Energy Sector Governance Program Grant

“Smart Development” Initiative

MONTHLY REPORT – SEPTEMBER 2004

Prepared for:
Energy Division—Energy Sector Governance Program
Office of Energy and Information Technology
Bureau for Economic Growth, Agriculture and Trade

Prepared by:
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The following are the activities conducted in the month of September.

- The UH IELE and ISSER continued preparations for the kick-off meeting. Prospectus for the kick-off meeting was developed. It included short one-page descriptions of the main products to be developed by the Resource Center.

- Dr. Gülen visited Ghana to conduct meetings with other members of the Steering Committee and participate in the kick-off meeting of the Resource Center. Dr. Gülen’s trip report is attached.

- The kick-off meeting was held on September 24, 2004. A newspaper article and a TV news report covered the opening of the Resource Center. Meeting information is attached.

- The University of Houston’s Office of Contracts and Grants has finalized the draft sub-contract agreement and submitted it to the ISSER. It is expected that the agreement will be signed in early October.

**Next steps**

Actions expected in the months of October-November include:

- Sign the sub-agreement between the UH OCG and ISSER.

- Start preparation of a “Natural Gas Primer” and initiate preparations for the Educational Forum on Natural Gas (which will be held upon completion of the “Natural Gas Primer”)

**Trip Report**

Activity: Trip 2 of UH IELE to Ghana – Resource Center Kick-Off Meeting  
Dates: September 23 to September 25, 2004

**Key Results**

The Resource Center for Energy Economics and Regulation at ISSER was successfully launched with the support of the Ministry as well as other key players such as the Public Utilities Regulatory Commission (PURC) and Energy Commission (EC).

**Summary Report**

**Thursday, September 23**

Dr. Gülen met with Eline Okudzeto, economist and Kwabena Appenteng, private sector officer at the Office of Trade, Agriculture & Private Sector of the USAID mission in Accra to provide project background. Eline and Kwabena will take over from Cleveland Thomas the overseeing of developments in the energy sector. Dr. Gülen also visited briefly with Jerre Manarolla, Chief of Office of Trade, Agriculture and Private Sector at the Mission, who mentioned some possibilities for supporting the Resource Center from Mission resources.

Dr. Gülen attended parts of the West African Gas Pipeline (WAGP) conference organized by the Ministry of Energy. The conference was organized to provide results of an independent economic and financial assessment of the WAGP by IPA Energy Consulting and Mott MacDonald Limited on behalf of the World Bank. Ministers from Ghana, Togo and Benin as well as many of their officers, representatives from PURC, EC and other Ghanaian entities, and WAPco representatives attended the meeting, which was fully open to the public (open invitation published in the Daily Graphic, most circulated newspaper in the country). At the conference, Dr. Gülen had a chance to meet with Dennis Fahy of WAPCo and invite him to the kick-off meeting of the Resource Center. Most importantly, the conference demonstrated type of issues the Resource Center would work on and provide an independent perspective for the benefit of the Ghanaian energy sector.

Dr. Gülen, Mr. Stephen Adu, Commissioner at PURC and Mr. Felix Asante, Resource Center coordinator at ISSER, met to discuss final preparations for the kick-off meeting.

**Friday, September 24**

Dr. Gülen attended the kick-off meeting of the Resource Center for Energy Economics and Regulation at ISSER. The meeting agenda, the list of attendees and presentations/speeches are attached.

The meeting, chaired by Dr. Addae, Commissioner at the EC, has started with a strong statement by Mr. Pianim, Chairman of PURC, in support of the Resource
Center. He proposed several ways of funding the Resource Center after its initial USAID funding ends, such as the Energy Fund managed by the EC and/or additional fees collected by PURC.

The Minister of Energy provided the keynote address, emphasizing the importance of such a center and even proposing a study for the center to undertake for the Ministry (economics of expanding refinery capacity to become a net exporter of products in the region).

Overall, the meeting was successful in attracting supporters from a large variety of entities from the Ghanaian energy sector. With the support of both PURC and EC, under the leadership of Mr. Pianim, it appears that the center will become sustainable in a very short period of time.

The kick-off meeting and the launch of the Resource Center was covered by the Ghana TV at the evening news and the newspapers the following day.
The Launching of the
Resource Center for Energy Economics at ISSER

Kick-off Meeting
September 24, 2004
Accra, Ghana

This is the first deliverable scheduled in the sub-contract between UH IELE and ISSER.

Submitted by:
Institute of Statistical, Social & Economic Research (ISSER)
at the University of Ghana
P. O. Box LG 74
Lego, Accra
Ghana

October 5, 2004
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5. Presentation slides “Overview of the Resource Center For Energy Economics and Regulation at ISSER,” by Coordinator of Resource Center Dr. Felix A. Asante, I.S.S.E.R.
7. Presentation slides “Energy Value Chains: Overview,” by Dr. Gürcan Gülen, UH IELE
8. Presentation slides “Overview of the West African Gas Pipeline Project,” by Mr. Quaye-Foli, Ministry of Energy of Ghana
9. Presentation slides “Overview of Work Programme of Center,” by Mr. Adu, Executive Secretary, Public Utilities and Regulatory Commission of Ghana
Programme

Launching of the “Resource Center for Energy Economics & Regulation”
24th September, 2004

8.00 – 8.30: Arrival and Registration of Participants

8.30 – 8.40: Welcome Address and Introduction of Chairman – Director of ISSER

8.40 – 8.50: Chairman’s remarks – Prof. A. K. Addae, Member, Energy Commission

8.50 – 9.10: Overview of “Resource Center” – Coordinator of Resource Center

9.10 – 9.25: Comment by Chairman, Advisory Board of Resource Center

9.25 – 9.45: Keynote Address & Launch of Resource Center – Minister for Energy

9.45 – 10.15: Cocoa/Tea Break

10.15 – 10.45: Overview of the Energy Sector
Mr. Michael Opam, Ministry of Energy

10.45 – 11.15: General Discussions

11.15 – 11.45: Overview of Natural Gas and Electric Power Value Chain
Dr. Gurcan Gulen, UHIELE, Texas, USA.

