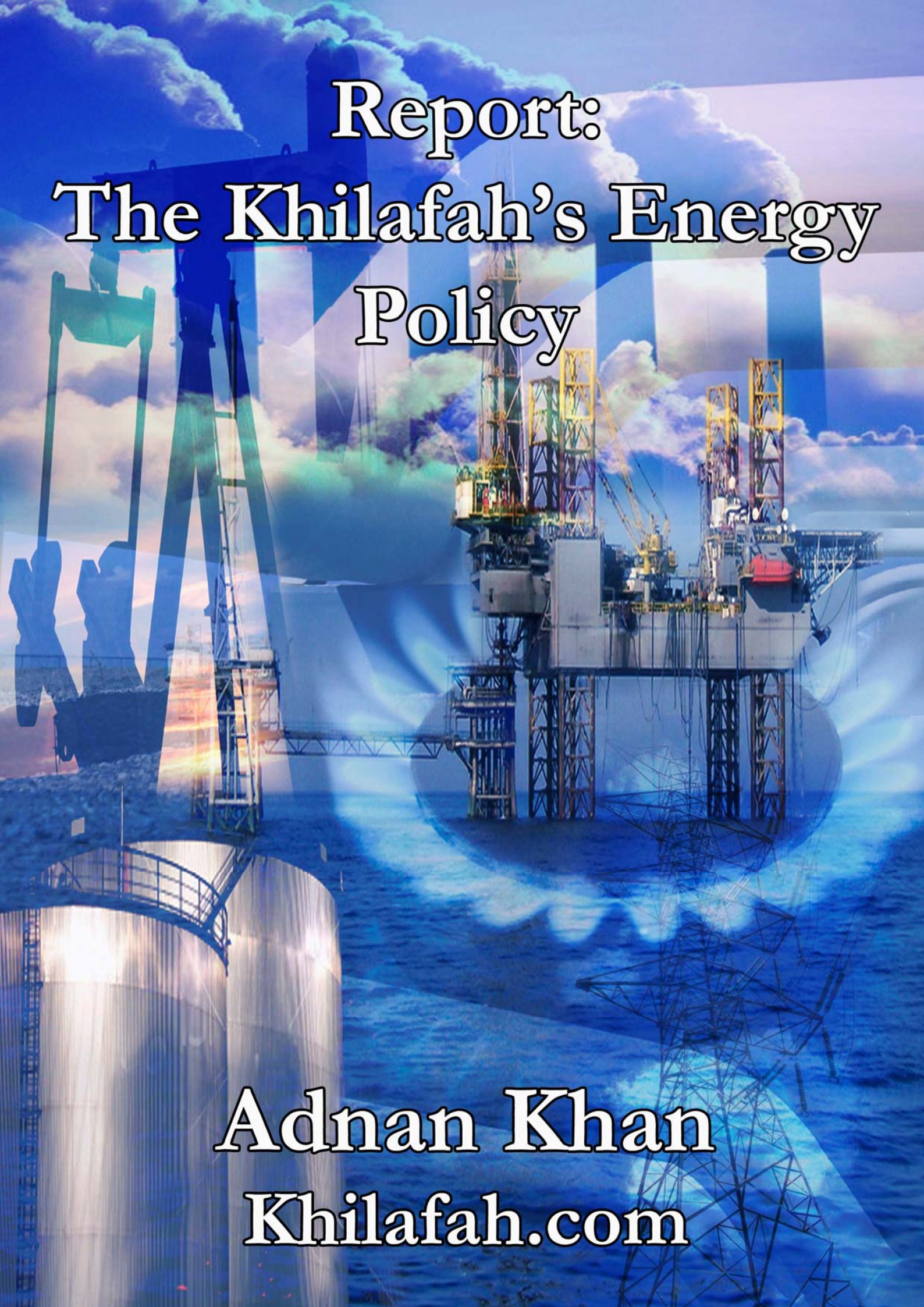

Report: The Khilafah's Energy Policy

Adnan Khan
Khilafah.com

أَلَمْ تَرَوْا أَنَّ اللَّهَ سَخَّرَ لَكُم مَّا فِي السَّمَاوَاتِ وَمَا فِي الْأَرْضِ وَأَسْبَغَ عَلَيْكُمْ نِعَمَهُ ظَاهِرَةً وَبَاطِنَةً وَمِنَ النَّاسِ مَن يُجَادِلُ فِي اللَّهِ بِغَيْرِ عِلْمٍ وَلَا هُدًى وَلَا كِتَابٍ مُّنِيرٍ

"Do you not see how Allah has made serviceable to you whatsoever is in the skies and whatsoever is in the earth, and he has loaded you with his favours, both the open and the hidden." (Luqman, 31:20)

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Introduction

Energy is of critical importance in the 21st century, without it, today's transportation, industry and agriculture could not exist. Without the harnessing of energy the industrial revolution may not have taken place. Due to this, energy policies around the world are dominated by energy efficiency, energy dependence and energy security. Increased awareness of the effects of global warming has also led to international debate and action for the reduction of greenhouse gas emissions.

Oil as an energy source revolutionised industry in the early 1900's. Not only does it provide the petrol and diesel we use for transportation. But its scope widens when looked within the context of a modern industrialised society. Oil as a source of energy is easy to extract, transform, transport and distribute. Not only is it a highly concentrated, mobile energy source, but it is used to produce an enormous range of materials used in the making of many everyday goods. The artificial synthesis of by-products from oil led to the growth in the petrochemicals industry. One of the by-products is plastics and lubricants. But equally important is the manufacturing of solvents (alcohols) through oil, without which there would be no chemicals industry. Nor would the existing agricultural setups present in much of the world exist without the free flowing hydrocarbons, since farming equipment consume oil. Also fertilizer would not exist were it not for the hydrogen that is cracked from natural gas. This is the method of extracting fertilizer or Ammonia to form fertilizer which is used in hundreds and thousands of farms across the globe - a billion dollar industry. In very broad terms the development of the industrial states has been almost entirely due to the ability of (Western) societies to harness energy in order to develop and operate the technology that enables the current cultures and lifestyles.

Energy policy is the manner in which governments decide to address issues of energy development including energy production, distribution and consumption. The Khilafah will on its emergence face similar challenges as the Western states did during the industrial revolution in harnessing its energy needs to ensure sufficient sources of energy are available for industry and domestic electricity. For these reasons the Khilafah will need to adopt an energy policy to ensure all energy sources, infrastructure and assets follow the same direction. Such a policy will need to be built based on the energy realities of the Muslim world. Such realities are constantly changing therefore what is being presented are the author's views on energy policy based upon the current energy circumstances of the world.

19th August 2009
Adnan Khan

Energy: Past and Present

Prior to the Industrial revolution industry was limited to manual labour in factories. The then British Empire began using steam to drive pistons and then eventually to generate rotary (motion) to move machines, which sparked the industrial revolution as mechanical factories started to gradually replace the manual ones and where hundreds of men and women would live out their years sewing by hand or producing cotton by hand or simply braking down raw materials such as wood by hand. Production increased twenty fold and the mechanised factory became one of the pillars of economic life. As industry required power to run its machinery coal was the main source of power. Even before the 18th century, some British industries had begun using the country's plentiful coal supply instead of wood, which was much scarcer. Coal was adopted by the brewing, metalworking, and glass and ceramics industries, demonstrating its potential for use in many industrial processes.

