been made to minimize the realistic possibility of disturbance to the local communities.

39. The Panel's investigation revealed that the socio-economic baseline studies were deficient, displaced peoples were not involved in the preparation of the environmental assessment for the Third Power Project and an environmental advisory panel was not instituted and consulted. The Panel therefore found only partial compliance on the part of the Bank with its policy on environmental assessment (OD 4.01). The Panel's Report also pointed out that the Bank had failed to perform a sectoral environmental assessment for the Third Power Project, which not only constituted a violation of the terms and conditions under which the Board of Executive Directors had approved the credit, but also a failure to comply with the sectoral environmental assessment requirement of OD 4.01. The Panel also found that the Bank was not in compliance with OD 4.01 with respect to the Bujagali Hydropower project. In this context, the Panel expressed concerns that a cumulative impact assessment of hydroelectric projects on the Nile was not properly completed. In terms of dam safety issues, the Inspection Panel found the World Bank in compliance with its policy (OP 4.37). Under the Fourth Power Project, the Panel found that appropriate consultations were not carried out to meet the requirements of the applicable Bank policies.

40. Another topic discussed in the Panel's report concerned the protection of the Kalagala Falls as a natural habitat in view of its religious, cultural, and tourism importance. The Panel concluded that the Bank had failed to ensure adequate mitigation measures to preserve Kalagala Falls as an offset, thereby failing to comply with its policy on Natural Habitats (OP/BP 4.04).

41. The Inspection Panel also focused on the economic and financial appraisal of the prior project and found that the forecast of future electricity demands and the analysis of tariff affordability used by the project were flawed and, therefore, not consistent with the Bank's policy. The Panel raised several concerns as to whether sufficient consideration was given to project alternatives, to the project's risks and the mitigation thereof during the appraisal of the project. The Panel identified, as a key area of concern, the narrow range of the load forecast. It concluded that a wider range of the load forecast would have been needed to fully satisfy the requirements of the Bank's policy on economic evaluation of investment operations (OD 10.04). Furthermore, the Panel also found that the economic appraisal lacked a thorough examination of the institutional risk of a delayed or under-performing privatization of the distribution system and its impact on the robustness of the prior Bujagali project's affordability. Such an examination was needed for full compliance with OD 10.04.

42. Another concern raised by the Panel was related to the power purchase agreement between the GoU and the private investor, AESNP. Included in the agreement was a clause which required the Ugandan government to buy all the power that could potentially be produced, based on the plant's capacity for 30 years,

regardless of whether the power was actually produced or needed. In this regard the Panel also highlighted two strategic risks of the agreement to the Ugandan Electricity Tariffs Committee and its guarantors: (a) the shortfall in the projected demand for electricity; and (b) the non-affordability of the electricity rates. The report also suggested two possible additional risk mitigation measures to provide flexibility as well as a mutually acceptable way of sharing and reducing stranded costs.

43. The Panel questioned whether a depreciation of the Ugandan currency against the U.S. dollar, leading to an increase in the electricity tariff, would be affordable for Uganda's population and pointed out that the effects of any currency depreciation should have formed part of the risk analysis with regard to affordability in the prior project appraisal document.

44. The Panel noted serious problems in the initial implementation of the Resettlement Action Plan (RAP) especially in the determination of legitimate claimants and the valuation of land and crops. It also found that the Bank's community development program set out neither long-term targets nor projects for institution building. In this respect, the Panel found the Bank not in compliance with its policy on involuntary resettlement (OD 4.30).

45. Regarding cultural and spiritual issues, the Panel indicated the efforts of the Bank and Management's good faith attempts to mitigate these issues. At the same time, the Panel also noted the importance of including all key stakeholders in consultation and taking steps to minimize the possibility of disturbance to the local communities that might arise from excluding any faction from such consultations as the prior project went forward. With respect to the indigenous peoples policy, the Panel found the Bank's policy on indigenous peoples (OD 4.20) did not apply.

46. The Request also alleged that the Bank failed to disclose relevant documents related to the prior projects. The Panel found that by failing to disclose the November 2001 report entitled "*Economic Review of Bujagali Hydropower Project*," the Bank had failed to comply with its obligation under BP 17.50 on disclosure of information.

47. The Inspection Panel found no evidence of serious efforts on the part of the World Bank to actively engage with project-affected groups or NGOs and accordingly found that the Bank was not in compliance with its policy on environmental assessment with respect to public consultations regarding the Fourth Power Project.

48. **Management Action Plan in response to the Panel's findings:** In response to the Panel's findings, the Management of the Bank proposed in its report a number of actions to remedy instances of noncompliance. The actions included a commitment to amend the agreement between Uganda and the Bank with respect

to the protection of the Kalagala Falls. Furthermore, the GoU reaffirmed its commitment not to develop the Kalagala Falls for hydropower but to set it aside exclusively as a natural habitat and for tourism. Management also agreed to provide support for multi-stakeholder consultations on the three hydropower Projects and to promote informed and comprehensive discussions.

49. In its response to the Panel's investigation report, the Bank Management also affirmed its support for a strategic and sectoral environmental assessment, as well as social assessments that would be a prerequisite to any future World Bank financing of investments in Uganda's power generation facilities. The Bank would also monitor future growth in electricity demand and the implementation of agreements to be signed with tourism operators. The Bank would further support measures to address reemployment of Ugandan citizens affected by loss of tourism-related jobs. Management agreed to assist the government in examining alternatives in power generation and proposed financing of geothermal exploration and possible drilling in western Ugandan areas.

50. On the topic of social issues addressed by the Inspection Panel, the Bank agreed to request that AESNP conduct surveys that would support implementing and monitoring the Project's Community Development Action Plan.

51. **Subsequent developments:** On June 17, 2002, the Board of Executive Directors met to discuss the Panel's Investigation Report and the Management Report and Recommendations in response to the Panel's findings, and endorsed Management recommendations. However, in 2003 the execution of the Project was halted due to financial difficulties of the Project sponsor.

52. Following Board approval of the prior project, the project encountered several difficulties which eventually led to a pull-out of AES and termination of the project with the Government in September 2003.[19] At the same time, the Bank discussed with the Government of Uganda "*its options, transition arrangements including the integrity of the Project site and intellectual property, and the maintenance of a unit to monitor the project, including the environmental and social aspects.*" [20] In January 2004, the Government "*initiated a transparent and competitive process soliciting the interest of prospective private sponsors in the Bujagali Hydropower Project. This led to the selection of a new project sponsor consortium (Industrial Promotion Services (Kenya) of the Aga Khan Group and Sithe Global (US)) in April 2005.*" [21] On October 3, 2005, Management sent to the Board a Project Completion Note summarizing the Project and explaining why it was not implemented.

53. The current investigation, addressed in the present Report, focuses on the second round effort to develop and complete the Bujagali Hydropower Project.

[19] Project Completion Note, p.1, ¶ 5.
[20] Project Completion Note, p.1, ¶ 6.
[21] Project Completion Note, p.1, ¶ 7.

Chapter II

The Project and its Context

54. This chapter presents an overview of the economic, social and environmental context relevant to the Project and this investigation. The discussion considers the electricity crisis in Uganda and presents an overview of the environmental and social setting in and around the Project area. It concludes with a more detailed description of the Project that is the subject of this Panel's investigation and of the World Bank's involvement in related projects in Uganda, Lake Victoria, and the Nile River Basin.

A. Poverty and Energy in Uganda: The Power Supply Crisis

55. Uganda is among the world's poorest countries, with poverty striking particularly rural areas. In recent years the country has experienced economic growth but the fast-growing population rate (the third fastest in the world) is one of the main challenges to the future economic growth of the country. Poverty has been increasing in rural areas along with a rise in inequality.[22]

56. A 2006 Bank Poverty and Vulnerability Assessment indicates that high poverty levels stem primarily from limited access to land and other assets, high rate of disease (though Uganda has made good progress in fighting HIV/AIDS), lack of control over productive resources by women, high fertility rates, and insecurity. [23] Though improvements have occurred, the poorest people have still very limited access to essential services, including education, health services, water and sanitation, roads and electricity, especially in rural areas.[24]

1. Shortages and Lack of Access to Electricity

57. The power sector is presently experiencing serious capacity constraints in relation to needs and demand, and Uganda is facing a major power crisis. This has strained the recent economic growth, as both consumers and businesses, in particular manufacturing and processing industries and high-value agriculture, have suffered prolonged cuts of service.

58. According to Project documents, the crisis and these severe power shortages are considered to be rooted in four main factors: 1) delay in developing power infrastructure, 2) low levels of water in the Lake Victoria, caused by regional

[22]United Nations Consolidated Appeal for Uganda 2008, Dec 10 2007, p.2. Available at http://ochaonline.un.org/cap2005/webpage.asp?Page=1632. See also PAD, p. 1

[23]World Bank Africa Region, Uganda Poverty and Vulnerability Assessment, Report No. 36996-UG, October 12, 2006. ¶ 3.47

[24] UNDP, Human Development Report 2007-2008, Human Development Index. Uganda Poverty Assessment, p. 23.

drought and over abstraction of water for hydropower 3) high levels of losses of the power distribution system and 4) a substantial increase of about 8 percent of the annual demand for power.[25] The Report considers these and other factors in detail in subsequent chapters.

59. Access to electricity in Uganda is generally very low. Only five percent of the total population, less than one percent in rural areas, has access to grid- supplied electricity.[26] Around 72 percent of electricity is consumed by twelve percent of the population living in the Kampala metropolitan area, the capital, and in nearby towns, Jinja and Entebbe. Electricity is very costly, particularly for poorer households. According to a World Bank study, poor urban dwellers consume little if any electricity, while most rural households are not close to a grid connection: "*electricity use by households in Uganda is stunningly low, but even worse in rural areas.*"[27] **The Panel notes the critical importance of providing affordable electricity to the people of Uganda, as an integral element of national development and of Uganda's poverty reduction efforts.**

60. Management states that the Government is addressing the power crisis through a "*power sector strategy*" which aims at promoting legal, regulatory and structural sector reforms, increasing the role of the private sector in its operations and future development; providing adequate, reliable and least cost power generation to meet increasing demand and guarantee increased access; and scaling up rural access to electricity. Thus far, the GOU has promulgated a new Electricity Act and established the Electricity Regulatory Authority (ERA) in 1999, established a Rural Electrification Agency in 2002 and granted concessions on power generation and distribution.

61. The Rural Electrification Agency established the Rural Electrification Programme to expand electricity coverage, but the ability of these communities to afford this electricity may be an issue. As a result, biomass is projected to remain the principal source of energy for people in rural areas.[28] An additional study conducted in 2006 reported that the cost of connections, especially in rural areas are very high, mainly because of the low capacity of the national distribution company, lack of planning methodology and tools, and lack of appropriate information and ability to compare technical options.[29]

62. Issues of pricing and affordability are critical to access to electricity, in particular the tariff rates (cost) of electricity to users (including families and households).

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[25] PAD, p. 4.
[26] Energy Sector Management Assistance Program (ESMAP), Sub-Saharan Africa: Introducing Low Cost Methods in Electricity Distribution Methods, Technical Paper 104. /06, October 2006, p. 1. [hereinafter, "ESMAP"]
[27] Uganda - Moving Beyond Recovery: Investment and Behavior Change for Growth, Report No. 39221-UG, World Bank, Sept 2007, V. 1, p. 25.
[28] UNDP, Uganda Human Development Report 2005, Linking Environment to Human Development: A Deliberate Choice, Section 4.10, p. 49.
[29] ESMAP, p. 2.

Chapter VI of this Report identifies key factors affecting the cost and affordability of electricity.

63. In the present context, a critical issue raised by the Request is whether the Bujagali dam, if built, will meet its economic projections and provide affordable electricity to the people of the country, in comparison to other alternative means for doing so. **During its visits to the Project area, the Panel heard strong expressions of concern from local people and their representatives that they will not benefit from the Project but will, nevertheless, have to bear its social, economic and environmental costs. In addition, they are concerned that, if Project costs are not properly estimated and accounted, the burden of below-capacity production will be passed to the people of Uganda.** In their own words, they fear "*being taken for a ride*" by a project that does not meet their needs, harms things of importance to them, and enriches somebody else. This issue is examined in more detail in later sections of this Report.

2. Current and Planned Sources of Electricity

64. Uganda's main source of electricity is the Nalubaale–Kiira dam complex, located just below the source of the Nile River in Lake Victoria. The complex consists of two separate dams: the Nalubaale dam constructed in the 1950's across the upper Nile (also referred to as the Owens Falls dam); and Kiira dam, constructed in 2000 in a side-channel artificially created next to the main flow of the Nile, and nearly parallel with the Nalubaale dam.

65. The combined potential operating capacity of the Nalubaale and Kiira dams is 380 MW. Over recent years, however, the actual electricity produced by Nalubaale and Kiira has dropped substantially below capacity, reaching 120MW (equivalent to water discharges of 750m^3/s) between August 2006 and 2007. This contrasts with a 380 MW peak system demand and a 290 MW base load demand, only 50 percent of which is met by the current power supply. Unmet energy demand in 2006 amounted to 364 GWh.[30]

66. A key reason that these two dams have been performing so far below their capacity relates to the release of water into the Nile from Lake Victoria, and the interactions between the dams and the water levels of the Lake. These issues, which are at the technical core of this Investigation as they relate to the Bujagali Dam, are described in more detail below.

67. To increase Uganda's hydroelectric power capacity beyond that provided by Nalubaale and Kiira, the Bujagali Hydropower Plant, addressed in this Report, has been approved and is under construction. In addition, Karuma dam, a run of the river plant significantly downstream from Bujagali Falls and upstream of the limit of Murchison National Park, has been proposed. Other existing and potential sources of energy include small and micro-hydropower sites, bagasse (cane

[30] PAD, Annex 1, ¶ 7, 11, p. 48-50.

residue) from sugar factories, biomass resources, geothermal, wind power, municipal solid waste, newly discovered oil resources, as well as approaches to conserve energy and reduce losses at all levels.[31] The question of alternative sources of energy for Uganda is considered in some detail in later sections of this Report.[32]

68. In 2005 and 2006, to increase power supply, the government leased two 50 MW thermal plants, while in 2007 IDA financed an additional temporary 50 MW under the Bank-funded Power Sector Development Operation (PSDO). The PAD also sets out an Interim Generation Expansion Plan from 2006 to early 2011 (when the Bujagali project would be commissioned). About 44 MW of mini-hydropower capacity and 15 MW of co-generation (using bagasse) were planned for commissioning between 2007 and 2009, while reliance on 150 MW of diesel and fuel oil power generation was expected to continue until 2011.[33]

B. Environmental and Social Context and Setting

69. The Bujagali dam is within the Nile Equatorial Lakes region, consisting of a number of interconnected lakes providing a natural storage for the Nile River, including Lake Victoria – the largest (69,000km²) – and Lake Albert, Lake Kyoga and Lake Edward, which are linked to Lake Victoria by the Victoria Nile. The Bujagali hydropower facility would be located on the Nile River about 8 kilometers downstream (north) of Nalubaale and Kiira and the source of the Nile at Lake Victoria. Since the flow of the Victoria Nile is regulated by Lake Victoria and is relatively steady from season to season, the Bujagali dam is designed as a "run-of-the-river" dam.[34]

70. The sections below provide an overview of the hydrology of Lake Victoria and the Victoria Nile and the environmental and social setting relevant to understanding the Project.

1. Hydrology of Lake Victoria and the Victoria Nile, and Hydropower Implications

71. The hydrology of Lake Victoria and the Victoria Nile is a key influence on the potential energy output of hydropower plants on the Victoria Nile. The Lake's

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[31] The Government has reported that an oil resource was discovered in western Uganda but that no impact on power generation is predicted until 2011.

[32] The Request and Project documents provide different descriptions and views on the availability and potential of these alternative sources of energy.

[33] PAD, p. 26 and PAD, Annex 1, p. 66.

[34] Hydropower projects can be either storage projects or run-of-the-river projects. Storage projects are usually built on rivers with significant variability in flow, whereas run-of-the-river projects suited to rivers with a fairly steady flow. Storage projects aim at capturing river flow during high flow periods and releasing it during low flow periods; run-of-the-river plants, by contrast, rely on a river's natural flow. While run-of-the-river projects sometimes have a small amount of storage to regulate flow during a 24-hour period to help meet peak power demands, the volume of water that needs to be stored, and consequently the area that needs to be flooded, is generally much smaller than that of storage projects.

water balance[35] is the essential link among lake levels, water flows and hydropower production. As explained below, changing lake levels affect water flows in the Victoria Nile River, which in turn affect hydropower generation.

