Review of IFC's Report "Bujagali Project: Summary of Economic Due Diligence"

by International Rivers Network
Berkeley, California

November 19, 2001

Executive Summary

The Summary of Economic Due Diligence (SEDD) contains numerous shortcomings. It is based on over-optimistic assumptions about growth in GDP and electricity demand. It fails to assess adequately the costs, benefits and risks of various non-Bujagali options, and uses questionable logic in discussing the impacts of a delay in Bujagali. It gives the impression of being written to justify the decision to build Bujagali rather than to assess in an open-minded manner the relative economic merits of Uganda's energy options.

Specific shortcomings of SEDD include:

- unjustified dismissal of the potential of geothermal power as a cost-effective, flexible and quick-to-implement supply option for Uganda;
- total lack of analysis of hydrological implications of global warming, the impact of increased drought risk on Bujagali performance, and the risks of increasing Uganda's dependence on hydropower and vulnerability to global warming;
- over-optimistic assumptions of growth in electricity demand and inadequate analysis of the risks of low-demand growth and its impacts on the viability of different power generation options;
- inadequate analysis of future tariff scenarios and affordability and political sustainability of large tariff increases;
- a lack of information on the contents of the Bujagali PPA and its implications for tariffs and risk allocation between Uganda and AES;
- a failure to analyze hydropower's vulnerability to cost and time overruns and to do sensitivity analyses of various overrun scenarios.

Electricity Generation Options

The assessment of generation options in SEDD is based in large part on an analysis by Acres International, a Canadian engineering firm which specializes in hydropower development. Ugandan and international NGOs have already explained in a number of letters to the World Bank Group that the Acres analysis is biased toward hydropower and against other power options, and have repeatedly requested a comprehensive options assessment be done for Uganda.

Contrary to SEDD's conclusions, geothermal and bagasse power sources together have the potential to supply all Uganda's grid power needs over at least the next decade with similar or lower costs and less vulnerability to climate change and other risks.

Geothermal

Evidence collected by IRN indicates that geothermal power could be available sooner than Bujagali, at a competitive price, at lower risk of exposure to drought and climate change, and with greater flexibility in meeting changing growth in demand for grid electricity.

SEDD quotes information from the Ugandan Electricity Board (UEB) and the World Bank-managed Energy Sector Management Assistance Programme (ESMAP) that "as much as 450MW of thermal potential may be available in the western Rift Valley" (p.17). According to the Geothermal Energy Association (1999), Uganda is one of only eight countries with populations above 20 million which have the potential to get virtually all of their power from geothermal, implying there may be a greater reserve than 450MW.

The non-Bujagali options reviewed by SEDD show geothermal as having a net present value (NPV) lower than any Bujagali option with IoH hydrology, and roughly similar to Bujagali options with Acres hydrology (Table 4.1). Despite this, SEDD dismisses geothermal power from further analysis and comparison with Bujagali and other generating options on the grounds that its costs "are very speculative."

There is little obvious reason for geothermal's costs to be dismissed as "speculative." Geothermal is an established energy source with 8,000 MW of global installed capacity in 1999. The cost of geothermal power generation is in the US5 cents/kilowatt-hour range, competitive with most conventional sources.

In neighboring Kenya, according to the utility Kengen, studies show geothermal to be the least cost option for new power sources in the country (see http://www.kengen.co.ke/current_generation.html). Kenya currently has 45MW of geothermal capacity in operation and two 64MW geothermal plants under development (one with MIGA support). By the year 2017, Kengen states, geothermal is expected to represent about 25% of Kenya's power requirement.

SEDD further dismisses the potential of geothermal generation with the statement that it "could not be commissioned much before 2010 if decisions were made now to embark on a development program" (p.17). No further explanation is given for this statement which flies in the face of other evidence. A geothermal expert with extensive experience in Uganda contacted by IRN believes that Uganda has a number of high-potential sites that could be developed in as little as 2-3 years. These sites are also well-situated, both to take advantage of the existing grid and to expand Uganda's energy-development to a region outside of Kampala.