11.45 – 12.15: Overview of the West African Gas Pipeline
Mr. Quaye-Foli, Ministry of Energy

12.15 – 12.45: General Discussions

13.15 – 13.30: Work Programme of Center – Mr. Adu, Executive Secretary, Public Utilities and Regulatory Commission.

13.30 – 13.45: Chairman’s closing remarks

13.45 – 14.00: Vote of Thanks

14.00 Closure/Lunch
# Resource Center for Energy Economics and Regulation
## Launching of the Resource Center
### 24th September 2004

### Attendance List

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<tr>
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<th>Position &amp; Institution</th>
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<tr>
<td>Kwabena Appenteng</td>
<td>Private Sector Officer, USAID</td>
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<tr>
<td>Dr. Ofosu-Ahenkorah</td>
<td>Energy Foundation</td>
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<tr>
<td>Dr. Jay Mariyappan</td>
<td>IT Power, UK</td>
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<tr>
<td>Isaac Osei-Akoto</td>
<td>ISSER</td>
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<tr>
<td>E. B. D. Ayertey</td>
<td>ISSER</td>
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<tr>
<td>David Wiredu</td>
<td>Engineer, AGI</td>
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<tr>
<td>Kofi Kwarko</td>
<td>AITI</td>
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<tr>
<td>Alex Prempeh Kwarteng</td>
<td>Petroleum Engineer, GNPC</td>
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<td>Ahmed Nantogmah</td>
<td>Chamber of Mines</td>
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<td>Dzodzi Tsikata</td>
<td>ISSER, UG</td>
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<td>Lawrence Sam</td>
<td>GNPC, Tema</td>
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<tr>
<td>Peter Quartey</td>
<td>Fellow, ISSER</td>
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<tr>
<td>Nii Adjei Akpue</td>
<td>Exploration Manager, GNPC</td>
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<tr>
<td>Geoffrey M. Biekro</td>
<td>M Phill Student, ISSER</td>
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<tr>
<td>Ishmael Edjeikumhene</td>
<td>Senior Project Manager, KITE</td>
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<tr>
<td>Prof. A. K. Addae</td>
<td>Member, Energy Commission</td>
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<td>Dr. Kwei Nduom</td>
<td>Minister, Energy Sector</td>
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<tr>
<td>Francis Gbeddy</td>
<td>Chief, Power</td>
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<td>S. Adu</td>
<td>Exec. Secretary, PURC</td>
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<td>Ebenezer Addo</td>
<td>Deputy Director, Ministry of Justice</td>
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<td>Ama Sewa Bodu</td>
<td>Ag. Solicitor General</td>
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<tr>
<td>E. A. K. Kalitsi</td>
<td>Former Chief Executive Officer, VRA</td>
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<tr>
<td>S. Osei Bonsu</td>
<td>Special Assistant to the Senior Minister</td>
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<td>W. Kyeremanteng</td>
<td>ECG</td>
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<td>Andrew Quayson</td>
<td>Commissioner, Energy Foundation/PURC</td>
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<tr>
<td>Simons Akorh</td>
<td>Manager, Regulation Economics, PURC</td>
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<tr>
<td>Eline Okudezo</td>
<td>Economist, USAID</td>
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<tr>
<td>E. Quaye-Foli</td>
<td>Head, Regulation Upstream</td>
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<td>K Sarpong Manu</td>
<td>PURC/ASI</td>
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<td>E. Antwi-Darkwa</td>
<td>Director of Power, Ministry of Energy</td>
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<td>B. Senadza</td>
<td>Lecturer, Econ. Dept. University of Ghana</td>
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<td>R. Evans-Appiah</td>
<td>Director, VRA</td>
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<td>S. Q. Barnor</td>
<td>Chief Director, Ministry of Energy</td>
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<td>Gurcan Gulen</td>
<td>UH IELE</td>
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<td>Felix Asante</td>
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<td>Kwame Pianim</td>
<td>Chairman PURC</td>
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<td>Ezekiel Attuquaye Clotey</td>
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<td>Raphael Agbodzi</td>
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THE LAUNCHING OF THE RESOURCE CENTER FOR ENERGY ECONOMICS AND REGULATION

Statement by Kwame Pianim, Chairman, PURC.

We in Ghana are used to the traditional system where state owned utility companies supply public utility services to the Ghanaian public. Over the past two decades the received wisdom has been a shift from public sector models to private sector entities or market-oriented systems for the delivery of utility services. With this shift has come the need for the establishment of credible regulatory institutions with transparent regulatory framework and processes for protecting the interest of stakeholders who sometimes appear to have irreconcilable interest.

The PURC for example is charged with protecting the interest of disparate groups ensuring;

- Reasonable tariffs for utility companies so that they not only recover their operational cost but have enough left over to replace their equipment, improve quality and expand the service to the majority who are yet to be connected.
- That consumers face tariffs that give value for money spent.
- The poor and marginalized are protected in terms of access to service by putting in place pro-poor programmes.
- That the tariff setting process and their outcomes do not cause tension for the government.
- That way the services provided does not impact adversely on the environment, are inter-generationally neutral, and environmentally sound.

For the PURC to achieve its objectives it has to independent not just legally but in reality and especially in the perception of stakeholders. Operational independence should not be conceived as a right to formulate policy, which is the responsibility of politicians who are the elected representatives of the sovereign people of Ghana. Our independence relates to the making of operational judgment in implementing and interpreting the responsibilities assigned to us in the enabling regulations or legislation that established the regulatory institutions. Operational independence should not be construed as excluding the need to consult those whom our processes impact and especially those who formulate the policies we are supposed to implement.

For us at PURC to be in apposition to discharge our responsibilities effectively we need professionally competent, skilled and dedicated staff. The tendency has been to rely on outside consultants to advise us on certain operational areas. Sometimes advisory services tend to assume line-duty functions. Even to be able to use consultants efficiently demands in-house capabilities that include ability to discern good from bad advice. This is why the establishment of the Resource Center with its skills training, education and research can be of tremendous value to the PURC.

