Assessing the Coal Resources of Afghanistan

Coal tipple, Dudkesh Mine, Baghlan Province, north-central Afghanistan

Afghanistan has moderate to potentially abundant coal resources. The distribution of coal is restricted to the north-central and southeastern parts of the country, however, and much of the coal is relatively deep. Indigenous coal has historically been used in Afghanistan for small industry (notably cement and textile manufacture and food processing) and as a primary source of household fuel in both raw and briquetted forms. Electrical generation from coal has occurred from time to time at Mazar-E-Sharif. The main factors limiting the more widespread use of coal in the past appear to have been lack of a transportation and industrial infrastructure, and remote terrain. In addition, the geology of Afghan coal is poorly understood, and much of the known coal occurs in structurally deformed areas where exploitation can be difficult.

As one component of a much larger program, the U.S. Geological Survey (USGS), under the auspices of the U.S. Agency for International Development (USAID), is conducting a cooperative coal resource assessment with the Afghan Ministry of Mines and Industries (MMI). The various agencies of MMI involved in this cooperative effort include the Afghan Geological Survey (AGS), the North Coal Department (NCD), and the Coal Mining Section of MMI. The objectives of the assessment are to determine the quality, quantity and distribution of coal throughout Afghanistan and to develop the indigenous capability for refinement of these assessments on a sustainable basis. The assessment will determine the stratigraphic and areal extent of coal in Afghanistan and quantify the coal on a regional and national level. The coal will be characterized as to its fuel characteristics and environmental attributes. Special attention will be paid to determining the potential for shallower and less structurally deformed coals than those that have been mined historically. The potential for commercial recovery of coal mine methane, and in the deeper areas, commercial quantities of coal bed methane, will also be assessed.

While the primary focus of the assessment will be to determine and characterize the coal resources in place, the work will be conducted in close cooperation with the various governmental and nongovernmental stakeholders so that the Afghan coal mining sector can be rationalized on a safe and sustainable basis.

Coal in Afghanistan

The primary coal being mined in Afghanistan occurs in Jurassic age rocks of the central Afghan platform (fig. 1). Other Mesozoic coal occurrences include several reports of Triassic age coal. Paleogene age coal also occurs in Afghanistan, generally restricted to the Katawaz Basin and associated areas of eastern Afghanistan. These coal basins are separated by continental-scale faults that mark current and ancient tectonic plate boundaries. The Jurassic coals have a provenance and affinities to similar age coals of Central Asia, while the Paleogene coals are similar to coals of the same age in Pakistan and India. While the thermal maturity (coal rank) of the younger Paleogene coals is apparently similar to that of the Jurassic coals, there is very little data on the overall quality, distribution, or past exploitation of the Paleogene coals. Preliminary results of coal bed analysis by USGS indicates that the coals of Afghanistan have been regionally metamorphosed to the subbituminous to high volatile bituminous ranges, but the rank is locally elevated by deformation. The general coal quality of Afghan coals appears to also vary considerably, both stratigraphically and laterally.