72. Studies of Lake Victoria have shown that rainfall is the principal contributor to the Lake's inflow, and evaporation and outflow via the Victoria Nile are the principal contributors to the Lake's outflow. The Lake's water balance is thus dominated by rainfall over the lake, evaporation from the lake, and outflows via the Victoria Nile. When the net volume of inflow into the Lake (that is, rainfall plus basin inflow minus evaporation, referred to as the "Net Basin Supply") exceeds the net volume of outflow via the Victoria Nile, the amount of water stored in the Lake and thus the Lake's level will increase. However, when the Net Basin Supply is less than the amount outflowing via the Victoria Nile, the amount of water stored in the lake will decrease and the Lake's water level will drop.

73. The Net Basin Supply in any given time period is determined by climatic variables, and varies considerably from season to season and year to year. The outflows from the Lake to the Victoria Nile, however, are subject to human control. Prior to the construction of dams on the Victoria Nile, the amount of water flowing from Lake Victoria was naturally determined by the level of water in the Lake – the higher the level of the lake, the more water that poured out from the lake into the Victoria Nile. However, the successive development of the Nalubaale (formerly Owen Falls) and Kiira dams at the entry point from the Lake to the upper Nile changed all that. Before the completion of the Nalubaale dam in 1959, the outflow from Lake Victoria into the Nile was at Rippon Falls, a rock barrier at the outflow point of the Lake that naturally regulated the water levels. During construction of the dam in the 1950's, this rock barrier was blasted and lowered, providing more outflow of water to the dam. Since 1959, when the Nalubaale dam started operating, the dam has regulated the outflow of Lake Victoria into the Victoria Nile, transforming the Lake into a quasi-reservoir.[36] At

[35] The water balance of a lake (or other body of water) establishes that the difference between the total volume of water flowing into the lake in any given time period and the total volume flowing out during that same time period will be equal to the change in the volume of water stored in the lake during that time period. The volume of water flowing into the lake generally consists of surface water inflow (from rivers or streams or direct runoff), groundwater inflow (from aquifers), and precipitation in the form of rainfall or snowfall on the surface of the lake, while the volume flowing out will consist of the evaporation from the lake, storage losses including seepage, and water flowing out via downstream rivers or streams. If inflow volume exceeds outflow volume, the difference between the two will be added to the volume of water stored in the lake, while if the lake's outflow volume exceeds its inflow volume, the difference between the two will reduce the water stored in the lake by that amount. Mathematically, this relationship can be expressed as C= S+G+P- (E+L+R), where C is the change in the volume of water stored in the lake or reservoir, S is the volume of surface water inflow (from rivers or streams or direct runoff), G is the volume of groundwater inflow (from aquifers), P is the volume of precipitation (rainfall or snowfall) on the surface of the reservoir, E is the volume of evaporation from the reservoir, L is the volume of storage losses including seepage, and R is the volume of water flowing out via rivers or streams.

[36] Daniel Kull, 2006, "Connections Between Recent Water Level Drops in Lake Victoria, Dam Operations and Drought." Available at http://www.irn.org/programs/nile/pdf/060208vic.pdf

that time, it was agreed that the dams must be operated in accordance with the so-called Agreed Curve, described below.

74. The Agreed Curve is the result of agreements between Egypt and the British Government that stipulated how much water should be released from the Lake. The agreements provide that the Nalubaale dam should be operated pursuant to a rating curve (the Agreed Curve)[37] aiming to ensure that the outflow from the lake mimics the conditions of the Lake before the Nalubaale dam was constructed. This meant restoring the natural behavior of the lake by allowing fluctuation in rainfall and evaporation to determine the amount of water flowing out. With the Agreed Curve, low water levels determine a lower outflow to the Victoria Nile and thus a lower input of water to the hydropower plants; conversely, high lake water levels determine a higher outflow to the Victoria Nile and thus a higher input of water to the hydropower plants.

75. In the 1990s, the need to increase power production led the government to examine possible alternatives for additional power generation. According to 1990 studies, two "feasible" options were identified: the Owen Falls Dam extension project (Kiira), which was designed to operate in parallel with Nalubaale, and the construction, downstream of Nalubaale, of the Bujagali hydropower plant.[38] The former, Kiira, was chosen[39]; its turbines are only a few meters lower than those of the Nalubaale and use the same water drop (referred to technically as "head"), from Lake Victoria, plus some additional "head", which results in increased relative production capacity. A canal above Nalubaale diverts water to Kiira in a way that allows the two dams to control the water level and the outflow from the Lake.[40] Because Kiira operates in parallel to Nalubaale, power generation from Kiira requires additional outflows from Lake Victoria over and above those required for Nalubaale. One study states that when Kiira was built, the discharge into the Victoria Nile was increased "*possibly by as much as 50%*", and "*it became impossible for Uganda to adhere to the Agreed Curve.*"[41]

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[37] Rating curve is the relationship between river level and flow. The "Agreed Curve" relationship is: Q = 132.924(h –8.486) ^1.686 where Q is discharge in cubic meters per second and h is water level (stage) in meters at the Jinja Pier.

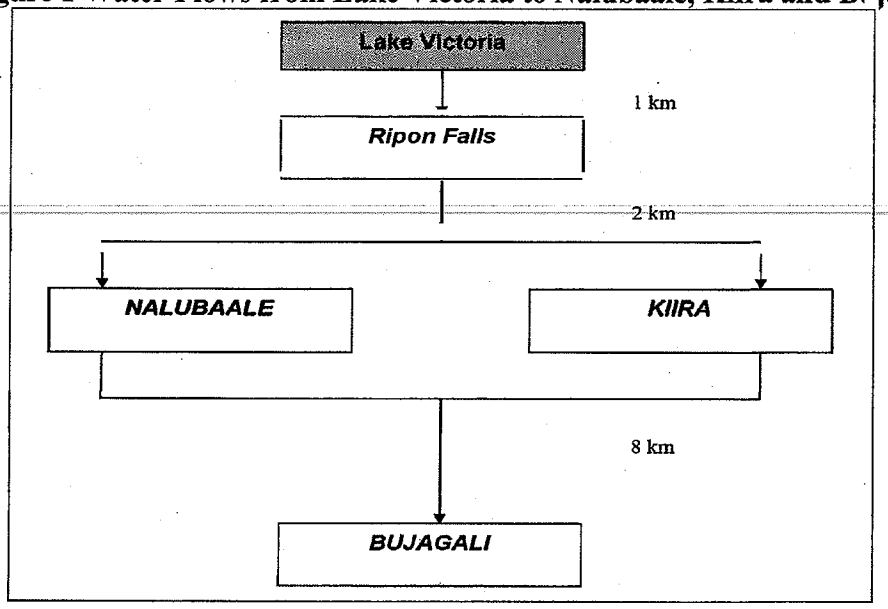
[38] Acres International Ltd. "Proposed extension to Owen Falls Generating Station: Feasibility Study Report," Oct. 1990.

[39] The Panel's expert considers that this decision was biased by the hydrologic series that was used. During the period of 1961-1989 the mean outflow of water was 1,200 m^3/s while before1961 the mean outflow was 660 m^3/s. The hydrological studies analyzing the two possible alternatives, the Owen Falls dam extension (Kiira) and the Bujagali Falls dam, concluded that the flow observed before 1961 would not occur in the future and, as a result, considered as valid only the hydrological series 1961-1989. This led to the decision of constructing the Owen Falls dam extension (Kiira) rather than the Bujagali plant and to rely on data showing an averagely high discharge of water. According to the Panel expert, this solution was less expensive but relied on a mistaken assumption: as noted in the text since 2000 the Lake Victoria's water levels have decreased and the Nalubaale/Kiira system's energy output has been lower than planned.

[40] Kull 2006, p. 4. It was also in this context, amidst an electricity crisis and rising demand for electricity, the Bujagali dam was first proposed in late 1999 early 2000.

[41] Kiwango and Wolanski, "Papyrus wetlands, nutrients balance, fisheries collapse, food security and Lake Victoria level decline in 2000-2006." Wetlands Ecol. Management, Nov. 2007. p. 90. The study notes that other sources attributed the decrease of the lake level between 2000 and 2006 "*to both lack of rain and*

Figure 1 Water Flows from Lake Victoria to Nalubaale, Kiira and Bujagali[42]



76. Over the past 100 years the water levels of the Lake Victoria have shown significant changes in regimes. In general, the period before 1960 is characterized as a period of relatively low water levels and outflows to the Victoria Nile. Between 1960/61 and 1999, Lake Victoria rose, nearly doubling the average outflows in comparison to the previous period. In contrast, from 2000 until recently, lake levels again decreased to reach a level observed before the 1960s. Experts are divided as to the causes of the recent drops of levels of the Lake Victoria. Bujagali Project documents claim that a "*main cause of the drop in lake level in the past few years was the exceptionally dry period 2003-2005.*"[43] On the other hand, it is clear that from 2003 to 2005, the water from Lake Victoria was over-abstracted (that is, released above the Agreed Curve) to expand power generation and meet the increased demand for electricity.[44] Some authors conclude that this over-abstraction is the main cause of the low levels of

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excessive water extraction at Kiira dam, although their relative contribution was not quantified." (90) It should be noted, however, that had Kiira been commissioned at a time of sufficiently high Lake levels, the discharge according to the Agreed Curve could have been high enough to permit the operation of both Kiira and Nalubaale at capacity.

[42]This figure was adapted from the figure "Hydrology and Lake Victoria" on p. 19 of the Technical Briefing "UGANDA: Bujagali Hydropower Project." Presented by IDA, IFC, and MIGA on April 2, 2007.

[43] Management Response, Annex III, ¶ 10. Management also states the "analysis of Lake Victoria water levels during 2003-2005 period concluded that the main origin of the drop in the lake level during this timeframe is an exceptionally dry period..." Management Response, Annex 1, p. 18.

[44] The PAD, for example, states that during the period 2003 and 2005, ". . . the power demand in Uganda required a sustained release that was above the net inflow, thus accelerating the drop in lake level, and automatically increasing the departure from the Agreed Curve." (PAD, Annex 10, ¶ 9.) The Request notes, among other things, that *"[w]ithout doubt, Kiira has contributed substantially to the over-draining of Lake Victoria, causing a lot of misery and economic loss to Uganda and neighboring countries.*" (Request, p. 2)

the Lake's waters.[45] In Management's view, both drought and over-abstraction are to blame; as stated in the Management Response, changing water levels are the "*consequence of this low inflow [due to lack of rainfall in the recent dry period], combined with the over-release of water for power generation.*"[46]

77. Since lake levels determine river flows, which in turn determine the amount of water that flows through the power turbines, lake levels and power generation are strongly inter-linked. The World Bank – Netherlands Water Partnership (BNWPP)[47] background description for the "Victoria Nile -- Independent Hydrological Review" activity, which was carried out in 2006 as part of the "River Basin Management" window of the Partnership states that the amount of power that can be supplied by water from Lake Victoria:

> "*. . .depends importantly on the Lake level and its management through the operating regime of the hydroelectric facilities,* ***which until recently depended upon an Agreed Curve*** *governing water releases from the Lake for power production. If Uganda over-draws the Lake for power production, as it has been doing, this could impact on the usable volumes of water relative to what they would have been under the "Agreed Curve" policy. Also,* ***when the Lake level deteriorates, it can affect, and apparently has affected a number of other economic activities that the riparian countries depend upon****, such as agriculture, fishing and transportation.*"[48] (emphasis added)

78. The same 2006 World Bank – Netherlands Water Partnership source notes that Uganda is gradually reducing its hydropower output to be more aligned with the Agreed Curve, but in the meantime "*is suffering major day-long power cuts that are adversely affecting economic, public service and household activities.*"[49] In its response to the Request, Bank Management states that *"[s]ince the end of 2005, the GoU has steadily decreased hydropower generation in an effort to*

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[45] Kull 2006, estimates that that the level drops are 45 percent due to drought and 55 percent to the over-releases (p. 7).

[46] Management Response, Annex 1, p. 18.

[47] The Bank-Netherlands Water Partnership Program (BNWPP) aims at improving water security by promoting innovative approaches to Integrated Water Resources Management (IWRM), and contributing to poverty reduction. The BNWPP currently operates through a framework of 14 sub-programs or windows. Each window is a sub-component of a broad framework that embraces comprehensive, cross-sectoral water management; water-user participation; transparent and efficient institutions; the treatment of water as a social and economic resource; the importance of water to the natural environment; and the link between water management and poverty alleviation. Available at http://www-esd.worldbank.org/bnwpp/ (Last accessed on June 30, 2008).

[48] World Bank - Netherlands Water Partnership (BNWPP), background description for the "Victoria Nile-Independent Hydrological Review" activity, http://www-esd.worldbank.org/bnwpp/index.cfm?display=display_activity&AID=439, accessed on 23 July 2008

[49] World Bank - Netherlands Water Partnership (BNWPP), background description for the "Victoria Nile-Independent Hydrological Review" activity, http://www-esd.worldbank.org/bnwpp/index.cfm?display=display_activity&AID=439, accessed on 23 July 2008

return to the Agreed Curve operating regime. Water flows for power production are being scheduled so as to return to the Agreed Curve as soon as reasonably possible."[50]

79. A significant question raised by the Request is the extent to which the proposed Bujagali Dam will or might create incentives to depart from the Agreed Curve, and contribute to a lowering of Lake water levels and corresponding serious impacts for the Lake's riparian states. This issue, and related issues of hydrology and water flow, is addressed in Chapter IV of this Report.

80. An important related question is the extent to which the future hydrology of Lake Victoria may be influenced by climate change. Since the Lake's water balance is dominated by rainfall and evaporation over the surface of the Lake, the Requesters are concerned that even relatively small long-term decreases in rainfall and/or increases in temperature could have significant impacts on Lake levels and on outflows via the Victoria Nile and, in turn, on the economic and politics of operating the dams. An analysis of potential climate change effects, and the extent to which they were taken into account in Project analyses in line with Bank Policies, is included in Chapter IV of this Report.

2. Lake Victoria and the Impact of Declining Lake Levels

81. Lake Victoria is the largest fresh water lake in Africa and a most important natural resource. The Lake and its 3,450km of shoreline are shared by Kenya, Tanzania and Uganda; its basin includes Rwanda and Burundi, which are part of the upper watershed draining into the Lake through the Kagera River. The Lake is part of the Nile River Basin system that is shared by ten countries, including the aforementioned countries as well as the Democratic Republic of Congo, Egypt, Ethiopia, Eritrea, and Sudan.[51]

82. Lake Victoria is an inland transport linkage for Uganda, Kenya and Tanzania. It is also a major natural reservoir and source of water for domestic, industrial and commercial purposes, serving major cities, towns and urban and rural centers within the basin. The Lake is considered the "*largest inland water fishery sanctuary in Africa*", its fishery resources supporting livelihoods for around three million people involved in the fisheries industry.[52] Lake Victoria and the rivers flowing from it also are seen as a major potential source for hydropower generation, as discussed earlier.

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[50] Management Response, Annex 1, p. 18.

[51] World Bank - Netherlands Water Partnership (BNWPP), background description for the "Victoria Nile-Independent Hydrological Review" activity, http://www-esd.worldbank.org/bnwpp/index.cfm?display=display_activity&AID=439, accessed on 23 July 2008

[52] East African Community (EAC), Lake Victoria Basin Commission, Special Report on the Declining of Water Levels of Lake Victoria, Arusha, Tanzania, January 2006, p. 2, [hereinafter "EAC Report 2006"].

83. Many studies have examined the extraordinary ecology, wildlife and habitats of the Lake Victoria region, its importance to the life and livelihoods of its people, and also the history of change and biodiversity loss in the region.[53] Over time, factors and pressures on the natural systems include intensified fishing methods, the introduction of non-indigenous species such as the Nile Perch, pollution and eutrophication of the Lake itself from agricultural and industrial activity, and the loss of riverine migratory routes important to potamodomous fishes due to, among other things, the construction of dams such as those at Owens Falls.[54] To these should be added a potentially new set and scale of impacts associated with climate change (discussed later in the Report).

84. Various studies have also addressed changes that have occurred over time in the lake level, its chemistry, ecology, sedimentation and water quality.[55] The Lakes Basin Development Authority, established by the Government of Kenya in 1979 to spearhead development in the Lake Victoria Basin Catchments area in Western Kenya, recommends the following measures to restore the health of the lake:

> • *Catchment protection – re- afforestation, agro forestry, soil and water conservation and good agricultural practices promotion in the catchments.*
>
> • *Develop a sustainable regional conservation and management plan for fishery resources. Enhance environmental–friendly fish harvesting practices, protection of breeding sites, enforcement of quality control and all other fisheries regulations.*
>
> • *Rehabilitate and maintain waste treatment facilities in all municipalities and industries in the region, so as to reduce pollution and eutrophication in the lake. Industries should endeavour to initiate cleaner production technologies as a way of safeguarding and protecting the environment.*
>
> • *Develop a long term comprehensive and well coordinated river and lake water quality monitoring programme as a tool for water quality*

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[53] Balirwa et al (citing many studies) note the more than 100 endemic species of large, "magnificent" (705) piscivorous haplochhromine cichlids, most of which vanished at about the time of the increase in the Nile perch; the over 200 species of mormyrids, a family including the elephant-nose fish which is well known for their "remarkable electrongenic and electroreceptive capabilities" (705); the African lung fish, and others. See also publications listed on the home page of NaFFIRI at http://www.firi.go.ug/.

