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SHEBERGHAN GAS FIELD DEVELOPMENT PROJECT

CAPACITY BUILDING AND TRAINING WORKSHOPS

December 14, 2010

Sheberghan Gas Field Development Project (SGFDP)
USAID Contractor



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Table of Contents

I.	EXECUTIVE SUMMARY	i
II.	INTRODUCTION.....	1
III.	TRAINING WORKSHOP AT KABUL UNIVERSITY	2
IV.	TRAINING WORKSHOP AT THE MINISTRY OF MINES – HYDROCARBON UNIT.	4
V.	TRAINING WORKSHOP AT MINISTRY OF ENERGY AND WATER.....	7
VI.	TRAINING WORKSHOP AT AFGHAN GAS ENTERPRISE	9
VII.	TRAINING WORKSHOP AT THE MINISTRY OF MINES – NORTHERN DIRECTORATE OF THE HYDROCARBON UNIT.....	11
VIII.	OVERALL EVALUATION OF THE CAPACITY BUILDING PROGRAM.....	13
IX.	FUTURE RECOMMENDATIONS.....	15
	APPENDIX A: KABUL UNIVERSITY TRAINING PROGRAM	16
	APPENDIX B: MINISTRY OF MINES HYDROCARBON UNIT TRAINING PROGRAM	18
	APPENDIX C: MINISTRY OF ENERGY AND WATER TRAINING PROGRAM	20
	APPENDIX D: AFGHAN GAS TRAINING PROGRAM.....	21
	APPENDIX E: MINISTRY OF MINES – NORTHERN DIRECTORATE OF THE HYDROCARBON UNIT	22

I. EXECUTIVE SUMMARY

The Sheberghan Gas Field Development Project was tasked under USAID contract EPP-I-00-03-00004-00 with designing and implementing a capacity building program to develop basic technical capabilities within the scope of the original contract. AEAI's original contract with USAID focused on the private development of the gas fields in the Sheberghan area and the development of a privately operated independent power project utilizing the gas reserves and delivering power into the Northeast Power System (NEPS) for transmission to Kabul. Based on that objective, AEAI, through the Sheberghan Gas Field Development Project (SGFDP) team, developed a capacity building project designed to enhance the ability of specific groups in the Afghan Government and the higher education institutions to understand the technical and legal aspects of hydrocarbon development and electrical power systems. These training workshops were specifically designed for the different audiences that would be dealing with various aspects of the project.

The capacity building workshops were designed to enhance the capabilities of the ministries and departments involved in the development of the gas fields and in the electrical generation and distribution aspect of the project. As an additional benefit, the discussion portions of the workshops in particular allowed the SGFDP team to make determinations about the current capabilities of the various departments and identify areas where further training and capacity building efforts would be needed to facilitate greater participation by Afghan government officials in the SGFDP project. The SGFDP team designed five training workshops for Kabul University, the Hydrocarbon Unit of the Ministry of Mines, the Policy and Planning Department of the Ministry of Energy and Water, Afghan Gas Enterprise and the Northern Directorate of the Hydrocarbon Unit, the latter two of which were conducted in Sheberghan during a site visit in late fall 2010.

The SGFDP team prepared lectures in both English and Dari and utilized simultaneous translation to assist participants in understanding the presented material. The SGFDP team also prepared English and Dari handouts of the lecture materials including slides and background documents which were distributed to participants at the beginning of the each workshop. Following the lectures, participants took a short break before being divided into discussion groups to further analyze the material presented. Participants were provided with a set of discussion questions prepared by the SGFDP team and a set of written questions to further expand on the material. All materials prepared by the SGFDP team for the training sessions have been included in electronic form on the compact disc provided with this report. The discussion sessions offered participants a chance to ask questions about the material presented to both the SGFDP team and each other and to share their experiences and perspectives on the day's material.

Overall, the feedback from the participants involved in the workshops was very positive and the SGFDP team and participants considered the training programs to be extremely successful. Collectively, the SGFDP team trained a total of 162 people, including 19 women. The workshops achieved the goal of greater professional development for the employees of the ministries, as well as increasing interest among the next generation of engineers in the gas field development process. The workshops also allowed the SGFDP team to identify additional capacity building needs and make informed recommendations on the existing capabilities and capacity of the ministries and departments involved in the SGFDP project.

The discussion sessions in particular allowed much greater interaction by the SGFDP team with the participants and resulted in an improved learning environment. The translation of the presentations, discussion questions and written questions further enhanced the learning experience for the participants, a fact which was demonstrated by the level of questions and interaction between the participants and the SGFDP team. In sum, the workshop participants and the SGFDP team considered the training module design and capacity building workshops to be a valuable contribution to the efforts to develop the gas fields in Sheberghan and the corresponding independent power project.

II. INTRODUCTION

The development of Sheberghan gas fields and the construction of a gas-fired power plant in the form of an independent power producer (IPP) would provide sustainable, long-term energy for Afghanistan. Currently, Afghanistan is only able to supply electricity to approximately 20% of its roughly 24.5 million citizens, and even that service is lacking in quality and reliability in many areas. Afghanistan is importing power from Turkmenistan, Uzbekistan, Tajikistan and Iran, and while these supplies have provided a cheap source of immediate power, they are not guaranteed for the long-term. The area around Sheberghan is blessed with gas resources, which were discovered and mapped by the Soviet Union, and could provide a reliable fuel source for a gas-fired thermal power plant that would provide much needed power to Kabul and points beyond.

