Solar Australia

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SOLAR

AUSTRALIA

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AUSTRALIA - SOLAR ENERGY

1. INTRODUCTION

Energy development is still very important subject with strong rise of China, India, Brazil but also possibilities of low income countries to gain more of energy needs. Hand in hand with new infrastructure and high energy consumption developed world is concerned with topics such as energy efficiency measures, environmental positive and negative consequences of energy use, right measure of renewables in end supply structure, energy conservation and saving through better energy management, long range transmission and reduction of losses, credits, fines that are related with harmful emissions.

This paper supports strategy of development in respect to add new clean energy infrastructure in total energy supply picture of one country and continent: Australia. This Concentrated Solar Plant can serve as clean energy resource not just to Australia but also to China if transmission lines or innovative thinking are developed, build or considered.

Australia's potentials as a base for clean energy resource can be utilized better and larger, be significant clean energy input, can serve not just electricity input to new cars, but also as CO_2 credit exchange (Japan,Australia, China) , and reduce coal inputs in production that harms environment with greater CO_2 emissions.

Another aspect that is put in consideration is right of indigenous people on land with certain dividend from project, or educational and social rights connected with that.

Besides direct and visible demand for energy in China (rising GDP, increasing energy import, more population) consumers can be interested in Project if they can be part of ownership structure, have a share as pension fund part, influence end usage of resource, be part of pricing policy, enjoys tax deduction if choses energy friendly input etc.

2. LITERATURE

Growing body of literature is obtained not just as scientific literature but as the information gained from numerous international bodies that provide insight into new research. In addition to that great potentials are recognized from statistical data bases. Just to mention few of them *iea.org; eia.org; BP.com, inogate, Eu.europe/energy; worldenergy.org; iiasa.ac.at; solar, wind, geo – observation, Greenpeace, nooa and many other governmental and non-governmental bodies*.

Paper uses literature as source of information and strengthen observation it with computer program - Ret screen – from Canada based pro-environment organization.

The reasoning in paper and research goes from non-renewables studies and their implication on economy, environment end usage in transport: Adelman, Mineral Depletion with Special Reference to Petroleum ; World Oil Production Consumption; Aguiar Coraria, Luis Francisco Yi Wen: Understanding the Impacts of Oil Shocks; Bacon: Asymmetric speed of adjustment of UK retail gasoline prices to costs; Balke, Oil Price Shocks to Economy; Baell Ray and Olga Pomerantz: Oil Prices and the World economy; Bernanke Ben: Oil Shocks and Aggregate Macroeconomic Behavior; To Other Topics Such as Renewables, Consumer Behavior, Impact of Climate to Earth.

Just a few authors among many significant contributors to field are here to mention: Malter, Muller, Werle: Handbuch Ausgewahlter Klimastationen der Erde; Benhamou Nennouna, Brugmann Czischich: Trans Mediterranean Cooperation, Sahara Wind Solar; Berger: Dany: Auswirkugen der Zunehmenden Windenergieeinspeisung auf die Ubertragungsnetzbetreiber; Creutzburg M. : Solarthermie und Photovoltaic im Kostenvergleich, Czisch: Potentiale der Regenerativen Stromerzeugung ; Dixit Avinash : Optimization in Economic Theory Oxford; European Commission: Assessment of Solar Power Plant Technology; Finn: Perfect Competition and the Effects of Energy Price Increases on Economic Activity; Hausler M: Energietransport uber Land und See mit Gleichstrom; Kaldor: Speculation and Economic Stability; Kannigieser: Nutzung Regenerativer Energiequellen Africa's zur Stromversorgung durch Combination von Wasserkraft und Solarenergie; Knies Milow, Nitsch: Markteinfuhrung Solarthermischer Kraftwerke Chance fur die Arbeitsmarkte und Klimapolitik, Knies: Nitsch: Strom und Trinkwasser aus Solarthermischen Kraftwerken; Kronshage S: Evaluation System for Solar Thermal Power Station; Pelzman S: Prices rise faster than they fall; Pindyck Rober: The long run evolution of energy prices: Solarmundo: Economic assessment of Solarmundo Solar Thermal Power Plant; Trail Bruce: Estimating Irreversible Supply Functions and many other.

3.BASIC EXPLANATION OF WORK

This work is a result of several facts that served as starting point for further development of the project Solar Australia. Besides classical demand- supply questions that each project is naturally related to some technological advances, natural wealth as well as problems, social considerations as well as innovative thinking can be part and basis for further discussions and even project realization. This paper tries to connect two very distinct countries China and Australia that are not neighbors but can help each other in having energy security while reducing negative impact of electricity coals productions.

A) The first fact that is important and seen as a base is the amount of solar energy that comes on Earth. It comes in unlimited form, in day light; it is abundant and not exhaustible.

B) The second fact is the technology achieved so far that makes possible electricity production on various ways from PV, Concentrated Solar to Thermal Solar Plant. Further research, in making better efficiency, more secure transport, especially problem of energy loss on long distance route, storage opportunity as well as new innovative thinking (space - ground interrelation) are recognized by technical and scientific personal.

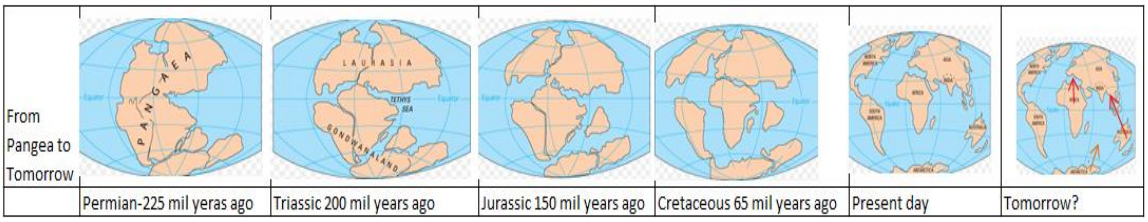
C) The third fact is the observation of the market. In Australia usage of electricity per person do not have such a strong growth, and is supported by coal. Low level of solar technology and renewables as a general picture in Australia, make additional pressure on environment making CO_2 emission to rise, and could harm not just environment in Australia, but bring Antarctica under stress and sooner than expected floods from that part of the world.
The second observed big market in that part of the work is China. This country has seen a large GDP/Capita growth that was accompanied with growth in electricity consumption. There is a market and strong demand for electricity if we compare average electricity usage USA/China; further population expectation of rise (second child policy), continuing GDP growth and rise of standard, possible usage of electrical cars and bigger and wide spread change in technology (from oil to electricity, gas) etc. Additional pressure or opportunity has been seen from Environmental part where electricity production is primarily done by coal, so further expectations of additional CO_2 quantities are expected and with that possible damage to environment, human health animal world.

D) Importance of environmental topics has been stressed by numerous Conferences so far (1979 the first climate conference started; 1988 the Intergovernmental Panel on Climate change IPCC; 1977 Kyoto Protocol; 2012 Doha Amendment (2013-2020 – raised a list of greenhouse gases; Montreal; 2015 Paris –just a few important places that put some long and short term decision a and obligation on level of harmful gases.

History of change is the only reality that we had so far. Through studying past picture on geo foot printed we have noted that the world have passed through several great floods, and faced with great negative consequences of the climate change. Not just the danger of reducing the ice on Antarctica, but large weather change, disappearance of protected natural resources (Coral Reefs), damage to homes and business are connected with the long term change and once accomplished can be irreversible.

Source: Wikipedia .org/ Ammonite

Even some big picture from the past can serve for the future strategy in making a global world more energy secure place. Although history never repeats itself on exact way some observation of Earths past can teach us of danger and possibilities. It is recognized that the past event, floods, movement of continents brought distinct not just geographical picture but also change in flora and fauna to the picture of not recognizable place.
Some up to date knowledge and scientific research pointes us further that movements of continents is not over and we can expect Australia and Africa to slowly move toward north.
This can bring different climate to Australia and shortened the distance between main land Asia and Islands. Further human endeavors are pointed toward satellite Earth communication and interrelation. Although this present great challenge not just from the technological point of view, new commercial strategies but also some new dangers (danger to bird species) that need to be solved prior project start.



Source:Wikipedia.org

The change from the past can serve as further input to realize that oil, coal and emission that are caused by humans do harm environment, making CO_2 concentration bigger, causing ice to melt and with flooding further change face of the Earth.

Table 1: Geo history of Earth

1. PRECAMBRIAN			Includes 90% geological time; From 4,6 bill years ago;
	Hadean		Solar System was formed from large cloud dust. Era before solid rock, first zircons 4 400 mil years ago
	Archean		The Earth of early time(4000 mil years ago) ;Earth crust cooled; First rock, continents, mudstone, low high grade metamorphic rocks; From volcanic
	Proterozoic		Era around 2500-541 mil years -rapid continental accretion, first super continent Rodinia, after comes Pannozia:;First glaciations
2. PHANEROZOIC			Covers 541 mil years, Continent collected into one single Pangea
	Paleozoic		The Paleozoic is divided into 6 geological periods ,start after Erath mass was broken into large number of smaller continents
		Cambrian	Result from break up of Neoprotezoic supercontinent Pannotia. Laurentia,Baltica and Siberia remained indipendent,Gondwana started to drift toward South pole,Pnathalassa covered South hemisphere etc.
		Ordovian	Started major extinction called Cambrian Ordovician extinction, southern continents were collected into single Gondwana;
		Siluriam	The Silurian time Gondwana drifted to south, but Silurian ice caps were less extensive than later Ordovician period. One large continent called Euroamerica formed
		Devonian	Great tectonic activity; one ocean
		Carboniferous	A global drop in sea level,
		Permian	One super continent Pangea
	Mesozoic		
		Triassic	All Earth landmass was concentrated into a single supercontinent ;organism lived in lagoons Estheria crustaceans and terrestrial vertebrates
		Jurassic	Pangea broke up, From plants coniferous, Animals -dynatopia,
		Cretaceous	Large biodiversity ,Ended in extinction
	Cenozoic		Covers 66 mil years after extinction event, up to current era, Continents drifted to current form; Gondwana split into South America, Australian, Antarctica, Indian subcontinent, This impact gave rise to Himalaya
		Paleocene	Demise of non-avian dinosaur, giant reptiles much flora fauna
		Eocene	Lasted from 56-33mil years ago; impact of large bolides in Siberia;
		Oligocene	Antarctica become more isolated, Global expansion of grasslands, regression of leaf forest to equatorial belt
	Neogene		
		Miocene	Apes arose and widespread, kelp forests the most productive places
		Pliocene	Temperature 2-3 C high than today, Artic cup formed, In North America rodents did successful, huffed declined, in Africa first Hominins appears, Asia elephants, stegodoonds successful
	Quaternary		

		Pleistocene	The Pleistocene (from 2.588 million years ago to 11,700 years before present). The modern continents were essentially at their present positions during the Pleistocene, the plates upon which they sit probably having moved no more than 100 kilometresrelative to each other since the beginning of the period.
		Holocene	The Holocene Epoch - approximately 11,700 calendar years before present till toady-continental motions have been less than a kilometer; ice melt before 10 000 years caused world sea level to rise 35 meters; Holocene marine fossils are in area of Montreal, Vermont etc. and primarily in lakebeds, floodplains and cave deposits. Post glacial rebound in Scandinavia causes the region to rise and provoking small earthquakes-similar in Hudson Bay North America region

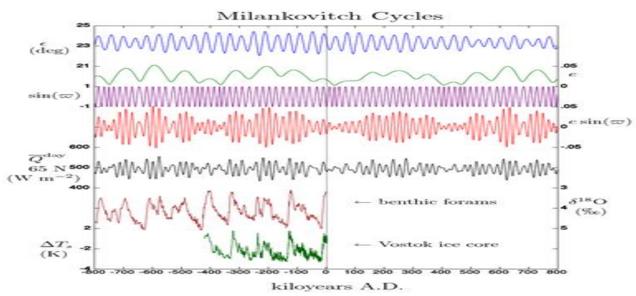
Long term climate impact was studied by Mr. Milanković and reported as the natural state of the Earth that repeats itself in long term cycles. Milanković analysed past and future orbital parameters and made observation on: *e obliquity (axial tilt)*, *e eccentricity*, *W longitude of perihelion, e –sin(w) precession index (together with obliquity, controls the seasonal cycle of isolation) ;* Qday- calculated daily averaged insulation at the top of atmosphere , day of the solstice at 65 degree N latitude. Beside on these parameters MIlanković described collective effect of changes in the Earth's movements upon its climate.

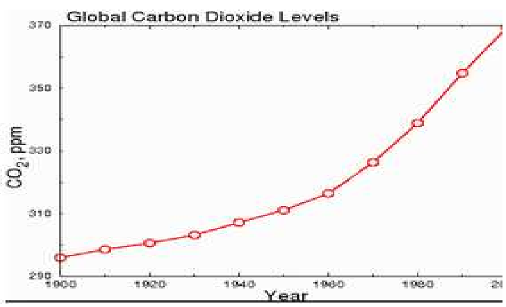
Earth orbit is an eclipse which is a measure of the departure of this path from circularity. The major component of variation occurs in a period of 400 000 years and this is influenced by major planets - Jupiter, Saturn - without them Earth orbit would not vary in a period of million years.

Earth's axis completes one full cycle of procession approximately 26 00 years, while elliptical orbit rotates more slowly. This effect leads to 21 000 years period between astronomical season and the orbit. Angle between the Earths rotational axis and the movement to the plane obliquity oscillates between 22,1- 24,5 degree in 41.000 year cycle. When obliquity increases summers in both hemisphere receives more radiative flux from the sun and winters less. When the obliquity decreases summers receive less isolation and winters more.

Precession is the trend in the direction of the Earth's axis of rotation to the fixed stars- period of around 26 000 years. When the axis point toward Sun is at the north –the northern hemisphere has a greater difference between seasons, while southern hemisphere has milder season. Hemisphere that is in summer at perihelion receives much of the corresponding increase in solar radiation.

Problems that arose in 100 000 Milanković cycle that are not going as planned are searched among following variables: carbon dioxide influence and level, cosmic ray and ice sheet dynamics.

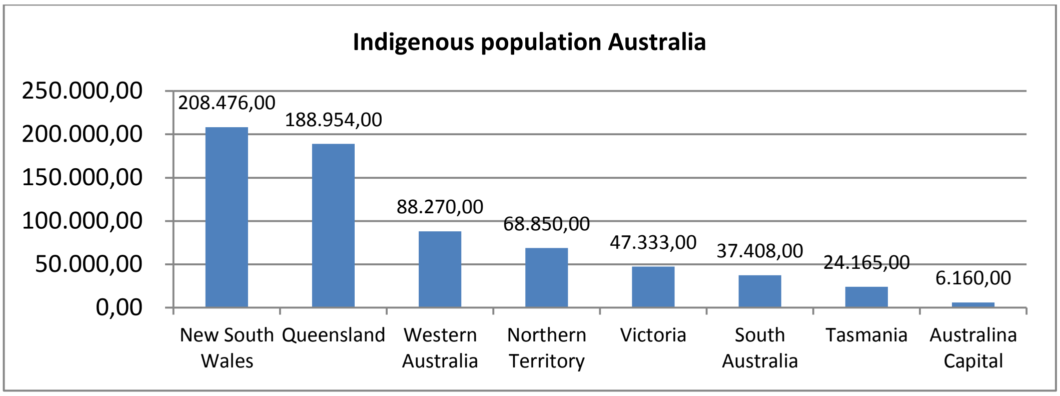




E) Social consideration

Australia is inhabited with around 24 mil people where only 3% are indigenous population. This group of people presents many tribes (Koori,Nyunnawal, Murri, Murreli,Nyungar, Yamatji, Wangan, Nunga, Anangu, YAPA,Tiwi,Anindilyakwa, Palawah, Yolngu itd) that are believed to be settled in the area from the long period of time around 125 000 to 40 000 years ago.

Indigenous population - Australia



Picture 1

Although with very log history and significant cultural , intellectual and land property ownership there is a huge difference between standard, educational possibilities, health, life age, access to modern facilities (electricity ,water) etc. Topics that were for long time allocated to indigenous people are to be searched in following problems: poverty, insufficient education, substance abuse, far remote community, poor access to health, very poor urbanization possibilities, cultural pressure, misunderstanding, lack of communication etc.

Also despite very wide spread and good non-governmental organizational body difference still exist in standard and life expectations (AADNC, ACMPR, Bureau of Indian Affairs, CDI, Council of Indigenous Peoples,Funai,Ncip, UNpfii.)etc.

Due to long term history of their ancestors those 3% of population have the right on land, ancestral domain, intellectual property - culture, songs, builder, language (more than 250 languages were spoken before white settlers came), traditional knowledge rights, treaty rights, etc.

This right can be allocated further to solar project in form of right on land, work activity, health care, educational opportunity etc.

4. DEMAND MODEL

With rising technology advances, communication and transport means that started with the firsts sailing across the ocean and continued until today (modern computers, Internet, airplanes, mobile, large production, computer mechanization) the world is faced with many issues that need to be tackled and solved on the best possible way in form of world optimization procedure processes. The one of the subjects related is a question of energy, energy reserves, distribution, energy efficacy methods, conservation, energy savings and low negative impact on environment.

This paper tries to tackle a question of possible energy solutions at the area of Australia and China and in that respects tries to determine:

1. Optimal value or possible output that can be achieved from solar energy
2. Amount of labor, capital, energy put into project
3. What is a market or consumer preferences related to buying energy, rising or falling market, market that is willing to pay a more for cleaner energy, and is the consumer in situation to afford right choice of energy bundle offered

When observing this facts it is possible to determine level of success of certain project, profit to level of input and output, costs that will be suffered in projects in global market (labour,machines, time, raw material,) costs that are related to environment that can be positive or negative, and at the end if all is done consumer satisfaction with the quantities and price received.

As in all other projects and this one is pointed toward minimization of inputs, and maximization of profit, but what is different with this case is that it observed indirect costs of social well-being as inseparable part, and put a price on CO_2 emission as positive and negative values.

In our project feasible set is an amount of solar energy that is coming to Earth, (that has a large and unlimited supply options), labor option (Indigenous community, others), capital (large possible credit option at global market, dividend distributed to international, national shareholders and aboriginal communities a part of land options), technology (silicon, machines – obtained from demand market in this case it is a China).

Y=Y (E input, L , R , T)

Demand market is market with income opportunity, price consideration, and quantity that is with the end bought.

$P_1X_1 + P_2X_2 + P_3X_3 + \ldots + P_nX_n < M < \sum p_i * x_i$

End result or optimization will result of right choice of bundle sets that is available in nature, with human labor and technological advances put as objective function on feasible set.
Right choice will lead to minimization of all costs (material, environmental, social) and maximization of revenue (monetary, non-monetary terms, short term as well as long term objectives related).
On that respect we have a function that is long term solution to energy security availability and reduction of environmental negative impacts by helping the poorest in Australia.

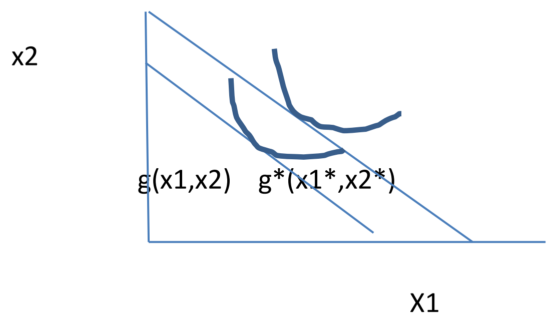
Y=f(x) …continues…

While the sun influx has no limits and can provide with technological advances and right usage as a long term strategy option for this part of the world.

The second possible mark that comes from this project is a low level of risk while we can from start to end obtain financing, reach market and connect monetary and non-monetary values.

The end solution production curve have convex and concave lines (rising cost to point , and revenue and then after paying all interest credits statically decreasing costs).

In that way we can observe two functions
f1-y*g1=0……………current coal based electricity production
f2-y*g2=0………….solar electricity production (low level CO_2 objective as well as energy stability)
g(x1*,x2*)-b=0…end solution where buyer is having an electricity as an bundle or combination of solar (low level of CO_2), and coal production-current production.



The buyer in China will determine his basket opportunity in a way that is cupped by his income, preferences, availability, social status, tax implication, environmental preferences etc.

For the end supplied good he expects to be available with complete information, where a buyer choses a good between x1 and x2 in a way that he states:

-The set of bundles he preferred, or is indifferent at where x2 solar is called a better set than x1 good with coal, high CO_2 emission

-He can be indifferent of x1 and x2 (in a way he do not feel any environmental impact, have no social implication tax benefits etc.)

-The set of goods or input he do not prefer or is indifferent can be called a worse set - solar is more expensive , he do not see implication on his life as in case of social environment benefits; for example
For the buyer at the electricity market is important fact that he can choose among sets of good and change. In one point of time he may prefer one input over other (based on personal believes,

preferences, tax status, employment, family status , benefits, right information of input bundles and his impact on end result).

The third possible consumer behavior is a basket of goods (possible price of each good) related to personal income, and state average income. With rise of GDP/capita it is expected that each household have water, electricity supply in home, possibility to choose, but also pay for electricity that is in schools, hospitals, public transport (more cars , available on electric power) etc.

With increasing supply of electricity function takes a continues form (basic fix+C*var level) part of service that is on market, available to all, and subject of decreasing cost due to completion, technological advances etc.

End decision that was inelastic regarding income and electricity supply becomes more open with high level of utility options. Where end utility is:

$d_u=u_1dx_1+\ldots u_2dx_2+\ldots u_nd_{xn}$
$-dx_2/dx_1 = u_1/ u_2=MRS =p_1/p_2 = tax_1/tax_2 = environment_1/ environment_2$

$X_2=(M-p_1x_1)/p_2$

$Xi^*=D(p1,p2,\ldots.,M)$

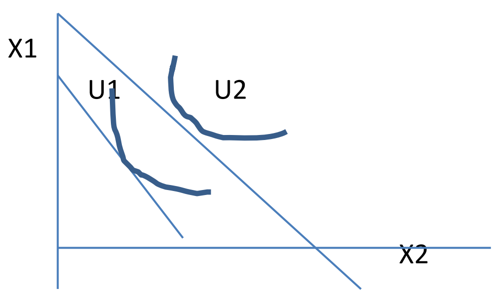
His end bundle will be determined upon his income, maximization of utility (economic, social, and environmental, health, etc.)

End function= $u(x1,x2,x3,\ldots.xn)+\lambda(M-\sum Pixi)$

In China with GDP rising, income curves are shifted toward right making possible to have more options, goods, utility alternatives. With additional supply of electricity option from Australia solar electricity Chinese customer can chooses between price options that incorporates clean energy option, possible tax deduction, reduced CO_2 in environment etc.

Australia do not have such a high GDP growth rates (also it has a high base GDP per Capita level) and not so high electricity consumption growth but there decisions are related toward price of coal, price solar, social and environmental consideration.

Chinese case:



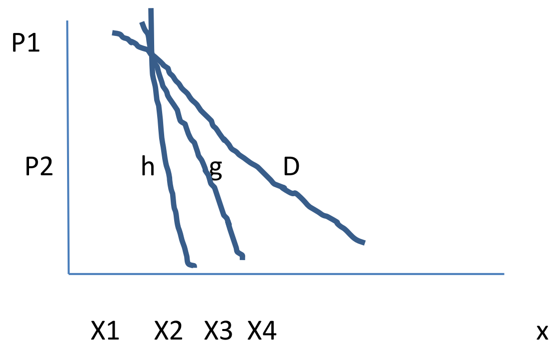
The first possible option is to choose a bundle of good alone U1 curve and current option on market (current solar, coal input in his customer basket). He can -with open electrical market - chose and substitutes one good for another.

The second possible case is the income effect –rising income can move utility function from U1 to U2 with constant supply of each good. With new options- new plants that uses solar energy , and price competition that incorporates social and environmental effect he has on disposal total price effect that consists of income as rising income and price –lower price /KWh as substitution effect.

In Australia we can observe situation on following way. Lower level of GDP rise, constant population and majority of customers that already do have established a contact with electricity supplier.
Three possible options can be noted:
-***D curve***- Where new plant bring new p1 consideration (tax deduction, environmental benefits, social help), so p2 price of coal electricity is held constant income is constant - we have DD Curve Marshallian constant money income demand curve. Bundle rises from x1 to x4

-***g curve***- The constant purchasing power demand curve gg is similar to CP curve. The fall in price p1 from p2 as a result of new plants , competion and choice. Customer demand rises x1 to x3

-***h curve***- The customer keep utility constant, Hicksian utility demand curve is hh is derived from constant utility function. The competition new plant causes –p- to decrease (p1 to p2) and he changes x1 to x2 keeping utility constant.



Price effect on demand takes a following form where Marshallian demand function is a sum of two effects: the substitution effect $\partial Hi/\partial pj$ and income effect $x j * \partial D/\partial M$.

$\partial D/\partial pj= \partial Hi/\partial pj- x j * \partial D/\partial M$ i,j =1….n

Some possible new way to contract an electricity supply that can be given to customer is seeing as:

1. Customer can enter into contract themselves, or as part of community , building, quart (additionally reduced price).Price of electricity night /day can vary also be different for distinct social bracket categories.

2. Possible incentive to make a contract with level of renewables including solar can be done as tax incentive. Further possible right of customer can be allocation of this right to longer period of time (the right is not exercise immediately or even transfer to hospitals, schools, social institution or other as humanitarian / or donation.)

3. Customer has the right of access supply , residual electricity that cannot be saved is wasted and take decision in what type of business opportunity (greenhouse, hydrology, desalinization, etc.) can than this access energy be transferred to .

4. Customer has the right to know the price of electricity made to productive services and to - based on quantity delivered- but and high income and dividend - influence further his own contract price

5. Can be given the right to change the supplier side without limitation and additional fees

Although solar is still considered as the most expensive type of electricity source some additional benefits to customer can be given as a part of financing opportunity and guarantee of dividend payment .It can serve as investment into pension fund as well.

To enter into contract and become one of owner's customers is further interested in:

1. Ownership

How many owners / stock holders are present/ how many large investors/ where the investors came from / is it possible that some pension fund is also part of ownership structure etc.

A small individual customer – as owner – must be additionally informed about performance one example is to have an access to web page of company (with owner number) with all information that are broader than publicly known data

A one customer is not interested in having an ownership in company but prefer investing into pension fund or large base of indexed based in his/hers risk preferences level.

To enter into ownership structure and give a rise to project, his own interest in keeping environment and promoting social rights of indigenous people, a customer besides of his dividend, information rights is interested in having a control to further actions.

He can be asked directed toward future decisions in a way to approve, or not. Suggest further company actions.

2. Organization

It would be of benefit for solar plant to employ as many indigenous people as possible as a way to promote equality but in a ways to compensate for land usage.

While each company need to have educated and capable people –further schooling, scholarship fund can be established on regular base

3. Information

It is considered that once that solar plant is put into operation is static place and need not further variable costs- and majority of costs are on the side of fixed, obligatory reporting etc. The truth is that each company need market research, to follow technological advances in order to reduce operative costs, to see new opportunities, examine possible new ways of selling (better transmission, betters storage, ground space) having an fixed amount of energy bought per year and

following that amount like on mobile, allocation energy to distant areas on new ways etc. Although all information can be research there is an always a degree of uncertainty in new projects or decisions. Customer can support, approve, be interested in new research or himself make proposal.

4. Conflict

Conflict can arise in many respects. The one already recognized are:

-Separation of ownership/management structure and not capable to enter into decision process .In this subject topics such as moral hazard and adverse selection are just few to mention- while the owner cannot control manager to the wanted degree. The strength of owner raises with his share part and in case of many customers small owners, this risk arises.

-Boundaries of the firm are not seen clearly. Where the profit part ends and environmental and social consideration take part tackling the part or whole society? Different party can realize that there is a way for conflict and try to influence

-Conflict inside the company, right structure, right decision making process, architecture of job and decisions made

-Shareholder structure – after the first ownership structure is put in place additional debt / capital can be a subject of conflict between owners (those risk averse/risk willing)

-Internal labor market- further separation of indigenous/others, allocation of responsibilities in a wrong way, low level of employee benefit structure etc.

The main topic inside the company is as follows:

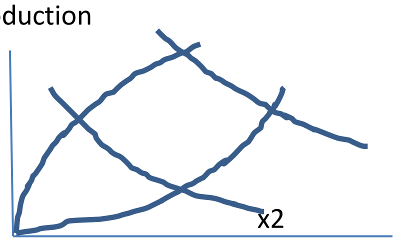
1. Production-risng further levels

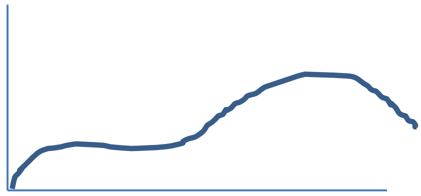
2. Costs-minimisation, allocation, distribution.

3. Revenue-new potentials, growth rate,costs, prices , WACC

Production

x1





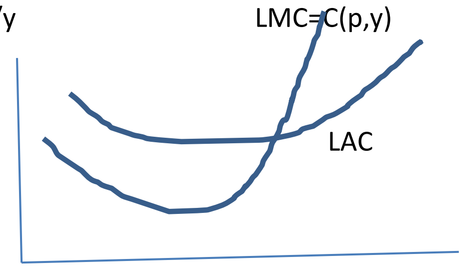
y(f(x1,x2)

Costs

P1x1+p2x20C

X2=C1/p2-p1/p2X1

C/y



Supply

Max profit =py-∑pixi

dProfit/d y= p- ∂C/∂y <0

5 . ENERGY IN THE WORLD-RENEWABLES

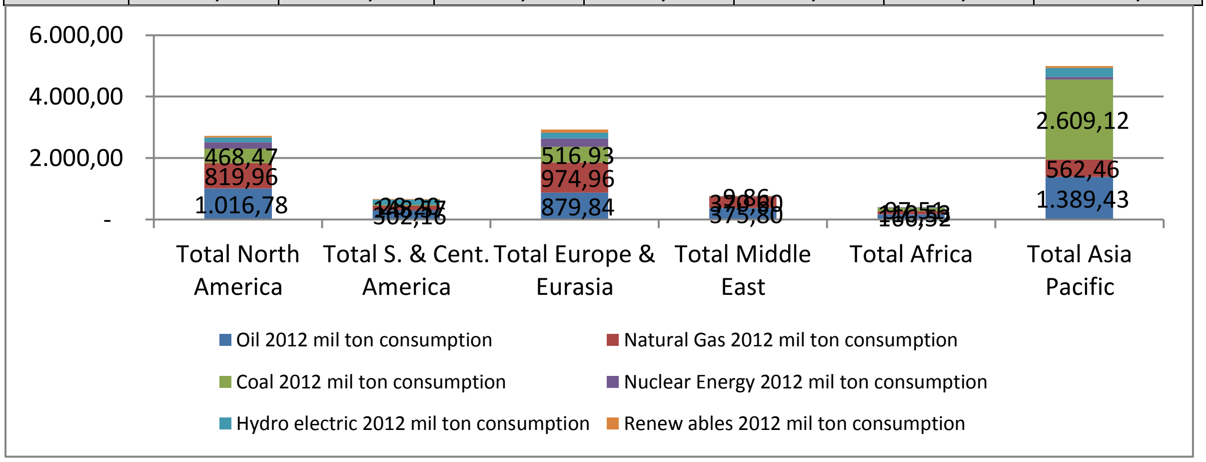
What is current and future energy need, level of renewables already employed in the world as well as in China and Australia, what can we expect on the cost and investment side of equation based on current level of technological advances is further to explore.

a. Energy consumption

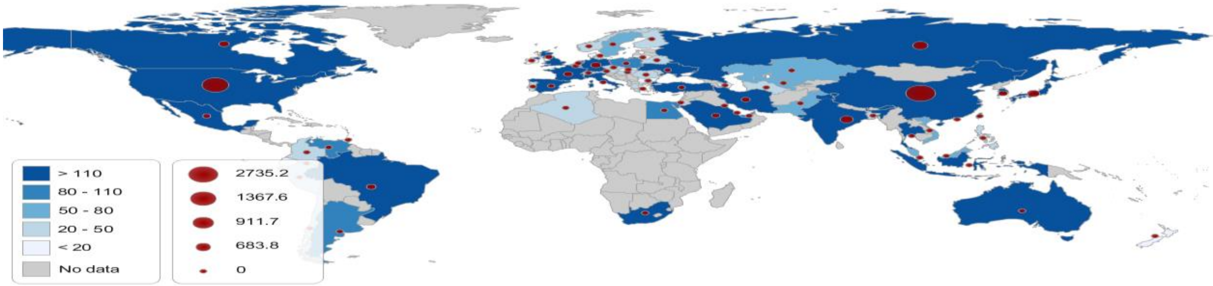
Increased consumption of primary energy is due to increased number of population, GDP growth, industrial developments, increased trade, and communication on the world scale. Oil is still the most significant energy source, followed by coal that is in China and the less developed world still widely in usage. Last decade is features with lingering or closure plans of nuclear industries and strong advances and communication regarding renewable technology and implementation. Wind, solar geo and biofuel went with big steps in the most developed world forward-EU, USA, but made significant effort to diversify in some developing countries such as Brazil (ethanol in transport). The biggest energy consumers are interested in developing its owns technologies and further to implement in its country strategies.