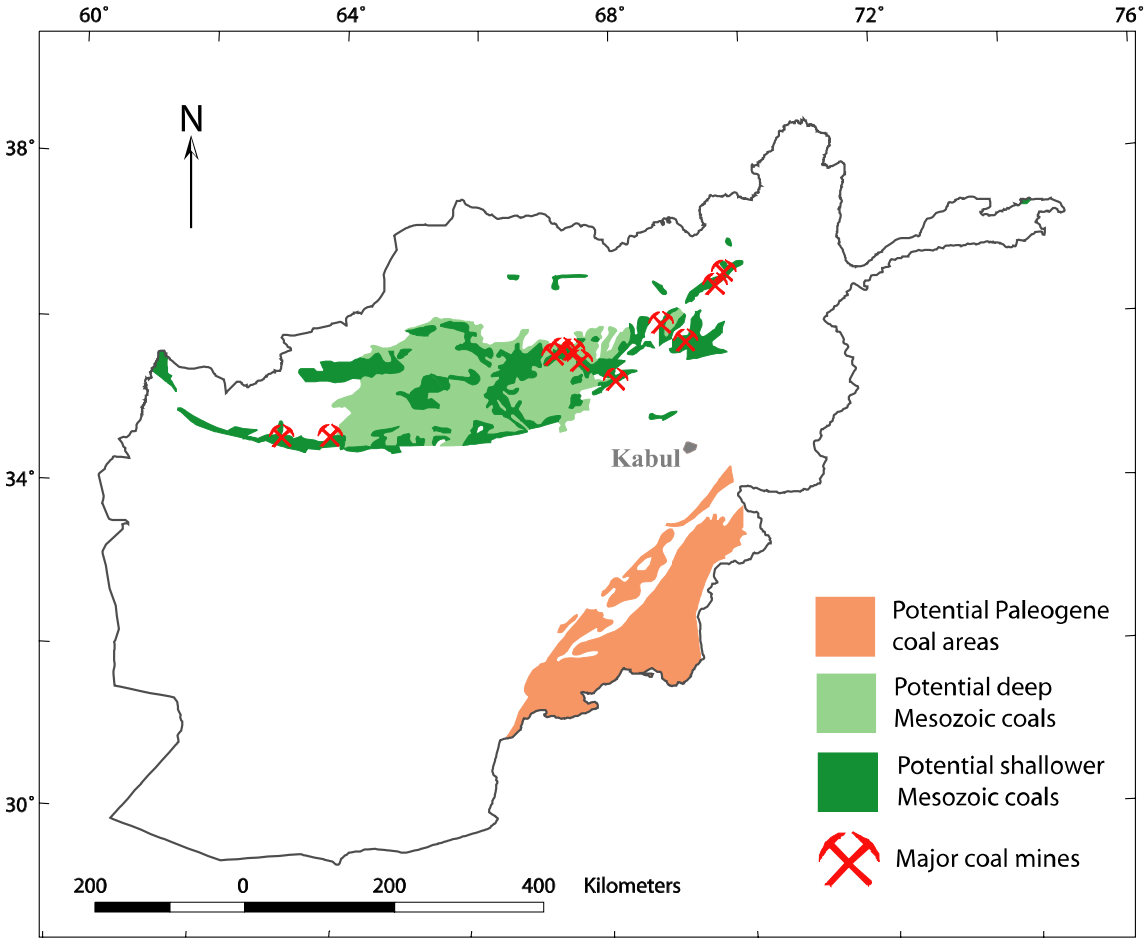

Figure 1. Distribution of major coal-bearing rocks in Afghanistan. The potential shallower Mesozoic coals shown on this figure, though largely inferred, are generally <3000 ft in depth. Such coals could potentially be mined by underground methods, and possibly surface mined in places. These rocks and the deeper Mesozoic coals (~3000 - 4200 ft depth to Jurassic) shown in the figure could have potential for coal bed methane (CBM). The Paleogene coal–bearing rocks shown on this figure are generally quite deformed, but have been mined for local use, and could have CBM potential. The coal associations shown in the figure could also have been source rocks for conventional petroleum accumulations.

Current coal production in Afghanistan is estimated to be about 220,000 tons per year, which is about the same as the prewar peak reported in 1978, which was all from government mines. Today, however, only about 20 percent is from government mines, operated by the NCD or associated agencies in the Province of Herat. The remainder of the production comes from small private "artisanal" mines, often without government sanction. NCD mines were mechanized in the decades past, but are severely undercapitalized at present (fig. 2). The artisanal mines are primitive in nature and are dangerous and potentially damaging to the resource (fig. 3).

Figure 2. Karkar Mine, Baghlan Province. This NCD mine is currently operating well under prewar capacity. The mine ventilation system is no longer fully functional, electric railcars have been replaced by winches, and expensive imported timbers are being used for roof support.

Figure 3. Small artisanal mine in the Ahandara area of Baghlan Province. These small 'dog holes' are hand driven and without roof support, often causing fatal accidents. They subject the coal to widespread oxidation, potentially damaging adjacent unmined resources, and are difficult to manage in terms of federal royalty accounting.

In addition to the areas shown in figure 1, there are isolated occurrences of coal in other areas and stratigraphic intervals in Afghanistan, but these appear to be of little, if any, commercial interest.

The Assessment Approach

The coal assessment will be comprehensive in nature, but will be executed in phases appropriate to the overall relief and reconstruction effort. Very little is known about the character of the Afghan coal resource, and much of the existing data is not in the public domain. The first phase of the assessment will concentrate on gathering and archiving existing data. Much of this data resides with various MMI agencies and may exist as single copies only. These data are currently being catalogued and digitally archived - along with similar data for other commodities - in a joint effort with the British Geological Survey (BGS). The data will be incorporated in a comprehensive Geographic Information System (GIS) which will form the basis of the coal resource assessment. The GIS will include new cartography and geologic mapping on a regional scale that will be done as part of the overall USGS Geospatial program in Afghanistan.

Reconnaissance investigations of the known coal areas and sampling of the existing mines has begun and will continue as the data inventory and GIS construction takes place. The approach will be to characterize the quality of the coal and to determine the geologic setting of the existing mines and extrapolate these data to areas of unknown but favorable coal potential. Individual coal fields will be mapped in detail in conjunction with the geospatial effort, and drilling and other exploration targets will be identified. In light of the lack of existing data and the logistical problems that can be anticipated in Afghanistan, newer technologies such as using remote sensing to identify potentially oxidized coaly rocks at the surface will be investigated. USGS will supervise drilling operations as security issues are resolved and drilling capabilities are developed. As data are developed, important parameters including coal tonnages and grade will be quantified using USGS and other internationally recognized standards.

Institutional Building

The USGS program in Afghanistan will engage in institutional development of the various components of MMI and associated agencies, including the coal departments. The focus of this effort will be hands-on training of counterpart geologists and engineers in the techniques of coal resource assessment in the field and office (fig 4).

Figure 4. Geologists and mining engineers from the Afghan Geological Survey and the Coal Mines Department of the Ministry of Mining and Industries receive training in basic computer skills and coal chemistry database management at AGS headquarters in Kabul, December 2004.

In addition, basic analytical and exploration capabilities for coal will be upgraded in conjunction with the overall effort of capacity building under the multi-component USGS program in Afghanistan. USGS will also provide expert assistance to the US mission in Afghanistan and the Afghan government in their efforts to develop and rationalize the Afghan coal sector.

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