The ambitious scope of the SGFDP necessitates increased capacity building efforts to ensure that the appropriate Afghan energy professionals are adequately trained to handle the demands of private participation in development of the Sheberghan gas fields and the independent power plant. This capacity building effort was focused on five entities: the Ministry of Mines Hydrocarbon Unit, the Ministry of Energy and Water Planning and Policy Department, Kabul University, Afghan Gas Enterprise, and the Northern Directorate of the Hydrocarbon Unit. The SGFDP team designed targeted training modules for each of the five groups in order to achieve maximum effect from the limited training time available. The training modules provided a basic foundation course on natural gas exploration, exploitation, processing and utilization for all participants except the Ministry of Energy and Water. The training for the Ministry of Energy and Water participants focused on the Independent Power Producer model and Power Purchase Agreement principles. These targeted training programs were a valuable part of the overall SGFDP effort and should be continued and expanded to support both the gas field development and power plant construction objectives.

III. TRAINING WORKSHOP AT KABUL UNIVERSITY

Introduction and Course Description

The training began at Kabul University with a three day workshop focused on the development and processing of natural gas, and included a brief introduction to natural resource contracting using the production sharing agreement model. The primary thrust of the training workshop was the exploration and exploitation of natural gas resources, along with a presentation on different processing requirements to fully utilize the available gas reserves. Several different departments participated in the training, including the geosciences department and industrial chemistry department. The trainees included department heads, professors and students of the various departments. Overall, there were approximately forty participants in the training workshop, including six female participants. The workshops were well received by the participants and provided valuable insight for the SGFDP team on the capabilities of future engineers and specialists coming from Kabul University.

Presentation and Group Discussion Analysis

The first lecture focused on the history of oil and gas development in Afghanistan. This included recent events in the Afghan oil and gas fields, as well as the technical and logistical aspects of existing oil and gas infrastructure in and around the Sheberghan. The lecture also included information on potential utilization of natural gas for various functions. The participants were provided with a Dari version of this presentation, along with all other presentations included in the workshop, and several background materials (in English) to further develop the concepts. The group discussion portion reinforced the basic concepts of the lecture and asked participants to examine possible uses of natural gas in Afghanistan.

The second lecture focused on the development of natural gas systems. However, due to several questions at the conclusion of the first day regarding drilling, the lecture began with a brief introduction to the drilling and exploration process. The remainder of the lecture was on the composition and processes for treatment of natural gas. The group discussion explored various options and requirements for the treatment of natural gas to remove condensate, hydrogen sulfide and other contaminants prior to use in different applications.

The final lecture focused on natural resource contracting and the production sharing agreement (PSA) model. This presentation was designed to provide participants with a brief introduction to the production sharing agreement and the risks and opportunities of private investment in natural resources. The group discussion explored these risks and opportunities and challenged participants to identify and prioritize various benefits of the production sharing agreement model for Afghanistan.

Feedback and Observations

The participants and the SGFDP team found the approach of a lecture combined with group discussion and written questions to be a much more interactive and engaging program than a simple lecture on specific natural resource topics. The group discussions were monitored by SGFDP team members, who were available to answer questions and develop the discussion. Further, each group contained at least one professor who was able to moderate the discussion

and encourage student participation in the session. The combination of written questions and oral discussion questions highlighted specific issues for participants and encouraged them to ask follow-up questions, both of each other and the SGFDP team members. The SGFDP team found the participants to be very enthusiastic about the subject matter and was impressed by the abilities and level of participation of the trainees. The SGFDP team members collected the written assignments from students and invited the top five in the workshop to participate in the more advanced training program to be held at the Ministry of Mines the following week.

Participants were also provided with an additional page on their written assignments to provide feedback on the presentations and to evaluate the quality of the training workshop. The SGFDP incorporated these comments into the next round of training workshops and was able to make adjustments and refinements in the presentations to get maximum effect from the training sessions. The feedback obtained from the students was overwhelmingly positive and the comments and suggestions were almost uniformly constructive and helpful. The enthusiastic reception of the training module design and course material by the participants at Kabul University was a very positive start to the capacity building aspect of SGFDP.

Recommendations

Based on the feedback received from the participants and the observations of the SGFDP team, the involvement of Kabul University in the capacity building initiative should be continued and possibly expanded to include students from Kabul Polytechnic University. The integration of the future engineers and scientists being educated at these institutions into the overall project strategy will be likely to yield much higher benefits than exclusively training existing employees of the ministries. Exposing the students to modern oil and gas concepts, particularly natural resource development projects, during their education can build enthusiasm and facilitate greater understanding and expectations once they graduate and begin their careers in their respective fields. The SGFDP team strongly recommends the integration of Kabul University and Kabul Polytechnic University into the long-term capacity building efforts in the energy and mining sectors.