A major breakthrough in the use of coal occurred in 1709 at Coalbrookedale in the valley of the Severn River England. The English industrialist Abraham Darby successfully used coke - a high-carbon, converted form of coal—to produce iron from iron ore. Using coke eliminated the need for charcoal, a more expensive, less efficient fuel. Metal makers thereafter discovered ways of using coal and coke to speed the production of raw iron, bar iron, and other metals – all critical for industrial use.

It was British naval power that brought oil on to the international scene. In 1882, oil had little commercial interest. The development of the internal combustion engine had not yet revolutionised world industry. With Germany on the verge of shifting the global balance of power by developing its own oil propelled ships Britain began converting its naval fleet from bulky coal-fired propulsion to the new oil fuel.

WW1 brought to the international scene the importance of oil; it came to be seen globally as the key to military success. In an age of air warfare, mobile tank warfare, and naval warfare bulky coal-fired propulsion gave way to oil. Oil required only 30 minutes for ships to reach top speed compared to 4-9 hours when coal was used, battleships powered by coal emitted smoke which could be visible 10 kilometres away whilst oil had no tell-tale signs. The strategic advantage it gave was insurmountable and the British empires control of oil supplies become became even more important given the fact that Britain had no oil supplies at the time. It was the capturing of the rich oil fields of Baku on the Caspian Sea denying vital supplies to Germany that resulted in the end of WW1 and German surrender. William Engdahl geopolitical expert outlined the importance of oil; '*rarely discussed, however is the fact that the strategic geopolitical objectives of Britain well before 1914 included not merely the crushing defeat of Germany, but, through the conquest of war, the securing of unchallenged British control over the precious resource which by 1919, had proved itself as a strategic raw material of future economic development – petroleum. This was part of the 'great game' – the creation of a new global empire, whose hegemony would be unchallenged for the rest of the century, a British – led new world order.* Britain and France concluded a secret oil bargain agreeing in effect to monopolise the whole future output of Middle Eastern oil between them. Oil therefore became critical for the modern industrialised society.

WW1 brought to the international scene the importance of oil; it came to be seen globally as the key to military success. In an age of air warfare, mobile tank warfare, and naval warfare bulky coal-fired propulsion gave way to oil

The world's first public electricity supply was constructed in 1881, when the streets of the Surrey town of Godalming in the UK were lit with electric light. This system was powered from a water wheel on the River Wey, which drove a Siemens alternator that supplied a number of arc lamps within the town. This supply scheme also provided electricity to a number of shops and premises.

Centralised power generation became possible when it was recognized that alternating current power lines can transport electricity at very low costs across great distances by taking advantage of the ability to raise and lower the voltage using power transformers. The first power plants were run on water power and then coal. Today the world relies on coal, nuclear, natural gas, hydroelectric, and oil for powering and generating electricity.

Today much of the world is electrified. The infrastructure required for electrification includes power plants, an electric power transmission grid, substations and shorter distribution lines to the end user.

The energy process

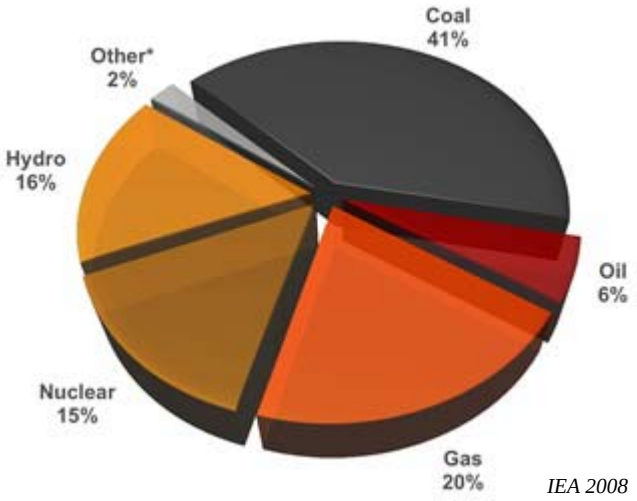
The energy the world uses today goes through a number of stages before it is used as fuel for transport and electricity for lighting the world's cities. There are two key stages:

1. Electricity generation through a power plant, and
2. Electric power transmission and distribution

The first stage and probably the most important is converting energy from a source such as coal or oil into electrical energy. This is the realm of a power plant. A power plant converts various forms of energy, into electrical energy. At the centre of nearly all power stations is a generator, a rotating machine that converts mechanical energy into electrical energy by creating relative motion between a magnetic field and a conductor.

Most electric generation today is driven by heat engines, this is where a fossil source is burned, and the heat generated in turn boils water that creates steam, which is compressed and used to turn a turbine which creates energy that is converted to electrical energy. Most of the world's electric power is generated in steam plants driven by coal, oil, nuclear energy and gas.

Total World Electricity Generation by Fuel (2006)



IEA 2008

The world's power plants are classified by the type of fuel and the type of prime mover (usually a turbine) installed. These include:

- Nuclear power plants use a nuclear reactor's heat to operate a steam turbine generator.
- Fossil fuelled power plants use a steam turbine generator or in the case of natural gas fired plants may use a combustion turbine. A coal-fired power station produces electricity by burning coal.
- Geothermal power plants use steam extracted from hot underground rocks.
- Renewable energy plants may be fuelled by waste from sugar cane, municipal solid waste, landfill methane, or other forms of biomass.
- Waste heat from industrial processes is occasionally concentrated enough to use for power generation, usually in a steam boiler and turbine.
- Solar thermal electric plants use sunlight to boil water, which turns the generator.

Prime movers include:

- Steam turbine plants use the dynamic pressure generated by expanding steam to turn the blades of a turbine. Almost all large non-hydro plants use this system.
- Gas turbine plants use the dynamic pressure from flowing gases to directly operate the turbine.

- Combined cycle plants have both a gas turbine fired by natural gas, and a steam boiler and steam turbine which use the exhaust gas from the gas turbine to produce electricity. This greatly increases the overall efficiency of the plant, and many new base load power plants are combined cycle plants fired by natural gas.
- Internal combustion reciprocating engines are used to provide power for isolated communities and are frequently used for small cogeneration plants. Hospitals, office buildings, industrial plants, and other critical facilities also use them to provide backup power in case of a power outage. These are usually fuelled by diesel oil, heavy oil, natural gas and landfill gas.
- Micro turbines, Stirling engine and internal combustion reciprocating engines are low cost solutions for using opportunity fuels, such as landfill gas, digester gas from water treatment plants and waste gas from oil production.

The second stage is where Electric power transmission takes place. This is the bulk transfer of electrical power (energy), a process in the delivery of electricity to consumers. A power transmission network typically connects power plants to multiple substations near a populated area. A power transmission network is referred to as a 'grid.' Multiple redundant lines between points on the network are provided so that power can be routed from any power plant to any load centre.

