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Iraq Oil Ministry Needs Assessment Workshop

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Meeting Report
Iraq Oil Ministry Needs Assessment Workshop
3-5 September 2006

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Abstract

Representatives from the U.S. Department of Energy, the National Nuclear Security Administration, and Sandia National Laboratories met with mid-level representatives from Iraq's oil and gas companies and with former employees and senior managers of Iraq's Ministry of Oil September 3 - 5 in Amman, Jordan. The goals of the workshop were to assess the needs of the Iraqi Oil Ministry and industry, to provide information about capabilities at DOE and the national laboratories relevant to Iraq, and to develop ideas for potential projects.

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Meeting Report

Iraq Oil Ministry Needs Assessment Workshop

3-5 September 2006¹

Summary

Representatives from the U.S. Department of Energy (DOE), the National Nuclear Security Administration, and Sandia National Laboratories (Sandia) met with mid-level representatives from Iraq's oil and gas companies and with former employees and senior managers of Iraq's Ministry of Oil September 3 - 5 in Amman, Jordan.² The goals of the workshop were to assess the needs of the Iraqi Oil Ministry and industry, to provide information about capabilities at DOE and the national laboratories relevant to Iraq, and to develop ideas for potential projects. All participants agreed reconstruction of the oil sector, defined as bringing facilities back to their *design* capacity, should proceed much more rapidly.

On the first day, participants discussed the difficulties facing the North, Central, and South oil companies and the Ministry of Oil. Identified needs were in the following areas: security; staff; facilities and infrastructure; environment; research and development; and special needs for the Ministry of Oil. Although some needs were common to all companies, there was significant variation from the North to South in some categories.

On the second day, Daura refinery representatives gave an in-depth presentation on the refinery, including an historical overview and detailed plans for upgrading facilities and capabilities. Following this, DOE and Sandia made presentations on their selected capabilities relevant to Iraq's oil sector, including security systems design, evaluation, and implementation; assistance in developing hydrocarbon laws, and assistance in strategic planning for the energy sector. Potential projects to address these needs were discussed throughout.

On the third day, former Ministry of Oil senior management and employees participated in a panel discussion focusing on the future outlook and strategy on Iraq's oil sector. A proposal for guidelines for a national oil policy was also presented, and is included as Appendix B. The group also prioritized projects identified on Day 2.

¹ Please direct questions or comments concerning this document to Adriane Littlefield, Sandia National Laboratories, aclittl@sandia.gov

² See Appendix A for a list of participants.

Difficulties and Needs

Security

All companies identified sabotage – of tanker trucks transporting refinery products and disruptions in electricity supply – as significant obstruction to all companies. The sabotage of tanker trucks prevents shipments to the market, causing a surplus of product at the refineries. To complicate the situation, there is little-to-no storage capacity for this surplus. Disruptions to electricity supply also limit production, as well as damaging equipment.

North and South companies similarly identified the following problems:

- Sabotage of strategic pipelines delivering crude oil to the refineries,
- Sabotage of pipes connecting refineries to storage areas,
- Attacks on storage areas, and
- Intimidation of staff, lowering morale and affecting job performance.

Interestingly, attacks on the refineries themselves were not identified as a major issue. But, follow-up comments to the draft report stressed that insurgents have attacked the Daura refinery 21 times in the last two years. The resulting damage has varied.

Staff

For the North and Central companies, a shortage of qualified staff is a major problem. In the South, a surplus of staff exists due to the migration of workers moving over safety concerns. This surplus, in turn, creates its own set of issues. The reasons for staff shortages vary from facility to facility, but emigration (which started in the early 90s) and migration of experienced staff from the North to the South contribute significantly to the skills deficit in the North and Central areas. Security of the staff remains a large concern. The staff at the Daura refinery, in the Central region, has ongoing fears over their own safety, keeping many from going to work; in the North, ethnic tensions intimidate some staff from coming to work.

For those who remain, they experience a deficiency in critical skills, which prevents them from operating facilities at design capacity. Among the most significant issues are:

- Lack of facility and refinery management skills (e.g., planning for upgrades and improvements to increase product quality; energy forecasting for domestic and international markets; and decision-making),
- Lack of technical skills for operating up-to-date facilities and refineries results in inefficiencies and damaged equipment (needed skills include risk analysis and facility optimization),
- Lack of facility maintenance skills (including knowledge about how to manufacture critical components or to maintain complex rotating machinery). In many cases, maintenance documents have been lost, or have not been translated into Arabic.

Representatives from the Daura facility note that the efforts of the Iraqi-American training committee have not been sufficient to address the current training needs because the classes have been too compressed to support learning and the courses have been entirely

theoretical. The preferred training method would include hands-on learning at refineries (e.g.) with sufficient learning time to transfer knowledge.

Facilities and Infrastructure

The participants generally agreed that increasing production, improving product quality, and reducing the production of heavy products, such as fuel oil, are key to the future success of the oil sector. Impediments to achieving these goals include:

- Lack of spare parts for maintaining facilities (in many cases critical components are no longer manufactured or require special manufacturing. In some cases, stores have been depleted through years of sanctions.),
- Lack of instrumentation for monitoring equipment and product quality,
- Inefficient processes for ordering and purchasing critical components such as compressors,
- Infrequent routine maintenance (lack of excess production capacity causes reluctance to shut down facilities for non-emergency maintenance),
- Poorly maintained national electricity grid (frequent outages damage equipment and impede production).

All companies voiced the need for constructing new storage capacity and acquiring additional fire-fighting equipment. In addition, all have the goal of developing distributed power production to provide stable electricity supplies.

The participants recognize that meeting future production targets requires upgrading the capacity of existing refineries, and constructing new facilities, but also noted there is no national policy to guide decisions, or how to prioritize efforts. Therefore, upgrades and construction should be given a lower priority now.

Environment

Notably, the participants seriously stressed environmental degradation and pollution. It is understood that this has adversely impacted public health. Despite this general assessment, there is very little specific information on how the oil sector creates environmental problems – and no information on possible solutions. Some argued the environment should take second place to the goal for increasing production in the current situation. Others, pointed out that adherence to internationally acceptable environmental standards could help attract foreign direct investment and to market product internationally. Examples of environmental problems include:

- Air pollution near refineries,
- Leakages due to corrosion of pipes, pumps and tanks,
- Inadequate industrial waste water monitoring and treatment,
- Lack of modern incinerators for destroying waste and sludge.

In addition, there currently are no regulations for solid and gaseous waste – despite existing environmental regulations for liquid waste.

