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ENERGY SECTOR STRATEGY

Islamic Republic of Afghanistan

For

The Afghanistan National Development Strategy

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Through USAID & BearingPoint

TABLE OF CONTENTS

Figures

Tables

ABBREVIATIONS AND ACRONYMS

AC	Afghanistan Compact
ADB	Asian Development Bank
ADF	Afghan Development Forum
AISA	Afghanistan Investment Support Agency
ANDS	Afghanistan National Development Strategy
ARTF	Afghan Reconstruction Trust Fund
BCM	Billion cubic meters
BPD	Barrels per Day
BTU	British Thermal Units
CAR	Central Asian Republics
CASA	Central and South Asia
CDCs	Community Development Councils
CFL	Compact Fluorescent Lights
DABM	Da Afghanistan Breshna Moassessa (the Afghan electric utility)
EIA	Environmental Impact Assessment
ETS	Eastern Transmission System
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GWH	Giga-Watt Hour
GOA	Government of Afghanistan
JCMB	Joint Coordination and Monitoring Board
ICE	Inter-Ministerial Commission on Energy
IPP	Independent Power Producers
IROA	Islamic Republic of Afghanistan
kW	Kilowatt (Unit of electric capacity)
kWH	Kilowatt-Hour (Unit of electric energy)
MDG	Millennium Development Goals
MEW	Ministry of Energy and Water
MHP	Micro-Hydro Plant
MoE	Ministry of Economy
MOF	Ministry of Finance
MOJ	Ministry of Justice
MoM	Ministry of Mines
MoUD	Ministry of Urban Development
MRRD	Ministry of Rural Rehabilitation and Development
MW	Mega-What (measure of energy capacity)
MWH	Mega-Watt Hours (measure of energy flow)
NEPA	National Environmental Protection Agency
NEPS	North-East Power System
NGOs	Non-Government Organizations
NRRDC	New & Renewable Energy Research and Development Center
NSP	National Solidarity Program
NTS	Northern Transmission System
NURC	National Utility Regulatory Commission
O&M	Operation and Management
PPA	Power Purchase Agreement

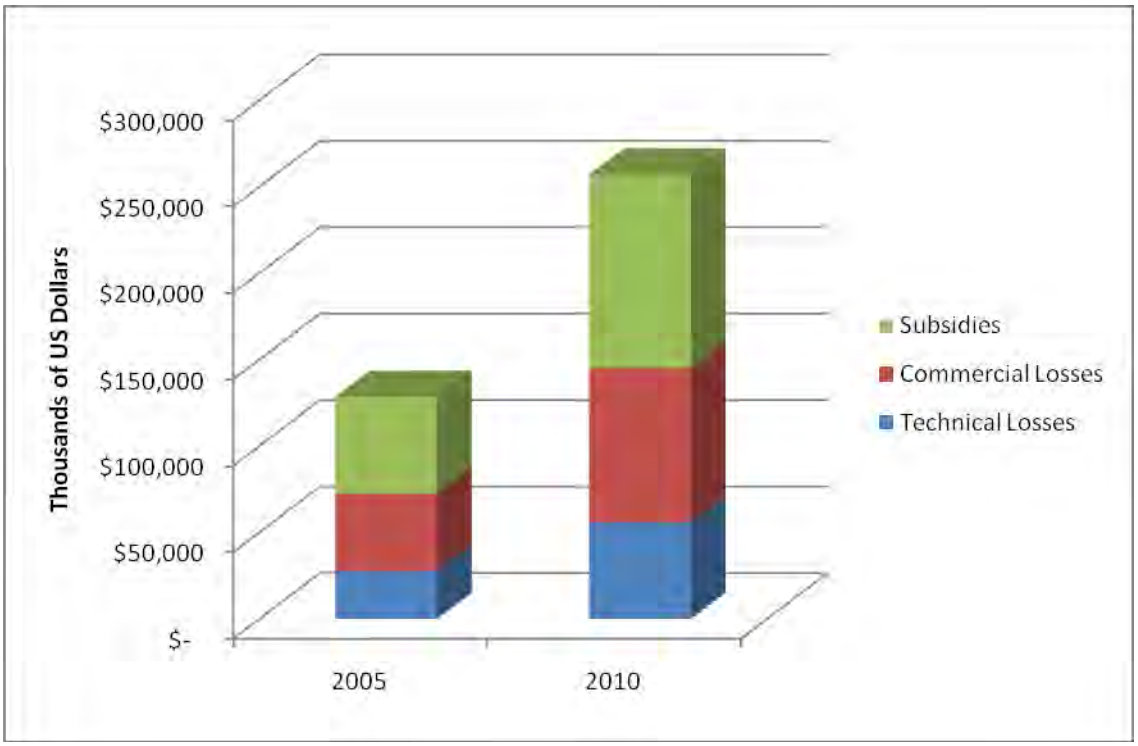
PPP	Public-Private Partnership
PSA	Production Sharing Agreement
PV	Photovoltaic
RIMU	Reform Implementation Management Units
RLED	Rural Livelihoods and Energy Department
SEPS	South-East Power System
SHS	Solar Home System
SOE	State Owned Enterprises
TAP	Trans-Afghan Pipeline
TCF	Trillion cubic feet
TSC	Technical Standards Committee
USGS	United States Geological Survey
USAID	US Agency for International Development
WB	World Bank
WTS	Western Transmission System

I. EXECUTIVE SUMMARY

Afghanistan's energy sector and its economy are at a crossroads. Energy, abundantly and cost effectively supplied, can be a very important input in the sustainable development of Afghanistan. However, energy is no panacea. In fact, if it is supplied imprudently, instead being a vehicle for growth, it will pull down the Government's development efforts and be a drag on economic growth. Capital investment in energy is rising rapidly attesting to the efforts to the Islamic Republic of Afghanistan (IROA) and the donor community. At the same time though, the efficiency of energy operations is not increasing. If left unchecked, much of the investment that is being made will be wasted.

To illustrate this gravity of the problem, the cost of losses has been estimated. Because of the state of the infrastructure and the familiar short comings of Government owned and operated energy provision, losses are enormous. Losses in 2005 amounted US$ 128.5 million.

Figure 1. Annual Impact of Poor Commercial Operations and Subsidies



The actual cost to the economy is greater! What this highlights is that continuing to operate on a business as usual basis is unsustainable. The number one priority in the energy sector must be on operating efficiency: commercialization of DABM, investments in transmission and distribution to reduce losses, and, repair and maintenance of all power assets. Moreover, it is important to focus now on efficient use of energy and the enabling policy, legal and regulatory frameworks should address this aspect.

When this is considered against the Afghan Compact Goals, the importance of efficiency becomes even more important. By 2010 the number of connections to meet the AC goals will rise by 211 percent while capacity will increase only 194%, assuming that imports go

according to plan. This means that unless there are changes in efficiency, the average kWh consumed per connection **must** go down. This is not a recipe for economic growth. Compounding the problem and not included in this analysis are that the demand for power will actually rise and that with more connections the cost of unserved energy will rise. While it is imperative that additional infrastructure be added, it is even more important that the IROA focus on efficiency. While much can be done by the Government, the real solution lies in creating and expanding a meaningful role for the private sector.

Realizing that the Afghan economy is starved of reliable and cost effective energy, the immediate task of the IROA, with assistance from the Donor community, is then to (1) provide energy to those that can use best use and pay for it and for economic growth, that may well be business, (2) in the quantities and quality that they need, (3) at a price that covers cost (for all but the poorest members of society), and (4) to do so in the most cost effective manner. At the same time though, it must begin to take steps that will provide a solid footing for the transition of the sector from Government provision to Private Sector provision. This strategy acknowledges that there are many steps that need to be taken on the road to fully involving the private sector. It will begin with changes in policy and laws and in some small way in the involvement of the private sector in rural energy provision and in outsourcing at DABM. It is a gradual process that will be enhanced by a deliberate process of reform.

The availability of secure energy supplies within Afghanistan was significantly disrupted by the conflicts of the past two decades. Post-conflict efforts by the Islamic Republic of Afghanistan (IROA) and international donors to date have focused on expanding the availability of energy resources throughout the country. Particular emphasis has been on expanding and rehabilitating the electricity sector in the major economic hubs of the country and providing basic service in rural areas. Efforts also have been taken to improve the supply of natural gas, increase availability of hydro-electric generation, rehabilitate and expand electricity and natural gas transmission and distribution systems, develop renewable energy resources in rural and remote areas, increase low-cost power imports and improve the capability of energy sector institutions.

Since 2001, Afghanistan energy efforts have focused on "bailing out the boat" or keeping the lights on and providing heat in the winter. At some point, one must also focus on stopping the flow of water before they become exhausted. The short term focused activities alone can continue only so long before the long term growth path of the country is adversely impacted. Having achieved moderate success in these areas, the time is ripe to review current activities and programs and place greater emphasis on behalf of the IROA and donors on a more long-range, sustainable future for the energy sector. This would include balancing on-going efforts to rehabilitate and expand energy resources with a longer-term strategy for the sector.

The Afghan Energy Strategy contains an implicit prioritization of energy subsector activities. Electricity is given far greater preference or priority than other sectors because modern economies are built on electricity. Priority is then assigned to other subsectors based on their supporting role in electricity and in overall economic activity. In practical terms this means that MoM and MoCI need to prioritize their policies, programs and projects towards the production of fuels for electricity generation. The strategy is based on four prongs or pillars.

1. Increased Efficiency in Existing Operation: At this time, it is easier, faster and cheaper to gain a megawatt of power from increasing efficiency than from building a new generating plant. Moreover, attacking end-use efficiency now, does not cost the Government anything but actually reduces overall costs. For example, for every US $5 the Government spends in providing compact fluorescent light bulbs, it actually saves US $51 and 49 watts.
2. Improved Sector Governance and Public-Private Partnership Promotion[1]: The ultimate success of the energy sector depends critically on mobilizing the private sector. This can begin now with establishing a multi-sector regulator, looking to outsource at State Owned Enterprises, preparing the enabling legal, policy and regulatory infrastructure for business, and the commercialization of SOEs.

   Additionally, coordination among the Government entities must increase and coordination between the Government and the Donor community must likewise be strengthened. Assistance needs to be given to ICE to strengthen its capacity. An integrated energy master plan is required to serve as a road map for the Government and Donors alike. Finally, to accomplish all of this, capacity must be significantly strengthened and training is an imperative
3. Rural Energy versus Rural Electrification: Most rural Afghans are unable to pay for expensive electricity. Energy is required for growth but energy alone won't do the job. The role of rural energy to seek out opportunities for economic activities that lack energy, that will pay for energy, and, thereby subsidize rural energy consumption while raising rural incomes at the same time.
4. Expanded or New Supply: Investments in new capacity or energy infrastructure: A lot of progress has been made, but not enough, in creating new supply. It is time now that the Government and Donor community can consider alternative supplies such as wind energy or reducing consumption alongside the more traditional methods. New supply must be rationalized and efforts focused on a few large projects such as the North East Power System.

These are the pillars of Afghanistan's near term energy strategy. Alongside addressing the immediate and short term needs, it is imperative that the country look to longer term issues. Because it is building its energy infrastructure anew, it can learn from the lessons that other countries now painfully address. It can focus on energy efficiency, renewable energy and decentralized energy. If it does this at the same time it builds its industrial base, then the benefits are enormous. Thus, while a national grid is important to transport power from cheaper markets, it will prove more beneficial in the long run to focus on decentralized power. A recent British study concluded that 61 percent of the energy value of the primary fuel disappears. "Another 4 percent vanished in transmission." This means that roughly two thirds of the energy is lost in a centralized system. By locating power generation closer to users, these losses can be significantly reduced. Thus, the long term strategy will increasingly focus on cogeneration, distributed power, renewables and end-use efficiency as well as the more traditional areas.

The strategy is focused on poverty reduction through all its four pillars. First, by improving operating efficiency, the drain on government resources is reduced. More is available for other programs. Similarly, by focusing on end-use efficiency, the drain on the customer's

[1] Clearly there is overlap between pillars 1 and 2. Increased efficiency will in some part necessitate improved Governance and the ultimate efficiency gains will be possible only with private provision. These commonalities notwithstanding, these two areas are different in their major focus.

resources is reduced. More of their income is available for other things. Second, improving sector governance will also have a significant impact on poverty. It will bring about better subsidy mechanisms so that the subsidy is targeted to those that need it the best way possible. Yes, it will reduce the overall level of subsidy in the sector but the neediest members of society will have access to energy at subsidized rates. Moreover, every Afghani of subsidy that can be freed up in this sector, can be used in other sectors. Third, this strategy reorients rural energy to focus on income generating activities. Thus, by definition this is a poverty reduction activity. Fourth, the economy is starved for energy. The fourth pillar is the investment in new energy supply and the economy can't grow without energy; poverty can't be reduced in Afghanistan without economic growth. Finally, the combined impact of these policies, programs and projects will be more energy supplied more efficiently and reliably. This is a solid prescription for economic growth, which growth is important for poverty reduction.

II. INTRODUCTION

Energy, abundantly and cost effectively supplied, is an important input in the sustainable development of Afghanistan. It is a necessary but not sufficient condition for economic growth. Energy provided cost effectively in sufficient quantity and quality on a sustainable basis will support economic development and employment; help reduce poverty; contribute to social and political stability both within Afghanistan and regionally; improve living standards; and contribute to a reduction in environmental impacts. Energy alone, though, is no panacea to Afghanistan's problems.. In fact, if it is supplied imprudently, instead being a vehicle for growth, it will drag down the Government's development efforts and be a drag on economic growth.

Realizing that the Afghan economy is starved of reliable and cost effective energy, the immediate task of the IROA, with assistance from the Donor community, is then to (1) provide energy to those that can use best use and pay for it, (2) in the quantities and quality that they need, (3) at a price that covers cost (for all but the poorest members of society), and (4) to do so in the most cost effective manner. At the same time though, it must begin to take steps that will provide a solid footing for the transition of the sector from Government provision to Private Sector provision.

The availability of secure energy supplies was significantly disrupted by the conflicts of the past two decades. Post-conflict efforts by the Islamic Republic of Afghanistan (IROA) and international donors have focused on expanding the availability of energy resources throughout the country. Emphasis has been on expanding and rehabilitating the electricity sector in the major economic hubs of the country and providing basic service in rural areas. Efforts also have been taken to improve the supply of natural gas, increase availability of hydro-electric generation, rehabilitate and expand electricity transmission distribution system, develop renewable energy resources in rural and remote areas, increase low-cost power imports and improve the capability of energy sector institutions.

Since 2001, Afghanistan energy efforts have focused on "bailing out the boat" or keeping the lights on and providing heat in the winter. The short term focused activities alone can continue only so long before the long term growth path of the country is adversely impacted. Having achieved moderate success in these areas, the time is ripe to review current activities and programs and place greater emphasis on behalf of the IROA and donors on a more long-range, sustainable future for the energy sector. This would include balancing on-going efforts to rehabilitate and expand energy resources with a longer-term strategy for the sector.

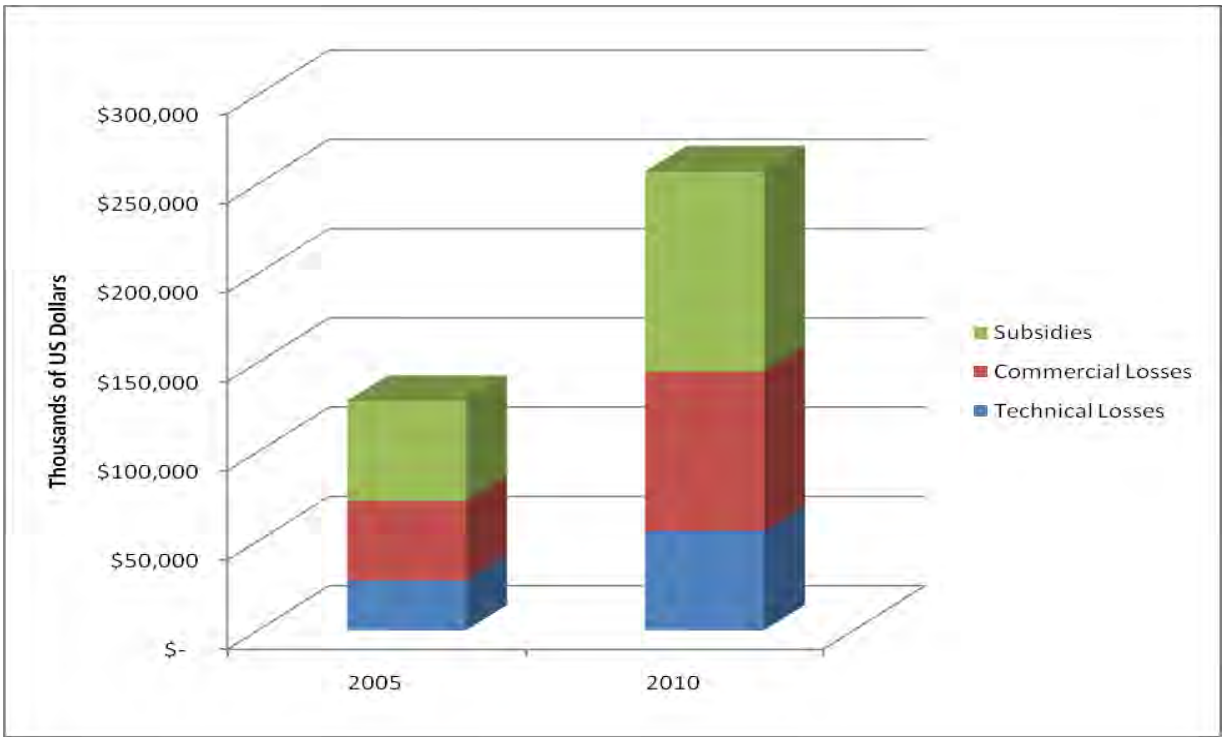
To illustrate this gravity of the problem, the cost of losses has been estimated. Because of the state of the infrastructure and the familiar short comings of Government owned and operated energy provision, losses are enormous. Technical losses in power are 30% where as in a reasonable system they would be on the order of 10%. This 20% loss of energy equates to a substantial financial drain. In 2005, Afghanistan produced and imported 1,162.3 Gwh of power[2]. If 20% of this is lost, this means 232.5 MWH and at $0.12 per kWh[3], the cost of these losses amounts to $27.9 million annually. To this must be added the cost of subsidies, or $56 million a year. Finally, there are commercial losses. This covers everything from theft to that the fact that (1) not all power sold is billed and (2) not all power billed is collected. Collections are 60% of billing. It can safely be assumes that commercial losses are 40%, or 371.9 mWh for a cost of $44.6 million. This is dramatically illustrated in the following figure.

The total cost of losses and subsidies equaled $128.5 million in 2005. The actual cost to the economy is greater! What this highlights is that continuing to operate on a business as usual basis is unsustainable. The number one priority in the energy sector must be on efficiency: commercialization of DABM, investments in transmission and distribution to reduce losses, repair

[2] AEIC website 2005 electricity production.
[3] Soucre: MEW Power Sector Strategy.

and maintenance of all power assets. Changing business as usual also means changing how subsidies are provided. For example, if DABM provided each connection with one CFL to replace one incandescent bulb at the manufacturers cost of $5, it would save 38.8 thousand mwh per year in generation and reduce its losses by $US 3 million per year. It would cost DABM only $1.2 million to change out the bulbs, a rate of return of 17% and the bulb program would pay for itself in 2.5 years. Beyond the financial rewards, this is the easiest way to reduce commercial losses and make more power available. This is equivalent to a 38.8 MW boost in power with no additional investment and in a very short time frame. A 38.8 MW power plant would cost on the order of $40 million.

Figure 2. Annual Impact of poor commercial operations and subsidies



The IROA will continue to rely on energy from diversified sources. However, modern economies are driven off of electricity and so the paramount objective in jump starting Afghanistan's energy sector and, therefore, its economy must give priority to electricity and then transportation fuels. In rural areas, it means linking income generating activities to energy and this means providing a slate of energy supply options. This will mean a great deal of coordination among ministries and agencies and it may mean subordinating one Ministries plans to that of another.

This report provides an overview of Afghanistan's energy sector highlighting basic elements and issues and then offers an Energy Sector Strategy to address these issues over the next 2-to-10 year period.

Importance of Energy for Economic Development

The goal of the Afghanistan Energy Sector Strategy is to deliver sufficient energy to support the projected economic growth rate of 9-10% per annum,[4] which in turn will help lower poverty by 3% a

[4] This has been the Government's growth goal for the economy since 1383 (2004) (See: Securing Afghanistan's Future), and is estimated to be sufficient growth to build a legal economy while eliminating illicit the trade without causing devastating poverty.

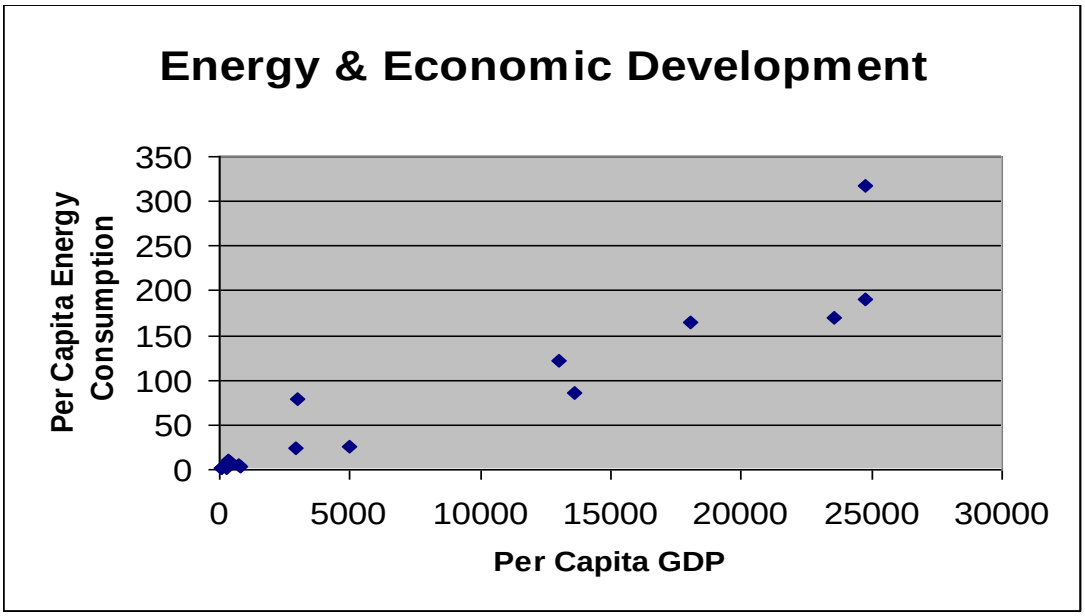
year[5] and to do so in the most cost effective manner. In accordance with the AC, this is translated into the following sector specific goals.

> *By end-2010: electricity will reach at least 65% of households and 90% of non-residential establishments in major urban areas and at least 25% of households in rural areas; at least 75% of the costs will be recovered from users connected to the national power grid. A strategy for the development and use of renewable energies will be developed by end-2007."*

Economic growth that raises incomes and reduces poverty is strongly correlated with increased energy use. Energy is used in the production process of every sector of the economy. The provision of adequate and reliable energy services at affordable and cost-based prices, in a secure and environmentally sustainable manner, and in conformity with social and economic development needs, is an essential element of sustainable development. A sufficient supply of energy is **a** vital input for eradicating poverty, improving human welfare and raising living standards.

The correlation between commercial energy and development is aptly shown in Figure 3 where per capita GDP is measured against per capita energy consumption. If Afghanistan is to grow and take its place among industrializing nations, then it must have more electricity, petroleum products, and natural gas. Modern economies require modern fuels.

Correlation does not imply causation and adequate supply of commercial energy is a necessary but not sufficient condition for economic growth. Economies can't grow without commercial energy but simply providing more energy to an economy does not guarantee growth. What this means for the Energy Sector Strategy is that energy must often be combined with other interventions. Providing adequate, cost effective energy supplies to an area where there is commercial and/or industrial activity, may lower costs and allow things to be done. This in turn will create jobs and expand the economy. Jobs will include those in the sector; for example, miners, electrical workers and oil rig workers as well as those in industries set up because energy was available. However, supplying the same energy to an area where there are few economic activities is no panacea. In that case, energy supply must be coupled with economic activity if it is to be effective and sustainable.

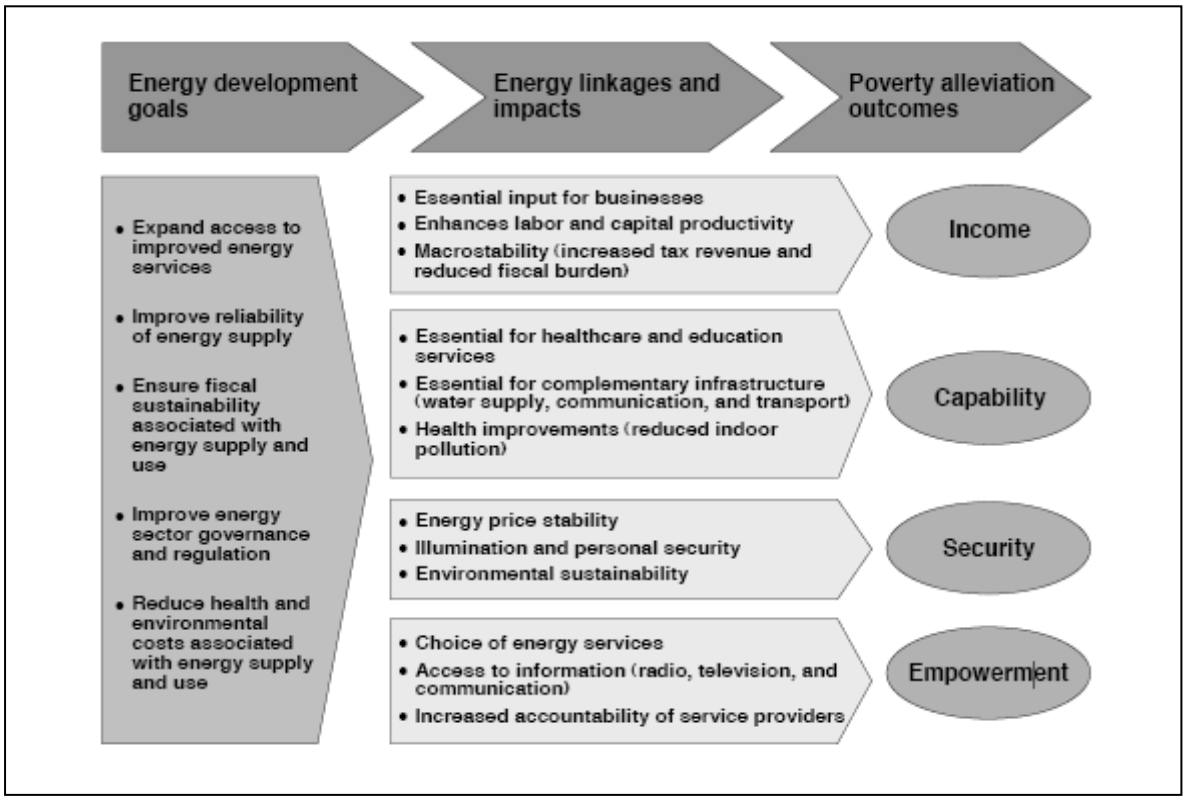


[5] Afghanistan Compact benchmarks.