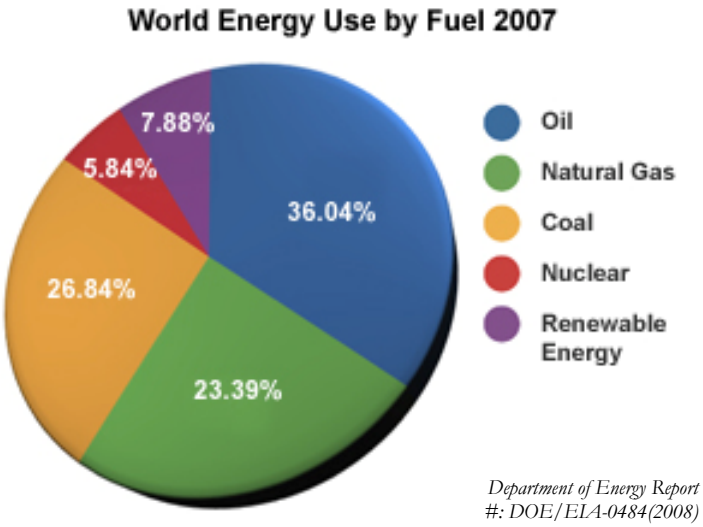
small distribution networks was greatly spurred by the requirements of World War I, where large electrical generating plants were built by governments to provide power to munitions factories; later these plants were connected to supply civil load through long-distance transmission

Electricity is then distribution and delivered – often through a utilities company to homes. A distribution system's network carries electricity from the transmission system and delivers it to consumers. Typically, the network carries less voltage, which is appropriate for home use. Voltages used for electric power transmission have increased throughout the 20th century. By 1914 fifty-five transmission systems each operating at more than 70 kV were in service. The highest voltage then used was 150 kV.

The rapid industrialization in the 20th century made electrical transmission lines and grids a critical part of the economic infrastructure in most industrialised nations. Interconnection of local generation plants and small distribution networks was greatly spurred by the requirements of World War I, where large electrical generating plants were built by governments to provide power to munitions factories; later these plants were connected to supply civil load through long-distance transmission. Today most countries in the world have developed electricity grids making electricity in theory available for all. Some nations however have poor infrastructure and load shedding is a common occurrence in such nations. Much of the necessary infrastructure is determined by the availability of energy sources and the nature of domestic terrain – these are the main challenges facing any emerging nation which would require the development of an energy policy.

The Future of Energy

The primary challenges facing the world is the depletion of energy resources especially oil, the pollution caused by the use of fossil fuels is also a challenge the world faces, for this many have presented renewable energy as a solution. Whilst the development of power plants has taken place and will continue to do so through the harnessing of energy at more efficient rates, the availability of the sources of energy across the world is the challenge for the foreseeable future. In the past Africa and the Middle East were colonised and their mineral resources were used for the imperial expansion plans of the colonial nations. Rapid industrialisation during the industrial revolution era and the emergence of nations such as China and India mean more and more nations are competing for dwindling sources of energy. As both world war's showed, the control of energy sources is the key to economic success therefore it is very likely wars will break out over the earth's riches.



Department of Energy Report #: DOE/EIA-0484(2008)

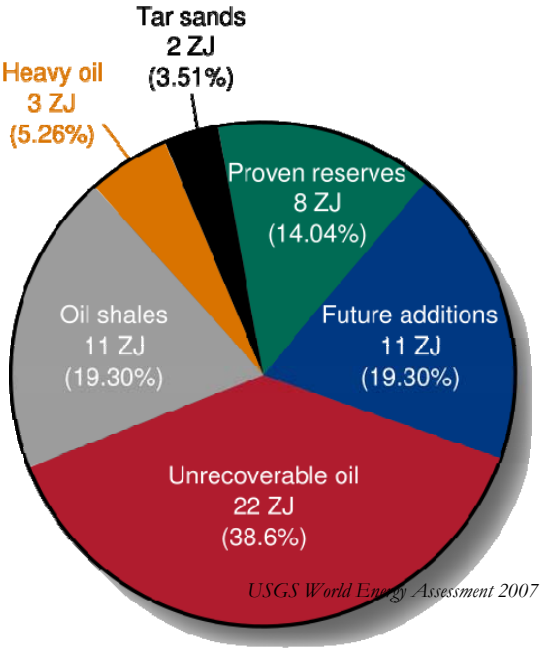
In order to understand the trends in energy, it is important the current developments are understood.

Oil

World oil production is currently at 81 million bpd (barrels per day); of this amount OPEC produces 29.5 million bpd – over 30% of world oil production.

Geology experts claim that 85% of the Earth has been mapped for oil. It is unlikely that in the remaining 15% another Middle East will be found. Western Siberia and the South China Sea are contenders for holding large undiscovered reserves. Effective exploration in the South China Sea is being stifled by territory disputes, the Spratley Islands being the most famous.

Remaining oil breakdown



USGS World Energy Assessment 2007

Deep sea exploration has been a disappointment, but polar hydrocarbons are still in abundance. As the price for oil increases, there will be rush to exploit these areas; a case example may be ANWR (Artic National Wildlife Reserve) in Alaska. At the moment moves by the environmental lobbies are blocking the full development of this area, but if oil prices continue to rise, their cries will just echo of the walls off Congress.

Unconventional oils – are conventional oils that have been biologically degraded by exposure to the surface and atmosphere. Unconventional oils come in various forms and differ substantially in their quality. Typical unconventional oils are tar sand, heavy oils, and shale oils. All can be extracted and refined, but at tremendous energy and environmental costs. It is known that they have a lower energy returned than the energy invested. Another unconventional oil source is synthetic crude's. During WW2 the Germans produced synthetic oil from coal through the Fischer-Tropsch method; currently the South Africans are the leading manufacturers of synthetic oils from coal.

Coal

Coal is the most abundant fossil fuel. This was the fuel that launched the industrial revolution and has continued to grow in use. Coal is primarily used as a solid fuel to produce electricity and heat through combustion. Coal reserves throughout the world are estimated to last for another 165 years. US, China, South Africa, Australia and Europe have the largest reserves. Whilst this fossil fuel exists in abundance its polluting aspect has gained much attention, it is unlikely this mineral will reduce in importance especially when through the Fischer-Tropsch process.

Natural Gas

Whilst it is recognised that gas can be a partial substitute for oil, it however depletes very differently from oil. More gas has been generated in nature than was oil, but more also escaped from imperfect seals to the reservoirs. By most estimates, global consumption of natural gas - a cleaner-burning alternative to coal and oil will double by 2030. But in the areas of highest expected demand - North America, Europe, China, and South and East Asia - the projected consumption of gas is expected to far outstrip indigenous supplies. Delivering gas from the world's major reserves to the future demand centers will require a major expansion of inter-regional, cross-border gas transport infrastructures.