IV. TRAINING WORKSHOP AT THE MINISTRY OF MINES – HYDROCARBON UNIT

Introduction and Course Description

The second of the training workshops was developed for the Hydrocarbon Unit of the Ministry of Mines. This three day training workshop contained more detailed technical information based on the experience and educational levels of the Hydrocarbon Unit personnel. Again, the primary focus of the program was on the exploitation, processing and utilization of natural gas, with an introduction to natural resource contracting. As with Kabul University, the training was well received by the participants, which included five members of the Northern Directorate of the Hydrocarbon Unit from Sheberghan. Including the five employees from Sheberghan, the five students from Kabul University and three female participants, a total of 25 individuals participated in the training workshop at the Ministry of Mines. The SGFDP team also had an opportunity to make a preliminary evaluation of the technical capabilities of the Hydrocarbon Unit personnel during the training workshop.

Presentations and Group Discussion Analysis

The first presentation was a more detailed and exhaustive version of the presentations given at Kabul University. The lecture briefly touched on the history and recent events in the oil and gas industry in Afghanistan, and then moved to a more in-depth analysis of the technical and logistical aspects of the existing oil and gas infrastructure. A large portion of the lecture session was focused on possible means of utilization of natural gas resources in Afghanistan, including uses for compressed natural gas and liquefied petroleum gas. The lecture concluded with a brief summary of technical and logistical requirements for future oil and gas development in Afghanistan. The group discussion session based on the first presentation challenged participants to identify and analyze different aspects of the existing oil and gas infrastructure in Afghanistan and to seek out potential uses for the existing natural gas reserves near Sheberghan. The group discussions allowed participants, primarily engineers and scientists, to share their experiences with gas field development and to discuss strategies for both short and long term utilization of the Sheberghan gas resources.

The second presentation contained information on natural gas systems development, including a detailed analysis of the amine sweetening process, glycol dehydration and other processing systems to clean and refine natural gas. Based on the SGFDP team's analysis, gas processing (and sweetening in particular) is going to be crucial to the proper development of the Sheberghan gas fields and this lecture provided a realistic assessment of the processing requirements to fully utilize the gas reserves. The lecture provided a step-by-step analysis of amine sweetening as well as glycol dehydration processes, which was extremely valuable for the participants. The lecture also discussed methods of evaluating the composition of raw gas and the chemical aspects of the various components. The group discussion based on this lecture allowed participants to ask additional questions of the SGFDP team regarding the amine process and the existing gas processing infrastructure and new infrastructure requirements for the Sheberghan gas fields.

The final presentation was on the topic of natural resource contracting and the legal framework for natural resource development. The lecture briefly introduced various types of

natural resource contracts including concession agreements, leases and licenses, and service contracts. However, the main focus of the presentation was on the Production Sharing Agreement model and the risks, challenges, and opportunities presented by that model. This lecture was useful in addressing some of the concerns of the Afghan government employees regarding private sector participation in the development and exploitation of natural resources. The lecture also introduced many of the employees of the Hydrocarbon Unit to the Afghan Hydrocarbon Law and its requirements. During the group discussion, participants were able to debate the merits of private sector participation in the development of Afghanistan's natural resources and were challenged to determine the priorities and needs of Afghanistan that should be addressed during the contracting phase. Participants were also able to ask specific questions related to private sector participation in natural resource development and were provided with background information on the structure and objectives of the Production Sharing Agreement model.

Feedback and Observations on Participation

As with Kabul University, the SGFDP team found the training module design of a lecture followed by a group discussion to be a very valuable capacity building method. Also, the addition of the five students from Kabul University and the participation from the five members of the Northern Directorate in Sheberghan seemed to boost participation and provided extremely valuable contributions in terms of both questions and shared experiences and knowledge. The SGFDP team also provided discussion questions and a set of written questions, though these were not graded and were for the benefit of participants only. However, the SGFDP team collected workshop evaluation forms from the participants. The feedback provided by the participants was very positive and the suggestions were constructive and useful.

Over the course of the training workshop, it became clear to the SGFDP team that the "refresher" nature of the lectures was very valuable to the members of the Hydrocarbon Unit. Many of the engineers received training in petroleum operations in the Soviet Union, but have not had the opportunity in Afghanistan to fully utilize their training and skills. These observations were echoed by the comments and feedback received from workshop participants.

Overall, the SGFDP team found the participants to be engaged and enthusiastic, led primarily by the five students from the Geosciences Department at Kabul University and the five participants from the Northern Directorate of the Hydrocarbon Unit. However, several participants from the Hydrocarbon Unit in Kabul were late to the lecture on the third day to protest not receiving payment for their attendance. In discussions with the general director of the Afghan Geological Survey, the SGFDP team and AGS had come to an agreement prior to the training workshops on a per diem payment to Sheberghan participants to cover their travel expenses to and from Kabul. The expectation by the Kabul-based employees of the Hydrocarbon Unit of payment for participation in the capacity building sessions was disappointing to the SGFDP team. Fortunately, Dr. Rahman Ashraf intervened and brought the protesting members to the training room, and the remainder of the training workshop continued without incident.

Recommendations

The participants expressed interest in continued training workshops on advanced natural gas concepts, including drilling, data interpretation, seismic study and gas composition analysis. The representatives of the Northern Directorate of the Hydrocarbon Unit suggested more targeted training at their location in Sheberghan, which the SGFDP team subsequently conducted in November 2010. The SGFDP team recommends additional training courses for the Hydrocarbon Unit employees as the project continues, particularly to support the operations of the new Project Management Unit. This would include training workshops on hydrocarbon bidding, contract formation and advanced natural gas systems development, including gas processing. The relocation of the SGFDP team to the PMU offices in the Afghan Geological Survey will allow the SGFDP team to conduct these training workshops with minimal expenditure of resources.