Figure 3. Energy & Economic Development

The overwhelming majority of the population of Afghanistan lives in rural and remote areas. Over the medium to long term is where energy investments and policy reforms can make the greatest impact in reducing poverty, improving the quality of life, and supporting achievement of the ANDS cross-cutting goals. A priority effort in this regard will be to conduct a comprehensive energy needs and consumption survey to support more focused and effective delivery mechanisms for rural projects. ***Figure 4: Energy-Poverty Framework*** highlights goals, impacts and outcomes, as they relate to the energy-poverty nexus.

Figure 4. Energy Poverty Framework



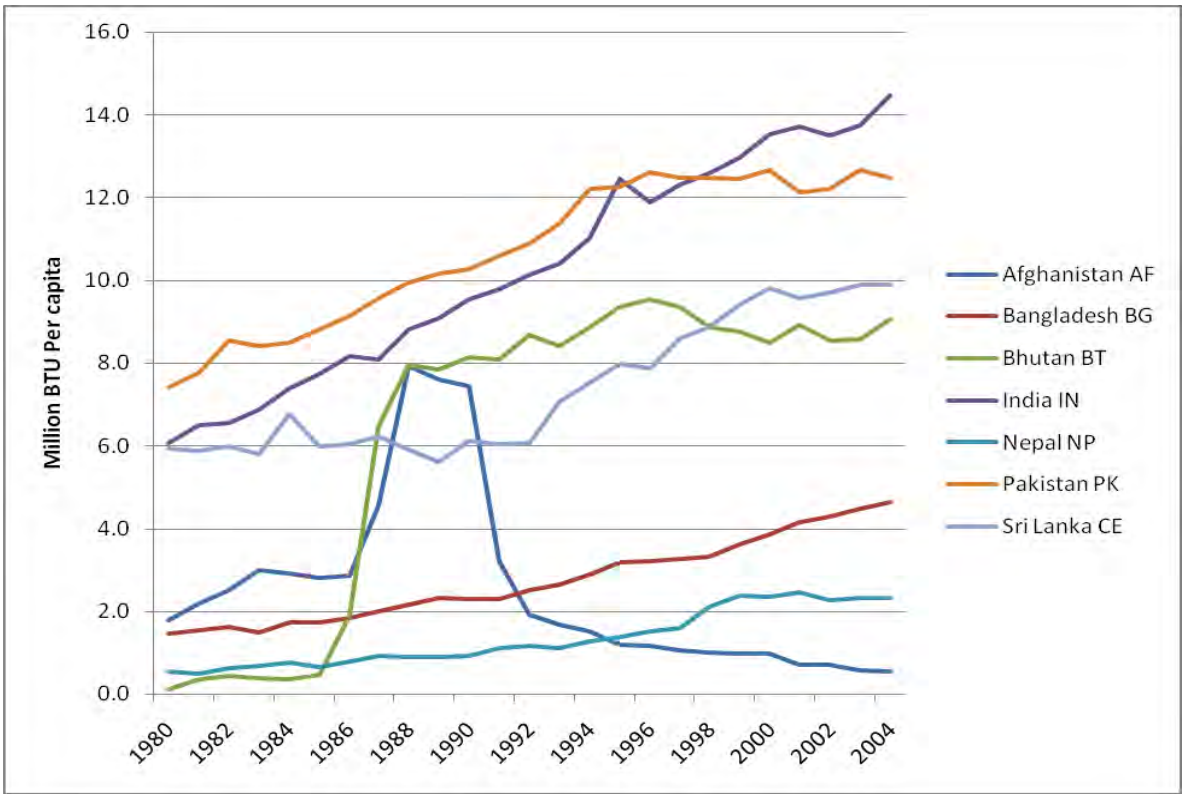
III. CONTEXT: CURRENT STATE OF THE ENERGY SECTOR

1. The State of the Overall Energy Sector

As mentioned earlier, modern economies demand energy and there is a strong direct relationship between per capita GDP and per capita energy consumption. Economic growth is not accompanied by declining energy consumption! Perhaps the most compelling description of the energy sector in Afghanistan is shown in Figure 5. In 1980, the per capita energy consumption of Afghanistan was fourth in the region, greater than that of Sri Lanka and Bangladesh. By 2004, per capita consumption had fallen drastically from slightly less than 2 million BTU per person to just around 0.5 million BTU. This is at a time when all other economies in region exhibited strong growth. The significant jump in consumption between the late 1980s and early 1990s was due to the export of natural gas to Russia.

Reliable energy data for Afghanistan is about as scarce as energy in Afghanistan. The data below are from the US Energy Information Administration, the US National Renewable Energy Laboratory and other Afghan sources.

Figure 5. Per capita Energy Consumption



Electricity (hydro and imports) comprises the vast majority of energy consumed or about 77% of commercial energy. This is followed by coal, natural gas and then petroleum. Figure 6 below presents the composition of commercial energy in 2005. Petroleum products account for less than 1% of primary energy consumption.

Figure 6. Primary Energy Consumption, 2005

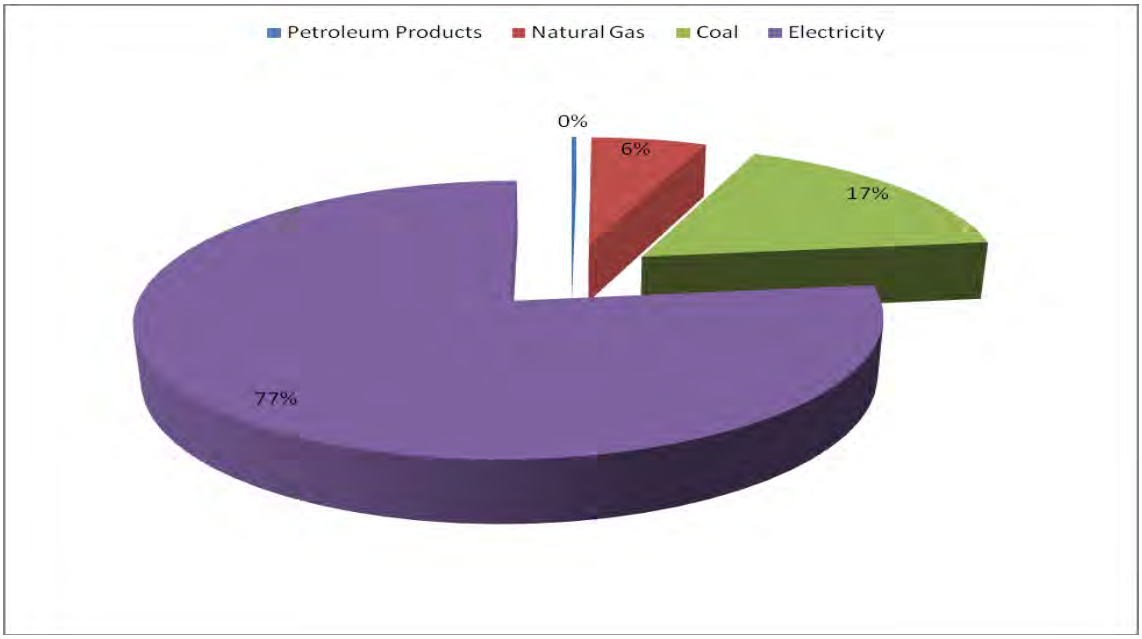


Table 1 presents commercial energy or energy that is bought and sold in commercial markets such as coal, oil, and gas. It excludes the vast amount of biomass energy that is consumed and in countries like Afghanistan traditional energy represents a major source of energy. Afghanistan has gone from where it exported energy, natural gas to the Soviet Union, to where it imports a substantial amount of energy. In 2005, over half of the commercial energy consumed came from imports. This is due to the deterioration in energy infrastructure rather than an increase in consumption. As can be seen, consumption has remained relatively the same over the last several years being constrained by the ability to import energy.

Table 1. Historical Primary Energy Data
(Quadrillion Btu)

	1980	1990	2000	2001	2002	2003	2004	2005
Production	0.073	0.119	0.014	0.007	0.010	0.009	0.009	0.008
Consumption	0.027	0.109	0.024	0.017	0.020	0.018	0.018	0.019
Imports	-0.046	-0.010	0.010	0.010	0.010	0.008	0.009	0.011

Source: US EIA

Energy in Afghanistan in recent history can be categorized as a period where supply has always been short of demand, as it has in many similar countries. The demand for energy outstrips current supply in every category of energy, including traditional energy which is unsustainably harvested. Much of the deficit in supply can be blamed on the lack of investment, cannibalization and carnage that has accompanied Afghanistan's civil crises since 1978. As civil strife strains financial resources new investment is abandoned, routine maintenance is postponed; spares are taken from one plant for another; skilled human resources that are needed to maintain the capital stock leave; and soon parts are stolen and sold for other uses. Sad and unpreventable as this is, a large share of the gap can be blamed on faulty resource allocation policies.

Subsidies, as they are so often carried out, create a vicious downward cycle. For example, the electric utility often does not collect enough to pay for operating cost let alone capital costs. This is because

(1) thirty percent of the energy it supplies is lost, (2) some energy that is consumed that is not billed, (3) some energy that is billed is not collected, and (4) the price of energy is below the cost of production. When the utility does not collect enough, it begins to let maintenance slip and as a result, technical losses increase; consumers with lower power quality, see less reason to pay and so collections are even lower. As it continues it leads to a downward spiral.

As mentioned earlier, combined losses and subsidies are costing the Government $128.5 million annually. As can be clearly seen in Table 2, this is unsustainable. Given that infrastructure investments are growing and increasingly more power is being produced, unless radical changes take place, losses will steadily climb. These losses are not only a drain on the power system. They represent resources that could be going to more energy or to other development needs. It is clear that changing this must be a top priority in the electricity sector.

Table 2. The Cost of Losses and Subsidies (2005)

	MWH	US $ Thousands
2005 (AEIC) Supply	1,162,304	
Technical Losses	232,461	$ 27,895
Available for Sale	929,843	
Commercial Losses	371,937	$ 44,632
Subsidies		$ 56,000
Total		$128,528

The energy sector in Afghanistan is predominately state owned and operated with little private sector participation. Although encouraging private investment is a stated goal of the IROA, the substantive work that is required to create the enabling environment for meaningful private sector participation is absent. The proper place to begin is with the adoption of an overarching energy law and redrafting of the sub-sector laws to adequately address the required enabling frameworks. The energy sector and its sub-sectors (electric power, coal, oil, gas, renewable energy) are undergoing significant expansion. However, poor infrastructure, insufficient budgetary resources, lack of trained personnel and weak government policies (including non-resolution of inter-ministerial cross-cutting issues), have complicated and in some instances significantly delayed energy resource development and deployment. The result is that each sub-sector's entities often are not able to effectively maintain, repair, manage or expand the system to meet the country's needs. Development of Afghanistan's fossil fuels, in particular natural gas and coal, require large capital investment and significant private sector participation to reach fruition.

2. The State of the Energy Sub-sectors

Electricity

Electricity drives modern economies and per capita consumption of electricity in Afghanistan is one of the lowest in the world. After a long period of decline, generating capacity, is beginning to grow again as are generation and consumption. Hydro plants account the largest share of capacity with imports in second place and growing.

The most promising long-term resource for power generation in Afghanistan is hydropower, which accounts for over 50% of grid-connected installed capacity[6]. Following hydropower, thermal

[6] In the 1980 Master Plan it was estimated that Afghanistan has the potential of developing about 23,000 MW of additional hydro generating capacity, with 18,000 MW located on the Panj and Amu Rivers that form the border with Tajikistan and

generation, primarily diesel generation, supplies power mainly to urban areas. Utilization of indigenous fossil fuels (natural gas and coal) for power generation is very limited as is utilization of solar, wind and other renewable energy resources. Reliance on diesel is both expensive and environmentally hazardous. Diesel generation costs almost 30 US cents per khw compared to natural gas at 3.5 US cents per kWh. **Efforts are underway to utilize local natural gas for power production and this should remain a top priority.**

Figure 7. Power Capacity (MW) 2007

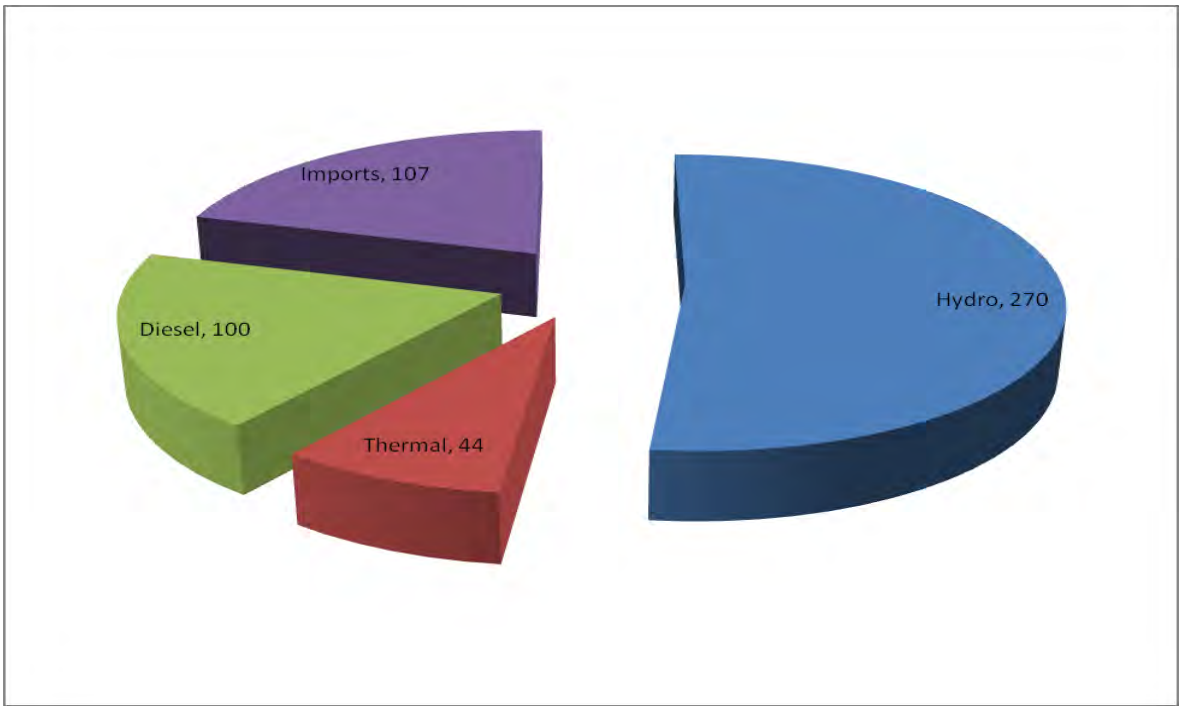


Table 3 provides historical data on generation, consumption and capacity.

Table 3. Historical Electricity Data

	1980	1990	2000	2001	2002	2003	2004	2005
Generation (billion kWh)	0.94	1.10	0.47	0.39	0.69	0.81	0.76	0.75
Imports (billion kWh)	0.00	0.00	0.10	0.20	0.15	0.10	0.10	0.10
Consumption (billion kWh)	0.88	1.02	0.53	0.56	0.79	0.86	0.81	0.80
Capacity (million kW)	0.426	0.494	0.405	0.265	0.264	0.323	0.323	0.320

Rural power supply continues to rely mostly on micro-hydro plants (MHPs), limited diesel (mostlyprivately owned), and batteries, with very limited availability to the rural population.[7] Most rural power generation efforts are funded by donors with limited cost-sharing by the Government.

Uzbekistan. The remaining 5,000 MW potential is primarily in two areas, about 1,800 MW on the Kokcha River and 3,200 MW in the Kabul River basin.

[7] There is no reliable estimates of rural electricity coverage; some anecdotal evidence, including discussions with senior executives with DABM, indicates coverage from all sources is over 7%, other estimates place it as high as 14%.

Connecting each new customer to the system is expensive, and can cost up to $1,000 or more in distribution costs alone. For Kabul, total costs to expand the distribution system are estimated at US $310 million. Weak distribution systems can lead to significant power losses, with estimates for the Kabul system at about 40%. As stated earlier, technical losses amount to around $28 million per year. Since most initial assistance focused on rehabilitating and upgrading generation, **funding for and implementation of transmission and distribution system improvements must now be a high priority.** Since it is faster and cheaper to correct technical losses than to put in a new large scale power plant, this should take equal, if not greater, priority with capacity additions.

Table 4. Generation Costs

Type	Average Estimated Unit Price (USc/kWh)
Hydro	2.29
Thermal (NW Kabul)	27.115
Imported	2.62
Diesel (All Provinces)	29.53
Hydro and Diesel	5.19
Hydro, Thermal and Diesel	6.473
Natural Gas	2.8 to 3.5
Coal	NA

Source: DABM. The estimated cost of power from natural gas is based on Sheberghan power plant; no estimate of cost of coal fired capacity is available at this time.

Table 4 shows the cost of generating power from various sources on the Afghanistan power system. The cost of generation differs significantly and displacing diesel generation with other energy sources through a least-cost expansion plan can reduce costs significantly. Moreover, it excludes the cost of transmission and distribution. When this cost is included, extension of the grid may often be more expensive than decentralized generation including many renewables.

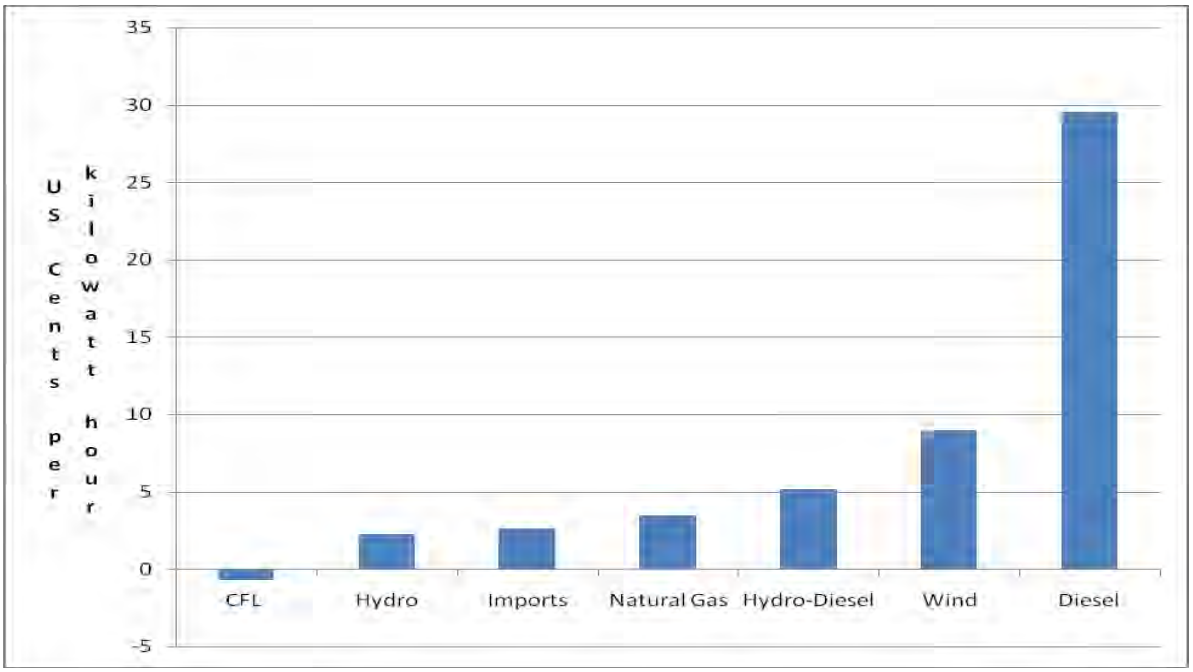
The financial condition of the sector and the utility is going from bad to worse because there has been little improvement in tariffs and operations while at the same time substantial assets have been added to the system. Maintaining and operating these is expensive and if the Government does not shift its focus from building new infrastructure alone to efficiently operating and maintaining what is has, the burden on the economy will be enormous.

So, what Table 4 clearly shows that if DABM wants to expand generation, then there is a rank order based on cost. Clearly, hydro and imports are preferred to diesel as is natural gas. However, what Table 4 does not show is the cost of increasing electricity supply and this is a more important concept in the case of Afghanistan given both the imperatives of cost and time. Electricity supply can be increased by increasing generation, increasing efficiency (reducing technical and commercial losses) and by reducing the demand for electricity. In fact, because the Government subsidizes electricity, it actual saves money for every kilowatt hour it can reduce demand while it spends for every kWh that it generates.

One simple example will the importance of concentrating on reducing demand. For every compact fluorescent light (CFL) bulb used, there is a saving in energy over the standard incandescent bulb. If a 60W bulb is replaced with a 14 watt CFL, there is saving of 46 watts. Over the life of the bulb, 10,000 hours on average, this is saving of 657 kWh. If the bulb costs US$ 5, then the cost of freeing up a kWh is US subsidy amounts to 0.8 US cents per kWh or one third that of hydro and it takes far less time to do this. If the subsidy is considered, then the Government actual saves money by helping

consumers be more efficient. For every US$ 5 the Government spends (on a new CFL), it reduces the amount it spends on the subsidy by US$ 51. This can be seen in Figure 8.

Figure 8. Cost of Supply



Petroleum

Relative to other forms of energy and to the region, Afghanistan has minimal oil and gas resources and consumption at this time is mainly transportation fuels and liquid fuel for power. Currently petroleum products such as diesel, gasoline, and jet fuel are imported, mainly from Pakistan and Uzbekistan, with limited volumes from Turkmenistan and Iran. Natural gas holds potential for power generation but suffers from a severe lack of investment.

Natural Gas

Natural gas it not yet a significant energy resource, although it has the potential to be a significant source of energy for the country and an important source of revenue to the Government. The consumption of natural gas is supply constrained just as it is for all other energy resources. Consumption and production have been declining from the highs of the 1990s because the infrastructure has been abandoned in practical terms and there has been very little effort to locate new resources. The data in the table below

Table 5. Natural Gas Energy Data
(Billions of Cubic Feet)

	1980	1990	2000	2001	2002	2003	2004	2005
Production	60	104	8	2	2	1	1	1
Consumption	2	67	8	2	2	1	1	1
Reserves	NA	NA	3,530	3,530	3,530	3,530	3,530	3,530

Source: US EIA.

Production and Reserves

Production of gas is estimated at about 21.2 million cubic feet/day, although it is likely that this is an overestimate[8]. In 2003, the World Bank reported that Afghanistan "meets only 40% of increasing domestic natural gas demand, produces gas at 25% of its peak level in the 1980's, and loses 30% of that production to leakage - posing revenue and safety issues." By 2006, this had fallen to about 20% of gas demand being met. To increase production, both the complete infrastructure must be re-built and/or constructed as new, and new exploration and development must be undertaken.

Like other energy prices, current gas prices are too low to cover costs of rehabilitation, O&M and expansion of production and infrastructure. For incremental gas production, tariffs may be less than half of the level needed to cover costs. Moreover, the IROA collects no taxes or royalties from the natural gas sector, missing out on a potentially major source of revenue. As a result, sector entities have been unable to effectively operate, repair and maintain the system. A large part of the infrastructure for storage, transmission and distribution has been damaged while the remaining capacity is in need of rehabilitation. There is no incentive to conserve or to optimize use of gas resources as the present cost is so low and operations are so inefficient.

There is a good deal of uncertainty about reserves that can only be resolved with further exploration. Studies put proven reserves between 1 trillion cubic feet (tcf) and 15 to 20 tcf. Other studies estimate additional probable reserves of 15 or 20 tcf. Regardless, of the whether reserves are 1 tcf or more, there is still sufficient gas to justify immediate exploration and develop and utilization in power and, possible, for compressed natural gas (CNG) vehicles.

Crude Oil

Afghanistan has only limited supplies of oil. According to the USGS reserves are 13-14 million tons. Domestic oil production is insignificant with current production is about 400 barrels/day.[9] As a result, Afghanistan depends on imports for most of its consumption. Oil is produced in limited quantities primarily from the Angot oil field, located in Sar-i-Pol province. The U.S. government estimates that total oil reserves could be as much as 270 billion barrels.

If investments take place as envisioned, it is estimated that oil production could increase from the current 400 bpd (barrel of oil production per day) to 3,000 bpd by 2008; 5,000 bpd by 2010 and 10,000 bpd by 2015. Clearly, however, the increased investment will require changes in the laws, rules and regulations in the sector and creating an environment conducive to expanded private sector involvement. Total revenue streams from these investments are estimated to increase, at a minimum, from $5.1 million in 2004 to about $292 million/year by 2015 assuming a price of $80 a barrel. These revenue estimates do not include additional revenue from value added taxes that could be derived from converting the crude oil to refined petroleum products.

Petroleum Products

Afghanistan does not have an operating refinery and so imports all of its refined products. During the Taliban regime a 3,000 bpd refinery had been constructed but was never operational. To increase value added output, the IROA is considering construction of an oil refinery (approximately 10,000 bpd) in North East Afghanistan to refine crude oil produced domestically in the region. If constructed, this refinery would reduce Afghanistan's dependence on imported oil products and improve the quality of refined products consumed in the country. Preliminary estimates for range from $12-$32 million, depending on configuration, infrastructure requirements and other factors.

[8] Engineer Amir Zada, Director of Oil and Gas, Ministry of Mines, November 2006

[9] Securing Afghanistan's Future: Accomplishments and the Strategic Path Forward; OIL AND GAS Technical Annex, January 2004.

All petroleum are imported through the neighbouring countries of Pakistan, Iran, Turkmenistan, Uzbekistan, and Tajikistan[10]. Afghanistan consumes approximately 1,200,000 tons of state-supplied fuel per year[11]. This includes all types of petrol and diesel as well as mazut and kerosene. It is estimated that about 80% of these fuels are consumed for automotive purposes, while 20% are used for power auto-production (gasoline mainly) or small-scale grid power generation (diesel mainly), and water pumps. Demand for liquid fuels in Afghanistan has increased dramatically in the past five years; with continued and increased reliance on diesel generation, air traffic and home uses, this demand is expected to increase. Additionally, fuel quality is quite poor compared to international standards and is often adulterated.

While previously the government had a monopoly on petroleum products trade, this sector is now entirely in private hands. Ten traders are registered with the Ministry of Transport, as are the 2,658 trucks that are authorised to import petroleum products into Afghanistan. The Petroleum and Gas Enterprise (Liquid Fuels), under the auspices of the Ministry of Commerce and Industries, oversees 1600 gas stations and 1300 fuel trucks. Infrastructure as well as operational improvements could provide an opportunity for private investment and more transparent operations.

There has been no donor support to this sector. Instead, more than 30 reported private contractors work with the Petroleum and Gas Enterprise to supply Afghanistan's gas stations with fuel as well as to import diesel fuel for power generation.