Ministry of Oil

The Ministry of Oil currently devotes much of its time to the day-to-day management, and has not devoted sufficient time to developing an overall policy to guide prioritization of projects in an effort to develop the oil sector in the future; nor has a philosophy for indigenous R&D been developed. In addition, the Ministry and its project arm, SCOP, lack the skills to execute projects the country needs. For example, skills to issue a proper engineering tender document are lacking. This means that companies bid on jobs based on inadequate requirements data, and bids differ greatly in scope and price. Without clear design requirements, objective evaluation of bids based on price is impossible. This leads to delays and contributes to corruption.

Selected Project Ideas to Meet Needs

This section presents a summary of projects that were identified as high priority and which DOE, NNSA, or the national laboratories would be able to implement in the near term, if provided with sufficient resources. A full listing of potential projects, and the priorities assigned by different breakout groups is included as Appendix C.

Security

Security System Design, Evaluation, and Implementation. A project to design, evaluate and implement a security system for a specific facility, the pipeline infrastructure, and/or transportation tankers could be undertaken as a partnership between Sandia National Laboratories and Iraqi personnel. From the Iraqi side, participation from the Oil Police, the Electricity Police, facility operators, and internal security personnel would be critical, as would a Quick Reaction Force. Training in the process of threat identification and design of cost-effective systems to address specific threats would be of particular importance. Sandia routinely provides international training on all aspects of security system design and evaluation and also has extensive international experience in design, evaluation, and implementation of security upgrades.

Staff Development

Training on a wide range of topics ranging from facility operations to management to risk analysis was strongly recommended. Participants recommended a focus on “training the trainer” to maximize benefit. There are training institutes in Iraq that could be revitalized. Curriculum development and translation of key texts, such as texts on risk analysis, was strongly recommended. Extended training and job shadowing would be particularly helpful at the current stage; both were frequently mentioned by the delegates as a key component to future success. Aside from training on security system design and evaluation, as discussed above, the DOE could also provide training on strategic planning and on energy data forecasting and analysis.

Training on Strategic Planning. Training on strategic planning for senior staff at the Ministry of Oil would assist them in developing long-term plans for the oil sector. The DOE believes this can be accomplished relatively easily.

Training on Energy Data Forecasting and Analysis. DOE is prepared to invite 10-12 selected Iraqi oil company and ministry representatives to the DOE for a one week overview of Energy Information Administration (EIA) and other DOE statistical operations. The training could include: a review of the organizational structure, budget, mission of relevant DOE program offices; program-by-program presentations of statistical survey operations with opportunities to sit with individual analysts and learn the activities and issues; overview of short-term forecasting models, operations; overview of mid-term forecasting models, operations; overview of Information Technology operations; overview of energy information dissemination through web releases and other programs; and review of EIA and other DOE statistical methods.

Facilities and Infrastructure

Facility Optimization for the Daura Refinery. Process efficiency improvements through infrastructure investments and facility optimization are needed to increase output to meet production targets. DOE's Office of Energy Efficiency and Renewable Energy could help implement facility optimization strategies and measures for the Daura refinery. Optimization Teams would coordinate with Iraqi partners to conduct a Plant Wide Assessment, and evaluate and make recommendations for improved operation.

Distributed Power System with Capability to Export/Import Power to the National Grid. Experts from the DOE national laboratories will work with Iraqi partners to design and implement a distributed power system to provide stable, secure energy to refineries, that can import or export power to the national grid if desired.

Risk assessment for Petroleum Facilities. DOE and national laboratory experts will partner with Iraqi facility personnel to perform a comprehensive risk assessment of a specific facility. Depending on specific interests, multiple perspectives could be included, ranging from the risk of cascading failures to risk of facility operations to public health. The team will recommend measures for reducing risk and also note implications for future planning. As stated under *Staff Development* above, DOE and national laboratory experts will also look into the possibility of translating key texts into Arabic.

Environmental

Environmental Impact Studies for the Oil Sector. DOE and national laboratory experts can partner to plan and implement an environmental impact study for the oil sector in Iraq. The study should assess solid, liquid, and gaseous pollution for all aspects of the oil sector, identify potential solutions, and establish a timetable for implementation of solutions and make recommendations for environmental legislation. Based on such a study, the group recommends that the MoO establish regulations for the treatment of solid and gaseous waste and update regulations for gaseous waste.³

³ A representative of the Ministry of Oil indicates that numerous studies were planned, but have not been conducted due to the security situation, and the reluctance on the part of contractors to do on-site studies at this time.

Ministry of Oil

Absent an overall policy for the future of the oil sector in Iraq, it is not possible to prioritize projects for increasing capacity at existing facilities or for developing new capabilities. Because of the importance of increasing Iraqi production in the next 5 years, the group strongly recommended the development of an oil policy by the Ministry of Oil that could lead to the development of a strategic plan. To assist in this process, the DOE is prepared to provide training on strategic planning to key MoO personnel.

Conclusions and Next Steps

The “Needs Assessment Workshop” provided valuable insight from representatives of the major oil companies in Iraq and from former ministry officials about the critical needs of the oil sector in Iraq. There is significant potential for cooperation between the DOE and its national laboratories and the oil sector in Iraq to address those needs. We have highlighted here several high-priority projects that could be undertaken in the near term, provided sufficient resources were available.

As a next step, the U.S. and Iraqi participants will forward these ideas to senior leaders in the DOE and MoO, respectively, and work to obtain resources for implementation.

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Appendix A: Attendees

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Appendix B: Guidelines on Petroleum Policy

Authored by Jafar Dhia Jafar

Guidelines on Petroleum Policy

Introduction

In addition to the highest priority of establishing peace and security, our beloved Iraq is in need of urgent action on many economic fronts. Among the top priorities will be the acceleration of progress in the petroleum sector, in order to rapidly boost oil production and revenues. In this regard the Iraqi Government cannot be satisfied with slow progress in small increments, but must take bold steps to enable a quantum leap in Iraq's economic fortunes. Iraq, with its enormous potential and resources, can and must be at the forefront of developing nations, and that development must be sustained for the foreseeable future.

It is useful to establish an Oil Policy Council. This paper proposes guidelines to initiate the work of such a Council in earnest. This 'Council' should deliberate to develop a coherent policy recommendation in the shortest time possible. This policy should be presented to the Council of Ministers for approval.