[54] Balirwa et al. 2003.

[55] See Lehman J T (Ed). "Environmental Change and Response in East African Lakes." Kluwer Academic Publishers, 1998. Specific data on present day Lake Victoria may be obtained from the World Lakes Database maintained by the International Lake Environment Committee. (Available at: http://www.ilec.or.jp/database/database.html) This committee has also published a report on Lake Victoria Issues specific to the health of Lake Victoria and its Management. Report also appears in a paper presented to the Living Lakes African Regional Conference held in Kisumu, Kenya in October 2005. See Nzomo, R. "Sustainable Development of African Lakes, The Case of Lake Victoria." Living Lakes African Regional Conference, Kisumu, Kenya, 2005.

management. Regional water quality standards should be adopted and enforced.

• *Enhance water hyacinth control, and eradication of other obnoxious weeds e.g. Striga weed in the region. A long term regional monitoring programme for this invasive aquatic weed is important.*

• *Communities should be made aware on the significance of environmental management and conservation. As stake holders they should participate in decision making and implementation of environmental conservation and management projects in the basin.* [56]

85. Similarly, the International Lake Environment Committee records the major threats to Lake Victoria as:

- *"Population pressure, contributing to the existence of "hot spots" caused by human waste, urban runoff, and effluent discharges from such industries as breweries, tanning, paper and fish processing, sugar, coffee washing stations and abattoirs;*
- *Nutrient (phosphorous, nitrogen) inflows, including atmospheric deposition, causing a five fold increase in algal growth since the 1960s, resulting in deoxygenation of water that threatens the survival of deep water fish species;*
- *Residual inflows from the use of chemical herbicides and pesticides and, to a limited extent, heavy metals resulting from gold mining operations that cause localised pollution;*
- *Proliferation of water hyacinth, resulting in biodiversity and economic losses in the lake's near shore areas;*
- *Unsustainable use of the major wetlands for agricultural activities and raising of livestock, which has greatly compromised the buffering capacity of the wetlands; and*
- *Introduction of two exotic species (Nile perch, Nile tilapia), and use of unsustainable fishing practices and gears, altering the composition of the lake's fauna and flora species."* [57]

86. Neither report mentions hydropower generation nor changing lake levels as a problem affecting the lake or deems them responsible for the problems that the

[56] Lehman J T (Ed). "Environmental Change and Response in East African Lakes." Kluwer Academic Publishers, 1998.

[57] Kayombo, Sixtus; Jorgensen, Sven Erik. "Lake Victoria: Experience and Lessons Learned Brief." Published by the International Lake Environment Committee as part of the Lake Basin Management Initiative. Available at http://www.ilec.or.jp/eg/lbmi/pdf/27_Lake_Victoria_27February2006.pdf

Lake is experiencing. Nevertheless, there is no doubt that lake levels do vary over a range of almost two meters and that this has a real impact on socio-economic conditions on the lake's shoreline[58].

87. Clearly low water levels[59] have had serious environmental, social and economic impacts on Uganda and the other riparian states and the lives of about 30 million people using the lake water. Water intakes for Kampala and Jinja are affected, as are docking facilities at Jinja. During the recent period of low lake levels, fish landing and water supply structures at riparian communities were left literally high and dry and this increased the cost of living and reduced access to clean water. Many people began using non-purified water from shallow shoreline areas, which poses a health hazard from water based and water borne diseases. In addition, hydraulic and civil structures along the shoreline required modification or began being abandoned due to the low water levels. The PAD describes the impact of these recent low water levels in Lake Victoria as follows:

> "*Because of low water levels, these benefits have been threatened by environmental degradation manifested in reduced fish stocks, the drying out of fish breeding areas and the loss of livelihood to many fishing communities; a decline of biodiversity; increased sedimentation and nutrient loads resulting in eutrophication; the drying out of wetlands and loss of littoral habitat; increased lake transportation costs, since ports and piers are left hanging on dry land, and water shortages for shoreline towns and farmers.*"[60]

88. There are, moreover, serious problems in developing responsive actions to address these problems. The PAD notes that: "*Efforts to regulate and manage the activities threatening the lake are clearly insufficient at present, and widespread poverty in the basin exacerbates environmental stress.*"[61] A study by Kiwango and Wolanski,[62] referred to earlier, focused on the potential impacts of lower water levels in Lake Victoria on papyrus wetlands and the nutrient balance around the Lake and concludes by stating: "*If Uganda resumes overdrawing water from the lake and permanently dries out the papyrus of Lake Victoria, the resultant eutrophication of Lake Victoria may be large-scale and could also result in the collapse of artisanal fisheries and threaten food security for the impoverished fraction of the population living on the lake's shores, while also possibly*

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[58] Changing lake levels and their effects are well outlined in EAC Report 2006 and Lake Victoria Basin Commission, April 2006 See also Chapter II Context.

[59] Lake Victoria has undergone significant changes in both paleo- and historic-times. An authoritative source documenting changes that have occurred is *Environmental Change and Response in East African Lakes.* This volume produced by the International Decade for the East African Lakes discusses changes that have occurred in *inter alia* Lake Level, Chemistry, Ecology, Sedimentation and Water Quality. Specific data on present day Lake Victoria may be obtained from the World Lakes Database maintained by the International Lake Environment Committee. This committee has also published a report on Lake Victoria. Issues specific to the health of Lake Victoria and its Management appear in a paper presented to the Living Lakes African Regional Conference held in Kisumu, Kenya in October 2005.

[60] PAD, Annex 1, p. 49.

[61] PAD Annex 1, p. 49.

[62] Kiwango and Wolanski 2007, p. 95

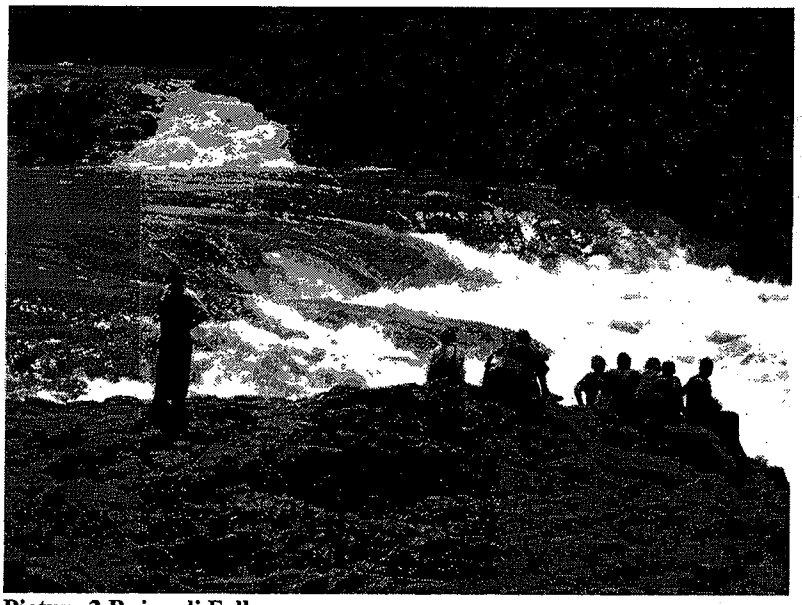
exacerbating the infestation of the water hyacinth exotic weed. Global warming may also be accelerated."

89. Low water levels also lead to a decline in electricity generated from hydropower. Load shedding[63] disrupts industrial activity and reduces revenue from taxation; emergency thermal generation raises the cost of electricity to consumers.[64]

3. Bujagali Falls and Surrounding Habitats

90. The network of lakes within which the Bujagali project is located is rich with floodplains and wetlands and supports a diversity of animals and plants and many water-dependant ecosystems. It is also one of the most important areas in Africa for biological diversity.

91. The Project requires the flooding of important natural habitats including the Bujagali Falls, the riverbank portions of the Jinja Wildlife Sanctuary and the Nile Bank Central Forest Reserve, a protected area, and the island between the sections of the Bujagali rapids. In addition, the associated transmission lines would run through the important and valuable Mabira Forest, and an area of important and productive wetlands.



Picture 2 Bujagali Falls

92. The Jinja Wildlife Sanctuary, established in 1953, is a protected area which is home of several bird species, reptiles and a diversity of insects. When the Sanctuary was established, there were hippopotami in this section of the river.

[63] Load shedding is a controlled way of rotating the available electricity between all customers.
[64] EAC Report 2006, Section 3.4.3.

The Nile Bank Central Forest Reserve is a protected area held in trust by the national government for the people.

93. Many studies also document the diverse fish species, populations and fisheries in the Lake Victoria region, and the history of change and loss over the last decades due to human activities and interventions.[65] According to the Project Environmental Assessment, the Victoria Nile "originally had a very rich assemblage of fish dominated by riverine species." The EA states that while the dams have created a physical barrier for fish movements, "*viable population of many fish continue to exist in the Victoria Nile.*"[66] Hundreds of species have evolved to fill almost all of the major niches available to freshwater fishes.[67] Other studies, by comparison, raise significant concerns about the situation of fish species in the upper Nile, and the potential effects of the existing dams and the Project on these species. These studies and related issues of environmental impacts are considered in Chapter III (Environmental Issues).

4. The Project's Socio-economic and Cultural Setting

94. Most of the people living in and around the Project area are farmers, though fishing is also a very important economic activity for the area. In addition, the particular site of Project site is very attractive to tourists because of the scenic topography of the area and the rapids of the Bujagali Falls, which offer white water rafting opportunities. The potential impacts of the Project on the economy of the area, including through fishing and tourism, is a highly important element of the Request and is examined in Chapter VII (Involuntary Resettlement), which also examines the displacement of people within the area that would be flooded by the Bujagali dam.[68]

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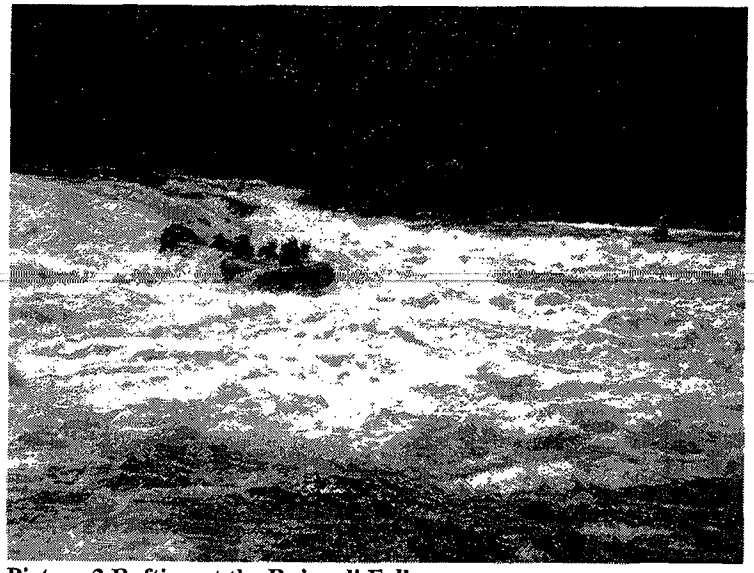
[65] Balirwa et al. 2003. See also fn 65.

[66] R J Burnside International Limited, Bujagali Hydropower Project Social and Environmental Assessment Main Report, December 2006. (D102) [hereinafter "HPP-SEA"] Executive Summary, p. 18. See also Salzburger W *et al* "Out of Tanganyika: Genesis, explosive speciation, key-innovations and phylogeography of the haplochromine cichlid fishes." *BMC Evolutionary Biology* 2005, 5:17. Available at <http://www.biomedcentral.com/1471-2148/5/17> The cichlid fishes of East Africa are "well known for their spectacular diversity and their astonishingly fast rates of speciation ...virtually all cichlid species from Lake Victoria (~500 species) ... are haplochromines"(1).

[67] Nile perch (*Lates niloticus*) is a large predatory fish that was introduced into Lake Victoria by man in the 1950s. An estimated 150-200 cichlid species from Lake Victoria are thought to be extinct as a consequence. Not all haplochromines are lacustrine (lake dwellers) and close to 200 species inhabit rivers. They are known to inhabit almost every available lake and river habitat. Rocky shores and islands are important refuges for a number of cichlid species that were formerly not restricted to rocky substrates, but now survive there to escape Nile perch predation.

[68] The process of resettling people in the area of inundation and other land areas taken as a result of the Project commenced in 2000 at the time of the prior Bujagali dam project, as discussed in Chapter VII even though the dam was not constructed and no flooding yet occurred.



Picture 3 Rafting at the Bujagali Falls

95. Another very important social aspect is that the Bujagali Project has a strong, complex cultural and spiritual tradition. The Busoga make up 46 percent of those living immediately adjacent to the dam site compared to 17 percent of the Buganda people. Although the peoples of other ethnic groups inhabit the Project area[69], the Busoga claim spiritual dominion of both sides of the Nile, its islands, the water and its waterfalls.[70] According to a 2002 census, there are about 2.7 million Busoga in Uganda, whose territory lies to the east of the Project site. [71] Their language, Lusoga, predominates in this area, on the East bank of the River Nile.

96. The Busoga share a common dialect and ideological, spiritual history, sharing a cluster of eight or more high status spirits – including *Budhagaali*, the spirit residing at the Bujagali Falls site – who are invoked in their specific ceremonies. The Busoga are distinct from the Buganda, Uganda's largest ethnic group - whose traditional realm reaches to the west bank of the Nile. The potential implications of the Project on places of cultural and spiritual significance to local people, and whether the Bank has complied with its operational policies and procedures on these matters, is addressed in Chapter VIII (Cultural Property)

[69] Several ethnic groups live in and around the Project site, including the Busoga and Busanga people whose lives and livelihoods will be affected by the Project.

[70] The 2001 RAP states its baseline survey identified 22 ethnic groups living in the project area (HPP-SEA, p. 161). The region was repopulated by migrants from throughout Uganda and other central African countries in the 1940's after being nearly abandoned by the Busoga at the turn of the century due to sleeping sickness. (Bujagali Power Project - Hydropower Facility - Resettlement and Community Development Action Plan, March 2001 (D001) [hereinafter "RCDAP 2001"], p. 98).

[71] Obwa Kyabazinga Bwa Busoga Online: <http://www.busoga.com/aboutBusoga.php>

C. The Project Description

97. The Project consists of the construction of the Bujagali hydropower plant on Dumbbell Island on the Nile River, just below the Bujagali Falls, about 8km downstream from the existing Nalubaale and Kiira Hydropower Plants. Under the Project, an intake powerhouse complex providing a maximum capacity of 250MW and a rock filled dam about 30 meters high with spillway and other associated works will be developed. On the west bank of the Victoria Nile, adjacent to the powerhouse, a high voltage substation, the Bujagali Substation, through which all power generated from the Project will flow, is to be constructed.[72]

Picture 4 Panel team at Bujagali Dam Construction Site

98. The reservoir, which will inundate the Bujagali Falls and the islands, is to have an estimated surface area of 388 hectares (ha) at full supply level, which will provide a total volume of water at full supply level of 54 million m^3. The Project requires 238 ha of land take to construct project facilities and thus will cause the involuntary resettlement of affected people living in and around the site. The flooding for the reservoir will also cause the loss of white water rafting opportunities over 2.5 km from the Bujagali Falls to Dumbbell Island.

99. The Bujagali hydropower system also includes the construction of 100 km of transmission lines, a new substation at Kawanda and the extension of the

[72] PAD on a Proposed International Development Association Partial Risk Guarantee in the amount of up to US$115 million for a Syndicated Commercial Bank Loan and on a Proposed International Finance Corporation Financing consisting of: an "A" Loan in the amount of up to US$100 million and a "C" Loan in the amount of up to US$30 million, and on a Proposed MIGA Guarantee in the amount of up to US$115 million for Sponsor's Equity to Bujagali Energy Limited for the Private Power Generation (Bujagali) Project in the Republic of Uganda, April 2, 2007, p. 9.

substation at Mutundwe, all financed by the African Development Bank (AfDB) under the Bujagali Interconnection Project (BIP).[73]

100. The PAD states that Dumbbell Island was chosen as the Project location because at this point the river is divided into two channels, a division that provides support for the dam and facilitates the construction of cofferdams. The embankment is to be located across the eastern channel at the downstream end of Dumbbell Island, and the powerhouse and spillway will be in the western channel.[74] Located downstream from the Nalubaale and Kiira plants, the Bujagali dam is to use water released from Lake Victoria that passes through the two existing hydropower plants.

101. As noted earlier, Bujagali Energy Limited (BEL) is to develop the Project. BEL is responsible for financing, constructing and operating the Project "*on a Build-Own-Operate-Transfer basis.*" On December 13, 2005, BEL and the Government signed the Implementation Agreement (IA), which defines the rights and obligations of BEL and the Government.