LPG has been increasingly popular as a residential fuel in Afghanistan and the monthly consumption is estimated to have increased to 12 000 tons over Islamic year 1382. The retail price of LPG in Kabul is of 21-25 Af / kg, and far less in Herat, which is closer to the supplying countries. Turkmenistan is the main supplier, followed by Iran. The product is carried within Afghanistan in 15-20 tons trailer vessels, or in cylinders. LPG is stored in three dedicated depots: Kotal-e-Khain near Kabul, (80 tons capacity), Herat (110 tons capacity), and Hairatan near the Uzbekistan border (120 tons capacity). The unloading and bottling capacities at these plants are unknown, but these storage capacities seem small in comparison with the estimated overall LPG demand. LPG is sold to final consumers in cylinders with capacities of 10, 20, and 40 kg.

Coal[12]

Like all other in Afghanistan, the demand for coal does not drive production but rather production limits consumption. The table below illustrates the production and consumption position since 1980. The Afghan coal industry is operating at low production rates, less than 200,000 tons reported per year; devastation of more than 2 decades of war and years of neglect, Afghanistan's coal mines struggle to sustain current levels of production. The supply of coal is essential for domestic energy / heating and industrial uses. The quantity and quality of coal resources remains relatively unknown and programs to assess alternatives could take up to three years. As such, there will be a continued reliance on existing producing mines in Baghlan province as well as small mines in Bamyan provinces[13].

[10] Energy Sector Review and Gas Development Master Plan; ADB TA 4088; Sofregaz, June 2004.
[11] This figure excludes privately imported or other fuel imports not reported to the state.
[12] This section is taken from the work of Mary Louise Vitelli.
[13] Emergency Mine Rehabilitation assessment, World Bank, 2004.

Table 6. Coal Energy Data
(million short tons)

	1980	1990	2000	2001	2002	2003	2004	2005
Production	0.131	0.116	0.089	0.092	0.096	0.099	0.103	0.099
Consumption	0.131	0.116	0.089	0.092	0.096	0.099	0.103	0.099

Source: US EIA

Until the end of 2006, Afghan coal operations were primarily contained in state enterprises of Northern Coal Enterprise and Sabzak Coal with oversight of the Ministry of Mines. Some recent lease arrangements to private operators have since been put in place that provide private firms with coal mining rights affiliated with cement operations. In May 2007, President Karzai announced the establishment of a Coal Commission. The genesis of this commission is the increasing discussion within Government to promote indigenous energy resources for power use as well as to examine the industry demand for coal as a fuel source. No programmatic assistance has been provided to the Afghan coal sector.

Coal deposits and cost. In general terms there are 11 coal mines in Afghanistan with approximately 5 that have been deemed to be reasonably safe for operation and viable for local production and use. Considerable coal reserves have yet to be explored in Afghanistan. Coal is used in these mining areas as well as transported into Kabul and other cities; transport of coal is generally conducted by private market entities although some mines maintain their own transportation as well. The current price of coal is indicated to be $65-$90 per ton depending on transport costs – the actual coal price per ton is estimated to be around $20-$25.00. In terms of regional coal costs, this is high.

The health and safety conditions at the mines, many of which are underground, are horrific. An example is the ongoing fires at the Dahne Tor coal mine. US Geological Survey (USGS) experts visited the site in 2006 and indicated that unregulated mining observed is conducted in a seam that is several hundred feet (stratigraphically and topographically) higher than the main seam that was mined decades ago. The main mine was semi-mechanized, but everything is now collapsed, attributed by Afghan coal managers to landslides, poor technical oversight and general subsidence. It is estimated that millions of dollars are required to sufficiently upgrade the health and safety conditions at these mine operations.

Longer-term strategies for growth in the Afghanistan coal sector remain several years away but consideration of coal power is underway; the Ministry of Mines has included a 100MW coal fired power plant in its 1386 budget figures; this presents interesting inter-ministerial issues as the Ministry of Energy and Water is responsible for state power generation which is implied in this budget proposal. The confirmed quantity and quality of coal resources remains relatively unknown but appears good.

Coal Uses. Afghan coal is primarily used for home cooking and heating needs. The estimated demand for coal in Afghanistan is approximately 250,000 tones per year (for residential, commercial, and light industrial uses nationwide). Over the next three years it is expected that demand for coal will also increase as a result of the manufacture of cement and possible coal power development. Therefore, recovery of the cement industry will

significantly alter the total demand for coal. Mechanisms are not in place to transparently and rapidly address winter coal issues.

Coal for power. In addition to the Aynak copper power needs, Government has begun to assess the power needs of the proposed Hajigak Iron Ore deposit as well as simply the generation of coal for power to supply the central and western parts of the country that now have no or limited power access. This is a topic where both the Ministry of Mines and the Ministry of Energy and Water have important roles but have yet to determine strategic priorities for development of coal for power including methods to attract sustainable investment. Opportunities such as this argue for the development a cogeneration policy and simplified power purchase agreements for cogenerated power.

Rural and Renewable Energy

Renewable energy offers the greatest hope for Afghanistan in general and rural energy in particular. Renewable energy includes hydro, solar, wind, geothermal, biomass and wood. Hydro, both large and small, represents significant untapped resources. According to the ADB, there is 18,400 MW of untapped hydro potential in the country[14]. Afghanistan has excellent wind potential in many areas and is economical compared to diesel as shown in the table below.

Table 7. Wind Potential

Wind Resource Utility Scale	Wind Class	Wind Speed m/s	Total Capacity Installed (MW)
Good	4	6.8-7.3	75,970
Excellent	5	7.3-7.7	33,160
Excellent	6	7.7-8.5	33,100
Excellent	7	> 8.5	15,800
Total			158,100

Source: National Renewable Energy Laboratory

Not all of this potential wind energy can be economically converted into electricity because of a number of factors such as distance from population centers and wind speed. However, the first initial survey indicates that there is significant potential which can be tapped at around US$ 0.09 per kWh.

There is significant solar potential but it still remains a high cost energy resource for electricity. The Indian Government has funded a solar village initiative. While solar PV is expensive compared to the cost of generation for other alternatives, there is strong evidence that with the proper enabling environment of microcredit and training, solar home systems are a viable electricity source[15]. Solar cookers have shown significant promise in other countries and may have widespread application here. Solar cookers were deployed in Afghan refugee camps in Pakistan.

[14] Renewable Energy in Afghanistan, Regional Economic Cooperation Conference, Ali Azimi, 2006.

[15] For example, according to MicroEnergy International solar PV in Bangaldesh cost between US$ 0.45 to US$ 0.60 per kWh. Despite this high cost Grameen Shakti 70,000 solar home systems between 1996 and 2004.

It is important to note that there are many environmental benefits from using renewable energy such as reduced emissions (both indoor and outdoor) but the development of renewable energy must also consider the potentially negative environmental impacts. It is important that EIA guidelines be followed and the as with any energy project, public debate is an important tool.

There is an overwhelming view that rural areas need electricity and that providing access is the best use of resources for energy. An Asia Foundation survey in 2006 concluded that at the local level electricity was the second most important problem behind unemployment. When survey respondents were asked what were the largest problems at the national level, they citied electricity as the ninth most important problem. The Asia Foundation sample was not representative of the country from an energy perspective and used a definition for rural that obfuscates the real patterns of importance in planning development assistance[16].[17] The results from other countries consistently indicate that there is a hierarchy for demand to services and electricity is usually further down on the ladder than services such as an all weather road, water supply, schools, and clinics. For example, if the preponderance of survey respondents already have access to road, water and schools, then electricity may well be their next choice of service. In rural-remote Afghanistan, if Afghans are similar to the peoples of the region, then access to electricity will not be their most urgent priority.

Additionally, experience the world over has provided an important lesson with regard to blindly providing access to electricity. There is no guarantee that increased access to electricity will bring economic benefits. Simply look around in Kabul and other urban areas where residential access has increased. If access to electricity is not targeted to or coupled with income generating activities, then rural access brings lighting and little else.

Demand

Although there is little data for Afghanistan on rural energy use, inferences can be drawn from similar countries in the region. There is a tendency to assume that grid connected electricity offers the best form of energy for rural populations. Experience throughout the world has shown that there is a progression in the use of energy. Due to the dispersed nature of the rural population, renewable energy offers the best solution for electrification for the majority of Afghanistan's rural population that currently does not have access to electricity and has no real expectation of connection to the grid[18].

It is very important that the economic conditions and opportunities of rural population be fully understood when devising a rural energy strategy. Too often donors and Government officials have blindly followed a policy of rural electrification. The result has been much higher cost energy delivered than people can afford and little, if any, associated economic

[16] According to their survey, 49% of rural respondents had access to electricity and 89% of urban respondents had access. Their sample was not representative of the country with regard to energy access. In part, what they call rural actually represents sizable population centers. Moreover, their question did not ask if access to energy was an issue but rather the extent to which energy is a problem.

[17] The distinction between rural and urban in Afghanistan also causes blurring of responsibilities between MEW and MRRD and so we use the term rural-remote to denote those areas of very low population density that are far removed from population and commercial centers and lack access to basic services. More will be developed on this later in the strategy.

[18] Government of Afghanistan; Ministry of Energy and Water: Policy for Renewable Energy Rural Electrification, December 8, 2006.

activity. The goal of increasing energy is poverty reduction and economic growth. Electricity alone in rural areas is unable to do that job.

What is not known about rural Afghan's economic and energy characteristics? First, rural Afghani's are poor by most countries' standards. "Over 20.4% of the rural population cannot meet the minimum level of dietary energy required to sustain a healthy life." [19] Unemployment is rampant. Average household income is estimated to be no greater than $231 a year.[20]

Probably less than 4% of rural households have access to electricity[21]. Of those with access, 7% use electricity for lighting. Kerosene lamps are the major source of lighting, representing roughly 86 percent. It is highly likely given what is known about other countries, that the main source of cooking fuel is from self collected fire wood from which there is no monetary outlay or charcoal. This information is valuable because it tells us how much of a rural household's money income is devoted to energy. Using detailed data for Balochistan, the average rural household spends only 3.5% of its budget on energy and this includes imputed or noncash outlays. Clearly, for many families on the lower end of the income spectrum, the vast majority of energy services are self supplied – that is through the gathering of fuel wood, crop residues, and other biomass. Energy expenditures were dominated by wood, charcoal, and kerosene. Wood and charcoal are used mainly for cooking and heating, while kerosene is the main source of lighting. Rural Afghanistan is similar.

Extreme poverty in rural areas also is related to lack of income earning opportunities. The productive use of energy helps reduce poverty by providing alternative sources of livelihoods and increase educational and training opportunities. The remoteness of rural locations and the rough terrain make expansion of the electricity grid into these areas economically infeasible. Therefore, the application off-grid technologies to these areas—including renewable energy resources— and other forms of energy is the primary focus of IROA activities.

Supply

There is no reliable data on traditional energy use in rural Afghanistan. The bulk of commercial energy is supplied by kerosene, Hydro power and diesels. Hydro, wind and solar offer opportunities for small scale supply. Following hydro, solar energy has the greatest potential as a renewable energy source but cost remains a major barrier. Estimates indicate that in Afghanistan solar radiation averages about 6.5 kWh per square meter per day and the skies are sunny about 300 days a year. Consequently, the potential for solar energy development is high, not only for solar water heaters for homes, hospitals and other buildings, but also for generating electricity. In addition, some 125 sites have been identified for micro-hydro resource development with the potential to generate 100 MW of power.

Other renewable energy technologies, particularly micro-hydro and wind energy, have broad applicability within rural areas of Afghanistan and offer employment opportunities directly through operation and maintenance requirements, and indirectly through businesses like agro-processing that provide off-farm work.

[19] ANDS Macroeconomy and Poverty Diagnostic, Chapter 3.
[20] This was based on the ratio of rural household income to urban household income in Pakistan. Clearly, the rural population of Pakistan is on average better off than that of Afghanistan.
[21] AEIC http://www.afghanenergyinformationcenter.org/Rural html

The IROA , primarily through the Ministry of Rural Rehabilitation and Development in cooperation with the MEW has developed projects to promote micro-hydro development in rural areas. In addition, under the US National Renewable Energy Laboratory, wind mapping has been undertaken for many parts of Afghanistan as a basis for developing individual projects. The data indicate good potential for generating wind electricity in several parts of the country. The lead institute to support development of these resources in Afghanistan is the National Renewable Energy Research and Development Center, a part of MEW.

Hydropower, solar, wind and biomass offer the most potential to contribute to energy supply. Development, however, requires sound institutional and financial support, sustained commitment and a long-term development horizon. Use of renewable energy is beset by a number of factors, including high upfront costs,[22] lack of suppliers, inadequate financing mechanisms, and weak institutional and technical capacity.

Afghanistan as An Energy Transit Route

Due to its location between the oil and natural gas reserves of the Caspian Basin and the Indian Ocean, Afghanistan has long been mentioned as a potential energy route. This might include power transmission via high tension lines, or perhaps eventually a gas pipeline.

Afghanistan is well positioned to be a transit route for electricity produced in CAR countries and exported to South Asia, and perhaps eventually it might also become a net exporter of power produced from its own hydro, natural gas, and coal resources. Efforts are currently underway to increase electricity imports from Uzbekistan, Tajikistan, Turkmenistan and Iran and to upgrade cross-border transmission links. Development of a regional power network with Afghanistan as a transit route between CAR and South Asia is an important potential medium-term objective.

At the present time, with support from the ADB and the World Bank, the four countries of Tajikistan, Kyrgyzstan, Afghanistan and Pakistan are actively exploring construction of a high tension line that would transmit 1300 MW of power from Central Asia through Afghanistan to Pakistan, with Pakistan receiving 1,000 MW, and Afghanistan gaining 300 MW. Construction of such a project would directly address Afghanistan's need for power, and might also help to lay the groundwork for an eventual natural gas pipeline.

During the mid-1990s, Unocal had pursued a possible natural gas pipeline from Turkmenistan's Dauletabad-Donmez gas basin via Afghanistan to Pakistan, but withdrew after 1998. The Afghan government has recently tried to revive the Trans-Afghan Pipeline (TAP) plan, and has held talks on these matters with Pakistan, and Turkmenistan. Little progress appears to have been made. The President has stated his belief that the project could generate $100-$300 million per year in transit fees for Afghanistan, while creating thousands of jobs in the country. Given the obstacles to development of a natural gas pipeline across Afghanistan, it seems unlikely that such an idea will make any progress until the security position is resolved. The estimated cost of the pipeline is $2.5-$3.5 billion estimated cost which represents a further obstacle to its implementation.

CASA-1000 and Proposed Power Levels. CASA-1000 is a proposed transmission system to transmit 1,000 Megawatts of surplus electricity from Tajikistan and the Kyrgyz Republic

[22] For example, estimate for Photovoltaic electricity, as per MRRD (Mostafa Torkan, May 24, 2007) is $12,000/kW, as compared to: (i) Micro-hydropower at $1,200/kW and Diesel generated power at $500/kW.

to Pakistan, with power transiting through and energy deliveries happening within Afghanistan. If it goes forward, it would start operations circa 2011. Kabul would have a substation, which initially would receive approximately 100 MW going up to about 300 MW by 2016. Over the life of the project about 90% of the power would be used by Pakistan while, 10% would be taken by Afghanistan.

With 562 km of HTDC transmission, Afghanistan has the largest share of CASA 1000 transmission lines, representing about 52.1% of the total project costs. Total estimated project costs are $545.6 mil of which Afghanistan's allocation is $284.5 mil. Afghanistan would receive common equity of $59.8 mil and begin receiving dividends following a grace period. Current analysis indicates a return of 16% on equity by year 2033. In addition, Afghanistan would begin receiving a 52.1% share of Transit Fees once CASA-1000 becomes operational.

3. Institutional Players

Responsibility for energy is complicated; at present, four ministries have portfolios that include direct engagement with the energy sector and its development in Afghanistan:

- Ministry of Energy and Water (electricity generation (hydro, imports), transmission, distribution)
- Ministry of Mines (oil, gas, coal)
- Ministry of Rural Rehabilitation and Development (rural electrification)
- Ministry of Commerce and Industries (liquid fuels)

The Ministries maintain Kabul headquarters and different numbers of regional offices (i.e., MoM has seven regional offices) in addition to state owned enterprise offices throughout the country (i.e., the Ministry of Energy and Water (MEW) oversees DABM that maintains 19 regional "breshnas" or operations).

A fifth ministry, the *Ministry of Urban Development*, is engaged with energy in two forms: (1) street lighting primarily in Kabul and (2) heating[23] of the five Kabul-based "Macrorayon Apartment blocks" constructed during the Soviet era. Until late 2006 there was virtually no coordination of energy related development among these ministries apart from personally initiated actions generally guided at the Minister and Deputy Minister level. Coordination has continued to be weak through 2007. Coordination may improve somewhat in the years 2008 – 2010.

In addition, the *Ministry of Finance* plays an integral role in determining and agreeing to development and national budget funds for energy-related projects. *The Ministry of Economy* was identified in August 2006 to lead and coordinate the above ministries as members of the *Inter-Ministerial Commission for Energy (ICE)* discussed below. Finally, the *Cabinet of Ministers* and *High Economic Council of Ministers (comprised of key economic ministers)* have undefined but definite roles in reviewing energy project selection, funding levels and approval at various times to various degrees. *Parliament's Economic Committee* has included energy in its portfolio and conducted occasional meetings with energy ministers and their staff.

[23] District heating was installed as part of the initial construction.

There are eleven state owned enterprises operating in the energy sector. They include companies such as DABM and Afghan Gas.

The Inter-Ministerial Commission for Energy (ICE) was established by a Presidential Decree signed in December 2006 as the coordinating and policy making body for energy sector activities. Chaired by the Minister of the Economy, it includes the Ministries of Energy and Water, Finance, and Mines as core members and the Ministries of Commerce and Industry, Foreign Affairs, Urban Development and Rural Rehabilitation and Development as ad hoc members.

The establishment of ICE was designed to help the Government understand, support, design, and monitor energy development based on commercial principles. It has oversight of energy sector policy and infrastructure investments and coordinates support from development partners. ICE brings together a wide array of government and donor interests to assure coordinated action and practical planning. It is not be responsible for project implementation but develops sound policy in line with fiscal and policy priorities and international standards. ICE is supported by an ADB grant, which includes formation of a commercial advisory team within the Commission that assists the Government in identifying energy investments and shaping ongoing projects. It also assists the Government in agreements to stimulate private sector investment. The Ministry of Finance is the executing agency for the project.

In addition to the above established institutions, the following advisor positions and national programs play a role in energy sector development in Afghanistan:

- Advisor on Mines and Energy to the Office of the President.
- Afghanistan Investment Support Agency (AISA).
- Afghanistan National Development Strategy (ANDS).
- Afghan National Standardization Authority (ANSA).
- MRRD's National Solidarity Program (NSP)
- Priority Reform and Reconstruction Program (PRR)

The complexity of this institutional framework contributes to the difficulties in developing an effective strategy for the sector and in implementing and monitoring sector rehabilitation and reform measures. Attention to sector governance aimed at streamlining and combining functions within the ministries with the ultimate goal of reducing the IROA's direct involvement in the energy sector in favor of increased private sector participation need to be an important part of the IROA's overall Energy Sector Strategy.

4. Legal, Policy and Regulatory Frameworks

Energy laws in Afghanistan are rudimentary and do not recognize the integrated nature of the energy sector. There are three energy laws:

- Power Consumption Law of 1982; addresses power imports, generation, transmission and distribution;
- Oil and Gas: Hydrocarbons Law of 2005; requires revisions to clarify ownership and development of resources; due to poor translation into Dari from English, draft regulations are reviewed by the Ministry of Justice.
- Coal: Minerals Law of 2005; regulations to be drafted in 2007-08.

Much more work is required to bring these to modern standards. For example, the laws are silent with regard to private provision of energy. This lack of explicit basis for the private sector will serve to increase risk and cost and delay the entrance of the private sector in a meaningful way. Moreover, the lack of a real regulator is an obstacle to efficient operation of the sector even if it is under Government control. Until recently tariffs were determined on an adhoc basis. There have been some preliminary steps taken to establish an informal regulator but this is far from what is needed to adequately address concerns and attract the private sector. None of these laws address the need for an independent regulatory regime to separate IROA policy functions from sector oversight and to remove political considerations from day-to-day operations of the sector.

Additionally, the Environment Law has been in force since January 2007 and this provides a framework for reviewing projects and their impact on the environment.

5. Donor Programs And Projects[24]

While there are many donors involved in all aspects of energy production, the largest are the World Bank, the Asian Development Bank, Germany, India and the US. The Table below is a summary of the donor participation in the electric power sector according to Afghanistan Energy Information Center (AEIC) as of mid-2006. Additionally the ADB is involved in the gas field rehabilitation at Sheberghan and WB is supporting coal mine feasibility study. The WB has also sponsored studies of distribution systems for major load centers in the north and has planned similar work in the southern cities of Kandahar and Lashkar Gah once the security situation there has stabilized. Also as indicated in the Table, the donors are active in both actual infrastructure projects as well as in institutional and capacity building efforts.

More recently there have been projects to upgrade the distribution systems at Lashkar Gah, Qalat, and Aybak underbillion, depending on the country's absorptive capacity.

The WB is intensively involved in the power sector. It has a five-year plan totaling $1.2 billion, depending on the country's absorptive capacity. The WBs plan has the following goals for 2008:

- Rehabilitate 94MW of hydropower capacity;
- Establish 25,000 new connections in Kabul;
- Rehabilitated medium voltage network in Kabul and Mazar-e-Sharif;
- TA in energy sector, including the corporatization of DABM;
- Trade facilitation to encourage energy transfer from Central Asia; and
- Continued involvement in NEPS.

The ADB has also been very active in the energy sector the following loans: Rehabilitation and Reconstruction (power;$40M for power transmission and gas; $24M for gas well and pipeline rehabilitation), Loan 2165-AFG/Grant 0004-AFG Power Transmission and Distribution Project ($50M), and iii) Loan 2304-AFG Regional Power Interconnection Project (Afghan side-$35M from ADB out of the total project cost of $55.5M (in Loan 2303-TAJ, $21.5M from ADB out of the total project cost of $54M)).
ADB support has been vital in implementing:

- A capacity-building and training program for the MEW and its enterprises;

[24] This section draws heavily from LBG/BV Needs Assessment Infrastructure report.

• A Project Preparatory Technical Assistance (PPTA) for small and medium hydropower development;
• A capacity-building TA at the MEW;
• A hydropower and transmission project; and
• Continued support for NEPS and the Priority Reform and Restructuring Program.

Rural Energy Donor Operations

At present, about 650 villages are supplied with electricity from photovoltaics (PV), through a program funded by the National Solidarity Program (NSP) and under the auspices of MRRD. The NSP is a nationwide community-driven development program run by the Ministry of Rural Reconstruction and Development (MRRD) and funded by various bilateral and multilateral donors, primarily through the Afghanistan Reconstruction Trust Fund (ARTF). NSP is supported by non-government (NGO) partners that facilitate the election of Community Development Councils (CDCs) and help the councils to identify community development projects. NGOs are contracted as facilitating partners to assist communities in the technical and financial implementation of projects that for energy have include micro-hydro and diesel power installations. NSP's partners have identified over 3000 rural energy projects. NSP has funded around 1700 diesel generators and 500 micro hydro plants.

Other donors (e.g., Government of India) and NGOs (e.g., Norwegian Church Aide) are active in this area. The private sector also is encouraged to participate and invest in rural electrification and deployment of energy efficiency and renewable energy technologies. Although, NGOs and donors provide much assistance, there appears to be no clear IROA policy for rural electrification or for promoting private sector participation in rural energy projects; also coordination among ministries and other project participants needs improvement.

6. The Role of the Private Sector

Throughout the world, the role of the private sector in energy is growing and is significant in most countries. In Afghanistan, it is virtually nonexistent. The roles of the private sector vary from managing government owned assets to outright ownership and operation. There are examples where all these mechanisms coexist in one country. There are other examples where countries have chosen one model and yet, others where the country transitions over time from the simplest model (management contract) to complete ownership and operation.

To be sure, there are obstacles in Afghanistan to greater private sector involvement, primarily to investment, but some of these obstacles can be completely overcome and others offset with innovative mechanisms. The private sector can be called upon to manage, operate, invest and/or own energy entities and operations. Each different mechanism has its advantages and disadvantages. Often, there is a progression from management through ownership that takes into account the current situation. Take the electricity sub-sector for example. **It is highly unlikely under the current security, institutional, policy and legal/regulatory situation, that private investors will be attracted to invest in a large-scale power plant.** However, until these issues are resolved, there are many other ways to use the private sector. Billing can be outsourced. The construction arms of DABM could be sold off, allowing DABM to focus on core operations. Following DABM's commercialization, distribution could be given on a management contract. Individual power plants could be given on management contract. There are a variety of mechanisms available now for the IROA to tap the private sector as it prepares the enabling frameworks and other requisite mechanisms to foster full private sector ownership and operation.

One of the questions that has been posed in this strategy exercise is whether or not DABM (and other SOEs) should be unbundled. In this context, unbundling has meant the separation of the utility into

different operating units and the privatization by sale of one or more of those units or ownership unbundling. For example, the distribution part of DABM might be separated into several smaller distribution companies and then sold as could be generation. The empirical evidence is mixed and does not strongly support one position or the other. In fact, many of the earlier proponents of unbundling have now taken a more conservative position that the virtues of unbundling depend upon numerous factors such as the size of the market, the availability of substitutes, the cost production and the overall structure and position of the sector within the economy. Simply put, when a country or market are small, unbundling may not achieve the results it will in larger, more mature markets. Afghanistan's market is quite small and immature. Ownership unbundling is the last stage of a four step process. At this time it is not possible because the other steps have not yet begun.

To be sure, the commercialization of DABM and other SOEs will require some unbundling. The first step is ***accounting unbundling*** or the separation of accounts of different functions. ***Functional unbundling*** will follow. This is the separation of functions within the company and the imposition of restrictions on activities such as physical separation of people, of management, separation of information that competitors may need, separation of services that should be regulated from those that are competitive in nature, etc. Functional unbundling can either take place within the same company or be unbundled into an affiliate company. Functional unbundling also means accounting unbundling. The there is l***egal unbundling*** but this "does not imply a change of ownership of assets and nothing prevents similar or identical employment conditions applying throughout the whole of the vertically integrated undertakings. However, a non-discriminatory decision-making process should be ensured through organisational measures regarding the independence of the decision-makers responsible." Legal unbundling will of necessity include accounting and functional unbundling.

The strategy envisions that with time DABM and other energy sector SOEs will go step by step to legal unbundling. Some non-core functions will either be outsourced or completely divested, reaching the last step of ownership unbundling. The outcome of this strategy exercise is that there are more fundamental reforms required in the laws, rules and regulations and at DABM before large scale ownership unbundling should be considered.

7. Challenges, Risks And Constraints

A number of challenges and constraints affecting the risks—both real and perceived—associated with the ability of the IROA to develop and implement a comprehensive Energy Sector Strategy need to be addressed. These include the following.

