

Précis

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Kenya's Geothermal Development Program

BETWEEN 1979 AND 1996, THE BANK CARRIED OUT five projects to support Kenya's program to develop geothermal power resources—the first such program in Africa. An OED audit* of the five projects found that they were successful, but warned that the sustainability of the last two projects is unlikely without further government support. The audit highlights actions that both the Bank and borrowers could take in the future to increase the chances of success for similar power projects in the region

The Bank could have taken greater advantage of its in-house technical expertise in geothermal drilling, and could have made the procurement process more flexible to respond more rapidly to drilling problems as they arose. For its part, the government could intensify its commitment to expanding geothermal exploration and development, boost its expertise in the field, and provide sufficient resources for maintenance, while pursuing private sector participation.

Between 1979 and 1989, the Bank approved three loans and two credits, for a total of \$117.2 million, to support the development of Kenya's geothermal power program and resources. The five projects, carried out between 1979 and 1996, helped the Kenya Power Company (KPC) install the first geothermal-based power plants in Africa.

The first three projects (approved in 1979, 1980, and 1983) drilled wells, set up transmission facilities, and built a power plant with 45 megawatts (mw) of capacity in the Olkaria Geothermal field of Kenya's Rift Valley. After the plant was successfully put into operation, the government decided to greatly expand its geothermal development program, with a





Implementation Issues

The Olkaria power plant experienced problems in maintaining adequate steam levels to its turbines. After operating above its rated capacity through 1985, the Olkaria power plant began to have production problems because of inadequate investments in new wells, which were needed to offset steady declines of 3-5 percent a year in steam production from existing wells. Steam and power production gradually fell from 45 MW in 1989 to 30 MW in 1995. KPC was expected to use internally-generated funds to pay for urgent work needed to connect replacement wells and drill five new wells. How-

ever, although the savings from reduced fuel oil imports could have offset the investments, KPC was unable to finance the work. Only in 1992, when production fell more than 20 percent, was an agreement reached to divert funds from another Bank project to pay for the well connections.

view to making it one of the main pillars of its future power generation system. The Bank supported this objective with two credits (approved in 1984 and 1989) for exploration, appraisal, and drilling in other parts of Olkaria and at the extinct volcano of Eburru.

Performance

The first three projects were completed essentially on time and within cost estimates, though drilling performance was below par. All power generation units operated at or above capacity for a number of years and all are currently operating at their installed capacity without significant operating problems.

However, the fourth project was plagued by poor drilling performance, a problem that had emerged earlier but that the Bank began to address effectively only in 1987, when it organized bilateral aid for a technical assistance program designed to enable Kenyan staff to take over full operation of the program. By early 1988, drilling performance began to improve dramatically.

The fourth and fifth projects drilled 29 wells at Olkaria and demonstrated that the geothermal field there could support a total of 78 MW of steam, which will be used by a power plant currently financed under a Bank-funded follow-up project. The drilling program at Eburru began three years behind schedule and was much less successful, eventually demonstrating that geothermal potential was significantly below expectations.

The Bank's procurement procedures were too inflexible to meet the project's needs. The Bank's Procurement Unit refused to accept the results of a limited international tender for cementing services when it produced only one bid, and requested that KPC issue an international competitive tender, although only a handful of companies worldwide provided this service and there was no evidence that other bidders would participate. KPC eventually financed the services itself. In addition, the Bank stopped the use of an off-shore agent for the rapid purchase of drilling equipment and materials that were urgently needed, even though the revised procedures added an additional three to six months to the procurement process, creating considerable difficulties for KPC.

The Private Sector.

The Bank has been suggesting that most, if not all, the future growth of Kenya's power supply should be met by the private sector. The government has agreed to offer the Olkaria West fields for private development and to promote private sector participation in conventional

coastal power generation plants. At the time of the audit, several private sector generation proposals were under discussion.

Conclusion

The five projects were all successful. Drilling production levels of the first three projects (1979-86) were unacceptably low but production greatly improved by 1987 and remained high throughout the remaining operations. KPC has increased its own capabilities to the point that it can now operate its geothermal program entirely with its own staff, without full-time external consultants. However, its equipment is old and will need replacement if effective operation is to continue.

The Bank was late in taking action to strengthen KPC's drilling operations and was unable to take effective action to help KPC stem production drops until output had fallen by one-third, at a substantial cost in increased oil imports. For its part, KPC was slow in addressing the fall in power output and was unable to fund the ongoing costs of connecting the required new wells.

KPC has yet to develop a geothermal organization with sufficient autonomy, authority, and financial independence to procure the necessary resources in a reasonable time or to meet the objective of using its investment resources efficiently. The sustainability of KPC's exploration and appraisal efforts is unlikely unless additional resources are provided for new drilling rigs and for its geothermal unit.

Recommendations

For the Bank:

- The Bank needs to make greater use of technical staff in reviewing drilling and resource development programs during both the appraisal and supervision stages of geothermal projects.
- The Bank needs to be more flexible in its procurement to allow the borrower to make unscheduled rush orders more efficiently and at minimum costs.

For the Borrower:

- KPC needs to review its commitments to geothermal exploration and development drilling and needs to identify the resources needed to implement its program efficiently. Geothermal development should become a self-supporting profit center within KPC's power generation activities, with the resources needed to support maintenance and expansion.
- KPC needs to expand training in the areas of surface facilities design for steam gathering systems.

For the Bank and Borrower:

- If the private sector cannot be attracted to participate in Kenya's geothermal development on equitable terms, the government and the Bank will need to prepare an alternative approach, in which government institutions play a more significant role. Such a strategy might include the provision of drilling services to investors or guarantees of competitive prices for steam, allowing the private sector to invest in lower-risk generating plants.

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* Performance audit report: "Kenya: Olkaria Geothermal Engineering Project, Olkaria Geothermal Power Project, Olkaria Geothermal Power Expansion Project, Geothermal Exploration Project, Geothermal Development and Energy Pre-investment Project," by Richard Berney, Report no. 16842, June 1997. Available to Bank Executive Directors and staff from the Internal Documents Unit and from regional information service centers, and to the public from the World Bank InfoShop:
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