Table 2: Consumption, total world 2012 mil ton oil equivalent

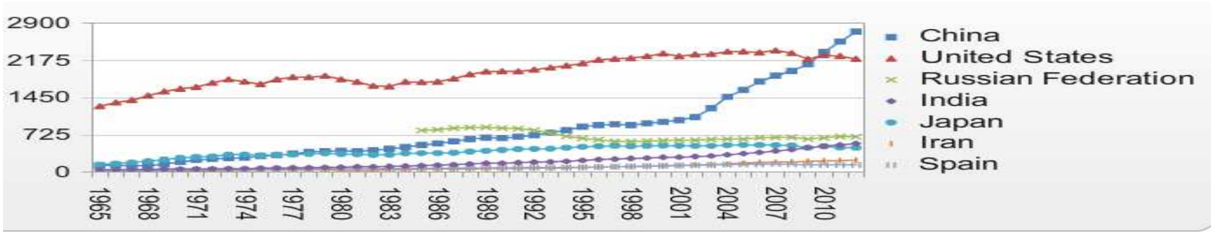
	Oil 2012 mil ton consumption	Natural Gas 2012 mil ton consumption/	Coal 2012 mil ton consumption	Nuclear Energy 2012 mil ton consumption	Hydro electric 2012 mil ton consumption	Renew ables 2012 mil ton consumption	**Total 2012 mil ton consumption/**
Total North America	1.016,78	819,96	468,47	206,90	156,31	57,01	**2.725,42**
Total S. & Cent. America	302,16	148,57	28,20	5,04	165,72	15,62	**665,31**
Total Europe & Eurasia	879,84	974,96	516,93	266,87	190,81	99,10	**2.928,51**
Total Middle East	375,80	370,60	9,86	0,32	5,14	0,14	**761,86**
Total Africa	166,52	110,53	97,51	3,22	24,14	1,40	**403,31**
Total Asia Pacific	1.389,43	562,46	2.609,12	78,06	289,02	64,15	**4.992,23**
Total	**4.130,53**	**2.987,06**	**3.730,09**	**560,39**	**831,14**	**237,42**	**12.476,63**

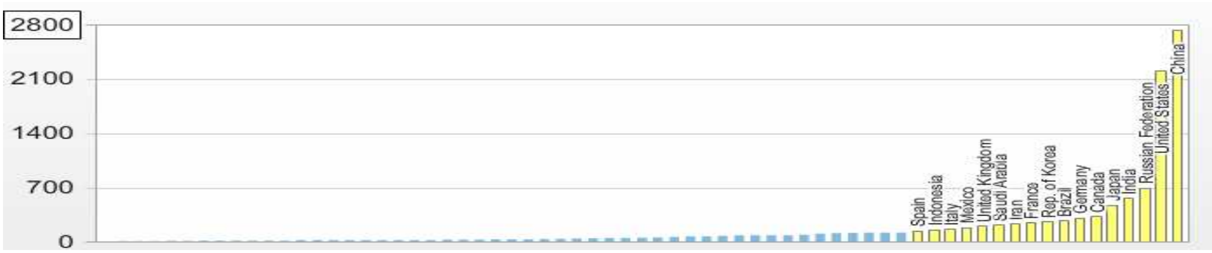


Picture 2

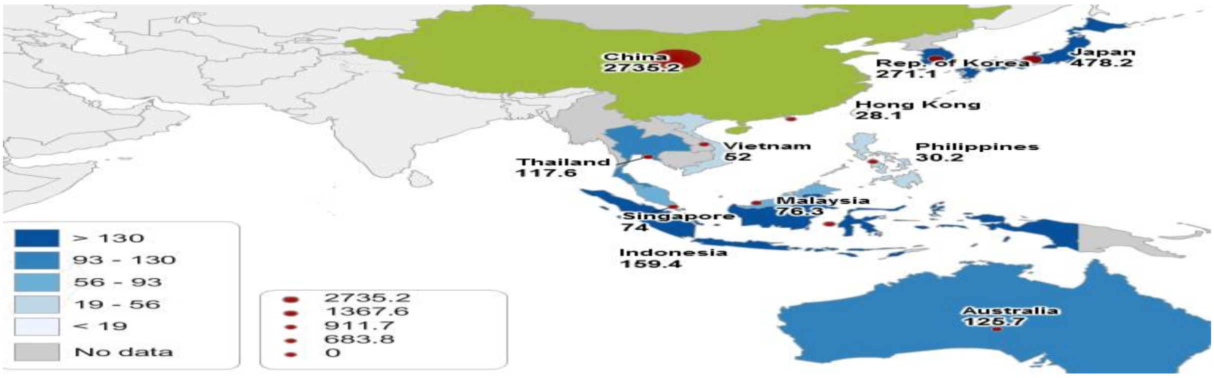


USA is known as large energy consumer but works also actively on implementing renewables in its strategy and putting technology on ground. China with its exponential growth is seen as developer for industry but also consumer of wind, geo, in future. Russia is lagging behind the world in renewable development strategy due to significant oil, gas reserves, Japan is concentrated on nuclear and oil , but in its technological advances such as car production produces new possibilities other than oil (hydro Toyota Mirage) and India is seen as important country in the future world plans due to rising population and GDP growth.

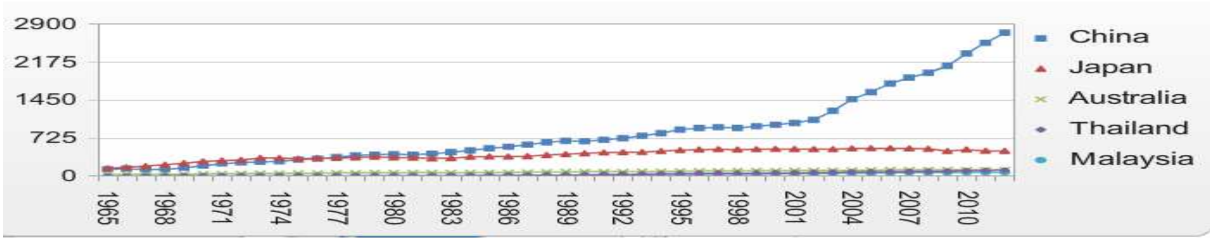


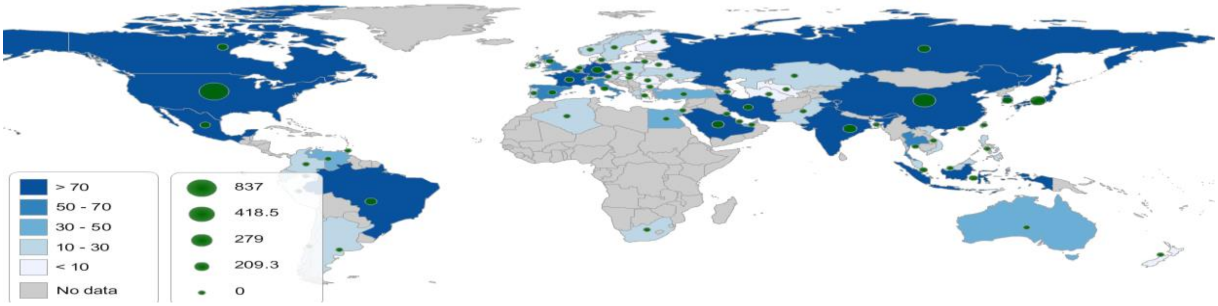


China uses the most energy 2 735 mil ton and further increases is to be expected. Other big consumers in Asia Pacific region are Japan 478 mil ton oil equivalent, Republic Korea 271 mil ton oil equivalent, Australia 125 mil ton oil equivalent and Indonesia 159 mil ton oil equivalent.



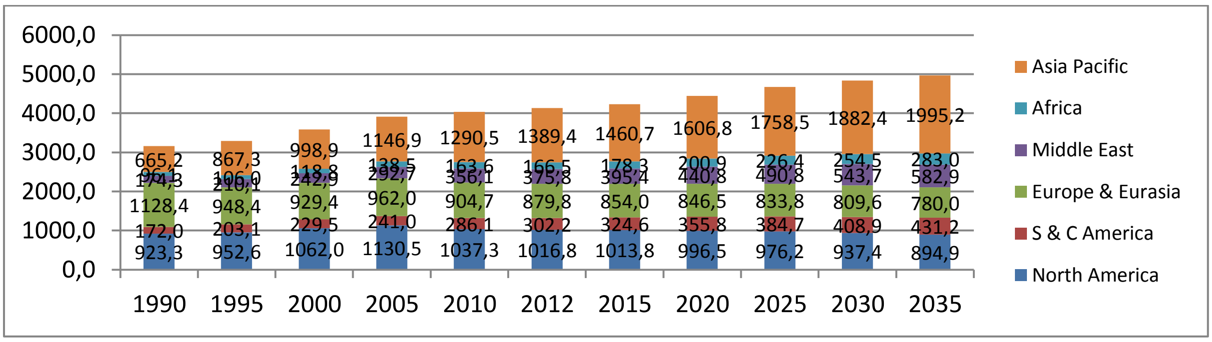
The biggest growth has China with further increased trend.





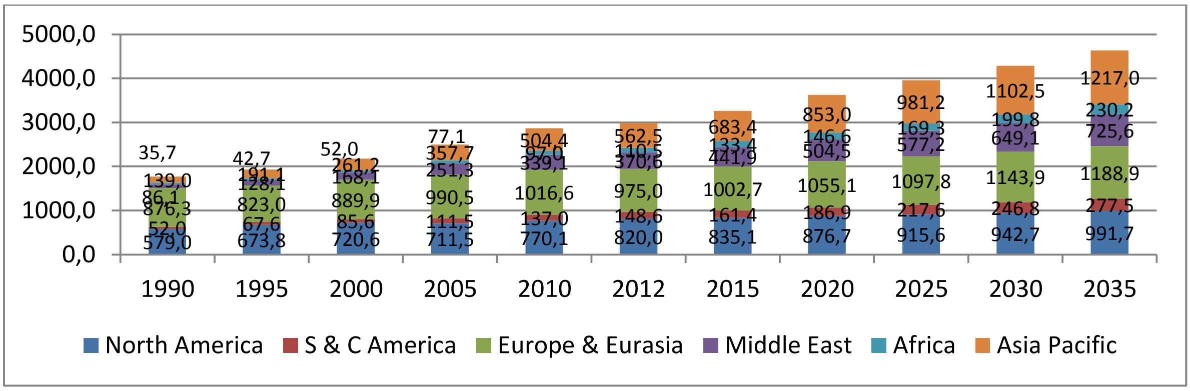
Institutes, energy companies, Government bodies, consumers and many other participants on market are trying to establish the best possible supply /demand structure in near future in order to increase its own energy pricing policy and contribute to efficiency. Although basis is current consumption, reserves, population growth, GDP/capita it is hard to establish right energy mixture as well as price that is going to be present in mid long term energy plan. Many analyst starts form current situation and have some base to observe future consumption. Usually they take into account population number, GDP/capita, current energy picture, new legislative, technology etc. This picture, in addition, can be added with some government interventions- taxes, credits- to certain technologies, advances that can came up from current research centers. Each analyst or institution has its own methods and it is possible that certain deviation occur. By following consumption history so far, BP analyst made certain forecast plans that stretches to 2035. They think that the biggest increase will come in the area of Asia and Pacific in respect of oil, and Europe will rely more heavily on gas in times that come. This short overview presents one point of view and calculation method.

Consumption oil /oil products mil ton 1990-2035 BP Oil consumption 1990-2035 BP



Picture 3

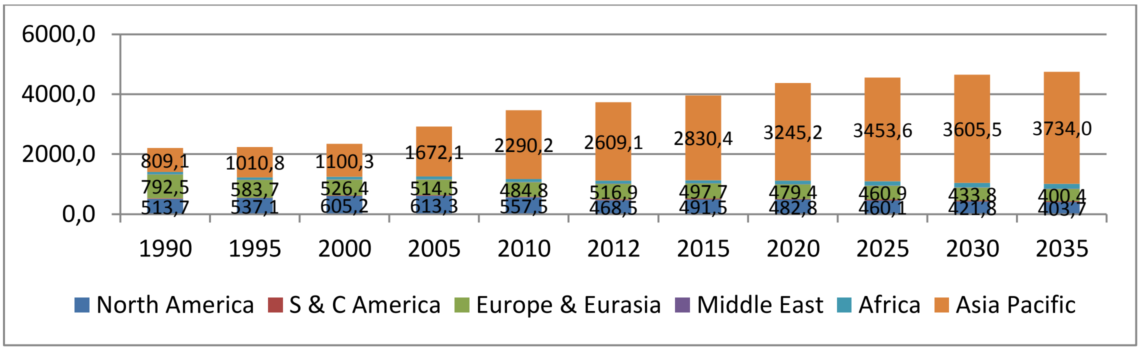
Gas consumption 1990-2035 mil ton oil equiv.



Picture 4

Asia and Pacific are still very much dependent upon coal - this trend is likely to stay according to some analyst. Further coal usage from 2.609 to 3.734 mil ton oil equivalent stresses this fact.

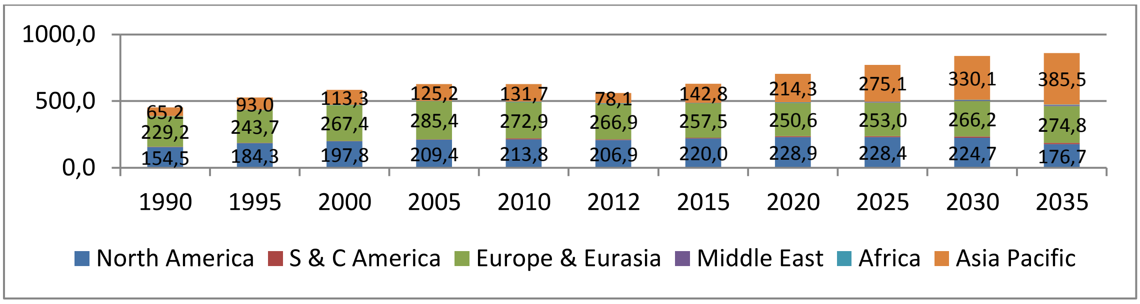
Coal consumption 1990-2035 mil ton oil equivalent.



Picture 5

Although NE is perceived as potential dangerous many countries still in its strategies have plans to build or invest in current nuclear energy capacity. It can be case for the region of Asia Pacific.

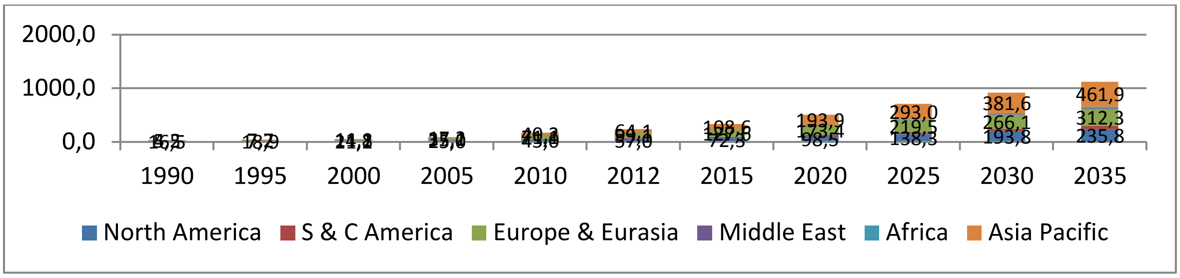
Consumption NE 1990-2035



Picture 6

The most significant feature is energy increase from renewables .While in 2000 it was less than 200 mil ton oil equivalent, in 2035 it is perceived to be around 1.500 mil ton oil equivalent on the world scale.

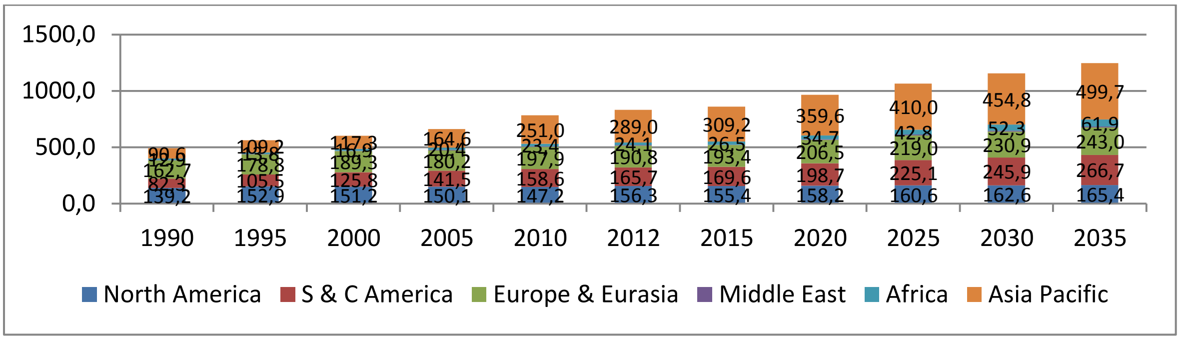
Total consumption of energy from renewable sources mil ton oil equivalent.



Picture 7

The most significant green resource comes from hydro energy and it further predicts growth from 800 mil ton oil equivalents in 2012 to 1200 mil ton oil equivalent in 2035.

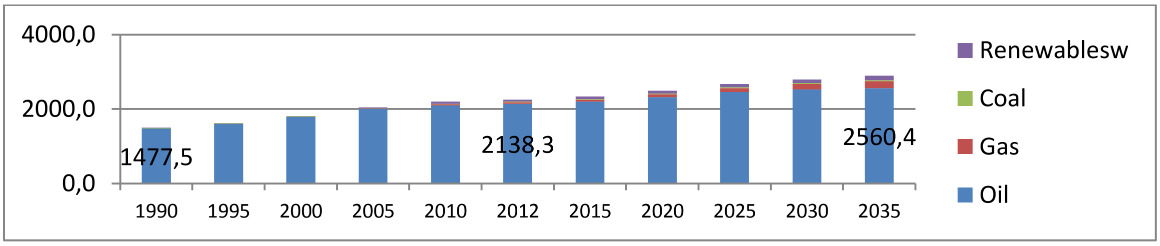
Total consumption of hydro energy 1990-2035, mil ton oil equivalent. 1990-2035



Picture 8

Oil is largely used in transport sector. With new technologies- electrical cars, hydro – it will decrease to certain extent its part in total used volume in period that comes.

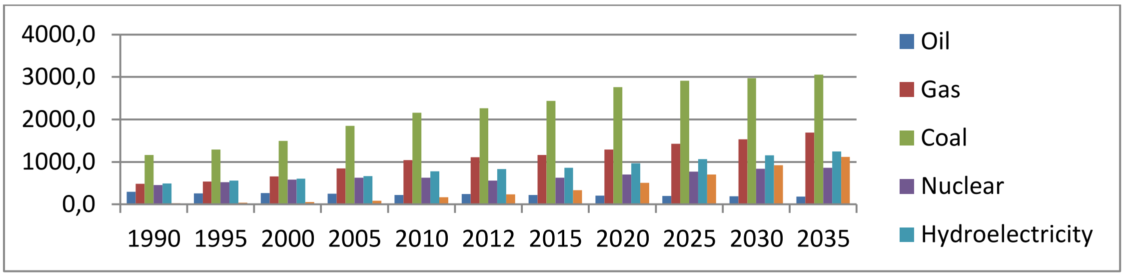
Consumption in transport sector



Picture 9

Electrical energy is produced using coal in Asia and this trend is likely to continue.

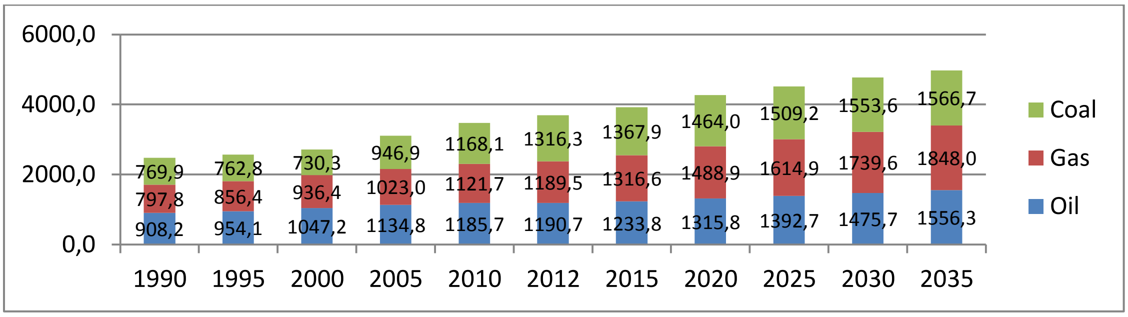
Electrical energy production –inputs 1990-2035



Picture 10

Industry is further heavily relied on coal, oil and gas.

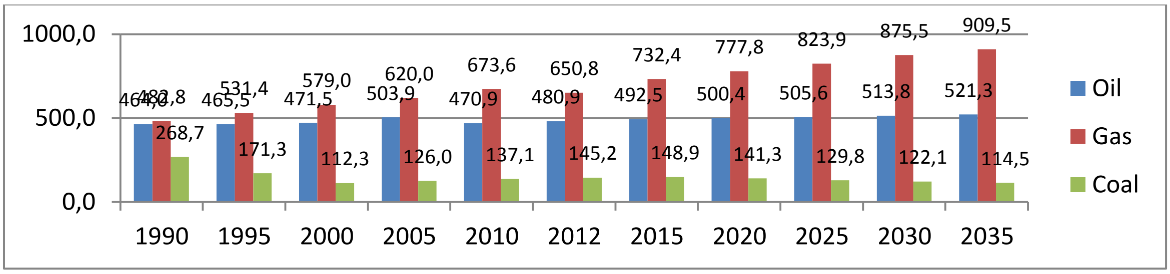
Energy consumption industry



Picture 11

Other sectors – households, heating, other- is based on consumption that grows from to 650-909 in observed period.

Consumption in order sectors

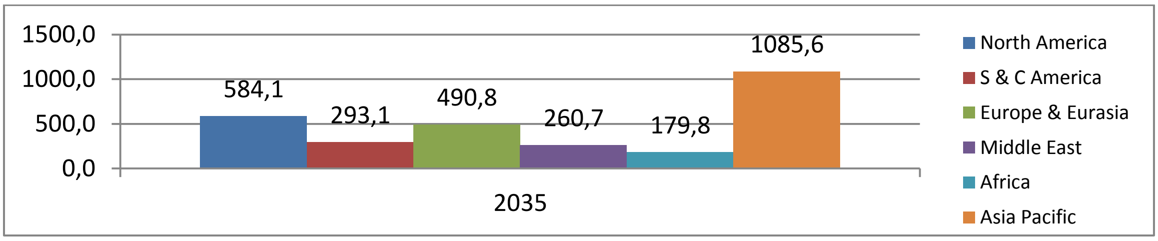


Picture 12

In the last observed period in year 2035 we can conclude that in the transport sector the biggest consumption is in area of Asia Pacific and almost half less in Northern America.

Transport sector will spend the most energy inputs in Asia Pacific region in times that come.

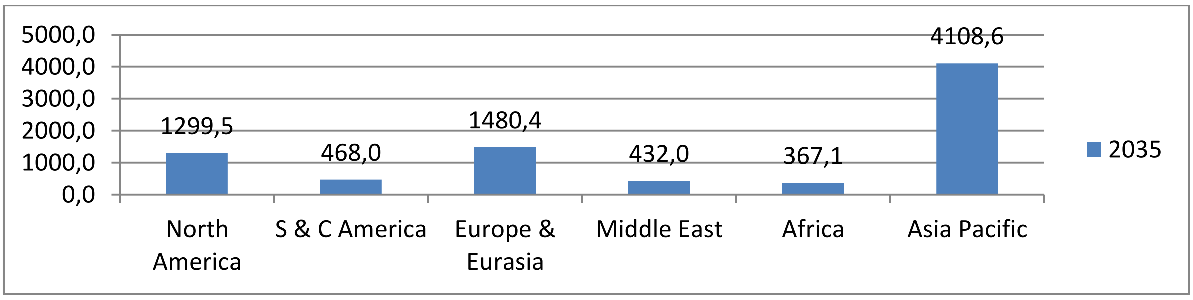
Consumption in transport sector BP forecast 2035 mil ton oil equivalent



Picture 13

Similar situation is observed for consumption of electrical energy (4108/1299 Asia/North America) for production and consumption of electrical energy with significant difference in usage between North America and Asia.

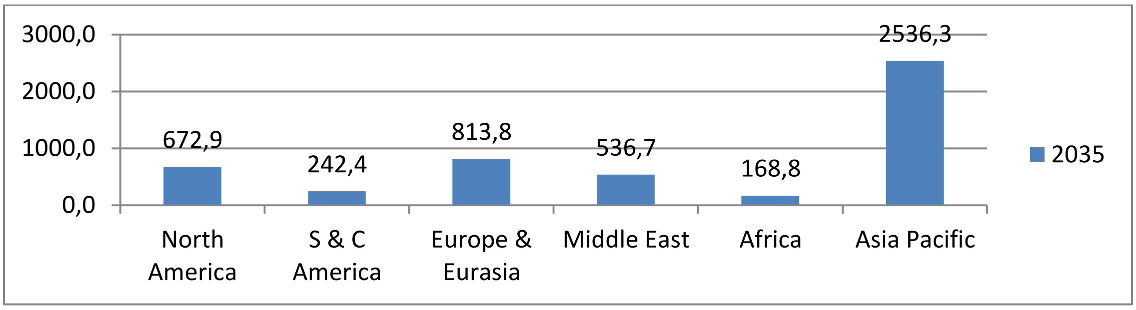
Electrical energy production mil ton oil equivalent.



Picture 14

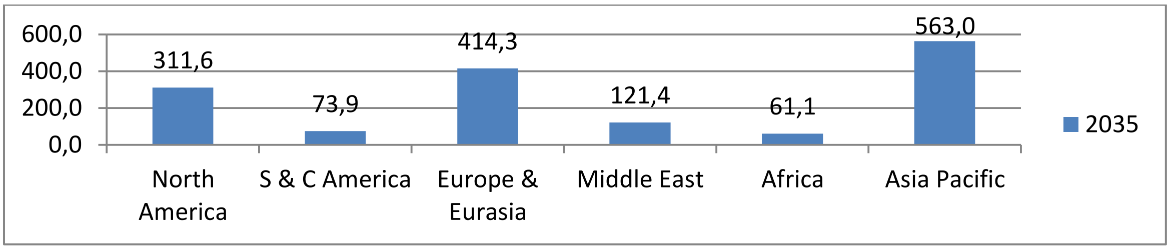
The same situation is visible for industry consumption almost 3,7 times more is forecasted to be used in Asia Pacific 2536/ 672 than in North America.

Energy consumption in industry mil ton oil equivalent.



Picture 15

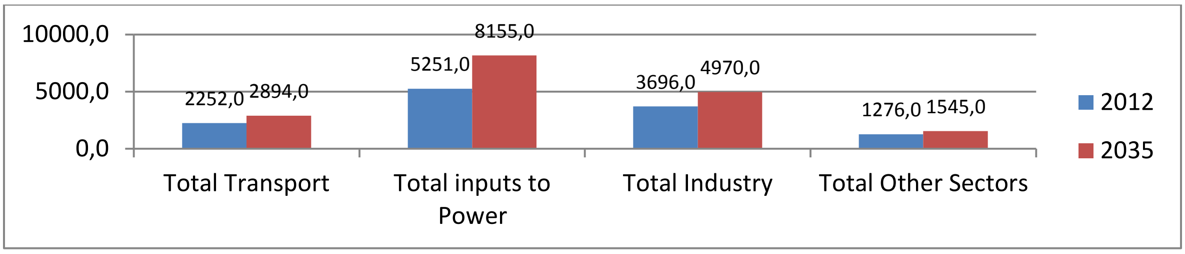
Consumption other sectors mil ton oil equivalent.



Picture 16

Total energy consumption is highest in the sector that is engaged in electrical energy production and this can further increase its share from 5251/8155)

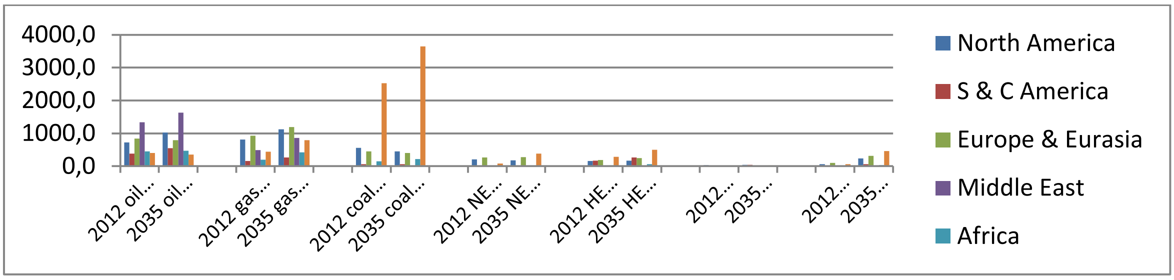
Total consumption 2012, 2035 BP forecast in mil ton oil equivalent.