According to a report prepared in 1999 by the Uganda Geological Survey, "The Katwe-Kikorongo and Kibiro geothermal fields are located a few kilometres from the existing power grid and their exploitation would have a minimum of infrastructure requirements to develop." This site and the others for which surface studies have been done are all clustered in the western part of the country, which is primed for development but in need of electricity.

Other sources agree that geothermal typically takes 2-3 years to develop (see, for example, "Economics of the Energy Industries" by William Peirce, 1996). One of the shortest delivery

times for a geothermal plant was a mere nine months. Even if it took five years to develop Uganda's geothermal resources, projects could be online in less time than Bujagali. It should also be noted that the WCD found that half the dams it reviewed took at least a year longer to build than stated by project planners. The first two units of Kenya's Okaria III geothermal project in Kenya recently came on line 10 months ahead of schedule.

Advantages of geothermal include that capacity can be added in smaller increments than hydro and so it is less vulnerable to the opportunity costs of investing in unneeded supply due to over-optimistic demand growth scenarios (see below). Geothermal is also highly reliable: according to the U.S. Department of Energy, typical geothermal plants produce electricity 95% of the time, whereas coal and nuclear power plants are typically shut down 30-40% of the time for maintenance and other reasons.

As geothermal may actually be the least cost power option for Uganda (in economic, environmental and social terms) it is imperative that a proper geothermal assessment be done before moving ahead with Bujagali. Uganda already has a geothermal development plan that was prepared in 1998 jointly by the Uganda Geological Survey, the US Geological Survey and US industry. A detailed feasibility study would cost approximately $500,000.

Other Options

According to a 1999 ESMAP study, costs for bagasse (sugar waste) powered generation in Uganda would be less than US$1,000 per kilowatt installed, and recurrent costs would be very low. ESMAP notes, "Large scale sugar factories would be a good source to consider for additional electricity generation." It is not clear if there has been further study of Uganda's potential generation capacity for bagasse electricity.

SEDD states that the 33MW Kakira bagasse project, which is "in final stages of project preparation," could not be commissioned sooner than 2004 and that "Government authorities have reason to doubt that this plant could be in service that soon" (p.17). However, the main reason for a lack of progress on bagasse appears to be government apathy rather than technical or economic constraints. According to an article in the *East African* (April 9, 2001), "Plans by the Kakira Sugar Works to extend their power production capacity have been affected by the government's delay in giving the project a go-ahead. The Kakira management recently told the Minister for Energy and Minerals, Mrs Syda Bbumba, that officials from her ministry and the Uganda Electricity Board (UEB) appeared uninterested in the project, which was initially mooted six years ago and for which a detailed feasibility study was carried out in 1998."

Even with such stalling on the part of the government, Kakira could be commissioned two years before Bujagali (by 2004), which would buy some time to conduct geothermal studies. SEDD's assessment of least-cost system expansion scenarios including Bujagali (see Table 4.2) does not include Kakira. SEDD's non-Bujagali expansion costs analysis (Table 4.1) includes "Kakira with large thermal plants" but no other scenarios including Kakira such as Kakira with geothermal and demand-side management which would likely be the least cost scenario.

Imports/Exports

SEDD states that "long-term competitive electricity imports is not a known option at this time" and that "in the 'medium term' [undefined] none of Uganda's neighbors have exportable surpluses." However this does not appear to allow for the development of Tanzania's Songo

Songo gas field (approved for World Bank support in October 2001). The first gas is planned to arrive in Dar es Salaam by 2003. The World Bank Project Information Document on Songo Songo states that the project has strong export potential.

A proposal for a pipeline from Dar es Salaam to Mombasa in Kenya to supply gas for electricity generation has been proposed by a consortium of Rolls Royce, Costain and Skanska. There are two major implications of the potential for a gas pipeline to Kenya: 1) that Kenya will be able to generate power more cheaply than it can import it from Uganda, thus impacting Uganda's plans to export Bujagali power (and therefore Bujagali's economic viability), and 2) that Kenya would be able to export either gas or power to Uganda. SEDD should thus include an assessment of implications for Ugandan power sector of Songo Songo gas development.