The existence of such a generation might have provided a place for storing all the various documents and information on the WAGP together with best practices on the structure of funding such projects and acceptable rates of return. Such a reference point might have improved the quality of debate and shortened the time it has taken to move to the implementation stage on such a strategic national project with potential to shape the efficiency of the energy sector and the overall international competitiveness of the national economy for decades to come.
The center as we have been told intends to be:

a) A source reference on energy economics and development in energy regulation.
   - Keeping up-to-date data on energy projects
   - Best country practices on energy matters including best country and next generation practices on project funding structures, acceptable rates of return on investments, and optimal tariff setting, and on environmental concerns
   - On-line storage of research funding and general information that can be accessed by researchers and regulatory operators and policy makers such as Parliamentarians and their supporters such as public servants.

b) A source for skills training for utility regulatory and licensing authorities. Often staff are well educated and only require a sharpening of their analytical capabilities and access to up-to-date skills and tools to perform their task better and cost effectively.

c) A center for research and dissemination of information and knowledge in energy economics and regulation through maintaining curriculum that keeps students abreast of energy economics and regulation. It will provide a pool of human resources to man our regulatory institutions.

d) Be a forum for the exchange of ideas with overseas counterparts such as University of Houston Institute and others around the world in the areas of education, research, and evolutions in regulatory and energy economics.

The Minister, the Honourable Dr. Paa Kwesi Ndoum, broached the need for Ghanaians to come to view regulatory institutions creatures of IMF and donor conditionalities. But to accept them as essential ingredients for managing a market oriented national economy. We in the regulatory institutions such as the Energy Commission and the PURC have a responsibility to help create a national constituency in support of regulatory functions by demonstrating that we task add value to the quality of life of the average citizen by ensuring reliable supply, improved access and good quality utility services. If these institutions are a necessary and useful part of sound management of the national economy then we should ensure that the new Center becomes viable and sustainable. This is the issue I want us to focus on at its very inception. Fortunately, we have in our midst the man who can facilitate making this a reality.

It is our view that we should start today in identifying sources of domestic funding for the Center. The PURC, the Energy Commission, The Energy Foundation and the Ministry of Energy should join forces in the search. We cannot allow such a critical function to be left to donor funding as the main source. Outsiders can and should supplement our efforts but their kindness should not be a substitute for own efforts.

May I suggest for the consideration of the Minister and all of us sponsoring organizations, the following sources of funding for the Center:

- Permitting the PURC to collect and put aside 10% of any windfall revenues collected by Utility Companies in any quarter. For example, our tariff for VRA for the past two quarters was based on lower assumptions of hydro-component of energy mix that generated windfall revenues for VRA. Our suggestion is that 10% of such windfall be collected and lodged in a Regulatory Education and Information Fund that could be used in part to fund the Center.
- In the rationalization and re-alignment of the energy prices in February 2005, that a levy of say 50 cedis be put on each liter of petroleum sold in Ghana.
• That the PURC, the Energy Commission, and the Energy Foundation and other sponsoring institutions make an annual contribution equivalent to 5% of their annual budget and/or inflows into a fund to finance the Center. This could be a budgetary item for all of us to negotiate with our funders during our annual budgetary sessions.
• The seeking of donor supplementary support for the Center.
• Internally generated resources such as training fees for refresher courses for our staff, fees for accessing data from our database, etc.

In conclusion, may I express my gratitude to USAID for its support to the PURC and especially for its support for the birth of the Center. Our thanks also go to the IELE of Houston University for their conception and pioneering work that is giving birth to the Center today. It is our hope that you will continue to support the institution to it grow into a Center of Excellence not only for Ghana but also most importantly for the sub-region. This may be the beginning of transforming Ghana into a center of learning and research for the sub-region in Energy and Regulatory Economics. This goal may go to supplement the Minister’s vision of making Ghana an energy product exporting nation though itself is devoid of energy resources in a region awash with energy exporting countries.

The Center is initially being housed at ISSER. It is our hope that part of it will be housed later at the PURC offices under construction or at the permanent office of the Energy Commission. We are grateful to Prof. Ernest Aryeetey and his colleagues at ISSER for agreeing to be part of the sponsorship for this initiative and to house and man it during its formative stage.

Mr. Chairman, it is our fervent hope that the Energy Commission will join the PURC in taking up the challenge of fathering and nurturing this institution into maturity under the patronage of the Ministry of Energy and the Universities of Ghana and Science and Technology. We are committed in creating a world class institution from which shall radiate information and insight for improving decision-making in the energy sectors of the economies of the member states of the sub-region. Some may think this is an impossible task, a mere dream. But as a friend of mine said, in this world people achieve impossible goals against all odds because nobody told them they were impossible. They just did not know. And nobody told them so.

I hope we achieve our goal. There will be difficulties. But these should be viewed as challenges to be faced and overcome. I wish all of us steadfastness, commitment, and single-mindedness in our support for the establishment and flowering of the Center for Energy and regulatory Economics based at ISSER.
SPEECH MADE BY DR. P KWESI NDUOM, MINISTER OF ENERGY, AT THE LAUNCHING OF THE RESOURCE CENTER FOR ENERGY & REGULATION ON FRIDAY, SEPTEMBER 24, 2004

I appreciate this opportunity to be here today as it gives me the chance to present briefly our energy vision and how it applies to the petroleum sector. On the occasion of the launching of the Resource Center for Energy Economics & Regulation, it is appropriate to provide a perspective of our policy direction and how we are implementing it.

An important test of progress in the world today is the extent of energy-petroleum and electricity used per capita in any country. The higher the energy resource used particularly when used efficiently, the more developed the country tends to be. My personal goal when I went to the Ministry of Energy last year was to give the energy sector a firm vision and quickly move to ensure that a road map is put into place for its implementation considering its importance for national development.

Our vision in the energy sector ties our productivity to the national vision. President Kufuor’s Coordinated Social & Economic programmes presented to Parliament included a goal for Ghana to become a middle-income country with a per capita income of at least $1000. The nation’s ability to meet and exceed this goal will depend largely on the performance of the energy sector.