Picture 17

The main fact to conclude is further coal share in total energy usage and further plans to increase coal consumption not just in Asia Pacific but worldwide.

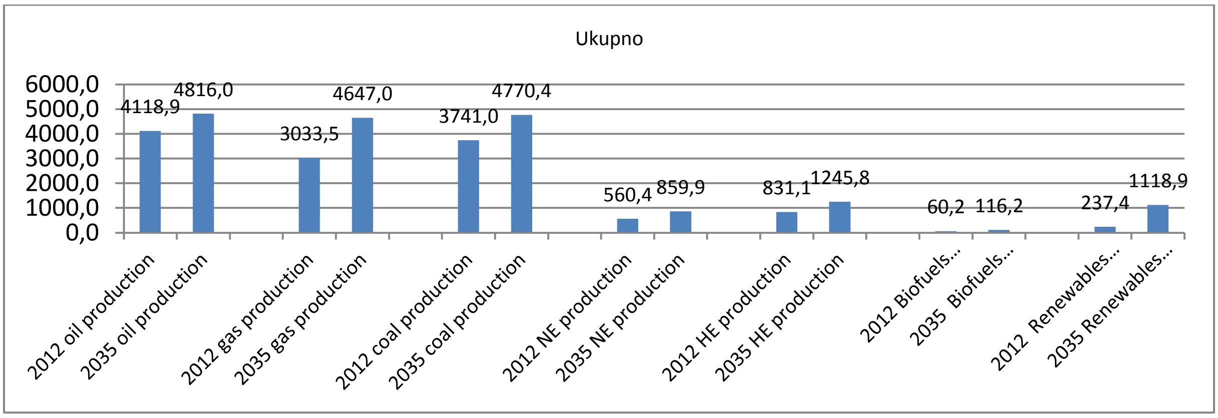
Production 2012/2035 mil ton oil equivalent. 2012/2035



Picture 18

The biggest jump in production will be made in area of renewable resources in period 2035/2012.

Production Total: 2012/2035 mil ton oil equivalent.



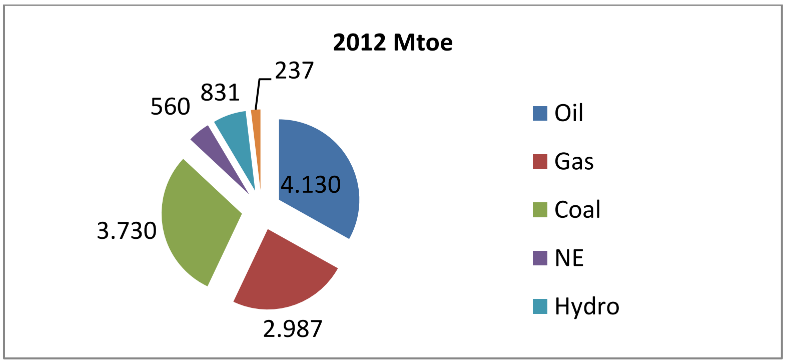
Picture 19

5.2. Renewables-as part of solution

Although renewables present large potential and possible impulse for further energy stability and security in the whole world it is still at the very beginning of its developing process and full capacity on the Planet Earth. Further advance is its potential to reduce harmful emissions, and impacts environment on more positive way than non-renewables (emissions, holes, wars etc.) If comparing data about consumption it is to be seen that total consumption is 12 475 mil ton oil equivalent, and only 2% is coming from renewables. Picture is colored with brighter point of view if hydroelectricity is taken as energy resource. In that respect world is having around 8, 5% of green energy in total energy supply.

Table 3: Energy consumption

	2012 Mtoe	%
Oil	4.130	33,11
Gas	2.987	23,94
Coal	3.730	29,90
NE	560	4,49
Hydro	*831*	*6,66*
Renewable energy	237	1,90
TOTAL:	12.475	100



Picture 20

Renewable energy is very different from each other where the most expensive technology is still to be found among solar potentials, and wind , bio energy are competitive with classical sources. It is to expect that solar technology price is going to decline with time, but this is still the long term period of time. The main obstacle for many is price for solar it is still to expensive in largest part of the world. Further to note countries with lowest income are the ones that have the most favorable conditions for solar technology. With usage of solar panels it is important to have enough solar days and to consider better energy storage than it is done so far. Wind energy can be important source of energy but also if some natural predispositions are reached, also facing problems with energy storage as downside risk.

So far is to be observed that very large potential lays in solar, but the countries such as Germany and USA have the largest installed capacity in their countries. Although some initiatives started a long ago to use Sahara as a resource some distribution, storage, financial considerations so far hindered growth in that respect.

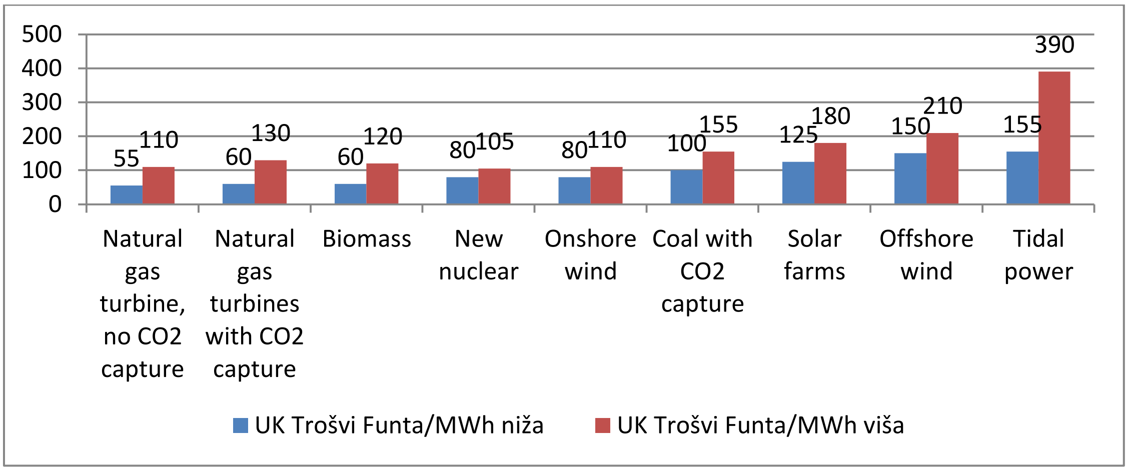
Table 4: Energy from different sources

	Thousand ton oil equiv
Biofuels	60.220,00
Geo	37.880,00
Wind	117.900,00
Solar	21.000,00
Renewables other	237.000,00
Hydro energy	831.000,00
TOTAL:	1.068.000,00

Table 5: Potential of energy usage

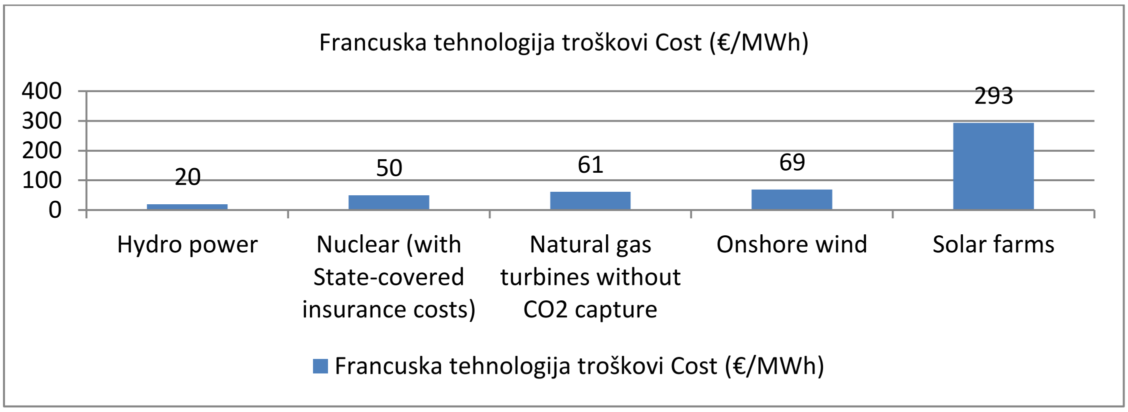
	Potential yearly usage TW
Solar	23.000,00
Wave	2
Geothermal	2
Hydro	4
Biomass	6
Wind	70
TOTAL	23.084,00
Current world production	16

Technology prices as given by Great Britain, Cost Pound /MW high /lower price



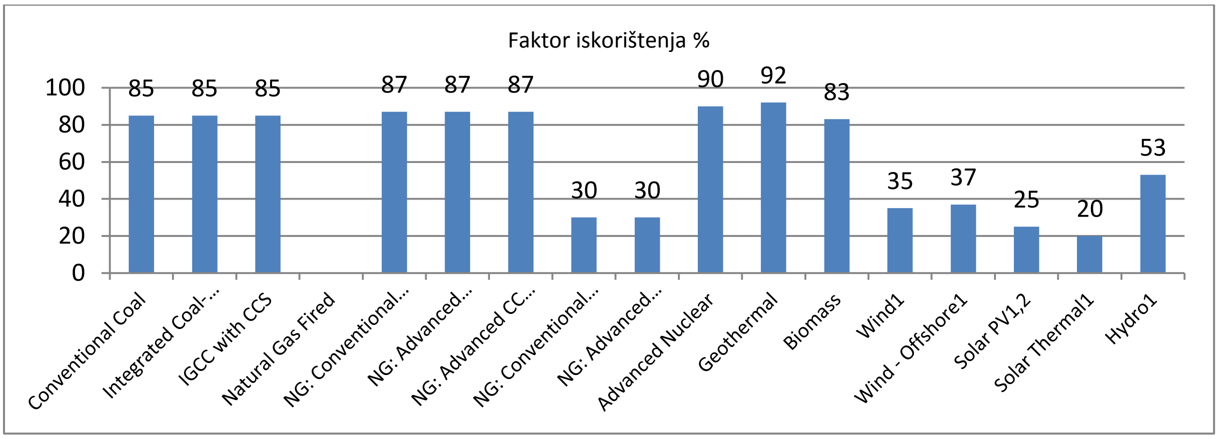
Picture 21

French technology costs €/MWh-changes with time- expected further to decrease



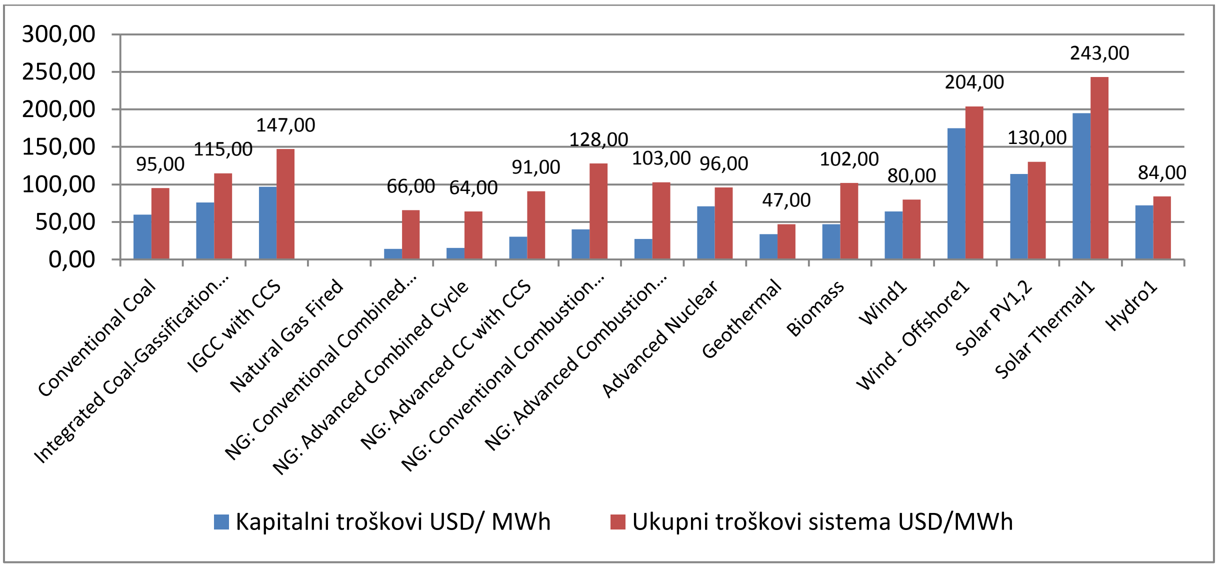
Picture 22

Capacity usage -possibilities



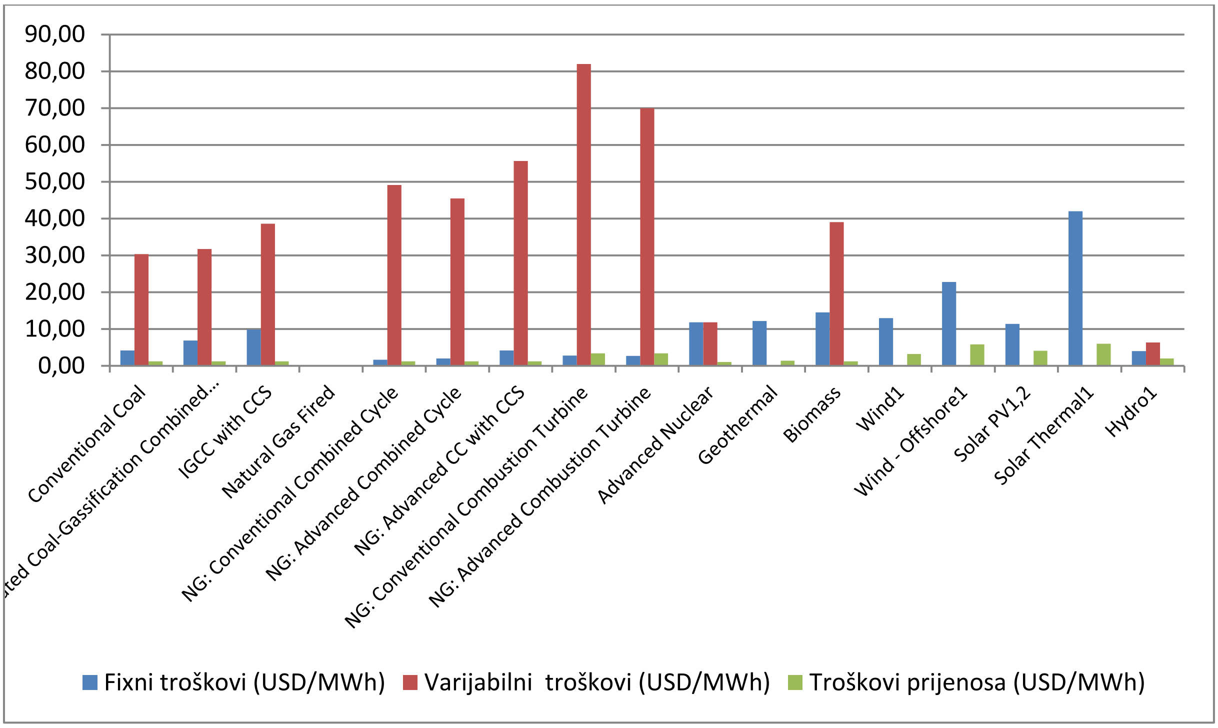
Picture 23

Capital costs- Total Costs USD/MWh



Picture 24

Fix, variable, Cost of transmission USD/MWh



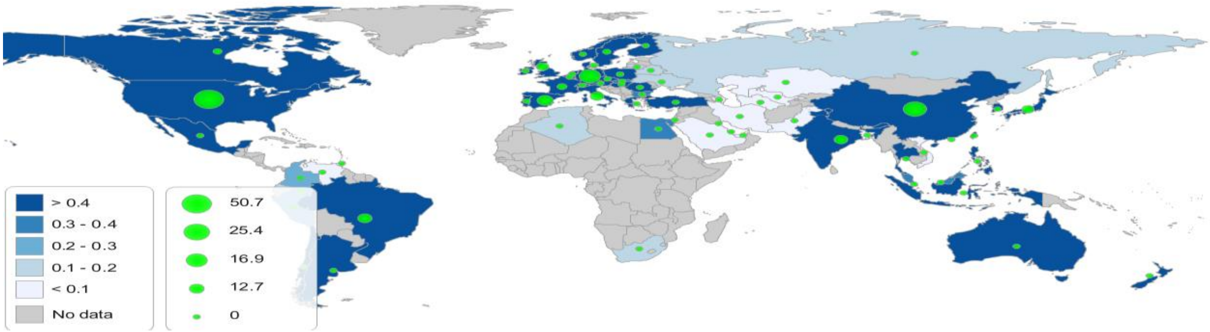
Picture 25

5.3. Renewables resources- Consumption and Installed capacity

Renewables present a great opportunity to mankind because it has no limit in quantities, and can be on one or another way be found everywhere in the world (sun, wind, geo, energy). Further important contribution to mankind is smaller negative impact on environment and reduction of harmful emissions currently present by oil/gas/coal usage. With technology advances and significant scientific steps in this area it is possible to make solid and ground plans to harness energy out of nature in this way.

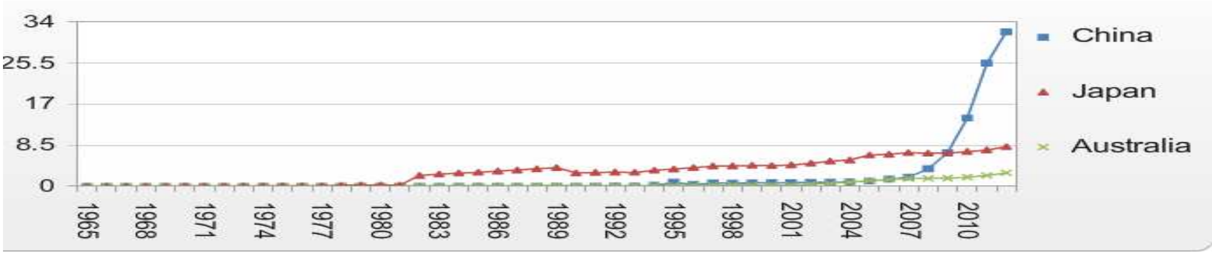
Increase in renewables was really impressive and the last ten years brought significant share of renewables in new investments and possibilities related to this part. It is enough just to compare numbers of consumption in 1965 where was 1,1 mil ton oil equivalent, with 2000 51,5 mil ton oil equivalent, or to further stress the last number of 237,4 mil ton oil equivalent, progress is visible. The biggest consumption has the riches countries and in that way OECD blocks uses 169,2 mil ton oil equivalents, and the countries that are not OECD only 68,2 mil ton oil equiv. It is important to stress that EU has consumption of 95 mil ton oil equivalent, while the countries of former Soviet Bloc only 0,6 mil ton oil equiv. This points further on conclusion that renewables advances in the countries with bigger GDP and lower quantities of reserves of classical energy resources. One of the richest countries in the world USA has 50,7 mil ton oil equivalent consumption of renewables.

Renewables (without hydro energy) consumption in mil ton oil equiv.

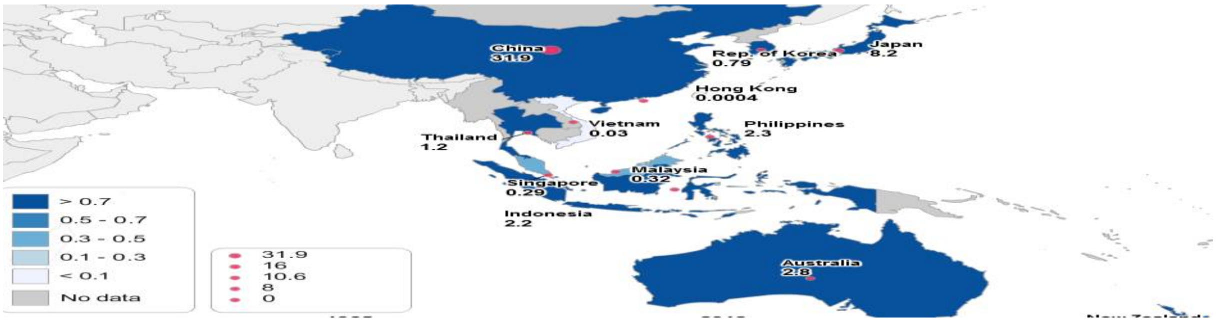


On Asian Continent China is proactive in supply its country with all form of energy resources and in this way incorporates strategy to increase renewables. Currently it uses 31,9 mil ton oil equivalent and Germany around 26 mil ton oil equivalent.

On the picture that follows it is visible that area inside Europe/Euro Asia consumption of renewables is around 99 mil ton oil equivalent from which the biggest consumption is in Germany with around 26 mil ton oil equivalent, Spain 14,9 mil ton oil equivalent, Italy 10,9 mil ton oil equip, UK 8,4 mil ton oil equivalent. Very small consumption is present in Russia with around 0,13 mil ton oil equiv.

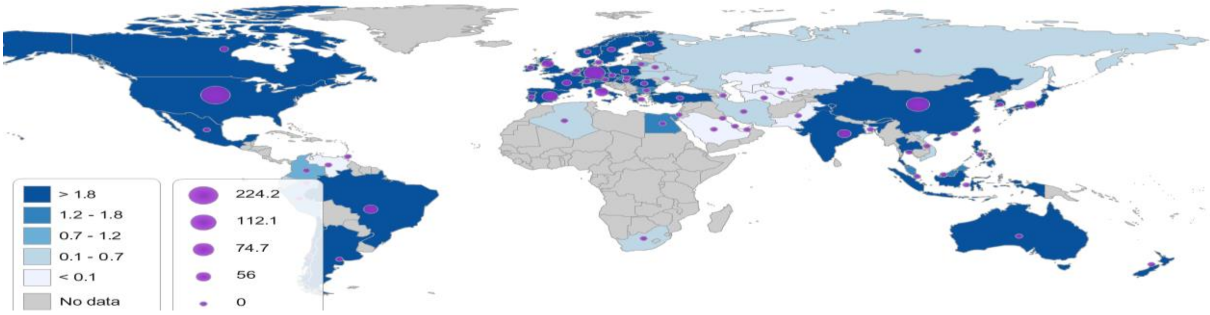


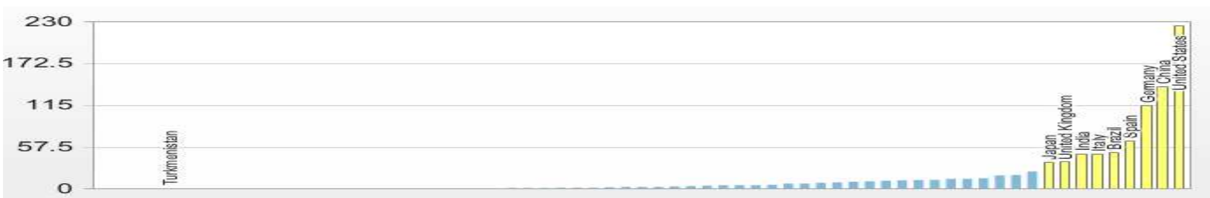
Total consumption of renewables without hydroelectric energy in Asia and Pacific area is around 64, 1 mil ton oil equivalent from which China has 31, 9 mil ton oil equivalent, Japan around 7-8 mil ton, Australia 2, 8 mil ton oil equivalent, Indonesia 2,2 mil ton oil equivalent, Thailand 1,2 mil ton oil equiv., Filipinos 2,3 mil ton oil equivalent, and Republic Korea 0,79 mil ton oil equiv.



5.3.1. CONSUMPTION OF ENERGY FROM RENEWABLES (WITHOUT HYDRO ENERGY) IN TWh

Energy consumption from renewables (without hydro energy) was in 2012 1.049 TWh what is significant increase from 1965 when was only 5 TWh or from 1990 when was 125,9 TWh. with USA China and Germany as leading forces in the field.

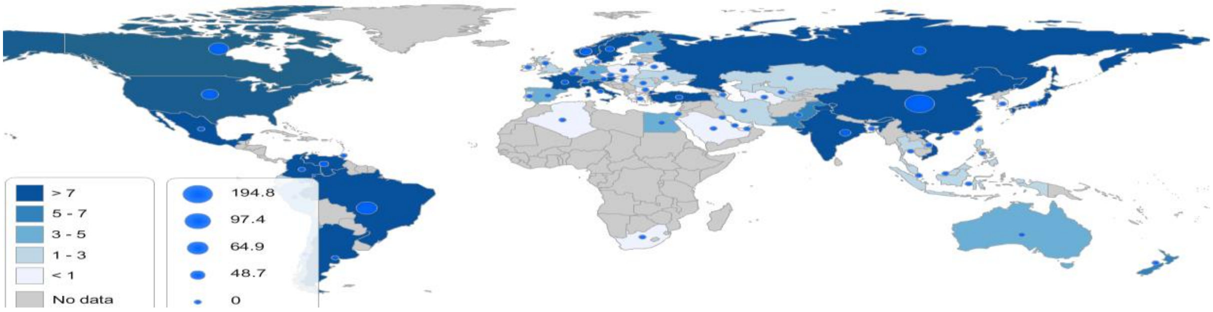


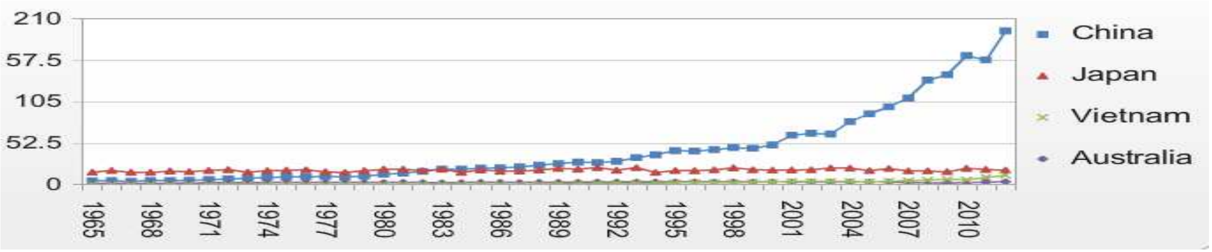


5.3.2. CONSUMPTION FROM HYDROELEKCTRIC PLANTS (mil ton oil equiv.)

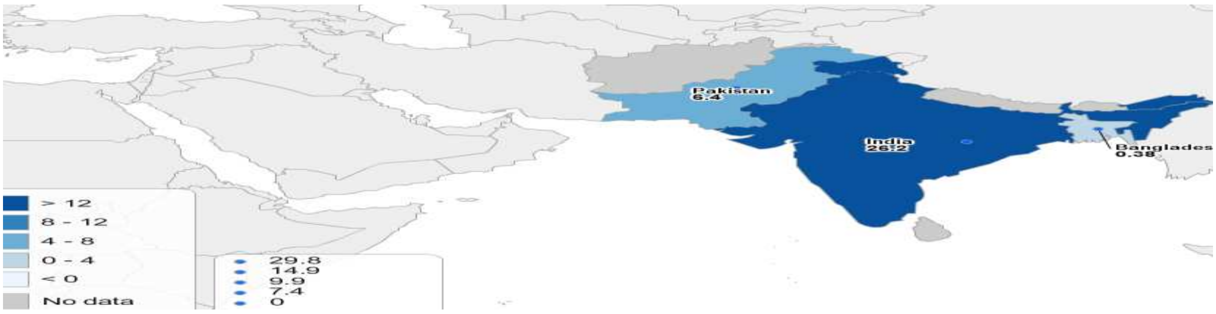
Besides non renewables sources of energy represented by oil, gas, NE, coal and other potential energy sources water resource is one of the leading energy sources in front of renewables. Total world consumption in 2012 was 831 mil ton oil equivalent what presents increase from 1965 when it was 209 mil ton oil equivalent, 1990 489 mil ton oil equiv. Countries of OECD had in 2012 consumption of 315 mil ton oil equivalent and countries that do not belong to this block 515 mil ton oil equiv. In EU consumption of energy from hydro sources was 74 mil oil equivalent, and in the countries of former Soviet bloc 55 mil ton oil equiv.

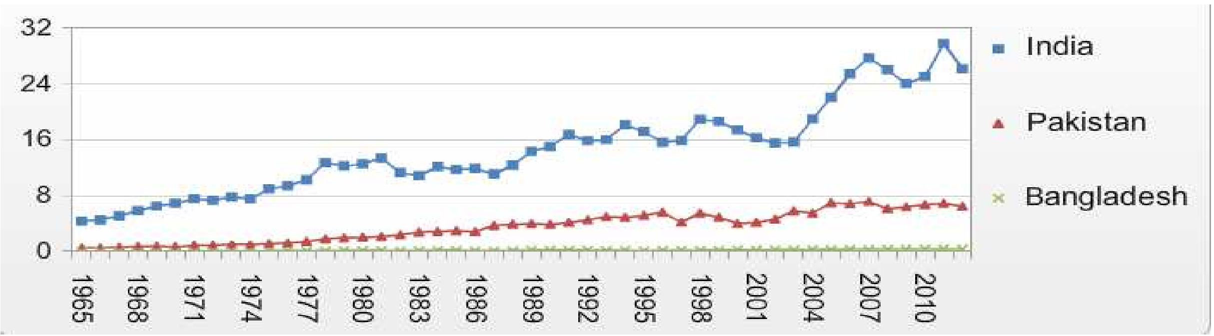
The biggest consumer is China with around 200 mil ton oil equivalent than Brazil 94,5 mil ton oil equivalent, Canada 86 mil ton oil equivalent, USA 63,2 mil ton oil equivalent, Russia 37,8 mil ton oil equiv.





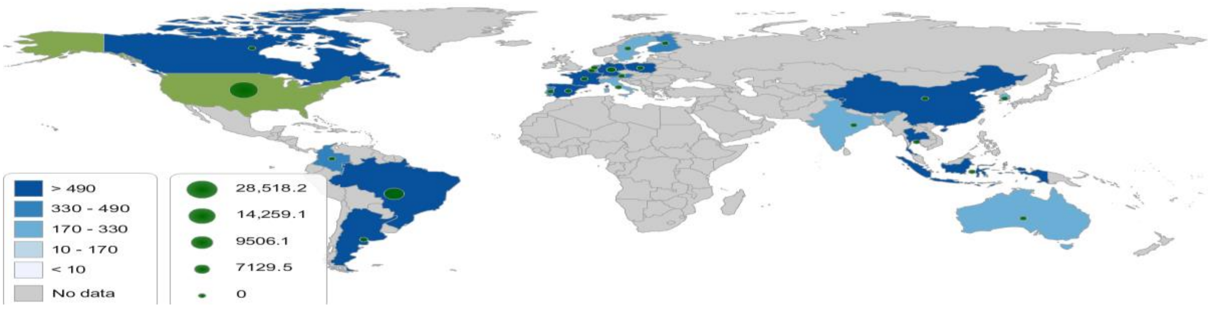
India has 26, 2 mil ton of oil equivalent that comes from hydro energy while Pakistan only 6, 4 mil ton oil equivalent.