SEDD estimates of the cost of thermal power options are based on an expected crude oil price of $25/barrel in 2001. These cost estimates should be reviewed and updated. As of mid-November 2001 Brent crude oil was priced at below $18 per barrel.

Demand Side Management

Acres International have stated that reducing transmission and distribution losses in the Ugandan grid could save 30MW ('Assessment of Generation Alternatives - Uganda', April 2000) and that this would be "the most economic development for the Uganda National Network. Programs to increase efficiency among end users could cut demand growth further." Demand-side management is not included in SEDD's assessment of power options although it would be the cheapest method of increasing electrical services in Uganda.

Bagasse and geothermal have the potential to provide all new grid-connected power needed by Uganda for the next decade. Geothermal appears likely to be able to meet demand growth for even longer. Biomass, small hydro and solar photovoltaics are the most cost-effective methods of meeting electrical demand in remote locations without grid access. At the higher estimates of tariffs when Bujagali comes online (see below) grid connected PVs could soon be competitive in Uganda.

Rapid developments in energy technologies including photovoltaics, microturbines and fuel cells indicate that within 10 years a new set of clean and cost-effective energy options will be available to Uganda. These options may well mean that Uganda will not need any further development of large hydro. Pressing ahead with Bujagali now risks leaving Uganda with an expensive stranded asset.

Hydrological Risk

SEDD does not adequately analyze the issues of hydrological risk. SEDD contains no mention of the following serious issues:

- the impacts that climate change may have upon Bujagali's power production;
- how expanding Uganda's dependence on hydropower could increase the already high vulnerability of its economy to climate change;
- how hydrological risk is allocated in the PPA. This issue is key to the ability of Ugandan citizens and others to assess the desirability of Bujagali as currently structured versus other options such as geothermal.

Rising greenhouse gas levels are increasing the amount of heat trapped by the Earth's atmosphere. This global warming is expected to accelerate through the period over which Bujagali is planned to be in operation. Global warming will cause changes to rainfall patterns (an increase in both floods and droughts are expected), which will in turn lead to changes in streamflow patterns. The power production and economic returns from Bujagali are directly dependent on the timing and amounts of streamflow in the Nile.

The predictions of Bujagali electricity production used by SEDD are made on the assumption that the Nile's flow over the coming decades will be the same as its flow in the 20th century (or rather, will be either of two different versions of its 20th century flow, the IoH or Acres hydrologies). This assumption can only be taken as valid if: 1) it is believed that the earth's climate is static and not affected by either natural or human-induced changes, or, 2) it is believed that climate changes will not affect streamflow in the Nile. Neither of these conditions is consistent with current scientific understanding. The SEDD assumption of future Nile hydrological patterns being the same as past patterns is thus extremely unlikely to prove valid. Assessments of the feasibility of hydropower plants in Uganda must therefore factor in possible changes due to climate.

A recent paper by two Edinburgh University engineers presented at the Hydropower 01 conference in Norway in June 2001 (G. Harrison and B. Whittington, "Climate change: A storm brewing …", *International Water Power and Dam Construction*, September 2001) states:

> "Global warming and changes in precipitation patterns will alter the timing and magnitude of river flows. This will affect the ability of hydropower stations to harness the resource and may reduce production, implying lower revenues and poorer returns."

The paper notes that it is "imperative that project analysis takes account of potential climatic impacts." It also states:

> "The techniques of hydropower appraisal are long established. However, the continuing reliance on historic flows to indicate future flow conditions is not prudent given the prospect of climate change."

The Edinburgh paper explains that a given percentage change in precipitation will tend to cause a greater percentage change in run-off, so that "river basins tend to amplify changes in precipitation." It illustrates this issue with a 1995 study of climate impacts on several major rivers:

> "The most severe change occurred with the Nile. Under one scenario, mean flows fell to less than a quarter of their historic level."