Cornerstone Principles of Petroleum Policy

- The days of a centrally-planned and State-dominated Iraqi economy are over. The Government's role should be to create policy, regulate and oversee the national economy – not to engage in the day-to-day running of commercial enterprises.
- The Iraqi National Oil Company (INOC) should be quickly re-established as an independent public-sector corporation to rehabilitate, enhance, operate and professionally manage Iraq's current producing oil and gas fields and refineries.
- Exploration and development of undeveloped fields and new refineries should be undertaken through mainly private sector investment, in order to address Iraq's public sector constraints in financial, technical, and management resources. Joint public-private sector endeavours should be avoided, except where deemed necessary as a transition in the orderly privatization of public sector companies.

Specific Guidelines for Petroleum Policy

With the above principles in mind, the quantum leap that Iraq must take to rapidly and optimally develop its petroleum industry, and be at the forefront of international competition, is through professional private sector involvement to boost and complement (as well as healthily compete with) INOC's efforts, and augment the enormous need that Iraq's oil and gas

industry has for financial capital resources, as well as technical know-how and managerial capacity.

Iraq's Petroleum Policy should therefore be structured along the following lines:-

1. **With regard to the Upstream Oil & Gas Sector:**

- Iraq should have an initial target production capacity of 6-8 million barrels per day within 5 - 7 years. This is ambitious but should be possible.
- INOC is to be re-established rapidly, as a State-owned professional corporation immune from political interference and direct Ministry management control (other than regulation and oversight, as with other commercial petroleum upstream ventures – see below). Eventually, in years to come, INOC may be partially privatized through wide distribution of ownership among Iraqis through transparent public subscription.
- For the existing producing oilfields, the re-established INOC should be in charge, and held responsible and accountable for bringing production from these fields up to 3.5 million barrels per day as soon as possible, but no later than two years from now. Longer-term, INOC must further enhance production within specific time-line targets. Initially, in order to accomplish this task without delay, INOC may be supported by emergency funding from the State, but as soon as practicable thereafter (within a specified timeframe) INOC should seek self-sufficiency in financing capital funding requirements, either (in a limited manner) through commercial borrowing against future incremental production (i.e. without encumbering the country's existing production), but preferably through partner funding in JV's and/or through short-term risk service contracts. The State should not guarantee any INOC borrowing (and use up the State's financial credit). Operationally, INOC should be allowed to earn a maximum of US\$1.5 for each barrel of oil that it produces in order to fund its operations.
- For new development of undeveloped oil and gas fields, and for exploration, all of which must start as soon as possible and in tandem with INOC's efforts, these should be accomplished through private-sector investment via competent international (both major as well as independent) oil and gas companies, with a variety of international diversification, and under appropriate long-term risk/reward contracts that do not encumber State credit nor mortgage Iraq's sovereign oil and gas reserves. International oil company partnerships with Iraqi private enterprise should be encouraged and professionally developed; however, these new ventures should specifically not be allowed to partner with any State-owned enterprises, including INOC, in order to ensure

State impartiality, and avoid the pitfalls of State interference in corporate enterprise management.

- As to the type of exploration and production contract that should be adopted for the foregoing private enterprise effort, the obvious answer is simple. Our able technocrats at the Oil Ministry have already spent over 12 years discussing and developing a long-term production sharing model contract (which, incidentally, is not precluded by existing Iraqi law). This is essentially a long-term (about 25 years) BoT structure that is the most internationally-recognized type of contract for our purposes. Iraq should provide the necessary long-term incentive to private sector investment, in order to optimize the production and reserve-management of our valuable petroleum resources - not only to benefit this generation, but for future generations of Iraqis as well. Short-term contracts in this business have largely proved to be a failure, as they do not provide the investor with the necessary continuing and long-term interest in resource value management and preservation. A good example of such a failed contractual system is the Iranian "Buy-Back" model which was a compromise invention designed to specifically circumvent Iran's constitution. Short-term contracts such as "Buy-Back" within a few years put the onus back on the State to manage the assets, which defeats our optimization objective.

Should we spend months and years trying to exact the last penny in negotiating the commercial terms? The answer is that there is no need to waste time. Time is of the essence. Besides - and this is very important - our contracts simply need to have a "Better Terms" (sometimes known as "Favoured Nations") clause, according to which the State has the right to negotiate and apply in a fair manner any better commercial terms that subsequent contracts may provide. With this dynamic approach in mind, we can get started without wasting endless months and years second-guessing as to what the best terms are.

Last but not least, there will undoubtedly be those who, possibly out of national pride, but more probably because of an outdated mind-set, will argue that the Iraqi public sector on its own can solely implement the objective within the requisite time-frame. It would be a mistake to delude ourselves with such irrational claims of heroism. Of course Iraqis are more than capable; but it would be wholly unrealistic to expect the public sector, under our present difficulties, and with our existing financial, technical and human resources so badly depleted, to carry out on our own, the enormous task ahead with the required degree of efficiency. Iraq would lose years, and Iraqis would forego billions in urgently needed funds for their early prosperity. Iraq must shrug off the outdated mind-set of centrally-planned and managed economies.

- The above principles should also apply to natural gas development and production, which need to be assigned appropriate priority, along with definition of strategic options for future gas export. As with oil, INOC will be vested with responsibility for enhancing gas production from existing producing fields, whereas new natural gas exploration and development will be accomplished through private sector/foreign investment.
- Because of the advent and importance of natural gas, it is probably time to update the name of our *Ministry of Oil* to the *Ministry of Oil & Gas* or *Ministry of Petroleum*, which is an expression that applies to both oil as well as gas.

2. **With regard to the Refining Sector:**

- Highest priority needs to be assigned to the rehabilitation of existing refineries through INOC in order to meet/ensure self-sufficiency for internal demand for petroleum products, and quickly eliminate the unnecessary bleeding of Iraqi foreign exchange expenditure on petroleum product imports. State funding/financing support will need to be provided for this priority effort, at least initially. Consideration should be given to establishing a national refining corporation, but this should not stymie or delay the urgent need for rehabilitation of this vital sector.
- Major refinery expansion and new grass-roots refineries should be undertaken whenever possible through private sector/foreign investment on a BOT basis.

3. **With regard to domestic wholesale and retail marketing of petroleum products:**

This should be gradually and methodically turned over to private enterprise, whenever economic circumstances permit, with as much Iraqi private sector involvement as possible. JV's of the Iraqi private sector with foreign companies should be encouraged and given priority, in order to attract the necessary capital, technology, and professional management know-how.

As for domestic product pricing, a program should be developed to gradually bring up the prices of petroleum products, including at the retail level, to international (or at least regional) market prices. This is in order to stop the current hemorrhaging of Iraqi State funds due to smuggling of petroleum products. In the meantime, of course, and until the general economic situation improves, the ordinary Iraqi must not be allowed to suffer, and therefore a parallel phased period of differential subsidy (e.g. through coupons) must be introduced.