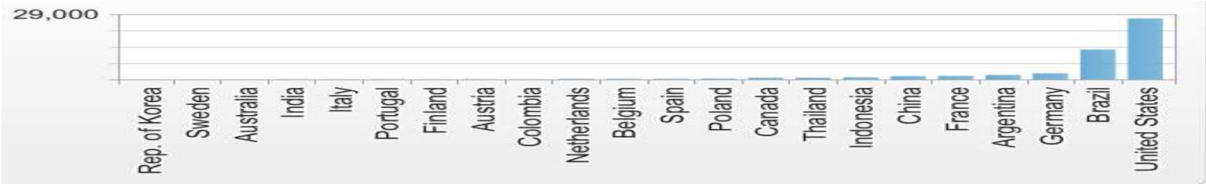




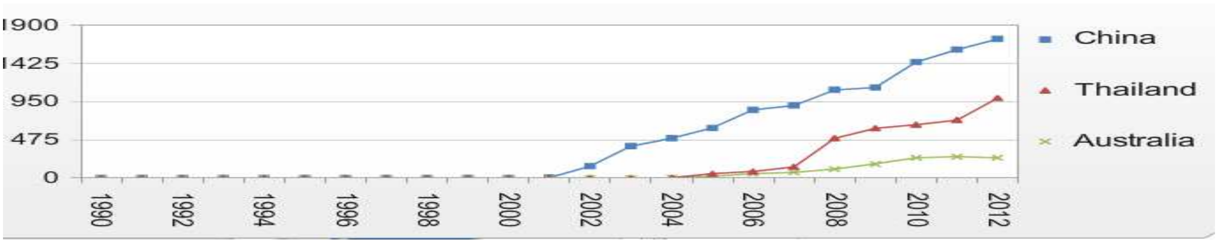
5.3.3. BIOFULES PRODUCTION (thousand ton oil equiv.)

Biofuel consumption grew significantly after 1990 when was 7 094 thousand ton oil equivalent to reach in 2012 around 60.220 thousand ton oil equiv. The biggest consumers are the richest countries OECD that spend around 38.456 thousand ton oil equivalent, while countries that do not belong to OECD block has consumption of around 21.763 thousand ton oil equivalent. The biggest consumption of bio fuels is in region of Northern America with consumption of around 16.675 thousand ton, EU 10.022 thousand ton and Asia Pacific 5.173 thousand ton. Very small quantities of biofuels are used in Africa with around 23 thousand ton oil equivalent.



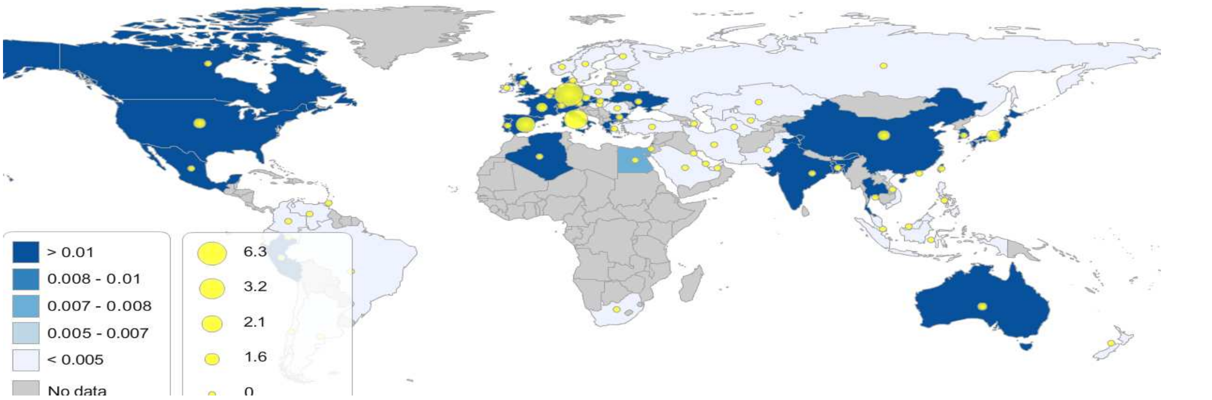


Although Asia is fetching the phase with western world in many aspects of living it also increases its part on biofuels consumption. China is consuming 1729 thousand ton oil equivalents, Indonesia 1212 thousand ton oil equivalent, and Republic Korea 211 thousand ton oil equiv. But this still lags after USA in quantities.

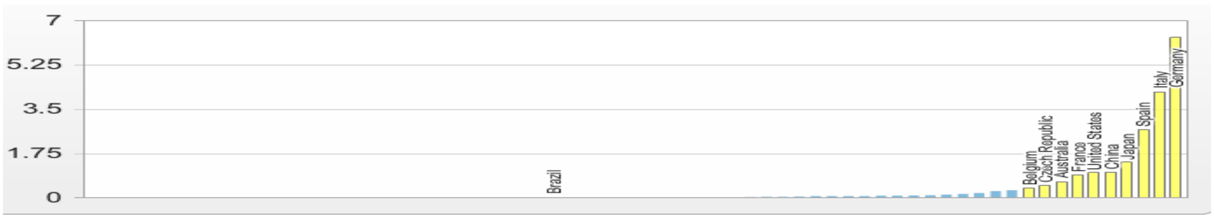


5.3.4. CONSUMPTION OF ENERGY FROM SOLAR RESOURCES (mil ton oil equivalent)

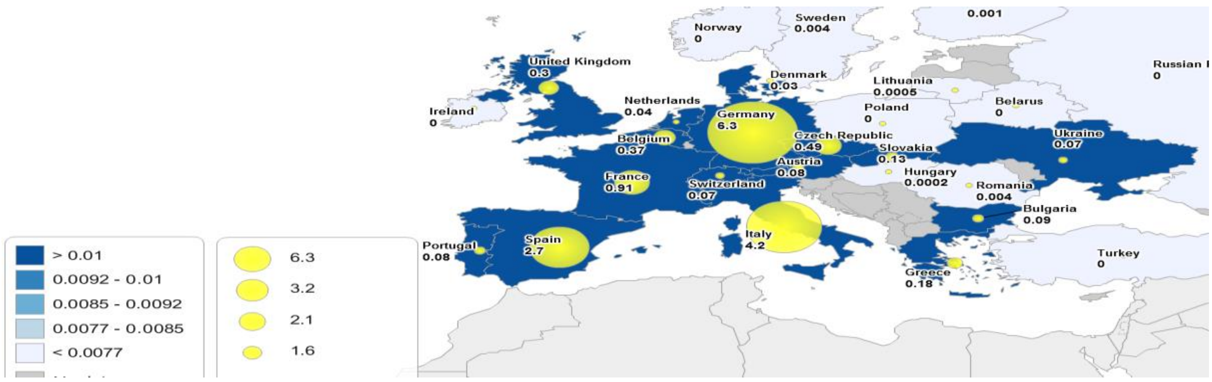
Possibilities of solar energy consumption are immense and only after 2000 full potential are recognized and come with each year to importance. In 1996 it was only 450 MW of installed capacity, it increased to 2006 where reached 6.961 MW, and in 2010 40.415 MW, to be at levels of around 100.114 MW in 2012. This quantity of installed capacity is equal to 21 mil ton oil equivalent that was spent in 2012.



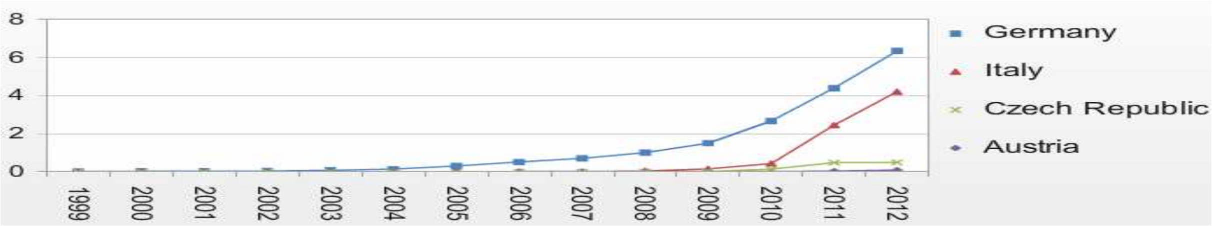
The most important region in the world is EU with 68.466 MW of installed capacity what is equal of around 16 mil ton oil equiv. Germany took and extreme effort and installed around 32.643 MW of solar panels what is around 6, 1 mil ton of oil equivalent consumption.



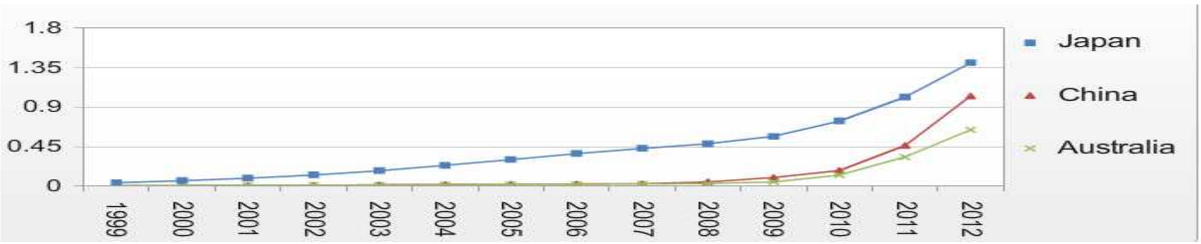
Besides Germany Italy has around 4, 2 mil ton oil equivalent, Spain 2, 7 mil ton oil equivalent from solar resources.



Production of solar panels and consumption of solar energy are new branches in economy to, and presents further possibilities in area of energy production, consumption, and work places.

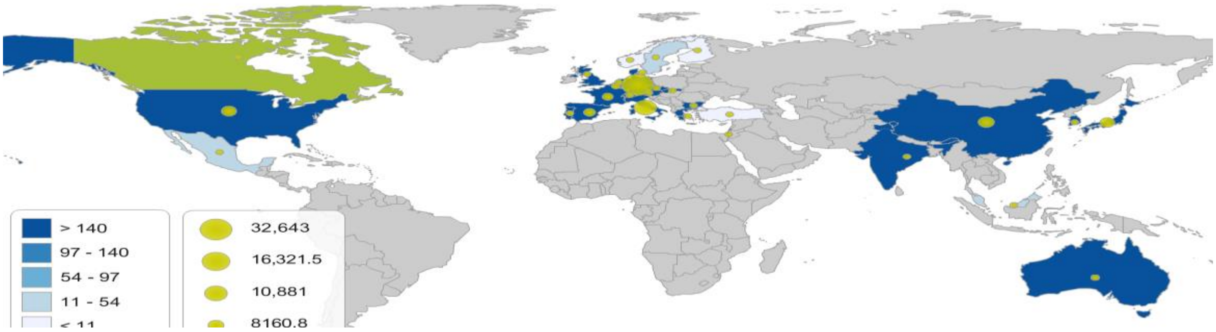


Similar consumption of solar energy is observed by China and Japan and that reaches 1 mil ton oil equivalent per year. Australia lags and yearly produces only 0, 64 mil ton oil equivalent from solar resources.



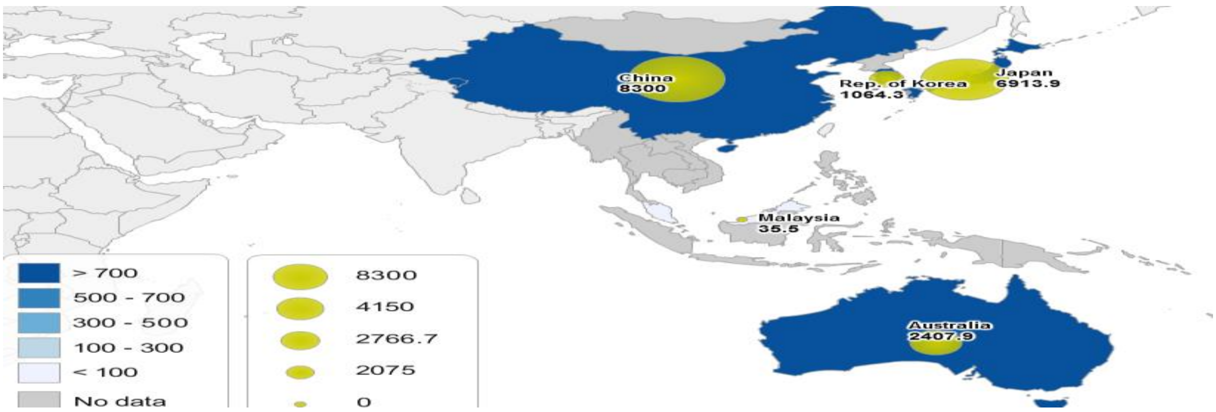
5.3.5. INSTALLED SOLAR SYSTEM (PHOTOVOLTAIC PV U MW)

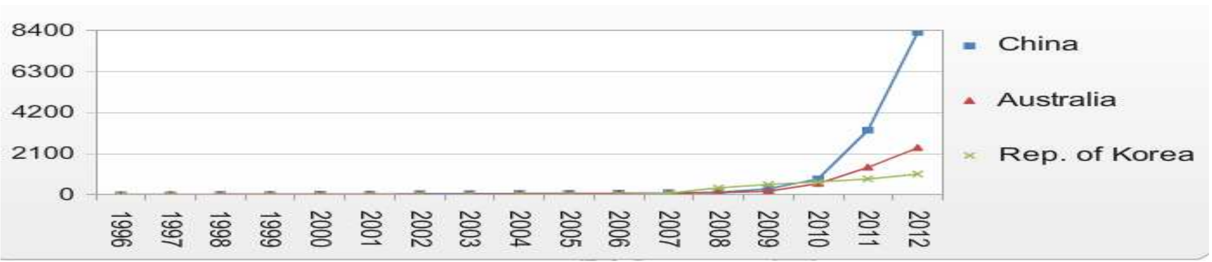
There are around 100.114 MW solar panels installed in the world. The most agile is Germany with 32.643 installed MW after comes China 8.300 MW and Italy 16.240 MW.



Germany and Italy advances in Europe where the total installed capacity is 68.466 MW.

China has around 8.300 MW while Australia only 2.407 MW.





6. STATISTICS CHINA, AUSTRALIA

6.1. Australia Statistics

Based on following variables statistical analysis is made. Some of the observed relations and facts are established as follows.

Australia

E	Land area (sq. km)
F	Electricity production from coal sources (% of total)
G	Electricity production from oil, gas and coal sources (% of total)
H	Electricity production from hydroelectric sources (% of total)
I	Electric power transmission and distribution losses (% of output)
J	Electricity production from natural gas sources (% of total)
K	Electricity production from oil sources (% of total)
L	Renewable electricity output (% of total electricity output)
M	Electricity production from renewable sources, excluding hydroelectric (kWh)
N	Electricity production from renewable sources, excluding hydroelectric (% of total)
O	Renewable energy consumption (% of total final energy consumption)
P	Combustible renewables and waste (% of total energy)
QQ	Electric power consumption (kWh per capita)
R	Energy use (kg of oil equivalent per capita)
S	CO_2 intensity (kg per kg of oil equivalent energy use)
T	CO_2 emissions from gaseous fuel consumption (kt)
U	CO_2 emissions from gaseous fuel consumption (% of total)
V	CO_2 emissions (kg per 2005 US$ of GDP)
W	CO_2 emissions (kt)
X	CO_2 emissions from liquid fuel consumption (kt)
Y	CO_2 emissions from liquid fuel consumption (% of total)
Z	CO_2 emissions (metric tons per capita)
AA	CO_2 emissions (kg per PPP $ of GDP)
AB	CO_2 emissions (kg per 2011 PPP $ of GDP)
AC	CO_2 emissions from solid fuel consumption (kt)
AD	CO_2 emissions from solid fuel consumption (% of total)
AE	Energy related methane emissions (% of total)
AF	GHG net emissions/removals by LUCF (Mt of CO2 equivalent)
AG	CO_2 emissions from residential buildings and commercial and public services (% of total fuel combustion)
AH	CO_2 emissions from electricity and heat production, total (% of total fuel combustion)
AI	CO_2 emissions from manufacturing industries and construction (% of total fuel combustion)
AJ	CO_2 emissions from other sectors, excluding residential buildings and commercial and public services (% of total fuel combustion)
AK	CO_2 emissions from transport (% of total fuel combustion)
AL	GDP deflator (base year varies by country)

AM	GDP at market prices (current US$)
AN	GDP at market prices (constant 2005 US$)
AO	GDP growth (annual %)
AP	GDP per capita (current US$)
AQ	GDP per capita (constant 2005 US$)
AR	GDP per capita growth (annual %)

-Once established relation between customer and supplier of electricity is strongly influenced under prior level of consumption

-Coal as input in electricity production is significant source of energy input

-Hydrology under weather influence

-Small impact of renewables in end supply and consumption

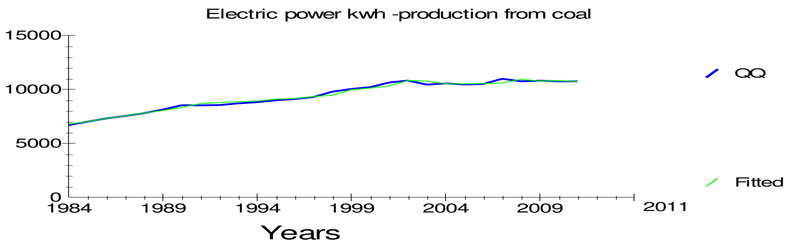
-GDP growth was not influence largely by new energy infrastructure

-Smaller impact of CO_2 rise from industries, manufacture – greatest influence from housing, commercial what gives rise to energy efficiency potentials and input of PV

-Once established electricity consumption per customer is subject to slower than expected further increase in respect to gdp growth

```
          OLS estimation of a single equation in the Unrestricted VAR
*******************************************************************************
 Dependent variable is QQ
 28 observations used for estimation from 1984 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 QQ(-1)                     .74269            .18720            3.9674[.001]
 QQ(-2)                     .14986            .17424            .86008[.398]
 F                        -23.8314           20.5009           -1.1625[.256]
 F(-1)                     38.7839           22.5157            1.7225[.098]
*******************************************************************************
 R-Squared                     .98515   R-Bar-Squared                   .98330
 S.E. of Regression          171.7093   F-stat.    F(  3,  24)  530.8263[.000]
 Mean of Dependent Variable    9370.8   S.D. of Dependent Variable      1328.6
 Residual Sum of Squares     707617.7   Equation Log-likelihood      -181.6546
 Akaike Info. Criterion     -185.6546   Schwarz Bayesian Criterion   -188.3191
 DW-statistic                  1.9081   System Log-likelihood        -181.6546
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   .25478[.614]*F(   1,  23)=   .21121[.650]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   1.4243[.233]*F(   1,  23)=   1.2326[.278]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   2.5874[.274]*      Not applicable        *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.7062[.191]*F(   1,  26)=   1.6872[.205]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
```

C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values



OLS estimation of a single equation in the Unrestricted VAR

Dependent variable is QQ
28 observations used for estimation from 1984 to 2011

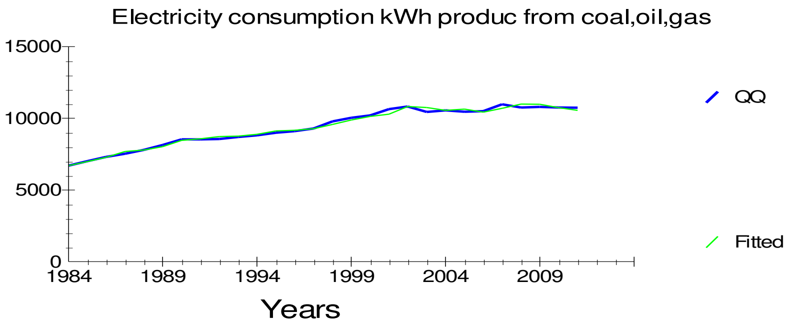
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
QQ(-1)	.85647	.16469	5.2005[.000]
QQ(-2)	.077904	.15695	.49636[.624]
G	132.1693	42.6523	3.0988[.005]
G(-1)	-123.6279	43.1331	-2.8662[.009]

R-Squared	.98692	R-Bar-Squared	.98529
S.E. of Regression	161.1635	F-stat. F(3, 24)	603.6496[.000]
Mean of Dependent Variable	9370.8	S.D. of Dependent Variable	1328.6
Residual Sum of Squares	623368.3	Equation Log-likelihood	-179.8799
Akaike Info. Criterion	-183.8799	Schwarz Bayesian Criterion	-186.5443
DW-statistic	1.6817	System Log-likelihood	-179.8799

Diagnostic Tests

Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= 1.8641[.172]	F(1, 23)= 1.6404[.213]
B:Functional Form	CHSQ(1)= .35703[.550]	F(1, 23)= .29706[.591]
C:Normality	CHSQ(2)= .16775[.920]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 5.7102[.017]	F(1, 26)= 6.6607[.016]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values



OLS estimation of a single equation in the Unrestricted VAR

Dependent variable is QQ
28 observations used for estimation from 1984 to 2011

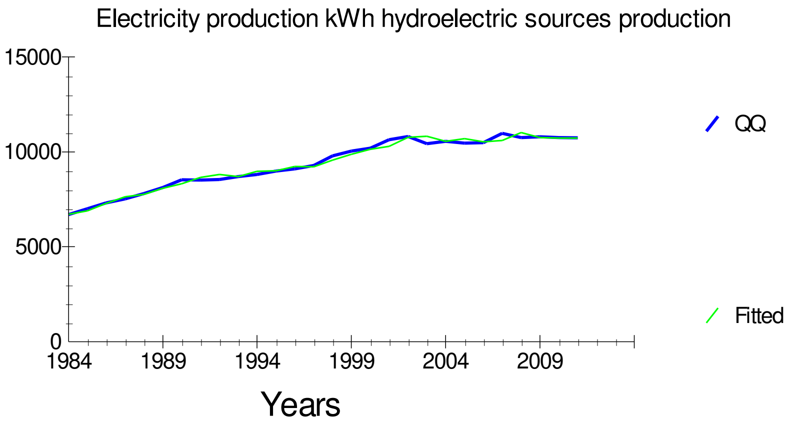
Regressor	Coefficient	Standard Error	T-Ratio[Prob]
QQ(-1)	.93886	.18112	5.1838[.000]
QQ(-2)	.047128	.18026	.26145[.796]
H	-49.3584	42.2903	-1.1671[.255]
H(-1)	84.8232	41.5654	2.0407[.052]

R-Squared	.98278	R-Bar-Squared	.98063
S.E. of Regression	184.9126	F-stat. F(3, 24)	456.6258[.000]
Mean of Dependent Variable	9370.8	S.D. of Dependent Variable	1328.6
Residual Sum of Squares	820623.8	Equation Log-likelihood	-183.7289
Akaike Info. Criterion	-187.7289	Schwarz Bayesian Criterion	-190.3933
DW-statistic	2.0744	System Log-likelihood	-183.7289

Diagnostic Tests

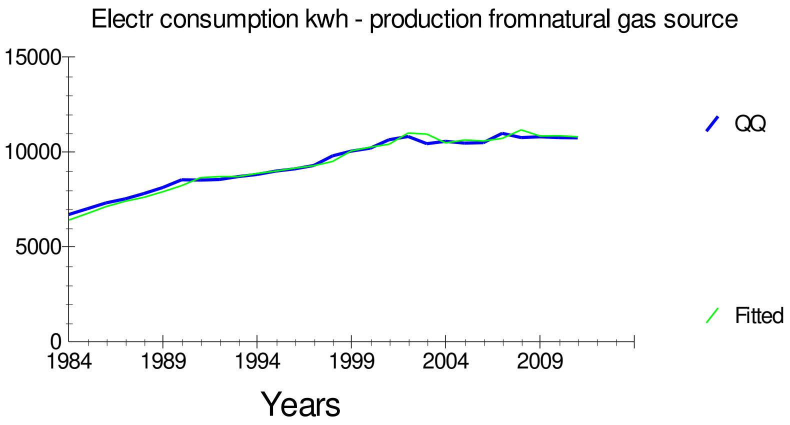
Test Statistics	LM Version	F Version
A:Serial Correlation	CHSQ(1)= .22308[.637]	F(1, 23)= .18471[.671]
B:Functional Form	CHSQ(1)= 3.7741[.052]	F(1, 23)= 3.5832[.071]
C:Normality	CHSQ(2)= .0074205[.996]	Not applicable
D:Heteroscedasticity	CHSQ(1)= 3.7427[.053]	F(1, 26)= 4.0116[.056]

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

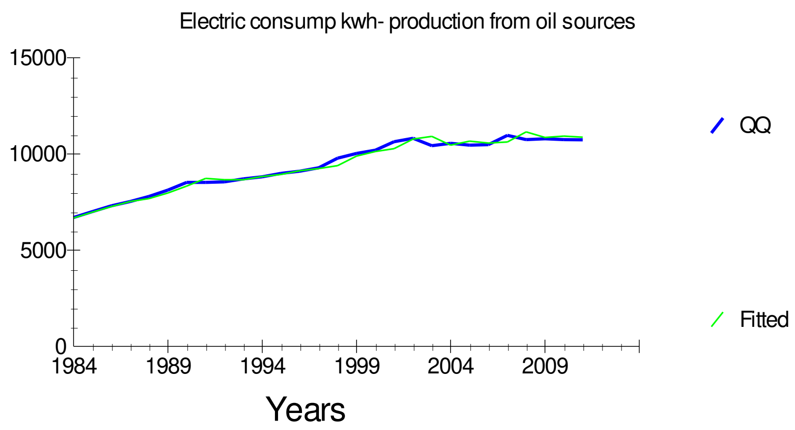



```
          OLS estimation of a single equation in the Unrestricted VAR
*******************************************************************************
 Dependent variable is QQ
 28 observations used for estimation from 1984 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 QQ(-1)                      1.1569               .19616            5.8977[.000]
 QQ(-2)                    -.12503                .20236           -.61787[.542]
 J                         14.1450               23.8614            .59280[.559]
 J(-1)                    -32.7947               26.1543           -1.2539[.222]
*******************************************************************************
 R-Squared                     .97633   R-Bar-Squared                    .97337
 S.E. of Regression          216.8253   F-stat.    F(  3,  24)  329.9220[.000]
 Mean of Dependent Variable    9370.8   S.D. of Dependent Variable       1328.6
 Residual Sum of Squares      1128317   Equation Log-likelihood       -188.1867
 Akaike Info. Criterion     -192.1867   Schwarz Bayesian Criterion    -194.8511
 DW-statistic                  1.6333   System Log-likelihood         -188.1867
*******************************************************************************
```

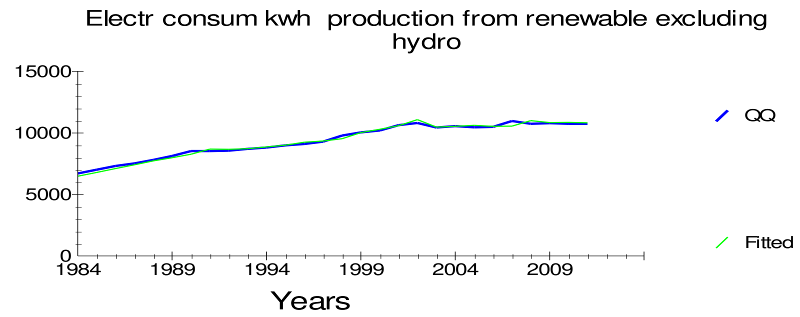
```
                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *           F Version        *
*******************************************************************************
*                     *                           *                            *
* A:Serial Correlation*CHSQ(   1)=   7.0099[.008]*F(   1,  23)=   7.6812[.011]*
*                     *                           *                            *
* B:Functional Form   *CHSQ(   1)=  12.8162[.000]*F(   1,  23)=  19.4135[.000]*
*                     *                           *                            *
* C:Normality         *CHSQ(   2)=   1.3850[.500]*       Not applicable        *
*                     *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .33948[.560]*F(   1,  26)=   .31910[.577]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



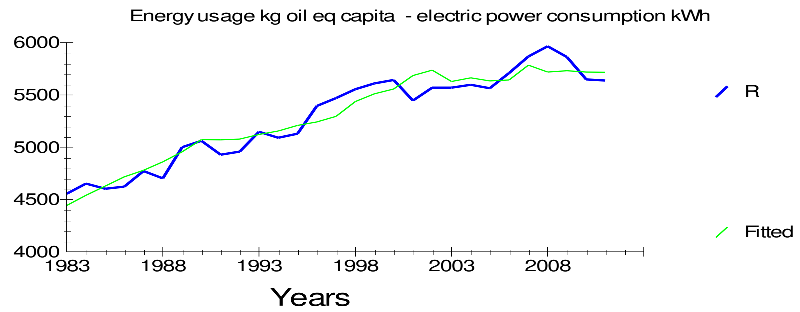

```
           OLS estimation of a single equation in the Unrestricted VAR
*******************************************************************************
 Dependent variable is QQ
 28 observations used for estimation from 1984 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 QQ(-1)                     1.0986            .19940            5.5096[.000]
 QQ(-2)                   -.092240            .20135           -.45811[.651]
 K                         37.8987           88.0918            .43022[.671]
 K(-1)                     23.2603           70.5038            .32992[.744]
*******************************************************************************
 R-Squared                     .97703   R-Bar-Squared                   .97416
 S.E. of Regression          213.5536   F-stat.    F(  3,  24)  340.3552[.000]
 Mean of Dependent Variable    9370.8   S.D. of Dependent Variable      1328.6
 Residual Sum of Squares      1094524   Equation Log-likelihood      -187.7610
 Akaike Info. Criterion     -191.7610   Schwarz Bayesian Criterion   -194.4254
 DW-statistic                  2.0182   System Log-likelihood        -187.7610
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  .085706[.770]*F(   1,  23)=  .070617[.793]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   8.0464[.005]*F(   1,  23)=   9.2748[.006]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .64252[.725]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   5.1084[.024]*F(   1,  26)=   5.8021[.023]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