V. TRAINING WORKSHOP AT MINISTRY OF ENERGY AND WATER

Introduction and Course Description

The third training workshop was developed for the Ministry of Energy and Water and was focused on the Independent Power Producer (IPP) concepts. The two day training workshop provided information on the structure, challenges, and opportunities of the IPP model. Participants were also given information on the components of a Power Purchase Agreement, including the “take-or-pay” provision and risk mitigation strategies. The participants included members of the Policy and Planning Department of the Ministry of Energy and Water and several individuals from Da Afghanistan Breshna Sherkat. The training workshop consisted of approximately 25 individuals including three women. The training was successful, but highlighted further need for IPP and PPA capacity building within the Ministry to accommodate the anticipated development of the IPP near Sheberghan.

Presentations and Group Discussion Analysis

The first presentation consisted of a broad overview of the IPP model for increasing power generation capacity. The lecture included the fundamental differences between an IPP and traditional generation options, as well as the risks, challenges, and benefits of the model. The presentation also included several case studies on regional experiences with the IPP model, including both economic successes and failures. The group discussion based on the first presentation challenged participants to identify the risks and challenges associated with the IPP model and how those risks and challenges might be mitigated in Afghanistan. The focus of many of the questions was on how the IPP model could be used to enhance power generation capacity in Afghanistan and what lessons could be learned from regional experiences to avoid some of the problems associated with the IPP model.

The second presentation was designed to introduce participants to the Power Purchase Agreement (PPA), which is the fundamental contract signed between the power buyer and the power producer. The lecture focused on the fundamentals, characteristics, and objectives of the PPA for both the power producer and power buyer. Specifically, the presentation addressed the controversial “take-or-pay” provision that requires the power purchaser to pay for a specified amount of power, regardless of whether it is used or not. The presentation also touched on the different risks involved in an IPP, and how the PPA can be specifically designed to fairly allocate those risks. The lecture ended with a brief analysis of how the above topics can be specifically applied to Afghanistan and how the various concepts work within the framework of the Afghan energy system. The group discussion, not surprisingly, was dominated by debates on risk allocation and the “take-or-pay” provision and whether it should be included in a PPA negotiated by Afghanistan. The group discussion also provided valuable insight into the perceived roles of both the Ministry of Energy and Water and Da Afghanistan Breshna Sherkat in planning, negotiating, and constructing additional generation capacity.

Feedback and Observations on Participation

Participation in the lectures and group discussion was very high and SGFDP team members were surprised by the technical abilities of several ministry employees. The representatives

from Da Afghanistan Breshna Sherkat did not show up the first day, and the representatives sent the second day were not individuals with direct involvement in the issues raised during the lectures. The representatives from the Ministry of Energy and Water posed challenging questions and shared valuable experiences with the SGFDP team. Again, the SGFDP team provided a set of discussion questions (translated into Dari) to facilitate the group discussion and provide a basis for questions and debate among participants regarding the materials presented during the day. While participants in the previous two trainings had been divided into groups prior to beginning the training workshops, participants in this program were simply assigned based on where they were sitting in the room for logistical reasons. This did not diminish the quality of the group discussions, even though it did not follow the previous practice of trying to combine participants from different departments and with different job responsibilities. In that respect, participation and questions tended to focus on specific individuals within a group or specific groups rather than a free flowing discussion and sharing of information as had occurred in previous trainings.

Recommendations

The SGFDP recommends that additional training workshops be conducted at the Ministry of Energy and Water, as well as Da Afghanistan Breshna Sherkat, as necessary to ensure the continued involvement in the Independent Power Producer process.

VI. TRAINING WORKSHOP AT AFGHAN GAS ENTERPRISE

Introduction and Course Description

The two final training workshops were held in Sheberghan as part of the SGFDP team's site visit. The SGFDP team prepared two workshops for the Northern Directorate of the Hydrocarbon Unit and Afghan Gas Enterprise based on their respective responsibilities in the gas development process. The training for Afghan Gas Enterprise was focused on gas transmission systems, natural gas development and utilization of natural gas. The Afghan Gas training workshop was attended by 44 employees, including four women.

Presentations and Group Discussion Analysis

The first presentation provided information on gas transmission pipeline design and construction. The participants were provided with a step-by-step analysis of pipeline design and construction, beginning from the route survey to the commissioning. The presentation generated positive response from the participants, who asked several questions related to international best practices regarding construction and safety systems of high pressure, cross country pipelines. The participants also asked questions about cathodic protection and internal inspection requirements of the pipeline.

The second presentation was on natural gas system development, which also received positive response from the participants. The lecture explained the basic geology of northern Afghanistan, particularly as it relates to oil and natural gas development. The presentation also discussed the chronological development of the Sheberghan gas fields, their present status and future prospects. Finally, the lecture discussed specific aspects of several of the wells in the Sheberghan gas fields and potential work programs to restore their functionality. Participants actively participated in both the lecture and the question and answer session.