4. **With regard to Crude Oil Export Marketing:**

This should remain with SOMO (State Organization for Marketing Oil) under the oversight of the Minister of Oil as delegated by the Prime Minister. Management should be independent, highly professional, and free from internal political interference. The same would apply to the export of Iraqi petroleum products. The export marketing of crude oil and petroleum products that are produced from private sector ventures need to be overseen by and/or coordinated with SOMO, in order to ensure Iraq's resource value preservation.

5. **With regard to the Petroleum Services Industry (e.g. drilling, well logging, cementing, etc.):**

These should be exclusively private sector based. Majority Iraqi-owned companies (in joint venture with foreign companies) should be given a 5 to 10% competitive price advantage over their competitors, up to 2011, and thereafter treated preferentially but competitively. Existing public sector-owned service companies should be privatized as soon as practicable, under a carefully planned and orderly program.

6. **In all of the above, two important factors need to be stressed as a matter of policy:**

- Maintaining employment of Iraqis, without however impairing efficiency. Training or retraining the Iraqi oil and gas workforce must be a condition encumbant on all enterprises and ventures operating in Iraq's petroleum industry.
- Priority must be given to real, effective participation of the Iraqi private sector, which needs to be nurtured and encouraged to develop professionally.

7. **The role of the Ministry of Petroleum should be efficient policy implementation, regulation, and oversight. Definitely not management of companies. The days of centrally-planned economies are history and riddled with failure. The Government needs to focus on governing, not on managing commercial enterprises.**

All matters and issues related to our new Petroleum Policy need to be identified and addressed as an adjunct to policy acceptance and implementation. These will include issues such as educating the public and political leaders, addressing Iraq's OPEC quota, defining congruent policies related to the petrochemical sector, and so on.

APPENDIX

Impediments and Perceived Obstacles

Clearly, we have a few real impediments, but there are also often-repeated nagging virtual (perceived) obstacles that we must clearly identify and brush aside at the outset, lest they hamper our progress. We have to recognise these obstacles, and develop a petroleum policy that, overtly and realistically, tackles the issues that confront us, and we need to do so boldly, with determination, and without hesitation. Governments often prevaricate. However, this Government, has been elected for four years and it should not hesitate and get bogged down in time-wasting bureaucracy. We need to act deliberately and with determination. Inevitably we will make mistakes, but these will not be many, and in any case they will indicate progress. Being overly cautious often results in no action. As noted earlier, we cannot afford procrastination and delay. We must be bold and move forward, because hesitation and procrastination is akin to failure.

As everyone knows, the *real impediments* that Iraq currently faces and these are three:

- Scarcity of immediate financial resources as we emerge from sanctions, war and insecurity.
- Scarcity of indigenous public sector technical resources; and
- Scarcity of indigenous public sector managerial resources.

On the other hand, there are many *perceived obstacles* that hecklers will face us with, but these are virtual obstacles that need to be recognized, tackled head-on, and dismissed, right from the outset. Why? Because we simply cannot afford to allow virtual obstacles to hinder our determined march forward. Examples of such virtual obstacles (outlined in *italics*, with comment in normal script) are the following:

- *The Government should not bind Iraq in long-term policy actions or commitments.*

This is nonsense. The current Government has been freely elected and has an obligation to embark on what is right for the sake of the country, for the people of Iraq, and to press ahead. It cannot shirk its duties and responsibilities. But we would be derelict in our duties if we ignore or delay initiating the economic progress of our people. Every day, every hour, counts. We must act with determination and in good faith, and take responsibility for our actions. If any future Government decides to change policy, that will be their prerogative. And as is the case for us, future Iraqi governments will be accountable for their own actions, as we are for ours, and the Iraqi people and history will be our judge and theirs.

- *By enlisting private enterprise, we compromise Iraqi sovereignty over our petroleum resources.*

Again, nonsense. There is no basis whatsoever for this often-repeated myth. Iraqi sovereignty and ownership over its oil and gas reserves is absolute, enshrined by our Constitution and also domestic law, and recognized by international law. There is no doubt whatsoever about this reality, and any speculation to the contrary emanates from ignorance.

- *Iraq has already nationalized its petroleum resources (Law 80). If we bring in foreign investment, it would compromise our sovereign rights.*

This is nonsense, too. Law 80 stands. Iraq's sovereignty and legal ownership rights over its natural resources is immutable and enshrined by law, and unquestionably recognised by international law.

- *In 1973, we kicked out the international oil cartel from the door; why do we bring them back in through the window?*

First of all, the world has moved on, colonial days are a by-gone era, and the whole nature of the international oil and gas industry has changed radically over the last 3 decades. We need to catch up with the times and our rightful place among the rest of the advanced world. International petroleum contracts have developed radically and are in common use world-wide, including by many Arab countries, all fully sovereign and in full unquestionable sovereign control over their oil and gas resources and reserves. Let us repeat: Iraq's sovereign authority over its natural resources is immutable, and cannot be compromised by enlisting any commercial enterprise.

- *Under the current security situation, international investment is reluctant to come forward and invest in Iraq, so we have time.*

In fact, we do not have time, and need to take the initiative ourselves. Others will not do it for us. Iraq cannot sit idly by and allow its progress to be hampered and dictated by the whims of reluctant international oil companies. We must kick-start the process of our development. Competition will see to the rest. Companies will follow one another in line, and the oil industry is no exception. However, we cannot expect the process to start if we ourselves, as Iraqis, do not demonstrate confidence in ourselves. The recent advent of high oil prices has resulted in sudden, enormous available cash resources with oil companies, eager to find investment. Iraq is the world's most attractive petroleum investment basin, but it is incumbent upon us to initiate the process, the invitation. Security and economic progress are inextricably linked, and the primary fuel of our economic progress will be rapid development of our oil and gas production.

- *Why give a profit margin to international companies if the State sector can borrow funds at low interest rates and do the work ourselves?*

First, Iraq for the foreseeable future will be unable to borrow funds at low interest rates, and in any event Iraq today is unable to borrow the required tens of billions of dollars to undertake the enormous task ahead of us and optimize our objectives.. And even if hypothetically we could, we no longer have the requisite human resource capacity in the public sector to efficiently carry out the enormous task that awaits us. Finally, the time value of early revenue resulting from a private-sector driven program will more than compensate for the comparatively low profit margin that would be required to attract foreign investment.