102. BEL is to sell the contracted capacity of 250MW exclusively to the Uganda Electricity Transmission Company (UETCL), which agreed to purchase the Project's contracted capacity under a 30-year Power Purchase Agreement (PPA), also signed on December 13, 2005. This agreement was amended and restated on May 25, 2007.[75] The Government will guarantee UETCL's payment obligations to BEL.[76]

103. The Project is a Public Private Partnership between the private project sponsors, the GoU, multilateral and bilateral development agencies, and commercial lenders as beneficiaries of the proposed IDA Guarantee. The total Project cost is estimated to be around US$798.6 million.[77] The International Development Association (IDA)[78] supports the Project through a partial risk guarantee of US$115 million, guaranteeing the commercial lenders involved in financing the Project against debt service and payment defaults of the Government in relation to the Government's payment obligations set forth in the Implementation

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[73] Bujagali Interconnection Project is closely related to the Bujagali Hydropower Project and will provide the transmission infrastructure to interconnect the new Bujagali hydropower station to the national electricity grid. A loan in the amount of approximately $28.6 million USD from the African Development Fund of the African Development Bank (AfDB) was approved by its Board of Directors on June 28, 2007.

[74] PAD, Annex 4, p. 63.

[75] The Requesters claim that there is no evidence that the Power Purchase Agreement (PPA) was debated and approved by the Ugandan Parliament. In his legal opinion dated May 31, 2007, the Attorney General of the Republic of Uganda issued an opinion stating that the Power Purchase Agreement "*...was duly authorized, signed, executed, and delivered*" and was legally binding on the Parties "*in accordance with the terms and conditions contained therein*", adding that "*there are no more legal formalities required to be fulfilled to make...the Power Purchase Agreement...more binding on the Parties.*" It should be noted that the PPA was amended and restated once more on December 6, 2007.

[76] PAD, p.19. The terms of this guarantee are included in the Implementation Agreement.

[77] PAD, Annex 5, p. 67.

[78] In this Report, the terms "IDA" and "the Bank" are used interchangeably.

Agreement. Under an Indemnity Agreement signed between IDA and the Government, the latter would reimburse IDA of any claims and expenses suffered if IDA were called upon to make payments under the Guarantee Agreement. The Project is also financed through, *inter alia*, an International Financial Corporation (IFC) loan and a Multilateral Investment Guarantee Agency (MIGA) Guarantee. In total, the World Bank Group's financial support to the Bujagali Project is up to US$360 million. IDA's Board of Executive Directors approved the IDA Guarantee on April 26, 2007.

104. As noted earlier, the Project is the second effort to develop the Bujagali Hydropower Project. On December 18, 2001 the World Bank Group approved its support to the prior Bujagali Project, which was to be undertaken by the AESNP. However, AESNP later withdrew because of, among other things, the company's "*weakening financial position.*"[79] The Government terminated the Project-related agreements in 2003. Though the Project under investigation in the present Report is considered a new financial operation, its design is practically the same as that of the project stopped a few years back.[80] In the first effort to develop the Bujagali dam, certain activities were initiated but not completed, such as the resettlement program leading to "legacy issues" for the current Project, discussed below.

105. The current Project presents a number of significant social and environmental issues and challenges. Two of these, relating to resettlement and cultural property, are noted briefly below. These and others, including those relating to environmental impacts and the Kalagala Falls offset, are dealt with in detail in subsequent chapters of this Report.

1. The Resettlement Program

106. Under the first Bujagali project, AESNP – the previous sponsor – began the physical resettlement of people whose land was to be taken by the Project, and paid compensation as part of the Resettlement and Community Development Action Plan (RCDAP).[81] The PAD states that the previous sponsor "*completed the planned compensation*" and that "*the resettlement housing was also completed and the 34 families have moved into it.*" However, "*several activities under the RCDAP were not completed at the time AESNP departed the project; these were primarily income generation activities.*"[82] Under the new Bujagali Project, the new sponsor BEL prepared an Assessment of Past Resettlement Activities and Action Plan (APRAP), which identifies the new Sponsor involuntary resettlement responsibilities.

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[79] Management Response, ¶ 20.
[80] As described in Chapter V, the power generation capacity of the Project is 250 MW, while that of the prior project was 200 MW.
[81] PAD, Annex 15, p. 142.
[82] PAD, Annex 15, p. 142.

107. To help complete the pending income restoration activities at the hydropower site, the Project documents state that BEL has committed to three programs: "*agricultural improvement, fisheries and small business support and microcredit.*"[83] BEL also developed a Community Development Action Plan (CDAP) which includes actions aimed at improving livelihoods of Project affected people; improving the overall quality of life by expanding on basic services such as water and sanitation, health and education; and providing mechanisms for dealing with vulnerable people.[84] These issues are addressed in Chapter VII (Involuntary Resettlement).

2. Cultural Resources

108. In the context of the prior Bujagali project, AESNP prepared a Cultural Property Management Plan (CPMP), which identified the project affected sites that are culturally significant for the local population: rocks, trees and land sites associated with spiritual forces, which, the local population believes, speak through medium or traditional spiritual leaders. Under the prior project, traditional leaders stated that the spirits would have accepted changes to the landscape of the area if appropriate ceremonial procedures were undertaken and financed by AESNP. AESNP carried out the ceremonies. According to the PAD, however, the consultations that BEL carried out with the Kingdom of the Busoga and the Busanga people revealed that additional ceremonies were necessary. These ceremonies are to be carried out under the current Project. This issue is addressed in Chapter VIII of this Report.

D. World Bank Involvement in Uganda Power Sector, the Lake Victoria and the Nile River basin

109. World Bank involvement in the Uganda power sector, through IDA, dates back twenty years, with projects supporting, among other things, the rehabilitation of the Owen Falls Dams (Nalubaale), the construction of the Owen Falls Extension (Kiira) and expansion of rural electrification. The World Bank Group's role in general aims at supporting infrastructure development and mobilization of private investments, the Government's power sector reforms, the structuring the project financing and the implementation of environmental and social policies acceptable to the World Bank.

110. According to Management, "*Uganda's Renewable Energy Policy and Plan provides for "off-grid" electricity options such as solar PV and micro-hydro, as well as biofuels for cooking and industrial applications. The Bank and other donors are actively supporting these programs as well.*"[85] Currently the World Bank Group is involved with three ongoing power projects, the Fourth Power Project, the Energy for Rural Transformation Project, the Private Power

[83] PAD, Annex 15, p. 143.
[84] PAD, Annex 15, p. 143.
[85] Management Response, p 27.

Generation/Bujagali Project. The Energy for Rural Transformation (ERT) Project (FY02) has supported preparation of a renewable energy resource database and capacity building plan[86]. It is also supporting investments in renewable energy power generation, including bagasse based cogeneration, mini-hydro, and micro-hydro. The Fourth Power Project (FY08) is supporting geothermal exploration in western Uganda (Kibiro and Katwe), including shallow-well drilling which is required to assess the resource. In addition several projects, including the Thermal Generation Project and the Karuma Hydropower Plant, are being proposed.[87]

111. The World Bank has also supported the Lake Victoria Environmental Management Project (LVEMP), a regional project, carried out under a Joint Project Agreement involving Uganda, Tanzania and Kenya. The LVEMP was the first phase of a longer-term program, intended to maximize benefits for riparian countries from using resources within the lake basin for food, employment etc, to conserve biodiversity, and to build scientific and institutional capacities to stop the environmental deterioration of the lake and its surrounding ecosystems. This effort comprised separate projects, implemented by national secretariats in the three countries and coordinated by a small regional secretariat, established in Arusha, Tanzania. [88] The LVEMP was launched in 1997 and funding for it totaled around US$ 75 million over a seven year period until 2005.

112. **Nile Basin Initiative**. The World Bank is also a partner of the Nile Basin Initiative (NBI), a regional partnership led by all ten Nile Basin countries: Burundi, Democratic Republic of Congo (DRC), Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda. NBI was launched in 1999 as a basin-wide framework to "*develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security.*"[89] The Nile riparian countries agreed on a "*shared vision*" to "*achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.*" NBI's structure consists of the Council of Ministers of Water Affairs of the Nile Basin Countries, the Technical Advisory Committee and the Nile Basin Secretariat. The World Bank has been involved in the Nile Basin Initiative since 1997 in partnership with UNDP and the Canadian International Development Agency (CIDA), "*to facilitate dialogue among the NBI countries and to chair the International Consortium for Cooperation on the Nile (ICCON) Consultative Group Meeting in Geneva, Switzerland in June 2001.*" About US$130 million were initially committed by the partners to the

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[86] Most recent report: Fourth Interim Report for Renewable Energy Resource Information Development and Capacity Building Assessment, Kamfor Company Ltd. April 2006.

[87] The issue of alternative energy generation options is further analyzed in Chapter V of this Report.

[88] PAD for the Supplemental Credit Document International Development Association Proposed Supplemental Credit To The United Republic Of Tanzania For The Lake Victoria Environmental Management Project, September 17, 2004.

[89] Nile Basin Initiative (NBI) Background at http://www.nilebasin.org/index.php?option=com_content&task=view&id=13&Itemid=42, (accessed on July 10, 2008).

Initiative and a multi-donor Nile Basin Trust Fund (NBTF), currently administered by the World Bank, was established to channel these funds to NBI.

113. One of the programs carried out under the NBI is the Nile Equatorial Lakes Subsidiary Action Program (NELSAP), the mission of which is "*to contribute to the eradication of poverty, to promote economic growth, and to reverse environmental degradation in the NEL* [Nile Equatorial Lakes] *region.*"[90] The NEL region includes the six countries in the southern portion of the Nile Basin—Burundi, Democratic Republic of Congo, Kenya, Rwanda, Tanzania and Uganda—as well as the downstream riparian states Egypt and Sudan. Under the NELSAP a Strategic/Sectoral, Social and Environmental Assessment (SSEA)[91] was prepared "*to provide guidance on the power generation options available in the region, based on an assessment of electricity demand, project costs, and environmental and social issues surrounding such projects.*"[92] The SSEA is analyzed in Chapter III of this Report - Environmental Issues.

[90] Nile Basin Initiative (NBI): http://www.nilebasin.org/ (accessed on July 10, 2008).
[91] Strategic/Sectoral, Social and Environmental Assessment of Power Development Options in The Nile Equatorial Lakes Region, February 2007.
[92] PAD, p. 43.

Chapter III

Environmental Issues

114. The Request submitted to the Inspection Panel presents a number of claims centered on the social and environmental studies supporting the Project. In the Requesters' opinion, these studies are generally inadequate and violate the Bank's Policy on Environmental Assessment (OP/BP 4.01). The Request develops from the overarching claim that the Project's SEA is based on old data—some of these data are allegedly 10 years old—which have "*little or no bearing to current situation*" and "*do not reflect the current environmental realities*" of the Project area. In the Requesters' view, the SEA also does not take into consideration specific important aspects of the Project, such as the hydrology of Lake Victoria and the Lake's long term health; the need for a cumulative impact assessment, and the consideration of climate change effects, all of which may have a significant impact on the production of hydropower.

115. In general, Management responds that the Project is a new operation and, as a result, social and environmental aspects have been reassessed. It adds however, that drawing upon former studies, the Project benefited from the baseline social and environmental data gathered for the prior Bujagali Project by AESNP. Management states that the current Project "*has also retained its original environmental footprint*" and the work conducted was designed to build upon earlier data and additional studies were undertaken as needed, to confirm or update that baseline.[93] Management considers that the baseline data gathering was satisfactory. Management also argues that the SEA addressed social and environmental issues related to the Project while "*the broader climate change (and hydrology) aspects were addressed in different studies*,"[94] in particular the SSEA prepared under the Nile Basin Initiative (NBI).[95]

116. Paragraph 2 of OP 4.01 states that the: "*EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favors preventive measures over mitigatory or compensatory measures, whenever feasible.*"

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[93] Management Response, p. 22.
[94] Management Response, p. 19.
[95] The Nile Basin Initiative was described in Chapter II of this Report.

117. This chapter of the Report begins by examining the general claim related to the adequacy of the social and environmental assessment studies related to the Project. The analysis of the specific issues, especially in relation to cumulative assessment and fisheries follow. Further sections of the chapter address issues related to the Kalagala offset and the safety of dams. Specific issues relating to the hydrology of the Lake Victoria and climate change are analyzed in Chapter V. Issues of involuntary resettlement, and cultural issues, are examined in Chapters VII and VIII.

A. The Environmental Component of the Social and Environmental Assessments

118. The objective and the main provisions of the policy on Environmental Assessment have been laid out in the preceding paragraph and will serve as the guiding norm for the Panel's analysis. As needed each section will also point to other specific provisions of OP 4.01 relevant for the discussion.

1. Adequacy of the studies

119. The Panel notes that the Sponsor, with input from Bank Management, has contracted international consultants to prepare the required SEA for the Bujagali Hydropower Project[96] and the Bujagali Interconnection Project.[97] The Panel has found evidence that the Regional environment sector unit as well as the Environment Department were actively involved in guiding the preparation of the SEAs.[98]

120. Because of the Project's history and the prior attempt to develop the Bujagali Hydropower Project, initial social and environmental studies, prepared under the previous sponsor AESNP, preceded the SEA studies required for the present Project. **The Project has appropriately been classified as category "A", the category under Bank policy used for projects with the most serious level of impacts. This complies with OP 4.01**. This classification together with key environmental issues and an Environmental Data Sheet are recorded in the Project's Concept Note, Appraisal Document and implementation documents.

121. OP 4.01 requires that an EA report on a project include the following: an executive summary; a survey of the policy, legal, and administrative framework within which the project will be undertaken; a concise description of the project; appropriate baseline data; and an assessment of environmental impacts taking into account human health and safety and social aspects, including involuntary resettlement, indigenous peoples and cultural property. It also requires

[96] HPP-SEA

[97] Bujagali Interconnection Project, Social and Environmental Assessment Report, December 2006 (hereinafter "IP-SEA")

[98] World Bank Management interviews, September 2007.

identification of mitigation measures and residual negative impacts that cannot be mitigated; a systematic comparison of feasible alternatives to the Project site – technological, design, and operation; and an environmental management plan to cover mitigation measures, monitoring, and institutional strengthening if required. These requirements are outlined in Annex B of OP 4.01

122. The Panel finds that, apart from the omission of an EMP, discussed below, the SEA includes the elements required by Annex B of OP 4.01. The Project is fully described and set in an appropriate policy, legal and administrative framework. Baseline data are provided, as is an assessment of the environmental impacts of the proposed alternative. Feasible technological, design and operational alternatives are examined. The study takes a holistic approach to environmental issues and considers natural aspects in an integrated way. The country's overall environmental policy framework, national legislation, and obligations under relevant international treaties and agreements are considered.

123. The preceding finding relates to the SEA in its entirety. Separate parts of the study are considered in the following sub-sections of this chapter.

2. Environmental Management Plan

124. The first paragraph of Annex C of OP 4.01 reads:

> *A project's environmental management plan (EMP) consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures.* [footnote omitted] ***Management plans are essential elements of EA reports for Category A projects*** ... (emphasis added)

125. The Panel notes that the SEA lacks of a detailed EMP for the Bujagali Hydropower Project. Although fourteen action plans are outlined in the SEA (seven sponsor plans and seven contractor plans) those that relate to Environmental Mitigation and Monitoring have yet to be drawn up for implementation.[99] **The fact that the EMP is not an integral part of the SEA that has been disclosed is a deficiency. This is not in compliance with the requirements of OP 4.01.**

[99] See Sections 8.3.7 and 8.4.7 of HPP-SEA and Sections 8.3.6 and 8.4.1 of the IP-SEA.

3. Institutional Capacity

126. The Panel notes that the need for strengthening country institutional capacity in the social and environmental sectors[100] was identified in the Project Concept Note (PCN) under the heading "Technical Assistance to the Government," among other things to assist the Government with monitoring the environmental and social compliance aspects of the Project. This requirement however was not carried through into the Project Identification or Project Appraisal documents. In the Panel's view adequate capacity to implement the social and environmental aspects of a project is critical for its success. OP 4.01 requires that when there is inadequate legal or technical capacity to carry out EA functions, the Project includes components to strengthen that capacity.[101] **This requirement to support needed capacity building, which is important in the implementation of the social and environmental aspects, has not been complied with in this Project.**

4. Independent Panel of Experts

127. The Panel also finds that although there is evidence that both the World Bank and the Sponsor have engaged the services of independent experts to review and advise on many aspects of the Project,[102] an independent panel of internationally recognized environmental specialists has not been appointed for the Project. This is not in accord with Paragraph 4 of OP 4.01, according to which in "*Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA.*"[103] **As the Project is contentious and involves complex multidimensional environmental concerns, appointment of an environmental panel of international experts is warranted and the lack of such a panel is not in compliance with OP 4.01.**

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[100] Particular concern is expressed and advice sought on: (a) Bujagali and transmission line project management; (b) contingent liabilities management; (c) financing second stage of geothermal drilling; (d) funds to foster potential tourism/other investments at the Caligula offset site; (e) to assist NEMA to monitor the environmental and social compliance aspects of the project; and/or (f) funding of community development activities that the sponsors may not be willing to finance through either debt or equity.