The last presentation was on natural gas utilization. The lecture began with information on different types of gas treatment, which depends on the composition of the raw gas, and requirements of pipeline quality gas. The PowerPoint presentation addressed the composition and quality of gas, how to conduct the analysis using chromatographs, dehydration through absorption and adsorption, natural gas liquids (NGL) recovery, and "sweetening" (desulfurization). The lecture also discussed the various means of utilizing natural gas including compressed natural gas (CNG), liquefied natural gas (LNG) and liquid petroleum gas (LPG), as well as the prospects of developing these methods with Sheberghan gas. The participants were very interested in the possible uses of the natural gas and were very active in the question and answer session.

Feedback and Observations on Participation

The feedback received from participants was overwhelmingly positive and participation was very active. The participants suggested further training in the design and engineering of a gas sweetening plant, specific information on chromatographic analysis of gas composition and heating value, and gas transmission and distribution system operation. The Afghan Gas participants showed keen interest in the modern gas treatment technology and the standards and operations of a modern, western gas company. They were actively involved in the

discussions on the technical aspects of gas transmission and distribution, including pipeline development, gas chromatography and distribution network development. The Afghan Gas officials requested additional training in marketing, revenue stream development and general business training for employees. In this sense, Afghan Gas had a broader outlook than other stakeholders, as they were asking for business development training as well as specific technical training. This display of “big picture” thinking was one of the most positive aspects of the SGFDP team’s trip to Sheberghan and suggests that Afghan Gas could play a major role in the exploration and exploitation of natural gas in Sheberghan.

Recommendations

The SGFDP team recommends additional training workshops for Afghan Gas Enterprise in all facets of the organization, from gas transmission and distribution to marketing and revenue collection. Specifically, the SGFDP team recommends that a gas chromatograph, gas leak detectors and other equipment be purchased and integrated into the next training program for Afghan Gas Enterprise. The SGFDP team will coordinate the training program for this equipment and will work with the appropriate officials to ensure it is being properly used on site in Sheberghan.

VII. TRAINING WORKSHOP AT THE MINISTRY OF MINES – NORTHERN DIRECTORATE OF THE HYDROCARBON UNIT

Introduction and Course Description

The final training workshop in Sheberghan was conducted at the Northern Directorate of the Hydrocarbon Unit of the Ministry of Mines and focused primarily on drilling and natural gas utilization methods. This training workshop was attended by 28 professionals, including four female participants.

Presentations and Group Discussion Analysis

The first presentation contained information on modern drilling techniques and managing the information and process of drilling a well. Participants were provided with methods for planning a natural gas well, the requirements to properly complete the well and a brief introduction to data interpretation. The lecture also discussed the utilization of a blow out preventer, proper perforation techniques and well testing methods. This introduction to the modern drilling practices was very well received by the participants and generated very high interest in a continuing training program to bring their operations to a higher standard.

The second presentation involved the methods of utilization of natural gas resources, including natural gas liquids (NGL) and liquefied petroleum gas (LPG) recovery. The participants were provided with information on several different methods, apart from fertilizer production and domestic consumption, to utilize natural gas. This presentation was similar to the natural gas utilization presentation given to the students of Kabul University and to the Hydrocarbon Unit at the Ministry of Mines in Kabul. However, the participants were very interested in the lecture material and the questions and observations offered by the participants, again, demonstrated their professional qualifications.

Feedback and Observations on Participation

The geologists, geophysicists and chemists from the Northern Directorate were very active participants in the lecture sessions and the question and answer sessions that followed. The participants were very interested in examples of modern exploration techniques, including seismic interpretation and in modern production practices, such as well log interpretation and well completion. Due to their direct involvement with both the exploration of prospects and drilling of wells, the participants showed great interest in updating their practices to reflect advanced technology in exploration and exploitation of natural gas resources.

The participants were also very interested in natural gas liquids (NGL) recovery from raw natural gas, the process of production of liquefied petroleum gas (LPG), and compressed natural gas (CNG). The presentation of different methods of utilizing natural gas was very useful for participants, particularly given that the use of natural gas in the Sheberghan area is limited to domestic heating. The wide variety of applications of natural gas generated more interest on the part of the Northern Directorate to successfully develop the Sheberghan gas fields.

Recommendations

The SGFDP team recommends further training on seismic interpretation, well log interpretation, well completion techniques, and gas chromatography for the Northern Directorate. These sessions were requested by the participants and found to be necessary by the SGFDP team in order to further support the goals of the gas field development project. As the successful development of the gas fields is a primary goal of the project, it is recommended by the SGFDP team that additional training for the Northern Directorate of the Hydrocarbon Unit and for Afghan Gas Enterprise be given a high priority and workshops based on the recommendations of the participants and the SGFDP team be conducted in Sheberghan as soon as possible.

VIII. OVERALL EVALUATION OF THE CAPACITY BUILDING PROGRAM

The capacity building project was a good opportunity for the SGFDP team to observe the capabilities and professional qualifications of the relevant stakeholders without conducting an intrusive assessment process. The SGFDP team was able to interact with stakeholder constituencies and ministry officials on a personal level, which was extremely helpful for our overall project goals. The capacity building workshops also allowed the SGFDP team to identify and begin to address training needs within the ministries in order to allow them to provide proper support to the project. The enthusiastic response from all participants and their requests for additional training and capacity building workshops suggests that the approach taken by the SGFDP team in implementing the capacity building program was successful.