It is disconcerting that the SEDD analysis does not analyze the risks to Bujagali performance from climate change-induced drought and other hydrological changes. The problem is well known – as far back as 1991 the UN's Intergovernmental Panel on Climate Change noted the implications of climate change for dam performance and safety (see IPCC, *Climate Change: The IPCC Response Strategies*, 1991, p.181). More recently the report of the World Commission on Dams recommended that planning of dams should take into account the impact of potential climate changes on dam performance and safety (the safety impacts arising because of the higher flood peaks expected).

SEDD claims that its risk analysis takes account of "the range of possible hydrological outcomes." However, because it fails to account for the hydrological impacts of climate change it does not account for the range of possible (or even probable) hydrological outcomes.

The World Bank's web site acknowledges that climate change will impact the poorest nations most heavily, stating: "Poverty alleviation and sustainable economic development are clearly threatened by global climate change. Developing countries will be more vulnerable than developed countries, with the poorest of the poor being the most vulnerable. Addressing global climate change can no longer be viewed as a fringe activity, nor can it be considered the agenda of the North; it is central to the development agenda." Analyzing this project for climate-change risks would seem to fit perfectly with this mandate.

Even in the absence of accelerated climate change, predictions of future hydrological conditions used in hydropower feasibility studies have been shown to be extremely unreliable. Of 63 hydropower dams reviewed by the WCD, 55% generated less power than predicted. Numerous countries have found that over-dependence on hydropower has high economic costs. Countries that have suffered major reductions in power generation because of droughts in recent years include Albania, Brazil, Chile, Colombia, Ecuador, Georgia, Ghana, Guatemala, Iraq, Kenya, Mexico, Peru, Sri Lanka, Tajikistan, Thailand, United States (Pacific Northwest), Vietnam, Zambia and Zimbabwe. Few of these countries are as dependent on hydropower as Uganda.

In some cases the World Bank has recognized the dangers of over-dependence on hydropower and the need to support efforts to diversify power sources. Examples include:

- *Kenya*: According to MIGA, the geothermal plant Okaria III "will help cut back Kenya's dependence on hydroelectric power, which is subject to repeated droughts" (www.miga.org/screens/news/press/091300.htm);
- *Colombia*: "the electricity sector needed to diversify away from its heavy reliance on hydroelectric power"; "structural problems that had affected performance, such as the risk-laden strategy of too heavy a reliance on hydroelectric power" (www.worldbank.org/wbi/sourcebook/sb0205.htm);
- *Ghana*: "Among the current problems are an over-dependence on hydro-electric power" (www.worldbank.org/html/extdr/extcs/wbn0223.htm).
- *Pakistan*: "will diversify the country's power generating base by reducing the current dependence on hydropower" (www.miga.org/screens/pubs/miganews/spr97/spring.htm).
- *Zimbabwe*: *World Bank News* of January 20, 1994, reported that the Bank had approved a loan for a coal-fired plant in Zimbabwe to make up for an energy shortage caused when low rainfall "drained the lakes and rivers that Zimbabwe's mighty hydropower plants relied on to fuel the country's energy needs. As water's receded, Zimbabwe's hydropower output fell behind demand and the country's power supply plummeted by nearly one-fifth."

Uganda's economy is already highly climate dependent because of the importance of rainfed agriculture for both local consumption and exports, and its near total reliance on hydropower. A recent report from UNEP warns that coffee and tea production in Uganda is extremely vulnerable to climate change. The study found that the total area for growing Robusta coffee in Uganda would be "dramatically reduced" with an average temperature rise of 2 degree C (by comparison the IPCC predicts temperatures rising by 1.4-5.8 degrees C by 2100). Deepening Uganda's

hydropower dependency through construction of Bujagali will increase the country's vulnerability to climate change.