[101] OP 4.01 ¶13.

[102] Bujagali Hydropower Development Uganda Project Review and Assessment Report for IFC, prepared by Colenco Power Engineering Ltd., February 2007 (hereinafter "Colenco 2007"); Power Planning Associates, Economic and Financial Evaluation Study, December 2006; Bujagali Hydroelectric Power Project Transmission Interconnection Study System Analysis Report for TRC Global Management Solutions LP, prepared by Siemens Power Transmission & Distribution, Inc. Power Technologies International, August 2006 (hereinafter 'Siemens 2006").

[103] OP 4.01 ¶4. The policy also reads: "The role of the advisory panel depends on the degree to which project preparation has progressed, and on the extent and quality of any EA work completed, at the time the Bank begins to consider the project."

5. Disclosure of Project Documentation

128. The Requesters believe that the Project SEA does not address significant potential impacts of the Project in relation to hydrology, the long term health of Lake Victoria, climate change and cumulative impacts. They also complain that the only document they had the chance to review was the Project's SEA while the "*World Bank has also recently refused to publicly release information on the Nile hydrology and the impacts of Kiira Dam's operations on the levels of Lake Victoria.*"

129. Management states that the SEA addressed social and environmental issues related to the project while climate change and hydrology were addressed in different studies—in particular the SSEA prepared under the Nile Basin Initiative—which were all publicly disclosed. Management states that "*learning from the past*" the Government "*implemented a stronger program of public disclosure.*" The Bank has disclosed the Project's Economic Study, the SEA and the SSEA, along with other environmental and social documents in the InfoShop in Washington and in various locations in Uganda.[104] It is Management's position that "*many of the information-related questions of the current Request are addressed within the body of information and analysis made available to the public.*"[105]

130. Paragraph 7 of OP 4.01 states that a range of instruments—environmental impact assessment (EIA), regional or sectoral EA, environmental audit, hazard or risk assessment, and EMP—can meet the policy's EA requirement, and these are used as appropriate. In addition, a sectoral or regional EA is required if the Project is likely to have sectoral or regional impacts.

131. This is qualified by a sentence from paragraph 8(a) of OP 4.01: "*For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the other instruments referred to in para. 7.*" In the section headed "Disclosure" OP 4.01 also requires that "*For a Category A project, the borrower provides for the initial consultation a summary of the proposed project's objectives, description, and potential impacts; for consultation after the draft EA report is prepared, the borrower provides a summary of the EA's conclusions.*"

132. The Panel notes that the Bujagali SEA makes only a passing reference[106] to the SSEA.[107] The latter study was managed and supervised by the World Bank and financed by the Canadian International Development Agency (CIDA) for the Nile Equatorial Lakes Subsidiary Action Program of the NBI. It was completed in

[104] Management Response, ¶ 39.
[105] Management Response, ¶24.
[106] HPP-SEA, Sections 4.3.4 (p. 183–4) and 7.6.6 (p. 436–7).
[107] SSEA.

February 2007, two months after the Bujagali SEA. The SSEA makes no mention of the Bujagali SEA.

133. The SSEA was undertaken, according to the PAD, "*to provide guidance on the power generation options available in the region, based on an assessment of electricity demand, project costs, and environmental and social issues surrounding such projects.*"[108] The PCN (the first document the Bank makes public containing essential information about a proposed project and financing), preceding the PAD, had also pointed to the 2002 Inspection Panel Investigation Report related to the prior Bujagali Project stating that the Project would take note of the issues raised in the Panel's report, including "*paying particular attention to undertaking a Strategic Sectoral Environmental Assessment and Cumulative Impacts Study.*"[109]

134. **It is clear from reading the two reports, the SEA and the SSEA, and the complete lack of cross-references between them, that they do not form part of the same suite of documents**—the link between them being that they both deal with the topic of electrical power in East Africa and were both supervised by the World Bank. Nevertheless the Management Response to the Request for Inspection gives the Nile Basin SSEA as the source of data and analysis of the potential effect of climate change on the Bujagali Project[110] as well as for Cumulative Effects of the project.[111]

135. Although the policy does not contemplate reports from one project/program being used to fulfill the requirements of another project—in this instance studies conducted under the NBI—the Panel is of the view that, in the interests of efficiency, an EA may, in principle, refer to and/or incorporate, as appropriate, other relevant studies. However, as the purpose of both the sectoral and project specific EA is to disclose information relevant to a decision, the fact that one study is reliant on another must be clearly stated and disclosed in project documentation.[112] Without this, information important to a project is obscured even if it is disclosed independently, which weakens or undercuts the achievement of the key elements of OP 4.01 relating to informed decision-making, public consultation and disclosure. The Panel finds justifiable the Requesters complaint that some aspects of the Project, that is effects of climate change and the cumulative effects,[113] have not been properly addressed in the project SEA. **The Panel acknowledges that the necessary studies have been conducted and**

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[108] PAD, p. 18 states that the SSEA was undertaken to "*provide an overview analysis of the social and environmental issues surrounding possible regional power development options in the Nile Equatorial Lakes Region of Africa based on demand scenarios up to 2020, taking into account potential climate change and cumulative impacts from multiple investments.*"

[109] PCN, Section B(e), p. 5.

[110] Management Response, Annex 1, Section 4, p. 19.

[111] Management Response, Annex 1, Section 6, pp. 20–1.

[112] A clear statement and graphic showing the inter-relationships and entire suite of documents that constitute the studies making up the SEA should be included as a preface to all such related documents.

[113] For a discussion of climate change and cumulative effects, see Chapter V.

disclosed, albeit independently, and considered by Management and referred to specifically in the PAD. However, the failure to disclose the SSEA or its relevant parts as an integral part of the Bujagali Hydropower Project's documentation in a timely manner is not consistent with OP 4.01.

6. Cumulative Impacts of Bujagali and Existing and Future Hydro Projects

136. Cumulative effects are changes to the environment that are caused by an action (a project) in combination with other past, present and reasonably certain future human actions irrespective of who undertakes such actions. Consideration is given to effects on: (i) bio-physical components of ecosystems and (ii) socio-economic and cultural characteristics of the affected space. The stress is on analyzing known or probable additive or synergistic interactions, and not simply the direct effects of the particular action under assessment.[114]

137. The Requesters claim that the issue of cumulative effects "*remains unresolved*" in spite of the Inspection Panel's 2002 finding that "*the issue of cumulative effects, addressed by Management and raised by the Requesters, is of real significance and is deserving of greater attention.*" In the Requesters' opinion, the SEA does not discuss cumulative impacts, and BEL did not attempt to identify issues, especially with respect to the health of the Lake Victoria, arising from building a cascade of dams on the River Nile, including Bujagali.

138. Management argues that cumulative impacts of the current Bujagali Project are addressed as part of the Project's SEA and in the SSEA. BEL's SEA examines the cumulative impacts of Bujagali, the hydropower plants at Nalubaale, Kiira and Karuma along with the transmission facilities on the Victoria Nile in Uganda. It focuses specifically on the reach of the river between Lake Victoria and Lake Albert and takes into account other initiatives such as environmental offsets, natural areas, parks, reserves and so on. The SEA concludes that the socioeconomic impacts of Bujagali, generally, would be local because the existing Nalubaale–Kiira power plants and Bujagali are separated by Lake Kyoga from Karuma Falls and other potential hydropower sites downstream on the Nile River. In addition, the SSEA analyzes the cumulative impacts of several hydropower development alternatives under differing scenarios of regional grid integration. It concludes that developing Bujagali and other sites in the Victoria Nile Basin (excluding Kalagala) will not have significant cumulative environmental impacts. The SSEA analyzes and ranks potential future power options, based upon multiple criteria. These are: assessment of direct, indirect/induced and cumulative impacts of multiple activities; additional costs and benefits through multi-purpose use of

[114] See for example: Larry Canter & Barry Sadler, A Toolkit for Effective EIA Practice—Review of Methods and Perspectives on their Application; A Supplementary Report of the International Study of the Effectiveness of Environmental Assessment, (International Association for Impact Assessment 1997) at, Chapter 5. See also Considering Cumulative Effects under the National Environmental Policy Act: Handbook on Cumulative Effects Analysis, (Council on Environmental Quality 1997), and Cumulative Effects Assessment Practitioners Guide (Canadian Environmental Assessment Agency 1999).

storage reservoirs; risk of rainfall variability; and sharing of benefits at the local and regional level. Management also claims that the studies conducted to inform the decision making process of the first Bujagali Hydropower Project served as part of the information base for the SSEA.[115]

139. Annex A of OP 4.01 states that a "[s]*ectoral EA pays particular attention to potential cumulative impacts of multiple activities*." The Management Response draws attention to section 14 of the SSEA. This section is headed "Assessment of Cumulative Impacts," covers 33 pages and provides an overview of the consequences of various portfolios of regional power options being adopted. However, the Panel notes that there is neither detailed analysis of the existing and proposed hydropower projects on the Victoria Nile nor of the Transmission Lines linking these projects to load centers.[116]

140. The analyses in the SSEA allow a comparison amongst the various proposed portfolios of power development options in the Nile Equatorial Lakes Region. **They do not, however, provide a systematic examination of the potential consequences of the Nalubaale and Kiira facilities, the Bujagali Project, and the planned Karuma project all being situated on the Victoria Nile between Lake Victoria and Lake Kyoga.** In addition, there is no examination of the impact of additional transmission lines between the hydropower stations and Kampala. **Although section 14 of the SSEA is headed "Assessment of Cumulative Impact" the Panel finds that the analyses are not sufficiently backed by evidence and include opinions rather than careful fact-based examinations of the additive effects of impacts from present and foreseeable projects.**

141. The Bujagali Hydropower SEA seems to address cumulative effects in more detail. For example a paragraph of section 7.7.3 of the Bujagali Hydropower SEA reads:

> *The following impacts are considered to be negative cumulative impacts of the Bujagali HPP ... all are judged to be of minor significance:*
>
> • *Relocation of people with compensation to accommodate the project's construction, facilities and operations;*
>
> • *Aesthetic impacts from the presence of another dam with the potential for knockon tourism impacts (potentially positive, as well, however);*

[115] Management Response, pp. 6 and 20.

[116] SSEA sections 14.7.1.5, 14.7.2.3 and 14.7.4 come closest to an analysis of the cumulative effects of adding the Bujagali and Karuma Hydro-power facilities to those already existing at Nalubaale and Kiira. Section 14.7.1.4 provides a brief statement on the potential cumulative effects of transmission lines.

• *Some disruption of the natural flow regime over an ~8-km stretch of the river Nile downstream of and as a result of Nalubaale and Kiira: with associated impacts on aquatic organisms and communities (also potentially positive if productivity of reservoir increased); and, river users (fishers) – also potentially positive if increased productivity in reservoir is reflected in fishers' catches.*

• *Losses of wildlife populations and habitats, as well as agricultural lands, due to inundation of terrestrial habitats.*

142. However, no data or arguments are provided to substantiate the above statements, including the judgment that the negative cumulative impacts of the Project are of minor significance. There is no determination of how many people stand to involuntarily lose access to their assets, how much agricultural land is to be lost, the extent to which riverine forest habitat will be lost, or the extent to which tourism will be affected.

143. **In light of the foregoing, the Panel finds that neither the SSEA nor the SEA has addressed the cumulative effects of the existing and planned projects in a meaningful way. This is not in compliance with OP 4.01.**

6.1 Cumulative Impacts of the Transmission Lines

144. Section 7.3.9 of the Interconnection Project SEA reads as follows with respect to the cumulative effects of transmission lines from Jinja to Kampala:

Cumulative effects resulting from the proposed interconnection project include the following:

Ecological Features

• *Wayleave width through Mabira and Kifu CFRs will increase from current 30 m to 65 m, but future potential incremental increase to 90 m (3-132 kV x 30 m) wayleave is avoided ...;*

• *Access to, and within, Mabira CFR may be improved and control measures implemented in collaboration with the NFA and UETCL, facilitating improved management of the forest; and,*

• *Recreational facilities within Mabira CFR will be relocated within the reserve and improved, resulting in a net positive benefit to the reserve and its users.*

Social Features and Conditions

• *By locating the transmission line between Bujagali and Kawanda substation parallel to the "northern route" versus the Danish International Development Agency (DANIDA) or 66 kV transmission corridor to the south, involuntary resettlement is minimised and sensitive compensation issues are not*

aggravated further. (Siting a new line adjacent to the DANIDA line could potentially displace some families for a second time as a result of transmission line construction.); and,

- *Landowners will receive compensation to meet World Bank Group requirements including in certain cases, a "top-up" over Government of Uganda requirements. In general, landowners may receive a small net positive benefit due to the project.*

Aesthetics

- *Visual impact of the interconnection project will be greatest in the vicinity of Lubigi Swamp where no major transmission infrastructure presently exists and along the Bujagali substation to the Tororo line connection (as seen from the eastern bank of the Nile River). Here, several transmission lines already come in/out of the Nalubaale switchyard.*

145. The Panel notes that these statements fail to address the cumulative effects of transmission lines or to propose mitigation to reduce additive effects. The cumulative loss of forest habitat from the transmission lines has not been determined and the statements relating to access and recreational facilities are not expressed in terms that allow determination of the overall cumulative effect of the multiple transmission lines. Cumulative impacts on social and aesthetic parameters are also not determined. The statement "*several transmission lines already come in/out of the Nalubaale switchyard*" is used to dismiss the possible aesthetic effect of yet another transmission line rather than to examine the cumulative effect of numerous lines emanating from the same switchyard.

6.2 Alternatives and Mitigation Measures—the Transmission Lines

146. The transmission lines that will transport electricity from the hydropower site pass through areas where people live, wetlands, and the ecologically important Mabira Forest. The Panel notes that the SEA fails to address the cumulative effects of transmission lines; neither does it propose mitigation to reduce additive effects.

147. The Panel was not furnished with documentation indicating that the Project considered ways to mitigate or reduce the amount of land taken for the second (Bujagali) transmission line. Rather, the Project assumed that the size of the existing right of way needed to be doubled, which is technically incorrect.[117] Considerate planning of the new transmission line to take into account the required minimum distance from the outside phases of the lines to the ROW edge, the minimum horizontal clearance required between phase conductors of the two

[117] See for example *Design Manual For High Voltage Transmission Lines*, Rural Utilities Service Bulletin 1724e-200, Electric Staff Division U.S. Department of Agriculture, May 2005.

lines, the spans and sags of the lines, as well as how structures of the two lines match up with one another, could significantly reduce the width of the required wayleave thus reducing the cumulative impact on Mabira and Kifu forest habitat as well as the number of families to be resettled. **The Panel finds that the failure to consider mitigation measures, which would reduce the social and environmental impacts of the transmission line, does not comply with OP 4.01 and OP 4.12.**

7. Environmental Impacts on Fisheries and Aquatic Systems

148. The Requesters express concern that the data on which the EA is based are dated and that such studies as were done were conducted over unrepresentatively short time periods. They express concern as to the accuracy of the surveys of endemic fish species.

149. Management responds that the Project builds on relevant work conducted for the prior Bujagali Project and on updated information gathered in further field studies and analysis, including studies on fisheries conducted for the prior project and updated for the current Bujagali Project. The Response adds that the Fisheries Resource Institute (FIRRI) conducted four surveys in 2000 and additional studies were carried out by the same institute (now known as National Fisheries Resource Research Institute—NaFIRRI) for BEL in 2006. The two sets of surveys (2000 and 2006) differ in number of species they found but according to Management "*this is to be expected*" and do not necessarily indicate species loss or extinction; it may be due to variations in data collection, migration or location of species. The overall conclusion is that the "*reach of the Victoria Nile that will be affected by Bujagali is not considered to be critical habitat for any fish species of conservation importance.*"[118]

150. As noted, OP 4.01 requires a project EA to evaluate potential environmental risks and impacts of the Project in its area of influence and to include a process to mitigate and manage adverse environmental impacts throughout project implementation, favoring preventive measures over mitigatory or compensatory measures if possible. OP 4.04 on Natural Habitats states that the Bank "*supports the protection, maintenance, and rehabilitation of natural habitats ... and expects borrowers to apply a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development.*" When a project would significantly convert or degrade a natural habitat, mitigation measures have to be provided for in the Project, measures such as minimizing habitat loss as appropriate.