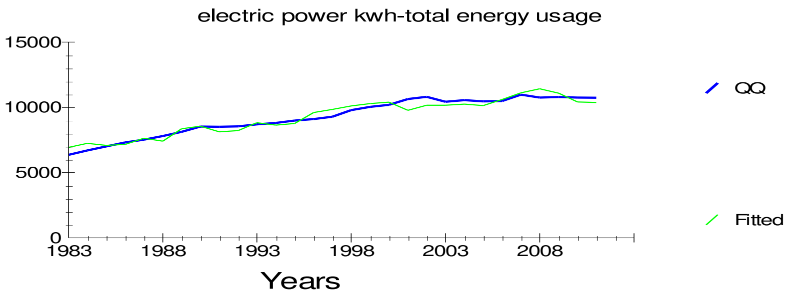

```
          OLS estimation of a single equation in the Unrestricted VAR
*******************************************************************************
 Dependent variable is QQ
 28 observations used for estimation from 1984 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 QQ(-1)                      .91247               .19200           4.7524[.000]
 QQ(-2)                     .094307               .19214           .49082[.628]
 M                        .3663E-6             .9229E-7            3.9690[.001]
 M(-1)                   -.1999E-6             .9338E-7           -2.1405[.043]
*******************************************************************************
 R-Squared                     .98451   R-Bar-Squared                   .98257
 S.E. of Regression          175.3959   F-stat.    F(  3,  24)  508.4130[.000]
 Mean of Dependent Variable    9370.8   S.D. of Dependent Variable      1328.6
 Residual Sum of Squares     738329.6   Equation Log-likelihood      -182.2495
 Akaike Info. Criterion     -186.2495   Schwarz Bayesian Criterion   -188.9139
 DW-statistic                  1.7938   System Log-likelihood        -182.2495
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=   .68652[.407]*F(   1,  23)=   .57810[.455]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=   8.1012[.004]*F(   1,  23)=   9.3638[.006]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   1.2703[.530]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=  .016300[.898]*F(   1,  26)=  .015144[.903]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        2588.4            150.0415            17.2512[.000]
 QQ                         .29126             .016010            18.1917[.000]
*******************************************************************************
 R-Squared                      .92457   R-Bar-Squared                   .92177
 S.E. of Regression           120.2146   F-stat.    F(  1,  27)  330.9369[.000]
 Mean of Dependent Variable     5287.5   S.D. of Dependent Variable    429.8150
 Residual Sum of Squares      390192.0   Equation Log-likelihood      -179.0021
 Akaike Info. Criterion      -181.0021   Schwarz Bayesian Criterion   -182.3694
 DW-statistic                   1.0879
*******************************************************************************


                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version          *         F Version        *
*******************************************************************************
*                     *                            *                          *
* A:Serial Correlation*CHSQ(   1)=   5.5250[.019]*F(   1,  26)=   6.1193[.020]*
*                     *                            *                          *
* B:Functional Form   *CHSQ(   1)=   .34913[.555]*F(   1,  26)=   .31683[.578]*
*                     *                            *                          *
* C:Normality         *CHSQ(   2)=   .73292[.693]*       Not applicable       *
*                     *                            *                          *
* D:Heteroscedasticity*CHSQ(   1)=   1.8193[.177]*F(   1,  27)=   1.8072[.190]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

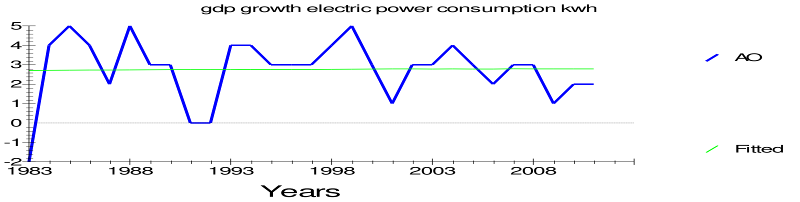


```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is QQ
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       -7517.6            925.5992            -8.1218[.000]
 R                          3.1744              .17450            18.1917[.000]
*******************************************************************************
 R-Squared                   .92457   R-Bar-Squared                     .92177
 S.E. of Regression        396.8723   F-stat.    F(  1,  27)  330.9369[.000]
 Mean of Dependent Variable  9267.2   S.D. of Dependent Variable        1419.0
 Residual Sum of Squares    4252705   Equation Log-likelihood        -213.6379
 Akaike Info. Criterion   -215.6379   Schwarz Bayesian Criterion     -217.0052
 DW-statistic                1.0338
*******************************************************************************


                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   5.5286[.019]*F(   1,  26)=   6.1242[.020]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   4.6409[.031]*F(   1,  26)=   4.9535[.035]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .66124[.718]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .46240[.497]*F(   1,  27)=   .43748[.514]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

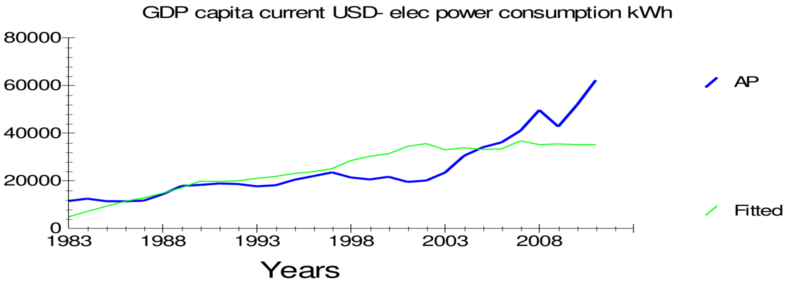



```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is AO
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        2.5919              2.0281             1.2780[.212]
 QQ                       .1799E-4            .2164E-3            .083125[.934]
*******************************************************************************
 R-Squared                 .2559E-3   R-Bar-Squared                   -.036772
 S.E. of Regression          1.6249   F-stat.    F(  1,  27)  .0069098[.934]
 Mean of Dependent Variable  2.7586   S.D. of Dependent Variable        1.5959
 Residual Sum of Squares    71.2921   Equation Log-likelihood         -54.1918
 Akaike Info. Criterion    -56.1918   Schwarz Bayesian Criterion      -57.5591
 DW-statistic                1.4575
*******************************************************************************


                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
```

```
*******************************************************************************
*                     *                         *                             *
* A:Serial Correlation*CHSQ(   1)=   .36462[.546]*F(   1,  26)=   .33106[.570]*
*                     *                         *                             *
* B:Functional Form   *CHSQ(   1)=   1.9073[.167]*F(   1,  26)=   1.8304[.188]*
*                     *                         *                             *
* C:Normality         *CHSQ(   2)=   6.3462[.042]*      Not applicable        *
*                     *                         *                             *
* D:Heteroscedasticity*CHSQ(   1)=   6.9614[.008]*F(   1,  27)=   8.5285[.007]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is AP
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -39275.8            11337.3            -3.4643[.002]
 QQ                         6.9248             1.2098             5.7241[.000]
*******************************************************************************
 R-Squared                     .54823   R-Bar-Squared                    .53150
 S.E. of Regression            9083.5   F-stat.    F(  1,  27)   32.7651[.000]
 Mean of Dependent Variable   24897.5   S.D. of Dependent Variable      13270.9
 Residual Sum of Squares     2.23E+09   Equation Log-likelihood       -304.4254
 Akaike Info. Criterion     -306.4254   Schwarz Bayesian Criterion    -307.7927
 DW-statistic                  .24651
*******************************************************************************


                            Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                         *                             *
* A:Serial Correlation*CHSQ(   1)=  22.1694[.000]*F(   1,  26)=  84.3856[.000]*
*                     *                         *                             *
* B:Functional Form   *CHSQ(   1)=   3.8750[.049]*F(   1,  26)=   4.0099[.056]*
*                     *                         *                             *
* C:Normality         *CHSQ(   2)=   7.7210[.021]*      Not applicable        *
*                     *                         *                             *
* D:Heteroscedasticity*CHSQ(   1)=   7.1658[.007]*F(   1,  27)=   8.8612[.006]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is AM
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      3.02E+09           8.08E+08              3.7437[.001]
 QQ                      -278751.2            86211.3             -3.2333[.003]
*******************************************************************************
 R-Squared                    .27913   R-Bar-Squared                    .25243
 S.E. of Regression         6.47E+08   F-stat.    F(  1,  27)   10.4545[.003]
 Mean of Dependent Variable 4.41E+08   S.D. of Dependent Variable     7.49E+08
 Residual Sum of Squares    1.13E+19   Equation Log-likelihood       -628.4752
 Akaike Info. Criterion    -630.4752   Schwarz Bayesian Criterion    -631.8425
 DW-statistic                 .60975
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  12.7638[.000]*F(   1,  26)=  20.4394[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  14.5719[.000]*F(   1,  26)=  26.2592[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   2.9187[.232]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.3365[.248]*F(   1,  27)=   1.3044[.263]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```


```
Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is AM
 29 observations used for estimation from 1983 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      3.02E+09           8.08E+08              3.7437[.001]
 QQ                      -278751.2            86211.3             -3.2333[.003]
*******************************************************************************
 R-Squared                    .27913   R-Bar-Squared                    .25243
 S.E. of Regression         6.47E+08   F-stat.    F(  1,  27)   10.4545[.003]
 Mean of Dependent Variable 4.41E+08   S.D. of Dependent Variable     7.49E+08
 Residual Sum of Squares    1.13E+19   Equation Log-likelihood       -628.4752
 Akaike Info. Criterion    -630.4752   Schwarz Bayesian Criterion    -631.8425
 DW-statistic                 .60975
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  12.7638[.000]*F(   1,  26)=  20.4394[.000]*
*                     *                          *                            *
```

```
* B:Functional Form   *CHSQ(   1)=  14.5719[.000]*F(   1,  26)=  26.2592[.000]*
*                     *                          *                              *
* C:Normality         *CHSQ(   2)=   2.9187[.232]*      Not applicable          *
*                     *                          *                              *
* D:Heteroscedasticity*CHSQ(   1)=   1.3365[.248]*F(   1,  27)=   1.3044[.263]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
          OLS estimation of a single equation in the Unrestricted VAR
*******************************************************************************
 Dependent variable is QQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 QQ(-1)                    1.0776              .20706              5.2042[.000]
 QQ(-2)                  -.066830              .20954             -.31893[.753]
 AM                     -.1274E-6            .8855E-7             -1.4386[.165]
 AM(-1)                  .1144E-7            .1054E-6              .10853[.915]
 AM(-2)                  .2653E-7            .1014E-6              .26154[.796]
 AM(-3)                  .1393E-6            .9552E-7              1.4587[.159]
*******************************************************************************
 R-Squared                    .97837   R-Bar-Squared                    .97322
 S.E. of Regression         203.6580   F-stat.    F(  5,  21)  189.9485[.000]
 Mean of Dependent Variable    9469.7   S.D. of Dependent Variable      1244.4
 Residual Sum of Squares     871008.3   Equation Log-likelihood      -178.4625
 Akaike Info. Criterion     -184.4625   Schwarz Bayesian Criterion   -188.3500
 DW-statistic                  1.9612   System Log-likelihood        -178.4625
*******************************************************************************
```

```
                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                              *
* A:Serial Correlation*CHSQ(   1)=  .012774[.910]*F(   1,  20)= .0094667[.923]*
*                     *                          *                              *
* B:Functional Form   *CHSQ(   1)=   2.9634[.085]*F(   1,  20)=   2.4658[.132]*
*                     *                          *                              *
* C:Normality         *CHSQ(   2)=   2.2347[.327]*      Not applicable          *
*                     *                          *                              *
* D:Heteroscedasticity*CHSQ(   1)=   3.2205[.073]*F(   1,  25)=   3.3858[.078]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

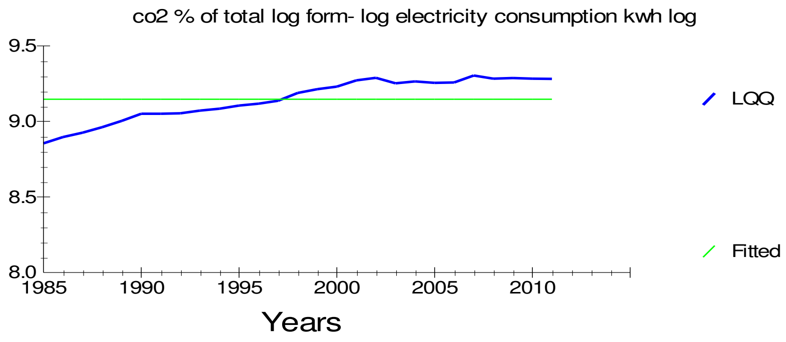
```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is QQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       6910.4            163.6968             42.2145[.000]
 TIME                    150.5482              8.7541             17.1974[.000]
*******************************************************************************
 R-Squared                    .92206   R-Bar-Squared                    .91894
 S.E. of Regression         354.2992   F-stat.    F(  1,  25)  295.7501[.000]
 Mean of Dependent Variable    9469.7   S.D. of Dependent Variable      1244.4
 Residual Sum of Squares      3138197   Equation Log-likelihood      -195.7662
 Akaike Info. Criterion     -197.7662   Schwarz Bayesian Criterion   -199.0620
 DW-statistic                  .34183
*******************************************************************************
```

```
                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
```

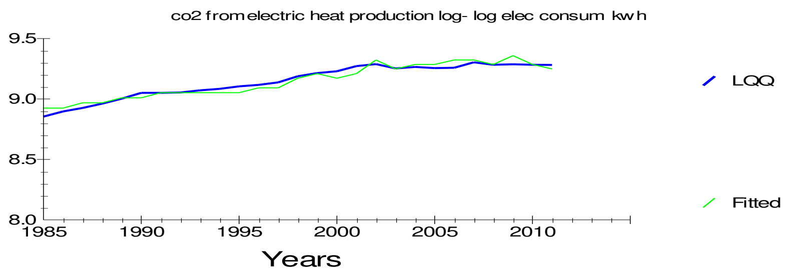
```
*******************************************************************************
*                   *                           *                             *
* A:Serial Correlation*CHSQ(   1)=  16.6317[.000]*F(   1,  24)=  38.4984[.000]*
*                   *                           *                             *
* B:Functional Form   *CHSQ(   1)=  16.7250[.000]*F(   1,  24)=  39.0655[.000]*
*                   *                           *                             *
* C:Normality         *CHSQ(   2)=   .29070[.865]*       Not applicable       *
*                   *                           *                             *
* D:Heteroscedasticity*CHSQ(   1)=   2.4688[.116]*F(   1,  25)=   2.5160[.125]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values

                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        4536.3             66.5594            68.1548[.000]
 TIME                      47.1673              3.5594            13.2513[.000]
*******************************************************************************
 R-Squared                     .87537   R-Bar-Squared                    .87039
 S.E. of Regression          144.0586   F-stat.    F(  1,  25)  175.5969[.000]
 Mean of Dependent Variable    5338.2   S.D. of Dependent Variable    400.1426
 Residual Sum of Squares     518822.2   Equation Log-likelihood      -171.4683
 Akaike Info. Criterion     -173.4683   Schwarz Bayesian Criterion   -174.7642
 DW-statistic                  .76073
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                   *                           *                             *
* A:Serial Correlation*CHSQ(   1)=   9.0142[.003]*F(   1,  24)=  12.0285[.002]*
*                   *                           *                             *
* B:Functional Form   *CHSQ(   1)=  10.6819[.001]*F(   1,  24)=  15.7106[.001]*
*                   *                           *                             *
* C:Normality         *CHSQ(   2)=   .45969[.795]*       Not applicable       *
*                   *                           *                             *
* D:Heteroscedasticity*CHSQ(   1)=   2.7042[.100]*F(   1,  25)=   2.7826[.108]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                     Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LQQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 LAG                        8.3260            .023997          346.9570[.000]
*******************************************************************************
 R-Squared                     .0000   R-Bar-Squared                     0.00
 S.E. of Regression           .13699   F-stat.                         *NONE*
 Mean of Dependent Variable   9.1471   S.D. of Dependent Variable      .13699
 Residual Sum of Squares      .48792   Equation Log-likelihood        15.8701
 Akaike Info. Criterion      14.8701   Schwarz Bayesian Criterion     14.2222
 DW-statistic                .038848
*******************************************************************************


                             Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=  21.4740[.000]*F(   1,  25)=  97.1493[.000]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=    .0000[1.00]*F(   1,  25)=    .0000[1.00]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   2.4436[.295]*      Not applicable       *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   *NONE*      *F(   1,  25)=   *NONE*      *
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```


```
                     Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LQQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 LAG                        8.3260            .023997          346.9570[.000]
*******************************************************************************
 R-Squared                     .0000   R-Bar-Squared                     0.00
 S.E. of Regression           .13699   F-stat.                         *NONE*
 Mean of Dependent Variable   9.1471   S.D. of Dependent Variable      .13699
 Residual Sum of Squares      .48792   Equation Log-likelihood        15.8701
 Akaike Info. Criterion      14.8701   Schwarz Bayesian Criterion     14.2222
 DW-statistic                .038848
*******************************************************************************


                             Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=  21.4740[.000]*F(   1,  25)=  97.1493[.000]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=    .0000[1.00]*F(   1,  25)=    .0000[1.00]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   2.4436[.295]*      Not applicable       *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   *NONE*      *F(   1,  25)=   *NONE*      *
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

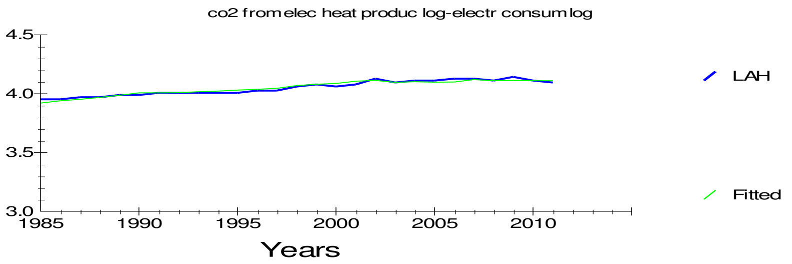



```
 Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LQQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 LAH                        2.2587           .0017872             1263.8[.000]
*******************************************************************************
 R-Squared                     .92462   R-Bar-Squared                   .92462
 S.E. of Regression           .037611   F-stat.                         *NONE*
 Mean of Dependent Variable    9.1471   S.D. of Dependent Variable      .13699
 Residual Sum of Squares      .036780   Equation Log-likelihood        50.7703
 Akaike Info. Criterion       49.7703   Schwarz Bayesian Criterion     49.1224
 DW-statistic                  1.0570
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=   4.2325[.040]*F(   1,  25)=   4.6475[.041]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=   .79361[.373]*F(   1,  25)=   .75708[.393]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   .73236[.693]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=  .093665[.760]*F(   1,  25)=  .087028[.770]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                         Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LAH
```

```
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 LQQ                        .44273            .3503E-3            1263.8[.000]
*******************************************************************************
 R-Squared                    .92567   R-Bar-Squared                    .92567
 S.E. of Regression          .016652   F-stat.                          *NONE*
 Mean of Dependent Variable   4.0497   S.D. of Dependent Variable      .061076
 Residual Sum of Squares    .0072092   Equation Log-likelihood         72.7698
 Akaike Info. Criterion      71.7698   Schwarz Bayesian Criterion      71.1219
 DW-statistic                 1.0570
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *           F Version        *
*******************************************************************************
*                     *                           *                            *
* A:Serial Correlation*CHSQ(   1)=   4.2288[.040]*F(   1,  25)=   4.6427[.041]*
*                     *                           *                            *
* B:Functional Form   *CHSQ(   1)=   .28775[.592]*F(   1,  25)=   .26931[.608]*
*                     *                           *                            *
* C:Normality         *CHSQ(   2)=   .72698[.695]*       Not applicable        *
*                     *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)= .0012093[.972]*F(   1,  25)= .0011198[.974]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LQQ
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       10.8222              .16825          64.3218[.000]
 LAI                       -.64150             .064266          -9.9820[.000]
*******************************************************************************
 R-Squared                    .79942   R-Bar-Squared                    .79140
 S.E. of Regression          .062567   F-stat.    F(  1,  25)   99.6397[.000]
 Mean of Dependent Variable   9.1471   S.D. of Dependent Variable       .13699
 Residual Sum of Squares     .097866   Equation Log-likelihood         37.5585
 Akaike Info. Criterion      35.5585   Schwarz Bayesian Criterion      34.2627
 DW-statistic                 .53906
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *           F Version        *
*******************************************************************************
*                     *                           *                            *
* A:Serial Correlation*CHSQ(   1)=  10.6048[.001]*F(   1,  24)=  15.5237[.001]*
*                     *                           *                            *
* B:Functional Form   *CHSQ(   1)=  19.4029[.000]*F(   1,  24)=  61.2961[.000]*
*                     *                           *                            *
* C:Normality         *CHSQ(   2)=   .97888[.613]*       Not applicable        *
*                     *                           *                            *
```

```
* D:Heteroscedasticity*CHSQ(   1)=   2.3000[.129]*F(   1,  25)=   2.3279[.140]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

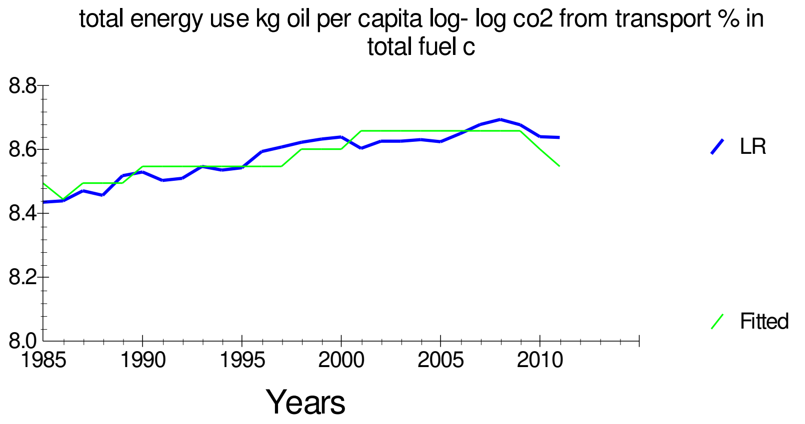
```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LAI
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      14.0102              1.1421            12.2674[.000]
 LQQ                      -1.2462              .12484            -9.9820[.000]
*******************************************************************************
 R-Squared                     .79942   R-Bar-Squared                   .79140
 S.E. of Regression           .087204   F-stat.    F(  1,  25)   99.6397[.000]
 Mean of Dependent Variable    2.6113   S.D. of Dependent Variable      .19093
 Residual Sum of Squares       .19011   Equation Log-likelihood        28.5942
 Akaike Info. Criterion       26.5942   Schwarz Bayesian Criterion     25.2983
 DW-statistic                  .65415
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  10.3369[.001]*F(   1,  24)=  14.8883[.001]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  15.3102[.000]*F(   1,  24)=  31.4330[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.7325[.421]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .37294[.541]*F(   1,  25)=   .35015[.559]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LR
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      12.3857              .43630            28.3884[.000]
 LAK                      -1.2245              .14036            -8.7244[.000]
*******************************************************************************
 R-Squared                     .75276   R-Bar-Squared                   .74287
 S.E. of Regression           .038730   F-stat.    F(  1,  25)   76.1151[.000]
 Mean of Dependent Variable    8.5799   S.D. of Dependent Variable     .076379
 Residual Sum of Squares      .037501   Equation Log-likelihood        50.5082
 Akaike Info. Criterion       48.5082   Schwarz Bayesian Criterion     47.2123
 DW-statistic                  .79733
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   7.0724[.008]*F(   1,  24)=   8.5178[.008]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   3.2353[.072]*F(   1,  24)=   3.2673[.083]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.1425[.565]*       Not applicable       *
*                     *                          *                            *
```

```
* D:Heteroscedasticity*CHSQ(   1)=   .34497[.557]*F(   1,  25)=   .32355[.575]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        3855.7            164.1397            23.4905[.000]
 T                         .035652            .0038443             9.2739[.000]
*******************************************************************************
 R-Squared                      .77479   R-Bar-Squared                   .76578
 S.E. of Regression           193.6547   F-stat.    F(  1,  25)   86.0061[.000]
 Mean of Dependent Variable     5338.2   S.D. of Dependent Variable    400.1426
 Residual Sum of Squares      937553.2   Equation Log-likelihood      -179.4564
 Akaike Info. Criterion      -181.4564   Schwarz Bayesian Criterion   -182.7523
 DW-statistic                   .50768
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version          *
*******************************************************************************
*                     *                           *                            *
* A:Serial Correlation*CHSQ(   1)=  12.8695[.000]*F(   1,  24)=  21.8581[.000]*
*                     *                           *                            *
* B:Functional Form   *CHSQ(   1)=  17.2400[.000]*F(   1,  24)=  42.3934[.000]*
*                     *                           *                            *
* C:Normality         *CHSQ(   2)=   1.5885[.452]*       Not applicable        *
*                     *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)=   3.0358[.081]*F(   1,  25)=   3.1670[.087]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

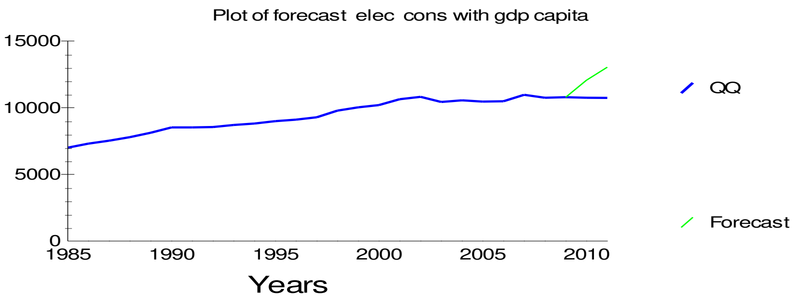
```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is W
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -261133.6            34050.6             -7.6690[.000]
 R                        107.2020             6.3615             16.8517[.000]
*******************************************************************************
 R-Squared                      .91909   R-Bar-Squared                   .91585
 S.E. of Regression            12979.6   F-stat.    F(  1,  25)  283.9801[.000]
 Mean of Dependent Variable   311130.4   S.D. of Dependent Variable     44744.4
 Residual Sum of Squares      4.21E+09   Equation Log-likelihood      -292.9929
 Akaike Info. Criterion      -294.9929   Schwarz Bayesian Criterion   -296.2888
 DW-statistic                   .53401
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  13.4240[.000]*F(   1,  24)=  23.7313[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   4.2596[.039]*F(   1,  24)=   4.4955[.045]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .93408[.627]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .99697[.318]*F(   1,  25)=   .95851[.337]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values


                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        2670.7            159.8583            16.7069[.000]
 W                        .0085734            .5088E-3            16.8517[.000]
*******************************************************************************
 R-Squared                      .91909   R-Bar-Squared                   .91585
 S.E. of Regression           116.0743   F-stat.    F(  1,  25)  283.9801[.000]
 Mean of Dependent Variable     5338.2   S.D. of Dependent Variable    400.1426
 Residual Sum of Squares      336831.2   Equation Log-likelihood      -165.6366
 Akaike Info. Criterion      -167.6366   Schwarz Bayesian Criterion   -168.9324
 DW-statistic                   .59126
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  11.8877[.001]*F(   1,  24)=  18.8789[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  10.1196[.001]*F(   1,  24)=  14.3877[.001]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.1524[.562]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=  .015873[.900]*F(   1,  25)=  .014706[.904]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

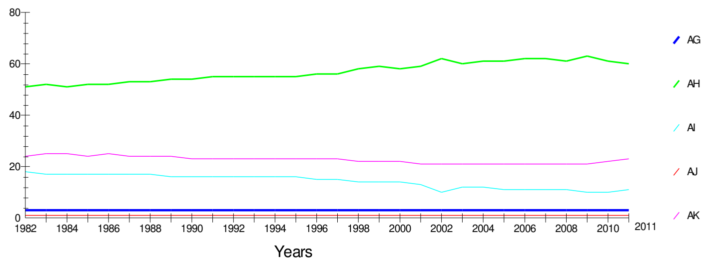
```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      2503.1             335.7739             7.4546[.000]
 X                       .031522             .0037069             8.5035[.000]
*******************************************************************************
 R-Squared                     .74309   R-Bar-Squared                   .73281
 S.E. of Regression          206.8345   F-stat.    F(  1,  25)   72.3099[.000]
 Mean of Dependent Variable    5338.2   S.D. of Dependent Variable    400.1426
 Residual Sum of Squares      1069513   Equation Log-likelihood      -181.2342
 Akaike Info. Criterion     -183.2342   Schwarz Bayesian Criterion   -184.5300
 DW-statistic                  .39910
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  16.9097[.000]*F(   1,  24)=  40.2200[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  10.2570[.001]*F(   1,  24)=  14.7027[.001]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .70010[.705]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .70845[.400]*F(   1,  25)=   .67365[.420]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

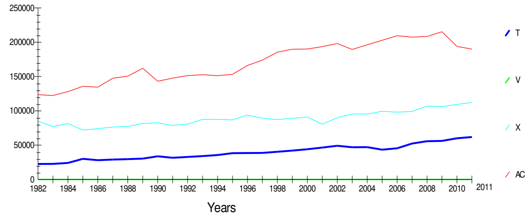
```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is X
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -35899.5             14838.7            -2.4193[.023]
 R                        23.5738              2.7722             8.5035[.000]
*******************************************************************************
 R-Squared                     .74309   R-Bar-Squared                   .73281
 S.E. of Regression            5656.3   F-stat.    F(  1,  25)   72.3099[.000]
 Mean of Dependent Variable   89941.6   S.D. of Dependent Variable     10942.7
 Residual Sum of Squares     8.00E+08   Equation Log-likelihood      -270.5665
 Akaike Info. Criterion     -272.5665   Schwarz Bayesian Criterion   -273.8623
 DW-statistic                  .46046
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  15.2423[.000]*F(   1,  24)=  31.1130[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .43292[.511]*F(   1,  24)=   .39109[.538]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   3.7722[.152]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.7153[.099]*F(   1,  25)=   2.7952[.107]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

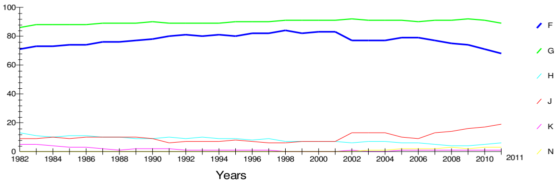
```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is R
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        2743.5            180.1040            15.2328[.000]
 AC                        .014782            .0010157            14.5534[.000]
*******************************************************************************
 R-Squared                      .89443   R-Bar-Squared                   .89020
 S.E. of Regression           132.5893   F-stat.    F(  1,  25)  211.8023[.000]
 Mean of Dependent Variable     5338.2   S.D. of Dependent Variable    400.1426
 Residual Sum of Squares      439498.0   Equation Log-likelihood      -169.2283
 Akaike Info. Criterion      -171.2283   Schwarz Bayesian Criterion   -172.5241
 DW-statistic                   .99633
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=   6.0419[.014]*F(   1,  24)=   6.9188[.015]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=   2.8693[.090]*F(   1,  24)=   2.8537[.104]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   1.5025[.472]*       Not applicable      *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   2.8232[.093]*F(   1,  25)=   2.9193[.100]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is AC
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -147473.2             22254.4            -6.6267[.000]
 R                         60.5085              4.1577            14.5534[.000]
*******************************************************************************
 R-Squared                      .89443   R-Bar-Squared                   .89020
 S.E. of Regression             8483.1   F-stat.    F(  1,  25)  211.8023[.000]
 Mean of Dependent Variable   175532.5   S.D. of Dependent Variable     25601.1
 Residual Sum of Squares      1.80E+09   Equation Log-likelihood      -281.5097
 Akaike Info. Criterion      -283.5097   Schwarz Bayesian Criterion   -284.8055
 DW-statistic                   .99988
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=   6.5835[.010]*F(   1,  24)=   7.7390[.010]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=   3.2804[.070]*F(   1,  24)=   3.3192[.081]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   1.0015[.606]*       Not applicable      *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   .67121[.413]*F(   1,  25)=   .63733[.432]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values