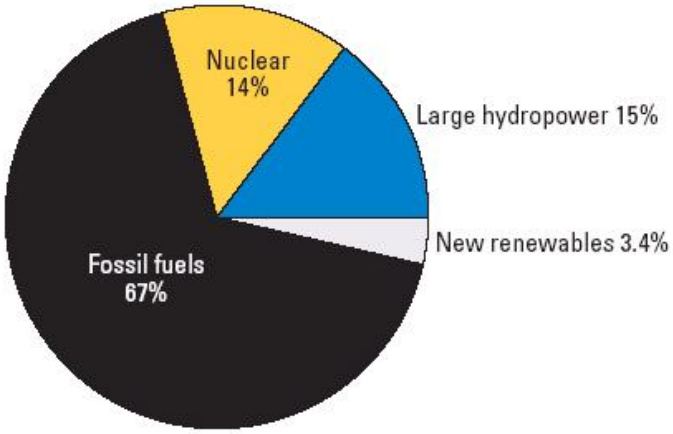
Nuclear Power

Nuclear power generates energy through nuclear fission by splitting atoms inside a nuclear reactor. The atoms which are split in the process of fission release large amounts of energy. The energy heats water to create steam, which spins a turbine generator, producing electricity. Estimates for existing uranium supply at known usage rates vary. Some estimates put several decades for the currently popular Uranium-235 to thousands of years for uranium-238. At the present rate of use, there are about 70 years left of known uranium-235. Proponents of nuclear reactors argue that a unit of uranium offers much more energy than coal. However a number of reactor disasters also show the dangers of such a source. Alongside such concerns the commissioning and decommissioning costs of nuclear reactors have proven to be very expensive.

Renewable energy

Because of the depleting scenario of fossil fuels renewable energy is being presented as the alternative. Renewable energy is energy generated from natural resources - such as sunlight, wind, rain, tides, and geothermal heat - which are renewable (naturally replenished). The use of renewable energy depends on climatic and geographical conditions of the region for which it is to be used for. Wind is the most

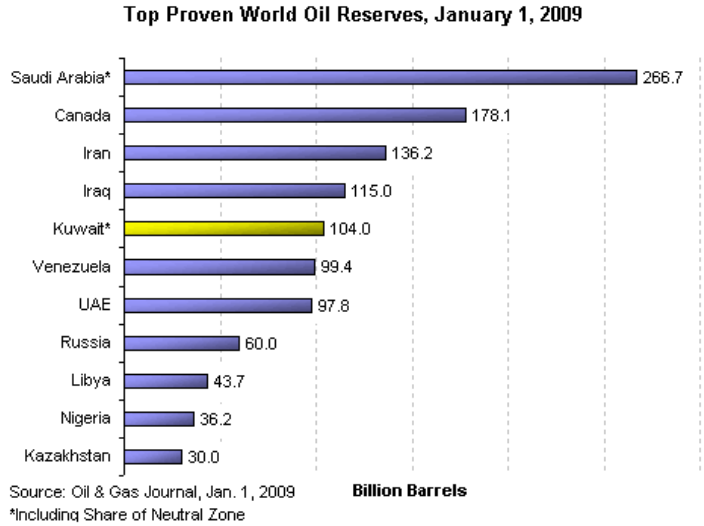
mature of all the renewable technologies, while Biomass generation is the most stable. Aside from concentrated Solar panel and wind turbine technology renewable energy is still in its early stages, most technologies are still operated thorough the use of fossil energy and much of the technology for renewables is still 20 – 40 years away.



Peak oil

The peaking of oil production has gained much attention recently due to the surge in oil prices. Oil peaking was a theory introduced in the 1950's by geologist Martin King Hubbert, he outlined that at some point the world would have pumped out half of the worlds oil. According to Hubbert when the maximum in production is reached and thereafter it continually declines, whilst oil is increasingly plentiful on the upslope, it is increasingly scarce and expensive on the down slope. The peak of the curve coincides with the point at which the endowment of oil has been 50% depleted. Once this peak is passed, oil production begins to go down while cost begins to go up. **So the peaking in the production of conventional oil is not the end of oil; it is the end of the era of cheap oil.**

Estimating figures for peaking dates is in theory a straightforward science. There are three vital numbers that are needed to project future oil production. First the tally of how much oil has been extracted to date, a figure known as the **cumulative production**. The second is an **estimate of reserves**; the amount that companies can pump out of known fields before having to abandon them. Finally, one must make have an educated guess at the **quantity of conventional oil** that remains to be discovered and exploited. Together they add up to the **ultimate recovery** i.e. the total number of barrels that will have been extracted when production ceases many decades from now.



The dates predicting when global oil production peaks vary from between now and 2012, some overly optimistic predictions give peaking dates up to the year 2060, but the most reliable estimates for world oil peaking, are within the next few years.

In reality the figures for reserves and conventional oil are unclear due to differing political interests. Looking for cumulative production statistics can be done by searching publications like *Oil and Gas Journal* and *World Oil*, since oil companies meter the amount of oil they produce. But getting estimates of reserves is much harder. There is an enormous expanse between the numbers of what are public

data and private industry data. Oil companies tend to exaggerate estimates to raise the price of the companies stock. While in the late 1980's six of the 11 OPEC nations increased their reserve figures by colossal amounts, ranging from 42% to 197%, they did so only to boost their export quotas. But reliable reserves estimates can still be found since the industry needs to keep track of its true state, but these typically can cost a million dollars per database – within reach of other oil companies, but not researchers and academics.

There is also another way to view the approach of peak oil. If production is meant to start diminishing worldwide very soon, then we should already see countries that have reached their peaks or are just about to reach their peak. Of the top seven oil producers, six are in decline or near peak production. USA peaked 1971, Norway peaked 2001, and the UK peaked in 1998. Russia, Mexico and China are forecast to peak this year. It is also possible that Saudi Arabia in 2005. The only one of the top 7 producers that has clear capability to increase production is Iraq.

The following issues also show the diminishing trend of the earth's oil:

- Oil-field discovery rates (by volume) have peaked and been declining for decades.
- EROEI (energy returned on energy invested, or net energy) rates are similarly declining.
- Oilfield depletion rates continue to accelerate
- There is growing consensus that the 'easy oil' is nearly gone.
- The number of countries with export capacity continues to decline and there is growing awareness that export decline and overall affordability may become problematic in the near term.
- The 'grey factor': oil industry veterans are retiring just as the industry must contend with new technological challenges.
- The 'rust factor': much of the existing oil and gas infrastructure is old and must be replaced.
- Apart from temporary recessionary dips, global consumption (i.e. global dependence) has increased to the present rate of about a thousand barrels a second.
- There are still no viable solutions to replace petroleum (when one considers energy density, the volumes of net energy, flow rates, infrastructure requirements, the convenience and flexibility of liquid fuels, etc).
- The media continue to overlook the issue of "the end of cheap oil" Therefore the public remains largely unaware, while politicians continue to avoid an issue for which they have no ready and viable solution.