The Bujagali PPA has not been made publicly available and SEDD contains no detailed analysis of it. However, it has been stated by informed sources that if Bujagali's production during the first 12 years after commissioning is reduced by drought to just above a "*force majeure*" level, GoU will have to pay AES for power that has not been produced – at a time when its repayments for the project are at their highest level. A drought could therefore put Uganda in a position of having reduced agricultural exports and food production, reduced power generation (from existing dams as well as Bujagali), likely reduced industrial output, and increased payments for power that is being produced.

The SEDD analysis should be redone to take into account the impact of climate change on both the IoH and Acres hydrologies. This would also require recalculating the merits of Bujagali and other hydropower options relative to non-hydropower options taking account of how different options could increase or decrease Uganda's vulnerability to climate change. The huge uncertainties surrounding global warming's possible impacts on Nile hydrology mean that it will be difficult to take account of these impacts in assessing Bujagali. This should not be taken as an argument to ignore the impacts but rather as one that highlights the major risks and uncertainties involved in dependence on hydropower.

Need for Sensitivity Analysis on Cost and Time Overruns

An extremely important issue missing from SEDD is any discussion of possible cost and time overrun impacts on Bujagali's macroeconomic viability. That hydro construction is prone to high cost overruns is well known. A World Bank study of 70 hydropower projects it financed found costs at completion were on average 27% more than estimated appraisal (*World Bank Technical Paper 325*, 1996). The WCD found an average cost overrun of 56% for 81 dams in its cross-check survey, with nearly three-quarters of the dams costing more than planned. Cost overruns on dams tend to be higher than for other development projects: the World Bank found cost overruns of 6% on a sample of 64 thermal projects and 11% on a sample of 2000 development projects of all kinds (see WCD, *Dams and Development*, p.41). SEDD should thus include a sensitivity analysis showing impacts on the net present value of Bujagali and other hydropower options compared to non-hydropower options (including geothermal) with various ranges of likely cost overruns.

World Bank and WCD analyses have also shown that dams are vulnerable to long delays in expected commissioning dates. The WCD knowledge base showed a "marked tendency towards schedule delays for large dam projects" with only half of 99 projects reviewed coming in on schedule. Nineteen percent of projects reviewed had time delays of more than three years. SEDD should thus include a sensitivity analysis showing impacts on Bujagali's economic performance of schedule delays.

SEDD should also explain how Uganda is protected from risks of cost overruns and delays under the contractual arrangements with AES.

Over-Optimistic Macroeconomic Assumptions

Decisions on least cost energy options and the best time for the commissioning of new plants are extremely dependent on accurate demand assumptions. Adding supply in small, quick-to-build increments is therefore normally preferable to adding it in large "lumps" of capacity which take many years to build and risk large opportunity costs if there is insufficient demand for their power when the new plants come on line.

The key driver of electricity demand growth is economic growth. SEDD's "expected" rate of GDP growth is 6.3% between 2000-2010, the rate achieved between 1990-1999. However this rate of growth is very unlikely to be sustained (and indeed has not been sustained in 2000 and 2001). The 10-year average masks the fact that growth was much higher in the first five years when Uganda was bouncing back from war and economic collapse. In recent years economic performance has been hindered by drought, a disastrous decline in coffee export receipts and slowing industrial growth. None of these factors are accounted for in the SEDD analysis.

According to the World Bank's World Development Indicators, Ugandan GDP growth between 1997-2000 averaged 5.7%. The most recent assessment from the Economist Intelligence Unit estimates real GDP growth as 5.4% in 2001 (compared to a government target rate of 7.1%). The EIU predicts that the expected slowdown in the US and world economy, exacerbated by the attacks on September 11, will keep Ugandan growth at 5.6% in 2002. Annual GDP growth over the period 2000-2002 would, according to these estimates, be a full percentage point below the expected value in SEDD.

An important reason for SEDD's over-optimistic growth estimates appears to be that it ignores the fact that coffee prices are currently at historic lows. Ugandan coffee receipts have slumped to under half those when coffee prices peaked in 1997. The RIMSIM macroeconomic model used in SEDD assumes annual growth rates of coffee exports of 4.6% which is hugely optimistic. The EIU forecasts a 24% drop in coffee prices between 2001-2003, which would mean Ugandan coffee receipts would continue falling through 2003 rather than rising as SEDD predicts.