                       Ordinary Least Squares Estimation
*******************************************************************************
```

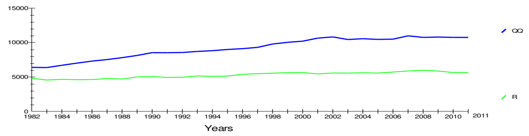
```
 Dependent variable is W
 27 observations used for estimation from 1985 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -261133.6           34050.6            -7.6690[.000]
 R                        107.2020            6.3615            16.8517[.000]
*******************************************************************************
 R-Squared                     .91909   R-Bar-Squared                   .91585
 S.E. of Regression           12979.6   F-stat.    F(  1,  25)  283.9801[.000]
 Mean of Dependent Variable  311130.4   S.D. of Dependent Variable     44744.4
 Residual Sum of Squares      4.21E+09  Equation Log-likelihood      -292.9929
 Akaike Info. Criterion      -294.9929  Schwarz Bayesian Criterion   -296.2888
 DW-statistic                  .53401
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *           F Version        *
*******************************************************************************
*                     *                           *                            *
* A:Serial Correlation*CHSQ(   1)=  13.4240[.000]*F(   1,  24)=  23.7313[.000]*
*                     *                           *                            *
* B:Functional Form   *CHSQ(   1)=   4.2596[.039]*F(   1,  24)=   4.4955[.045]*
*                     *                           *                            *
* C:Normality         *CHSQ(   2)=   .93408[.627]*       Not applicable        *
*                     *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .99697[.318]*F(   1,  25)=   .95851[.337]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```











Sample period	:1982 to 2011					
Variable(s)	:	QQ	R	AP	AO	AM
Maximum	:	10973.0	5965.0	62217.0	5.0000	1.94E+09
Minimum	:	6366.0	4555.0	11361.0	-2.0000	2357.7
Mean	:	9171.3	5271.8	24492.9	2.7667	4.91E+08
Std. Deviation	:	1489.9	430.9873	13227.1	1.5687	7.85E+08
Skewness	:	-.46571	-.22513	1.3334	-1.0780	1.0254
Kurtosis - 3	:	-1.0668	-1.2837	.93027	1.3755	-.79836
Coef of Variation	:	.16245	.081753	.54004	.56701	1.5974

Estimated Correlation Matrix of Variables

****

	QQ	R	AP	AO	AM
QQ	1.0000	.95204	.74217	.0050619	-.58615
R	.95204	1.0000	.76674	.029420	-.51032
AP	.74217	.76674	1.0000	-.13429	-.10156
AO	.0050619	.029420	-.13429	1.0000	-.069301
AM	-.58615	-.51032	-.10156	-.069301	1.0000

****

6.2. Statistics China

Variables from China obtained from the World Bank Data Base that are put in regression are as follows:

China variable

A	Electricity production from coal sources (% of total)
B	Electricity production from oil, gas and coal sources (% of total)
C	Electricity production from hydroelectric sources (% of total)
D	Electricity production from oil sources (% of total)
E	Energy imports, net (% of energy use)
F	Electric power consumption (kWh per capita)
G	Energy use (kg of oil equivalent per capita)
I	CO_2 intensity (kg per kg of oil equivalent energy use)
H	CO_2 emissions from gaseous fuel consumption (kt)
L	CO_2 emissions from gaseous fuel consumption (% of total)
K	CO_2 emissions (kg per 2005 US$ of GDP)
O	CO_2 emissions (kt)
P	CO_2 emissions (metric tons per capita)
R	CO_2 emissions from electricity and heat production, total (% of total fuel combustion)
S	CO_2 emissions from manufacturing industries and construction (% of total fuel combustion)
T	CO_2 emissions from other sectors, excluding residential buildings and commercial and public services (% of total fuel combustion)
Z	CO_2 emissions from transport (% of total fuel combustion)
U	Adjusted savings: carbon dioxide damage (current US$)
W	Population total
AA	GDP per capita growth (annual %)
D.D.	GDP per capita (current US$)
XY	GDP growth (annual %)
BN	Energy imports, net (% of energy use)
FG	GDP at market prices (current US$)

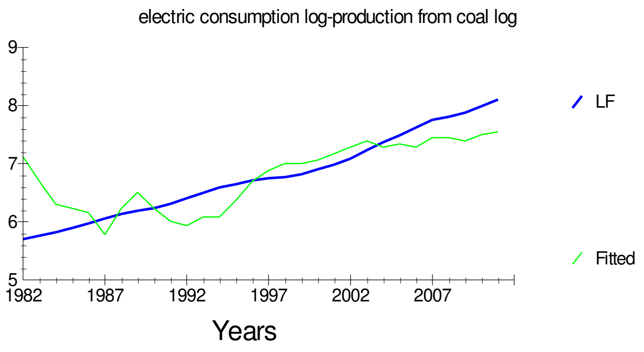
Some basic conclusions are:

-Total energy usage under strong influence of electricity input
-Electricity input under influence of hydro energy and production from coal
-Strong energy import observed in last decade
-Energy import related to GDP growth, number of population
-Number of people influence electricity consumption and import
-Rise of CO_2 emission as consequence of stronger demand and coal production
-Rise in CO_2 larges impacted from electricity production to less degree upon new industries – that seems to have slower phase of rise in last years
-GDP capita growth influence rise in electricity demand

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is F
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       -1050.8            31.1637            -33.7181[.000]
 G                          2.1675            .028838             75.1597[.000]
*******************************************************************************
 R-Squared                     .99507   R-Bar-Squared                    .99489
 S.E. of Regression           61.2083   F-stat.    F(  1,  28)    5649.0[.000]
 Mean of Dependent Variable    1135.7   S.D. of Dependent Variable    856.3866
 Residual Sum of Squares     104900.6   Equation Log-likelihood      -164.9617
 Akaike Info. Criterion     -166.9617   Schwarz Bayesian Criterion   -168.3629
 DW-statistic                  .84558
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   9.7345[.002]*F(   1,  27)=  12.9694[.001]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  .077531[.781]*F(   1,  27)=  .069958[.793]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .12134[.941]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .19553[.658]*F(   1,  28)=   .18369[.672]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

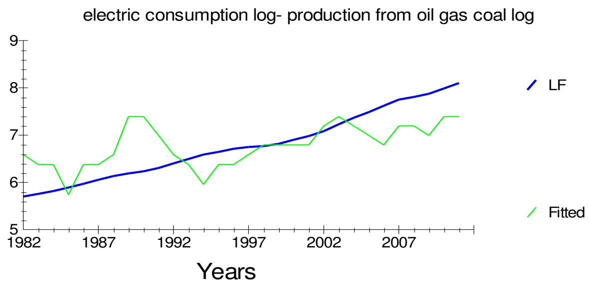
```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is G
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 F                          .73602            .038293            19.2209[.000]
*******************************************************************************
 R-Squared                     .43398   R-Bar-Squared                     .43398
 S.E. of Regression          296.5210   F-stat.                           *NONE*
 Mean of Dependent Variable    1008.8   S.D. of Dependent Variable      394.1317
 Residual Sum of Squares      2549817   Equation Log-likelihood        -212.8232
 Akaike Info. Criterion     -213.8232   Schwarz Bayesian Criterion     -214.5238
 DW-statistic                 .024868
*******************************************************************************


                           Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  27.9403[.000]*F(   1,  28)= 379.8226[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  20.8182[.000]*F(   1,  28)=  63.4853[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   8.0274[.018]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .42490[.515]*F(   1,  28)=   .40227[.531]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       -9.8010             2.4382            -4.0198[.000]
 LA                         3.9821             .58519             6.8048[.000]
*******************************************************************************
 R-Squared                     .62317   R-Bar-Squared                     .60972
 S.E. of Regression            .44919   F-stat.    F(  1,  28)   46.3048[.000]
 Mean of Dependent Variable    6.7810   S.D. of Dependent Variable        .71902
 Residual Sum of Squares       5.6497   Equation Log-likelihood         -17.5242
 Akaike Info. Criterion      -19.5242   Schwarz Bayesian Criterion      -20.9254
 DW-statistic                  .24700
*******************************************************************************


                           Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  14.7592[.000]*F(   1,  27)=  26.1470[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  12.1818[.000]*F(   1,  27)=  18.4591[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  12.4012[.002]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .22147[.638]*F(   1,  28)=   .20824[.652]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



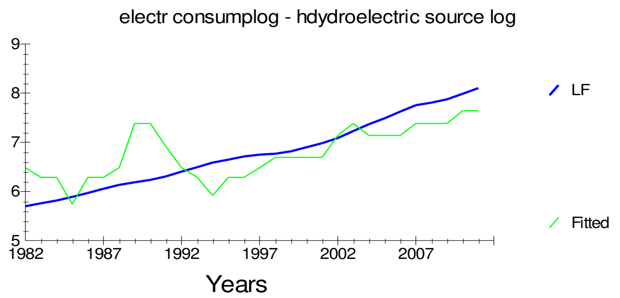

```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -63.4454            16.9024            -3.7536[.001]
 LB                        16.0751             3.8689             4.1549[.000]
*******************************************************************************
 R-Squared                     .38140   R-Bar-Squared                   .35930
 S.E. of Regression            .57553   F-stat.    F(  1,  28)   17.2632[.000]
 Mean of Dependent Variable    6.7810   S.D. of Dependent Variable      .71902
 Residual Sum of Squares       9.2746   Equation Log-likelihood       -24.9594
 Akaike Info. Criterion      -26.9594   Schwarz Bayesian Criterion    -28.3606
 DW-statistic                  .34432
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=  18.9944[.000]*F(   1,  27)=  46.5992[.000]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=  .036183[.849]*F(   1,  27)=  .032604[.858]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   1.3853[.500]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=   4.5528[.033]*F(   1,  28)=   5.0095[.033]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -63.4454            16.9024            -3.7536[.001]
 LB                        16.0751             3.8689             4.1549[.000]
*******************************************************************************
 R-Squared                     .38140   R-Bar-Squared                   .35930
 S.E. of Regression            .57553   F-stat.    F(  1,  28)   17.2632[.000]
 Mean of Dependent Variable    6.7810   S.D. of Dependent Variable      .71902
 Residual Sum of Squares       9.2746   Equation Log-likelihood       -24.9594
 Akaike Info. Criterion      -26.9594   Schwarz Bayesian Criterion    -28.3606
 DW-statistic                  .34432
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=  18.9944[.000]*F(   1,  27)=  46.5992[.000]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=  .036183[.849]*F(   1,  27)=  .032604[.858]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   1.3853[.500]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=   4.5528[.033]*F(   1,  28)=   5.0095[.033]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



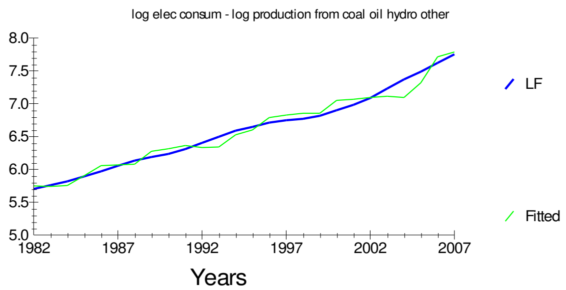

```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       19.4411             2.2040             8.8209[.000]
 LC                        -4.2557             .74025            -5.7490[.000]
*******************************************************************************
 R-Squared                     .54137   R-Bar-Squared                   .52499
 S.E. of Regression            .49556   F-stat.    F(  1,  28)   33.0515[.000]
 Mean of Dependent Variable    6.7810   S.D. of Dependent Variable      .71902
 Residual Sum of Squares       6.8761   Equation Log-likelihood       -20.4711
 Akaike Info. Criterion      -22.4711   Schwarz Bayesian Criterion    -23.8723
 DW-statistic                  .40957
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
```

```
*                           *                                 *                                    *
* A:Serial Correlation*CHSQ(   1)=  17.2524[.000]*F(   1,  27)=  36.5415[.000]*
*                           *                                 *                                    *
* B:Functional Form    *CHSQ(   1)=   1.1841[.277]*F(   1,  27)=   1.1095[.302]*
*                           *                                 *                                    *
* C:Normality          *CHSQ(   2)=   4.8442[.089]*       Not applicable      *
*                           *                                 *                                    *
* D:Heteroscedasticity*CHSQ(   1)=   1.9656[.161]*F(   1,  28)=   1.9632[.172]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



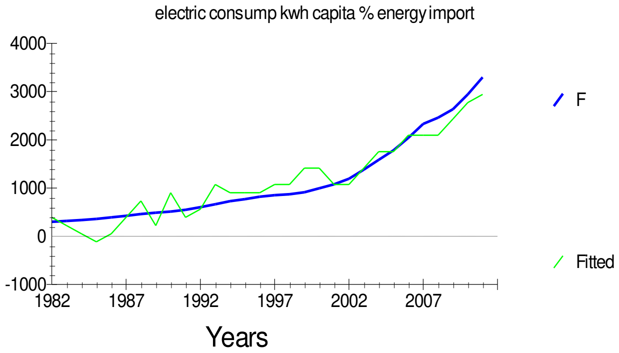

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 26 observations used for estimation from 1982 to 2007
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        7.7914             .055991            139.1555[.000]
 LD                        -.70740             .030068            -23.5271[.000]
*******************************************************************************
 R-Squared                     .95844   R-Bar-Squared                    .95671
 S.E. of Regression            .12284   F-stat.    F(  1,  24)  553.5222[.000]
 Mean of Dependent Variable    6.6023   S.D. of Dependent Variable       .59042
 Residual Sum of Squares       .36216   Equation Log-likelihood         18.6664
 Akaike Info. Criterion       16.6664   Schwarz Bayesian Criterion      15.4083
 DW-statistic                  .98497
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                           *                                 *                                    *
* A:Serial Correlation*CHSQ(   1)=   6.4977[.011]*F(   1,  23)=   7.6630[.011]*
*                           *                                 *                                    *
* B:Functional Form    *CHSQ(   1)= .4301E-4[.995]*F(   1,  23)= .3805E-4[.995]*
*                           *                                 *                                    *
* C:Normality          *CHSQ(   2)=   7.4415[.024]*       Not applicable      *
*                           *                                 *                                    *
* D:Heteroscedasticity*CHSQ(   1)=   1.8006[.180]*F(   1,  24)=   1.7858[.194]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 26 observations used for estimation from 1982 to 2007
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -13.9509             21.6557            -.64422[.526]
 LA                         .54218              .22606             2.3984[.026]
 LB                         3.9022              4.2367             .92104[.367]
 LC                         .79171              1.0943             .72348[.477]
 LD                        -.65208             .041036           -15.8904[.000]
*******************************************************************************
 R-Squared                    .97161   R-Bar-Squared                    .96620
 S.E. of Regression           .10855   F-stat.    F(  4,  21)  179.6531[.000]
 Mean of Dependent Variable   6.6023   S.D. of Dependent Variable       .59042
 Residual Sum of Squares      .24745   Equation Log-likelihood         23.6182
 Akaike Info. Criterion      18.6182   Schwarz Bayesian Criterion      15.4730
 DW-statistic                 .98567
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   9.8027[.002]*F(   1,  20)=  12.1041[.002]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .18673[.666]*F(   1,  20)=   .14468[.708]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   4.2402[.120]*      Not applicable        *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.3588[.125]*F(   1,  24)=   2.3946[.135]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

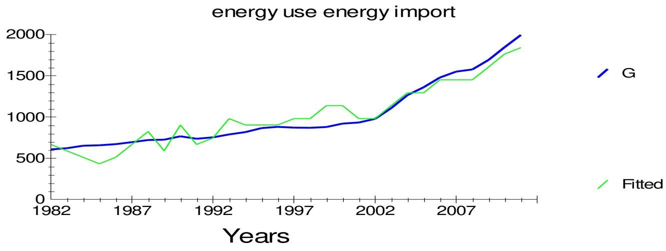



```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is F
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        1073.4             48.1748             22.2807[.000]
 E                        169.9895             10.1712             16.7128[.000]
*******************************************************************************
 R-Squared                    .90889   R-Bar-Squared                    .90564
 S.E. of Regression         263.0724   F-stat.    F(  1,  28)  279.3174[.000]
 Mean of Dependent Variable   1135.7   S.D. of Dependent Variable     856.3866
 Residual Sum of Squares     1937799   Equation Log-likelihood       -208.7061
 Akaike Info. Criterion    -210.7061   Schwarz Bayesian Criterion    -212.1073
 DW-statistic                 1.1192
*******************************************************************************


                               Diagnostic Tests
```

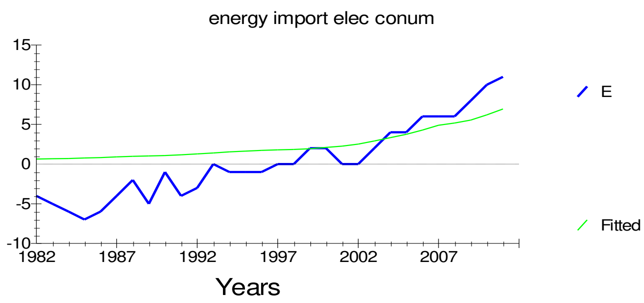
```
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=   5.3253[.021]*F(   1,  27)=   5.8271[.023]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=  16.7724[.000]*F(   1,  27)=  34.2354[.000]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   .91088[.634]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=  .018532[.892]*F(   1,  28)=  .017308[.896]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



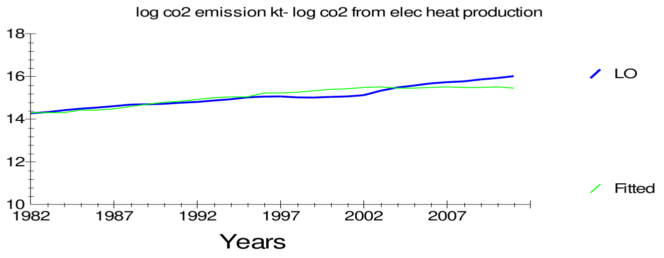

```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is G
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      980.0838            22.1930            44.1619[.000]
 E                         78.2260             4.6856            16.6948[.000]
*******************************************************************************
 R-Squared                    .90871   R-Bar-Squared                    .90545
 S.E. of Regression         121.1911   F-stat.    F(  1,  28)  278.7179[.000]
 Mean of Dependent Variable   1008.8   S.D. of Dependent Variable     394.1317
 Residual Sum of Squares    411244.0   Equation Log-likelihood       -185.4543
 Akaike Info. Criterion    -187.4543   Schwarz Bayesian Criterion    -188.8555
 DW-statistic                 .92969
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                     *                           *                           *
* A:Serial Correlation*CHSQ(   1)=   8.0774[.004]*F(   1,  27)=   9.9482[.004]*
*                     *                           *                           *
* B:Functional Form   *CHSQ(   1)=  17.3482[.000]*F(   1,  27)=  37.0227[.000]*
*                     *                           *                           *
* C:Normality         *CHSQ(   2)=   .71601[.699]*       Not applicable       *
*                     *                           *                           *
* D:Heteroscedasticity*CHSQ(   1)=  .053710[.817]*F(   1,  28)=  .050220[.824]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                              Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is E
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 F                        .0021048           .4840E-3             4.3488[.000]
*******************************************************************************
 R-Squared                     .39107   R-Bar-Squared                   .39107
 S.E. of Regression            3.7479   F-stat.                         *NONE*
 Mean of Dependent Variable    .36667   S.D. of Dependent Variable      4.8029
 Residual Sum of Squares     407.3534   Equation Log-likelihood       -81.6954
 Akaike Info. Criterion      -82.6954   Schwarz Bayesian Criterion    -83.3960
 DW-statistic                  .19160
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  23.1806[.000]*F(   1,   28)=  95.1771[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  13.7614[.000]*F(   1,   28)=  23.7287[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.2074[.547]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.1223[.145]*F(   1,   28)=   2.1316[.155]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

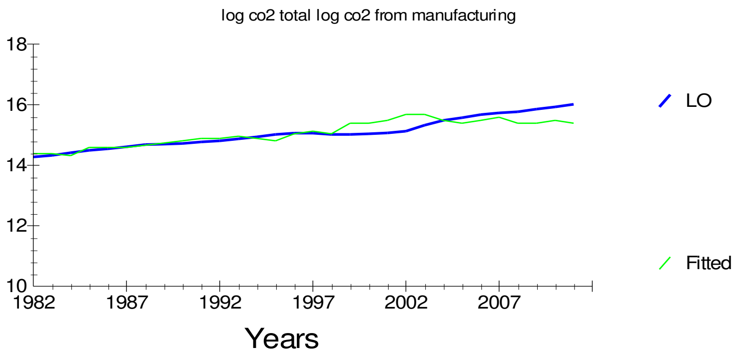


```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is E
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 G                        .0018105           .7412E-3            2.4426[.021]
*******************************************************************************
 R-Squared                     .16563   R-Bar-Squared                    .16563
 S.E. of Regression            4.3872   F-stat.                          *NONE*
 Mean of Dependent Variable    .36667   S.D. of Dependent Variable       4.8029
 Residual Sum of Squares     558.1664   Equation Log-likelihood        -86.4201
 Akaike Info. Criterion      -87.4201   Schwarz Bayesian Criterion     -88.1207
 DW-statistic                  .14453
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  24.5978[.000]*F(   1,  28)= 127.4918[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  22.7134[.000]*F(   1,  28)=  87.2807[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.8472[.397]*      Not applicable        *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .35784[.550]*F(   1,  28)=   .33801[.566]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values


                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LO
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        9.4515             .56065            16.8582[.000]
 LR                         1.5265             .15210            10.0366[.000]
*******************************************************************************
 R-Squared                     .78250   R-Bar-Squared                    .77473
 S.E. of Regression            .23507   F-stat.    F(  1,  28)  100.7340[.000]
 Mean of Dependent Variable   15.0620   S.D. of Dependent Variable       .49528
 Residual Sum of Squares       1.5473   Equation Log-likelihood          1.9023
 Akaike Info. Criterion      -.097738   Schwarz Bayesian Criterion      -1.4989
 DW-statistic                  .12705
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  26.7850[.000]*F(   1,  27)= 224.9452[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   4.3830[.036]*F(   1,  27)=   4.6197[.041]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .86548[.649]*      Not applicable        *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   9.4496[.002]*F(   1,  28)=  12.8751[.001]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

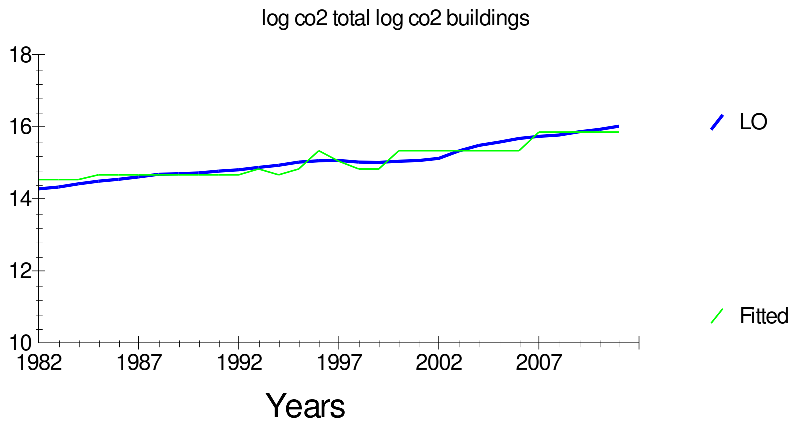



```
                           Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LO
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       25.6419            1.2679             20.2245[.000]
 LS                        -2.9581            .35422             -8.3510[.000]
*******************************************************************************
 R-Squared                      .71352   R-Bar-Squared                   .70329
 S.E. of Regression             .26979   F-stat.    F(  1,  28)   69.7391[.000]
 Mean of Dependent Variable    15.0620   S.D. of Dependent Variable      .49528
 Residual Sum of Squares        2.0380   Equation Log-likelihood        -2.2294
 Akaike Info. Criterion        -4.2294   Schwarz Bayesian Criterion     -5.6306
 DW-statistic                   .29926
*******************************************************************************
```

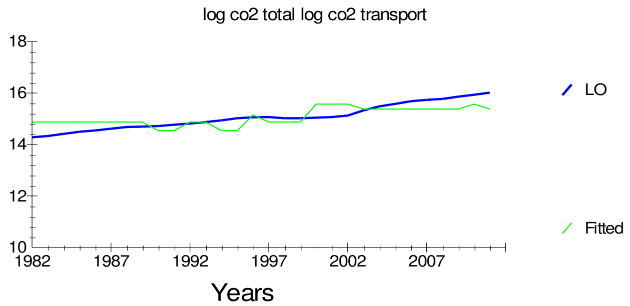
```
                                   Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version          *         F Version         *
*******************************************************************************
*                     *                            *                           *
* A:Serial Correlation*CHSQ(   1)=  21.2122[.000]*F(   1,  27)=  65.1736[.000]*
*                     *                            *                           *
* B:Functional Form   *CHSQ(   1)=   1.1484[.284]*F(   1,  27)=   1.0747[.309]*
*                     *                            *                           *
* C:Normality         *CHSQ(   2)=   .29611[.862]*       Not applicable        *
*                     *                            *                           *
* D:Heteroscedasticity*CHSQ(   1)=  11.2284[.001]*F(   1,  28)=  16.7485[.000]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



```
          Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LO
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       15.8483            .065926            240.3953[.000]
 LT                        -.73603            .053425            -13.7769[.000]
*******************************************************************************
 R-Squared                     .87144   R-Bar-Squared                    .86685
 S.E. of Regression            .18073   F-stat.     F(  1,  28)  189.8017[.000]
 Mean of Dependent Variable   15.0620   S.D. of Dependent Variable       .49528
 Residual Sum of Squares       .91454   Equation Log-likelihood          9.7898
 Akaike Info. Criterion        7.7898   Schwarz Bayesian Criterion       6.3886
 DW-statistic                  1.0763
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *          F Version         *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   5.3484[.021]*F(   1,  27)=   5.8579[.023]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .29378[.588]*F(   1,  27)=   .26701[.610]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.2769[.528]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=  .076741[.782]*F(   1,  28)=  .071809[.791]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```



```
                     Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LO
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       12.4804             .51949            24.0243[.000]
 LZ                         1.4853             .29639             5.0112[.000]
*******************************************************************************
 R-Squared                     .47282   R-Bar-Squared                   .45399
 S.E. of Regression            .36598   F-stat.    F(  1,  28)   25.1124[.000]
 Mean of Dependent Variable   15.0620   S.D. of Dependent Variable      .49528
 Residual Sum of Squares       3.7503   Equation Log-likelihood       -11.3778
 Akaike Info. Criterion      -13.3778   Schwarz Bayesian Criterion    -14.7790
 DW-statistic                  .41711
*******************************************************************************


                             Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  16.3630[.000]*F(   1,  27)=  32.3972[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   1.1792[.278]*F(   1,  27)=   1.1047[.303]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.8046[.406]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.7429[.187]*F(   1,  28)=   1.7270[.199]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```




```
                     Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LR
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        3.9551            .079205            49.9354[.000]
 LDD                      -.068348            .016415            -4.1638[.000]
*******************************************************************************
 R-Squared                     .38240   R-Bar-Squared                   .36035
 S.E. of Regression            .22954   F-stat.    F(  1,  28)   17.3370[.000]
 Mean of Dependent Variable    3.6753   S.D. of Dependent Variable      .28700
 Residual Sum of Squares       1.4753   Equation Log-likelihood         2.6170
 Akaike Info. Criterion        .61697   Schwarz Bayesian Criterion     -.78422
 DW-statistic                  .17888
*******************************************************************************


                             Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
```

```
* A:Serial Correlation*CHSQ(   1)=  22.2399[.000]*F(   1,  27)=  77.3802[.000]*
*                     *                          *                             *
* B:Functional Form   *CHSQ(   1)=  12.6985[.000]*F(   1,  27)=  19.8166[.000]*
*                     *                          *                             *
* C:Normality         *CHSQ(   2)=   .87076[.647]*      Not applicable        *
*                     *                          *                             *
* D:Heteroscedasticity*CHSQ(   1)=   9.8429[.002]*F(   1,  28)=  13.6726[.001]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LS
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        3.4173            .034776             98.2686[.000]
 LDD                       .038885           .0072070              5.3955[.000]
*******************************************************************************
 R-Squared                      .50973   R-Bar-Squared                    .49222
 S.E. of Regression             .10078   F-stat.    F(  1,  28)   29.1111[.000]
 Mean of Dependent Variable     3.5766   S.D. of Dependent Variable      .14143
 Residual Sum of Squares        .28439   Equation Log-likelihood        27.3108
 Akaike Info. Criterion        25.3108   Schwarz Bayesian Criterion     23.9096
 DW-statistic                   .38587
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                             *
* A:Serial Correlation*CHSQ(   1)=  17.4264[.000]*F(   1,  27)=  37.4205[.000]*
*                     *                          *                             *
* B:Functional Form   *CHSQ(   1)=  14.8264[.000]*F(   1,  27)=  26.3822[.000]*
*                     *                          *                             *
* C:Normality         *CHSQ(   2)=  .098553[.952]*      Not applicable        *
*                     *                          *                             *
* D:Heteroscedasticity*CHSQ(   1)=   6.1310[.013]*F(   1,  28)=   7.1921[.012]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LT
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        .33298             .14779              2.2531[.032]
 LDD                        .17959            .030629              5.8634[.000]
*******************************************************************************
 R-Squared                      .55113   R-Bar-Squared                    .53510
 S.E. of Regression             .42831   F-stat.    F(  1,  28)   34.3795[.000]
 Mean of Dependent Variable     1.0683   S.D. of Dependent Variable      .62817
 Residual Sum of Squares        5.1365   Equation Log-likelihood       -16.0958
 Akaike Info. Criterion       -18.0958   Schwarz Bayesian Criterion    -19.4970
 DW-statistic                   .68256
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
```

```
*******************************************************************************
*                    *                           *                            *
* A:Serial Correlation*CHSQ(   1)=  11.7783[.001]*F(   1,  27)=  17.4524[.000]*
*                    *                           *                            *
* B:Functional Form   *CHSQ(   1)=   .59227[.442]*F(   1,  27)=   .54378[.467]*
*                    *                           *                            *
* C:Normality         *CHSQ(   2)=   3.8238[.148]*       Not applicable       *
*                    *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)=  .018770[.891]*F(   1,  28)=  .017530[.896]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LZ
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        2.0220            .049881            40.5359[.000]
 LDD                      -.069317            .010338            -6.7054[.000]
*******************************************************************************
 R-Squared                    .61624   R-Bar-Squared                    .60253
 S.E. of Regression           .14456   F-stat.    F(  1,  28)   44.9623[.000]
 Mean of Dependent Variable   1.7382   S.D. of Dependent Variable       .22929
 Residual Sum of Squares      .58511   Equation Log-likelihood         16.4891
 Akaike Info. Criterion      14.4891   Schwarz Bayesian Criterion      13.0879
 DW-statistic                 1.4559
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                    *                           *                            *
* A:Serial Correlation*CHSQ(   1)=   2.4539[.117]*F(   1,  27)=   2.4053[.133]*
*                    *                           *                            *
* B:Functional Form   *CHSQ(   1)=   3.7004[.054]*F(   1,  27)=   3.7989[.062]*
*                    *                           *                            *
* C:Normality         *CHSQ(   2)=  45.3679[.000]*       Not applicable       *
*                    *                           *                            *
* D:Heteroscedasticity*CHSQ(   1)=   2.4292[.119]*F(   1,  28)=   2.4670[.127]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LR
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        3.5079             .26255            13.3608[.000]
 LAA                       .080308             .12334             .65112[.520]
*******************************************************************************
 R-Squared                   .014916   R-Bar-Squared                  -.020266
 S.E. of Regression           .28990   F-stat.    F(  1,  28)     .42396[.520]
 Mean of Dependent Variable   3.6753   S.D. of Dependent Variable       .28700
 Residual Sum of Squares      2.3531   Equation Log-likelihood         -4.3864
 Akaike Info. Criterion      -6.3864   Schwarz Bayesian Criterion      -7.7876
 DW-statistic                .038242
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
```