The basic model of a lecture followed by a guided group discussion and written questions seemed to be very effective as a teaching model and elicited much greater participation by the trainees than was expected by the SGFDP team. The group discussion in particular allowed participants to share their own experiences and knowledge with members of their group and allowed the lecture material to be reinforced and expanded by the participants. The translation of the presentations into Dari was found to be an essential process, as many of the participants had only limited command of English. The discussion questions and written questions were also translated into Dari, which facilitated greater participation and understanding by the trainees. The simultaneous translation of the lectures and the utilization of SGFDP's Afghan team members to assist in the group discussions ensured a smooth flow of information.

The training workshops were received with great enthusiasm and active participation by all trainees, particularly those among the younger generation of Afghans. However, the SGFDP team was able to identify additional training needs to allow these stakeholder groups to better support both the SGFDP objectives and to provide greater capabilities to execute their respective responsibilities. The SGFDP team observed a varying level of English abilities among the groups. While English is not an official language of Afghanistan, a wealth of information on modern drilling and oil and gas practices is available in English. Further, English language proficiency is extremely useful when combined with information technology resources. The SGFDP team also found basic computer skills and access to information through the internet to be lacking in many of the key constituencies. These two areas, while outside the immediate scope of the SGFDP, are considered by team members to be the most pressing of all future training and capacity building needs.

Most of the professionals in the Ministry of Mines have not been exposed to modern oil and gas systems or advanced technology. While this lack of exposure is due to circumstances beyond the control of these individuals, it represents a significant capacity building need that should be addressed in conjunction with the development of the gas fields and the power plant. The SGFDP team also observed that the professionals of Afghan Gas and the Northern Directorate of the Hydrocarbon Unit have tremendous enthusiasm and commitment, but they lack in some skills due to the absence of appropriate and localized capacity building efforts.

The SGFDP team's objective for the capacity building program was to increase the capabilities of the appropriate stakeholders to provide support for the gas field development and the gas-fired power plant. In addition to facilitating greater understanding of key stakeholders of the project, the training workshops were able to serve the dual role of addressing capacity building needs within the stakeholder groups and providing a realistic

assessment of their capabilities to support the SGFDP mission. The enthusiastic reception and level of effort demonstrated by the participants supported the conclusion by the SGFDP team of the successful execution of the capacity building program.

IX. FUTURE RECOMMENDATIONS

The SGFDP found that two of the principal needs of the constituent groups are training in English and information technology resources, including computer skills. While the SGFDP team was successful in providing a basic introduction to various concepts associated with natural resource development, training programs in English and in utilization of computer technology would allow participants to find information on the natural resource concepts independently and enhance the value of future training programs. The integration of computer technology and the appropriate training for the relevant ministry professionals would provide a significant benefit in terms of data gathering, communications, and independent learning opportunities. If information technology resources can be expanded, professionals will have access to a wide range of information on the internet. A training program addressing these needs are outside the scope of the SGFDP, but a successful capacity building effort in these areas will have a significant effect on the project's overall success.

Another major recommendation, based on the experience of the SGFDP team at Kabul University is the integration of institutions of higher learning with the government ministries and businesses that will be supporting natural resource development projects in the future. The SGFDP's recommendation in this area is two-fold. First, the SGFDP team recommends that capacity building programs with Kabul University and Kabul Polytechnic University be continued and expanded through the new Project Management Unit. Efforts should also be made to establish linkages between the ministries and institutions of higher education in order to better coordinate training and professional development opportunities for both ministry employees and students. Second, the SGFDP team recommends that capacity building be integrated into the Project Management Unit structure through internship opportunities for students and periodic training programs held by Project Management Unit consultants at institutions of higher learning, particularly Kabul University and Kabul Polytechnic University.

The SGFDP team further recommends that capacity building efforts be integrated into the new Project Management Unit in as many ways as possible. This includes requiring consultants working with the Project Management Unit to host training sessions with ministry employees on their areas of expertise, such as natural gas field development, legal and regulatory requirements, and other aspects of natural gas systems. In addition, the SGFDP team recommends that foreign consultants take on an Afghan counterpart to provide one-on-one capacity building. This recommendation is consistent with the USAID and Ministry of Mines philosophy that Afghans be trained to take over the responsibility of the Project Management Unit as soon as practicable. The capacity building aspect is critical to the continued success of the Project Management Unit, and the Sheberghan Gas Field Development Project as a whole.

Finally, the SGFDP team recommends that the initial round of training conducted as part of this deliverable be followed up with a more detailed and advanced program on the basic concepts that have been introduced. The expanded role with Kabul University and the Ministry of Mines has been addressed above, but efforts should be made to include the Northern Directorate of the Hydrocarbon Unit and Afghan Gas Enterprise in the expanded training programs. Any training effort with the Northern Directorate or Afghan Gas Enterprise necessarily involves additional travel to Sheberghan.