It is only abundant and relatively cheap energy that will provide the fuel to power the private sector engine. My point is that the public and private sectors in Ghana must pay particular attention to the energy sector if the Ghanaian economy is to grow to the extent that will allow the average Ghanaian to achieve an appreciable level of micro level prosperity. Mechanised agriculture requires fuel to work. ICT and any kind of advanced technology depend on sustained and reliable electricity and other energy resources. Industry needs appropriately cost effective fuel and power to be profitable. The internet revolution was developed on the back of abundant, cost-effective, reliable energy. With all this in mind, the Ministry of Energy has carefully crafted an aggressive vision to overcome our challenges, supply the domestic demand and lead Ghana to become a net exporter of power and fuel in five years.
Aggressive as this may sound, it can be achieved. Two actions are needed.

1. Make the present refinery more efficient and expand it’s capacity; and
2. Build an export-oriented refinery

The Tema Oil Refinery (TOR) today refines 45,000 barrels of crude oil per day and produces roughly 70 percent of the country’s requirements. An investment of about $250 million is what is needed to expand the finery to process about 60,000 barrels of crude oil per day to produce more than what we need in Ghana and put us into the net exporter category. Perhaps it may cost us a little bit more than that eventually. But this is the kind of investment needed to put us on the way firmly to becoming a net exporter of fuel.

We have launched a study to firm up our plans and produce a strategy to be completed in October. This strategy will be presented to Cabinet for consideration. If our strategy for TOR’s expansion is approved, implemented of it can begin next year and completed within three years.

Let me give you a rough idea of what I am talking about in money terms. Today, Tor’s turnover is about $600 million. This amount can be raised to $800 million with about $80 million in efficiency improvements. If the expansion is done, TOR can raise its turnover past the billion dollar mark. The efficiency improvements will also produce profits and enough cash flow to repay the additional investments if debt is used.

We are also carrying out an initial study into the construction of an additional export oriented refinery with capacity up to 150,000 barrels of crude oil per day. This will need investment of about $1.2 - $1.5 billion and would produce when built in four years an annual turnover of about $2 billion. These two refinery projects even when they are underway, will spawn additional investment in infrastructure and we hope related petrochemical companies.

I should add that a change in regulatory framework is needed to promote private sector participation in the sector. That is why government will certainly implement its deregulation agenda next year to make the market more predictable and more profitable.
Briefly, this I hope gives you an idea of what we want to accomplish in the petroleum sector to help make our national vision real and to boost our individual and national prosperity. I have chosen to talk about this here because to implement our vision in a timely manner needs analysis, more professional thought, promotion and good information. The Resource Centre can help in many ways to make our aggressive plans practical and very real. You can help us by making meaningful comparisons with what is happening in countries like South Korea, Thailand, Singapore and others. That is why I am extremely pleased to be here to launch the Center.

I am honoured to have this opportunity to declare the Resource Center for Energy Economics and Regulation launched.

Thank you for your attention.
OVERVIEW OF RESOURCE CENTER FOR ENERGY ECONOMICS AND REGULATION AT ISSER

BY
Dr. Felix A. Asante
I.S.S.E.R.

INTRODUCTION
- Established with support from USAID
- Collaborators
  Ghana:
  - Institute of Statistical, Social & Economic Research (ISSER)
  - Public Utilities & Regulatory Commission (PURC)
  - Energy Commission (EC)
  - Energy Foundation (EF)
  - Ministry of Energy
  - Kumasi Institute of Technology & Environment
- USA:
  - Institute for Energy, Law & Enterprise
    University of Houston Law Center, Texas

The Need for a Resource Center
- Natural gas will be playing an important role in Ghana’s energy sector when the WAGP is completed.
- Currently, information about the natural gas business and regulation is very scanty.
- Limited number of knowledgeable experts in Ghana.

The Mission of the “Resource Center”
The mission of the Resource Center is to become an independent resource for data, research, policy analysis, training and public education on energy and utility economics, regulation, and energy sector policy and development in Ghana and, ultimately, the greater region of West Africa.

The Core Activities of the “Resource Center”
The goals of the Resource Center are to:
1. Collect, store, process and disseminate energy and utility sector data and knowledge;
2. Conduct research to support energy and utility sector development and governance;
3. Develop energy and utility economics curriculum for both university and professional audiences; and
4. Educate the public on energy economics, energy policy, energy and socio-economic development issues by publishing reports and holding educational outreach activities

INTENDED RESULTS
- Increase the number of people across a number of disciplines and occupations (journalists, educators, private sector and general public) and within the ranks of the government with a better understanding of energy industry issues; and
- Ongoing delivery of education and information dissemination.
To implement its data collection, research, training and outreach activities, the Resource Center will work with advisors from public institutions, non-governmental institutions, universities, and academia.
OVERVIEW OF ENERGY SECTOR OF GHANA – POLICY PERSPECTIVES

September 2004

PRESENTATION FORMAT
- Background to policy framework – priority Gov’t objectives, key challenges in the energy sector
- Policy Framework – Vision, objectives and actions
- Medium Term Strategic Energy Sector Programmes and Projects
- Some key issues of concern
- Concluding remarks

ELECTRICITY SUPPLY INFRASTRUCTURE

Generation Sources
- Hydropower
  - Akosombo – 912 MW
  - Kpong – 160 MW
- Thermal Power
  - TAPCO (Takoradi I) – 330 MW
  - TICO (Takoradi II) – 220 MW
  - Power Barge – 125 MW
- Imports – up to 250 MW

TRANSMISSION & DISTRIBUTION INFRASTRUCTURE

- National Transmission Network – 4,000 km of 225 kV and 161 kV
  - 100 km of 69 kV lines
  - Transmission Grid connected to Lome by 161 kV lines
  - 225 kV lines connecting to La Cote D’Ivoire
- Distribution Infrastructure
  - 6,000 km of 33 kV sub-transmission network
  - 6,100 km of 11 kV distribution circuits
  - 22,000 km of other low voltage distribution circuits

PETROLEUM REFINING INFRASTRUCTURE
- Single Refinery – Secondary Conversion Facility (FCC)
- Capacity of 45,000 BPSD