It is accepted that economic recessions and political turmoil affects the price of oil and whilst other substitutes may change the dynamics of energy through the likes of bio fuels, tar sands, oil shale etc. they can never fully substitute easy conventional oil. This is why it needs to be understood that oil is finite in its nature

Energy Geopolitics

The age of oil, produced its own technology, its balance of power, its own economy and its patterns of living. The future of energy security will play a central role in the global balance of power. Some of the emerging trends that will shape the global geopolitical scene are as follows:

- **The Eastern threat -** The Middle East is gradually shifting from being a uni-polar region in which the US enjoys uncontested hegemony to a multi-polar region. The US will face more competition from China and India over access to Middle East oil. Soaring global demand for oil is being led by China's continuing economic boom and, to a lesser extent, by India's rapid economic expansion. Both are now increasingly competing with the US, the European Union and Japan for the lion's share of global oil production. The demand for greater oil is affecting America's ability to pull itself out of its downturn and is creating inflation across the Western world. If China at any time in the future should develop its political will and ambition, it is in a relatively strong economic position to substantially weaken America.

- **Russia** - Russia, the leading producer of natural gas and one of the leading oil producers, is a global winner. The relationship between the European Union and Russia is now dominated by Russia and will in the future make Europe dependent on Russian oil and gas. The oil shocks of the 1970s had different effects on different European countries. Britain had some North Sea oil and the prospect of more, as did Norway. Germany and France had little or no oil of their own. Differential shocks in the coming period of oil shortages will make it harder to maintain the Euro-zone.

  Vladimir Putin has already used oil and gas as a diplomatic weapon against the European states, which have had to fall into line in June 2007 after making grandiose demands against Russia. Russia has also stopped supplying energy to its neighbours to quell dissent and ensure political allegiances.

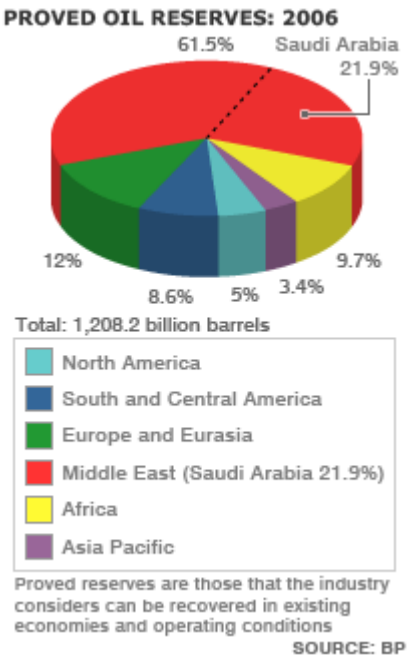
  Unlike China and India, Russia has a history of political strength and maturity, and the evidence over the last two years is that Russia has begun re-inventing itself as a regional power, after winning back Kazakhstan and Uzbekistan from the American grip and managing to stop the influence of the three revolutions in that region. America is becoming increasingly worried about the growing economic and political influence of Russia.

- **Petrodollars -** One of the achievements of the US in the 1970's was to peg the price of oil to dollars. This meant that oil transactions on the international markets are carried out in dollars only. This has allowed the US to maintain the dollar as the world premier currency and the currency of choice for foreign reserves.

  Today the European Union led by Britain and Germany are increasingly calling for pegging oil to the Euro; thereby stabilising the price of oil, and giving a stable revenue to oil producing countries. However, this severely impacts the dollar as a currency and if this was to happen it would perpetuate America's economic crisis as the dollar would devalue even more.

- **Fossil Dependency** – Governments around the world and corporations continue to view Fossil fuels (Oil, Coal and gas) as the world's principle energy source for the foreseeable future. According to most estimates these fuels will be satisfying an estimated 85% plus, of global energy needs by 2030. With both existing and new consumers reliant on such traditional fuels and no practical, plentiful alternatives in sight, the struggle over such traditional fuels sources is set to only intensify.

- **The importance of the Muslim world -** Despite current supply shortages of oil around the world, the importance of the Middle East, will not reduce. In fact it will become the most crucial area in the world. This is because 61% of the world's oil reserves are in the Middle East. "Proved" oil reserves are those quantities of oil that geological information indicates can be with reasonable certainty recovered in the future from known reservoirs. Of the trillion barrels currently estimated only 39% are outside the Middle East. Today, 61% of global oil reserves are in the hands of Middle Eastern regimes: Saudi Arabia (22%), Iraq (11%), Iran (8%), UAE (9%), Kuwait (9%), and Libya (2%).



Currently of the 11 million barrels per day (bpd) the US imports 3 million barrels per day from the Middle East. But in the years to come dependence on the Middle East is projected to increase by leaps and bounds. This is because the reserves outside of the Middle East are being depleted at a much faster rate than those in the region. The overall reserves-to-production ratio - an indicator of how long proven reserves would last at current production rates – outside of the Middle East is about 15 years comparing to roughly 80 years in the Middle East. It is for this reason that George Bush said in April 2007, US dependence on overseas oil is a "*foreign tax on the American people.*"

This is one of the most volatile regions in the world; and its importance will only grow stronger. The US is currently very worried about political developments in this region. A return of the Khilafah as predicted by several think tanks can potentially cripple America's economy, at a time where its political leverage is at its weakest since the end of the cold war.

- **New Contenders** – A class of new contenders are set to chase an ever dwindling base of fossil fuels. The rise of China and India alongside Brazil, Turkey, South Korea, Malaysia and Indonesia and many of the East Asian nations means that the energy industry will need to satisfy the needs of these new contenders and the existing requirements of the more mature industrialised nations. China and India on their own are transforming the global geopolitical scene.

- **China and India** – 'Chindia' on their own are searching the world for energy sources as they lack the necessary minerals within their borders. Their current growth rates will only continue if they can secure the necessary energy sources. India's rising energy demand has created a

perpetual state of energy crunch. India is poor in oil resources and is currently heavily dependent on coal and foreign oil imports for its energy needs. For these reasons India has made significant strides in renewable energy resources but to a large extent is relying on the Iran–Pakistan–India gas pipeline (IPI) which has been riddled with delays. China on the other hand although rich overall energy potential, most of its deposits still require development. In addition, the geographical distribution of energy puts most of these resources relatively far from demand. Both nations in the decades ahead will become ever more dependent upon energy imports bringing them direct conflict with the US who also faces an ever increasing import bill

- **Energy Crunch** - A large share of the world's current oil production comes from just 116 giant oil fields. 50% of the worlds daily comes from just 116 oil fields each of which produces more than 100 000 bpd, of these, all but four were discovered over 25 years ago and many of them are showing signs of diminished capacity. Among them are the worlds largest oil fields - Ghawar in Saudi Arabia, Cantarell in Mexico and Burgan in Kuwait, these three mammoth fields produce 10% of the worlds daily oil requirement. For every barrel lost in these fields a new barrel needs to be found somewhere to just maintain the current levels of oil production.

- **Non-Liquid Oil** – The only other possible source of new fuel is the conversion of non-liquid oil bearing materials such as Canadian tar sands and rock mountain oil shale into synthetic petroleum. The world has considerable reservoirs of non conventional resources, according to some estimates the same as conventional oil. However with existing technologies considerable energy needs to be invested just to extract such materials and convert them into useable liquids. However at most non-conventional fuel will only contribute several million barrels of liquid per day to global oil supply, in no way will it compensate for the impending decline in major conventional oil fields.