APPENDIX A: KABUL UNIVERSITY TRAINING PROGRAM

An Introduction to the Oil and Gas Industry

<i>Course Title:</i>	<i>An Introduction to the Oil and Gas Industry</i>
<i>Course Target Audience:</i>	<i>Distinguished Professors and Invited Guests of Kabul University and Kabul Polytechnic University</i>
<i>Prerequisites:</i>	<i>English (strongly advised)</i>
<i>Venue:</i>	<i>Kabul University</i>
<i>Duration:</i>	<i>September 19th – September 21st 12:30 p.m. to 3:30 p.m. (lunch provided)</i>
<i>Topics Covered:</i>	<i>The History of Gas and Oil Development in Afghanistan, Natural Gas Development, Systems and Processing, Production Sharing Agreement</i>

Day One

12:30 p.m. – 1:30 p.m. Lunch

1:30 p.m. – 2:30 p.m. Lecture: The History of Gas & Oil Development in Afghanistan

Lecture Contents

- * The History of the Development of Oil and Gas in Afghanistan*
- * Recent Events in the Development of Oil and Gas in Afghanistan*
- * Technical and Logistical Aspects of the Existing Oil and Gas Infrastructure*
- * Future Plans and Technical Requirements for Developing Oil and Gas in Afghanistan*

2:30 p.m. – 2:45 p.m. Break

2:45 p.m. – 3:30 p.m. Case Study and Group Discussion on Lecture Materials

Day Two

12:30 p.m. – 1:30 p.m. Lunch

1:30 p.m. – 2:30 p.m. Lecture: Natural Gas Systems Development

Lecture Contents

- * The Different Types of Wells Used in Natural Gas Extraction*
- * The Composition of Raw Natural Gas*
- * The Various Processes for Natural Gas Treatment*
- * Recommendations for Afghanistan*

2:30 p.m. – 2:45 p.m. Break

2:45 p.m. – 3:30 p.m. Case Study and Group Discussion on Lecture Materials

Day Three

12:30 p.m. – 1:30 p.m.

Lunch

1:30 p.m. – 2:30 p.m.

Lecture: Production Sharing Agreement (PSA)

Lecture Contents

- * The Fundamentals of a Production Sharing Agreement
- * The Characteristics of a Production Sharing Agreement
- * The Objectives of a Production Sharing Agreement
- * How a Production Sharing Agreement Can Benefit Afghanistan

2:30 p.m. – 2:45 p.m.

Break

2:45 p.m. – 3:30 p.m.

Case Study and Group Discussion on Lecture Materials

APPENDIX B: MINISTRY OF MINES HYDROCARBON UNIT TRAINING PROGRAM

An Introduction to the Oil and Gas Industry

<i>Course Title:</i>	<i>An Introduction to the Oil and Gas Industry</i>
<i>Course Target Audience:</i>	<i>Distinguished Employees, Invited Guests of the Ministry of Mines Hydrocarbon Unit, and Professionals from the Northern Directorate of the Hydrocarbon Unit</i>
<i>Prerequisites:</i>	<i>English (strongly advised)</i>
<i>Venue:</i>	<i>Afghan Ministry of Mines – Geological Survey Department</i>
<i>Duration:</i>	<i>September 27th – September 29th 9:00 a.m. to 3:00 p.m. (lunch provided)</i>
<i>Topics Covered:</i>	<i>The History of Gas and Oil Development in Afghanistan, Natural Gas Development, Systems and Processing, Production Sharing Agreements</i>

Day One

9:00 a.m. – 10:30 a.m. Lecture: Gas and Oil Development in Afghanistan

Lecture Contents

- * The History of the Development of Oil and Gas in Afghanistan*
- * Recent Events in the Development of Oil and Gas in Afghanistan*
- * Technical and Logistical Aspects of the Existing Oil and Gas Infrastructure*
- * Utilization of Natural Gas Resources in Afghanistan*
- * Future Plans and Technical Requirements for Developing Oil and Gas in Afghanistan*

10:30 a.m. – 11:00 a.m. Break

11:00 a.m. – 12:00 p.m. Continue Lecture: Gas and Oil Development in Afghanistan

12:00 p.m. – 1:00 p.m. Lunch

1:00 p.m. – 2:00 p.m. Begin Case Study and Group Discussion on Lecture Materials

2:00 p.m. – 2:15 p.m. Break

2:15 p.m. – 3:00 p.m. Complete Case Study and Group Discussion on Lecture Materials/Summary and Recommendations

Day Two

9:00 a.m. – 10:30 a.m. Lecture: Natural Gas Systems Development

Lecture Contents

- * The Different Types of Wells Used in Natural Gas Extraction*
- * The Composition of Raw Natural Gas*

- * The Various Processes for Natural Gas Treatment
- * Recommendations for Afghanistan

<i>10:30 a.m. – 11:00 a.m.</i>	<i>Break</i>
<i>11:00 a.m. – 12:00 p.m.</i>	<i>Continue Lecture: Natural Gas Systems Development</i>
<i>12:00 p.m. – 1:00 p.m.</i>	<i>Lunch</i>
<i>1:00 p.m. – 2:00 p.m.</i>	<i>Begin Case Study and Group Discussion on Lecture Materials</i>
<i>2:00 p.m. – 2:15 p.m.</i>	<i>Break</i>
<i>2:15 p.m. – 3:00 p.m.</i>	<i>Complete Case Study and Group Discussion on Lecture Materials/Summary and Recommendations</i>

Day Three

<i>9:00 a.m. – 10:30 a.m.</i>	<i>Lecture: Production Sharing Agreements and Natural Resource Contracting</i>
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Lecture Contents

- * The Fundamentals of a Production Sharing Agreement and Natural Resource Contracting
- * The Characteristics of a Production Sharing Agreement and other Natural Resource Contracts
- * The Objectives of a Production Sharing Agreement and other Natural Resource Contracts
- * Risks, Rewards, and Negotiation Strategies for Natural Resource Contracts
- * How a Production Sharing Agreement Can Benefit Afghanistan