KEY CHALLENGES IN ENERGY SECTOR
- Rapidly growing demand for energy in all sectors of the economy – Electricity 7% annually, Petroleum products 5% annually
- Imbalance in demand and local supply of electricity – Supply capability of 1,190 MW vs Requirement of 1,290 MW
- Deterioration of electricity distribution infrastructure – old age and poor maintenance
- Operational inefficiency in sector companies
- Rising costs of energy supply – rising crude oil prices resulting in Gov’t support of about $ 10 Million per month for revenue shortfall
KEY CHALLENGES IN ENERGY SECTOR
- High levels of end-use inefficiency – about 30% of electricity produced is wasted
- Rising energy delivery cost in an environment of low income levels
- Inability to explore and exploit the country’s hydrocarbon resources

ENERGY SECTOR VISION
- Ensure reliable supply of high quality energy services to all sectors of the economy
- Make significant contribution to export earnings of the country

ENERGY POLICY OBJECTIVES
- Consolidate and improve existing energy supply systems
- Increase access to high quality energy services
- Secure future energy supplies
- Stimulate economic development
- Minimise environmental impacts of energy supply and use
- Strengthen institutional and human resource capacity and R&D in energy development
- Enhance private sector investment in energy infrastructure development

CONSOLIDATE AND IMPROVE ENERGY SUPPLY SYSTEM
- Secure strategic private sector investment for re-capitalisation of supply system
- Ensure efficiency in management and restructuring of VRA, GNPC, ECG Power Sector Reform Programme, Petroleum Sector De-regulation Programme
- Ensure cost-recovery in energy supply through efficient pricing - petroleum pricing formula, electricity Automatic Adjustment Formula

INCREASE ACCESS TO QUALITY ENERGY SERVICES
- Expand support for rural electrification
- Accelerate Off-Grid electrification from solar PV – Remote rural communities
- Expand the supply and use of LPG to substitute for firewood and charcoal
- RFCC at Tema Oil Refinery will increase LPG production from 26,636 tonnes to 117,142 tonnes

SECURE FUTURE ENERGY SUPPLIES
- Diversification of energy supply sources – promoting exploitation of alternative sources
- Pursue development of West African Gas Pipeline Project, finalise all protocols and FID by 2004
- Promote end-use efficiency and conservation
- Intensify hydrocarbon exploration – provide more private sector-friendly environment
- Consolidate legal and regulatory regime to facilitate participation of Independent Power Producers
STIMULATE ECONOMIC DEVELOPMENT

- Promote Productive Uses of Electricity
- Enhance Gov't Revenue generation – taxes and levies on energy supply and consumption
- Employment generation – expanding domestic energy service provision through increased private sector investment

MINIMIZE ENVIRONMENTAL IMPACT OF ENERGY SUPPLY/USE

- Promote gradual increase of more environmentally friendly supply sources – such as solar, wind and small hydro
- Promote a shift from oil to natural gas where ever it is viable substitute
- Support and actively participate in international efforts at sustainable energy to mitigate climate change
- Ministry of Energy endorses the United Nations Joint Implementation (JI) and Clean Development Mechanisms

STRENGTHEN INSTITUTIONAL AND HUMAN RESOURCE CAPACITY AND R&D IN ENERGY DEVELOPMENT

- Support institutional reforms in the energy sector – Energy Commission Act 541, PURC Act 538
- Strengthen existing regulatory institutions – give comfort to private investors
- Support training of Ghanaians in all fields of energy development and management
- Re-direct Energy Fund to support energy R&D

SPECIAL CONCERNS

- Creating level playing field for renewable energy – remove fiscal and market barriers
- Committed to Power Sector Reforms process – finalise strategy for implementation of reforms
- De-regulation of petroleum products supply –
  (i) Private sector ownership of refineries,
  (ii) Importation of crude and products by Oil Marketing Companies & others,
  (iii) Independent Pricing Authority
- Woodfuel sector reforms – rationalisation of fiscal and regulatory regime for woodfuel exploitation, transportation and distribution

STRATEGIC ENERGY PROJECTS

POWER GENERATION

- Completion of Takoradi Thermal Power Project (TTP 2 – Combined Cycle) – 110 MW capacity addition – US$140 million
- Power Barge (125 MW)
- Bui Hydroelectric power development Project – US$600 million
- West African Gas Pipeline Project (WAGPP) – US$80 million as Gov't Equity in project

POWER TRANSMISSION

- Construction of Prestea-Obuasi Transmission line – US$10 million
- Ahanta Delta Transmission line – US$25 million
- Both transmission lines will enable evacuation of more power from Western Corridor
- Kumasi – Sanyani Transmission line to increase capacity to northern sector of Ghana
STRATEGIC ENERGY PROJECTS

POWER DISTRIBUTION

- Distribution network re-enforcement – US$185 million
- Pre-payment metering project – US$68 million
- Rural Electrification – completion of SHEP 3 and initiation of SHEP 4 – US$200 million
- Regional Capital street lighting project – US$40 million; concessionary loan funding and private sector financing are being encouraged

ENERGY CONSERVATION AND EFFICIENCY

- Efficient Lighting Retrofit to release about 200 – 400 MW of electric power demand – US$40 million
- Public education programme to promote energy conservation practices – US$200,000
- Introduction of Minimum Efficiency Standards & Labels for a range of energy consuming appliances and industrial equipment – US$50 million, up to 350 MW by 2030, (AC only)
- Distribution loss control – US$10 million

PETROLEUM REFINING

- Construction of Single Buoy Mooring to allow for more crude oil supply and reduce cost of crude supply to refinery – US$24 million
- Construction of New 100,000 BPSD refinery at Takoradi under Free Zones Scheme – US$600 million

PETROLEUM DISTRIBUTION

- Buipe-Bolgatanga Pipeline – to improve petroleum product supply to northern Ghana – US$34 million

RURAL KEROSENE DISTRIBUTION IMPROVEMENT PROJECT

- to ensure kerosene is made available at all times and at approved prices – US$5 million

CLEAN ENERGY DEVELOPMENT

- Solar Panel Assembly Plant – to assemble solar panels with view to reducing costs and for export – US$5 million for feasibility studies
- Development of Wind Park at Kpone for electric power generation – US$80 million
- National LPG Promotion Project – US$100,000 for review study

TECHNICAL ASSISTANCE REQUIREMENTS

- Ministry of Energy – Expertise in policy analysis, petroleum; capacity building for staff
- Energy Commission – Capacity building in regulation and monitoring
- GNPC – Hydrocarbon Data Acquisition and Analysis
SOME KEY ISSUES OF CONCERN

- Electricity pricing – conflict of pricing for cost-recovery vs affordability
- Under-recovery of costs is bad for utilities
- Should cost recovery go with ability to pay?
- Who subsidizes the 40% of population with access to electricity?
- PURC Transitional Plan to "economic tariffs" - Who pays for financial gap?
- US$185 million for crude oil purchases for power generation - Who pays?