Private Sector Provision

The single most important challenge facing energy is attracting the private sector in a meaningful way. The sector is plagued by inefficiency and under investment. While second best measures can be put in place, such as the commercialization of DABM, the optimal solution is eventual private sector provision throughout the sector. Private sector participation in Afghanistan's energy sector is crucial to achieving its long term objectives of the sector. Efforts to attract private investment are incorporated with IROA programs and projects, but there is no coordinated approach to achieving this goal. In particular, options for private participation beyond equipment and supplies and management contracts need to be explored, and effective policies put into place. The IROA and donors, through the "one-stop shop" at the MEW, the Afghanistan Investment Support Agency, or other mechanisms need to address this issue and increase opportunities for local and international investors and developers, including options to accelerate private investment in the energy sector as discussed in this report.

The constraints facing greater private sector involvement include legal cover for the private sector, lack of a regulatory environment, credit worthiness of a potential buyer, and general security.

Capacity

Perhaps the single biggest constraint in the sector is the very limited capacity given the tasks that need to be accomplished. Both the Ministries and the SOEs are characterized by limited capacity, the low numbers of trained/skilled personnel below the senior levels. It is imperative that basic managerial skills be provided and that training in accounting and finance also take place. Additionally, while a sector PMU is recommended, it is also important that project management, and monitoring and evaluation skills be upgraded at the Ministries and SOEs.

A lot of resources have gone into capacity building and the concern is how to make delivery more effective. First, general management, finance and accounting training are needed and this can take place as part of larger training programs rather than being explicitly focused on the energy sector. Second, the role of training at Ministries and SOE's needs to be elevated. Third, for technical training it is recommended to use developing country training venues, for example, in India there are the National Thermal Power Corporation and IREDA; ICIMOD in Nepal; TNB in Malaysia and the Egyptian Electricity Holding Company in Cairo. In petroleum, there are excellent training venues in the Gulf countries. Donors have helped to establish impressive institutionalized training programs in countries throughout the region and relying on these reduces cost and increases effectiveness.

Information and Planning

As mentioned in several places in this report, the lack of information severely hampers both analysis of current and historical information and planning. While the IROA and Donor strategy has out of necessity focused on immediate needs, the long run health of the sector and the economy depend critically on the collection, dissemination and evaluation of energy information and its use in planning.

Efficiency

The second most important challenge facing the energy sector is the efficient operation of SOEs and subsidies. Focus has been on expanding supply and major rehabilitation of generation and NEPS. The two principal constraints here are (1) the lack of complete and effective commercialization of SOEs such as DABM and (2) lack of priority given to funding these efforts. This is also the result of insufficient capacity.

Fuel

The cost of fuel to support electricity generation, especially for Kabul until NEPS is completed will be about $100 million/year and another $25 million/year for SEPS. Funding and procurement mechanisms to obtain this fuel are not yet established and need to be addressed.

Imports

Prices and availability of power from other CAR countries also are uncertain. Imported power costs will probably be as much, if not more, than 4 cents/kWh or more in 2010 requiring an annual hard currency requirement of $160 million and potentially placing a significant burden on the IROA. However, this is still much cheaper than diesel generation.

The average cost of power to residential customers currently is about 3.8 Afs/kWh. However to cover costs of supply, it would need to increase to 7 Afs/kWh or more[25]. The IROA 's goal is to raise tariffs to cover 75% of DABM's costs, thus rising to at least 5.3 Afs/kWh or 28% by 2010. This will place a significant burden on households and represents a political risk for the Government, especially if service quality isn't improved significantly commensurate with tariff increases. To help offset this revenue shortage, efforts at DABM to improve billing and revenue collection and reduce losses (currently estimated at a minimum of 40%) need to be a primary focus.

Rural Energy

Addressing rural energy needs and expanding access to commercial supplies of energy is a daunting task, requiring a long-term commitment of resources, both financial and institutional and a coordinated approach to addressing this issue through regional and local organizations. Moreover, an evaluation and prioritization of rural energy resource and delivery options is needed to ensure the effectiveness of programs and projects, and a comprehensive monitoring and evaluation process is needed. The GOA, with the support of donors needs to review, evaluate and revise its rural energy programs to effectively address these needs.

The biggest challenge in addressing effective rural energy needs will be to find innovative ways to couple energy service delivery with economic activities. Constraints are the low levels of income and lack of access to microcredit and the political inertia of providing rural, grid based electricity. Added to this is the need to rationalize rural electrification between MEW and MRRD so that each can best address the problems with their specific resources.

Additionally, as households transition from biomass to other fuels for cooking, heating and lighting, efforts need to be made to consider the differential impacts and uses between women and children and men. These differences are significant and adoption and use of different energy sources depends on addressing the needs of these different groups.

[25] MEW puts the cost of power generation at US $0.123 per kWh.

IV. ENERGY SECTOR STRATEGY

"It is much easier to get there if you know where you're going."
From Alice in Wonderland

8. Energy Strategic Vision

There is a time in Afghanistan's future when energy will be abundant, blackouts will be a thing of the past, and most of its energy needs will be provided directly by the private sector. Private investors will develop power plants, operate and own distribution systems and develop in situ resources, just as they have begun to do in many countries. But that is the distant future. For now, Afghanistan must work hard to increase energy production, doing so efficiently and in a cost effective manner. It can do this by building new capacity and by improving the efficiency of existing infrastructure, building capacity in its workforce, and reorganizing its energy operations to make them more transparent, increase operating efficiency and prepare them for eventual entry into the private sector. At the same time though, it must begin laying the ground-work for the eventual large-scale participation of the private sector.

Above all, this means that develop of the electricity sector and the fuels that feed it are the single most important priority in the energy sector!

India, a country with far greater security, more resources, a larger and better trained technical cadre and a much better established framework for energy and commercial ventures, began serious embarking on IPPs in 1992. The first IPP, a gas combined cycle by a local company, was commissioned in late 1996. Many foreign IPP developers such as Enron, Congentrix and AES all started the IPP process but only a handful finished. The bottom line is that day, 15 years after the IPP program started, most generation is still Government owned and most IPPs are Indian owned and financed. Afghanistan can learn from India's mistake and their success but can't expect to have large IPP projects in less time than they did. This is not to say that we can't and won't have private sector involvement; we must and we will. And the time to begin preparing for the private sector is now.

The time has come that Afghanistan must not only focus on the immediate energy needs but turn attention to the longer run. It knows where it is going and but not necessarily how to get there. This strategy will address the questions of where we are going and how we get there. What this means for energy is that as we continue to focus our efforts on short run options to increase supply[26], one must begin developing the foundation that will support long run sustainable growth. It means stemming the losses at SOEs like DABM, reorganizing them and commercializing them. It means investing in repair and maintenance and in loss reduction. It means making difficult choices among various projects of the different Government entities with the intent on the next two to five years. It means in some cases organizing other Ministries' projects around electricity supply because this is what will drive the economy. It is imperative that in the near future that more electricity be provided to more people in the most expeditious manner possible while being mindful of the long run economic impact. At the same time, Afghanistan must be laying the legal, regulatory, commercial and institutional foundations to unleash the power of the private sector when conditions are appropriate.

Afghanistan does not have an energy strategy! That is it does not have an integrated energy strategy. Rather, it has a coal strategy, an electric power strategy, and a hydrocarbons strategy. In part, this reflects the government's treatment of energy as separate institutional and sector silos and, in part, it reflects the lack of institutional depth to see that energy markets and, perhaps, more importantly, that

[26] Increasing supply can come about through building new capacity, increasing imports or reducing technical losses.

electricity supply projects are highly intertwined with other sub-sectors. In part it reflects the nature of assistance activities that focused on keeping the lights on and the vehicles rolling.

Integrated energy planning and policy development are key to a well functioning energy sector. But the IROA is not yet equipped to develop an integrated strategy, plans or policy analysis because the basic energy sector data is missing or rudimentary; energy-economic models do not exist; mechanisms for sharing information and collaborating are not in place. In short, work must begin on all of these so that better subsector and integrated energy planning and policy analysis/formulation can take place. For example, fundamental gaps in data on energy supply and consumption and the developable resource base coupled with uncertainties in forecasts of key developmental indicators (economic growth, income, level and structure of energy demand, rates of population growth and urbanization) have made development of an effective sector strategy, including determining the effectiveness of short-term assistance activities, all the more difficult.

To date, the primary focus has been short-term , the rehabilitation of generation and expansion of energy services using high cost resources such as diesel. Long-term sustainability requires promoting development of energy resources on a least-cost[27] basis in an environmentally sound and socially acceptable way. Now is the time to begin developing the tools that will help Afghanistan take a broader more long-term approach, to review options, and to look at developing least-cost energy resources for meeting Afghanistan Compact goals and objectives. This strategy incorporates projects that are already in the pipeline but also considers what policies, programs, and projects could be re-evaluated and given a new priority (e.g., sector governance) to ensure that they provide results at lowest cost and maximize impacts for a given level of assistance.

The broad goals for the energy sector are:

- Increased Private Sector Provision of Energy
- Better Sector Governance
- Increased trade with neighboring countries, focusing on the transmission of energy;
- Expand the availability of electric power;
- Develop a Master Plan for Rural Energy; and,
- Establish market-based tariffs with a clear timetable to phase out subsidies.

The best strategy at this time is a four paralleled prong approach. The **first prong** is to improve the efficiency of existing operations. This will be accomplished by physical investments such as the repair and renovation of existing energy infrastructure and the procurement of spares. It will involve changes in the operations of energy sector SOEs. The most important of these is DABM. Commercialization of DABM must be fast tracked. It must operate on a commercial basis with clear targets for loss reduction and officers and employees need to be rewarded for increasing efficiency and cutting losses and held accountable for performance. Aside from the financial implication of continued losses, there are other sound reasons for focusing on this area. **Adding a megawatt of power through repair and renovation is usually quicker and certainly cheaper than building new capacity.** Progress is being made on building new capacity but repair and renovation is slower

[27] A correct least cost program would define cost in the economic definition of cost and not the financial definition. Thus, it would include the environmental benefits or costs and price externalities. In this manner, the least-cost method would produce an economically optimal solution. However, this is rarely ever done and cost takes on a purely private definition with the result that too much fossil fuel energy is consumed and produced relative to other forms of energy and, in general, too much energy is used in the economy.

than it should be. For example, it is only now, in September 2007, that DABM has begun a limited campaign to identify losses. Training is urgently required in all areas from general accounting to advanced power system controls.

The **second prong** must be to significantly improve sector governance and begin involving the private sector in various aspects of energy until the legal, commercial and security climate is conducive to transfer most aspects of the energy sector to the private sector[28]. The single most important governance measure will be the establishment of a multi-sector regulator under the Ministry of Economy.

Arguments are frequently made that the private sector won't participate or that it should not participate until and unless significant reform and improvements have been made. The reality is different. Afghanistan can begin now by introducing management contracts for some aspects, outsourcing others and in the case of peripheral operations such as construction, they can be spun off. Small as these measures may be, they will invigorate the sector by tapping private sector resources and management. They will allow Government entities to focus on core activities and build a successful track record in private sector involvement. At the same time though, every effort must be made to lay the foundation of enabling laws, policies and regulations that unleash the full potential of private sector investment and operation of large scale energy facilities.

The **third prong** is rural energy instead of rural electrification.

Rural Energy in the Vision

Empirical evidence from the developing world clearly indicates that households transition to different forms of energy based on complex economic, cultural, technical and social relationships. People do not just go from cooking on firewood to cooking on electricity. Additionally, if they used a certain amount of lumens or btus in, for example, lighting, they do not use the same amount when moving up from candles to kerosene or from kerosene to electricity.

The findings discussed earlier lead to several major conclusions that have profound implications for rural energy.

- First, given these income levels, some electricity services will need to be subsidized. As shown above, if rural households were putting all their energy expenditures into electricity, this would mean consumption of 13.5 kWh per month or enough to run two 60 W electric light bulbs for about 4 hours per day.

- Second, residential energy use will be very limited and there is a definite transitioning in energy use that takes place. The order of use will most likely be lighting, radio, fan, TV, and then an iron or some other small appliance. It will be a long time before electricity takes on uses for cooking and heating in rural areas. This means that, until incomes rise significantly, only a small portion of energy expenditures will be directed to electricity. **Rural residential consumers will consume very small amounts of electricity for the foreseeable future. Income generating activities WILL require other forms of energy as well as electricity.**

- Third, another problem exists because of such low income levels and imperfect markets. Even if consumers were willing and able to afford the full cost electricity per kilowatt hour, they certainly could not afford the connection costs. This is called the first cost problem. For example, it has been estimated that the cost of purchasing a small solar home system (SHS)

[28] Clearly there is overlap between prongs 1 and 2. Increased efficiency will in some part necessitate improved Governance and the ultimate efficiency gains will be possible only with private provision. These commonalities notwithstanding, these two areas are different in their major focus.

would be 61% of a typical rural Pakistani household's annual income. In essence, it means that even if consumers would benefit or save money by paying their monthly electricity bill, they could not afford the "first cost" of opting in to electricity consumption. With rural Afghanis spending the bulk of their income on food, they would be unable without some form of subsidy to purchase a SHS. This leads many countries to subsidize connection costs even if they do not subsidize consumption or to provide other forms of concessional financing.

- Fourth, even when the first cost problem is overcome, the low population density coupled with the low income and low demand, will mean that either: (a) the consumption will need to be met by small modular units like solar; or (b) that a base load needs to be identified and developed such as a school or clinic or a larger scale economic use such as milling or irrigation.

- Fifth, where incomes and consumption are unlikely to support electricity, then rural electrification may need to focus on finding or creating a customer that can act as the base load as well as subsidize the other users[29]. Then, productive uses of electricity that will reduce costs, increase incomes or both. This must be the cornerstone for most rural electrification activities. It also means that this productive use will subsidize other consumers. Productive use here can be defined as either income generating activities such as milling or irrigation or end use in clinics or schools.

  There is an important difference between these two types of productive uses. In the first case, the productive uses are those that have economic impacts in the near term and those act to increase consumption and ability to pay because the demand for electricity grows as income increases. This first case impacts rural electrification in two ways. First, it acts as a base load with the consequent reductions in the cost of supply. Second, in the near term it increases economic activity in the area and increases demand due to the positive spillover effects. In the second case, those that consume education and health services will see an economic impact but it is usually in the distant future. The second use can benefit rural electrification by acting as a base load and reducing costs in that manner.

All of this leads to some important implications for the third prong of the energy strategy. **One**, focus on income generating activities. **Two**, determine the type of energy and amount of energy best suited for that specific income generating activity. **Three**, follow an integrated model that combines energy provision with that of other services. The Global Village Energy Partnership provides an excellent platform for sharing experiences and lessons learned. **Finally, and most importantly, Afghanistan needs a program focused on rural energy needs as opposed to focusing on Rural electrification and one that is focused appropriate technology**

The **fourth prong** is new supply of energy such as new investment in transmission, generation or distribution assets. It is principally concerned with the grid connected systems – generation, transmission and distribution assets. Priority activities here remain the NEPS and SEPS and the activities in other energy subsectors that support them.

9. Needs Assessment

Several higher level and detailed needs assessments have been carried out. They fall into two broad categories. The first category projects demand and supply or given an assumption about economic growth, investigates how demand and supply will respond. The second category is prescriptive in

[29] This subsidization can be indirect in that the increase consumption allows economies of scale in supply and lower costs. For example, the project sponsor identifies the use of electricity for a grain mill and then uses mini hydro instead of solar. This will result in lower costs of production for all users. The subsidization can be direct when the base load use pays more than its marginal supply costs, thereby lowering the amount needed to be covered from other users.

nature that is it is based upon some policy variables and sets targets about how the sector should respond. For example, it sets a rate of household connections as a target and then uses Government policies and control of the sector to move towards that target. Each of these is useful but one major drawback is that ALL have been at the subsector level. "These studies have primarily focused on individual energy subsectors such as power or oil and gas, in some specific instances illuminating important aspects of the strategic development of the energy sector in the overall context of Afghanistan's development agenda. At the same time, the subsector-based approach, while necessary to adequately address the technical complexities of the energy sector, has not captured the inter-related nature of energy sector developmental issues and, consequently, the trade-offs that may be entailed in the strategic decision-making process."[30]

This is a consequence of the fragmenting of energy across institutions and the lack of comprehensive, integrated planning policies and procedures. In reality, no energy subsector can stand on its own but is highly dependent upon what transpires in the other subsectors. For example, a forecast of the demand and supply of hydrocarbons that does not at the least consider the demand and supply of electricity, a major consumer of hydrocarbons, will surely miss the mark. While as an academic exercise this may have little consequence, nothing can be further from reality when scarce human, institutional and financial resources are required to develop an optimal mix. In short, the failure to forecast and analyze on an integrated sectoral basis means suboptimal investment plans and operating conditions, and a lower rate of economic growth than would otherwise have happened. Thus, an Overall Energy Sector Needs Assessment does not exist and at this will be simply an aggregate of the individual sub-sector needs assessments.

Electricity

The Afghanistan Compact developed at the London Conference in Jan-Feb 2006 defined energy benchmarks for Afghanistan:

> *"By end-2010: electricity will reach at least 65% of households and 90% of non-residential establishments in major urban areas and at least 25% of households in rural areas; at least 75% of the costs will be recovered from users connected to the national power grid. A strategy for the development and use of renewable energies will be developed by end-2007."*

To achieve these goals, IROA and donor assistance has focused on actions to rehabilitate hydro and thermal generating facilities; increase power imports and develop PPAs with Central Asian countries; purchase small diesel generating sets for supplementing power supply in selected urban areas; develop selected transmission lines to maximize deliverability from domestic generation sources and increase use of imported power; and develop micro-hydro and other energy resources in rural and remote areas. Through these combined efforts, the supply of electricity throughout Afghanistan has increased by 66% albeit from a very low base.

A key objective of these initiatives is to increase the number of connections, adding about 850,000 residential and non-residential connections by 2010 to increase access in urban areas from an estimated 27% currently to 65% by 2010[31]; and, country-wide from 6% currently to almost 25 % by 2010. By 2015 the goal is to increase urban access to 90% and achieve an overall national access rate of 33%.

[30] World Bank Afghanistan Energy Sector Strategy 2005

[31] Adding connections does not add additional power. The new power that is expected to come on line by 2010 comes to approximately 250 MW, added on top of existing power of 521 MW. Adding 850,000 new customers on top of the existing customer base of 517,000 would result in a substantial reduction of available power on a per capita basis to all customers in 2010.

Table 8. Afghanistan Compact Goals

Year	Number of Customers		Customer Additions	Capital Cost ($ mm)	Peak MW Supply
	Residential	Nonresidential			
2006	365,221	38,868			323
2007	485,058	51,621	132,591	132.5	429
2008	644,216	68,560	176,096	176.1	570
2009	855,598	91,056	233,878	233.9	757
2010	1,136,339	120,933	310,618	310.7	1,006
Total			853,182	853.2	

Notes: 33% annual growth in customers; $1,000 cost per customer connection;
800 watts peak demand per customer.

The estimated cost of increasing customer access to electric power to meet Afghanistan Compact goals is $853 million for the period 2006 to 2010. In addition, the cost of expanding generating supplies (domestic and imported) is approximately $400 million. Therefore, on this basis the funding needed to meet Afghanistan Compact goals would be about $1.2 billion for the period 2006-2010[32], excluding the costs of developing the energy supplies when indigenous resources are used. Meeting these goals in relation to existing budget constraints necessitates developing an overall Energy Sector Strategy that will identify least-cost options to meeting sector requirements in the longer-term; maximize the benefits of IROA and donor initiatives; and increase participation and investment by the private sector.

Information on Afghanistan's energy situation is constrained by a serious lack, and overall poor quality, of data. This hampers efforts to develop and implement a clear sector strategy. For example, ANDS goals are clear in the benchmarks that are to be met by 2010, including the percentage of urban and rural households and non-residential establishments with access to electricity and 75% of the cost of power recovered through tariffs. However, data on the number of households in Afghanistan, on their income and consumption patterns and overall energy demand generally is not available or is of very poor quality. The same situation exists for non-residential establishments; for the cost of power delivered by DABM; and the cost of improving revenue collection in order to recover costs from customers.

Until data collection and analysis capabilities are improved, the costs of meeting the ANDS benchmarks cannot be known with any certainty. Given this gap, the Energy Sector Strategy proposes to develop better quality and more complete data and modeling capabilities that are crucial to effective planning and to achievement of Afghanistan's overall national economic and energy sector goals. In this regard, a recent report prepared for USAID estimated electricity demand for Afghanistan for the period 2010-1020 needed to meet ANDS objectives[33].

Based on available data and information, the results of this analysis are shown in Table 9. This analysis indicates that total electricity generation needed in 2010 is 1,519.1 MW, while MEW estimates that available generating capacity in 2010 will be about 1,200 MW. This indicates a potential shortage of supply of about 320 MW. The data also show a need for an additional 917 MW by 2015.

[32] Ministry Strategy (With Focus on Prioritization); Ministry of Energy and Water, September 30, 2006.
[33] Needs Assessment Infrastructure Report: Energy and Transport Sector; Infrastructure and Rehabilitation Program (IRP); Contract No. 306-I-00-09-00517-00; prepared for USAID, 2007.

Table 9. Forecast Electricity Demand for Afghanistan 2010-2020

NEPS System Area	Required Generation (MW) (including losses)		
	Year 2010	Year 2015	Year 2020
Kabul System	**671.6**	**1,066.9**	**1,206.8**
Balance of Planned NEPS	**272.2**	**405.0**	**473.4**
Subtotal	**943.8**	**1,472.0**	**1,760.2**
Aybak	**16.1**	**25.4**	**30.0**
Khulm	**20.0**	**31.8**	**37.6**
Doshi	**6.5**	**8.8**	**10.4**
Charikar	**10.5**	**20.9**	**34.1**
Subtotal	**60.1**	**94.9**	**112.1**
NEPS with Intermediate Loads	**1,003.9**	**1,566.9**	**1,872.3**
Planned SEPS	**160.4**	**251.3**	**296.3**
Girishk	**11.5**	**18.4**	**22.3**
Qalat	**77.9**	**123.7**	**146.5**
Subtotal	**249.8**	**393.4**	**465.1**
Other Major Load Centers			
Jahalabad	**86.2**	**103.1**	**121.8**
Ghazni	**44.9**	**71.4**	**84.5**
Gardez	**32.2**	**51.2**	**60.6**
Heart	**102.1**	**150.0**	**164.9**
Subtotal	**265.4**	**375.7**	**431.8**
TOTAL ESTIMATED DEMAND	**1,519.1**	**2,436.0**	**2,769.2**

Source: Needs Assessment Infrastructure Report: Energy and Transport Sector; USAID, 2007

10. Priority Policies and Objectives

Following from the broad objectives above and using the four prong strategy approach, those priority policies to support implementation of the Sector Vision are put forward. This section provide more detail on elements for an Afghanistan Energy Sector Strategy, including those that address overall energy sector needs (e.g., prioritizing projects based on a cost-benefit analysis) as well as sector-specific elements (e.g., electricity tariff reform and completion of the Sheberghan gas field development). The intent is for this Strategy to provide overall guidance on achieving Afghanistan's energy sector goals in a timely and cost-effective manner and to address five primary areas:

a) Adopt policy that:

1. recognizes the priority of electricity supply projects and develop the mechanism to ensure coordination among the other Government entities as required. This means viewing electricity supply projects on an integrated basis so that development of fuel supply and other required infrastructure is an integral part of the electricity project.

2. prioritizes projects on the basis of their time and cost focusing on:
    1. Reducing technical losses in transmission and distribution.
    2. Reducing demand through end use efficiency such as CFLs.
    3. Metering of existing cross border transmission.
    4. Expanding transmission capacity to neighboring countries.

5. Completing the Sheberghan gas fields and power plant.
6. Develop New Hydro capacity.
7. And investment in oil, natural gas and coal infrastructure based on tenders using performance contracts and a permitting system.
   (Greater detail on these and other priority programs are presented in detail in the subsector strategy areas.)

b) Energy Sector Governance is the single most important issue for the long run health of the sector. The enabling frameworks and implementing rules and regulations need to be established along best practice guidelines. Activities include:
   1. Develop and adopt a modern, comprehensive energy law and then separate laws for electricity, oil and natural gas. Concurrently develop the implementing rules and regulations.
   2. Adopt in policy and embody in law, the principle of private sector provision of energy. The overarching energy law should explicitly address the role of the private sector which role is further developed in sub-sector law.
   3. Establish a Multi-Sector Regulator for electricity, coal, Petroleum and Petroleum Products and Water.
   4. Develop an Energy Policy that establish guidelines for energy production and consumption that is cross sector in nature, e.g. energy efficiency, cost recovery, environmental issues. The National Energy Policy should provide guidance on the role of energy in the Nation's economy and set guidelines for how energy will be used.
   5. Establish procedures to ensure effective coordination among the different sector Government entities and sharing of data by these institutions.
   6. Ensure that Government energy entities are effective by implementing capacity building programs and reorganizing these entities as and when their roles change.[34]
   7. Improve the production and delivery rural energy by clarifying the roles of MEW and MRRD and evaluating options for project development and ownership, technical support and pilot projects based on international best practices and attraction of private sector participation.

c) Enhance policy and planning and the effectiveness of donor support by strengthening Inter-agency cooperation and adopting tools that will allow integrated planning and analysis.
   1. Develop and deploy tools to evaluate and prioritize options such as a least-cost plan.
   2. Improve data collection and analysis.
   3. Establish a comprehensive monitoring and evaluation program, and
   4. Improving assistance coordination.

d) Accelerating private sector provision while an effective supporting framework is being put into place by such measures as:
   1. make an unequivocal commitment to involving the private sector including an aggressive time-table for action.

[34] As the private sector takes on increasingly more aspects of energy, Government's role will change to one of planning, policy and regulation.

2. recognizing that in the long run diesel power is too expensive but in short run, it may the stop gap measure. So explore a limited term IPP for diesel, say five years. This meets the immediate objective of getting power while developing some expertise in negotiation and power contractual instruments. It also has the advantage of restricting diesel power to a limited time period, time in which lower cost power can come on line.
3. issuing tenders for private investment in IPPs based on a ceiling bulk power tariff (avoided cost) or some other method that might promote more competition in cost, and a "one-stop shop" window at the MEW.
4. using "regulation by contract," management performance contracts and "light handed regulation" concepts[35];
5. issue tenders for coal sector development based on a permitting system.
6. Expediting the commercialization of Stated owned Enterprises such as DABM; and,
7. Outsourcing activities now that can immediately benefit from private sector involvement such as meter reading and billing

e) Establish a commercially oriented financial environment by:

- Increasing tariffs (while maintain a life line rate or mechanism)
- Public awareness program educating about the link between the cost of energy and its availability.
- GoA to pay subsidy directly to the Utility
- Establish subsidized tariffs for the poor and ensure that they are targeted
- Require both the Government to pay the utility for all power that is has purchased and require the utility to settle its accounts with other Government entities. Given the initial hardship that this could impose reconcile the accounts up to the value of accounts receivable from other Government entities. Similar treatment to other SOE in the energy sector.