- **Energy powers** – Although many nations produce some oil, very few produce a lot, and fewer are on the perch of increasing oil production. If the nations who are about the peak or have peaked are eliminated from the list of major producers, only 15 are left with significant potential to boost output, these are: Algeria, Angola, Azerbaijan, Brazil, Iran, Iraq, Kazakhstan, Kuwait, Libya, Nigeria, Qatar, Russia, Saudi Arabia, UAE and Venezuela. Some nations may join this privileged group however the trends are set to make these 15 nations pivots of global energy geopolitics and the centre of the next energy rush.

The Muslim world and Energy

The Muslim lands have been the centre of colonial conflict for well over a century. This is because the Muslim world is not short of energy resources that are fundamental to industrialisation. A cursory glance across the Muslim lands unfortunately presents a picture that is full of contradictions. In summary the Muslim world possesses the following strengths:

- 74% of the World's oil reserves, more than the rest of the world combined are in the Islamic lands
- The Muslim world pumps 42% of the world's daily oil requirement
- Has 54% of the world's gas reserves
- Pumps 30% of the world's daily gas requirement
- Saudi Arabia possesses the Ghawar oil field, which is the world's largest oil field
- Iran and Qatar posses the South Pars North Dome field, located in the Persian Gulf it is the world's largest gas field.
- Iran also posses the world's largest proven natural gas reserves after Russia
- Kuwait the small city state single handily posses 10% of the worlds oil reserves.
- The Shoaiba power and desalination plant is an oil-fired CCGT power and desalination complex in Saudi Arabia and the world's largest fossil fuel power plant, and the world's third largest integrated water and power plant.
- Kazakhstan is the world's largest Uranium producer after Australia and posses the world's largest uranium reserves after Australia. Kazakhstan single handily posses 20% of the worlds Uranium.
- Pakistan has the world's largest Coal reserves after the US. The Thar coal field in Sindh is the world's largest coal field.
- Brunei Liquefied Natural Gas (BLNG) plant, built in 1972 is the world's largest Liquefied Natural Gas plant.
- Qatar, Indonesia and Malaysia are the worlds largest exporters of Liquefied Natural Gas (LNG)

Despite possessing such strengths much of the Muslim world has a crumbling energy infrastructure leaving many without electricity. Whilst Saudi Arabia and the Gulf states have advanced energy infrastructures much of their populations live in poverty

Despite possessing such strengths much of the Muslim world has a crumbling energy infrastructure leaving many without electricity. Whilst Saudi Arabia and the Gulf states have advanced energy infrastructures much of their populations live in poverty. Much of the energy

infrastructure in the Persian Gulf and the Hijaz was developed by Britain and the US, very little skills transfer has taken place making the region dependent on Western skills.

It is important to realise that not all oil is the same. Oil differs from region to region in its thickness and its chemical composition. The oil pumped from the Middle East is the preferred choice since its extraction is relatively simple and its refining is cheaper due to it being the light 'sweet' type of crude oil. In contrast the heavier crude oils extracted from the Caspian basin are far more costly to extract and refine and are far more polluting.

The Muslims lands with the greatest energy wealth are the Middle Eastern states. Notably Iran and Qatar also have exceptionally large gas reserves. Indonesia peaked in oil production during the 1970's but is among the worlds largest exporters of Liquefied natural gas (LNG). Nigeria, Chad and Gambia have considerable reserves of oil and gas, but tend to be locked in offshore deep sea wells. Turkey and Pakistan have relatively poor oil resources, but Pakistan has large untapped gas and coal reserves. Central Asia and the Caspian was once touted as the next Middle East, but difficulties in extraction have seen the abandonment of investment by many private companies. Still Kazakhstan and Azerbaijan have huge oil and gas reserves, next being Uzbekistan, Turkmenistan and then Tajikistan.

The region that has the largest oil reserves (61%) and pumps 31% of the world's oil – the Middle East, only refines 8% of it. 76% of the worlds oil is refined in regions with very little oil, but increasing demand for oil……
Hence even though the Muslim world has the lions share of oil, in essence this is useless considering the inability to refine it, for this reason most of the oil is piped to the Far East and Europe to be refined, then the products are re-sold to the Muslim world

Although oil production has continued to increase and although consumption is set to rise, for the last 30 years very few refineries have been built across the world. The region that has the largest oil reserves (61%) and pumps 31% of the world's oil – the Middle East, only refines 8% of it. 76% of the worlds oil is refined in regions with very little oil, but increasing demand for oil. The US refines 20% of the world's oil, whilst Europe refines 22% of the world's oil and the Far East refines 27% of the world's oil. Hence even though the Muslim world has the lions share of oil, in essence this is useless considering the inability to refine it, for this reason most of the oil is piped to the Far East and Europe to be refined, then the products are re-sold to the Muslim world

The Khilafah's Energy Policy

The fundamental reason why the Muslim world has been unable to industrialise and take advantage of its mineral strengths is because the Muslims' rulers have never had any ambition or intention to improve the situation of the Muslim world. This lack of direction has resulted in a Muslim world full of contradiction; Saudi Arabia should be the world's superpower considering the sheer size of its oil resources. However the lack of ambition and foreign interference has made Saudi Arabia a satellite state initially for Britain and currently the US.

The Khilafah, its economy, industry and energy resources will all be shaped by a whole host of evidences which outline a clear policy position.

The Messenger of Allah صلى الله عليه وسلم said **"Each one of you is a Shepard and will be held accountable for his flock."** [Bukhari]

الَر كِتَابٌ أَنزَلْنَاهُ إِلَيْكَ لِتُخْرِجَ النَّاسَ مِنَ الظُّلُمَاتِ إِلَى النُّورِ بِإِذْنِ رَبِّهِمْ إِلَى صِرَاطِ الْعَزِيزِ الْحَمِيدِ

"Alif. Lam. Ra. This is a book which we have revealed to you, [O Muhammad], that you might bring mankind out of darkness into the light by the permission of their Lord - to the path of the Exalted in Might, the Praiseworthy." [Ibrahim, 14:1]

وَأَعِدُّواْ لَهُم مَّا اسْتَطَعْتُم مِّن قُوَّةٍ وَمِن رِّبَاطِ الْخَيْلِ تُرْهِبُونَ بِهِ عَدْوَّ اللّهِ وَعَدُوَّكُمْ وَآخَرِينَ مِن دُونِهِمْ لاَ تَعْلَمُونَهُمُ اللّهُ يَعْلَمُهُمْ وَمَا تُنفِقُواْ مِن شَيْءٍ فِي سَبِيلِ اللّهِ يُوَفَّ إِلَيْكُمْ وَأَنتُمْ لاَ تُظْلَمُونَ

"And prepare against them what force you can and horses tied at the frontier, to frighten thereby the enemy of Allah and your enemy and others besides them, whom you do not know (but) Allah knows them; and whatever thing you will spend in Allah's way, it will be paid back to you fully and you shall not be dealt with unjustly." [Al-Anfal: 60].