- *Iraq can borrow the required funds from the international financial markets to develop its production, without the need for private-sector/foreign investment.*

Such an approach would be totally unrealistic and doomed to fail. Iraq will need to invest tens of billions of dollars to optimize its oil and gas development. These sums are simply not available for us to borrow in the international financial markets or from other sources. And the meagre sums that may be available to the State as loans under current conditions, would be at a heavy price and burden. The reasons are as follows:

1. With a still heavy debt burden, Iraq currently has virtually no sovereign debt capacity. We have received very limited offers of finance from international banks that border on usury: unacceptably high interest rates with demands that we mortgage our future oil production. Both conditions are unacceptable.
2. While we are diligently striving to, and must, continue efforts to reduce Iraq's foreign debt, this will take months of hard work to achieve. And when (inshallah) we do achieve this objective, we must not then unnecessarily burden the country's debt capacity by borrowing funds which can otherwise be more appropriately attracted for the people's benefit through private sector/foreign investment. Any Iraqi Government debt capacity should be sparingly and wisely used to only fund infrastructure and programs that cannot otherwise attract private sector investment. That must clearly be our policy.
3. The same logic (as for '2' above) applies to utilization of the Government's own financial resources and reconstruction donor funds, except of course in exceptional circumstances of urgent need (such as refining capacity restoration).

Appendix C: Final Agenda

Saturday, September 2, 2006

8:00 pm **Welcome Dinner, Le Meridian Hotel, La Brasserie**

Sunday, September 3, 2006

8:30 am **Welcome and Introductions**
 ◇ *General (ret.) Mohammad Shiyyab, Director, CMC-Amman*
 ◇ *Christina Andersson, Office of Global Security Engagement and Cooperation, Department of Energy, NNSA*
 ◇ *Wanda Klimkiewicz, Executive Assistant to the Deputy Assistant Secretary for International Energy Policy*
 ◇ *Hikmet J.Hassan, Iraq Ministry of Oil*
 ◇ *Dr. Arian Pregenzer, Senior Scientist, Sandia National Laboratories*

9:00 am **Review of Agenda**
 Dr. Arian Pregenzer

9:15 am **Goals and Expectations for the Workshop**
 Roundtable Discussion on Concerns of Participants

10:45 am **Meeting Break**

11:00 am **Relevant DOE Work in Iraq**
 PI: Wanda Klimkiewicz
 NNSA: Adriane Littlefield, Sandia National Laboratories

11:30 am **Global Energy Outlook**
 Nicole Grant, US Energy Information Administration

1:00 pm **Luncheon**

2:00 pm **Critical Issues Facing Oil Companies and Ministry of Oil**
 Facilitator: Dr. Arian Pregenzer
 • Security, Staff, Facilities and Infrastructure, Environment, Ministry

Monday, September 4, 2006

8:30 am **Focus on Specific Facility: Current Status and Immediate Needs of the Daura Facility**
 • *Hikmet J.Hassan, Iraq Ministry of Oil*

10:30 am **Break**

10:45 am **Relevant DOE/NNSA/ National Laboratory Capabilities**
 ◇ Security of infrastructure and transportation
 Arian Pregenzer

- ◊ Energy, Critical Infrastructure
Arian Pregenzer
- ◊ Upgrading facilities, expanding capacity
Charlie Morrow, Sandia National Laboratories
- ◊ Legal Assistance: Hydrocarbon Law
Wanda Klimkiewicz
- ◊ Strategic Planning Assistance
Wanda Klimkiewicz
- ◊ Staff Development Opportunities
Adriane Littlefield

12:30 am **Prioritize Relevance / Value of Capabilities**

1:00 pm **Luncheon**

2:00 pm **Brainstorm: Project Ideas to Address Critical Issues**
Chaired by Dr. Arian Pregenzer

Tuesday, September 5, 2006

9:00 am **Panel Discussion: Views on Iraq's Energy Future**
Chaired by Dr. Arian Pregenzer

- Former and retired ministry employees

10:15 am **Break**

10:30 am **Review and Prioritization of Project Ideas**
Small Groups Review

- Need to include other ministries in projects and planning

1:00 pm **Luncheon**

2:00 pm **Presentation of Priorities from Break out Groups**
Compilation of Priorities

3:00 pm **Next Steps and Action Items**

Appendix D: Meeting Notes (detail)

Iraq Oil Ministry Needs Assessment

Meeting Compilation

September 3-5

Amman, Jordan

1

Round-Table

- Affiliation
- What is his role
- Difficulties facing his company (technically and resources)
- Difficulties facing the Ministry of Oil
- Any other issues

Categories of Difficulties

- Security
- Staff
- Facilities and Infrastructure
 - Maintenance
 - Upgrades
 - New facilities and infrastructure
- Environmental
- Medical facilities at refineries
- MoO

Difficulties: **Security** **Central**

- Electricity supply (limits production and damages equipment also hurts general population)
- Strategic pipeline sabotage: transport of crude to refinery
- Sabotage of transportation tankers
- Sabotage of pipes connecting refineries to storage areas
- Intimidation of staff (lowers morale and impacts performance)
- Insurgent attacks on storage areas

Difficulties: Security

South

- Electricity supply (limits production and damages equipment also hurts general population)
- Sabotage of transportation tankers of product (only have a single pipe for transporting white products)
- The following problems are negligible
 - Strategic pipeline sabotage: transport of crude to refinery
 - Sabotage of pipes connecting refineries to storage areas
 - Intimidation of staff (lowers morale and impacts performance)
 - Insurgent attacks on storage areas

Difficulties: Security

North

- Strategic pipeline sabotage: transport of crude to refinery
- Electricity supply (limits production and damages equipment also hurts general population)
- Sabotage of transportation tankers of product
 - Insufficient storage areas (at the refinery)
 - Decrease production
- Sabotage of pipes connecting refineries to storage areas
- Intimidation of staff (lowers morale and impacts performance)

Difficulties: Staff

- **Shortage of qualified staff** (not a problem in the South, where there is an excess)
 - Security concerns (Dora)
 - Ethnicity (North)
 - Emigration of senior staff
 - ◆ Started in early 90s – most senior engineers left
 - Migration of experienced staff among facilities in Iraq (North)
- **Lack of sufficient skills to operate facilities at design capacity**
 - Risk analysis (North – for technical staff) (but how to distinguish between lack of skill and negligence)
 - Decision-making (North – for technical and engineering staff))
- **Lack of management skills**
 - Systematic approach to management (refinery, facilities) (North)
 - Planning
 - ◆ Lack of expertise to plan and make decisions about upgrades that will increase production
 - Forecasting (local and international markets)
 - Operational research
- **Research and Development**
- **Lack of technical skills to operate up to date facilities**