SOME KEY ISSUES OF CONCERN

- Private sector participation in electric power generation and distribution, which way? Power Sector Reform Programme
- Private sector re-capitalisation through privatisation of distribution utilities
- Are electricity tariffs adequate?

SOME KEY ISSUES OF CONCERN

- Solar PV electricity – What role and at what cost?

CONCLUDING REMARKS

- Energy sector critical to socio-economic development of the country and the GOLDEN AGE OF BUSINESS
- Considerable amount of investment is required for planned energy sector infrastructure development – About US$2.0 Billion next 3 years
- Ministry of Energy has formulated Energy Policy Framework and Programmes to address the challenges in the sector
- Government will encourage and create appropriate environment for investment in energy infrastructure development

CONCLUDING REMARKS

- You are welcome to be part of the process
- Thank You
Energy Value Chains

Overview

A U.S. Illustration ca. 1999 (U.S. EIA)

Natural Gas: the Case of a Complex Value Chain

What is a “Value Chain?”

• The process of linking specific functions from input through output to delivery, enhancing the economic value of the final product
• Concepts – “business system,” “industry system,” “commodity,” “commoditization”
• The issue for energy – building value chains around dynamic commodity markets that require fixed infrastructure for liquidity

What is the natural gas business...

...and how should it be regulated?
• Is it a competitive, upstream-driven business?
• Is it an economies of scale, monopoly midstream-downstream business that affects the public interest?
• How much of direct end use and conversion is competitive?
• If the goal is to build the “natural gas factory,” then policy/regulatory approaches need to facilitate value chain development – “commercial frameworks.”

Building the Natural Gas Factory

International Investor Goals
Commercialize stranded natural gas production, by:
• Increasing diversity of midstream options
• Gaining access to downstream participation where supported by markets (“power the world with gas”)
• Export

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Worldwide Natural Gas Business
System Dynamics: Framework Issues

Benefits of Competitive Supply
- E&P (LNG): Profit driven; ROR decision based on expected prices; monetize stranded reserves
- Power Gen: Profit driven; ROR decision based on expected prices; fuel competition for gen
- Pipelines Transmission: Regulated asset optimization; market rates?
- LDCs: Regulated asset optimization; proximity to final customers (gas, power); market rates?
- End Users: End use based on expected prices; access to competitive supply

Achieving Competitive Supply
Pricing Supply
- COMPETITIVE SALES
  - Wellhead producers
  - Third party wholesalers

The challenges:
- Entry of new suppliers
- Managing common pools
- Developing liquidity to establish locational basis
- Protecting market transparency
- Dealing with third party wholesalers that are affiliated with regulated infrastructure
- Access for new supplies
- Balancing short term cycles and long term capital requirements for resource development

Pricing Transport, Distribution Capacity
- RESERVATION (DEMAND)
  - Fixed cost of investment
  - Return on equity, taxes, long term debt, A&G, DA, O&M
- COMMODITY (USAGE)
  - Variable cost of operation
  - O&M

“Mean reversion” is a reality if market-clearing participants exist, but is often not captured in capacity pricing

Regulated Infrastructure as the Conduit for Supply Competition
Pricing Transportation, Distribution
- RESERVATION (DEMAND)
  - Fixed cost of investment
  - Return on equity, Taxes
  - Long term debt
  - A&G, DA, O&M
- COMMODITY (USAGE)
  - Variable cost of operation
  - O&M

The challenges:
- Rate-making transitions
- Setting maximum allowable rates with market transparency
- Pricing new capacity
- Dealing with access for new capacity
- Determining contestable transportation markets
- Dealing with market power
- Balancing short term cycles and long term capital requirements for delivery

Achieving Competitive Demand
Pricing Consumption
- Market Price
- Margin
- Retail Cost
- Wholesale Cost

The challenges:
- Political will to allow wholesale price fluctuations to flow to retail users
- Price discovery and transparency
- Market structure ( unbundling)
- Market power
- Market oversight
- Balancing short term cycles and long term capital requirements for delivery

The U.S. Case
Pre-Natural Gas Restructuring
- FERC
- PUCs
- PRODUCERS
  - Locate
  - Produce
- PIPELINES
  - Aggregate
  - Purchase from Pipelines
- LDCs
  - Storage
  - Serve End User
- Sell to Pipelines
- Sell to LDCs

Value Chain
The U.S. Case
Post-Natural Gas Restructuring

- Marketers
- Gatherers & Aggregators
- Service Companies
- End Users
- Producers
- Storage Companies
- Pipeline Companies
- LDCs
- Production
- Storage Services
- Transport Services
- Distribution Services
- Aggregation
- Gathering
- Marketing
- Risk Management
- LNG
- Information Services
- Processing

U.S./Canada Natural Gas Value Chains

- Industrial
- Commercial
- Residential
- Small Commercial
- Electric Generation
- "City Gate"
- "LOC"
- "Open Access"
- "Unbundling"
- "Interstate Pipelines"
- "Transportation (pipe)"
- "Sales (commodity)"
- FERC
- PUCs
- LNG Information Services
- Processing
- Risk Management
- "Mean reversion" is a reality if market-clearing participants exist, but is often not captured in capacity pricing

U.S. Case: Market Trade Off
1984 (Open Access)-2002

As unbundling for C&I customers proceeded, more cost behind the city gate is absorbed by residential.