11. Desired Outcomes

Table 10. Desired Outcomes

Industry Sector	Short-Term (2-to-5 years)	Intermediate-Term (5 to 10 years)
Cross-Sector Issues		
Sector Governance	Modern Energy Law Modern Electricity Law Modern Hydrocarbon Law	
Sector Governance	Enabling Rules and Regulations in Support of new Energy Legislation	
Sector Governance	Review and reform sector governance to support restructuring and private investment	Significant involvement of the private sector
Improve GOA/Donor/ NGO coordination	Through ICE improve coordination to increase effectiveness of assistance efforts	Monitor and improve as needed
Sector Governance	Functioning Sector Regulator	Fully Functional Regulator
Capacity Building	Sector capacity enhanced through training	Monitor and evaluate program; up-date as needed

[35] Light-handed regulation is based on the Threat of Regulation providing an incentive on companies with market power to exercise self-regulation. Regulatory approval of rate levels resulting from arm's length negotiations, rather than calculated on a cost of service basis, and subject to challenge only under a complaint proceeding.

Least-Cost Expansion Plan	Least Cost Expansion Plan for the sector through ICE	Up-date models& expansion plan on a regular basis
Needs Assessment and Data Base	Needs Assessment & data base at the Afghanistan Energy Information Center	Up-dated assessment and data base and modeling & assessment capabilities developed
Sector Governance		Integrated Energy Planning & Policy Analysis
Monitoring & Evaluation Plan	Incorporate an M&E plan for all assistance efforts	Evaluate and update as needed
Electricity Sector		
Corporate Governance	DABM operating on commercial basis Some areas in private hands	Management Contract for DABM (in whole or in parts)
Technical Losses	27.5%	20%
Collections	70% collection to billed	85% collection to billed
Private Sector Investment	Issue tenders based on ceiling bulk power tariff; "one-stop shop" for project approval; regulation by contract; & performance incentive contracts	Implement regulatory reform & institutionalize regulatory process; unbundled & privatize electricity sector
DAMB Commercialization	Complete commercialization; improve metering, billing & collection; implement management performance contract	Unbundle & Privatize
Tariff Reform	Complete tariff reform for DABM	Modify tariff structure & rates as needed
Power Imports	Complete PPAs to support expanded imports from CAR	Develop in accordance with least-cost expansion plan
Installed Capacity	850 MW (2011)	1,019 MW (2013)
New Connections	730,000	
Oil & Gas Sector		
Sheberghan gas fields & power plant	Complete assessment of fields and issue PSA; rehabilitate infrastructure; issue tender for IPP; consider bundling with gas processing & fertilizer plant	Revise procedures as needed & issue new tenders for development of sector
Indigenous Fuels Development	Feasibility Study for CNG including stations and vehicle conversion	Develop CNG Infrastructure if cost-effective.
Complete feasibility study for oil refinery	Complete feasibility study for oil refinery as part of least cost energy sector plan	Develop refinery if cost-effective
Complete Tariff Reform	Complete tariff reform for gas sector based on economic costs of service	Modify tariff structure & rates as needed
Regulatory Reform	Establish National Energy Regulatory Commission	Capacity building and institutional strengthening as needed
Modify Hydrocarbons Law	Modify Hydrocarbons law to clarify roles & responsibilities of IROA and developers for oil and gas development	Develop rules & Regulations to complete implementation of Hydrocarbons Law
Private Sector Investment	Complete PSA for sector and implement management contracts to attract private sector investment	Complete sector restructuring and implementation of Hydrocarbons Law
Petroleum Imports	Improve control of imports and collection of import duties; enforce quality standards; increase storage capacity	Expand role of the private sector
Coal Sector		
Issue Tenders for development to private sector	Issue tenders for private sector development based on a Permit System with independent evaluation team	Evaluate and up-date process as needed; issue new tenders
Enable Minerals Law	Implementing rules and regulations	
Rural & Renewable Energy Sector		
Sector Reform	Consolidate all authority for rural energy development within the MRRD	Develop programs consistent with expanded role of the private sector
Develop Rural Energy Policy	Develop "light-handed regulation" and as a policy for rural energy projects	Monitor and up-date as needed
Renewable Energy	Deploy 10 MW of Wind Power	Deploy 50 MW of Wind Power
Renewable Energy	Geothermal Prospecting at 1 site	Geothermal Feasibility Study
Rural Energy	Rural Energy Master Plan and Rural Electrification Master Plan	Updated as necessary
Assess rural renewable energy technologies	Develop methodology to assess and deploy renewable energy technologies	Develop methodology and develop pilot projects based on assessment
Assess models for project	Assess and develop models for project	Assess and develop models based on

ownership	ownership, including coops, franchises, provincial or district entities	maximum benefits
Assess models for technical support	Assess models for technical support, including university outreach; MRRD/DABM district offices; franchises; district/provincial government	Assess and develop models based on maximum benefits
Pilot Projects	Develop & implement pilot projects to test best practices	Assess and develop projects and implement bases on maximum benefits

12. Inputs & Outputs

- ***Policy actions:*** important policy actions in terms of institutional and capacity development, regulation and legislative activities and policy measures to support implementation of the energy sector's overall goals and priorities and achievement of the desired outcomes are: (i) integrated energy policy; (ii) overarching energy law and redrafting of the electricity subsector law along with the implementing rules and regulations; (iii) commercialization of DABM and operation on a commercial basis; (iv) institutional reform, including creation of a National Utility Regulatory Commission; (v)accelerate private sector provision through explicit policy and legislative cover for the private sector; (vi) service delivery standards and options; (vii) refocus policy to stress repair and maintenance, loss reduction and commercial operation equally with new investment; and, (viii) tariff reform with a slow but deliberate phase out.

- **Programs:** Key programs to support implementation of the energy sector's goals and priorities and achievement of the desired outcomes are discussed briefly below and in greater detail in in Section V. The overall public investment need for the next five years is ??? The financing gap that will need to be covered externally (donors and private investments) is. A detailed list of programs, sub-programmes and projects is part of the Sector Investment Program (Annex II).

This section presents Major Programs and Projects by prong or focus area.

Prong One – Efficient Operation of Infrastructure

1. Fast Track Commercialization of DABM. Work here will also provide a model for commercialization of other SOEs in the energy sector. Begin loss reductions programs including metering of retail customers.

2. Procure spare parts and fuel

3. Repair existing transmission and distribution systems including rehabilitating and/or upgrading substations and distribution networks for towns under NEPS main transmission lines (estimated cost, US $120 M), Kabul distribution grid reconstruction and extension (estimated cost, US $ 250-300 M)

4. Install meters for cross border transmission

5. Repair existing thermal plants

6. National Energy Conservation Program (NECP),[36] and (iv) implement complementary activities to achieve its targets which may include such measures as demand side management and other best practice energy efficiency measures.

PRONG TWO – SECTOR GOVERNANCE

1. **Improved GOA, Donor & NGO Coordination.** Effective assistance and achievement of long-term sector goals and sustainability require effective coordination and cooperation among all stakeholders. Donor planning on an individual basis is well developed; however, integration of donor plans with firm commitments for funding and well defined integration with energy sector ministries and other stakeholders needs to be improved. Specific attention needs to be paid to these issues within the ICE to ensure that ANDS goals are met efficiently and on time.

2. **Subsidies and cross-subsidies in both power and fuel but done so in a way that matches improvements in the sector and recognizes the hardships that quick withdrawal of the subsidy could have. Universal service obligations should be directly funded through Government payments to the utility.**

Subsidies are an important and integral tool of Government policy. Energy subsidies that provide a basic level of energy services to the poor exist in almost every country. So the issue it no whether there should be subsidies but rather who gets the subsidy and the how of the subsidy mechanism. Subsidies need to be identified and made transparent during the restructuring process and removed.

In 2004/05, the average tariff collected by DABM was only five cents/kWh, compared to an average unit cost of power production of about 12/kWh. Currently, power subsidies cost the government $56 M/year, which is unsustainable and undesirable.

Assistance is required to review the existing tariff methodology and adjust a necessary, develop a targeted subsidy plan and a phase-in plan for subsidy reduction. Assistance will need to include a public outreach program. This could be one of the first tasks of the regulator (See below).

3. **Capacity Building.** Current efforts to train IROA energy personnel lack coordination and effectiveness. A comprehensive vocational training program to ensure future human resources adequate for the energy sector and to demonstrate evidence of a comprehensive, multi-disciplinary and multi-ministry approach by the IROA is required. Development of an Afghanistan Vocational Training Center is needed. The recently established National Capacity Building Program may be the proper entity to accomplish this task. Training will also support the commercialization of DABM and other energy sector SOEs. Additionally, all SOEs need training in basic management, accounting and finance.

4. **Improved Sector Governance.** Currently, energy sector governance is spread among numerous IROA Ministries, agencies, and SOEs where effective coordination often is lacking. Moreover, the roles and responsibilities of IROA entities will change as sector restructuring and private participation advances and the role of the Government evolves from direct sector intervention to oversight and regulatory functions. Actions to privatize SOEs need to be completed and the IROA needs to review the roles and responsibilities of Ministries and other IROA entities in light of the structure and expanding private sector role within the sector. Consolidation of functions and redefinement of roles and responsibilities

[36] To economize for cost-savings, people in Kabul have started using fluorescent bulbs (also called white bulbs), 8,11 and 18 watts; these produce as much light as 60-100 watts (regular) bulbs. White bulbs also do not produce heat and have a longer life, 6 months or more. However, white bulbs are expensive; an 18 watts costs 120 Afs, as compared to 20 Afs for a regular 100 watt bulb.

among IROA entities needs to be addressed. Improved governance is more than just properly aligning Ministries and IROA entities. It includes the establishment of sector regulation, the increased role of the private sector, and integrated policy and planning.

Almost all major reviews of the energy sector or sub-sectors conclude that it would be best to consolidate all energy operations under one Ministry, a Ministry of Energy. This is something that needs to be considered in the intermediate term.

4.1 Legal and Regulatory Reform Program. Currently, there is only an embryonic legal and regulatory framework for the Afghanistan energy sector, which is insufficient to support restructuring and private investment. The laws are silent with regard to private provision of energy. This lack of explicit basis for the private sector will serve to increase risk and cost and delay the entrance of the private sector in a meaningful way. Norway is providing assistance to redraft the hydrocarbons law and it will be completed soon. Drafting of an overarching energy law and the electricity sector law is a top priority.

Government needs to make an unequivocal commitment to involving the private sector including an aggressive timetable for action. Amend the law to restructure the energy sector with a strict timetable specifically mentioning (a) sector restructuring, and (b) private provision of energy.[37]

Establish a multi-sector regulatory body (water, electricity, coal, and petroleum) independent of the energy related ministries. This program would support the creation and ongoing operation of a new Government Entity to regulate the sector. To jump start the process, a shadow regulator would be created composed of expat staff in key positions to actually perform day-to-day functions and train local staff on both on-the-job training and formal training. As local staff are trained, expat assistance would be reduced. This serves the purpose of immediately have regulatory assistance in country to establish the necessary frameworks and provide "guidance" and this will go a long way to creating the favorable environment for the private sector.

The lack of a regulator, independent from the Ministries that deal with energy, is an obstacle to efficient operation of the sector even if the operations are under Government control. Because of the importance of catalyzing private sector provision of these services (water, electricity and natural gas), the regulator needs to begin using a more French/Arabic model of regulation and evolve with the sector over time. Emphasis needs to be on acting as a watchdog of SOE commercialization and performance improvement, and providing the early technical input into the contracts used with private sector entities. One of the first activities could be to develop modern production sharing agreements.

Develop and implement the organizational structure and staffing plan for NURC.

Recognizing the time to enact legislation and establish an effective regulatory authority, it may be appropriate to accelerate the process through a Presidential Decree that would establish the regulatory authority while legal and administrative issues are being resolved.

4.2 Private Sector Provision Program. As mentioned earlier, the country can no longer wait to actively begin attracting the private sector to the energy sector. The enabling legislation, policy and regulation will addressed through other efforts. This program is to establish a Public-Private Partnership Office to facilitate increased private sector involvement in the infrastructure areas beginning first with the energy sector. At a later date, it could focus on non-infrastructure reas. It would be housed in the Ministry of ? and be responsible for developing the laws and implementing rules and regulations that are not specific to any sector but rather cross cutting,

[37] Private provision is a catchall phrase that is used to convey all the possible ways of involving the private sector from management contracts through the sale to and operation by the private sector.

such as concession law or a BOT law. The PPP office would also develop prototype commercial instruments such as contracts, developing a tendering system that would be run by the PPP office on behalf of client Ministries or SOEs.

Develop and implement the organizational structure and staffing plan for PPP Office. This needs to be accompanied by a shadow expat staff to provide additional resources and critical on-the-job training.

Reforms that lead to transparency, fair competition, a functioning legal framework, and rule-of-law, among others can meaningfully bring private sector participation. For electricity, private sector can be mobilized through the use of: Independent Power Producers (IPP's), Management and Maintenance Contracts, Concessions, Build, Operate, Transfer (BOT) and Full Privatization of Assets, the highest extent of privatization.

As a start, DABM will outsource Works and Services and Billing/Meter reading. In the works and services area, the utility will no longer undertake construction and rehabilitation but will give them under tender to the private sector. Other areas that will be encouraged include O&M contracts. Moreover, when commercialization is complete and distribution unbundled in an accounting sense, DABM will seek a performance based management contract for distribution.

In the regulatory arena, our strategy includes: establishing enabling environment including commercial and power-sector specific contract laws such as for dispute resolution. Moreover, functioning courts can be an important enabler to attract private sector investments. It is proposed to create a Minimum Infrastructure Platform (MIP)[38] for private sector led growth.

Given the on-going power infrastructure activities, including those planned, under proper regulatory environment and security conditions, over time, selectively, there is a good potential for the privatization of power. While some success of telecom privatization exists, a key difference is the public's perception that providing power is the government's responsibility, and also much higher costs of power infrastructure as compared to telecom. Nevertheless, areas such as concessions, and licenses can be looked into for potential use.

Some of the privatization areas that will be investigated are: (i) Equipment and human resource supply to power construction and rehabilitation projects, (ii) Owning and operating of small and medium sized stand-alone grids,[39] (iii) Management/maintenance contracts for regional power programs and major power plants, (iv) The installation and operation of alternative energy sources (solar and wind installations), potentially with subsidies in the short- and medium-terms, (v) For the longer term, through unbundling and divestiture of power generation plants which could operate as stand alone units that sell power to the grid, and (vi) over the longer term (2015 or beyond), subsidized development of coal fired power plants to support major industry such as mining.

Security remains an important issue including for private sector participation and operation. To reduce security-related risks, the Government is increasingly implementing corrective measures including increased security, creating employment opportunities and apprehending criminals.

Additional regulatory improvements are also underway to lower risks to the private sector. Also, the public will be educated to help accept privatization, as it is gradually phased in. MEW will work towards improving the regulatory framework to reduce risks and costs. IROA is committed to encouraging and increasing private sector role in power.

[38] Proposed MIP is a comination of elements including: (i) business environment; (ii) investment facilitation; (iii) human capital; (iv) financial services; (v) Power sector-specific laws including dispute resolution, and (vi) Physical and support infrastructure.

[39] The Omary Electric Company in Ghazni serves 8,500 customers with 24 hour electricity and only 42 staff (compared to DABM in Ghazni who serve 1,460 customers with 5 hours of supply from 29 staff).

5. **Integrated Policy and Planning.** As part of improved sector governance comes the integration of policy and planning. It is imperative that the energy sector be seen from an integrated point of view and that the Ministries and Agencies involved in energy coordinate their policy and planning exercises so that the complex interactions among subsectors are adequately considered. This will result in a more optimal allocation of resources and a more effective capital investment planning process. ICE needs to be strengthened both institutionally and from a capacity point of view for this critical work.

5.1 Least-Cost Expansion Plan based on a rigorous cost-benefit analysis. As the coordinating institution for the energy sector, it is recommended that ICE undertake development of a **Least-Cost Expansion Plan** to achieve IROA objectives for the sector over the next 2-to-10-year period within overall budget constraints. This plan would utilize and expand upon current economic models developed through USAID-funded assistance to evaluate current and proposed projects and be updated on a regular basis. Based on this analysis and with input for the GOA, donors, NGOs and other stakeholders, a comprehensive expansion plan for Afghanistan's energy resources—including electricity, natural gas, oil, coal and renewables—would be drafted, vetted and put into place; and would include a detailed monitoring and evaluation program, indicating objectives, benchmarks, and reporting requirements. This plan would include capacity building; regulatory, legal and legislative reforms; private sector initiatives, and other programs needed to achieve ANDS objectives, in addition to specific projects to rehabilitate and expand energy sector infrastructure. It would prioritize projects and programs according to short-term (2-to-5 years) and intermediate-term (5-to-10 years) requirements given overall IROA and donor budget constraints.

As the implementing and coordinating entity, ICE could assign specific projects and programs to individual ministries and entities. This Plan should review:

- What is the optimal balance over time of domestic energy production from hydro, natural gas, oil, coal, renewable resources and energy conservation?
- What is the least-cost balance over time between domestic versus imported energy?
- What is the optimal balance over time of energy resource use for rural energy services?
- Given resource constraints, what is the optimal balance over time of IROA versus private sector involvement in the energy sector, including rural energy?
- What policy, institutional, legal and legislative reforms are needed to develop a sustainable energy sector with private sector participation?
- What studies and data and informational resources are needed to fill gaps in understanding and knowledge of the sector and to support development of an effective energy sector strategy?
- What is an effective strategy to increase participation, build support, and maintain realistic expectations among sector stakeholders with regard to assistance efforts?

5.2 Needs Assessment and Data Base. The IROA should undertake a detailed needs assessment and develop a comprehensive data base for the Afghanistan energy sector, including information on energy use by various categories of consumers (households, commercial, small and large industry, transportation); options for meeting sector demand; rural and urban household information, economic growth, level and structure of energy demand, rates of population growth and urbanization; energy cost and availability; etc. This information would be used to create a comprehensive data base to support achievement of Afghanistan's long-term energy sector objectives located at the Afghanistan Energy Information Center (AEIC).

6. **Project Management Unit.** These energy projects and programs are so large and institutional capacity at implementing entities so thin that is it imperative that a Project Management Unit

be established to handle all project management aspects including monitoring and evaluation**.** The PMU would work with ICE and the implementing entities to develop a comprehensive project management program that would be applied to the largest and most critical projects. At the time, the capability to monitor and evaluate would be strengthened at the ICE and implementing entities addressing all **other** assistance efforts not brought under the PMU. It is critical that efforts to rebuild and expand Afghanistan's energy sector, to strengthen energy sector institutions and to attract private sector investment be as effective and efficient as possible. Current efforts have produced some important results, but efforts need to be strengthened, particularly with regard to rural energy programs, to ensure that projects are completed on time, that they produce the desired results and that they contribute to Afghanistan's sustainable energy future.

Prong Three – Rural and Renewable Energy

Amend electricity law to clearly demarcate the boundaries between MEW and MRRD with respect to rural energy; concentrate rural-remote energy activities within the Rural Livelihoods and Energy Department (RLED). It is important to more clearly define the areas of control between the MRRD and MEW in providing energy services. MEW is principally concerned with providing electricity services to: (1) urban and peri-urban areas; (2) secondary towns and cities of 5,000 persons or more; and, (3) large industrial, mining, commercial or agro-industries. To more accurately reflect these differences, the distinction between rural energy and rural-remote will be made following the Bangladesh experience.

Rural-remote energy is energy that serves remote communities of a village or village and where the settlement is less than 5,000 persons that is a reasonable distance from a transmission line, or an urban or peri-urban area or any other area that would be covered by MEW. This is the clear domain of MRRD and this may include conventional energy such as diesel, liquid fuels, and coal and it may include small scale renewable such as biogas and micro or mini hydro.

While demarcating clearer lines of authority for energy services, this does not reduce the need for the two ministries to collaborate. The need to collaborate arises for many reasons such as: The MEW will have expertise in renewable energy, albeit large scale, that may be of use to MRRD; Eventually, some of the MRRD areas will connect to the grid and so a common understanding of the requirements for grid connection is require; and, there is a need to collaborate on technical standards for rural electrification.

Coordinate donor assistance activities for rural-remote energy through RLED.

1. **In collaboration with NURC, develop Rural-remote Energy Policy** and include **Light Handed Regulation** as an official policy to promote development of stand-alone rural energy systems. Policy and regulation must set guidelines for cost-recovery. In essence projects need to be able to recover operation and maintenance costs and set aside a sinking fund for capital replacement.

2. Undertake a Rural Energy Master Plan for rural-remote and develop a criteria for project selection based on the policy of income generation and cost recovery and on the master plan and do so in coordination with MEW as their **rural electrification plan** is developed.

3. Develop and implement the organizational structure and staffing plan for RLED. This needs to be accompanied by a shadow expat staff to do heavy lifting and provide critical on-the-job training.

4. Establish the Rural Energy Fund administered by RLED and allocated on the basis criteria developed above.

MEW to develop a rural electrification master plan to cover their area of control and coordinate it with the MRRD.

Prong Four - Expand Supply

1. Imports from neighboring countries expanded –

2. Establishment of a Dispatch and Control Center (US $25 M)

3. Power Purchase Agreements for Power Imports – Strengthening Power Purchase Agreements (PPA's) with Afghanistan's suppliers to assure guaranteed supplies at agreed upon costs and quality[40]. This is a top priority activity that cuts across several MEW projects and is critical to additional power needs. It is currently covered under an existing USAID project. Focus needs to be on non-western style PPAs that are consistent with the Central-South Asia way of doing business.

4. (1) North East Power System (NEPS)

NEPS is the most important supply effort consisting of generation, transmission and distribution. It includes a 100 MW power plant based on indigenous natural gas[41] and power imports. . NEPS's *primary* objective is to serve urban centers in Kabul, Nangarhar, Parwan, Balkh, Jawzjan, Kunduz and Baghlan. The transmission lines to transmit imported power from Uzbekistan, Turkmenistan, and Tajikistan to major urban centers in the North and East, in particular Kabul are being completed on a priority basis. The completion will help meet the existing shortfall on quicker basis.

In addition to the 100 MW gas fired generation, NEPS will also include the rehabilitation of Hydropower plants (HPPs) in Pul-i-Chumri and Khanabad in the North, and Naghlu, Saurobi and Mahipar in the east. The generated power will feed through the NEPS. For the long-term, 15 years and beyond, it is proposed to establish new hydro power plants in Baghdara and a second plant in Saurobi; pre-feasibility studies for these hydro plants have been completed. In addition, a transmission line will also be extended from Kabul to Logar and Gardez

4. (2) **Development of Sheberghan Gas Fields and Power Plant.**

Afghanistan needs to develop indigenous energy resources, including natural gas reserves in the Sheberghan area. Data on gas reserves indicate that there is sufficient low-cost gas reserves available to operate a combined cycle turbine plant at Sheberghan for 25 years and that the cost per kWh of power generated would be in the 2.8 to 3.5 cent range. While this is more expensive than the cost of imported power, which currently is in the 2.0 to 2.5 cents/kWh range, future prices are expected to be 4.0 cents/kWh or more. Also, it is important to note the domestic benefits resulting from developing the gas fields and gas-fired power plant.

USAID is exploring options for some funding of a 100MW gas-fired power plant to be located near the Khwoja Gegertak, Jarkaduk and Yatimtaq gas fields and an associated urea plant. USAID is confirming the size of the reserves, quality of the gas and delivery prospects for the plant and plans to move forward with construction of the generating plant pending results of these assessments.

[40] Currently, PPAs are skeletal and include no terms concerning technical quality, quality of service, or metering. In addition, MOU with Tajikistan has not been finalized.

[41] Estimated gas reserves available as of 2006: 1197.17 billion, current demand including for the 100 MW power plant is estimated at 21.09 billion ft^3; Expected life of gas reserves, 56 years. Plant operational target date: late 2008

A high priority for the Energy Sector Strategy is to complete assessment of the Sheberghan natural gas fields, issue a production sharing agreement for development of the fields, complete the rehabilitation of the gas pipeline and develop the 100 MW Sheberghan gas-fired power plant to feed into the NEPS grid. These activities should include reviewing options for private sector participation in development of the power plant, such as a management contract and bundling the project with rehabilitation and expansion of the gas processing and fertilizer plants. Moreover, the GOA needs to consider options to attract private sector participation and investment in the gas sector, including management contracts for Afghan Gas, to rehabilitate and operate the gas processing facility and to expand and operate the fertilizer plant.

5. South East Power System (SEPS)

SEPS aim is to serve urban centers in Helmand and Kandahar). It will enhance power supply to Kandahar and Helmand by rehabilitating two turbines, and by extending a third turbine at Kajakai. In addition to enhancing power supply, another key aim is to gradually reduce reliance on expensive diesel generation. Furthermore, MEW will attempt to advance the proposed time-frame for the feasibility study to expand hydro power production in Kajaki through a second dam.

However, security is a particular concern especially in the South-east including Kajakai-dam area. In the event it becomes a serious threat or an actuality, our Government, as an alternate power supply source will explore the feasibility of installing, small-scale power systems such as decentralized systems, mini-grids and others, in areas where security becomes a threat.

6. Reserve Estimation and Exploration

Increased power generation requires the use of indigenous resources of natural gas and coal. The Government is committed to developing the enabling frameworks that will promote private sector investment in exploration and development. Top priority will be given to existing gas and coal fields.

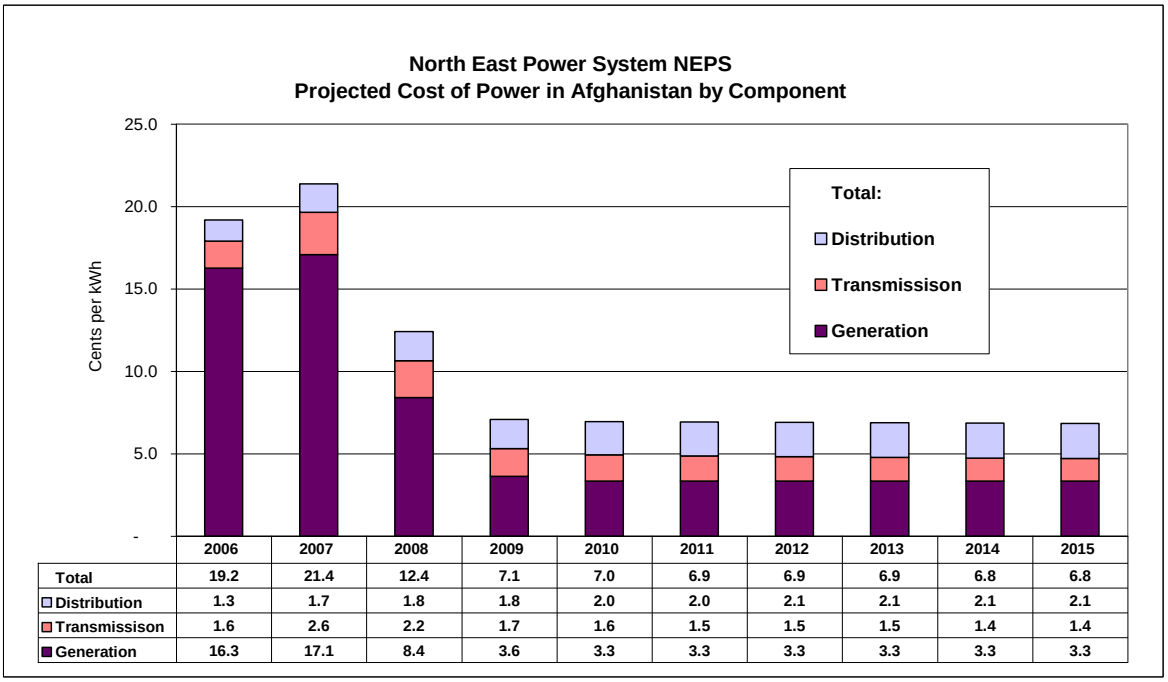
V. ENERGY SUB-SECTOR STRATEGIES

13. Electric Power

The goal of the IROA 's strategy for the power sector is to provide supplies of reliable, affordable electric power sufficient to support a growth rate in GDP of 9% per year and reduce poverty by 3% per year. If these targets are met, by 2013 these achievements would result in over 90% of residents in the three major cities and more than 50% of the rural population having electricity. However this remains an extremely ambitious goal.