Difficulties: Facilities and Infrastructure: Maintenance

- **Lack of spare parts (critical components) for old facilities**
 - Critical components are no longer manufactured or require special manufacturing
 - Stores of spare parts have been exhausted because of historical sanctions
 - Long time required for ordering and purchasing (e.g., compressors)
- **Untrained operators may damage equipment**
- **Monitoring instruments and facilities to establish the state of equipment during operation to prevent damage**
- **Badly maintained national grid electricity distribution system (all refineries are on national grid, rather than depending on local power generation)**
- **Longer time between routine maintenance because of lack of excess capacity**
- **Unavailability of maintenance documents (lost or in English)**

Difficulties

Facilities and Infrastructure: Upgrades and New Facilities

- Needs for upgrades
 - Improving quality of product
 - Reduce production of heavy products, such as fuel oil
 - Storage capacity (may need new tanks; upgrade fire-fighting equipment; also maintenance is on a 5 year basis – and tanks will be out of operation for 3-4 months for maintenance)
- New facilities and infrastructure
 - New refineries to meet future demand
 - New electricity generation (local versus centralized)
- Lack of response from international engineering contracting companies due to security situation

Difficulties: Environmental

- Lack of knowledge of environmental conditions and on regulations
 - Need environmental studies to identify pollution, identify solutions, set a timetable for remedying situation
 - Air pollution: need studies of air quality near refineries and impact on public health
- Lack of expertise in development of environmental regulations
- Lack of regulations for solid and gaseous waste (regulations exist for liquid waste)
- Lack of experience in developing procedures for monitoring water quality and treating industrial waste water prior to pumping back into river
- Lack of modern incinerators for destroying waste and sludge (currently dump outside Baghdad – can ignite)

Difficulties: Environmental North

- Air pollution is under control because hydrocracking unit is not working

Difficulties: Environmental South

- Industrial water quality monitoring and treatment
 - Corrosion of pipes
 - Damage of pumps
 - Waste pool is very old
 - Need upgrade of waste treatment
- Air pollution
 - Incinerating gases
 - High lead percentage
 - Benzene

Difficulties: Ministry of Oil

- Lack of overall policy to guide prioritization of projects to develop the oil sector
- Philosophy of development of indigenous capability
 - Project arm (SCOP) is incapable of executing projects that the country needs
 - ◆ Cannot issue proper engineering tender document, because they cannot develop a proper design. Result is that companies bid on very unreliable data, and different companies respond with bids which differ in price by large factors. They have discussions, ask for new bids, and the process takes much too long. Also encourages corruption.
 - ◆ Do not have common philosophy or approach for writing tenders between companies
 - No R&D philosophy
- Organizational structure

How Can DOE / National Laboratories Help?

- DOE could facilitate cooperation agreement between the three major Iraqi refineries (north, central and south) and US refineries
 - Training personnel
 - Providing spare parts in timely manner
- Similar cooperation agreements with gas and other oil-related companies
- Environmental clean-up
- Security
- Quality control
- Staff exchange to enhance capabilities

Focus on Daura

- Currently have plans to increase production and capabilities significantly through 2011 (Light Oil and Lube Oil).
 - Proximity to Baghdad market is an advantage
 - Environmental pollution in Baghdad is a disadvantage
- Current drivers (emergency situation)
 - Increasing demand for gasoline is paramount and supersedes environmental issues
 - Current security situation adds costs for transportation of product from north or south to Baghdad, however, this is a variable, rather than fixed cost
 - Are now creating many small refinery units in different towns, which is not cost-effective
- Need to concentrate on stable and in-depth planning for future refineries
 - Need to develop planning tools (how to optimize across many factors)
 - ◆ In 70s carried out some optimization taking into account many factors (labor, access to crude, But this process stopped with Iran/Iraq war)
 - Should evaluate needs for internal consumption and for export, then do a cost optimization for entire system
 - Where is the minimum cost, taking into account environmental regulations (for treating waste)
 - The South has greatest potential for export

Panel on Future of Energy in Iraq – Mahdi Obeidi

- Upgrade Daura facility – increase up to 30%
 - ◆ Senior staff would partner with international company to design upgrade and manage the new facility

Panel on Future of Energy in Iraq – Saad Mohummed

- Should be coordination between narrow and comprehensive planners.
- Need to consider multiple sectors, not just energy. There are interdependencies between transportation, electricity, energy, plus others.
- Plans should be implemented in stages according to priorities, which are determined by coordinated planning.

Panel on Future of Energy in Iraq – Jafar Jafar

- Among top priorities for Iraq is the acceleration of progress in the petroleum sector in order to rapidly boost oil production and increase revenues
- Need guidelines for a Petroleum Policy which will be the basis for developing a detailed policy. After policy is adopted, determine need for new laws / regs.
- Cornerstone Principles
 - State-dominated Iraqi economy is over. Government should not engage in day to day planning.
 - Reestablish the Iraqi National Oil Company as independent public-sector corporation to rehabilitate, enhance, operate and manage production and refineries. Existing enterprises come under this company. This enables professional management and shields them from political instability.
 - Exploration and development of undeveloped fields and new refineries should be undertaken through private sector investment. Avoid public-private sector endeavors except where essential for transitional reasons.
- Specific guidelines suggested for the following areas
 - Upstream Oil and Gas Sector
 - Refining Sector (rehabilitation is highest priority)
 - Domestic Wholesale and Retail Marketing of Petroleum Products (transition to private sector)
 - Crude Oil Export Marketing
 - Petroleum Services Industry (e.g., drilling, well logging, cementing, etc) – (exclusively private sector).
 - Other factors (retaining qualified Iraqi workers requires training; need to nurture and develop Iraqi private sector)
- Appendix on Impediments and Perceived Obstacles

Responses to Panel

- **Mahdi Obeidi**
 - Agrees with importance of policy. Believes that his ideas are consistent, and address rehabilitation and staff development.
- **Shawki Al-Khalisi**
 - All speakers have expressed notion that oil sector in Iraq must change. Are now considering privatization of downstream and refining sector. However, regarding the upstream sector, privatization may be impeded by “sentimental factors”. Regarding upstream, would benefit from countries who have faced this issue themselves, e.g., Norway, Finland, Then make decision that will be agreed by all.
- **Saad Mohammed**
 - Many people believe that state is responsible for all resources.
 - Need to educate people in new approach.
- **Hikmet Hassan**
 - The paper could be very helpful guidelines for the Ministry of Oil. Would like to have senior ministry officials here to discuss ideas.
 - If we spent three days with senior oil ministry staff, many ideas would arise, and perhaps would produce a consensus document on policy guidelines.
 - Will provide Jafar’s paper to senior people. But need to have a follow-on meeting with right-level people.
 - This is really the first step in developing priorities.
 - Need to have another meeting with senior experts.