SEDD predicts that the value of Uganda's overall exports will almost double between 2000 and 2005. However the value of Ugandan exports has fallen from $560 million in 1995 to $510 million in 2000. The EIU assumes that even with increased diversification, falling commodity prices will mean export receipts declining through 2002.

Lower than projected GDP growth rates in the early part of the 2000-2010 period would impact the robustness of SEDD's conclusions on the best date for Bujagali commissioning and the viability of other power generation options. It would thus be prudent for SEDD to be rewritten using a lower "expected" value of GDP growth rates.

Over-optimistic electricity demand growth forecasts

History shows that electricity demand forecasts are consistently overestimates and thus consistently give a misleading impression of the need and timing of large capacity additions. In more than 100 national electricity demand forecasts used by the World Bank, actual demand seven years after forecasts were made was on average one-fifth lower than projected. The SEDD carries a major risk of continuing this pattern of unrealistic demand growth assumptions. The SEDD value for "expected" annual growth in demand for grid electricity is 8.3% between 2000-

2010. This is based on partly on the "expected" economic growth rate, which as shown above is over-optimistic.

According to SEDD's calculations, even if GDP growth fell to a low value of 3.5% per annum, this would reduce electricity demand growth only by 0.2% per year from its "expected" case of 6.3% GDP growth (from 8.3% to 8.1%). Such a limited relationship between electricity demand and GDP is very unusual and appears contrary to assertions on SEDD p.14 of a high correlation between electricity demand and GDP. In fact, the Uganda Electricity Board web site notes that "Electricity demand has been, and is expected to continue growing at 2 percentage points above GDP growth." And ESMAP's 1996 study on Uganda states that for a "base case," electricity demand grows equal to or 1% higher than GDP. These assumptions imply that electrical demand growth under SEDD's low GDP growth scenario should be not above 5.5%.

One reason for SEDD's result of low GDP growth leading to high electrical demand growth may be that under the low GDP scenario it is assumed that residential tariffs increase by a one-off value of 20% and non-residential tariffs by 60%. Under the "expected" economic growth scenario, tariffs are assumed to increase in 2000 by 50% in the residential sector and 73% in the non-residential sector. It is not explained and does not appear to make sense why lower GDP growth over the next decade would result in a lower tariff increase in 2000.

The SEDD demand growth calculations are based on projections made in 1999. Actual tariff increases announced in 2000 by the Uganda Electricity Regulatory Authority were 130% residential (44% of sales) and 40-58% non-residential (56% of total sales). The actual residential increase was thus six times that assumed in the SEDD low GDP demand growth scenario, casting serious doubt on the reliability of the result of this scenario (these tariff increases are noted in a footnote to the SEDD study but not incorporated into its analysis).

The 2000 tariff increases caused an outcry among electricity consumers. The government reacted by agreeing to subsidize residential consumers. SEDD states that these subsidies will only be in place for one year. However it is unclear whether it will be politically possible to remove these subsidies after one year. Continuing the subsidies risks harming Uganda's economy and breaking agreements with donors, cutting them risks harming poor consumers, political instability, and reduced power demand growth.

SEDD assumes no further real tariff increases after 2000. According to an energy economist working in Uganda's power sector, however, the Electricity Regulatory Agency believes that new increases to pay for Bujagali will be necessary in 2006. If it proves politically impossible to raise prices sufficiently in 2006 the state-owned transmission company will not be able to pay its obligation to Bujagali and the World Bank would have to call in its sovereign guarantee from the Ugandan government. If prices do rise they will likely dampen demand growth.