```
*******************************************************************************
*                      *                           *                          *
* A:Serial Correlation*CHSQ(   1)=  26.0775[.000]*F(   1,  27)= 179.5034[.000]*
*                      *                           *                          *
* B:Functional Form   *CHSQ(   1)=   1.2182[.270]*F(   1,  27)=   1.1428[.295]*
*                      *                           *                          *
* C:Normality         *CHSQ(   2)=   3.4572[.178]*       Not applicable       *
*                      *                           *                          *
* D:Heteroscedasticity*CHSQ(   1)=   2.2002[.138]*F(   1,  28)=   2.2161[.148]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LS
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        3.6553             .12947            28.2338[.000]
 LAA                      -.037775            .060819            -.62111[.540]
*******************************************************************************
 R-Squared                    .013590   R-Bar-Squared                  -.021639
 S.E. of Regression            .14295   F-stat.    F(  1,  28)    .38577[.540]
 Mean of Dependent Variable    3.5766   S.D. of Dependent Variable      .14143
 Residual Sum of Squares       .57219   Equation Log-likelihood        16.8242
 Akaike Info. Criterion       14.8242   Schwarz Bayesian Criterion     13.4230
 DW-statistic                  .10297
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version         *         F Version         *
*******************************************************************************
*                      *                           *                          *
* A:Serial Correlation*CHSQ(   1)=  24.6323[.000]*F(   1,  27)= 123.9033[.000]*
*                      *                           *                          *
* B:Functional Form   *CHSQ(   1)=   1.1501[.284]*F(   1,  27)=   1.0763[.309]*
*                      *                           *                          *
* C:Normality         *CHSQ(   2)=   1.9811[.371]*       Not applicable       *
*                      *                           *                          *
* D:Heteroscedasticity*CHSQ(   1)=   2.8228[.093]*F(   1,  28)=   2.9082[.099]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LT
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                        1.7061             .56575            3.0156[.005]
 LAA                      -.30588              .26577            -1.1509[.260]
*******************************************************************************
 R-Squared                    .045170   R-Bar-Squared                   .011069
 S.E. of Regression            .62468   F-stat.    F(  1,  28)    1.3246[.260]
 Mean of Dependent Variable    1.0683   S.D. of Dependent Variable      .62817
 Residual Sum of Squares      10.9264   Equation Log-likelihood       -27.4179
 Akaike Info. Criterion      -29.4179   Schwarz Bayesian Criterion    -30.8191
 DW-statistic                  .20869
*******************************************************************************
```

```
                         Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  22.7625[.000]*F(   1,  27)=  84.9178[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .64007[.424]*F(   1,  27)=   .58862[.450]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   2.2421[.326]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   3.7122[.054]*F(   1,  28)=   3.9540[.057]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

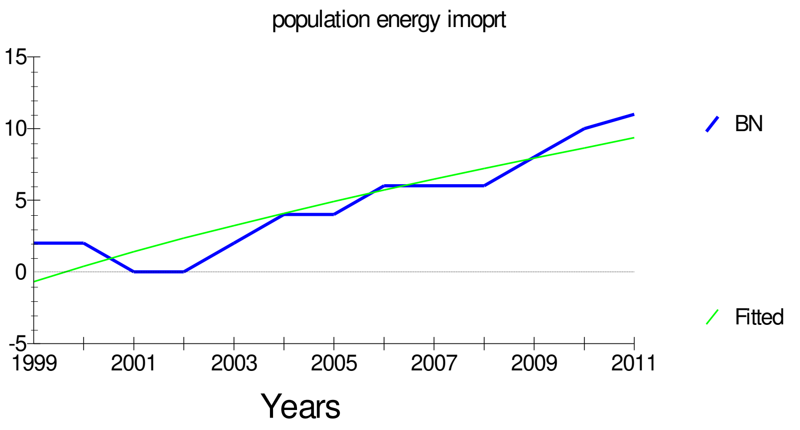
```
                 Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LZ
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       1.4764             .20522            7.1945[.000]
 LAA                       .12553            .096405            1.3021[.203]
*******************************************************************************
 R-Squared                     .057095   R-Bar-Squared                   .023420
 S.E. of Regression             .22659   F-stat.    F(  1,  28)   1.6955[.203]
 Mean of Dependent Variable     1.7382   S.D. of Dependent Variable       .22929
 Residual Sum of Squares        1.4376   Equation Log-likelihood          3.0048
 Akaike Info. Criterion         1.0048   Schwarz Bayesian Criterion     -.39637
 DW-statistic                   .45266
*******************************************************************************
```

```
                         Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  17.6192[.000]*F(   1,  27)=  38.4240[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   1.1161[.291]*F(   1,  27)=   1.0433[.316]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.6706[.434]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .54460[.461]*F(   1,  28)=   .51769[.478]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LF
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -154.2148            9.4138             -16.3818[.000]
 LW                         7.7012             .45030              17.1023[.000]
*******************************************************************************
 R-Squared                      .91263   R-Bar-Squared                    .90951
 S.E. of Regression             .21629   F-stat.    F(  1,  28)  292.4893[.000]
 Mean of Dependent Variable     6.7810   S.D. of Dependent Variable       .71902
 Residual Sum of Squares        1.3099   Equation Log-likelihood          4.4009
 Akaike Info. Criterion         2.4009   Schwarz Bayesian Criterion       .99970
 DW-statistic                  .062969
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  27.1178[.000]*F(   1,  27)= 254.0394[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  21.7977[.000]*F(   1,  27)=  71.7530[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   2.0404[.361]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   6.8908[.009]*F(   1,  28)=   8.3491[.007]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values


     Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LG
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -65.8488            7.1356              -9.2282[.000]
 LW                         3.4777             .34133              10.1887[.000]
*******************************************************************************
 R-Squared                      .78757   R-Bar-Squared                    .77998
 S.E. of Regression             .16395   F-stat.    F(  1,  28)  103.8090[.000]
 Mean of Dependent Variable     6.8530   S.D. of Dependent Variable       .34952
 Residual Sum of Squares        .75260   Equation Log-likelihood         12.7131
 Akaike Info. Criterion        10.7131   Schwarz Bayesian Criterion       9.3119
 DW-statistic                  .082838
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  27.0757[.000]*F(   1,  27)= 249.9870[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  19.6688[.000]*F(   1,  27)=  51.4030[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.5017[.472]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   8.0413[.005]*F(   1,  28)=  10.2536[.003]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LAA
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -11.3840           19.1646            -.59401[.557]
 LW                         .64428            .91672             .70281[.488]
*******************************************************************************
 R-Squared                    .017335   R-Bar-Squared                 -.017760
 S.E. of Regression            .44032   F-stat.    F(  1,  28)    .49394[.488]
 Mean of Dependent Variable    2.0850   S.D. of Dependent Variable      .43646
 Residual Sum of Squares       5.4288   Equation Log-likelihood       -16.9259
 Akaike Info. Criterion      -18.9259   Schwarz Bayesian Criterion    -20.3271
 DW-statistic                  .95460
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   8.1862[.004]*F(   1,  27)=  10.1324[.004]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   2.3588[.125]*F(   1,  27)=   2.3041[.141]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=  39.1441[.000]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.8147[.178]*F(   1,  28)=   1.8027[.190]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values



                      Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LDD
 30 observations used for estimation from 1982 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      391.2096           88.7547             4.4078[.000]
 LW                       -18.5175            4.2455            -4.3617[.000]
*******************************************************************************
 R-Squared                     .40456   R-Bar-Squared                   .38330
 S.E. of Regression            2.0392   F-stat.    F(  1,  28)  19.0242[.000]
 Mean of Dependent Variable    4.0945   S.D. of Dependent Variable      2.5967
 Residual Sum of Squares     116.4351   Equation Log-likelihood       -62.9102
 Akaike Info. Criterion      -64.9102   Schwarz Bayesian Criterion    -66.3114
 DW-statistic                  .40632
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  18.2333[.000]*F(   1,  27)=  41.8383[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  11.9926[.001]*F(   1,  27)=  17.9814[.000]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   2.1220[.346]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   3.5374[.060]*F(   1,  28)=   3.7430[.063]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

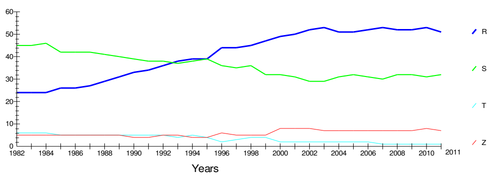
```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is BN
 13 observations used for estimation from 1999 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                     -138.4065            19.6910            -7.0289[.000]
 W                        .1099E-6            .1512E-7            7.2689[.000]
*******************************************************************************
 R-Squared                     .82769   R-Bar-Squared                   .81202
 S.E. of Regression            1.5368   F-stat.    F(  1,  11)   52.8373[.000]
 Mean of Dependent Variable    4.6923   S.D. of Dependent Variable      3.5446
 Residual Sum of Squares      25.9795   Equation Log-likelihood       -22.9465
 Akaike Info. Criterion      -24.9465   Schwarz Bayesian Criterion    -25.5115
 DW-statistic                  .78428
*******************************************************************************


                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=   2.5979[.107]*F(   1,  10)=   2.4975[.145]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=   8.0733[.004]*F(   1,  10)=  16.3868[.002]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   .60545[.739]*       Not applicable      *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   1.7062[.191]*F(   1,  11)=   1.6618[.224]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

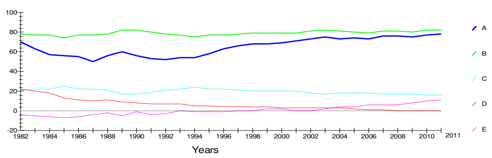


```
                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is BN
 13 observations used for estimation from 1999 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                      -.95849             5.4440            -.17606[.863]
 XY                        .58302             .55253             1.0552[.314]
*******************************************************************************
 R-Squared                    .091915   R-Bar-Squared                  .0093615
 S.E. of Regression            3.5280   F-stat.    F(  1,  11)    1.1134[.314]
 Mean of Dependent Variable    4.6923   S.D. of Dependent Variable       3.5446
 Residual Sum of Squares     136.9113   Equation Log-likelihood        -33.7497
 Akaike Info. Criterion      -35.7497   Schwarz Bayesian Criterion     -36.3146
 DW-statistic                  .22939
*******************************************************************************


                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=  10.3421[.001]*F(   1,  10)=  38.9100[.000]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=   .87644[.349]*F(   1,  10)=   .72292[.415]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   1.3453[.510]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   .91755[.338]*F(   1,  11)=   .83535[.380]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values


                        Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is BN
 13 observations used for estimation from 1999 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       5.1844             1.0554             4.9124[.000]
 D.D.                    -.0034544           .0029486           -1.1715[.266]
*******************************************************************************
 R-Squared                     .11093   R-Bar-Squared                   .030105
 S.E. of Regression            3.4908   F-stat.    F(  1,  11)    1.3725[.266]
 Mean of Dependent Variable    4.6923   S.D. of Dependent Variable       3.5446
 Residual Sum of Squares     134.0445   Equation Log-likelihood        -33.6121
 Akaike Info. Criterion      -35.6121   Schwarz Bayesian Criterion     -36.1771
 DW-statistic                  .36646
*******************************************************************************


                                Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   8.5403[.003]*F(   1,  10)=  19.1497[.001]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  .043094[.836]*F(   1,  10)=  .033259[.859]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .20129[.904]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   1.6659[.197]*F(   1,  11)=   1.6168[.230]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

```
                       Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is BN
 13 observations used for estimation from 1999 to 2011
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 CON                       -3.5042             .76031            -4.6089[.001]
 F                        .0043265           .3727E-3            11.6089[.000]
*******************************************************************************
 R-Squared                      .92454   R-Bar-Squared                  .91768
 S.E. of Regression             1.0170   F-stat.    F(  1,  11)  134.7668[.000]
 Mean of Dependent Variable     4.6923   S.D. of Dependent Variable     3.5446
 Residual Sum of Squares       11.3775   Equation Log-likelihood      -17.5797
 Akaike Info. Criterion       -19.5797   Schwarz Bayesian Criterion   -20.1446
 DW-statistic                   1.2540
*******************************************************************************
```

```
                               Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version         *
*******************************************************************************
*                     *                          *                           *
* A:Serial Correlation*CHSQ(   1)=   .91503[.339]*F(   1,  10)=    .75716[.405]*
*                     *                          *                           *
* B:Functional Form   *CHSQ(   1)=   1.1103[.292]*F(   1,  10)=    .93380[.357]*
*                     *                          *                           *
* C:Normality         *CHSQ(   2)=   .57217[.751]*       Not applicable        *
*                     *                          *                           *
* D:Heteroscedasticity*CHSQ(   1)=   3.3530[.067]*F(   1,  11)=   3.8233[.076]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```






```
 Sample period     :1982 to 2011
 Variable(s)       :      A          B          C          D          E          F
 Maximum           :    78.0000    82.0000    25.0000    22.0000    11.0000     3298.0
 Minimum           :    50.0000    74.0000    16.0000       0.00    -7.0000   299.0000
 Mean              :    64.9667    78.9667    19.7333     6.2667     .36667     1135.7
 Std. Deviation    :     9.0838     2.1732     2.4486     5.8659     4.8029   856.3866
 Skewness          :    -.12136    -.22313     .15687     1.2367     .52221     1.1238
 Kurtosis - 3      :    -1.5045    -.66622    -.95991     .85157    -.49703    .093288
 Coef of Variation:      .13982    .027521     .12408     .93605    13.0988     .75406

 Sample period     :1982 to 2011
 Variable(s)       :      G          O          P         AA       D.D.         XY
 Maximum           :     1994.0    9019518     6.0000    13.0000   954.0000    15.0000
```

Minimum :	606.0000	1580260	1.0000	2.0000	1.0470	3.0000
Mean :	1008.8	3935323	2.6333	8.6333	290.3597	9.8000
Std. Deviation :	394.1317	2101024	1.4967	2.6972	296.3864	2.7089
Skewness :	1.1186	1.0250	1.0245	-.54600	.81177	-.30362
Kurtosis - 3 :	.019547	-.13315	-.15898	.56188	-.40591	.39539
Coef of Variation:	.39071	.53389	.56838	.31241	1.0208	.27641

Estimated Correlation Matrix of Variables

****

	A	B	C	D	E	F
A	1.0000	.63051	-.70271	-.54213	.79461	.79815
B	.63051	1.0000	-.97375	-.51322	.61238	.60602
C	-.70271	-.97375	1.0000	.57891	-.72444	-.73416
D	-.54213	-.51322	.57891	1.0000	-.79303	-.73522
E	.79461	.61238	-.72444	-.79303	1.0000	.95336
F	.79815	.60602	-.73416	-.73522	.95336	1.0000
G	.78316	.60386	-.73560	-.73179	.95326	.99753
O	.77553	.59365	-.72590	-.76082	.95756	.99593
P	.71175	.64277	-.76151	-.72685	.93554	.97218
AA	-.5161E-3	-.40807	.29797	-.011043	.12254	.18813
D.D.	-.39617	-.41733	.49316	.099695	-.34164	-.50049
XY	-.13901	-.47562	.38679	.11198	-.018023	.050096

Estimated Correlation Matrix of Variables

****

	G	O	P	AA	D.D.	XY
A	.78316	.77553	.71175	-.5161E-3	-.39617	-.13901
B	.60386	.59365	.64277	-.40807	-.41733	-.47562
C	-.73560	-.72590	-.76151	.29797	.49316	.38679
D	-.73179	-.76082	-.72685	-.011043	.099695	.11198
E	.95326	.95756	.93554	.12254	-.34164	-.018023
F	.99753	.99593	.97218	.18813	-.50049	.050096
G	1.0000	.99810	.97913	.19295	-.50688	.055055
O	.99810	1.0000	.97928	.19559	-.47876	.057439

7. PROJECTS / CASES

So far demand related observations are just the first step in long line of processes that lead to project pre calculation, calculation, finding financing, and further implementation on the ground. For the Solar Australia to be implemented some basic points and inputs are to be noted: what part of the project is put in land for consumption, what is to export, how many sunny days are in area of solar plant, what types of modern technology is on disposal and what price, solar reflex ion and irradiation index etc. Technical solutions need to have sound and solid implementation; economical price competitiveness and environmental concerns should be clearly visible.

$\Delta GHG==a1+a3(X_{fuel\ mix2}-X_{fuelmix1})+e1$

$Power=Central\ grid+Isolated\ grid+Off\ grid+e$

$\min(P_{base\ case}-P_{renewable})+(CO_{2\ base\ case}-CO_{2\ renaw.\ mix})$

$\max(E_{efficacy\ proposed}-E_{efficacy\ based})+(Revenues_{proposed}-R_{based})$

Incorporating renewable need to follow carefully maximization of potential natural possibilities and resources where following is observed at least for a year after decision is made:

Photovoltaic*=b1+b2*Climate (number of sunny days, declination, sun reflection, extraterrestrial radiation, clearness index,)+b2Grid system (On /off grid)+b3*Photovoltaic system (batteries, inverters, controllers, structure)+b4*PV modules (single crystalline silicon, polycrystalline silicone, ribbon silicon, cadmium telluride, copper indium di selenide, amorphous silicon)+b5*Utilization+b6*Power production+e2*

Besides the plant itself additional calculation need to be established based on transport of high energy grid current and needed infrastructure. Some modern solution (space- land) is not to be excluded.

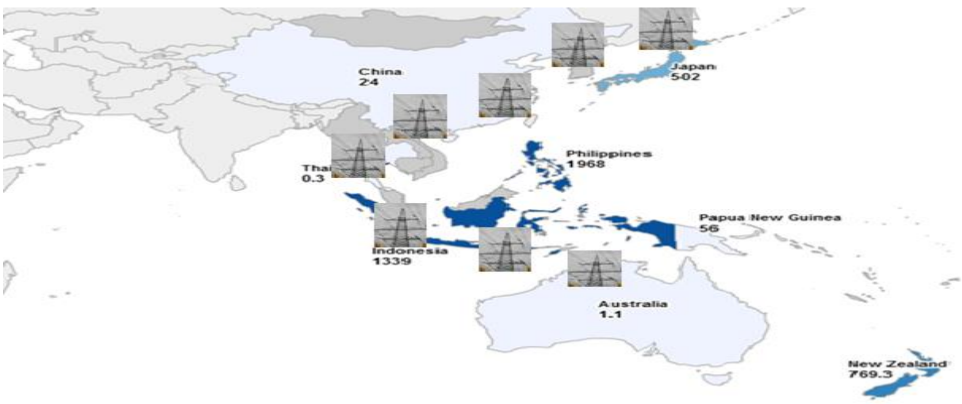
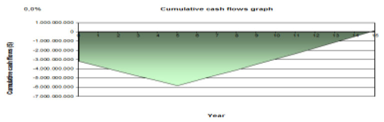
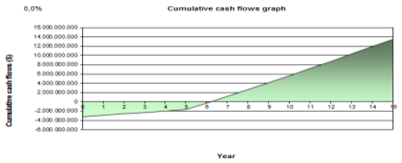
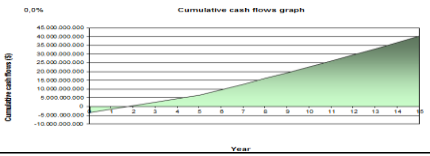
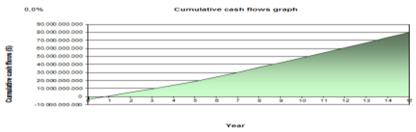


Table 6: PV basic current market available technology/prices

PV		
MW	30.000	
MWh	78.840.000	
KW	30.000.000	
KWh	78.840.000.000	
%	20-30	
COST INVESTMN MWH	100 €/MWh	7.933.900.000,00
OPER COST MWH	10 MWH FIX +VAR	1.068.400.000,00
tCO_2 ALL TYPES OF FUEL	0,19	14.664.240,00
CARS/TRUCKS NOT USED		2.734.063,00
BAESE CASE tCO_2	14.696.580,00	146.965.800,00
PROPOSE CASE tCO_2	1.469.658,00	14.696.580,00
REDUCED tCO2	13.226.922,00	132.269.220,00
GASOLINE NOT SPEND 1400 L/YEAR 1,5 €/L MAX		5.741.532.300,00

Source: Based on Ret Screen pre calculation

Table 7: Output Results Price - IRR

Price output MWh	Graph Result	Project Results
20 /MWh		Financial viability Pre-tax IRR - equity % 0,2% Pre-tax IRR - assets % -5,6% Simple payback yr 13,9 Equity payback yr 14,8
30 €/MWh		Financial viability Pre-tax IRR - equity % 20,9% Pre-tax IRR - assets % 8,1% Simple payback yr 5,9 Equity payback yr 6,2
50 €/MWh		Financial viability Pre-tax IRR - equity % 63,2% Pre-tax IRR - assets % 28,0% Simple payback yr 2,7 Equity payback yr 1,7
80 €/MWh		Financial viability Pre-tax IRR - equity % 135,8% Pre-tax IRR - assets % 56,5% Simple payback yr 1,5 Equity payback yr 0,7

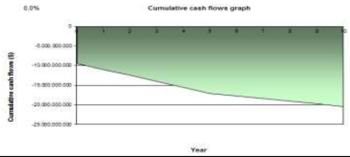
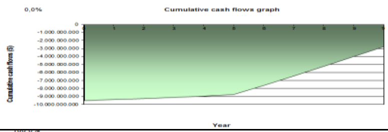
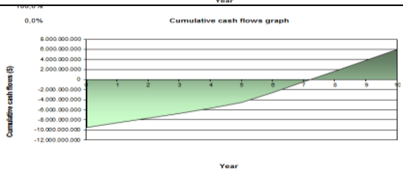
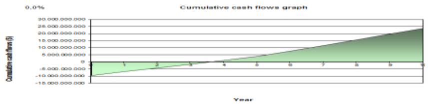
Source: Ret Screen Pre calculation, Graph

Table 8 : SOLAR THERMAL

SOLAR THERMAL		
MW	30.000	
MWH	78.840.000	
KW	30.000.000	
KWH	78.840.000.000	
%	30	
COST INVESTMENT MWh	172 €/MWh	13.560.480.000,00
OPER COST MWh	37 MWH	2.917.080.000,00
tCO_2 /MWh ALL TYPES OF FUEL	0,186	14.664.240,00
CARS/TRUCKS NOT USED		2.734.063,00
BAESE CASE tCO_2	14.696.580,00	146.965.800,00
PROPOSE CASE tCO_2	1.469.658,00	14.696.580,00
REDUCED tCO_2	13.226.922,00	132.269.220,00

Source:Based on Ret Screen pre calculation

Table 9:Output Price/IRR Solar Thermal

OUTPUT PRICE	GRAPH	RESULT
20 /MWh	negative	negative
30 €/MWh		Financial viability Pre-tax IRR - equity % negative Pre-tax IRR - assets % negative Simple payback yr -27,8 Equity payback yr > project
50 €/MWh		Financial viability Pre-tax IRR - equity % -4,4% Pre-tax IRR - assets % -8,7% Simple payback yr 12,4 Equity payback yr > project
60 /MWh		Financial viability Pre-tax IRR - equity % 8,3% Pre-tax IRR - assets % 2,2% Simple payback yr 7,2 Equity payback yr 7,2
80 €/MWh		Financial viability Pre-tax IRR - equity % 28,2% Pre-tax IRR - assets % 18,1% Simple payback yr 3,9 Equity payback yr 3,6

Source:Ret Screen Pre calculation, Graph

Similar comparison between coal infrastructure and Concentrated Solar Plant is made using Financial Tools and Discounted procedure of future Cash in/outflows.

Project starts from the same quantity of initial plant 30.000 MW, calculates average (based on international observed data) investment and operative costs, takes into account different efficiency possibilities, and starts with direct environmental and social costs. Environmental costs are calculated on 5€/ton CO_2 and this is only observed fact. This price can together with increased emission or harm done in environment rise, or fall as would be in case of wide spread cheap renewable technologies. Indirect costs are: melting of ice, reduce agricultural yield, damage to natural resources, long term or short term disappearance of species, damage to environmentally protected natural sited(coral reefs), floods and damage connected etc. Social benefits are those that land that was inherited from ancestors to indigenous are prices and put in calculation as repayment in form of dividend, or job, educational, health payment. On the Chinese side with rise of coal and CO_2 health problems can arise and some basic small amount of health contribution is added as costs. This is all just the first step, in a long line of procedures, measurement and payment and repayment that arose from current or added electricity infrastructure.

The results are shown as follows:

- Coal have better results in IRR, normal and dynamic payback time if no environmental or social considerations are calculated
- Solar plant –have advances if basic direct environmental and social considerations are put in calculation , can even compete with price if all indirect effect are recognized and put into observation.

Table 10: Basic End of Line observed Results from Coal /Concentrated Solar Plant

Type	Social Direct in country	CO_2 Revenue/Costs Direct	%	MWh	Investment	Operative costs	Price €/MWh	Return
PV concentrated	Not calculated	Not calculated	30	78840000	9.219.000.000	1.273.936.000	35	NORM 7,08m DYNAMIC 9,21 IRR 15,33
Coal integrated	Not calculated	Not calculated	85	223380000	17.810.184.000	2.561.364.000	25	Normal 6,92; Dynamic 8,91:IRR 15,8
PV concentrated	Not calculated	66.134.615	30	78840000	9.219.000.000	1.273.936.000	35	norm 6,83 dynam 8,75;irr 16,11
Coal integrated	Not calculated	-903.805.900	85	223380000	17.810.184.000	2.561.364.000	25	Normal 9,41; Dynamic 14,14:IRR 10,18
PV concentrated	187.810.000	66.134.615	30	78840000	9.219.000.000	1.273.936.000	35	Normal 6,21; Dynamic 7,71:IRR 18,32
Coal integrated	-372.300.000	-903.805.900	85	223380000	17.810.184.000	2.561.364.000	25	Normal 11,17; Dynamic 16,64:IRR 7,76

7.1. CONCENTRATED SOLAR without CO_2, without Social

Table 11: Cash Flow Concentrated Solar

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2027
TOTAL CASH INFLOW	9.219.000.000,00	2.759.754.666,67	. 2.759.400.000,00	2.759.400.000,00	2.759.400.000,00
Inflow funds	9.219.000.000,00	354.666,67			
Inflow operation		2.759.400.000,00	2.759.400.000,00	2.759.400.000,00	2.759.400.000,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.956.217.964,14	1.956.217.964,14	1.956.217.964,14	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00				
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20	20
Financial costs		150.000.000,00	133.131.541,68	115.757.029,60	
Loan repayment		562.281.944,14	579.150.402,46	596.524.914,53	
SURPLUS (DEFICIT)		803.536.702,53	803.182.035,86	803.182.035,86	1.515.463.980,00
CUMULATIVE CASH BALANCE		803.536.702,53	1.606.718.738,39	2.409.900.774,26	9.456.738.913,58

Table 12 : Discounted Cash Flow

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2029
TOTAL CASH INFLOW		2.759.400.000,00	2.759.400.000,00	2.759.400.000,00	2.759.400.000,00
Inflow operation		2.759.400.000,00	2.759.400.000,00	2.759.400.000,00	2.759.400.000,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.243.581.353,33	1.243.936.020,00	1.243.936.020,00	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00				
Increase in net working capital		-354.666,67			
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20	20
NET CASH FLOW	-9.219.000.000,00	1.515.818.646,67	1.515.463.980,00	1.515.463.980,00	1.515.463.980,00
CUMULATIVE NET CASH FLOW	-9.219.000.000,00	-7.703.181.353,33	-6.187.717.373,33	-4.672.253.393,33	8.966.922.426,67
Net present value	-9.219.000.000,00	1.416.652.940,81	1.323.664.931,44	1.237.070.029,38	672.884.130,92
Cumulative net present value	-9.219.000.000,00	-7.802.347.059,19	-6.478.682.127,75	-5.241.612.098,38	2.818.186.451,05
NET PRESENT VALUE	at 7,00%	6.108.094.648,43			
INTERNAL RATE OF RETURN	15,33%				
MODIFIED INTERNAL RATE OF RETURN	15,33%				
NORMAL PAYBACK	at 0,00%	7.08 years	2024		
DYNAMIC PAYBACK	at 7,00%	9.21 years	2026		

Table 13 : Profit / Loss CS

	Production 2018	Production 2019	Production 2025	Production 2028
Sales revenue	2.759.400.000,00	2.759.400.000,00	2.759.400.000,00	2.759.400.000,00
Less variable costs	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
VARIABLE MARGIN	1.515.464.000,00	1.515.464.000,00	1.515.464.000,00	1.515.464.000,00
in % of sales revenue	54,920055	54,920055	54,920055	54,920055
Less fixed costs	334.250.000,00	334.250.000,00	334.250.000,00	334.250.000,00
OPERATIONAL MARGIN	1.181.214.000,00	1.181.214.000,00	1.181.214.000,00	1.181.214.000,00
in % of sales revenue	42,806915	42,806915	42,806915	42,806915
Financial costs	150.000.000,00	133.131.541,68	20.746.076,04	
GROSS PROFIT FROM OPERATIONS	1.031.214.000,00	1.048.082.458,32	1.160.467.923,96	1.181.214.000,00
in % of sales revenue	37,37095	37,982259	42,055082	42,806915
GROSS PROFIT	1.031.214.000,00	1.048.082.458,32	1.160.467.923,96	1.181.214.000,00
TAXABLE PROFIT	1.031.214.000,00	1.048.082.458,32	1.160.467.923,96	1.181.214.000,00
Income (corporate) tax	20	20	20	20
NET PROFIT	1.031.213.980,00	1.048.082.438,32	1.160.467.903,96	1.181.213.980,00
in % of sales revenue	37,370949	37,982258	42,055081	42,806914
RETAINED PROFIT	1.031.213.980,00	1.048.082.438,32	1.160.467.903,96	1.181.213.980,00
RATIOS				
Net profit to equity (%)	24,442142	24,841963	27,505757	27,997487
Net profit to net worth (%)	19,641371	16,640729	8,947009	7,152761
Net profit+interest to investment (%)	12,813314	12,813314	12,813314	12,813314

Table 14: Balance Sheet CS

	2017	2018	2024	2027
TOTAL ASSETS	9.219.000.000,00	9.688.286.702,53	12.501.878.917,71	15.333.238.913,58
Total current assets		803.536.702,53	5.622.628.917,71	9.456.738.913,58
Total fixed assets, net of depreciation	9.219.000.000,00	8.884.750.000,00	6.879.250.000,00	5.876.500.000,00
TOTAL LIABILITIES	9.219.000.000,00	9.688.286.702,53	12.501.878.917,71	15.333.238.913,58
Total current liabilities		354.666,67	354.666,67	354.666,67
Total long-term debt	5.000.000.000,00	4.437.718.055,86	691.535.868,09	0,000005
Total equity capital	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00
Reserves, retained profit brought forward			6.450.662.300,40	9.932.670.266,91
Retained profit		1.031.213.980,00	1.140.326.082,56	1.181.213.980,00
Net worth	4.219.000.000,00	5.250.213.980,00	11.809.988.382,95	15.332.884.246,91
RATIOS				
Equity to total liabilities (%)	45,764183	43,547431	33,746927	27,515387
Net worth to total liabilities (%)	45,764183	54,191356	94,465708	99,997687
Long-term debt to net worth	1,185115	0,845245	0,058555	
Current assets to current liabilities		2.265,61	15.853,28	26.663,74