Questions about Jafar Paper from Floor

- **Timelines for privatization?**
 - Jafar said that it was too early to speak about privatization of specific facilities. Need policy and laws first, then need transition plan.
- **Details about potential production of different products.**
 - Jafar said that there needs to be a policy to guide decisions about which products should be developed. Should be based on economic feasibility.
- **Regarding establishment of INOC: there are few differences between the proposed role of INOC is and what MoO is doing. The main difference is how to involve the private sector.**
 - Jafar responded that the MoO will be doing much less management of day to day work. MoO would then focus more on policy.

Break-Out Groups

- **Group 1**
 - Saad Mohammed, Middle Refinery Company
 - Jamal Mali, North Oil Company
 - Abdul Alhauany, South Gas Company
- **Group 2**
 - Jassim Hossain, Middle Refinery Company
 - Riyadh Hassan, North Refinery Company
 - Fikrat Ahmed, North Gas Company
- **Group 3**
 - Majeed Taib, Middle Refinery Company
 - Abdul Hassin, South Refinery Company
 - Qassum Hamadi, South Oil Company
- **Group 4**
 - Jafar Jafar, URUK Project Development
 - Mahdi Obeidi, Consultant
 - Shawki Khalisi, Consultant
 - Hikmet Hassan, Middle Refinery Company

Potential Projects: Security (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	Security System Design, Evaluation and Implementation		Iraqi facility managers should be involved in any projects.
1	<ul style="list-style-type: none"> ● Facilities (refineries and oil companies and electricity) Includes perimeters. 	<p>Training is critical.</p> <p>Should include: Oil police, electricity police, internal security, operational, MoO dealing with security.</p> <p>Priority would be training on DBT.</p>	Security arm in Ministry of oil. "Oil Police Department" They are responsible. They need to be engaged and trained. They also have data on past incidents and threats. In the past, have not tried to penetrate fence of refinery, as theft is a primary motive.
	<ul style="list-style-type: none"> ● Pipelines 		Threat is new; need temporary --
	<ul style="list-style-type: none"> ● Transportation tankers 		Threat is new. People are stealing tankers to get products, or are hitting with RPGs to blow them up. Hikmet is concerned that if we focus on transportation, we will not get anything useful.
	<ul style="list-style-type: none"> ● Electrical grid 		Electricity Police

Risk assessment is a critical element of the process of determining objectives for security system

Potential Projects: Staff Development (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
1	• Strategic planning (forecasting)	Senior facility staff and MoO	Must make the level of participants homogeneous.
1	• Energy Data Forecasting and Analysis	Ministry and Companies	Maximum of 12 people. Need to specify how many from Ministry and from companies. Also need to specify the technical capabilities that the participants should have. DOE can do this now.
	• Security system design and evaluation		
1	• Risk analysis	Facilities	Recommend translating key texts into Arabic. This can then lead to Iraqi training for government officials. Could be included in syllabus for engineering.
Training is one of the most critical needs. Should focus on train the trainer to maximize benefit.			
1	• Facility and Refinery Management / Operations / Maintenance ... (including decision-making, rotating machinery maintenance)	Facilities	Different courses for different types of management. Many more people need this kind of training than need strategic planning.

Possibilities include training programs, internships with companies or universities, staff exchanges, and CMC visiting scholars program.

Training Institutes in Iraq (Group 4)

- APTI (Arab Petroleum Training Institute)
 - Training for engineers and also trains other countries
 - Suggest training the trainers. Could help design training courses that would be implemented in these institutes.
- MoO – for training technicians

Training needs to target those people who will benefit most from training.
Training the trainers is critical.

Potential Projects: Facilities and Infrastructure (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
1	<ul style="list-style-type: none"> Risk assessment for petroleum facilities: cascading failures / hazards. 		Work with facility management and international experts to do comprehensive risk assessment. Can also be input to future planning
2	<ul style="list-style-type: none"> Design distributed power system with capability to export power to the grid. 		Need local power generation for all facilities that can be exchanged with national grids. This is already being discussed.
	<ul style="list-style-type: none"> Upgrade of Daura refinery 	Design engineers	<p>There is a lot of uncertainty about Daura. Daura's future is between 0 and 200,000 B/D. Wait until a comprehensive policy has been adopted.</p> <p>Should focus on training people on the process of upgrading.</p>
1	<ul style="list-style-type: none"> Facility optimization and training for Daura refinery 	Facility staff	DOE can support this with team of experts. Could also be generalized to other facilities

Potential Projects: Environmental (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
1	<ul style="list-style-type: none"> Studies for the oil sector to assess pollution, identify solutions, and establish a timetable for implementation and recommendations for legislation 		
	<ul style="list-style-type: none"> Studies on air quality near refineries and the impact on public health 		
	<ul style="list-style-type: none"> Development of systems for monitoring water quality 		
	<ul style="list-style-type: none"> Development of new methods for waste water treatment 		
*	<ul style="list-style-type: none"> Adopt regulations for solid and gaseous waste 		* Not a project, but should be a recommendation.

Potential Projects: Research and Development (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	• Well construction		
	• Reservoir evaluation: existing reservoirs		
	• Reservoir evaluation: modeling		
	• Advanced recovery technologies		
R&D is not a priority at this time.			

Potential Projects: Ministry of Oil (Group 4)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	• Development of policy to guide prioritization of projects		Not a project. Should be seen as a recommendation to the MoO
	• Development of strategic plan for oil sector		Not a project. Should be seen as a recommendation to the MoO.
1	• Training on strategic planning process and other key skills for senior staff		
	• Tools for optimizing production and consumption; infrastructure; ...		
	• Analysis of infrastructure interdependencies		
	• Training policies / philosophy / staff development		

Systems dynamics modeling is a potential approach for evaluating impacts (including economic) of different policy options and to explore system interdependencies. It also requires interaction of multiple, knowledgeable stakeholders.