Islam obliged the Ameer to take care of the affairs of the Ummah as he would be held accountable for this. Throughout numerous ayah's of the Qur'an Allah (swt) obliged the Ummah to propagate Islam to the wider world, take mankind from the darkness to the light whilst in other verses Allah (swt) characterised the Muslim Ummah as the best Ummah due to having such characteristics. The propagation of Islam is achieved through projecting an image of strength globally, so that those who have designs on the Ummah should consider the existence of its deterrent force so powerful as to render success in an attack too doubtful to be worthwhile. These ayah's amongst many prove the Khilafah will need to harness its energy resources ensuring they are available for all its citizens.

Islam has also designated electricity as public property. Islam lays out three types of property: state, public and private. It designated any utility regarded as indispensable for the community, such that its absence would require people to search far and wide for it, as public property. It would then be publicly owned – administered by the state and the revenue generated would be administered for the benefit of all citizens. This is derived from the hadith of the Prophet Muhammad صلى الله عليه وسلم: **"Muslims are partners in three things: in water, pastures and fire".** Although the hadith mentioned just three things we can utilise qiyas (analogy) to extend the evidence to cover all instances of indispensable community utilities. Thus water sources, forests of firewood, pastures for livestock and the like are all public utilities as well as the mosques, state schools, hospitals, oil fields, electricity plants, motorways, rivers, seas, lakes, public canals, gulfs, straits, dams etc. Islam would allow ownership if it were not indispensable for the community.

The Industrial plants would come under the description of 'fire' in the hadeeth: **"People are partners in three; Water, Pastures and Fire,"** 'Fire' includes all that is implied by it in term of energy, whether derived from the burning of trees, coal or electricity. All of these would be categorised under the public wealth and the state, individuals or companies are not allowed to own these sources of electricity which is used as fuel to drive industrial plants. These resources are public properties supervised by the state and revenues generated from these are to be disbursed to the state's citizens after the deduction of costs.

Energy Policy

Oil and gas are two of the most important commodities in the world. The engines of modern life are interlinked into every aspect of how today's societies function. The rate of industrialisation is dependent on the rate of available energy. Even modern farming is dependent on natural gas, through the feedstock's that make up fertilisers. But oil and gas are finite resources and non-renewable. They are essential to public life, meaning that their benefit has to be shared by the public, and cannot be privatised.

The Khilafah's energy policy will need to be adopted with the following realities in mind:

- As energy is essential to industrialisation, the Khilafah's energy policy will need to be viewed through such a lens.

- Energy is needed for numerous domestic tasks, the Khilafah needs to build upon the current energy infrastructure present in the Muslim world

- Oil and Gas should be allocated to essential uses such as feed stocks, plastics, agriculture, petro-chemicals as no alternatives currently exist for these.

- Oil and Gas should also be utilised for transport and energy generation as current technologies are primarily run on them, but alternatives need to be sought. This will help to create a more sustainable use of the Khilafah's resources, allowing flexibility in the sale of oil for revenue generation, and as aid to assist nations in bringing them closer to the fold of Islam

The Khilafah on its emergence will from day one be faced with three key challenges that will need to be overcome and will define the Khilafah's energy policy:

1. The Khilafah in all likelihood will be a rapidly industrialising state that will be on a permanent war footing, this makes energy utilisation critical

2. A military strike by the US

3. As the rate of industrialisation is dependent on the energy available the current energy and electricity infrastructure is poorly designed in many of the current Muslim lands to cope with base load (minimum energy need) demands of heavy industries. Furthermore the centralised nature of both local and national grids in many of the Muslim lands would leave many without electricity if a number of power stations sustained an attack.

Both Hugo Chavez of Venezuela and Vladimir Putin of Russia pursued such a policy of nationalising their energy resources so they could be used for domestic development rather than being siphoned off to the West

The first challenge can only be overcome by the Khilafah securing its own supply of oil and natural gas and other energy sources. If the Khilafah is to emerge anywhere other than the Middle East then it will begin to face difficulties in securing supplies beyond the end of the decade. As an example, the current natural gas reserves of Bangladesh would supplement the nation for the next 40 years based on its current demand but if export agreements with India are concluded, this would drop to 12 years. Existing reserves will deplete faster than the current status quo. Both Hugo Chavez of Venezuela and Vladimir Putin of Russia pursued such a policy of nationalising their energy resources so they could be used for domestic development rather than being siphoned off to the West.

From the outset, the use of oil should be preserved for the armed forces, petrochemicals industries, and freight, flight transport and fertilizers. Considering that 90% of all transport is currently oil dependent, transport that can run on alternatives means should be developed. This would imply the use of compressed natural gas (CNG) for public transport and personal automobiles. Pakistan has an estimated 25.1 trillion cubic feet (tcf) of proven gas reserves. This has led to Pakistan having the highest number of compressed natural gas (CNG)-run vehicles in the world leaving Brazil and Argentina behind in the race as largest user of natural gas vehicles. This would mean saving gas reserves for the transport and not the power sectors. Thus power generation would rely on coal, nuclear and renewables. The Khilafah will need to use nuclear energy for its huge industrialisation programme as it has the capacity for massive power generation which the Khilafah's new industries will need.

Such a policy would make the other challenges facing the Khilafah much more manageable.

There is the very real possibility of a strike by the US as the Persian Gulf Oil and Gas – the largest in the world are threatened for the first time as US strategic assets. It should be remembered that the US has the capability to carry out a sustained attack using an array of missiles. Whilst there is no short answer to this dilemma, the Khilafah will need to mitigate the possibilities of such an attack occurring,

this can be achieved by annexing and expanding very quickly, so the US will then be dealing with a much larger area. As Afghanistan and Iraq has shown, the longer the supply lines have to travel the weaker the front lines. It should also be borne in mind that the US makes use of a number of military bases that have been provided to them by the Muslims' rulers, cutting such supply lines will severely hinder US capabilities.

The Khilafah from her inception needs to build a decentralised energy infrastructure. A decentralised infrastructure is where local power generation is the priority, through numerous small scale power-plants, as opposed to a centralised grid where the nation is dependent on power production through larger but fewer power-plants.

There are a number of advantages a decentralised energy infrastructure over a centralised infrastructure will bring to the Khilafah:

- The Khilafah will be an expanding state; expanding grid networks will be more difficult, expensive and inefficient if expanded from power stations positioned long distances from demand.

- The Khilafah will in all likelihood face a foreign attack; local power generation through a decentralised grid re-enforces regional and local grids – facilitating continuation of power in one region if another was to lose power.

- In most Muslim lands, populations are distributed with a larger percentage resident in rural areas rather than urban areas, a decentralised energy infrastructure will help prevent the formation of 'mega-cities' and large urban conurbations seen throughout the world.

- Local grids will be a key element in providing power for existing areas that do not have power.

- Without the need for power to be sent over long distances, the larger power-plants would be used to ensure a secure supply for the heavy industrial complexes and sensitive installations.

The stability of the grid should be secured by base-load generation through Combined Cycle Gas Turbines (CCGT) and coal, as the Khilafah progresses nuclear energy should take over from the role of gas. But it should be noted; although nuclear energy is the most stable base-load generation available, its commissioning and decommissioning costs are extremely expensive. Through industrialisation the speed of the Khilafah's depletion will increase, in order to deal with this eventuality the Khilafah's should put in place a policy of researching for alternative sources of energy.