151. The endemic cichlid fishes of East Africa are "*well known for their spectacular diversity and their astonishingly fast rates of speciation ...virtually all cichlid species from Lake Victoria (~500 species) ... are haplochromines*".[119] Hundreds

[118] Management Response, p. 23.
[119] Salzburger W *et al* 2005.

of species have evolved to fill almost all of the major niches available to freshwater fishes. Not all haplochromines are lacustrine (lake dwellers) and close to 200 species inhabit rivers. They are known to inhabit almost every available lake and river habitat. Rocky shores and islands are important refuges for a number of cichlid species that were formerly not restricted to rocky substrates, but now survive there to escape Nile perch predation.[120] The cichlids that inhabit rocky shores were less subject to Nile perch predation. Consequently, rocky habitats in Lake Victoria are important to the survival of some endangered cichlids. It may be construed that rocky habitats (rapids) are similarly important in the Victoria Nile, where the Nile perch is also a predator.

152. A baseline aquatic ecology and fisheries survey of the Victoria Nile was carried out by FIRRI in 2000.[121] The survey was based on quarterly surveys of water quality, aquatic plants, invertebrate animals and fish. Twenty sites were sampled using routine field and laboratory techniques. These sites covered all habitats present in the upper Victoria Nile from slower-flowing vegetated margins, to fast-flowing rapids. The field studies were carried out in February, May, August and October/November 2000 to assess seasonal conditions during Uganda's short and long rainy seasons, and the short and long dry seasons. Each survey used four transects, one above[122] and three below,[123] the Dumbbell Island site of the Bujagali Dam. Gill nets of graded mesh sizes as well as beach seines were used to sample habitats at each transect. This study found that the Upper Victoria Nile has two zones, each with a characteristic fish population. An upstream zone (transects 1, 2 and 3) is characterized by swift mid-channel current with rock outcrops and rapids such as Bujagali and Kalagala. Further downstream (transect 4), a zone with more gentle flow that is uniform across the channel occurs. In the upstream zone fish populations are better adapted to the rocky fast-flowing habitat than the fish populations occurring downstream. The study recommended further investigation of possible potamodromous[124] migratory behavior between the two zones and the role of the natural barriers (such as the falls at Bujagali and Kalagala) in separating fish species and causing different populations in the upstream and downstream reaches of the Victoria Nile. It also recommended a feasibility study of a fish pass at Bujagali to allow in-stream fish migrations from below to above the dam.

153. In 2001 an additional more detailed investigation of the haplochromine fishes was commissioned in response to the concern that the previous study had not adequately addressed the potential loss of rocky, fast-flowing habitats. Fieldwork for this supplementary study was carried out during July and August 2001. Eleven

[120] Nile perch (*Lates niloticus*) is a large predatory fish that was introduced into Lake Victoria by man in the 1950s. An estimated 150–200 cichlid species from Lake Victoria are thought to be extinct as a consequence.

[121] The National Fisheries Resources Research Institute (and the same institute under its former name–FIRI) is a reputable established research institute that has specialized in the study of Ugandan fisheries.

[122] Kalange-Makwanzi.

[123] Buyala-Kikuba Mutwe; Matumu-Kirindi; Namasagali-Bunyamira.

[124] Migration within streams or rivers.

sites were sampled to cover the range of fast-flowing and rocky habitats in the upper Victoria Nile, from Ripon Falls to Kakindu, 63 km downstream of Ripon Falls. Experimental fishing was carried out at each site, with equipment designed to target the haplochromine fishes, which are generally small fish less than 100 mm in length. Angling was also carried out by local fishermen with hooks and rods. In addition, sets of gill-nets (ranging in mesh size from 25 mm to 203 mm) were set overnight.

154. A final report of this haplochromine study was included as an appendix to the AES Nile Power Environmental Assessment. Part of the study's conclusion reads:

> *A total of 35 haplochromine cichlid species were recovered from the upper Victoria Nile by experimental fishing in rocky, rapidly-flowing habitats. All of the specimens recovered from sites upstream of Busowoko were previously known to science, and none are listed as threatened on the IUCN Red List for Uganda. The fact that they are relatively well known is probably due to the species flock in the upper reaches of the Victoria Nile being closely related, if not a continuation of, the well-studied Lake Victoria flock. All of the species recovered from the area between Owen Falls and Dumbbell Island are well known from sites in Lake Victoria, including the Mwanza Gulf (Tanzania), and the Napoleon Gulf (Uganda). These findings are similar to the findings of the FIRRI (2001) study.*
>
> *It is concluded that fast-flowing, rocky areas are not the principal habitat for haplochromine fishes in the upper Victoria Nile. Although the Bujagali Hydropower Project will result in a reduction in flow velocity in a 4 km stretch of the river, this area is not considered an important site for haplochromines. Reduction in flow velocities may in fact result in increased haplochromine abundance. Therefore it is concluded that the Bujagali Hydropower Project will not have a significant negative impact on haplochromine cichlids in the Victoria Nile.*[125]

155. The taxonomy of the East African haplochromines is the subject of ongoing debate in the fisheries literature. It has been found that species thought to be extinct are re-emerging in Lake Victoria.[126] The IUCN 2005 study *The Status and Distribution of Freshwater Biodiversity in Eastern Africa*[127] reports:

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[125] *Haplochromine Habitat Study*, Report No. AF6097/70/dg/1215 Rev. 2.0 (WS Atkins International Ltd and FIRRI 2001).

[126] Balirwa, J.et al 2003 p.703.

[127] Will Darwall, K. Smith, T. Lowe, & Jean-Christophe Vié, *The Status and Distribution of Freshwater Biodiversity in Eastern Africa* Occasional Paper of the IUCN Species Survival Commission No. 31 (IUCN 2005).

Many of the Lake Victoria cichlids were previously thought to be extinct but, following additional and more extensive surveys, it appears that a number of these species still exist in small pockets in the lesser-known parts of the main lake and in the smaller satellite lakes (e.g., Bisini, Kanyaboli and Nabugabo).

156. The IUCN 2005 study also concedes that assessments of the status of fish based on the 2003 Red Lists were not representative.

> *Two-hundred-and-fifty-two of the 901 fish taxa assessed at the global level (mostly endemic to the region) are threatened (28% of the total number of fish taxa assessed), with two species (Aplocheilichthys sp. "Naivasha" and Barbus microbarbis) thought to be extinct. This assessment provides a significantly improved picture for the regional level of threat than that previously obtained from the 100 species assessed for the 2003 IUCN Red List of which 87% were assessed as either threatened or extinct. These earlier assessments focused on the Lake Victoria fish community in an effort to highlight the apparent large-scale decline and loss of cichlid species due to the combined impacts of invasive species, eutrophication and possibly overfishing. Clearly this picture was not representative of the threatened status for fish throughout the region.*

157. **Based on its review of relevant research studies, the Panel observes that the status of the fish species inhabiting both Lake Victoria and the Victoria Nile is disputed and that ongoing research is desirable. However, significant effort has been devoted to study these fish in the reaches of the Victoria Nile that will be affected by the Bujagali Hydropower Project.**

158. As the FIRRI report on its Bujagali surveys had recommended a feasibility study of a fish pass, the Ugandan National Environmental Management Authority formally requested FIRRI to provide an indicative position on the necessity for a fish ladder at the Bujagali dam. In the FIRRI response, dated September 14, 2001, the Director writes as follows:

> *The Lake Victoria and Lake Kyoga basins are connected by the Upper Victoria Nile flowing out of Lake Victoria northwards to Lake Kyoga downstream, and, eventually through Lake Albert, the Albert Nile and beyond.*
>
> *The fish fauna of both lakes Victoria and Kyoga for the most part share a similar evolutionary origin. This means that many species of fish in Lake Victoria have also been recorded in Lake Kyoga.*

It is also well known that many species of fish in the lakes undertake longitudinal upstream migrations on a seasonal basis for spawning... These migrations have been well studied in fish from Lake Victoria migrating to inflowing rivers and streams... The Victoria Nile with respect to Lake Victoria is an OUT-FLOWING river. It becomes IN-FLOWING with respect to Lake Kyoga. [Emphases in original] This means that it is the in-flowing influence at the Victoria Nile–Lake Kyoga mouth where we would expect upstream migration.

The investigated transects of Dumbbell Island had a fish fauna which was in many respects similar to the Lake Victoria fish fauna. There was a transition zone from the third transect downstream of Dumbbell island merging into more typically Lake Kyoga fish fauna.

The most downstream transects also contained the highest density of anadromous (i.e. migrant species)... It was thus noted that from a fish migratory point of view, the Upper Victoria Nile behaved more as an IN-FLOWING river for fishes in Lake Kyoga.

... their occurrence throughout the system proved that there were riverine fish populations that breed within the river irrespective of the natural physical barriers. Such populations especially upstream were unlikely to be affected by other barriers in terms of breeding.

It was observed that inspite of the present Owen Falls Dam barrier, the fishes know to be migrants occur in Lake Victoria (where they migrate UPSTREAM) and also occur in sections of the river where breeding specimens have been found.

This indicates that these fishes breed within the river.

The present Owen Falls Dam is already a barrier to assumed migration towards Lake Victoria. Migrant fishes are found upstream and downstream of this barrier but the same species occur throughout the Upper Victoria Nile towards Lake Kyoga.

It is not justifiable that a fish ladder or pass would improve the stocks of migrating fish in the Upper Victoria Nile. Were this to be so (which it is not), the present Owen Falls Dam would need a fish pass, as would Owen Falls Extension. This is not necessary and ***a Bujagali Fish ladder is not scientifically justifiable.*** *(emphasis added). A barrier in the Upper reaches up to Dumbbell Island would not significantly affect the stability of fish populations in Lake Victoria and neither would a fish ladder be relevant.*"

159. The studies undertaken by, and the formal indicative position of, the Ugandan NaFIRRI are substantial and professional. Bank Management exercised diligence

in using these documents in its decision-making. **The Panel consequently finds Bank Management acted consistently with the provisions of OP 4.01 and OP 4.04 in so far as these relate to assessment of the likely consequences of the Bujagali hydropower Project on fish stocks in the Upper Victoria Nile and Lake Victoria.**

B. Mitigation Measures: The Kalagala Offset Agreement

160. The Requesters express concerns about the agreement between the World Bank and the GoU stating that the "*Government of Uganda undertakes that any future proposal which contemplates a hydro power development at Kalagala will be conditional upon satisfactory EIA being carried out which will meet the World Bank Safeguard Policies as complied with in the Bujagali Project. Government and the World Bank will jointly review and jointly clear such an EIA.*" In the Requesters' opinion this agreement is not a guarantee that the Kalagala Falls will never be developed for hydropower.

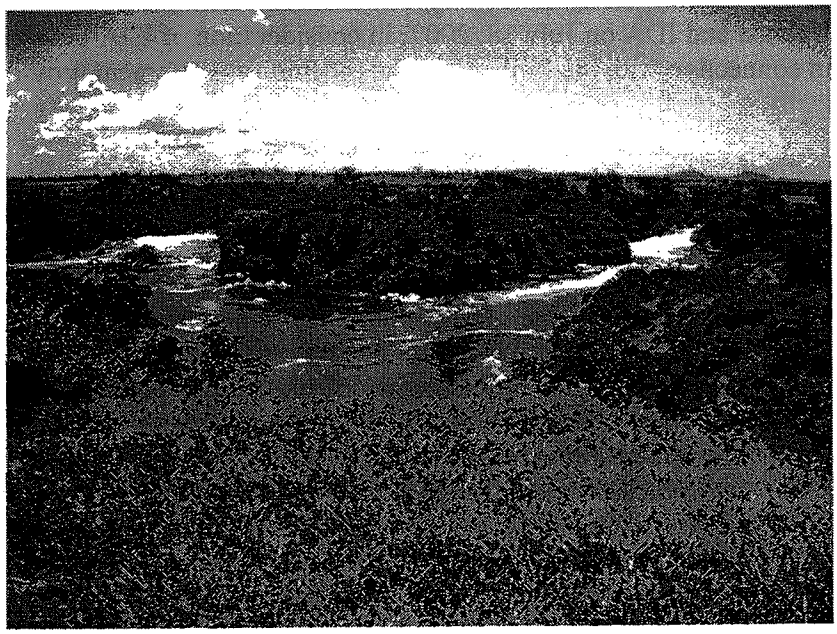
161. In its Response, Management claims that the offset provision related to the Kalagala Falls "*will be included as a GoU obligation in the IDA Indemnity Agreement for the Bujagali project, and will be binding throughout the life of the Indemnity.*"[128] This, in Management's view, is in compliance with OP 4.04 on Natural Habitats. Management also notes that, because the Bank's legal resort to enforce the Government's commitment is not available after the termination of the Indemnity Agreement, this agreement "*includes a provision that, prior to the termination of the Indemnity Agreement, the World Bank and the GoU will pursue discussions to identify mechanisms or instruments to enable the continuation of the GoU obligation to set aside the Kalagala Falls site.*"[129]

162. According to OP 4.04 on Natural Habitats, the policy of the Bank is to support the protection, maintenance, and rehabilitation of natural habitats and their functions in the Bank's work. The policy further states that in project design and implementation "*the Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs.*"[130] Further, it states that "*if the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project includes mitigation measures acceptable to the Bank. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g., strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically*

[128] Management Response, p. 22 and p. 10 ¶ 28
[129] Management Response, p. 22 and p. 10 ¶ 28
[130] OP 4.04 ¶5.

similar protected area."[131] The Bank, however, "*may accept other forms of mitigation measures only when they are technically justified.*"[132]

163. According to Project documents, the inundation of the riverbank portions of the Jinja Wildlife Sanctuary and Nile Bank Central Forest Reserve, as well as the islands between the sections of Bujagali rapids, is technically necessary for the hydropower project. As a result, there will be an irreversible impact to natural riverine forest as well as aquatic habitats. For natural habitats, OP 4.04 allows such impact to be mitigated by establishing and maintaining an ecologically similar protected area. The phrase "establishing and maintaining an ecologically similar protected area" has come to be known as "an offset."[133] Kalagala Falls, a site with hydropower development potential, was agreed between the GoU and the Bank to be an appropriate offset for the natural habitats that would be inundated by the Project.



Picture 5 Kalagala Falls

164. Considerable correspondence pertaining to the so-called "Kalagala offset" took place between the GoU, the project sponsor and the World Bank at the time of the 2001 proposal to develop a hydropower facility at Bujagali. This correspondence is reproduced as Appendix D1 of the SEA for the Bujagali Hydropower Project. Appendix D2 of this SEA provides a copy of a letter dated September 15, 2006 from the Ugandan Electricity Regulation Authority refusing a potential project sponsor permission to conduct investigations at Kalagala with a view to establishing the site's power generation potential. In this letter it is stated that:

[131] OP 4.04 ¶5.
[132] OP 4.04 ¶5.
[133] Management Response, pp. 21–22, 24.

"The Government position on the site is that it continues to be frozen for development purposes."[134]

165. However, the Requesters believe that the assurances given by the GoU in the correspondence with the World Bank "*...are not a guarantee that Kalagala Falls would never be developed for hydropower. The commitment on Kalagala Falls as an 'Off-set' by government of Uganda is not binding. It does not completely remove Kalagala as a future dam site.*"[135]

166. In order to meet the requirements of OP 4.04 the World Bank has conditioned its participation in the Project as follows: "*...the long term protection of the Kalagala Falls and the preclusion of development of hydropower potential at Kalagala is a necessary offset for World Bank Group participation in the proposed project.*"[136]

167. In this context, an Indemnity Agreement was entered to between the Republic of Uganda and IDA on July 18, 2007, in consideration of IDA providing a guarantee in connection with the Project.[137] The Indemnity Agreement provides that

> *Uganda shall:*
>
> *(a) set aside the Kalagala Falls Site exclusively to protect its natural habitat and environmental and spiritual values in conformity with sound social and environmental standards acceptable to the Association. Any tourism development at the Kalagala Falls Site will be carried out only in a manner acceptable to the Association and in accordance with the aforementioned standards*" The same paragraph of the Indemnity Agreement provides, however, that *".. Uganda also agrees that it will not develop power generation that could adversely affect the ability to maintain the above-stated protection at the Kalagala Falls Site* ***without the prior agreement of the Association.*** (emphasis added)

In other words, the possibility of a power generation development at the Kalagala site is not precluded but rather subject to the Bank's agreement.

168. During Panel interviews with Bank Management, Government of Uganda officials and the Bujagali Project Sponsor,[138] it was evident that the "Kalagala

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[134] In a November 2007 interview with the Inspection Panel the official responsible for drafting the Kalagala Offset agreement stated that this provided a Ugandan Government commitment that no hydropower facility would be developed at Kalagala and that it effectively takes Kalagala "off the desks of planning officials".

[135] Request, p. 5.

[136] PAD, Annex 15, p. 155.

[137] Indemnity Agreement (Partial Risk Guarantee for the Private Power Generation (Bujagali) Project) between the International Development Association and the Republic of Uganda, dated July 18, 2007 (hereinafter "Indemnity Agreement").