Hydropower holds the greatest promise for Afghanistan followed by natural gas and coal. Utilization of indigenous fossil fuels (natural gas and coal) for power generation is very limited as is utilization of solar, wind and other renewable energy resources.

Figure 9. Cost of Power Under MEW Strategy



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	19.2	21.4	12.4	7.1	7.0	6.9	6.9	6.9	6.8	6.8
Distribution	1.3	1.7	1.8	1.8	2.0	2.0	2.1	2.1	2.1	2.1
Transmissison	1.6	2.6	2.2	1.7	1.6	1.5	1.5	1.5	1.4	1.4
Generation	16.3	17.1	8.4	3.6	3.3	3.3	3.3	3.3	3.3	3.3

Source: Ministry of Energy and Water.

Figure 9 shows that the cost of delivered power can be significantly reduced through efforts by the IROA and MEW to displace costly diesel power with other sources, such as natural-gas and coal and with lower cost power imports. As most of the cost of power is associated with generation (as opposed to transmission and distribution), replacing costly diesel generation will have a major impact on the delivered cost of power as shown in Figure.8.

Priority objectives of the Government in electricity include:

- Commercialization of DABM including outsourcing and/or privatization some functions.
- Institute a CFL penetration program.
- Increase operating capacity in Afghanistan from 448 MW to 850 MW by 2012.
- Increase power distribution in Kabul to 500 MW by 2013.
- Increase power distribution in other major urban centers by 100 MW by 2013.

- Provide 100 MW to electrify 25 small towns and 800 representative rural households by 2013 (MRRD estimates that as of 2006, there were over 38,000 villages in Afghanistan.).
- Promote supply of energy services to rural and remote areas.
- Support development of renewable energy resources, particularly micro-hydro, solar and wind.
- Support institutional strengthening and capacity building and private sector involvement in the power sector.
- Tariff reform.

Measures to Increase Power Generation and Delivery

Rehabilitation and expansion of power generation, low-cost power imports, and increased access to rural electricity supply are the core components of the IROA 's efforts to increase accesses to electric power in Afghanistan.

Major efforts by the IROA and donors to increase power generation and delivery include the following[42]:

- Rehabilitation of the NW Kabul thermal plant (44MW).
- Reconstruction of East GT (450MW).
- Development of a gas-fired generation plant at (100MW).
- Power generation activities directed to off-grid supply, including micro-hydro and solar powered systems, potentially adding about 21MW.
- Installation of 25 diesel generators to help meet winter and emergency needs in Kabul and Kandahar (21MW).
- North-East Power System (NEPS) to connect Kabul to Pul-e-Khumri with ties to Tajikistan, Uzbekistan and Turkmenistan for power imports and the addition of thermal power through indigenous gas at Shebergahan.
- North Transmission System (NTS), including constructing 220kV lines from Nahri Shahi (Mazar-e Sharif) to Surkhan Daria in Uzbekistan and to Pul-e-Khumri and beyond.
- Eastern Transmission System (ETS) is being rehabilitated and strengthened, including the existing 110kV lines from Kabul to Mahipar, Naghlu and Sarobi.
- Western Transmission System (WTS) includes strengthening the existing 110 kV line connecting Herat and Mary in Turkmenistan and the 132 kV line connecting Herat to Taiband. The South East Power System (SEPS) which via a 110kV line connects Kandahar to Lashkar Gah and Dural Junction and connects Dural Junction to Kajakai.
- Installation of diesel generation in various cities where no alternatives are available.
- For small towns and cities, strengthen power availability including: the Qalat Electrification Project and the Aybak Distribution Project to strengthen distribution networks and establish 4,300 new connections in rural areas; micro-hydro projects in various parts of the country; limited wind energy projects (such as in Herat, with over 120 days of potentially strong winds); and an estimated 200 small biogas digesters in Kandahar.

Longer-term initiatives that might be undertaken between 2012 and 2020 might eventually include some of the following:

- Developing a national grid, and becoming a power transit country; plus the following specific projects
- Kajakai 2 (100 MW) and Saurobi 2 (180 MW) hydropower development.
- Kokcha hydro cascase, (perhaps up to 1000 MW)

[42] This list is intended to indicate IROA and donor activities undertaken to expand availability of electric power. The status of these activities often is unclear as to whether they have been completed, are being implemented or have been delayed.

- Baghdara (280 MW)
- Kunar, (300 MW)
- Panship (Gulbahar) (120 MW;
- Possible hydro projects in Bali Murghab and Balkh, with currently unknown capacities; and
- Perhaps one or more coal to power facilities with a capacity of up to 350 MW..

These activities will take some time to complete. New generation to serve the Kabul area is not expected to be available until December, 2008, including delivery of expanded power imports from Central Asia. Completion of the Sheberghan power plant depends on completion of the resource assessment and finalizing the production sharing agreements; development of other resources options, such as coal-fired generation or new hydro plants, depends on completing a number of ongoing initiatives designed to clarify the roles and responsibilities of the IROA and developers and to reduce to manageable levels the risks and uncertainties associated with development of these resources. In addition, a recent analysis of the sector indicates a potential electricity supply shortfall in 2010 of about 320 MW, or perhaps more, depending on how 'demand is defined.' Currently most customers receive some power some of the time. There seems to be latent demand for far more power than is planned for any time in the foreseeable future.[43].

Institutional, Regulatory and Legislative Policy Requirements

While physical improvements to the power structure are underway, simultaneously initiatives are being taken to build institutional and implementation capacity across relevant power sector entities many of which will increase transparency. Such efforts include:

- Strengthening institutional capacity at MEW, MRRD and MoM to be completed by 2015.
- Technical training of technicians and engineers at DABM in power sector infrastructure maintenance; management courses and training in procurement, billing and collection and other areas.
- Efforts to unbundle and corporatize DABM also are underway, including inventorying of DABM's assets; training to selected DABM staff in procurement, billing and collection; and approval of bye-laws to authorize DABM's conversion to a new commercial entity.
- Tariff reform for DABM, including raising tariffs to cover 75% of costs by 2010.
- Establishment of an independent Energy Regulatory Commission with authority over tariffs, service quality, and other issues.
- Energy needs survey.

A major part of the IROA 's efforts to increase supply of electric power needs to be development of an effective policy to attract private investment to the sector, Here, lessons learned from other countries in the region may be helpful.

A.1. One-Stop Shop- The Private Public Partnership Office

In 1987, Pakistan requested assistance from the World Bank to increase private sector participation in the electricity sector[44]. An initial framework of incentives to attract private investment was put in place in 1988 to address the following constraints:

[43] At the present time, most DABM customers often are receiving power for about 3 hours a day. Why would such customers not want to receive power for 6 hours per day? If this happened, why would they not want to receive power 12 hours per day. And if they started receiving power for 12 hours a day, why would they not want to receive power for 24 hours per day? This represents one simple measure of potential demand.

[44] Lack of Access to Energy; The Enabling Environment Conference: Effective Private Sector Contribution to Development in Afghanistan; The World Bank Group, June 2007.

- Absence of a comprehensive policy framework concerning incentives, fiscal treatment, reparation of profits, availability of foreign exchange and pricing.
- Lack of long-term financing for projects.
- Inadequacy of institutional arrangements for the review, negotiation and approval of projects.

In 1992, the Government adopted a Strategic Plan for power sector privatization, which included commercialization and unbundling and eventual privatization of the electric utility; establishing an independent regulator for the sector; and issuing tenders for private sector development of power projects based on two important elements:

- A "one-stop shop" to address all issues relating to development of an IPP.
- A ceiling bulk power tariff against which potential developers would bid.

The World Bank provided assistance to the Power Ministry to develop procedures to implement this Plan, with major elements to: (1) develop policies to support investment; (2) create a vehicle for long-term financing for private power projects; and (3) establish a new entity to evaluate, negotiate and approve private power project investments. This new entity was a "one-stop shop" within the power utility in charge of evaluating proposals and negotiating agreements between the Government and the project developer necessary to bring the project to market (e.g., PPAs, FPAs, pricing, financing, etc.).

This policy and institutional framework proved to be very successful in bring to market 20 IPPs with a total capacity of 4,500 MW, with an average closing time of 2 years.

This process can be utilized while other activities to commercialize and privatize the government-owned utility, establish an independent regulator and complete tariff reform are ongoing, thereby shortening the time for private sector project development. Major elements of this policy to ensure success include the following (some of these elements were missing from the Pakistan program, but are based on lessons learned from that process)[45].

- A clear policy and package of incentives to promote private investment.
- A "one-stop shop" to address all issues related to approval, financing and development of projects.
- Establish a bulk power tariff ceiling price indexed to inflation that developers bid against to accelerate project development, rather than a using a competitive bidding process (the tariff needs to be evaluated and altered over time in successive tenders to reflect market conditions).
- Standardized security package (including Government and Donor guarantees) to reduce country and project risk.
- A standardized and transparent review and approval process (with a dispute resolution procedure) so that the best (most economical) projects are selected and review criteria are known and fairly applied.

This type of procedure could be adapted to Afghanistan as it is designed to address very similar conditions that currently exist in its electric power sector. In addition, this procedure could accelerate development of IPPs in Afghanistan while current efforts at regulatory and tariff reform and commercialization of DABM are ongoing.

A.2. Multi-sector Regulator & Regulation by Contract.

[45] "Lessons from the Independent Power Experience in Pakistan;" by Julia M. Fraser; Energy and Mining Sector Board Discussion Paper No. 14; The World Bank Group, May 2005.

Regulation by contract is a mechanism that specifies the roles, responsibilities and obligations of the electricity distribution company and the regulator in providing electric power service to retail customers[46]. This contract is similar to, but more detailed than a Power Purchase Agreement, which defines the terms and conditions for the sale of power from a generator to a distribution company. Also management contracts are a type of regulation by contract, in that they specify certain performance requirements for the contractor tied to rewards and penalties in exchange for a commitment by the government to provide revenue to cover costs, including profit.

Recently established regulatory commissions in developing countries often do not have adequate experience or expertise in effectively regulating power providers and also are often not truly "independent" from political influence. In addition regulatory procedures and mechanisms, including dispute resolution procedures, generally are not well established. Therefore, developers may be reluctant to invest in distribution facilities as the perception of regulatory, financial and political risk remains too high in relation to expended benefits from the investment. To address this situation, and also to speed up the development process while the necessary conditions are being put into place to establish an effective regulatory commission, the concept of "Regulation by Contract" may be usefully applied.

Regulation by contract does not specify prices. It pre-specifies a regulatory treatment for individual cost elements, which taken together determine the prices charged for electric service. The contract is a detailed tariff-setting agreement between the service provider and the regulator that forces the regulator to set tariffs based on a set of specific formulas and procedures. In this way it limits the discretion of the regulator and reduces the risks associated with investing in a power distribution company. In exchange, it establishes certain service and performance obligations on the distribution company to ensure that customers receive adequate service. The key component of the regulatory contract is a performance-based, multi-year tariff setting system. This type of mechanism has been used for a number of years with success in a number of developing and developed countries, including the US, UK, France, India, Brazil, Chile, Peru, Colombia, and Bolivia.

The agreement or contract contains a formula with pre-specified parameters that determine how annual total revenue or average tariffs levels will be established by the regulator. The formulas generally distinguish between controllable and non-controllable costs. Controllable costs are tied to external indexes or benchmarks with performance targets and associated rewards or penalties. Non-controllable costs are allowed to be passed through to customers on a regular basis. There also is usually a mechanism to deal with unforeseen events, such as natural disaster that might affect the company's costs or revenues and a dispute resolution mechanism to address disagreements between the company and the regulator.

The purpose of this regulatory contract is to reduce the risks associated with investment in distribution assets so as to promote private investment while also ensuring adequate protection of customers by supporting adequate, safe, efficient, and economically priced service.

Elements of a regulatory or performance-based contract typically include:

- Pass through of power purchase costs
- Recovery of distribution costs
- Loss reduction and other quality of service requirements for the distribution company
- Obligation to provide service by the distribution company
- Performance requirements on behalf of the distribution company, such as minimum efficiency standard, number of new hook-ups, revenue collection targets, etc.
- Distribute resolution mechanism
- Mechanisms to reduce foreign exchange risk

[46] Regulation by Contract: A New Way to Privatize Electricity Distribution?; World Bank Working Paper No. 14, September 2003.

Projects

To ensure that ongoing activities to expand electricity supply mesh effectively with the IROA 's longer-term objectives for the electricity sector and produce cost-effective results, it is recommended that the following activities be undertaken as part of an overall Afghanistan Energy Sector Strategy:

1. **DABM Commercialization and Capacity Building**. It is critical that DABM be placed on a sound financial basis. Some progress has been made to commercialize DABM and improve its operational management and efficiency, these efforts need to be completed. Emphasis on improving, metering, billing and collections is needed; consideration also should be given to implementing a management contract to the private sector for these functions.

Support for full-scale COMMERCIAL AUDIT

a. Audit to be performed by one of the three major international audit firms doing business in Kabul.
b. Capacity building within the power utility to deal with outside auditors and respond to AUDITOR'S COMMENTS.
c. Pre-audit training, or audit preparations, to help DABM become ready to be audited. This would be a major piece of work, given the general condition of financial reporting in DABM over the past (say) 30 years, because of the war, etc.

Capacity building for Accounting Systems and Software Implementation

a. DABM will begin Implementing Microsoft "Great Plains" Accounting Software. Comprehensive integrated package.
b. Significant training will be required to:
    i. Modernize and standardize all accounting procedures at all provincial offices, reporting to central finance department;
    ii. Systematize preparation of all financial reports and statements and develop meaningful financial management reports and annual report that allow decision makers to prioritize activities and focus producing optimal value for money at each decision point
    iii. Design and implement budget planning and control systems
    iv. Systemize cost accounting and resource management to optimize decisions involving outsourcing, management contracting, etc.
    v. Provide required financial data inputs for tariff models and projection of subsidy requirements.
c. Capacity Building for design/implementation of sophisticated internal Audit Systems
d. Computer training in Basic Operations, Programming, Database Management, Networking, and if possible MS Great Plains (needed immediately)

Social Safety Net[47]: -- Design & Training Issues.

a. Retirement Incentives for redundant personnel to leave
b. Vocational training plans for up to 3000 DABM employees to enter the labor force
c. Labor-intensive activities and performance standards that may make it economically feasible to retrain and retain workers productively.

[47] *DABM has approximately 5,800 employees; the news DABS will probably have something like 2,000 to perhaps 2,500 employees. The residual staff will remain with DABM for some time, and/or remain on the Ministry's complement. These people need a Social Safety Net package, to allow them to retire, (if they are old enough) or be retrained with other marketable skills if they are of a suitable age. It is imperative to address this now so that it does not become an obstacle to full commercialized business practices and provides a model for other SOEs.*

Capacity Building-and Training for Commercial Procurement & Inventory Control Systems

a. Design/implement/manage transparent and efficient procurement policy, systems, and procedures, with internal audit procedures and pre award certification by external auditor
b. Inventory, warehouse and minimum stock controls training
c. Standardization of equipment, parts, and materials training
d. Requisition, standardized specifications, purchase order systems, receiving reports and professional inspection at product delivery to insure compliance with specifications, quantity verification, transfer to job site or warehouse, etc.
e. Training in preparing and maintaining specifications sheets

Capacity Building-Tariff Policy

a. Training in preparation of cost-sheet and cost accounting management
b. Training in development of rational tariff development, rate structure, and rate justification
c. Strategies for appropriate system wide data collection, data management for rate assessments, and cost accounting procedures suitable for tariff defense
d. Training for development, documentation, and presentation of a rate case for tariff modification/adjustment

Capacity Building- Equipment Maintenance Management Systems

a. Training and technical assistance to help the power utility determine whether to develop and implement in-house equipment maintenance management systems with standard EMMS software or outsource equipment maintenance management through a management contract
b. Capacity building for operation of the system - or - for contract development, management, and evaluation if outsourcing is the preferred option. (including preventive maintenance management systems, schedule enforcement, etc.
c. Capacity Building or training in contract management for specific, high value equipment such as generation plants, dispatching, substations and transformers
d. Capacity building for optimization of routine maintenance, cleaning of components, and minor functions that will normally be performed by utility personnel. (planned maintenance management by objectives)

Capacity Building-for Corporate Culture Transformation

a. Transition from tradition line item budget and bureaucratic governmental cyclical management approach to cost effective goal setting
b. Creative finance solutions, project finance schemes for off-balance sheet (off-budget) systems/equipment upgrades that produce high return on investment [for Senior Management Group, particularly the CEO, CFO, and part of the Change Management Office staff.]
c. Project management concepts for specific problem solving and short term transformative projects, inter-departmental projects, and corporate issues
d. Commercial Policy Development and implementation[48]

[48] *There is virtually no local capacity for any of the above services and no licensed electricians. Energy efficiency projects increase service levels without adding generation costs and can be financed through utility bills. Obsolete wiring must be replaced or houses will burn when new capacity is online in late 2008 and customers add appliances that their houses were not wired to sustain. The electric utility can initiate these businesses with some quality control, employing some excess DABM staff. Later these business units can be spun off at full commercial value.*

i. Opportunities options and analysis for new services
    1. Demand side management and energy efficiency
    2. ESCO Services
    3. Wiring safety inspections prior to new connections or service upgrade (e.g., from 25 to 50 amp service, or single phase to 3 phase)
    4. Re-wiring services for customers
    5. Certification/sale of energy efficient products
    6. Project finance of Energy efficiency products
    7. Vocational training for private service
ii. Spin-off of non core services, after start-up

e. Development and implementation of key performance indicators for each department, business unit, cost/profit center
f. H.R. & Personnel Policy Development (Software and hardware)
g. Personnel Development and corporate career development
    iii. Job specification with performance standards
    iv. Personnel evaluations
    v. Individual and group performance incentives based on objective key performance indicators

Capacity Building-Information Technology, Information Systems

a. Integrated management reporting systems
b. Communications systems and equipment
c. Database management (Systems approach to handle financial and technical data referenced in key items above, and relevant information from all departments throughout the corporation)
d. Acquisition and installation of technical management systems (hardware and software for line management, GIS and others)

Capacity Building-/Training in Security Management Systems & Procedures[49]

a. Facilities security
b. Inter agency security agreements
    i. Training for basic utility security
    ii. Commercial security outsourcing
    iii. Agreements with Military and para-military agencies to ensure security at high value installations (Dams, Generation Plants, other major infrastructure)
    iv. Training for implementation of such agreements

Capacity Development for Revenue Protection Systems

a. Practical economics for task prioritization
b. Technical training for loss reduction
c. Meter replacement programs, transformer replacement programs,(project finance schemes)
d. Metering/billing/collection/audit policies, etc.
e. Collection strategies
f. Baseline verification, best practices, outsourcing only when value-for-money is clearly demonstrable

2. **Tariff Reform.** There is an immediate need for tariff reform and improved financial viability of DABM while regulatory reform and other initiatives are ongoing. In 2004/05 the average tariff collected by DABM was 5 cents/kWh compared with an average unit cost of 12 cents/kWh. The average annual cost of this subsidy to the government is an

[49] DABM has contractual obligations to provide sophisticated security at major installations being commission or turned over by contractors in Feb 2008, but has no capacity to comply.

unsustainable $56 million. The goal of the IROA is to increase tariffs to cover 75% of costs by 2010. Completion of tariff reform is urgently needed.

3. **Power Imports.** The PPAs for power imports from the CAR region need to be completed and signed in order to reduce the uncertainty of increasing the supply of power to Kabul and other demand centers and support construction of cross-border transmission facilities.

4. **Regulatory Reform.** Currently, there is only an embryonic legal and regulatory framework for the Afghanistan energy sector, which is insufficient to support restructuring and private investment. None of the energy laws address the need for an independent regulatory regime to separate IROA policy functions from sector oversight and to remove political considerations from day-to-day operations of the sector.

As part of the multi-sector regulator, bring electricity regulation under this body. Afghanistan's energy sector is small and technical capacity limited. Therefore, the IROA should consider establishing one regulatory commission with authority over the electricity, natural gas and water sectors. The National Utility Regulatory Commission (NURCNURC) would have responsibility over tariff setting; facility siting; service standards and quality; technical, health and safety issues; dispute resolution; data collection and enforcement authority; grid codes; power and fuel purchasing agreements; and production sharing agreements.

5. **Private Sector Investment.** To encourage development of PPPs including IPPs, the IROA should develop a policy to issue tenders to the private sector based on a ceiling bulk power tariff against which potential developers would bid and incorporating a clear package of incentives and a "one-stop shop" that would address all issues relating to development and financing of PPP proposals. The IROA also should implement "regulation by contract," including management performance contracts to encourage private investment in various segments of the energy sector.

Private sector involvement in Afghanistan's energy sector could include:

- Place metering and billing for DABM under a commercial management contract with performance incentives and inclusion of a training program for DABM staff.
- Distribution area management contracts
- Legitimizing existing informal small local level electricity providers
- Development of IPP facilities, both on- and off-grid.
- In conjunction with ongoing infrastructure projects, such as NEPS, NW Kabul, and Kabul 100MW additions; provide for commercial management contracts with performance incentives and inclusion of capacity development for DAMB staff.
- EPC (Turnkey) contract and O&M for the gas-fired plant in Sheberghan.
- Small-scale manufacturing of turbines, solar installations, networks.
- Suppliers to the on-going reconstruction effort.
- Owners/operators of stand-alone power grids and gas distribution systems.

14. Petroleum Sector

The indigenous fossil fuels in Afghanistan are coal, oil and natural gas. Currently petroleum products such as diesel, gasoline, and jet fuel are imported, mainly from Pakistan and Uzbekistan, with limited volumes from Turkmenistan and Iran serving regional markets. Turkmenistan also has a petroleum product storage and distribution facility at Tagtabazar near the Afghan border, which supplies northwestern Afghanistan. The Government has given high priority in policy to development of oil and gas infrastructure as a potentially significant source of energy for the country and revenue to the GOA. It also plans to address import issues, including increasing private sector participation and

improving quality standards and collection of import duties. But plans have not been substantially put into action!

Natural Gas

Commercially, the second most important energy resource in Afghanistan is natural gas. The natural gas reserves need to be evaluated and estimates of proven and recoverable resources confirmed and fields developed; many existing gas fields and wells need to be rehabilitated and infrastructure rebuilt and expanded. Total investment required to develop the sector through 2015 is estimated at $1.15 billion. If planned investments take place it is estimated that gas production could increase from the current 600,000 cubic meters/day to about 5 million cubic meters/day by 2015. Clearly, however, the increased investment will require changes in the laws, rules and regulations in the sector and creating an environment conducive to expanded private sector involvement. Government revenues could increase from $1.53 million/year in 2004 to about $21.4 million/year in 2015, not including additional taxes from value added through conversion of the gas to fertilizer or electric power.

Development of Afghanistan's natural gas resources has the potential of improving domestic energy resources, reducing environmental impacts and supporting economic growth. Natural gas reserves are potentially large enough to support development of electricity generation as well as a fertilizer plant and local commercial and residential markets in the Sheberghan area. Plans are underway to rehabilitate the gas fields to expand production and to upgrade the existing gas pipeline network to supply the fertilizer plant and the local market. Activities to promote exploration and development of additional gas resources have been underway for some time.

Data on gas reserves indicate that there is sufficient low-cost gas reserves available to operate a 100 MW combined cycle turbine plant at Sheberghan for 25 years and that the cost per kWh of power generated would be in the 2.8 to 3.5 cent range. Also, gas fired generating capacity would be much less expensive than diesel power at about 30 cents/kWh.

Progress in developing these resources is being delayed by a number of factors that affect the ability to develop this resource and attract private investment. Technical assistance and training activities provided through donor funding have been ongoing for a number of year to help resolve this impediments. To date, results have been mixed and many of the activities are behind schedule.

Due to the importance of the natural gas sector as a significant contributor to Afghanistan's domestic energy production, as well as provide an important revenue source to the GOA, efforts to develop the sector need to be given a high priority within the IROA 's overall Energy Sector Strategy.

1.1. Reserve Estimates

Overall, the infrastructure for gas production is either non-existent or is functioning inefficiently, and suffers from chronic under-funding. Moreover, the level of local expertise in gas exploration and development is limited. Numerous studies place proven reserves from between 1 trillion cubic feet (tcf) and 15 to 20 tcf[50]. This latter estimate is from a recent US Geological Survey report. Other studies predict additional probable reserves are as high as 15 or 20 tcf. Given the great range of variability in reserve estimates far more assessment and exploration is required. The Ministry of Mines indicates that there are at least 20 untested geologic structures in the Sheberghan gas region where there is high confidence in future natural gas discoveries.
In addition to proven reserves, there exist numerous un-drilled prospective structures that have undergone various stages of exploration. If even a small number of these un-drilled structures

[50] The USGS definition of proved reserves is: Estimated quantities of energy sources that analysis of geologic and engineering data demonstrates with reasonable certainty are recoverable under existing economic and operating conditions. The location, quantity, and grade of the energy source are usually considered to be well established in such reserves. They have a 90% probability of being produced.

contained commercial hydrocarbon accumulations, the estimated undiscovered gas resources in northern Afghanistan could dramatically exceed current resource estimates.[51]

Based on studies and assessments conducted to date, there is a consensus among most international experts that some important issues require further review:

(1) The manner in which these undiscovered reserves are categorized.
(2) It is possible that some of these structures may have no hydrocarbons or only marginal accumulations. Only by drilling and testing the wells can this information be confirmed.
(3) It is likely that many of these reserves will be categorized as higher risk.

1.2. Production and Infrastructure

Production of gas is estimated at about 21.2 million cubic feet/day, although it is likely that this is an overestimate[52]. This is less than $50 million of gas per year assuming regional gas market prices and no extraction costs. Until new wells are drilled and production begins, production cost estimates involve extremely high risk factors that inhibit investment in the sector.