Through a decentralised grid local power generation can be achieved through the use of renewables. The use of renewables depends on climatic and geographical conditions of the region for which it is to be used for. Wind is the most mature of all the renewable technologies, while Biomass generation is the most stable. The most ideal situation in a decentralised network is where every building is itself a power source. This could take place via the Khilafah adopting building standards whereby all new buildings must have a certain percentage of its energy needs met through micro-generation i.e. through solar and Combined Heat and Power units. Pakistan and Bangladesh have huge hydropower potential, whilst

Indonesia and Malaysia have large wind power potential, at the same time the Middle East has huge solar potential

Conclusions

The Muslim world possesses all the necessary ingredients to fulfil the Ummah's energy needs, Allah (swt) has endowed the Muslim lands with many minerals that are more than sufficient for the Khilafah to launch an industrial revolution. The Khilafah would in fact from some perspectives be in a much better position on the eve of its development then many of the industrialised nations were. Germany, Japan and China all lacked the necessary resources, it was this challenge that led Germany and Japan to colonise resource rich nations. The US and Britain lacked the necessary population for industrial development, this was overcome through enslaving the people of colonised nations. This Khilafah will not have face problems as the Ummah number over 1 billion and the Islamic lands posses more than enough mineral resources for an industrial revolution.

The current status quo only benefits the elites in the Muslim world who live in their air conditioned palaces whilst the Ummah starve in the towns in sweltering heat. Attempts by the World Bank and the United nations to take charge of the energy potential present in the Muslim lands have been designed to allow Western companies to take control of the oil fields, gas fields and energy infrastructure in the name of the 'market solution' to the energy crisis across the Muslims lands. The Muslims' rulers have no intention or ambition to make the Muslim world self sufficient in energy.

The development of the necessary energy infrastructure would in reality create million of jobs which would lift million out of poverty in the Muslim world. In turn the development of energy would have massive knock on effects by stimulating the wider economy through the development of heavy industry, manufacturing complexes, military industries, refineries and mills.

Many would contend that as energy, especially oil is a key resource for the West they would carry out military intervention if the Khilafah took charge of its own resources. De-classified documents have shown the US and Britain were planning military action in the wake of the oil price hikes in 1973. Such a theory is also used as a justification by many of the Muslims' rulers to continue oil exports to the West whilst their own population suffer load shedding.

Whilst this reality is a possibility in reality the only country who is heavily dependent on oil imports and would consider such an act in its strategic interests is the USA. However the US currently is bleeding to death in Iraq and Afghanistan and would need to carry out a sustained attack involving millions of troops to wrestle control over the Muslim world's oil reserves. Venezuela has shown that nationalising ones energy resources does not necessarily entail a US invasion.

The only assured strategy that will almost certainly ward off the US and at the same time turn the Khilafah into a world power is reunification with the Muslim world. Islam obliges only one state for the whole Ummah and this means reunification with the Muslim world is compulsory. With most of the Muslim world living under dictators in severe poverty unification is not a difficult task to achieve, however it does face challenges. Aside from

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Western agents who will want to hold onto their positions, the challenge to a large extent will be the ability to expand and join the nations together through linking their governance, judiciary, administration and economies. The Soviet Union achieved such a feat in the past by building the Communist camp. Wherever the Khilafah is established first it will have a very powerful motivation which will easily make different nations become part of the union and - that is Islam itself.

وَإِذْ قَالَ رَبُّكَ لِلْمَلاَئِكَةِ إِنِّي جَاعِلٌ فِي الأَرْضِ خَلِيفَةً قَالُواْ أَتَجْعَلُ فِيهَا مَن يُفْسِدُ فِيهَا وَيَسْفِكُ الدِّمَاء وَنَحْنُ نُسَبِّحُ بِحَمْدِكَ وَنُقَدِّسُ لَكَ قَالَ إِنِّي أَعْلَمُ مَا لاَ تَعْلَمُونَ

And (remember) when your Lord said to the angels: "Verily, I am going to place mankind as a caliph on earth." They said: "Will You place therein those who will make mischief therein and shed blood, - while we glorify You with praises and thanks and sanctify You." He (Allâh) said: "I know that which you do not know." (Al Baqara: 30)

Glossary

Balance of power	The international situation and structure of the international relations between the world's nations. It is the status of the superpower and the nations that compete with it.
Base load	The minimum amount of power that must be available or the amount of power required to meet minimum demands based on reasonable expectations of customer requirements.
Bio fuels	Solid, liquid or gaseous fuel obtained from relatively recently lifeless or living biological material and is different from fossil fuels, which are derived from long dead biological material
Biomass	A renewable energy source from living, or recently living organisms such as wood, waste, and alcohol fuels.
Coking	Usually produced from coal, a solid carbonaceous material derived from destructive distillation of low-ash and is used as a fuel and as a reducing agent in smelting iron ore in a blast furnace.
Combines cycle gas turbine (CCGT)	A turbine that generates electricity and the waste heat is used to make steam to generate additional electricity via a steam turbine; thereby enhancing efficiency
Combustion engine	An engine in which the burning of a fuel occurs with an oxidizer (usually air) in a combustion chamber. The temperature and pressure gases directly apply force to a movable component of the engine, such as the pistons or turbine blades and by moving it over a distance, generate useful mechanical energy.
Electrical Energy	Electricity
farming implements	Farming tools
Fertilizer	Chemical compounds applied to promote plant and fruit growth
Fossil	The preserved remains or traces of animals, plants, and other organisms from the remote past
Fischer-Tropsch process	A chemical reaction in which gas is converted into liquid hydrocarbons through the cracking of coal.
Electrical generator	A device that converts mechanical energy to electrical energy, generally using electromagnetic induction
Heat engine	A physical device that converts thermal energy to mechanical output
hydrocarbons	A organic compound consisting entirely of hydrogen and carbon
Industrial Revolution	The term given to the period in the late 18th and early 19th centuries when European society shifted from being primarily agrarian to industrial through the discovery and application of new production techniques.
Load shedding	A temporary reduction in a supply of electricity as a method of reducing the demand on a generator
Magnetic Field	Surround magnetic materials and electric currents and are detected by the force they exert on other magnetic materials and moving electric charges
Mechanical energy	The sum of potential energy and kinetic energy present in the components of a *mechanical system*

Petrochemicals	Chemical products made from raw materials of petroleum
Prime mover	A machine that transforms energy from thermal or pressure form to mechanical form; typically an engine or turbine
Renewable energy	Energy generated from natural resources - such as sunlight, wind, rain, tides, and geothermal heat - which are renewable i.e. naturally replenished
Solid Fuel	Refers to various types of solid material that are used as a fuel to produce energy and provide heating, usually released through combustion. Solid fuels include wood, charcoal, peat, coal, Hexamine fuel tablet
Synthetic oil	A lubricant consisting of chemical compounds which are artificially made (synthesized) from compounds other than crude oil (petroleum). Synthetic oil is used as a substitute for lubricant refined from petroleum, because it generally provides superior mechanical and chemical properties than those found in traditional mineral oils

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