Potential Projects: Security (Group 1)

Priority			Project Idea	Relevant Iraqi Organization	Comments
N	M	S			
			Security System Design, Evaluation and Implementation		
			• Facilities		Daura is installing cameras.
			• Perimeters	Interior security	Daura is installing cameras. North is installing concrete barriers
	1		• Pipelines	Ministry of Oil Ministry of Interior & Ministry of Defense	Efficiency of guards and equipment are both problems. Need additional stations, and other equipment. Guards have central authority and report to each company.
1		1	• Transportation tankers		Have guards and travel in convoys. Frequent losses of shipments and lives. Shipment is burned or stolen. Not an issue in the south except for LNG tankers (1x per year). Daura needs cameras for tankers.
			• Electrical grid	Local govt, local community. Local company	

Risk assessment is a critical element of the process of determining objectives for security system

Potential Projects: Staff Development (Group 1)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	• Strategic planning	MoO or Company or Facility	Have staff development program for training. Responsibility depends on project. Training needed on each level.
	• Security system design and evaluation	Dept of Public Relations coordinates	
1	• Risk analysis		Critical area. No expertise in this area
	• Decision making	Companies (DG and Dept heads)	South also includes technical committees.
	• Facility and Refinery Management / Operations	Companies (DG and Dept heads)	
	• Forecasting for local, national, and international markets	MoO	
	• Research and development	Companies	Just starting work in this area. Need equipment, training, better funding, experienced personnel. North has been doing this well (lots of study abroad). South, people have lost status when transferred to R&D

Possibilities include training programs, internships with companies or universities, staff exchanges, and CMC visiting scholars program.

Potential Projects: Facilities and Infrastructure (Group 1)

Priority	Project Idea	Relevant Iraqi Organization	Comments
3 (mid)	<ul style="list-style-type: none"> Risk assessment for Daura: cascading failures / hazards 	Inspection Depts	Have established procedures for control.
2 (mid)	<ul style="list-style-type: none"> Development of quality control methods and procedures 	QC Divisions at facilities and companies	<p>Well established certification of products and procedure for remedies of problems.</p> <p>Need lab equipment for testing, as funding has been cut.</p>
1 (mid)	<ul style="list-style-type: none"> Distributed power system design and evaluation 		Affected by sanctions. Planning to be independent of national grid. Need substation upgrades. Not a problem in the south

Potential Projects: Environmental (Group 1)

Priority	Project Idea	Relevant Iraqi Organization	Comments
1	<ul style="list-style-type: none"> Studies to assess pollution, identify solutions, and establish a timetable for implementation 	MoE & MoO	Critical need in Mid.
1 (south)	<ul style="list-style-type: none"> Studies on air quality near refineries and the impact on public health 	MoE & MoO	Mid has current studies – planning for mobile units.
	<ul style="list-style-type: none"> Development of systems for monitoring water quality 	MoE & MoO	Mid needs water monitoring systems
	<ul style="list-style-type: none"> Development of new methods for industrial waste water treatment 	MoE & MoO	
	<ul style="list-style-type: none"> Draft regulations for solid and gaseous waste 	MoE & MoO	Mid has gaseous detectors. Need mobile labs to take analysis.
			In North, old equipment is leaking and polluting.
	<ul style="list-style-type: none"> Environmental regulations and parameters for acceptable emissions. 	MoE	

Potential Projects: Research and Development (Group 1)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	• Well construction		
	• Reservoir evaluation: existing reservoirs		
	• Reservoir evaluation: modeling		
	• Advanced recovery technologies		
			Need more information before decisions.

Potential Projects: Ministry of Oil (Group 1)

Priority	Project Idea	Relevant Iraqi Organization	Comments
	• Development of policy to guide prioritization of projects		
	• Development of strategic plan for oil sector		
1	• Training on strategic planning process for senior staff		Critical need
	• Tools for optimizing production and consumption; infrastructure; ...		Part of planning process
	• Analysis of infrastructure interdependencies	Planning Ministry \	Also part of planning process
	• Public information program for the Ministry		Communication to public

Systems dynamics modeling is a potential approach for evaluating impacts (including economic) of different policy options and to explore system interdependencies. It also requires interaction of multiple, knowledgeable stakeholders.

Potential Projects: Security

Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
Security System Design, Evaluation and Implementation			2 S	
• Facilities		5 M 1 NG 4 N		1
• Perimeters		4 M 4 NG 5 N		
• Pipelines	1 (M)	2 M 3 NG 1 NR	1 M (crude) 3 S (products)	
• Transportation tankers	1 (N&S)	3 M 5 NG 3 N	2 M	
• Electrical grid		1 M 2 NG 2 N	3 M 1 S	

Potential Projects: Staff Development

Priority	Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
	• Strategic planning			5	1
	• Security system design and evaluation				
	• Risk analysis	1	1 N	1 M 2 S	1
	• Decision making		2 N	3	
	• Facility and Refinery Management / Operations			1 S	1
	• Forecasting for local, national, and international markets				1
	• Research and development			4 M	
	• Staff stability		1 N		
	• Staff training (new – in country Experienced – outside county)		1 NG	2 M 3 S	

Potential Projects: Facilities and Infrastructure

Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
• Risk assessment for Daura: cascading failures / hazards	3 (M)		1	1
• Development of quality control methods and procedures	2 (M)		2 S 3 M	
• Distributed power system design and evaluation	1 (M)	1	3 S2M	2
• Facility optimization and training for Daura				1

Potential Projects: Environmental (all important)

Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
• Studies to assess pollution, identify solutions, and establish a timetable for implementation	1 (M&N)	3 M 2 NG 5 N		1
• Studies on air quality near refineries and the impact on public health	1 (S)	1		
• Development of systems for monitoring water quality	3	2 M 4 NG 2 N		
• Development of new methods for waste water treatment		4 M 5 NG 3 N		
• Draft regulations for solid and gaseous waste		5 M 3 NG 4 N	1 S	
• Environmental regulations and parameters for acceptable emissions.	2			

Potential Projects: Research and Development

Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
• Well construction		1 M 4 N	4	
• Reservoir evaluation: existing reservoirs		4 M 1 NG 1 N	1	
• Reservoir evaluation: modeling		3	3	
• Advanced recovery technologies		2	2	

Potential Projects: Ministry of Oil

Project Idea	Priority Group 1 Saad	Priority Group 2 Riyadh	Priority Group 3 Majeed	Priority Group 4 Hikmat
• Development of policy to guide prioritization of projects		2 M 4 NG 3 N		
• Development of strategic plan for oil sector		5 M 5 NG 4 N		
• Training on strategic planning process for senior staff	1	4 M 2 NG 5 N		1
• Tools for optimizing production and consumption; infrastructure; ...		3 M 3 NG 2 N		
• Analysis of infrastructure interdependencies		1	1 S	

Next Steps

- U.S. side will draft report of the meeting (September 12)
 - What was discussed
 - Priority projects
 - Conclusions / recommendations
- Will share with Iraqi team and request comments (September 14)
- Iraqi team will provide feedback (September 25)
- U.S. side will send memo to Senior Leadership of DOE, Iraqi team, ...) (October 1)
- Hikmat will send memo to MoO (October 7)