In 2003, the World Bank reported that Afghanistan "meets only 40% of increasing domestic natural gas demand, produces gas at 25% of its peak level in the 1980's, and loses 30% of that production to leakage - posing revenue and safety issues." For 2006, it is estimated that only about 20% of gas demand was being met. Complete infrastructure must be re-built and/or constructed as new including basics such as roads, power plants, and water and gas treatment plants in addition to drilling specific rigs and other requirements. Extracted gas will require new pipelines; approximately 11 pipelines exist in the Sheberghan region but are of very limited capacity and many are presently inoperable. The most well known pipeline linking Sheberghan gas to Mazar-i-Sherif, is visible from the road and reflects a hodge-podge of pipeline materials of difference diameters, with an estimated more than 300 illegal taps into the line by local users. The degradation of this important pipeline has been such that apparently it is no longer functioning.

Afghan Gas

In addition, current gas prices are too low to cover costs of rehabilitation, O&M and expansion of production and infrastructure. For incremental gas production, tariffs may be less than half of the level needed to cover costs. Moreover, the IROA collects no taxes or royalties from the natural gas sector, missing out on a potentially major source of revenue. As a result, sector entities have been unable to effectively operate, repair and maintain the system. A large part of the infrastructure for storage, transmission and distribution has been damaged while the remaining capacity is in need of rehabilitation.

The majority of more than 12,000 residential customers and more than 700 business customers are not metered. Afghan Gas management indicates that metered and non-metered customers generally pay the same rate for gas. No meaningful data is available to adequately present the costs of operating and maintaining the system at this time.[53] Moreover, the technical standard of Afghan gas operations is extremely low. There is no incentive to conserve or to optimize use of gas resources as the present cost is so low and operations are so inefficient.

Afghan Gas reports that its customers are $15 million in arrears for the past 10-15 years. According to Asian Development Bank (ADB) funded data[54], non-payment is high. According to Afghan Gas if a

[51] Evaluation of Investment Options for the development of Oil and Gas Infrastructure; Hill International, 2004-2005.
[52] Engineer Amir Zada, Director of Oil and Gas, Ministry of Mines, November 2006
[53] Engineer Amir Zada, Director of Oil and Gas, Ministry of Mines, November 2006
[54] Establishing a Gas Regulatory Framework; ADB TA 4354-AFG; Energy Markets, Ltd., May 2006

customer fails to pay for gas use on time, they are cut off. However, there is a common occurrence of carrying the customer debt to the next billing period and not cutting them off so long as some payment is made. Credible indications of illegal connections are provided by Afghan Gas officials but no action underway to legitimize connections, replace meters or build meter reading capacity. There is a "winter billing period" from October through end of March based on a Soviet system that did not necessarily reflect weather conditions.

1.3. Natural Gas Development Program

The natural gas development program supported by the IROA is intended to increase production and develop the transmission and distribution infrastructure so that a higher proportion of the Afghanistan's energy requirements can be met by natural gas and dependence on imported oil can be reduced.

Key issues relating to the natural gas sector are that are receiving IROA attention include:

- Strengthening the capacity of key institutions to support sector rehabilitation and reconstruction and for negotiating and monitoring investments in exploration and development.
- Reviewing policy, institutional, regulatory and environmental issues in order to establish an efficient policy and regulatory framework.
- Developing a policy framework to support private investment in gas exploration and production.
- Increasing Government revenues by phasing out price subsidies and improving revenue collection.
- Implementing regulatory reform to separate policy, regulatory and operational functions for the sector and for establishing appropriate codes, standards and enforcement mechanisms for the sector.

The operational strategy of the Government for the gas sector is to promote economic growth by removing impediments to the reconstruction and modernization program and to open the sector to private investment, particularly for gas exploration and development. Efforts to attract private investment depend on developing policy reforms and structural changes to support longer-term sector development and expansion. Progress to date has been slow, thereby limiting investor interest. Options to speed up this process and to increase private sector involvement need to be explored.

1.4. Measures to Support Gas Exploration

The following measures are being undertaken to support natural gas exploration and development:

- Complete a detailed study of the gas fields to determine their potential size and development potential.
- Modify the hydrocarbons law to clearly define roles and responsibilities of the government and developers with regard to exploration and development of gas reserves. (Underway through assistance from Norway.)
- Draft a gas sector law to address down-stream (delivery, pricing) issues.
- Bring regulatory oversight operations under NURC.
- Capacity building and training for MoM and Afghan Gas.

Efforts need to be undertaken to coordinate ongoing assistance efforts to improve their effectiveness; develop a focused policy for development of the sector, including attracting private investment; and to establish pricing, tax and royalty regimes that promote sustainable development and provide a steady source of revenue to the Government. Activities that need to be taken as part of the Energy Sector Strategy include:

1. **Development of Sheberghan Gas Fields and Power Plant.** Afghanistan needs to develop indigenous energy resources, including natural gas reserves in the Sheberghan area. Data on gas reserves indicate that there is sufficient low-cost gas reserves available to operate a combined cycle turbine plant at Sheberghan for 25 years and that the cost per kWh of power generated would be in the 2.8 to 3.5 cent range. While this is more expensive than the cost of imported power, which currently is in the 2.0 to 2.5 cents/kWh range, future prices are already moving closer to 4.0 cents/kWh or more. Also, it is important to note the domestic benefits resulting from developing the gas fields and gas-fired power plant.

   Based on World Bank and USTDA assessments of the Sheberghan gas fields, USAID is considering construction of a 100MW gas-fired power plant to be located near the Khwoja Gegertak, Jarkaduk and Yatimtaq gas fields. USAID is confirming the size of the reserves, quality of the gas and delivery prospects for the plant and plans to move forward with construction of the generating plant pending results of these assessments.

   A high priority for the Energy Sector Strategy is to complete assessment of the Sheberghan natural gas fields, issue a production sharing agreement for development of the fields, complete the rehabilitation of the gas pipeline and develop the 100 MW Sheberghan gas-fired power plant to feed into the NEPS grid. These activities should include reviewing options for private sector participation in development of the power plant, such as a management contract and bundling the project with rehabilitation and expansion of the gas processing and fertilizer plants. Moreover, the IROA needs to consider options to attract private sector participation and investment in the gas sector, including management contracts for Afghan Gas, to rehabilitate and operate the gas processing facility and to expand and operate the fertilizer plant.

2. **Complete Tariff Reform** to raise natural gas prices to cover costs and improve metering, billing and collections.

3. **Come under NURC** for effective oversight of the sector as outlined above in the Electricity Sector section. NURC would have authority over licensing, siting, tariff, and other rate making and oversight authority. While this authority is being established options to promote development of these sectors, including attraction of private sector investment should be employed, such as a PPP Office to promote development and issuance of management contracts and other PPP instruments.

4. **Revamp the Hydrocarbons Law** to reflect a modern oil and gas sector and incorporate international best practices; clearly define the roles and responsibilities of the government and developers with regard to exploration and development of gas oil reserves and to address environment, health and safety issues; and set a timetable for designated turning sector areas over to the private sector. This is being done through assistance from Norway and the consultants need to work closely with others to incorporate PPP provisions in the law.

5. **Reserve Estimation and Exploration is important to determine the location, size, and economics of recoverable reserves. This has to be coupled with reform so that the private sector will begin to undertake the exploration and development natural gas.**

6. Conduct a CNG feasibility study. CNG holds significant promise both economically and environmentally in most countries in South Asia have already embarked on CNG vehicle programs. Clearly, the viability of a CNG program is linked to the availability of natural gas and items 1 and 5 above will provide the basis for the feasibility study.

7. **Afghan Gas Reform.** Afghan Gas is not commercially viable for a host of reasons including tariffs that don't cover costs, a lack of functioning equipment, modern methods and

procedures, funds and trained personnel, customers that aren't metered and don't pay and an infrastructure that is crippled. Performance at Afghan Gas can be improved. In addition to the capacity building measures already underway, the company should be unbundled and functionally separated into upstream (resource development) and downstream (gas transmission and distribution) entities with an eventual eye towards some form of private sector involvement. At the earliest, this could take the form a management performance contract, including performance incentives and training requirements for MoM and Afghan Gas staff. The economics do not support metering but there are creative ways of effectively recovering for service and these need to be explored by the NURC.

Crude Oil and Petroleum Products

Afghanistan has only limited supplies of oil. Domestic oil production is insignificant and current production is about 400 barrels/day.[55] As a result, Afghanistan depends on imports for most of its consumption. Oil is produced in limited quantities primarily from the Angot oil field, located in Sar-i-Pol province. Given the serious supply shortfall, in order to meet country's needs, most petroleum products—diesel, gasoline and jet fuel included—are imported primarily from Pakistan and Uzbekistan.

Infrastructure for local production of oil is largely non-existent and what infrastructure is present is functioning inefficiently and suffers from chronic under-funding. In addition, the level of local expertise in oil exploration and development is limited. As a result, sector entities have been unable to operate effectively, to repair and maintain the system, nor engage effectively in new exploration and development. A large part of the infrastructure for storage, transmission and distribution of petroleum products has been damaged, while the remaining capacity is in need of rehabilitation.

Much of the petroleum resource potential of Afghanistan and all of the known crude oil and natural gas reserves are in northern Afghanistan, located in parts of two geologic basins – the Amu Darya Basin to the west and the Afghan-Tajik Basin to the east. Most of the undiscovered crude oil is in the Afghan-Tajik Basin, and most of the undiscovered natural gas is in the Amu Darya Basin. The U.S. government estimates that total oil reserves could be as much as 270 billion barrels.

If planned investments take place as envisioned, it is estimated that oil production could increase from the current 400 bpd (barrel of oil per day) to 3,000 bpd by 2008; 5,000 bpd by 2010 and 10,000 bpd by 2015. Clearly, however, the increased investment will require changes in the laws, rules and regulations in the sector and creating an environment conducive to expanded private sector involvement. Total revenue streams from these investments are estimated to increase, at a minimum, from $5.1 million in 2004 to about $292 million/year by 2015 assuming a price of $80 a barrel.. These revenue estimates do not include additional revenue from value added taxes that could be derived from converting the crude oil to refined petroleum products.

The IROA also has a proposal to install a crude oil refinery in the country**.** Preliminary estimates for a refinery in the 10,000 pbd range from $12-$32 million, depending on configuration, infrastructure requirements and other factors. Clearly the first step is the technical and financial due diligence which is proposed precursor activity to any investment.

2.1. Petroleum Products

All petroleum products consumed in Afghanistan are imported from the neighbouring countries of Pakistan, Iran, Turkmenistan, Uzbekistan, and Tajikistan[56]. The gasoline produced by refineries in

[55] Securing Afghanistan's Future: Accomplishments and the Strategic Path Forward; OIL AND GAS Technical Annex, January 2004.
[56] Energy Sector Review and Gas Development Master Plan; ADB TA 4088; Sofregaz, June 2004.

these countries does not conform with the international standard for lead content (0.13 g / l of lead content) to achieve the 91 RON (octane) that modern car engines require. Furthermore, some of the imports are adulterated with locally produced and processed crude oil from the oil field of Angot. With diesel, the sulphur content of imports can be 5 times the European and US norm of 0.15 percent. In Kabul, the city's altitude has the effect of derating diesel engines, with the effect (if they are not adapted to the altitude) of increasing particulate emissions as well as fuel consumption. The low quality of automotive fuel imposes a serious health cost on the urban population, as well as a financial cost in the form of engine maintenance.

While previously the government had a monopoly on petroleum products trade, this sector is now entirely in private hands. Ten traders are registered with the Ministry of Transport, as are the 2,658 trucks that are authorised to import petroleum products into Afghanistan. The Department of Petroleum Products of the Ministry of Commerce is responsible for supervising the import, storage and distribution of petroleum products and, until recently, it taxed imports (This is now the responsibility of the Ministry of Finance.)

According to the *Petroleum Storage Rehabilitation* report of the ADB (project TA 3874-AFG, March 2003), the country's original (pre-war) storage capacity was of 37,000 kl. Of this, 18,000 kl has been completely destroyed, 14,000 kl could be commissioned after moderate repairs, and the remainder needs only minor repairs.

Afghanistan consumes approximately 1,200,000 tons of state-supplied fuel per year[57]. This includes all types of petrol and diesel (i.e., JP1, JP4, TC1 – generation, heating, aviation) as well as mazut and kerosene. It is e estimated that about 80% of these fuels are consumed for automotive purposes, while 20% is used for power auto-production (gasoline mainly) or small-scale grid power generation (diesel mainly), and water pumps.

At present, eight border transfer points exist to facilitate the import of liquid fuels into Afghanistan. Prices to its stations are set by the state monopoly, Petroleum and Gas Enterprise (Liquid Fuels) operating under the auspices of the Ministry of Commerce and Industries. Operations include 1600 gas stations and 1300 fuel trucks that are closely controlled and impact virtually every province in the country. Infrastructure as well as operational improvements could provide an opportunity for private investment and more transparent operations. Demand for liquid fuels in Afghanistan has increased dramatically in the past five years; with continued and increased reliance on diesel generation, air traffic and home uses, this demand is expected to increase.

There has been no donor support to this sector. Instead, more than 30 reported private contractors work with the Petroleum and Gas Enterprise to supply Afghanistan's gas stations with fuel as well as to import diesel fuel for power generation.

The low quality of automotive fuel imports imposes serious health impacts on the urban population as well as financial costs in terms of engine maintenance and higher fuel consumption. The IROA needs to put into place a system for certification of petroleum traders and to randomly test products at retail outlets and storage depots to enforce quality standards. It also should look at increasing storage facilities and review the import duty and collection process to ensure maximum revenue to the Government.

Lastly, the IROA is considering construction of an oil refinery in North East Afghanistan to refine crude oil produced domestically in the region. If constructed, this refinery would reduce Afghanistan's dependence on imported oil products and improve the quality of refined products consumed in the country.

2.2. Measure to Support Oil Exploration

[57] This figure excludes privately imported or other fuel imports not reported to the state.

The operational strategy of the Government for the hydrocarbon sector is to promote economic growth by removing impediments to the modernization and reconstruction program. In particular policy, financial, regulatory and institutional constraints need to be addressed. The Government plans to open up the oil sector to private participation, specifically for exploration, petroleum imports and marketing. It is recognized that there is a need to establish separate policy and regulatory functions, to undertake sector restructuring, and to improve operation, maintenance and safety standards. It will take time to put these reforms in place; therefore, a parallel approach is being pursued by using existing Government structures to implement reconstruction and capacity building programs while exploring options and developing a consensus on policy reforms and structural and institutional changes. However, this strategy suffers from a lack of technical expertise and poor coordination among IROA entities.

Given the current security, institutional, policy and infrastructure situation, it may be difficult to attract interest by the private sector to invest in the Afghanistan oil sector. If significant interest is not displayed, other options such as management contracts for development of oil fields could be pursued.

In order to pursue its objectives for the oil sector, the IROA is addressing a number of initiatives relating to strengthening the sector and establishing a basis for future expansion and private sector investment. Key issues relating to the oil sector that are being addressed include:

- Strengthening the capacity of key institutions to support sector rehabilitation and reconstruction.
- Undertaking a review of policy, institutional, regulatory and environmental issues.
- Establishing an efficient policy and regulatory framework, including support for private investment in oil exploration, production, import and marketing.
- Increasing Government revenues by phasing out price subsidies and improving revenue collection.
- Implementing regulatory reform to separate policy, regulatory and operational functions.
- Creating institutional capacity for negotiating agreements and monitoring investments in exploration and development of oil.
- Establishing appropriate codes and standards and developing enforcement mechanisms for the sector.

Recommendations.

The IROA has made broad policy commitments and engaged in technical assistance and capacity building efforts supported by donor funding to restructure and develop the oil sector. However, these activities have not been incorporated into a comprehensive strategic plan for the energy sector. As part of the Energy Sector Strategy, the IROA and donors need to undertake the following activities with regard to the oil sector:

1. **Review Options for Attracting Private Sector Participation** and investment, including management contracts for research and development of oil reserves; development of a small oil refinery and distribution of crude oil products; and development and implementation of the first oil production sharing agreement. It could also take the form of privatizing service stations.
2. **Modify the Hydrocarbons Law of 2005** to clarify ownership and development of resources; to provide for exploration and development by the private sector, including stetting production sharing agreements, establish fiscal, tax, health and safety policies and standards; and establish an independent regulatory authority.
3. **Complete Feasibility Study** of construction of a small size refinery for refined petroleum products.
4. **Petroleum Imports.** The IROA needs to improve control of imports and collection of duties; test products at retail outlets and storage depots to improve quality; and should consider increasing domestic storage facilities..

15. Coal

Afghanistan has reasonably good quality coal resources and is estimated to have significant coal reserves (probable reserves estimated at about 400 million tons), most of which are located in the northern part of the country in the region between Herat and Badashkan[58]. Although Afghanistan produced over 100,000 short tons of coal annually as late as the early 1990s, production had fallen to only around 1,000 short tons in 2000.

The primary coal resources in Afghanistan occur in the Katawaz Basin south and west of Kabul. Prospective economically viable coal deposits are found in four coal districts: Karkar, Ishpushta, Dara-i-Suf, and Chalow. However, the real extent of coal deposits in the country is not known and there is an urgent need to assess the resource base.

Some current coal operations are taking place at Karkar and Ispushta mining districts. The literature indicates that Dara-i-Suf appears to have the greatest potential for significant reserves, estimated to be over 84 million tons. This coal is believed to be of coking grade with a high calorific value in the range of 7,000 kilo-calories/kg. The mines at Kalich in the Ispushta district are active. Coal in these districts is extracted by either crude, inefficient, mechanized mining methods or by "artesian" methods. Current production from all operations is estimated to be about 110,000 short tons.

The existing industrial sized coal mines are marginal (if not out of operation) due to antiquated machinery and lack of maintenance and new investment. However, there is considerable small scale production. At present, the small scale mining sector, including coal is wholly unregulated and occupies large numbers of persons in difficult security, health, and environmental conditions. Moreover, coal demand and prices in urban centers have risen due to domestic energy needs during the winter months and also due to increasing industrial demand to fire construction bricks.

Development of coal and other mineral resources requires investments in excess of government abilities. Therefore the IROA's policy is to establish an enabling environment conducive to attracting and retaining investment by both private local and international groups. However, privatization and/or leasing of existing state owned mining enterprises to private groups is, at present, held up by the lack of adequate mining legislation and the need for a clear policy on sector development. Enabling legislation and a proper mineral concession system is needed to establish clear lines of authority and responsibility for the Government and for private developers.

If appropriate measures are taken to distinguish regulatory from operational functions within the ministry departments responsible for coal; put existing operations on a commercial basis so that they may attract private investment; and establish market prices for coal, it is estimated that the value of annual coal production could increase from the current US$ 10 million to US$ 40 million.

To develop the coal sector and increase production to support new electricity generation, the Government needs to adopt appropriate policies and programs to stimulate private sector investment, rather than direct government investment in operations. To achieve these objectives internationally competitive mining legislation and fiscal measures are necessary.

There is good potential for the mining sector—including coal—to be an important source of growth for the Afghanistan economy. In assessing that potential, the IROA needs to assess existing constraints on development of the sector in terms of enabling policy; regulatory and taxation regimes for private investment; institutional capacities; infrastructure, safety and other constraints. Upon addressing these constraints, a reasonable sector development scenario needs to be developed, including estimates of benefits (production value, taxes, jobs, value added).

[58] Securing Afghanistan's Future: Accomplishments and the Strategic Path Forward; Mining Sector, Technical Annex, January 2004.

Comprehensive data on the scale and economic recoverability of coal and other mineral resources is largely unavailable and a strategy to exploit these resources in an economic and sustainable basis needs to be developed. The MoM places recoverable coal reserves in Afghanistan at over 1 billion metric tons. Other estimates are quite a bit lower at about 400 million tons.[59] Recent estimates place recoverable coal reserves for Afghanistan at about 200 million tons. Allowing for coal handling losses and preparation processing further losses of about 20% can be expected, bringing the recoverable resource to about 165 million tons.

If conducted in an environmentally sustainable manner, exploitation of coal resources can provide substantial tax revenues to central and local governments, create direct and indirect jobs, and stimulate spin-off industries in and around the mining operations. While Afghanistan has excellent geological potential the mining sector is significantly under developed. Three difficulties currently hinder development of the sector:

- Mining rules and regulations and taxation arrangements do not reflect modern practices and are not conducive to new private sector investment. Additionally, the capacity and technical know-how of government institutions responsible for the sector are not up to modern standards.

- The security situation in the country has limited the ability of the central government to establish national sovereignty over mineral resources and to promote exploration and development.

- Development of coal and other mineral resources requires investments in excess of government abilities. The IROA needs to establish an enabling environment conducive to attracting and retaining investment by both local and international entities.

Afghanistan's coal reserves are under-surveyed. Current production is about 110,000 short tons/year, of which about 40,000 short tons comes from government-controlled mines. The supply is far less than the demand. Coal has the potential to displace fuel wood and charcoal used in the vast majority of rural households. The MoM estimates annual demand at about 500,000 short tons used primarily for kilns in the construction of bricks, cement and commercial and industrial uses, including power generation.

Estimates of the cost of coal produced from new underground mines in Afghanistan at about $28.5 USD/short ton, not including taxes and royalties, which typically average about 10%. The cost of coal from a surface mine is estimated at about $18/ short ton, excluding taxes and royalties.

Measures to Increase Coal Production

To increase coal production for power generation and other uses, and to attract private investment to the sector, the following initiatives are receiving IROA attention, although a coordinated and comprehensive program is needed:

- Create a modern and internationally competitive legal and regulatory framework emphasizing the primary role of the private sector, the regulatory role of the Government, and taking into account the special condition of small scale producers. This includes.
  - Clarifying state ownership of mineral resources in their natural state.
  - Clarifying the legal basis for private access to mineral rights.
  - Establishing a clear mandate for government institutions to grant private access to mineral rights.
  - Establishment of a Mining Cadastre.

[59] Energy Sector Overview and Gas Sector Master Plan: Final Report; TA-4088AFG; Sofregaz, June 28, 2004; and US Energy Information Administration; Washington, DC.

- Clear identification of the form and nature of mineral rights available to the private sector.
- Transparent and uniform fiscal and taxation package.
- Security of tenure for license holder.
- Transferability of title.
- Appropriate environment, health and safety requirements.

- Institutional strengthening for Ministry of Mines.
- Establishment of an internationally competitive taxation regime.
- Reinforcement of the geological and geo-science database.
- Improvement in small scale mining.
- Establishment of environmental and social management capacity.

Coal Sector Policy

Afghanistan's coal sector requires immediate capital investment to support development of resources as well as for development of power plants that utilize coal for fuel. The current process by the MoM to complete resource assessments and invite private participation in the sector is unwieldy and slow. This process relies in the MoM to evaluate development potential, decide which resources and projects to develop and then issue a tender for potential developers to respond to. The MoM simply does not have the resources and expertise to complete this process in a timely manner. As a result, development of projects that could contribute to economic growth and employment, provide an important source of revenue to the Government, and provide a fuel source to support expanded power generation are unnecessarily delayed.

A solution to this dilemma would be for the MoM to issue tenders to which the private sector would respond and propose projects for development of coal resources and associated power plants based on the private sector's analysis of the potential value of the project. The MoM—through a panel of experts convened with donor assistance—would evaluate the proposals and award contracts to those projects with the greatest economic potential, including revenue source to the Government. This mechanism places the impetus for developing domestic energy resources on the private sector rather than on the MoM, thereby providing a much greater incentive to complete these projects in a timely and efficient manner.

This type of approach to resource development has proven successful in India, where the Government has issued three types of permits to the private sector to encourage development of mineral resources. These include:

- A Reconnaissance Permit, which is a license to conduct preliminary surveys and prospecting in a defined area to determine the scope of the resource base. The permit is granted for a set number of years (e.g., 3); for a maximum area (e.g., 5,0000 square kilometers);and includes a "development fee" to the Government. After 2 years, the area must be reduced to (1/2 to 1/4th the original size) in which development is likely to occur. At the end of 3 years, the size is further reduced to e.g., 25 square kilometers where development is to occur.
- A Prospecting License, which is a license for exploring, locating, and proving a mineral or hydrocarbon deposit. It is granted for a 3-year period for the area where development is to occur.
- A Development License, which permits the project developer to undertake development activities to bring the project to completion and market its output.

There are a number of advantages to this process:

- It relies mainly on the private sector, rather than the Government, to verify a resource and develop a project, thereby placing the greater incentive on the entity with the greatest experience and expertise.
- The tenders provide information on which proposals will be ranked and awarded so that all developers know the rules of the game and the best (most economically attractive) projects can be selected. These criteria can be altered with successive tender offerings to reflect new information and market conditions to ensure that new projects provide the greatest benefit.
- The tenders provide a time limit for development of the project, thereby preventing undue delay.

Recommendations. As part of Afghanistan's Energy Sector Strategy, the IROA needs to undertake the following programs:

1. **Issue Tenders** for private sector development of coal resources and associated power plants. This would include issuing a Reconnaissance Permit, Prospecting License and Development License as discussed above, with specific deadlines and incentives to develop resources and associated infrastructure.
2. **Develop the implementing rules and regulations** to clarify ownership and development roles and responsibilities of the IROA and developers; establish pricing, tax and royalty regimes; and set production, environmental, safety and health standards for the sector.

16. Rural and Renewable Energy

Due to the dispersed nature of the rural population, renewable energy offers the best solution for electrification for the majority of Afghanistan's rural population that currently does not have access to electricity and has no real expectation of connection to the grid[60].

Most of Afghanistan's 25 million people have no access to modern forms of energy. Fuel wood accounts for an estimated 75% of total rural energy supplies. This is having an adverse impact on forests and watersheds. In addition, burning these fuels increases indoor air pollution, which adversely affects the health of women and children in particular.

Extreme poverty in rural areas also is related to lack of income earning opportunities. The productive use of electricity helps reduce poverty by providing alternative sources of livelihoods and increase educational and training opportunities. The remoteness of rural locations and the rough terrain make expansion of the electricity grid into these areas economically infeasible. Therefore, the application off-grid technologies to these areas—including renewable energy resources—is the primary focus of IROA activities.

The role of the IROA is to provide policy and regulatory frameworks to encourage and facilitate participation by the private sector and civil society in rural electrification and application of renewable energy technologies. Ultimate responsibility for renewable and rural electrification resides in the Ministry of Energy and Water (MEW), although other entities, particularly the MRRD and its program, NSP, CDCs, NGOs, and donors are active in rural development projects. MEW also is charged with establishing a renewable and rural energy policy in conformance with the development objectives of the IROA and ANDS.

In addition to hydro, solar energy is considered the most important renewable energy source. Estimates indicate that in Afghanistan solar radiation averages about 6.5 kWh per square meter per day and the skies are sunny about 300 days a year. Consequently, the potential for solar energy development is high, not only for solar water heaters for homes, hospitals and other buildings, but also

[60] Government of Afghanistan; Ministry of Energy and Water: Policy for Renewable Energy Rural Electrification, December 8, 2006.

for generating electricity. In addition, some 125 sites have been identified for micro-hydro resource development with the potential to generate 100 MW of power.

