process.