A variety of non-tariff factors could also lead to lower grid demand than forecast. These include the pattern of income growth according to income groups (e.g., lower than expected income growth for poorest households could seriously limit their ability to afford both electricity and electrical appliances); the amount of those who currently use power without paying who get disconnected after privatization ("non-technical losses" are currently around 12% of total generation); and the attractiveness of off-grid connections. The latter would be due to reasons including continued grid unreliability, improved efficiency and falling prices for small generating sets, falling prices for PV systems, and promotion of small hydro (off-grid

connections in Kenya are growing at several times the rate of grid connections). Demand growth could also be reduced if an effective demand-side management program were put in place.

SEDD does not include any analysis of how industrial sector competitiveness may be affected by high electrical tariffs. This analysis should be done, including by analyzing possible tariff implications in Kenya of arrival of natural gas via pipeline from Tanzania.

These and numerous other uncertainties involved in predicting demand growth over a ten-year period indicate that SEDD should be reworked with a sensitivity analysis showing the impact on least-cost power choices with scenarios using demand growth much lower than 8.1% per annum.

Tariff Affordability

SEDD calculates that electricity tariffs after Bujagali construction will be "broadly consistent" with the demand forecast value of 10.5 cents/kWh except between 2006-8 when they will be "one to two cents higher." SEDD also states that tariffs in the range of 10c/kWh are "not unusual in quite a few African and other countries." It would be helpful if SEDD included a table of power costs in neighboring countries, which would make it easier to assess attractiveness of exports from Uganda to these countries and possible impact of higher Ugandan tariffs on industrial competitiveness.

The SEDD figures appear to conflict greatly with cost estimates from AES, which states the following on www.bujagali.com:

"At 3.9 US cents per kWh (1999$ net generation), the Bujagali hydro facility will produce some of the lowest cost power in the Sub Saharan African region. Uganda's neighbors produce power at costs exceeding 8 US cents (Kenya 8.6 US cents, Tanzania 8.3 US cents)."

It is important for Ugandan citizens that the World Bank explain the apparent discrepancy between SEDD and AES figures.

In July, IRN distributed a paper on the tariff implications of Bujagali at the World Bank's forum on the project. IRN has not received a response to this report from the World Bank Group, and SEDD does not refer to it. We are thus compelled to reiterate its major assumptions here.

> IRN has obtained an analysis of some provisions of the confidential PPA from an energy economist working in Uganda's power sector. According to this analyst, the PPA guarantees AES payments of US$100 million per annum for the first 10 years of project operation, with the payments decreasing somewhat for the subsequent 20 years. The Ugandan government is committed to ending subsidies to the power sector, therefore all costs are to be passed onto the consumer. The PPA appears to guarantee payments to AES regardless of power demand or the availability of power from the dam, thus transferring market and hydrological risks from the developer to the Ugandan consumer.
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> Presuming the project comes online as planned in 2005, and accepting the extremely high estimates of demand growth used by project proponents, the marginal cost of power from Bujagali to the off-taker in 2005 would be **557 Ush/KWh,** or **US$0.18/KWh** using the presumed 2005 exchange rate (see calculations below). The cost to the consumer would obviously be considerably higher to reflect overheads and profit of transmission and

distribution companies. By comparison, the state of California has recently secured long-term contracts for gas-fired power at an average rate of **$0.08/KWh.**

Retail prices for power in Uganda have recently undergone massive hikes due to the removal of subsidies in preparation for privatization. Per kilowatt prices to small domestic users have increased from 20 shillings to 50 shillings, and for large industrial users from 75 shillings to 172 shillings. **The marginal cost of Bujagali power in 2005 to the offtaker would thus be more than 3 times the post-hike retail charges to large industrial users and more than 11 times post-hike charges to small domestic users.**

According to press accounts, the recent rate hikes could have serious impacts on both domestic and industrial consumers. "With this, manufacturing has no future in this economy," says one economist in Uganda. "People manufacture for half the cost in Far East and still undercut local producers ... they better start closing shop." According to the government controlled newspaper *New Vision*, "Manufacturers, traders and domestic power users interviewed . . . were bitter that the abrupt power hikes could force them out of business. Many domestic users expressed plans to use kerosene and other cheaper fuels."