Offset" has come to be accepted as a site to be used to "*offset*" a variety of the features that are to be lost by inundating the Bujagali rapids, but there is almost no mention of the core purpose of a conservation for lost natural habitats as provided by Bank policy on Natural Habitats.[139] During its investigation visit, the Panel observed uses at Kalagala Falls that are not necessarily consistent with this conservation purpose. The visit to the site served to confirm that tourism is actively being promoted but that the natural habitats at Kalagala are not being maintained as required by paragraph 5 of OP 4.04. Removal of natural vegetation and subsequent burning and cultivation of the western bank of the Nile was seen, as was an apparently new structure on one of the islands.

169. The Project SEA also reports that a rafting company has "*been awarded a concession from the National Forestry Authority to operate a high quality eco-tourism Lodge on Kalagala Island, within the Kalagala-Itanda Offset area, which will involve an investment of USD 1 million in association with international partners...* "[140] **The Panel finds that there is evidence that an offset has been created, to meet the requirement of OP 4.04, and notes the efforts of Bank Management to this end. On the other hand, the Panel finds that there is evidence that the offset site is not being subject to appropriate conservation and mitigation measures[141] in conformity with sound social and environmental standards. The Project is thus not in compliance with OP 4.04 on this point.**

170. Paragraph 6 of OP 4.04 provides that: "*if there are potential institutional capacity problems, the project includes components that develop the capacity of national and local institutions for effective environmental planning and management.*" The Panel finds that the capacity of local institutions to plan and manage the Kalagala offset has not been developed and that no provision has been made to rectify this. As a consequence **the Kalagala offset may not achieve the purpose for which it was set aside, and this is not consistent with the provisions of OP 4.04.**

171. In addition to the Kalagala offset, mitigation measures that will be undertaken within the Jinja Wildlife Sanctuary and Nile Bank Central Forest reserve include enhancement planting on the residual islands and in the 100 m riparian strip along the reservoir margins. This is for erosion control and general catchments protection, but also to offset the loss of ecological habitat on the Bujagali islands and riverbanks as a result of the Project. This planting will be undertaken in consultation with landowners and with National Environmental Management Authority (NEMA), the government authority charged with management of this

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[138] Interviews in Washington DC and in Uganda, December 2007.

[139] In an interview with the Inspection Panel (Entebbe, November 2007) an official of the National Environmental Management Authority stated that he understood the Kalagala Offset was primarily to accommodate tourism activities displaced from Bujagali and that the offset agreement allowed for eco-tourism development on the Kalagala islands. Replacement plantings for lost riverine forest were seen to be the responsibility of BEL, overseen by the National Forestry Authority.

[140] HPP-SEA, p. 148

[141] OP 4.04 ¶6.

area.[142] Seedlings are to be sourced from NGOs as well as from the National Forest Authority and local people—especially women—will be employed to plant and tend the plantings. To encourage positive engagement of local people fruit trees for their use will be included in the mix of trees to be planted.[143]

172. The success of such enhancement planting will be heavily dependent on adequate husbandry being provided until the seedlings are established and thereafter to ensure that saplings are not harvested for poles or firewood. Appropriate management and oversight of the enhancement plantings will be required. **The Panel notes with concern that the proposed Environmental Mitigation and Monitoring Plan[144] is silent on the need for monitoring of enhancement and offset plantings. Also, monitoring of replacement plantings has not been included in the terms of reference of the witness NGO that has been appointed to monitor Project compliance with IDA conditionalities. This is not consistent with the provisions of OP 4.04.**

C. Safety of Dams

173. The Request claims that the safety issues regarding the Nalubaale dam at the Owen Falls are not taken into consideration in the Bujagali dam design. The Requesters raise the issue of whether the Bujagali dam would be able to survive a failure of the Owen Falls dam. The Requesters do not consider sufficient the proposal to form a dam safety panel, because they believe a comprehensive plan and strategies to address these issues should be integrated into the Project design. They argue that these strategies are very important, since there was no Environmental Impact Assessment for the Kiira Dam or a post-construction audit for the Nalubaale Dam.

174. Management responds that dam safety is an integral part of the review of any hydropower development, that a Dam Safety Panel has been established to provide advice through design, construction, filling, and start-up to ensure that the project is consistent with Bank policies.

175. For large dams such as Bujagali OP 4.37 requires:

> *a) reviews by an independent panel of experts (the Panel) of the investigation, design, and construction of the dam and the start of operations;*
>
> *b) preparation and implementation of detailed plans: a plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan, and an emergency preparedness plan;*

[142] HPP-SEA, Section 7.5.2.3.
[143] HPP-SEA, Section 7.5.2.3.
[144] HPP-SEA, Section 8.3.7.

c) prequalification of bidders during procurement and bid tendering.[145]

Paragraphs 7 and 8 of the Policy provide that

> *The Bank may finance ... diversion dams or hydraulic structures downstream from an existing dam or a DUC* [dam under construction], *where failure of the upstream dam could cause extensive damage to or failure of the new Bank-funded structure;*
> ...
>
> *If such a project ... involves an existing dam ... in the borrower's territory, the Bank requires that the borrower arrange for one or more independent dam specialists to (a) inspect and evaluate the safety status of the existing dam ... its appurtenances, and its performance history; (b) review and evaluate the owner's operation and maintenance procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam ...to an acceptable standard of safety.*[146]

The OP further states that

> *The Bank may accept previous assessments of dam safety or recommendations of improvements needed in the existing dam or DUC if the borrower provides evidence that (a) an effective dam safety program is already in operation, and (b) full-level inspections and dam safety assessments of the existing dam or DUC, which are satisfactory to the Bank, have already been conducted and documented.*[147]

176. As part of the dam safety review required for the Bank-supported Uganda Power III Project[148] a review of the safety of the original Owen Falls dam indicated that the 1940's design of the dam was inadequate to meet current safety standards. Remedial work to bring the dam up to modern safety standards was thus required: this was financed by the Bank under a supplemental credit to complete the Power III project. In all Bank projects related to the Owen Falls Dam and to the Owen Falls Extension Project (Power II, Power III, Power III supplemental credit, and Power IV), the Inspection Panel found in 2002 that the provisions of the Policy on

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[145] OP4.37 ¶4.
[146] OP4.37 ¶¶ 7& 8.
[147] OP4.37 ¶9.
[148] The Uganda Power III Project is also referred to as the Owen Falls Extension (now known as Kiira). Supported by IDA, the project included the construction of a powerhouse, the installation of two 40-megawatt generating sets, the provision of remedial works at the Owen Falls Dam, and the provision of technical assistance to the Uganda Electricity Board.

Safety of Dams had been fully addressed. Appropriate professionals had been appointed for design and construction, an independent panel of experts had been appointed and used to advise on the best way to bring old structures up to modern standards, operational and maintenance plans had been prepared and implemented, an emergency preparedness plan was in place and routine independent safety checks were being carried out. The Bank had also appointed its own experts to review the reports of the project's independent panel of experts.

177. Similarly, for this Project, the lenders appointed their own expert advisors to review the report of the project's expert panel on dam safety. The Inspection Panel's expert has reviewed this report and accepts that "*the situation at Owen Falls does not pose an unusual risk to the Bujagali project.*"[149]

178. The Panel expert also studied the report commissioned by the lenders to review preliminary dam design, including an evaluation of flood risks in the event of catastrophic failures. The report finds that the design of Bujagali is consistent with industry design practice. Nevertheless it recommends that further studies be conducted to determine whether any human settlements would be affected by flood waters consequent upon a catastrophic dam failure or from sudden increases in river flow that may occur when the siphon spillway operates.

179. The Panel visited the Nalubaale complex in December 2007 and was shown the cracks in the powerhouse as well as the routine measurements of structural movement and of pore-water pressure that are undertaken and reported. The Panel expert is satisfied that Eskom (Uganda) is undertaking and reporting the monitoring of the Nalubaale complex that the Bank requires. The Panel notes that the cracks are in the powerhouse structure and not in the wall of the dam. **The Panel finds that Management has complied with the procedures set forth in OP 4.37.**

[149] Colenco Power Engineering Ltd., Bujagali Hydropower Development, Uganda: Project Review and Assessment Report (second draft), Feb. 2007.

Chapter IV

Hydrological and Climate Change Risks

A. Introduction

180. This chapter analyzes the issues of hydrological and climate risk raised by the Requesters, specifically the impact of hydrological regimes on energy output, the impact of the Project on lake levels, and the impact of climate change on the hydrology of Lake Victoria and the Victoria Nile River and thus on energy output.

181. According to the Requesters, BEL's SEA does not adequately address the issues of possible hydrological changes affecting power production at the Nalubaale, Kiira and the Bujagali facilities, especially when Lake Victoria water levels decline. The Requesters state that BEL has little or no control on the manner in which Nalubaale and Kiira will be operated and cannot control the outflow of water from the power stations upstream. Further, BEL had not taken into account Lake Victoria's diminished hydrological state and its flow regime changes. As a result, the Requesters believe power-generating capacities of the Bujagali Dam are overestimated and the dam will not be able to operate to achieve its designed capacity under the current hydrological regime because there will not be enough water for this purpose. They also contend that the environmental studies do not assess the possible scenario of the Bujagali Dam providing further incentives to release higher flows.

182. Management states that the impact of hydrological flow rates on the planned Bujagali Dam has been addressed extensively: an analysis of the lake's hydrology and its impact on power generation at Nalubaale, Kiira and Bujagali, which complements the SEA, is included in the study "Bujagali II—Economic and Financial Evaluation Study" (Section 2: Hydrology and Energy Generation of Hydropower Plants), known as the Economic Study.

183. According to the abovementioned studies, "*the proposed 250MW project is not expected to significantly alter or affect the hydrology of Lake Victoria or the Victoria Nile.*" The Bujagali Dam and its energy output are based on water releases from Lake Victoria consistent with the Agreed Curve and on the assumption of a low flow regime occurring during the first 20 years of operation at about 79 percent probability. The amount of water released from the Lake and the timing of this release will be controlled through operating the Nalubaale and Kiira facilities. Data used to assess the hydrology of the Lake comprises 106 years of data, including several hydrological cycles, which were considered adequate and sufficient to determine the hydrological risk for energy generation.

184. Management acknowledges that in recent years the "*GoU over-abstracted water for power generation*" because of a general drought, lack of generation investments and a demand growth of 8 percent. However, it also states that the

"GoU has steadily decreased hydropower generation in an effort to return to the Agreed Curve operating regime. Water flows for power production are being scheduled so as to return to the Agreed Curve as soon as reasonably possible."[150] Management also recognizes that BEL will not control water released from the Lake but argues that the Government has an interest in ensuring that the three facilities are operated in an efficient way.

185. The remainder of this chapter is divided in four sections. Section B analyzes the hydrology of Lake Victoria and the Victoria Nile, with particular attention to the appropriateness of the hydrological data used in project design and the recent changes in Lake Victoria levels and their relationship to power plant operations. Sections C, D and E analyze, respectively, the impact of hydrology on energy output; the assessment of the impact of the project on lake levels, including the impact of the Project on lake levels, and climate change risks.

B. The Hydrology of Lake Victoria and the Victoria Nile

186. This part of the Report analyzes the adequacy of the Project's assessment of the hydrological risk and impact of the Project on Lake Victoria and the Victoria Nile. To do so, the Report first examines whether the 1900–2005 hydrological data series used in Project design is appropriately representative of long-term lake level and flow conditions—Section 1 below. A discussion of the changing conditions of the Lake's water levels in the last few years (2000–2005) and the extent to which this may be related to the operation of the Nalubaale–Kiira system follows in Section 2.

1. Appropriateness of Hydrological Data Series used in Project Design

187. To determine whether the 1900–2005 hydrological data series used in Project design is truly representative of long-term lake level and flow conditions, it is important to take into account that, as noted in Chapter II, observers generally divide the history of Lake Victoria's water levels into three main periods (though the hydrology of the Lake and the outflow from the Lake Victoria have long been a topic on which hydrologists and engineers disagree[151]).

188. In general, the period before 1960 is characterized as a period of relatively low water levels. Between January 1960 and June 1964, the lake level increased about 2.5m for a total volume increase of 170 x $10^9 m^3$. Between 1960/61 and 1999, Lake Victoria had much higher average inflows (around 1200 m^3/s, or nearly double the average inflows in the previous period), and the Lake level rose. In contrast, starting in 2000 and until very recently, Lake levels and net inflow again decreased to a level observed before the 1960s (see Figure 2).

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[150] Management Response, p. 18.

[151] Inspection Panel Investigation Report 2002, ¶80. See also Kull 2006, p. 10.

189. Between 2001 and 2004, outflows from Lake Victoria, which were 15 percent above the average inflow for 1950–2000, exceeded net inflows and lake levels declined.[152] The lake cannot maintain its water level, if human controlled outflows are higher than naturally occurring inflows.

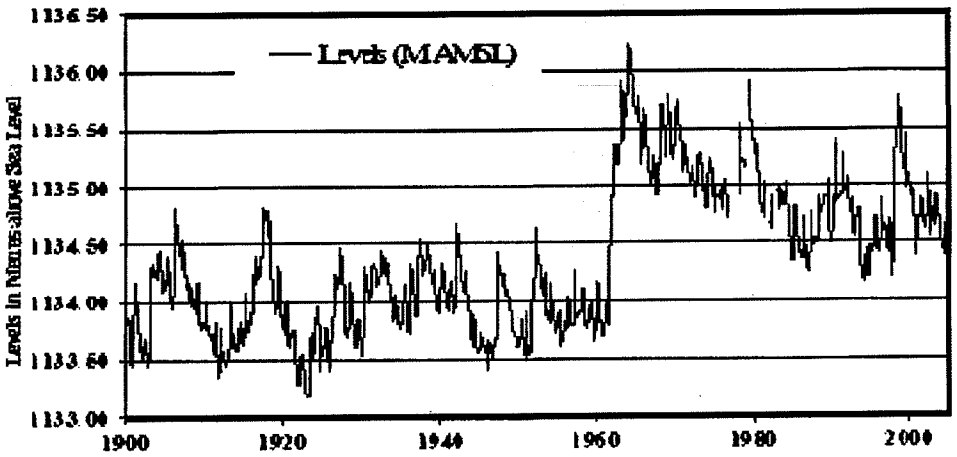


Figure 2 Lake Victoria Water Levels from January 1900 to January of 2005 (Source: Lake Victoria Basin Commission)

190. As also noted in Chapter II, the main input of water to Lake Victoria is rainfall directly onto the Lake's surface (significantly greater than basin inflow), and the main loss of water from the lake is evaporation (significantly greater than outflow down the Victoria Nile). The amounts of direct rainfall, basin inflow, evaporation from the lake, and outflow via the Victoria Nile from 1950 to 2004 are provided in Table 1 below, which summarizes the water balance for Lake Victoria during this period.

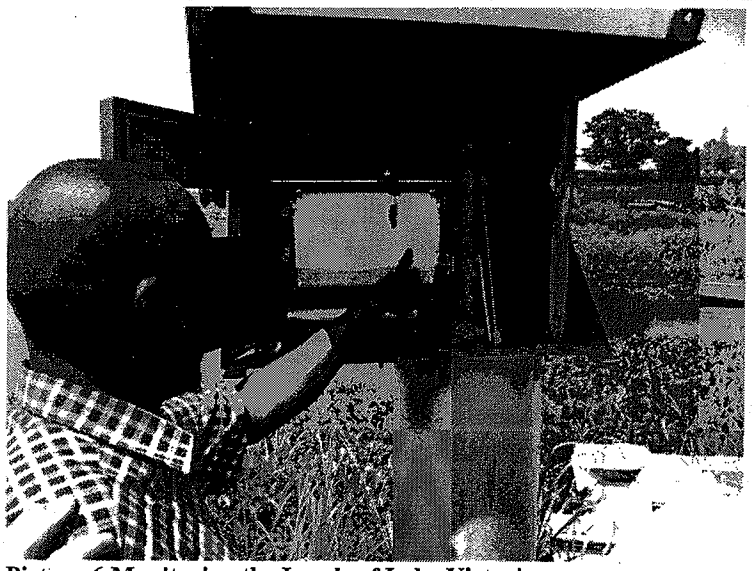
Table 1 Summary of Water Balance for Lake Victoria[153]

Process	1950-2000 Average Flow m^3/s	%	2001-2004 Average Flow m^3/s	%	1950-2004 Average Flow m^3/s	%
Inflow	**4416.8**		**4330.2**		**4410.4**	
Direct Rainfall	3611.5	81.8	3644.0	84.2	3613.8	81.9
Basin inflow	805.3	18.2	686.2	15.8	796.6	18.1
Outflow	**4376**		**4539.4**		**4387.9**	
Evaporation from lake	3329.8	76.1	3337.5	73.5	3330.3	75.9
Victoria Nile Outflow	1046.2	23.9	1201.9	26.5	1057.6	24.1
Balance	**+40.8**		**-209.2**		**+22.5**	

[152] Lake levels at the Jinja gauge reached a low point of 10.4m in October 2006. Since that date lake levels have been rising.