Electric Power: the Case of Balancing a Dynamic System

"We will make electric light so cheap that only the rich will be able to burn candles." – Thomas Edison

Electric Power Value Chain

- Integrated Utilities
- Merchant (IPP)
- Self (mostly Industrial)
- System Operator
- Electric Power Transmission
- Local Distribution
- Marketing

Achieving Competitive Supply

Pricing Supply

- COMPETITIVE SALES
  - Commodity
  - Power generators
  - Third party wholesalers for power

Pricing Transport, Distribution Capacity

- RESERVATION (DEMAND)
  - Fixed cost of investment
  - Return on equity, taxes, long term debt, A&G, DA, O&M
- COMMODITY (USAGE)
  - Variable cost of operation
  - O&M
  - CONGESTION MANAGEMENT

"Mean reversion" is a reality if market-clearing participants exist, but is often not captured in capacity pricing.
Achieving Competitive Supply

Pricing Supply

**COMPETITIVE SALES**
- Power generators
- Third party wholesalers for power

**The challenges:**
- Entry of new suppliers
- Managing common pools
- Developing liquidity to establish locational basis
- Protecting market transparency
- Dealing with third party wholesalers that are affiliated with regulated infrastructure
- Access for new supplies
- Balancing short term cycles and long term capital requirements for resource development

Achieving Competitive Demand

Pricing Consumption

**Wholesale Costs**

**Retail Costs**

**Margin**

**Market Price**

**Not to scale**

**The challenges:**
- Political will to allow wholesale price fluctuations to flow to retail users
- Price discovery and transparency
- Market structure ( unbundling)
- Market power
- Market oversight
- Balancing short term cycles and long term capital requirements for delivery

Initial Competition Pares Back Capacity...

The Global View

**RELIABILITY**

**GENERATION**

**TRANSMISSION**

**WHOLESALE MARKET DESIGN**

**Spot market: Pool?**
- Bilateral contracts?
- Combo?
- Nodal?
- Zonal?
- Other?

**Congestion Management?**
- ISO geography?
- For profit v Regulated?
- Access rules?

**Price transparency?**

**How to ensure the expansion of generation capacity with a “healthy” reserve margin?**

**How to ensure the maintenance, expansion and reliable operation of the T&D system?**

**Resource adequacy?**

**Capacity payments?**

**Number of competitors?**
- Or, market share?

**NATURAL GAS**

**Stranded gas?**

Regulated Infrastructure as the Conduit for Supply Competition

Pricing Transportation, Distribution

**RESERVATION (DEMAND)**

Fixed cost of investment
- Return on equity
- Taxes
- Long term debt
- A&G, DA, O&M

**COMMODITY (USAGE)**

Variable cost of operation
- O&M

**The challenges:**
- Rate-making transitions
- Setting maximum allowable rates with market transparency
- Pricing new capacity
- Dealing with access for new capacity
- Determining contestable transportation markets
- Dealing with market power
- Balancing short term cycles and long term capital requirements for delivery

Pricing Consumption

The challenges:

- Political will to allow wholesale price fluctuations to flow to retail users
- Price discovery and transparency
- Market structure ( unbundling)
- Market power
- Market oversight
- Balancing short term cycles and long term capital requirements for delivery

Value Chain
Transmission Issues

- Still searching for the right model that would efficiently:
  - allocate transmission capacity
  - maintain & expand the transmission system
  - manage congestion
  - arrange for ancillary services
AN OVERVIEW OF THE WEST AFRICAN GAS PIPELINE PROJECT

PRESENTED AT THE LAUNCHING OF THE
“RESOURCE CENTER FOR ENERGY ECONOMICS AND REGULATION”

BY EMMANUEL A. QUAYE-FOLEY
MINISTRY OF ENERGY

WAGP Project Objectives

- Overall purpose of transporting natural gas from production facilities in Nigeria to commercially viable markets in neighbouring countries of Ghana, Togo, and Benin. Objectives include:
  - Develop a Regional Energy Infrastructure Project
  - Provide a sustainable energy supply for the economic development and integration of countries in the sub-region

WAGP - Historical Background -1

- Sept 1995 - Four States; Ghana, Togo, Benin & Nigeria; sign Heads of Agreement (HoA) for the Supply & Transmission of Natural Gas. Provisions of HoA include:
  - Independent consultant to carry out feasibility
  - If viable, then Project Developer to be appointed
  - Pipeline to be owned by Public-Private Partnership (Special provision for citizens of the sub-region)
  - Pipeline to be managed & operated on commercial basis
  - Pipeline to be regulated with “Open Access” as well as common technical & fiscal regime

WAGP - Historical Background -2

- March 1999 - Independent Feasibility Study by Pipeline Engineering GmbH of Germany is completed and concludes that WAGP is technically feasible and economically viable.

WAGP - Historical Background -3

- Aug 1999 - The four States appointed as Developer, a consortium of Public and Private companies from the states comprising:
  - Ghana National Petroleum Co. (GNPC) of Ghana;
  - Societe Togolaise du Gaz of Togo;
  - Societe Beninoise du Gaz of Benin;
  - Nigerian National Petroleum Co. (NNPC) of Nigeria;
  - Chevron Nigeria Ltd.; and
  - Shell Petroleum Development Corporation of Nigeria.
- Feb 2002 - Inter-Governmental Agreement signed for states to facilitate the pipeline development by harmonizing their legal, regulatory and fiscal regimes.
WAGP - Historical Background -4

- **Aug 2002** - Development Consortium makes positive decision to proceed after Preliminary Commercial Evaluation (PCE).
- **Jan. 2003** - International Treaty among states was signed.
- **May 2003** - West African Pipeline Company (WAPCo) formed as the project company to Build Own and Operate (BOO).
- **May. 2003** - International Project Agreement between WAPCo and States signed.

Benefits of WAGP to GHANA - 1

- Reduced cost of electricity generation
  - Reduced Fuel Cost
  - Reduced Maintenance Cost of Thermal Plant
- Open Access Pipeline enables transportation of indigenous gas, once discovered.
- Environmentally cleaner source of fuel leading to reduction of greenhouse gas emissions
- Reduction in deforestation and receipt benefits under the Kyoto Protocol

Benefits of WAGP to GHANA

- Long Term Energy Security through the provision of abundant natural gas from Nigeria’s Delta Basin
- Regional cooperation and economic integration of sub-region
- Tax Revenue to the States from WAPCo operations and activities
- Creation of Jobs
  - During construction & During operations over the 20 year useful life assumed
  - Reliable power supply stimulates new industry and direct investment
- Development of Secondary Gas Market
  - For industrial use (industrial furnaces, feedstock for fertilizer plants, LPG plants, iron and steel mills, etc.)
  - For Domestic use.