<i>10:30 a.m. – 11:00 a.m.</i>	<i>Break</i>
<i>11:00 a.m. – 12:00 p.m.</i>	<i>Continue Lecture: Production Sharing Agreements and Natural Resource Contracting</i>
<i>12:00 p.m. – 1:00 p.m.</i>	<i>Lunch</i>
<i>1:00 p.m. – 2:00 p.m.</i>	<i>Begin Case Study and Group Discussion on Lecture Materials</i>
<i>2:00 p.m. – 2:15 p.m.</i>	<i>Break</i>
<i>2:15 p.m. – 3:00 p.m.</i>	<i>Complete Case Study and Group Discussion on Lecture Materials/Summary and Recommendations</i>

APPENDIX C: MINISTRY OF ENERGY AND WATER TRAINING PROGRAM

Independent Power Projects and Power Purchase Agreements

<i>Course Title:</i>	<i>Independent Power Projects and Power Purchase Agreements</i>
<i>Course Target Audience:</i>	<i>Distinguished Employees and Invited Guests of the Afghan Ministry of Energy and Water</i>
<i>Prerequisites:</i>	<i>English (strongly advised)</i>
<i>Venue:</i>	<i>Ministry of Energy and Water</i>
<i>Duration:</i>	<i>October 3rd – October 4th 12:00 p.m. to 4:00 p.m. (lunch provided)</i>
<i>Topics Covered:</i>	<i>Independent Power Projects, Economic Impacts of Independent Power Projects, Power Purchase Agreement Fundamentals and Analysis</i>

Day One

<i>12:00 p.m. – 1:00 p.m.</i>	<i>Lunch</i>
<i>1:00 p.m. – 2:00 p.m.</i>	<i>Lecture: Independent Power Projects & Economic Impacts</i>

Lecture Contents

- * The Fundamentals of an Independent Power Project
- * The Risks and Challenges of Independent Power Projects
- * The Economic Impacts of Independent Power Projects (Based on Case Studies from Regional Experiences)
- * The Benefits of the Independent Power Project Model for Afghanistan

<i>2:00 p.m. – 2:30 p.m.</i>	<i>Break</i>
<i>2:30 p.m. – 4:00 p.m.</i>	<i>Case Study and Group Discussion on Lecture Materials</i>

Day Two

<i>12:00 p.m. – 1:00 p.m.</i>	<i>Lunch</i>
<i>1:00 p.m. – 2:00 p.m.</i>	<i>Lecture: Power Purchase Agreements (PPAs)</i>

Lecture Contents

- * The Fundamentals of a Power Purchase Agreement
- * The Characteristics of a Power Purchase Agreement
- * The Objectives of a Power Purchase Agreement
- * How to Structure a Power Purchase Agreement to Benefit Afghanistan

<i>2:00 p.m. – 2:30 p.m.</i>	<i>Break</i>
<i>2:30 p.m. – 4:00 p.m.</i>	<i>Case Study and Group Discussion on Lecture Materials</i>

APPENDIX D: AFGHAN GAS TRAINING PROGRAM

Natural Gas Systems Development

<i>Course Title:</i>	<i>An Introduction to the Oil and Gas Industry</i>
<i>Course Target Audience:</i>	<i>Distinguished Employees and Invited Guests of Afghan Gas Enterprise</i>
<i>Prerequisites:</i>	<i>English (strongly advised)</i>
<i>Venue:</i>	<i>Afghan Gas Enterprise – Sheberghan, Afghanistan</i>
<i>Duration:</i>	<i>November 29th, 9:00a. – 12:30p.</i>
<i>Topics Covered:</i>	<i>Natural Gas Development, Systems and Processing, Natural Gas Utilization</i>

9:00 a.m. – 12:30 p.m. Lecture & Question and Answer Session

Lecture Contents

- * Natural Gas Resource Development
- * Natural Gas Processing Methods
- * Natural Gas Transmission Systems
- * Utilization of Natural Gas Resources

APPENDIX E: MINISTRY OF MINES – NORTHERN DIRECTORATE OF THE HYDROCARBON UNIT

Introduction to Modern Drilling and Natural Gas Utilization

<i>Course Title:</i>	<i>Introduction to Modern Drilling and Natural Gas Utilization</i>
<i>Course Target Audience:</i>	<i>Distinguished Employees and Invited Guests of the Northern Directorate of the Ministry of Mines Hydrocarbon Unit</i>
<i>Prerequisites:</i>	<i>English (strongly advised)</i>
<i>Venue:</i>	<i>Northern Directorate of the Hydrocarbon Unit, Sheberghan, Afghanistan</i>
<i>Duration:</i>	<i>November 30th, 9:00a. – 12:00p.</i>
<i>Topics Covered:</i>	<i>Modern Drilling Best Practices, Utilization of Natural Gas Resources, Seismic Survey Methods</i>

9:00 a.m. – 12:00 p.m. Lecture & Question and Answer Session

Lecture Contents

- * Modern Drilling Best Practices (including well planning, monitoring program, health, safety & environmental issues and troubleshooting)
- * Natural Gas Resource Utilization
- * Seismic Survey Methods and Interpretation