7.1.2. Concentrated Solar With Direct CO_2 costs

Table 15: Environmental CO_2 Assumptions

			MWh	g Co2/kwh	gCo2	tCo2	tCo2	this case	savings	t Co2 = 5€
1	*2*	*3*	*4*	*5*	*6*	*7 (5x4)*	*8(all types of fuel tco2/MWh = 0,186*4)*	*9*	*10*	*11*
PV concentrated	30000	30	78840000	46	3,6266E+12	3.626.640,00	14.696.580,00	1.469.658,00	13.226.922,	66.134.610,00
Coal integrated	30000	85	223380000	1001	2,236E+14	223.603.380,00	42.442.200,00	181.161.180,00		- 905.805.900,00

Table 16: Cash Flow CS with Direct Environmental – Direct CO_2

	Construction 2017	Production 2018	Production 2019	Production 2025	Production 2030
TOTAL CASH INFLOW	9.219.000.000,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00
Inflow funds	9.219.000.000,00				
Inflow operation		2.825.534.615,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.956.217.964,14	1.956.217.964,14	1.956.217.964,14	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00				
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20	20
Financial costs		150.000.000,00	133.131.541,68	20.746.076,04	
Loan repayment		562.281.944,14	579.150.402,46	691.535.868,09	
SURPLUS (DEFICIT)		869.316.650,86	869.316.650,86	869.316.650,86	1.581.598.595,00
CUMULATIVE CASH BALANCE		869.316.650,86	1.738.633.301,73	6.954.533.206,91	14.862.526.181,91
Local surplus (deficit)		869.316.650,86	869.316.650,86	869.316.650,86	1.581.598.595,00
Local cumulative cash balance		869.316.650,86	1.738.633.301,73	6.954.533.206,91	14.862.526.181,91
Net flow of funds	9.219.000.000,00	-712.281.944,14	-712.281.944,14	-712.281.944,14	

Table 17: Discounted CF , CS direct CO_2

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2028
TOTAL CASH INFLOW		2.825.534.615,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00
Inflow operation		2.825.534.615,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.243.936.020,00	1.243.936.020,00	1.243.936.020,00	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00				
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20	20
NET CASH FLOW	-9.219.000.000,00	1.581.598.595,00	1.581.598.595,00	1.581.598.595,00	1.581.598.595,00
CUMULATIVE NET CASH FLOW	-9.219.000.000,00	-7.637.401.405,00	-6.055.802.810,00	-4.474.204.215,00	8.178.584.545,00
Net present value	-9.219.000.000,00	1.478.129.528,04	1.381.429.465,46	1.291.055.575,19	751.406.099,26
Cumulative net present value	-9.219.000.000,00	-7.740.870.471,96	-6.359.441.006,51	-5.068.385.431,32	2.640.892.796,27
NET PRESENT VALUE	at 7,00%	6.710.240.117,96			
INTERNAL RATE OF RETURN	16,11%				
MODIFIED INTERNAL RATE OF RETURN	16,11%				
NORMAL PAYBACK	at 0,00%	6.83 years	2023		
DYNAMIC PAYBACK	at 7,00%	8.76 years	2025		

Table 18: Profit/loss ; CS direct CO_2

	Production 2018	Production 2019	Production 2025	Production 2030
Sales revenue	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00	2.825.534.615,00
Less variable costs	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
VARIABLE MARGIN	1.581.598.615,00	1.581.598.615,00	1.581.598.615,00	1.581.598.615,00
in % of sales revenue	55,975199	55,975199	55,975199	55,975199
Less fixed costs	334.250.000,00	334.250.000,00	334.250.000,00	334.250.000,00
OPERATIONAL MARGIN	1.247.348.615,00	1.247.348.615,00	1.247.348.615,00	1.247.348.615,00
in % of sales revenue	44,145579	44,145579	44,145579	44,145579
Financial costs	150.000.000,00	133.131.541,68	20.746.076,04	
GROSS PROFIT FROM OPERATIONS	1.097.348.615,00	1.114.217.073,32	1.226.602.538,96	1.247.348.615,00
in % of sales revenue	38,836849	39,43385	43,411344	44,145579
GROSS PROFIT	1.097.348.615,00	1.114.217.073,32	1.226.602.538,96	1.247.348.615,00
TAXABLE PROFIT	1.097.348.615,00	1.114.217.073,32	1.226.602.538,96	1.247.348.615,00
Income (corporate) tax	20	20	20	20
NET PROFIT	1.097.348.595,00	1.114.217.053,32	1.226.602.518,96	1.247.348.595,00
in % of sales revenue	38,836848	39,433849	43,411343	44,145578
RETAINED PROFIT	1.097.348.595,00	1.114.217.053,32	1.226.602.518,96	1.247.348.595,00
RATIOS				
Net profit to equity (%)	26,009685	26,409506	29,0733	29,56503
Net profit to net worth (%)	20,64102	17,32689	9,086259	6,320081
Net profit+interest to investment (%)	13,530194	13,530194	13,530194	13,530194

Table 19 : Balance Sheet, CS direct CO_2

	2017	2018	2025	2030
TOTAL ASSETS	9.219.000.000,00	9.754.066.650,86	13.499.533.206,91	19.736.276.181,91
Total current assets		869.316.650,86	6.954.533.206,91	14.862.526.181,91
Total fixed assets, net of depreciation	9.219.000.000,00	8.884.750.000,00	6.545.000.000,00	4.873.750.000,00
TOTAL LIABILITIES	9.219.000.000,00	9.754.066.650,86	13.499.533.206,91	19.736.276.181,91
Total long-term debt	5.000.000.000,00	4.437.718.055,86	0,000005	0,000005
Total equity capital	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00
Reserves, retained profit brought forward			8.053.930.687,95	14.269.927.586,91
Retained profit		1.097.348.595,00	1.226.602.518,96	1.247.348.595,00
Net worth	4.219.000.000,00	5.316.348.595,00	13.499.533.206,91	19.736.276.181,91

7.1.3. Concentrated Solar With Direct CO_2 costs + Social Direct for Indigenous Community, Land (repatriation),compensation

Table 20: Social Direct Possible reasoning

Social costs:land rights, birth rights, price	
Australia land km^2	7692024 km^2
Australia land m^2	7,69202E+12
Total Australia Price 10 Euro $/m^2$	76.920.240.000.000
Total Australia Price 20 Euro $/m^2$	153.840.480.000.000
Social cost minimum 50 god 699000 persons	***375.620.000,00***
Social cost:-(health	190.000.000,00
education	85.620.000,00
job ,other	100.000.000,00
in calculation 100 god total/per year	**187.810.000,00**

Table 21: Cash Flow/ CS +CO_2+Social compensation

	Construction 2017	Production 2018	Production 2024	Production 2031
TOTAL CASH INFLOW	9.219.000.000,00	3.013.344.615,00	3.013.344.615,00	3.013.344.615,00
Inflow funds	9.219.000.000,00			
Inflow operation		3.013.344.615,00	3.013.344.615,00	3.013.344.615,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.956.217.964,14	1.956.217.964,14	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00			
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20
Financial costs		150.000.000,00	40.887.897,44	
Loan repayment		562.281.944,14	671.394.046,69	
SURPLUS (DEFICIT)		1.057.126.650,86	1.057.126.650,86	1.769.408.595,00
CUMULATIVE CASH BALANCE		1.057.126.650,86	7.399.886.556,05	19.073.464.776,91
Local surplus (deficit)		1.057.126.650,86	1.057.126.650,86	1.769.408.595,00
Local cumulative cash balance		1.057.126.650,86	7.399.886.556,05	19.073.464.776,91
Net flow of funds	9.219.000.000,00	-712.281.944,14	-712.281.944,14	

Table 22: Discounted Cash Flow/ CS +CO_2+Social compensation

	Construction 2017	Production 2018	Production 2019	Production 2029
TOTAL CASH INFLOW		3.013.344.615,00	3.013.344.615,00	3.013.344.615,00
Inflow operation		3.013.344.615,00	3.013.344.615,00	3.013.344.615,00
TOTAL CASH OUTFLOW	9.219.000.000,00	1.243.936.020,00	1.243.936.020,00	1.243.936.020,00
Increase in fixed assets	9.219.000.000,00			
Operating costs		1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
Income (corporate) tax		20	20	20
NET CASH FLOW	-9.219.000.000,00	1.769.408.595,00	1.769.408.595,00	1.769.408.595,00
CUMULATIVE NET CASH FLOW	-9.219.000.000,00	-7.449.591.405,00	-5.680.182.810,00	12.013.903.140,00
Net present value	-9.219.000.000,00	1.653.652.892,52	1.545.469.993,01	785.638.576,96
Cumulative net present value	-9.219.000.000,00	-7.565.347.107,48	-6.019.877.114,46	4.834.857.400,52
NET PRESENT VALUE	at 7,00%	8.420.797.447,26		
INTERNAL RATE OF RETURN	18,32%			
MODIFIED INTERNAL RATE OF RETURN	18,32%			
NORMAL PAYBACK	at 0,00%	6.21 years	2023	
DYNAMIC PAYBACK	at 7,00%	7.71 years	2024	

Table 23: Profit/Loss - CS +CO_2+Social compensation

	Production 2018	Production 2019	Production 2025	Production 2030
Sales revenue	3.013.344.615,00	3.013.344.615,00	3.013.344.615,00	3.013.344.615,00
Less variable costs	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00	1.243.936.000,00
VARIABLE MARGIN	1.769.408.615,00	1.769.408.615,00	1.769.408.615,00	1.769.408.615,00
in % of sales revenue	58,719093	58,719093	58,719093	58,719093
Less fixed costs	334.250.000,00	334.250.000,00	334.250.000,00	334.250.000,00
OPERATIONAL MARGIN	1.435.158.615,00	1.435.158.615,00	1.435.158.615,00	1.435.158.615,00
in % of sales revenue	47,626767	47,626767	47,626767	47,626767
Financial costs	150.000.000,00	133.131.541,68	20.746.076,04	
GROSS PROFIT FROM OPERATIONS	1.285.158.615,00	1.302.027.073,32	1.414.412.538,96	1.435.158.615,00
in % of sales revenue	42,648909	43,208701	46,938293	47,626767
GROSS PROFIT	1.285.158.615,00	1.302.027.073,32	1.414.412.538,96	1.435.158.615,00
TAXABLE PROFIT	1.285.158.615,00	1.302.027.073,32	1.414.412.538,96	1.435.158.615,00
Income (corporate) tax	20	20	20	20
NET PROFIT	1.285.158.595,00	1.302.027.053,32	1.414.412.518,96	1.435.158.595,00
in % of sales revenue	42,648909	43,208701	46,938293	47,626766
RETAINED PROFIT	1.285.158.595,00	1.302.027.053,32	1.414.412.518,96	1.435.158.595,00
RATIOS				
Net profit to equity (%)	30,461213	30,861035	33,524829	34,016558
Net profit to net worth (%)	23,348866	19,130055	9,428151	6,471148
Net profit+interest to investment (%)	15,5674	15,5674	15,5674	15,5674

Table 24: Balance Sheet / CS +CO_2+Social compensation

	2017	2018	2019	2024	2030
TOTAL ASSETS	9.219.000.000,00	9.941.876.650,86	10.664.753.301,73	14.279.136.556,05	22.177.806.181,91
Total current assets		1.057.126.650,86	2.114.253.301,73	7.399.886.556,05	17.304.056.181,91
Total fixed assets, net of depreciation	9.219.000.000,00	8.884.750.000,00	8.550.500.000,00	6.879.250.000,00	4.873.750.000,00
TOTAL LIABILITIES	9.219.000.000,00	9.941.876.650,86	10.664.753.301,73	14.279.136.556,05	22.177.806.181,91
Total long-term debt	5.000.000.000,00	4.437.718.055,86	3.858.567.653,40	691.535.868,09	0,000005
Total equity capital	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00	4.219.000.000,00
Reserves, retained profit brought forward			1.285.158.595,00	7.974.329.990,40	16.523.647.586,91
Retained profit		1.285.158.595,00	1.302.027.053,32	1.394.270.697,56	1.435.158.595,00
Net worth	4.219.000.000,00	5.504.158.595,00	6.806.185.648,32	13.587.600.687,95	22.177.806.181,91

7.2. COAL INTEGRATED

The similar type of reasoning as the first steps in project calculations are done in China. It is important to establish a relation between existing and potential new environmentally friendly technology possibilities.

7.2.1. INTEGRATED COAL ,WITHOUT ENVIRONMENTAL, SOCIAL DIRECT CONSIDERATION

Table 25: Cash Flow/ Coal Integrated

	Production 2018	Production 2019	Production 2020	Production 2021	Production 2023
TOTAL CASH INFLOW	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00
Inflow operation	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00
TOTAL CASH OUTFLOW	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05
Operating costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax	20	20	20	20	20
Financial costs	300.000.000,00	273.830.848,02	246.876.621,48	219.113.768,14	161.064.418,10
Loan repayment	872.305.066,05	898.474.218,03	925.428.444,57	953.191.297,91	1.011.240.647,95
SURPLUS (DEFICIT)	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95
CUMULATIVE CASH BALANCE	1.586.214.913,95	3.472.429.827,90	5.358.644.741,85	7.244.859.655,79	11.017.289.483,69
Local surplus (deficit)	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95	1.886.214.913,95
Local cumulative cash balance	1.586.214.913,95	3.472.429.827,90	5.358.644.741,85	7.244.859.655,79	11.017.289.483,69
Net flow of funds	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05

Table 26: Discounted Cash Flow /Coal Integrated

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2030
TOTAL CASH INFLOW		5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00
Inflow operation		5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00
TOTAL CASH OUTFLOW	18.110.184.000,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00
Increase in fixed assets	18.110.184.000,00				
Operating costs		2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax		20	20	20	20
NET CASH FLOW	-18.110.184.000,00	3.058.519.980,00	3.058.519.980,00	3.058.519.980,00	3.058.519.980,00
CUMULATIVE NET CASH FLOW	-18.110.184.000,00	-15.051.664.020,00	-11.993.144.040,00	-8.934.624.060,00	21.650.575.740,00
Net present value	-18.110.184.000,00	2.858.429.887,85	2.671.429.801,73	2.496.663.366,10	1.269.177.054,86
Cumulative net present value	-18.110.184.000,00	-15.251.754.112,15	-12.580.324.310,42	-10.083.660.944,32	7.451.857.787,76
NET PRESENT VALUE	at 7,00%	12.692.230.594,39			
INTERNAL RATE OF RETURN	15,80%				
MODIFIED INTERNAL RATE OF RETURN	15,80%				
NORMAL PAYBACK	at 0,00%	6.92 years	2023		
DYNAMIC PAYBACK	at 7,00%	8.91 years	2025		

Table 27: Profit/Low Coal

	Production 2018	Production 2019	Production 2020	Production 2027
Sales revenue	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00	5.584.500.000,00
Less variable costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
VARIABLE MARGIN	3.058.520.000,00	3.058.520.000,00	3.058.520.000,00	3.058.520.000,00
in % of sales revenue	54,768019	54,768019	54,768019	54,768019
Less fixed costs	665.531.100,00	665.531.100,00	665.531.100,00	665.531.100,00
OPERATIONAL MARGIN	2.392.988.900,00	2.392.988.900,00	2.392.988.900,00	2.392.988.900,00
in % of sales revenue	42,850549	42,850549	42,850549	42,850549
Financial costs	300.000.000,00	273.830.848,02	246.876.621,48	34.144.807,75
GROSS PROFIT FROM OPERATIONS	2.092.988.900,00	2.119.158.051,98	2.146.112.278,52	2.358.844.092,25
in % of sales revenue	37,478537	37,94714	38,429802	42,239128
GROSS PROFIT	2.092.988.900,00	2.119.158.051,98	2.146.112.278,52	2.358.844.092,25
TAXABLE PROFIT	2.092.988.900,00	2.119.158.051,98	2.146.112.278,52	2.358.844.092,25
Income (corporate) tax	20	20	20	20
NET PROFIT	2.092.988.880,00	2.119.158.031,98	2.146.112.258,52	2.358.844.072,25
in % of sales revenue	37,478537	37,94714	38,429801	42,239127
RETAINED PROFIT	2.092.988.880,00	2.119.158.031,98	2.146.112.258,52	2.358.844.072,25
RATIOS				
Net profit to equity (%)	*26,798202*	*27,133266*	*27,478383*	*30,202157*
Net profit to net worth (%)	*20,513118*	*17,197704*	*14,833056*	*7,780593*
Net profit+interest to investment (%)	*13,213498*	*13,213498*	*13,213498*	*13,213498*

7.2.2. COAL INTEGRATED WITH CO_2

Table 28: Environmental calculation-only direct costs

			MWh	g Co2/kwh	gCo2	tCo2	tCo2	this case	savings	t Co2 = 5€
1	*2*	*3*	*4*	*5*	*6*	*7 (5x4)*	*8(all types of fuel tco2/MWh = 0,186*4)*	*9*	*10*	*11*
PV concentrated	30000	30	78840000	46	3,6266E+12	3.626.640,00	14.696.580,00	1.469.658,00	13.226.922,	66.134.610,00
Coal integrated	30000	85	223380000	1001	2,236E+14	223.603.380,00	42.442.200,00	181.161.180,00		- 905.805.900,00

Table 29: Cash Flow, Coal Integrated + CO_2

	Production 2018	Production 2019	Production 2020	Production 2021	Production 2026
TOTAL CASH INFLOW	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00
Inflow operation	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00
TOTAL CASH OUTFLOW	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05
Operating costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax	20	20	20	20	20
Financial costs	300.000.000,00	273.830.848,02	246.876.621,48	219.113.768,14	67.295.106,53
Loan repayment	872.305.066,05	898.474.218,03	925.428.444,57	953.191.297,91	1.105.009.959,52
SURPLUS (DEFICIT)	980.409.013,95	980.409.013,95	980.409.013,95	980.409.013,95	980.409.013,95
CUMULATIVE CASH BALANCE	680.409.013,95	1.660.818.027,90	2.641.227.041,85	3.621.636.055,79	8.523.681.125,54
Local surplus (deficit)	980.409.013,95	980.409.013,95	980.409.013,95	980.409.013,95	980.409.013,95
Local cumulative cash balance	680.409.013,95	1.660.818.027,90	2.641.227.041,85	3.621.636.055,79	8.523.681.125,54
Net flow of funds	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05	-1.172.305.066,05

Table 30: Discounted Cash Flow, Coal Integrated + CO_2

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2021	Production 2022
TOTAL CASH INFLOW		4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00
Inflow operation		4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00
TOTAL CASH OUTFLOW	18.110.184.000,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00
Increase in fixed assets	18.110.184.000,00					
Operating costs		2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax		20	20	20	20	20
NET CASH FLOW	-18.110.184.000,00	2.152.714.080,00	2.152.714.080,00	2.152.714.080,00	2.152.714.080,00	2.152.714.080,00
CUMULATIVE NET CASH FLOW	-18.110.184.000,00	-15.957.469.920,00	- 13.804.755.840,00	- 11.652.041.760,00	-9.499.327.680,00	-7.346.613.600,00
Net present value	-18.110.184.000,00	2.011.882.317,76	1.880.263.848,37	1.757.255.933,06	1.642.295.264,54	1.534.855.387,42
Cumulative net present value	-18.110.184.000,00	-16.098.301.682,24	- 14.218.037.833,87	- 12.460.781.900,81	-10.818.486.636,28	-9.283.631.248,86
NET PRESENT VALUE	at 7,00%	4.442.228.351,87				
INTERNAL RATE OF RETURN	10,18%					
MODIFIED INTERNAL RATE OF RETURN	10,18%					
NORMAL PAYBACK	at 0,00%	9.41 years	2026			
DYNAMIC PAYBACK	at 7,00%	14.14 years	2031			

Table 31: Profit/Loss- Coal Integrated + CO_2

	Production 2018	Production 2019	Production 2027	Production 2032
Sales revenue	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00	4.678.694.100,00
Less variable costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
VARIABLE MARGIN	2.152.714.100,00	2.152.714.100,00	2.152.714.100,00	2.152.714.100,00
in % of sales revenue	46,011003	46,011003	46,011003	46,011003
Less fixed costs	665.531.100,00	665.531.100,00	665.531.100,00	665.531.100,00
OPERATIONAL MARGIN	1.487.183.000,00	1.487.183.000,00	1.487.183.000,00	1.487.183.000,00
in % of sales revenue	31,786284	31,786284	31,786284	31,786284
Financial costs	300.000.000,00	273.830.848,02	34.144.807,75	0
GROSS PROFIT FROM OPERATIONS	1.187.183.000,00	1.213.352.151,98	1.453.038.192,25	1.487.183.000,00
in % of sales revenue	25,374239	25,933564	31,056491	31,786284
GROSS PROFIT	1.187.183.000,00	1.213.352.151,98	1.453.038.192,25	1.487.183.000,00
TAXABLE PROFIT	1.187.183.000,00	1.213.352.151,98	1.453.038.192,25	1.487.183.000,00
Income (corporate) tax	20	20	20	20
NET PROFIT	1.187.182.980,00	1.213.352.131,98	1.453.038.172,25	1.487.182.980,00
in % of sales revenue	25,374238	25,933564	31,05649	31,786284
RETAINED PROFIT	1.187.182.980,00	1.213.352.131,98	1.453.038.172,25	1.487.182.980,00
RATIOS				
Net profit to equity (%)	15,200448	15,535513	18,604404	19,041587
Net profit to net worth (%)	12,769024	11,54395	6,834944	5,182747
Net profit+interest to investment (%)	8,21186	8,21186	8,21186	8,21186

Table 32: Balance Sheet/ Coal Integrated + CO_2

	2017	2018	2019	2020
TOTAL ASSETS	18.110.184.000,00	18.425.061.913,95	18.739.939.827,90	19.054.817.741,85
Total current assets		980.409.013,95	1.960.818.027,90	2.941.227.041,85
Total fixed assets, net of depreciation	18.110.184.000,00	17.444.652.900,00	16.779.121.800,00	16.113.590.700,00
TOTAL LIABILITIES	18.110.184.000,00	18.425.061.913,95	18.739.939.827,90	19.054.817.741,85
Total long-term debt	10.000.000.000,00	9.127.694.933,95	8.229.220.715,92	7.303.792.271,34
Total equity capital	8.110.184.000,00	8.110.184.000,00	8.110.184.000,00	8.110.184.000,00
Reserves, retained profit brought forward			1.187.182.980,00	2.400.535.111,98
Retained profit		1.187.182.980,00	1.213.352.131,98	1.240.306.358,52
Net worth	8.110.184.000,00	9.297.366.980,00	10.510.719.111,98	11.751.025.470,50
RATIOS				
Equity to total liabilities (%)	44,782449	44,017133	43,277535	42,56238
Net worth to total liabilities (%)	44,782449	50,460438	56,087262	61,669577
Long-term debt to net worth	1,233018	0,981751	0,782936	0,621545

7.2.3. INTEGRATED COAL - COAL CO_2 AND SOCIAL (China health)

Table 33: Social Costs, Direct Implication only in China

China : social consideration	
kWh	223.380.000.000
Person/kwh	6000
Number of persons	37.230.000
Health care 10 €/person minimum direct costs	372.300.000
Indirect costs:	Not monetized –something to do All other social costs in China over this small amount, in Australia project that was not undertaken due to low demand

Table 34 : Cash Flow/ Integrated Coal CO_2+Social in China

	Production 2018	Production 2019	Production 2020	Production 2027
TOTAL CASH INFLOW	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00
Inflow operation	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00
TOTAL CASH OUTFLOW	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05	3.698.285.086,05
Operating costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax	20	20	20	20
Financial costs	300.000.000,00	273.830.848,02	246.876.621,48	34.144.807,75
Loan repayment	872.305.066,05	898.474.218,03	925.428.444,57	1.138.160.258,30
SURPLUS (DEFICIT)	608.109.013,95	608.109.013,95	608.109.013,95	608.109.013,95
CUMULATIVE CASH BALANCE	308.109.013,95	916.218.027,90	1.524.327.041,85	5.781.090.139,48

Table 35: Discounted Cash Flow/ Integrated Coal CO_2+Social in China

	Construction 2017	Production 2018	Production 2019	Production 2020	Production 2027
TOTAL CASH INFLOW		4.306.394.100,00	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00
Inflow operation		4.306.394.100,00	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00
TOTAL CASH OUTFLOW	18.110.184.000,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00	2.525.980.020,00
Increase in fixed assets	18.110.184.000,00				
Increase in net working capital					
Operating costs		2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
Income (corporate) tax		20	20	20	20
NET CASH FLOW	-18.110.184.000,00	1.780.414.080,00	1.780.414.080,00	1.780.414.080,00	1.780.414.080,00
CUMULATIVE NET CASH FLOW	-18.110.184.000,00	-16.329.769.920,00	-14.549.355.840,00	-12.768.941.760,00	-306.043.200,00
Net present value	-18.110.184.000,00	1.663.938.392,52	1.555.082.609,83	1.453.348.233,49	905.072.237,27
Cumulative net present value	-18.110.184.000,00	-16.446.245.607,48	-14.891.162.997,64	-13.437.814.764,15	-5.605.300.532,50
NET PRESENT VALUE	at 7,00%	1.051.351.967,77			
INTERNAL RATE OF RETURN	7,76%				
MODIFIED INTERNAL RATE OF RETURN	7,76%				
NORMAL PAYBACK	at 0,00%	11.17 years	2028		
DYNAMIC PAYBACK	at 7,00%	16.64 years	2033		

Table 36: Profit/Loss/ Integrated Coal CO_2+Social in China

	Production 2018	Production 2019	Production 2020	Production 2025
Sales revenue	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00	4.306.394.100,00
Less variable costs	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00	2.525.980.000,00
VARIABLE MARGIN	1.780.414.100,00	1.780.414.100,00	1.780.414.100,00	1.780.414.100,00
in % of sales revenue	41,343501	41,343501	41,343501	41,343501
Less fixed costs	665.531.100,00	665.531.100,00	665.531.100,00	665.531.100,00
OPERATIONAL MARGIN	1.114.883.000,00	1.114.883.000,00	1.114.883.000,00	1.114.883.000,00
in % of sales revenue	25,889015	25,889015	25,889015	25,889015
Financial costs	300.000.000,00	273.830.848,02	246.876.621,48	99.479.862,64
GROSS PROFIT FROM	814.883.000,00	841.052.151,98	868.006.378,52	1.015.403.137,36

OPERATIONS				
in % of sales revenue	18,922629	19,530311	20,156223	23,578965
GROSS PROFIT	814.883.000,00	841.052.151,98	868.006.378,52	1.015.403.137,36
TAXABLE PROFIT	814.883.000,00	841.052.151,98	868.006.378,52	1.015.403.137,36
Income (corporate) tax	20	20	20	20
NET PROFIT	814.882.980,00	841.052.131,98	868.006.358,52	1.015.403.117,36
in % of sales revenue	18,922629	19,53031	20,156222	23,578964
RETAINED PROFIT	814.882.980,00	841.052.131,98	868.006.358,52	1.015.403.117,36
RATIOS				
Net profit to equity (%)	10,433595	10,76866	11,113776	13,001014
Net profit to net worth (%)	9,130273	8,611938	8,162461	6,590259
Net profit+interest to investment (%)	6,156111	6,156111	6,156111	6,156111

Table 37: Balance Sheet/ Integrated Coal CO_2+Social in China

	2017	2018	2030	2031
TOTAL ASSETS	18.110.184.000,00	18.052.761.913,95	20.880.612.079,48	21.995.495.059,48
Total current assets		608.109.013,95	11.422.332.379,48	13.202.746.459,48
Total fixed assets, net of depreciation	18.110.184.000,00	17.444.652.900,00	9.458.279.700,00	8.792.748.600,00
TOTAL LIABILITIES	18.110.184.000,00	18.052.761.913,95	20.880.612.079,48	21.995.495.059,48
Total long-term debt	10.000.000.000,00	9.127.694.933,95	0,000007	0,000007
Total equity capital	8.110.184.000,00	8.110.184.000,00	8.110.184.000,00	8.110.184.000,00
Reserves, retained profit brought forward			11.655.545.099,48	12.770.428.079,48
Retained profit		814.882.980,00	1.114.882.980,00	1.114.882.980,00
Net worth	8.110.184.000,00	8.925.066.980,00	20.880.612.079,48	21.995.495.059,48

8. CONCLUSION

Energy is by far and large recognized as important input to industry, household, commerce and transport. Current level of energy consumption in the world are around 12.500 mil ton oil equivalent out of which Asia and Pacific Region uses around 5.000 mil ton oil equiv. , Europe 2.930 mil ton oil eqiv, North America 2.730 mil ton oil eqiv.

This data alone points us toward Asia as important energy user and consumer to look a little big deeper and note that China alone needs around 2.735 mil ton oil eqiv, Japan 478 mil ton oil eqiv, Republic Korea 271 mil ton oil eqiv., Australia 127 mil ton oil eqiv. China as the largest consumer experienced almost exponential growth in energy usage after 2002 together with strong GDP growth. This demand was supported with increased energy import. Based on forecast of some energy subjects (BP data base) it is expected in period 2015-2035 further rise in energy consumption especially for the region Asia Pacific. For the oil it is expected that consumption increase in the world in period 2015-2035 from 4.000-5.000 mil ton oil eqiv), and in Asia Pacific 1.460-1.995 mil ton oil eqiv,; gas consumption on the world scale can rise from 3.000-4.500 mil ton oil eqiv., Asia Pacific 683-1.217 mil ton oil eqiv., coal consumption 4.000-4.200 (Asia Pacific 2.830-3.734 mil ton oil equv.) Electricity consumption in the region is around 4.108 mil ton oil eqiv and further increase in production and demand is expected as well.

Although Asia Pacific have been seen large and significant rise in GDP, energy need it was not accompanied with rise in renewable production at the rate that was expected.

This paper provide insight into two projects: Solar Concentrated and Coal Integrated with and without direct environmental and social costs and benefits. Although coal is superior as a means of input while having a cheaper technological base and better efficiency it loses a battle with concentrated solar if full environmental and social costs are put into observation. (health impact, flooding, indigenous rights, damage to agriculture, damage to commerce, disappearance of some flora , fauna, protection of natural resources –coral reef.. etc.).

Customers –faced with choice –are likely to accept more cleaner technologies if at the same time have more flexible contract opportunity, are faced with stable and rising GDP, can be part of ownership structure, can change price or influence decision although on a small scale.

History of Earth has shown many changes although in the long run. The majority of changes were irreversible for certain regions, species so constant alert on environmental and social topics are the way to go with large and significant projects.

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