West African Gas Pipeline Company (WAPCo)

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Chevron</td>
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<tr>
<td>NNPC</td>
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<tr>
<td>Shell</td>
<td>18.0%</td>
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<tr>
<td>VRA</td>
<td>16.3%</td>
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<tr>
<td>SoBeGaz</td>
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<tr>
<td>SoToGaz</td>
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</tr>
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</table>

Project Development Schedule

<table>
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<th>Phase</th>
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</thead>
<tbody>
<tr>
<td>Conceptual</td>
<td>Complete</td>
<td>Feasibility</td>
<td>Complete</td>
<td>Definition</td>
<td>In Progress</td>
<td>Construction</td>
<td>Phase 4</td>
</tr>
</tbody>
</table>

Gas Supply Chain

Gas Producers

Gas Seller (N-Gas)

Gas Buyer (VRA)

Transporter (WAPCo)
## Gas Price Components

- Gas Contract Price (GCP)
- WAGP Transportation Charge (WTC)
- ELPS Transportation Price (ETP)
- Delivery Fee (DF)
- Other Charges
  - WAGP Authority Charge (WAC)
  - WAGP Commodity Charge (WCC)
  - Credit Support Charge (CSC)

THANK YOU FOR YOUR ATTENTION
Launching Of The “Resource Centre for Energy Economics and Regulation”

SEPTEMBER 24, 2004

Overview of Work Programme of the “Resource Centre”

Presentation by
Stephen N. Adu
Executive Secretary
Public Utilities Regulatory Commission

1. Kick-off Meeting of the Resource Center
• Goal is to make formal public announcement of the opening of the “Centre”.
• Aim to attract main stakeholders in Ghana’s energy industry, e.g. Energy Ministry, Utility Companies, regulators, NGO’s, other local and international energy Companies
• Stakeholders expected to participate in the Resource Centre activities
  - promoting the centre at various levels
  - supplying energy industry expertise for research

2. Natural Gas Project
• WAGP Project will provide a big role for Natural Gas in the Energy Sector of Ghana.
• Current information is scanty on natural gas business and regulations.
• Limited number of knowledgeable experts in Ghana
• There is great need to build basic understanding of natural gas business among:
  - Energy industry professionals
  - General public
• First product of the Resource Centre will be “a Natural Gas Primer” to address this need.

Natural Gas Project: Contd.

1. Natural Gas Industry Overview
   * Background, sources, uses, history;
   * Value chain overview (from exploration and production to end-use);
   * Markets overview – supply and demand, regulation.

2. Natural Gas in Ghana - overview of natural gas issues

3. Primer will serve as information source for government, industry, educational institutions, media, public.

4. Primer to be discussed at an educational forum
   - Wide coverage to public, media
   - Available at ISSER and other websites

Target Date
By November 2004

3. “Guide to Electric Power in Ghana” Project

1. “Guide to Electric Power in Ghana”
   • The Resource Centre will develop the guide in collaboration with stakeholders, with data collected from various sources.
   • Guide will serve as a “First Reference” source for Ghana’s industry, government, educational institutions, media and the public.

2. The Guide will provide the following information:
   • Facts on the Ghanaian electric power sector;
   • The basics and history of electric power;
   • Energy regulations and policies in Ghana that affect electric power;
   • Major industry challenges/issues – economic development, consumers, financing and other;
   • Future industry development issues.
“Guide to Electric Power in Ghana”
Project: Contd.

3. Guide to be discussed at an educational forum – to secure participation by all stakeholders in Ghana’s energy sector.
   - Coverage to media and interested persons in the energy sector

4. Guide will be made available at the Resource Centre as well as on various websites – e.g. PURC, KNUST, VRA, Energy Ministry etc.
   - Soft and Hard copies will be distributed widely to TV, radio, newspapers and industry publications.

Timeline
February 2005

4.0 Resource Center Sustainability Plan

Provisions are to be made to continue the Resource Center activities after the funding by USAID expires at the end of the grant.

The plan should address the following issues:
1. Scope of activities/tasks for post-grant period
   - areas of interest for industry stakeholders and other potential sponsors
   - revenue generating activities such as training programs and database access
   - Plan for dissemination of information

2. Budget. Determine resource requirements for the Resource Center to continue its operations and undertake the activities identified under 1 above.

Resource Center Sustainability Plan:
Contd.

3. Sources of funding
   - a list of potential funding organizations including local and foreign companies, and international development agencies

4. Action plan
   - A strategy to develop and market revenue generating programs (e.g., replication around the country and the greater region of West Africa)
   - A strategy to attract different sponsors while keeping the Center’s independence and credibility
   - Preliminary proposals to grant-issuing entities
   - Preliminary proposals to potential sponsors
   - A plan for long-term partnerships with similar institutions in or outside Ghana

Timeline
March 2005

5.0 Energy Utility and Regulatory Economics Curriculum Development

• The Resource Centre and UH IELE will collaborate to develop energy, utility and regulatory economics curriculum for training programs for:
  a) regular university-level and
  b) short-term focused training for professionals.

• The courses will be offered by the Resource Centre at UG-Legon and KNUST – Kumasi, and other locations.

• The Resource Centre will benefit from experience that UH IELE currently gaining from Bangladesh University of Engineering and Technology

• It is expected that a number of energy and regulatory courses and syllabi will be developed;

• Teaching Resource can be provided by UH IELE, other academic experts, professional and industry practitioners.

6.0 Energy Industry Database Development

1. The Resource Centre will collect comprehensive energy industry data in the process of fulfilling activities such as the “Natural Gas Primer” and “Guide to Electric Power” in Ghana.

2. A natural extension of this data collection activity is the establishment of a database that the Centre would make available to interested parties in an easily accessible way (online subscriptions/web-based, etc).

3. Information will be obtained from all agencies involved in the development and operation of the Resource centre

4. Resource Centre will develop database usage guidelines – including accessing and price

5. Plan for the database management to be developed – including how to keep it current.

Energy Industry Database Development: Continued

Timeline
March 2005