Other renewable energy technologies, particularly micro-hydro and wind energy, have broad applicability within rural areas of Afghanistan. The GOA, primarily through the Ministry of Rural Rehabilitation and Development in cooperation with the MEW has developed projects to promote micro-hydro development in rural areas. In addition, under the US National Renewable Energy Laboratory, wind mapping has been undertaken for many parts of Afghanistan as a basis for developing individual projects. The data indicate good potential for generating wind electricity in several parts of the country. The lead institute to support development of these resources in Afghanistan is the National Renewable Energy Research and Development Center, a part of MEW.

It is proposed that a Rural Energy Institute (REI) be established in the MRRD to demonstrate the application of appropriate technologies to rural environments and to demonstrate business models for income generation and cost recovery. The National Renewable Energy Research and Development Center would still remain the focal point for development of large renewables and would coordinate and lend assistance as required to the REI. This is consistent with both the new delineation of roles and the mission of MRRD as working with and through other Ministries.

At present, about 650 villages are supplied with electricity from photovolaics, through a program funded by the National Solidarity Program (NSP). Other donors (e.g., Government of India) and NGOs (e.g., Norwegian Church Aide) are active in this area. The private sector also is encouraged to participate and invest in rural electrification and deployment of energy efficiency and renewable energy technologies. Although, NGOs and donors provide much assistance, there appears to be no clear IROA policy for rural electrification or for promoting private sector participation in rural energy projects; also coordination among ministries and other project participants needs improvement.

Hydropower, solar, wind and biomass offer the most potential to contribute to energy supply. Development, however, requires sound institutional and financial support, sustained commitment and a long-term development horizon. Use of renewable energy is beset by a number of factors, including high upfront costs,[61] lack of suppliers, inadequate financing mechanisms, and weak institutional and technical capacity.

The objectives of the IROA ‘s program for rural and renewable energy development are to provide a sufficient level of efficient, clean energy service to all rural customers. Current activities to promote rural and renewable energy projects include:

- Development of micro-hydro and solar power systems in rural areas.
- Installation of diesel generation in small and medium size cities where no alternatives to electricity access are available.
- NSP is working with Community Development Centers (CDCs) to install over 500 micro-hydro projects since 2003.
- Development of wind energy and biogas systems in selected rural locations.
- Institutional reform and capacity building initiatives at MEW and MRRD.
- Rehabilitation of hydro generation plants in Pul-i-Chemri, Khanabad, Saurobi, and Mahipar.
- Feasibility studies for new hydro power plants in Baghdara (280MW) and Saurobi 2 (180MW).
- Electrify 25 Small Towns and 800 Representative Rural Households by 2013 (80MW). The Inter-ministerial Commission for Energy (ICE) is supporting several action items including[62]: (1) strengthening the NSP program; (2) initiating a rural electrification action-oriented agenda

[61] For example, estimate for Photovoltaic electricity, as per MRRD (Mostafa Torkan, May 24, 2007) is $12,000/kW, as compared to: (i) Micro-hydropower at $1,200/kW and Diesel generated power at $500/kW.

[62] ICE is a coordinating body, not an implementing body. It is not clear that it is supporting these actions in any direct way.

and establish an energy committee to connect small towns such as Khulm, Aybak, Doshi, Chatikar and Baghlan.

Rural and renewable energy projects contribute several types of benefits that help improve rural well being. They contribute to physical capital through infrastructure development, financial capital through credit provision, human capital through training, and social capital through enhancing the ability of communities to work together to better the lives of inhabitants. Project activities also focus on rural enterprise development and local empowerment. Alone, they do little to increase economic activity but combined as part of an integrated rural development package they very effective.

Electrifying rural areas faces daunting challenges, including dispersed populations; often difficult terrain; high initial capital and operating costs of power systems; poor load profiles; weak rural energy implementing entities; need for continual subsidies; poor private sector participation; and lack of standards and regulation. A comprehensive strategy is needed to promote an enabling environment that supports project development and also ensures participation by the poor in decision-making and project implementation.

Development of rural and renewable energy resources, including rural electrification, is taking place in Afghanistan without a clear institutional or policy framework. There is a de facto split of responsibility for rural electrification among ministries and coordination between ministries and donor-funded programs needs improvement. The Government needs to articulate a policy that clearly defines goals and objectives; clarifies the role and expected scope of subsidies; and emphasizes the role of the private sector. A clear, standardized procedure for assessing and evaluating renewable energy resources as the basis for supporting development of pilot projects needs to be established. Various methods of supporting rural energy projects, such as community development entities, rural cooperatives, and franchises, need to be evaluated and tested as to their applicability to Afghanistan.

Examples of successful rural energy projects that could be supported by the IROA and donors include the following:

E.1 Power Distribution in Ghazni.

Omary Electric Company (OEC) is a private company operating in Ghazni for over 8 years. It operates 8 diesel generators with a total capacity of about 1 MW and distributes power throughout the city on its own low-voltage system. OEC serves more than 8,500 customers with a staff of 42 and offers 24-hour service. The power tariff is based on the cost of diesel fuel and in July 2006 was 35 Afs/kWH. All customers are metered and new customers pay a non-refundable connection fee of between 1,000 and 3,000 Afs depending on the connection distance. OEC is essentially self-regulated, and provides a good example of private sector initiative that could be encouraged through an official "light handed regulation" policy.

E.2. Rural Electrification in Bangladesh[63].

The Bangladesh off-grid electrification fund supported by the World Bank Rural Electrification and Renewable Energy Development Project (RERED) provides solar home systems to rural households and has supported deployment of as many as 3,000 household systems per month. With the assistance of Participating Organizations (POs), including municipalities, NGOs and the private sector, the program has resulted in the installation of nearly 90,000 solar home systems and has extended its funding to cover biogas and community electricity systems.

The fund is administered by the Infrastructure Development Company Limited, a non-bank financial institution and provides both credit and Global Environmental Facility (GEF) subsidies to 14 Pos to

[63] While the market characteristics of Bangladesh are significantly different than Afghanistan, the example highlights how innovative mechanisms can be effectively used.

purchase PV household systems from a list of venders approved by a Technical Standards Committee (TC). Overall, the Fund provides the following benefits:

- Provides loans to POs who pass the funds on to customers (up to 80% of cost of a PV system).
- Provides the GEF-financed grant.
- Develops customer awareness of solar home systems or other rural energy programs.
- Provides technical assistance to POs in developing proposals for financing.
- Selects POs based on their performance and financial track record.
- Supervises activities of POs and coordinate activities between POs, suppliers and customers.
- Assists the TSC on program-eligible equipment specifications.

The success of the program relies on the ability to mobilize the POs and micro-finance providers based on their experience and knowledge of rural communities in Bangladesh to support development of solar home systems.

E.3. Barriers to Access.

For Afghanistan, barriers to increasing access to electric power, particularly in rural areas—in addition to policy constraints—have much to do with the physical nature of the investments required, the large scale of the undertaking, and broad country issues (e.g., security, remote location, difficult terrain). These issues need to be effectively addressed through IROA policies and project development and implementation.

Solutions to these problems can be found through a mixture of policies and programs that continue to rely on IROA involvement in the sector (with donor assistance) particularly over the short-term while the necessary framework is being put into place. These programs also need to unleash the potential of the domestic and international private sector to provide an expanded array of energy services and allow the withdrawal over time of direct involvement in the sector by the IROA and its transition to an oversight and regulatory function.

The IROA needs to explore options for achieving this goal and to put in place policies and programs that will remove barriers to private participation in the energy sector. Examples of supportive policies and programs include “Light Handed Regulation for Stand Alone Systems” similar to that currently practiced by the Omary Electric Company. However, to be effective this needs to be part of an official IROA policy for rural electrification. The policy would allow self-contained power systems in rural or urban areas to be “self-regulating” in terms of setting service quality, pricing, connection and disconnection standards, billing, etc. and would apply to cooperative or private sector providers. Basic licensing, safety and technical standards would be applied by the GOA.

The need for small-scale, site specific solutions means that significant technical and financial resources are required to bring modern energy services to the bulk of the rural population. Given the scope of the problem and the limitations on Government resources, it is particularly important to prioritize specific means measures to be pursued in order to maximize impact and ensure sustainability. The Government should seek to promote rural electrification with an emphasis on income-generating activities where possible.

This underscores the importance of maximizing the benefit of limited resources and of considering the trade-offs within an overall Energy Sector Strategy of rural versus urban programs; government versus private intervention; and fossil versus renewable energy resources. Given the scope of rural energy needs and the limitations on IROA resources, it is important to prioritize specific measures to be pursued, to ensure that they meet IROA objectives and that efforts by the GOA, donors and NGOs are properly coordinated to maximize results.

E.4. Recommendations

To accomplish these goals within the Energy Sector Strategy, the following activities should be pursued.

1. Increase collaboration between MEW and MRRD and Delineate Responsibility for Rural Energy Development. As noted under the Electricity Sector section, responsibility for all rural-remote energy efforts should be consolidated within one institution, RLED, with membership by all stakeholders to help coordinate rural-remote energy programs and projects. It appears that the MRRD is the proper entity to head up this effort. Rural energy is defined as off grid applications such as SHS, micro-hydro, and diesels in areas of less than 2,500 persons. It could also include the use of wind power for both electrical or mechanical energy, for example. It would not include any grid connected applications. It also includes rural electrification. Since there is no universal definition of rural, the definition for this purpose is something needs to worked out. REDA would also be responsible for developing a rural-remote energy master plan.

2. In collaboration with NURC, develop Rural Energy Policy to include **Light Handed Regulation** as an official policy of the IROA and implemented by the MRRD to promote development of stand-alone rural energy systems by cooperatives or the private sector. Policy and regulation must set guidelines for cost-recovery. In essence all project need to be able to recover operation and maintenance costs and set aside a sinking fund for capital replacement. The rural energy policy and master plan will investigate appropriate fuels for cooking.

3. Develop a Methodology for Assessing Rural and Renewable Energy Resources and Technologies, including hydro (large scale, mini and micro), diesel, solar, wind, biomass; and evaluating and prioritizing potential projects based on expected benefits; and a rural and renewable energy development program needs to be incorporated within the IROA's overall energy sector strategy, including an effective monitoring and evaluation program.

4. Assess and Establish Models for Project Ownership and sustainability with emphasis on capital and operating requirements, government subsidies, and financing methods. Models could include electric cooperatives, franchises, provincial or district government entities, or some combination. Any policy needs to incorporate household and community involvement to the maximum extent possible.

5. Assess and Establish Models for Technical Support (technical standards, installation, O&M support) such as university outreach or extension program; MRRD/DAMB offices at the district level to include rural technical support and funding; district or provincial governments; private sector involvement.

6. Pilot Projects utilizing alterative project implementation techniques (e.g., coops, franchise) and technologies (e.g., wind, solar, hydro) need to be developed. Best practices in developing, operating, monitoring and assessing the benefits for projects from within the region and elsewhere need to be applied. Pilot projects may also include appropriate cooking and heating that is not electricity based.

VI. CROSS-CUTTING ISSUES

To achieve its goals, in addition to providing for affordable and sustainable energy development the Energy Sector Strategy will incorporate mechanisms to support cross-cutting issues that impact all energy sector initiatives. These include the environment, counter narcotics, anti-corruption, gender and regional cooperation—in addition to capacity building.

Environment

Energy, even renewable energy, has an environmental impact. This strategy directly addresses environmental impacts by:

1. Focusing on policies and projects that improve the operating efficiency of energy production. It strives to get the most energy delivered for the minimum environmental impact. For example, reducing technical losses or cogeneration.
2. Focusing on policies and projects that improve end use efficiency. These are areas that seek to reduce the amount of energy needed for any given activity. A CFL program is one such measure.
3. Shifting investment and production to cleaner sources of energy, for example, wind power.
4. Through the promotion of combining energy supply with income generating activities, as incomes increase, there is less pressure on natural assets. And,
5. Through focusing on appropriate energy such as better cooking fuels and better lighting, thereby reducing indoor air pollution.
6. For oil, gas and coal, current law provides a set of environmental requirements to conform to NEA regulations. These will be incorporated into sector implementing rules and regulations. In addition, all environmental impact assessment and pollution control provisions of the Afghanistan Environmental Law will complied with in regard to the construction, upgrading and operation of facilities and infrastructure for the generation, transmission, distribution and use of electricity developed through this strategy.
7. The National Environmental Protection Agency (NEPA) will issue new Environmental Impact Assessment regulations in conjunction with the Ministry of Justice. Energy sector institutions, including the MEW, MoM, and MRRD will establish a working relationship with the NEPA to learn about the EIA process and ensure that its provisions are incorporated into all energy sector activities.

Anti-corruption

The energy strategy directly tackles corruption in several ways. One of the most important measures for reducing corruption is limiting the role or influence of Government. In energy, we are promoting increased private sector participation; we are reducing the role of Government. Additionally, in SOE's, such as DABM, we introduced loss reduction programs that are targeted at finding and deploying ways of controlling corruption. We are also introducing better, more transparent procurement procedures. Furthermore, increasing private investment in the energy sector requires rule-of-law and increased transparency and accountability; thereby indirectly strengthening anti-corruption, and anti-narcotics measures. Finally, the introduction of a multi-sector regulator outside the concerned ministries and under the Ministry of Economy will provide greater oversight.

Region Cooperation

The most important areas furthering regional cooperation include expansion of energy trade by upgrading electricity transmission ties with Central Asian countries and exploring options for transport of electricity and natural gas through Afghanistan for regional supply. The NEPS represents one of the largest sector investments and the cornerstone of success in NEPS is expanded energy trade. Technical standards and commercial instruments will be developed. Physical investments are being made to improve trade. CASA 1000 is looking at using Afghanistan as an energy transit corridor. Regional cooperation will be enhanced by projects such as NEPS and efforts to increase cost-effective electricity imports from neighboring countries.

Gender and Poverty Reduction

Most energy interventions have the potential to provide positive benefits for women and children in particular and also for the poor in general. For example, women have specific energy needs in water

pumping, agriculture processing, security, work productivity and health – most often that energy is provided by their own effort meaning that work significantly longer days than men. More efficient stoves, drinking water pumping and agro-processing can reduce women's workloads, improve their health, and expand income-earning potential.
The energy sector has the potential to provide a wide pool of jobs as it is developed; for example, in the construction and repair of thermal plants, in coal mines, and in oil fields. Labor intensive construction methods should be considered. For skilled technical jobs, the energy sector can initiate training and apprenticeship schemes to provide on-the-job experience for new trade and technical graduates and engineers. Foreign personnel can contribute to such schemes as mentors and can also be tapped to advice on competency-based occupational analyses, new curricula for training colleges and universities. Planning for major energy development projects should involve an "employment audit" which indicates numbers of temporary and permanent jobs expected; plans for training and replacement of foreign workers.

Counter Narcotics

The strategy does not directly address this issue but it is clear that increased economic growth supported by an expanded energy sector particularly in rural and remote areas will help counter the cultivation of poppies and illicit drug trade. In many programs that have targeted poppy areas, success has been made when alternative livelihoods are found. A cornerstone of this strategy is the linking of energy supply to income generating activities.

Capacity Building

Finally, the major emphasis within the Energy Sector Strategy placed on institutional strengthening and capacity building—and on institutional reform, such as consolidating authority over rural electrification and rural energy projects and separating policymaking from regulatory authority—will result in fostering a professional, open environment and increase opportunities for participation in energy sector activities on behalf customers and other stakeholders. This, in turn will support achievement of the ANDS cross-cutting goals. The strategy explicitly provides for capacity building projects and capacity building is one of the four pillars of the strategy.

Achieving improvements in capacity building requires a coordinated approach. The IROA has recently initiated the National Capacity Building Policy and Program designed to effectively address capacity building and training needs throughout the Government. It establishes an Inter-Ministerial Committee to coordinate and monitor capacity building efforts throughout the IROA to ensure their effectiveness. To improve program implementation and effectiveness, it established Reform Implementation Management Units (RIMU) within IROA Ministries. All capacity building initiatives developed through the Energy Sector Strategy will operate through this mechanism, and will include elements to address cross-cutting issues..

Moreover, achievement of counter narcotics and anti-corruption goals will be promoted through Energy Strategy efforts to expand access to electricity and promote economic development in rural and remote areas and to reform the sector by separating policy, regulatory, and operational function and promoting involvement by the private sector.

VII. MONITORING AND EVALUATION

OBJECTIVES	EXPECTED RESULTS	INDICATORS	RISKS
PROGRAMS	IMPACTS		
Efficient Operations			
Commercial Reform and Capacity Building at DABM	DABM setup along commercial lines with increase in efficiency of operations. With time readies DABM for some form of private sector involvement.	1. External audit completed 2. Percentage of Staff trained in specific technical areas 3. Technical losses reduced 4. Commercial losses reduced 5. Meters installed on crossborder transmission lines 6. Repair of existing distribution and transmission assets 7. Spares procured. 8. Non-core operations outsourced	1. Political will to severe DABM from the Ministry 2. Commitment of DABM staff to organizational transformation 3. Commercial sector laws reformed 4. Social safety net for excess workers 5. Political will to reform laws and institutions 6. Neighbors meet timetables for power export 7. Funding for sector in place and matching IROA priority
Sector Governance			
Legislative and Policy Reform	Policy & Law promote explicit private sector Best practices in energy instilled in law and policy Modern integrated approach to energy sector planning and policy Creation of multi-sector regulator Consolidation of Rural Energy	1. Policies approved by Ministries 2. Laws approved by Parliament 3. Regulations approved by Cabinet 4. Guidelines prepared for application of the law and regulations. 5. NURC established 6. Tariff revised with subsidy phase out plan & universal service provisions 7. Rural Energy Agency established 8. PMU established	

Capacity Building	More effective planning & policy analysis Staff capable of modern project management Staff capable of basic regulatory functions	1. Integrated energy policy prepared 2. Least-cost and IRP models applied 3. Comprehensive energy data based in place 4. Afghan staff capable of tariff review 5. Afghan staff capable of commercial audit support 6. Afghan staff capable of modern dispatch and control functions	
Private Sector Provision Program	Increased penetration of private sector in energy activities with attendant increase in efficiency, quality and investment.	1. PPP office established 2. Concession, BOT, BOO law enacted 3. Prototype commercial documents developed 4. PPPs begun 5. DABM Construction company privatized 6. Some DABM distribution management contracts.	
Rural Energy			
Sector Governance	Focused rural energy provision that support economic activity and cluster development	1. Rural Energy Development Agency established. 2. Light handed regulation developed to promote and protect rural energy providers 3. Rural Energy Master Plan developed 4. Rural Energy Fund established	
Expanded Supply			

North East Power System	Strengthening of north east transmission system to allow power to flow more easily from Tajikistan, Turkmenistan & Uzbekistan. Increase ability to import power. Adds control center to infrastructure. Rehabilitate hydro plants.	1. Control/dispatch center operating 2. Transmission lines completed 3. Substations completed 4. Hydro capacity increased 5. Import PPA signed	
Sheberghan Gas Fields and Power Plant	Add 100 MW of power into the NEPS and strengthen natural gas production.	1. Develop gas collection system 2. 100 MW Power Plant commissioned 3. Urea Plant commissioned	
South East Power System	Enhance power supply to Kandahar and Helmand by rehabilitating power assets and will also reduce reliance on diesel. Lower system costs.	1. Two turbines rehabilitated 2. Kajakai turbine extended	

VIII. ANNEX 1. ENERGY SECTOR POLICY MATRIX

Concerned Ministry	Policy Decision Item	Current Situation	Proposed Action	Justification
MEW	Equal importance to efficient operation of sector	Ministry, Donors and DABM focused primarily on new investment	Provide equal weight in seeking donor funding for increasing efficiency of current operations. Focus on reducing technical and commercial losses.	Current losses in electricity sector are over $128 million and are increasing as new infrastructure is added. The quickest way to increase output is to focus on reducing technical and commercial losses. This will also reduce the financial drain of utility operations.
MEW, MoM, MRRD	Need to explicitly allow private sector role in the sector.	Law does not explicitly allow private sector role in the sector.	Policy statement acknowledging the need to expand the role of the private sector in the provision of energy services. Amend law.	The lack of explicit basis for the private sector increases risk and cost and delays the entrance of the private sector in a meaningful way.
ICE, MEW, MoM, MRRD	Need explicit sector regulation located in the Ministry of Economy.	Ministry responsible for sector regulation.	Create multisector regulator located in the Ministry of Economy.	The lack of a real regulator is an obstacle to efficient operation of the sector even if it is under Government control. It is also a major impediment to increasing private sector participation in the industry. There have been some preliminary steps taken to establish an informal regulator but this is far from what is needed to adequately address concerns and attract the private sector.
MEW	Commercialization of DABM	Government has agreed but implementation is lacking commitment.	Appoint independent board; perform internal audit; invite external audit & increase capacity building.	
MoM, MEM and	Increased Private	Very Little	Divest SOE's of non-core	Increased progress in the energy sector requires that (a)

Concerned Ministry	Policy Decision Item	Current Situation	Proposed Action	Justification
MoCI	Sector Participation	Private Sector Involvement the in Sector.	operations such as construction; look for creative ways to involve the private sector such as electricity distribution, oil & gas exploration and development and concession mining.	government focus on those things which are its natural domain such as policy, law and regulation and (b) that the private sector be mobilized to operate, investment and/or own energy services. Experience the world over has shown the wisdom of organizing the sector this way.
MEW	Cogeneration	No policy, law or operating rules for cogeneration	Policy statement giving preferential access to the grid and purchase of cogenerated power. Develop enabling framework to promote cogeneration and develop commercial instruments. This can be dealt with at the same time as IPPs.	Cogeneration represents a very quick and cost effective way of getting electricity to the people. Yet, traditional utilities are biased against it. Explicit treatment of and preference for cogeneration are required to catalyze these operations.
MEW MRRD	Strengthening Rural electrification	MEW and MRRD have overlapping responsibilities	More clearly delineate rural energy domains. Focus rural-remote electrification in MRRD Focus rural (secondary cities) in MEW. See 1 below	Many of Afghanistan's secondary cities and towns are unserved and will need to begin as isolated systems. While "rural" in nature, their needs are best served through MEW. On the other hand, remote and sparsely populated areas (rural-remote) will not be well served by a large utility mindset. Experience the world over has shown that large utilities do not adequately address or understand the small scale nature of remote rural electrification. Moreover, institutional capacity is thin at all Ministries.
ICE, MEW, MoM, MRRD, MoCI	Integrate Energy Policy	Energy Policy is purely on the basis of subsectors	Coordinate Ministry strategies through ICE using ANDS to draft along with subject matter specialists.	Energy policies and planning have not recognized the integrated nature of energy in the economy. Overarching policy required. Will address prioritization, energy efficiency, role of private sector, regulation and

Concerned Ministry	Policy Decision Item	Current Situation	Proposed Action	Justification
				other key issues. Addresses need to consolidate rural energy in one Ministry and establish guidelines for rural electrification.
ICE, MEW, MoM, MRRD, MoCI	Integrated Sector Planning	No mid to long term planning – no integrated, least cost planning or integrated resource planning	Begin collecting data that will allow and facilitate both analysis and forecasting. Data collection could be housed in NURC since they will be collecting much of this data already as part of their regulatory mandate. Training required in modeling techniques and model such as WASP.	As part of the overall energy policy, it should become standard practice to develop integrated models of the economy-energy interactions and then least cost or IPR energy models to guide investment planning.
MEW, MoM, MRRD, MoCI, NURC & possibly MoF	Energy Prices	Prices not reflective of costs.	Review and adopt tariff methodology based on cost recovery. Develop universal service obligations and explicitly fund those with line item in the budgets and direct transfers to the energy provider. Develop a subsidy phase-out plan that recognizes that the economic and social disruption must be taken into account in any time table. Link service improvement	Controlled energy prices are well below costs. This leads to poor financial performance and Policy needs to be consistent with cost recovery but recognizing need to provide poor with some basic level of service.

Concerned Ministry	Policy Decision Item	Current Situation	Proposed Action	Justification
			with tariff increases.	
MRRD, MEW	Coordinate rural energy supply with other activities	Provision of energy to rural areas follows an adhoc procedure.	1.) Combine the provision of energy with income generating activities. Coordinate with the provision of other services producing a combined service model	Many of the rural energy projects that have been introduced in the last few years are no longer viable. This can be the result of inappropriate technology or the provision of energy when it can't be afforded on a sustainable basis by the community. By focusing on income generating activities, residential consumption can be subsidized by the income generating activity. Often times other services are supplied that rely critically on energy supply. The coordination of the planning and provision of services will reduce cost and increase success.
MEW, DABM, NURC	Technical Standards	There are no written technical standards such as a grid or distribution code.	Technical panel composed on MEW, DABM, and NURC to develop standards for rural electrification drawing on international best practices.	
MRRD, MEW, DABM, NURC	Technical Standards	There are no technical standards for rural electrification.	Technical panel composed on MEW, DABM, MRRD, and NURC to develop standards for rural electrification drawing on international best practices. Focus on Afghanization of international standards.	Currently rural electrification projects do not conform to any technical standards. This can have implications for both cost and longevity as well as potential to interconnect with the grid at some point in the future. Adoption of international best practice will reduce cost and increase sustainability.
MEW, MoM, MRRD, MoCI	Develop Protoype Commercial Instruments	Few commercial instruments, contracts, licenses, etc.	Develop prototype contracts, small power purchase agreements, power purchase agreements, production sharing agreements, royalties, etc.	Progress is often stalled because commercial instruments are not available. It takes time to develop these instruments and obtain concurrence. This stalls or even thwarts sector development.

Notes 1. It is important to more clearly define the areas of control between the MRRD and MEW in providing energy services. Greater definition will reduce overlap and potential duplication or waste. The problem of demarcating service areas is compounded by the fact that the country does not have a legal definition of a town, a city, a settlement or a rural area. MEW will be principally concerned with providing electricity services to: (1) urban and peri-urban areas; (2) secondary towns and cities of 5,000 persons or more; and, (3) large industrial, mining, commercial or agro-industries. In Afghanistan's current context, items two and three could be considered rural energy. Yet, this is clearly distinct from the rural areas where MRRD would be providing assistance. To more accurately reflect these differences, the distinction between rural energy and rural-remote will be made following the Bangladesh experience.

Rural-remote energy is energy that serves remote communities of villages or a village and where the settlement is less than 2,500 persons that is a reasonable distance from a transmission line, or an urban or peri-urban area or any other area that would be covered by MEW. This is the clear domain of MRRD and this may include conventional energy such as diesel, liquid fuels, and coal and it may include small scale renewable such as biogas, solar, wind and micro or mini hydro.

While demarcating clearer lines of authority for energy services, this does not reduce the need for the two ministries to collaborate. There is still gray area: that area between settlements of 2,500 persons and those of 5,000 persons. It is recommended that the two Ministries continue to coordinate as they have in the past for those settlements or towns that fall with the gray area.

The need to collaborate arises for others reasons such as: The MEW will have expertise in renewable energy, albeit large scale, that may be of use to MRRD; Eventually, some of the MRRD areas will connect to the grid and so a common understanding of the requirements for grid connection is require; and, there is a need to collaborate on technical standards for rural electrification.

IX.

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