The political sustainability of the rate hikes are in doubt due to the angry public reaction. According to *New Vision* "[President] Museveni said he did not attend the Cabinet meeting that endorsed the power rate hikes. 'I will fight it like I have fought many other wars. I don't agree that the power consumers should be made to pay for building a new dam."

There is considerable uncertainty over how much power can be exported to Kenya from Bujagali and at what price. Our calculations assume exports of 250 GWh/yr. This is an optimistic figure as power analysts put likely exports in 2005 at 150-250 GWh. Lower exports will raise further the marginal cost of Bujagali power. The price to be paid by Kenya is still undecided. If Kenya is unwilling to pay the high marginal cost of US$0.18/KWh prices to Ugandan consumers will have to be raised to cover the shortfall and Ugandans will effectively be subsidizing Kenyan consumers.

Numerous implications follow from the reaction to current rate hikes and the sweetheart deal given to AES in the Bujagali PPA. If the rate hikes hold they are likely to suppress demand growth, making the marginal cost of power from Bujagali even more expensive and eroding the supposed justification for such a large dam. Further rate hikes to pay for Bujagali will only suppress demand further.

Only 3% of Ugandans are connected to the grid. According to a World Bank ESMAP report, even at the 1996 tariff level, "No more than 7% of [Uganda's] total population can afford unsubsidized electricity." Electricity from Bujagali would only be affordable to a tiny minority of Ugandans and the project would hinder rather than help expand access to electricity in the country.

If current rate hikes are even partially reversed this will call into question the feasibility of Uganda's power sector privatization and thus the institutional and economic context within which Bujagali is to be built. Reversing the hikes would also imply that it will be impossible to force consumers to pay the costs of Bujagali's power, presumably meaning that responsibility for the payments to AES will have to be transferred onto Ugandan taxpayers as a whole.

The political, contractual and financial fiascos of projects such as Enron's Dabhol plant, the Indonesian coal IPPs, and Pakistan's Hub River plant are likely to be repeated in Uganda if World Bank/IFC moves forward with AES's Bujagali Dam.

SEDD calculates five tariff scenarios. Only one of these tariff scenarios does not include Bujagali construction. This "counterfactual" scenario appears to be based on all future demand being met with thermal power. A scenario should be developed including bagasse and geothermal power.

The tariff scenarios for Bujagali should also include a range of sensitivity analysis allowing for lower economic and power demand growth in Uganda, cost and time overruns, and hydrological impacts of climate change.

Power Purchase Agreement

Because the PPA for the project is confidential it remains impossible to assess adequately the distribution of risks between AES and GoU. This issue has repeatedly been raised by NGOs and was recently noted by the CAO ("IFC's position is that its release of the PPA to the public would violate the IFC information disclosure policy. NGOs point out that it is difficult if not impossible to have a useful discussion regarding the economic implications of Bujagali without access to the PPA. Furthermore if AES wants to maintain a degree of secrecy consistent with a private sector project, perhaps public institutions should not be asked to provide guarantees for or subsidize the undertaking.").

Concerns on this issue remain unanswered. Below are critical outstanding questions on the PPA:

- PPA payments are to be in US dollars, providing a foreign-exchange burden for Uganda. SEDD states that PPA payments would not exceed 2.9% of Uganda's foreign exchange earnings. This is based on SEDD's assumption of steady increases in coffee export receipts which as explained above is highly over-optimistic. What difference would more realistic assumptions of export growth make to the relationship between PPA payments and forex earning?
- How would the obligation to make foreign currency PPA payments be affected by lower than expected demand for Bujagali's electricity, or low flows during drought?
- SEDD states that future tariff impacts can be mitigated by measures such as "reshaping the Bujagali PPA payments to mitigate the impact of the cost increases in the early years of Bujagali's operating life." What is being done to ensure that PPA payments are reshaped?

For Ugandan citizens, the World Bank Board and others to make an informed decision of the costs, benefits and risks of Bujagali relative to other power options, it is essential that the PPA is made public, and these questions addressed.