[153] Table 2, p. 8 *Special Report on the Declining of Water Levels of Lake Victoria,* East African Community, Lake Victoria Basin Commission (2006).

191. After reviewing the striking variations in the net inflow of water into the lake[154] between the three key periods dating back to 1900, the Project Economic Study concluded that "[...] *the whole period of record from 1900 should be used to determine the future dependable flow for power generation at hydro power stations on the Victoria Nile.*"[155]



Picture 6 Monitoring the Levels of Lake Victoria

192. Hydrology studies conducted by Acres in 1990,[156] which analyzed the feasibility of two hydropower plant alternatives, the Owen Falls dam extension (Kiira) and the Bujagali Falls Hydropower Plant, concluded that the low flows observed before 1961 (when the mean outflow was 660 m^3/s) were **not** truly representative of long-term flow conditions; as a result, these studies considered only the hydrological series 1961–1989, during which the mean outflow of water was 1,200 m^3/s, as a valid basis for Project design. In contrast, the 1993 studies of the Nile Basin by the Institute of Hydrology of the United Kingdom (IOH, Wallingford, England) concluded that the increases recorded in the period 1961–1964 were due to an increase of rainfall in the basin rather than an error in the hydrological series. This period was therefore considered not representative of a

[154] As explained earlier, the net inflow of water into the lake is often termed Net Basin Supply (NBS). NBS = rainfall – evaporation + basin inflow, and indicates the net amount of water which enters in the lake after accounting for evaporation. In a dry year evaporation increases and rainfall decreases, which can result in a near zero or negative value of NBS.

[155] Power Planning Associates Ltd, Bujagali II - Economic and Financial Evaluation Study, Final Report, February 2007 (hereinafter "Economic Study") Executive Summary, p. 4. The review was carried out by Power Planning Associates (UK), in consultation with Coyne et Bellier (France) and ECON (Norway). The study also concluded that the Institute of Hydrology of the United Kingdom (IOH) series was a reliable one since other rivers showed conditions similar to those observed in the periods 1900–1961 and 1960–1964.

[156] Acres International Ltd., Proposed extension to Owen Falls Generating Station: Feasibility Study Report, Oct. 1990.

long term hydrology for the Lake: both low and high flows could occur in the future. Subsequent studies by EDF (Electricité de France) in 1998 and Knight Piesold in 1999 confirmed this analysis.

193. The Project's Economic Study compared the outflow hydrologic series obtained by IOH and Acres and analyzed it based on the flow of other rivers in the region. It concluded that the IOH series was more reliable, since the data recorded during the period 1900–1961, and the changes in 1960–1964, reflected similar conditions in these other rivers. Other studies[157] also showed that the net inflows of water into the Lakes Victoria, Kyoga and Albert exhibited similar behavior for the period of high flow as compared to the previous period. Other authors showed that a period of high levels had also occurred in the 19th century, though most of the time the levels were similar to those in the period 1900–1960 or lower[158].

194. The Management Response indicates that a *peer review* analysis of the Economic Study was prepared by Prof. Juan Valdés from the University of Arizona.[159] This independent review was financed under the BNWPP,[160] *inter alia*, to "*expand the knowledge on the projections pertaining to Lake Victoria hydrology,* [and] *provide an important second opinion on some of the key assumptions with regard to hydrology for both the proposed Bujagali and Thermal Generation operations*." This independent analysis studied the hydrological series and compared it to other rivers in the regions and concluded that the variability exhibited in the data series was natural and recommended the use of the full series in the future analysis.

195. **The Panel's hydrology expert has concluded that the hydrologic data sets used in Project design constitutes a reliable data series and its variability over time is a natural condition, which can be observed in other hydrologic series of different parts of the world, when the hydrologic series is long enough. The Panel finds that this provides an appropriate baseline for analysis of environmental and economic issues, in compliance with OP 4.01.**

2. Lake Victoria Water Levels and Power Plant Operations on the Victoria Nile

196. The Requesters contend that the Project will have severe negative impact on the long-term health of Lake Victoria because the addition of the Bujagali

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[157] Johan Grijsen, *Potential Impacts of Hydrologic Uncertainty and Climate Change on Regional Power Options in the Lake Victoria Basin* Presentation made at World Bank Water Week, February 27—March 2, 2007 (hereinafter "Grijsen 2007"), available at: http://siteresources.worldbank.org/INTWRD/Resources/Johan_Grijsen_Hydrologic_uncertainty.pdf (date accessed July 30, 2008).

[158] Nicholson, S.E., Yin, X.; BA, M.B. 2000. On the feasibility of Using a Lake Water Balance Model to Infer Rainfall: An Example from Lake Victoria. *Hydrological Sciences Journal,* N.1 Vol 45, February, p 75-95.

[159] Juan B. Valdés, *Evaluation of Hydrology of Bujagali (Uganda) Hydropower Project*, Sept. 17, 2006.

[160] Further information about the BNWPP in "Hydrology of Lake Victoria and the Victoria Nile, and Hydropower Implications" in Chapter II of this Report.

hydropower plant to the plants already operating—Nalubaale and Kiira—will serve to increase social and political pressure for water to be released above the Agreed Curve so as to meet electrical demand.

197. This is denied by Management, which argues[161] that the Bujagali project uses the same water as the plants already operating and thus would have no additional impact on the levels of water in Lake Victoria. Management indicates that: "*Since the project is located downstream from the Nalubaale/Kiira dam complex, it will use the same water that has already been released through Nalubaale/Kiira and, given the project's higher head, will allow Uganda's generation output to more than double without any additional release of water.*"[162]

198. This section analyzes the changing conditions of the Lake's water levels in the last few years, and the extent to which this may be related to the operation of the Nalubaale/Kiira system.

199. As indicated earlier, the Agreed Curve (a mathematical relationship between Lake level measured by a gauge at Jinja and outflow), has been used to specify the outflow that should be released from Lake Victoria down the Victoria Nile.[163] Between 2000 and 2006, outflow exceeded the Agreed Curve due to Ugandan demand for electricity.[164]

200. In the period immediately before 2000, flow releases from Lake Victoria were less than those required by the Agreed Curve, in order to minimize the effects of floods downstream;[165] water not released was thus held in storage in the Lake. In addition, since the only dam operating during this period was Nalubaale, not all the flow released went through the turbines, meaning that part of the flow was released downstream through the spillways without generating energy. During this "high Net Basin Supply"[166] period, therefore, the Lake was used as a reservoir for dampening floods.

201. After 2000, the entry into operation of Kiira increased the generation capacity of the Nalubaale–Kiira system. **Since these two dams operate in parallel to one another, the system required more water to flow downstream and through the turbines to generate energy**. Unfortunately, this development coincided with a period of low Net Basin Supply, and the lack of inflow water combined with the need for greater releases started to decrease the lake levels. In July 2001, the

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[161] Management Response, pp. 18–19

[162] Management Response, ¶40.

[163] The relationship is: Q = 132.924(h –8.486) ^1.686 where *Q* is discharge in cubic meters per second and and *h* is water level (stage) in meters at the Jinja Pier.

[164] In June 2006 outflows were cut back to align these with a fixed 750 m3/s discharge.

[165] Dropping Water Levels of Lake Victoria, Technical Note, Ministry of Water Lands and Environment, Directorate of Water Development (DWD), Water Resources Management Department, 2005, p. 27 (hereinafter, "DWD 2005").

[166] As noted in Chapter II, rainfall plus basin inflow minus evaporation is referred to as the "Net Basin Supply."

additional volume retained in 1998–2001 period began to be released and the lake started to decrease more than it would have if its flow had been regulated by the Agreed Curve. All releases went through the turbines and the total flow was greater than the flow which would have been released under the Agreed Curve.

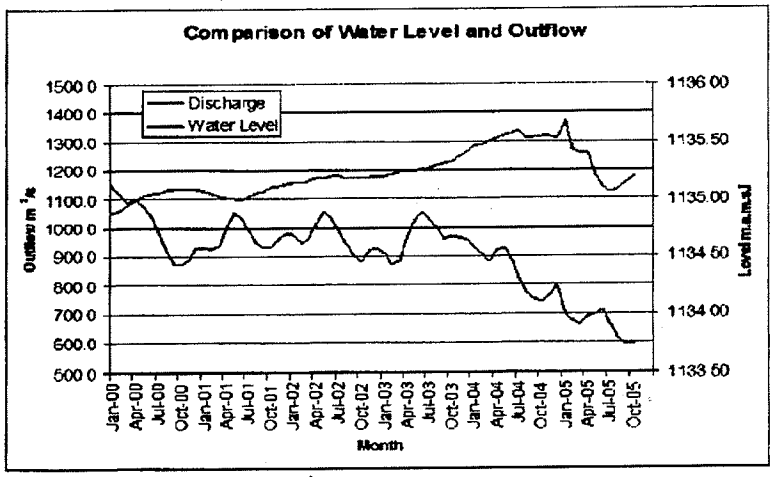
202. Table 2 below shows the yearly reduction of water levels in Lake Victoria during the period 2002–2005 and the flows released during these years in comparison with the Agreed Curve. The large differences were in 2004 and 2005—and mainly in 2005, because in that year, the Net Basin Supply was near zero due to drought conditions, which meant that a large volume of water from the lake was released downstream over and above the Agreed Curve amount.

Table 2 Changes in Lake Levels, and Flow Releases Over and Above the Agreed Curve[167]

Year	Lake level decrease (cm)	Increase of mean flow release over and above the Agreed Curve (m^3/s)	Proportion of total release (%)	Net Basin Supply (m^3/s)	Net Basin Supply as proportion of long term mean (%)
2002	6	170	14.5		
2003	10	238	19.8	693	80
2004	26	538	41.5	461	53
2005	27	561	47.7	31	4

203. Figure 3 shows the lake levels and outflows for the period. It can be seen from any of the points of the curve that the outflows are above the Agreed Curve. For instance, in July 2004, when the Lake level was 1134.25 m, the flow released according to the Agreed Curve should have been 802 m^3/s, while the actual outflow exceeded 1300 m^3/s.

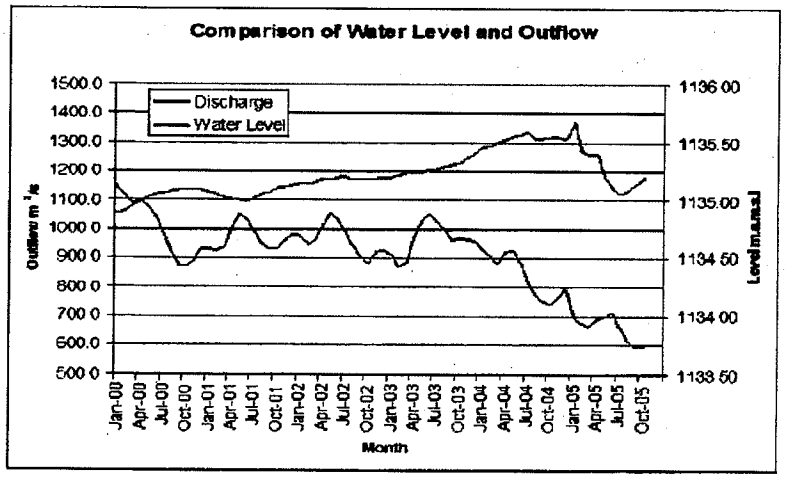
Figure 3 Levels at the Lake and Outflow (2000-2005) (Lake Victoria Basin Commission, 2006



[167] Economic Study

204. The PAD states that: "*Since the end of 2005, the Government has steadily decreased hydropower generation in an effort to return to the Agreed Curve operating regime. Water flows for power productions are being scheduled in such a way that the return to the* ***Agreed Curve is achieved as soon as reasonably possible.***[168] (emphasis added)

Figure 4 Comparison of Water Level and Outflow



205. An analysis of the long term hydrologic data series[169] shows that approximately 5 percent of the time the Net Basin Supply to Lake Victoria is negative—meaning that any outflows to the Victoria Nile come from water stored in the lake. In these years, if the waters released are according to the Agreed Curve, the lake level would decrease, since outflow would be greater than net inflow. The dam operation effect—that is, beyond the natural conditions—would occur when the release is greater than that specified by the Agreed Curve.

206. The effect of the release policy during the period 1998–2001, which resulted in holding the flow in the lake, had downstream benefits in mitigating floods. Likewise, in the period 2001–2005, the increase of the water release of the lake above the Agreed Curve had downstream benefits (increased energy production), but negative upstream effects (lake depletion).

207. The Panel notes that the Agreed Curve constrains the ability to use the lake to store "excess" water for later use when inflow exceeds outflow. During Panel interviews in December 2007, responsible authorities in the Government of Uganda noted the need for the Agreed Curve to be understood as a tool for water resource management rather than simply a mechanism to determine volumes of water to be released, and indicated that a new mechanism for determining water release from Lake Victoria to the Nile, based on maximum benefit to all riparian countries, is in the process of being developed. The World Bank–Netherlands

[168] PAD, p. 37.
[169] DWD 2005.

Water Partnership (BNWPP) background description for the 2006 "Victoria Nile-Independent Hydrological Review" activity, referred to earlier, states that "*partly because of pressure from the riparian states, Uganda has been sensitized to the importance of making cogent choices between reverting to the Agreed Curve policy, or adopting some other water management policy that would be no more harmful to its neighbors.*"[170]

208. In Panel discussions with the NBI, it was indicated that the notion of managing the waters of Lake Victoria as a resource for all riparian countries was integral to a new treaty that is being drafted to replace the numerous existing treaties and accords that relate to use of Nile waters. This would mean a move away from water releases dependent on lake level to variable releases based on water demand management and an increase in the "balancing times" from 10 days—as at present—to seasonal or even annual accounting.

209. During its field visit in December 2007, the Panel was given documentation showing what appears to be a new release policy, whereby discharge was fixed at either 850 or 750 cubic meters per second depending upon the level of the lake. The Panel received information suggesting that this new rule, which allows for a constant release to be applied when the lake level fluctuates within a certain range, with mean outflow the same as under the Agreed Curve rule, has been in effect since June 2006, and it is the basis for the analysis in the Economic Study.

C. Impact of hydrologic risk on energy output

210. The Requesters state that: "*Even the recently (26th February, 2007) released economic analysis does not adequately address the economic viability in relation to hydrological risks.*"[171] Management considers that "*The Economic Study* [...] *addresses the economic viability and risk analysis of the Bujagali project.* [...]*The key elements assessed in the economic analysis include:* [...] *(iv) the hydrology of Lake Victoria and its impact on hydropower generation....*"[172] Management also says "*that the economic* [...] *and other required analyses to date are compliant with relevant World Bank Group policies* [...]." [173] IFC appointed consultants to carry out the Economic and Financial Evaluation Study, in this Report referred to as the "Economic Study," in January 2006 and the final report is dated February 2007.[174]

211. Bank Economic Evaluation policies applicable to this Project are OP 10.04 on Economic Evaluation of Investment Operations. OP 10.04, provides in paragraph

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[170] World Bank–Netherlands Water Partnership (BNWPP), background description for the "Victoria Nile-Independent Hydrological Review" activity, available at: http://www-esd.worldbank.org/bnwpp/index.cfm?display=display_activity&AID=439 (accessed on 23 July 2008).

[171] Request, pp. 3–4. See also p. 7.

[172] Management Response, Annex 1, p. 25.

[173] Management Response, ¶33.

[174] Economic Study.

1 that "*For every investment project, Bank staff conduct economic analysis to determine whether the project creates more net benefits to the economy than other mutually exclusive options for the use of the resources in question.*" The Policy then sets out specific provisions in seven areas: Criterion for acceptability, alternatives, non-monetary benefits, sustainability, risks, poverty and externalities.

212. Paragraph 2 of OP 10.04 defines the Criterion for Acceptability of a Project on economic grounds in the following way: "*a project must meet two conditions: (a) the expected present value of the project's net benefits must not be negative; and (b) the expected present value of the project's net benefits must be higher than or equal to the expected net present value of mutually exclusive project alternatives.*" Note 3 states that "*standard practice has been to calculate the expected internal rate of economic return* [...]." Paragraph 3 lays out the importance of the analysis of alternatives "*to ensure that the project maximizes expected net present value,*" while Paragraph 5 calls for an analysis of the sustainability of a project to make sure that its "*benefits will materialize as expected and will be sustained throughout the life of the project.*"

213. The hydrology of Lake Victoria, along with the water release regime, is a key influence on the potential energy output of hydropower plants on the Victoria Nile. Annex 10 of the PAD discusses the detailed review of Lake Victoria hydrology in the Economic Study (100 pages, including tables and charts).[175] The main objective *was* "*to assess the performance of Lake Victoria, by deriving the longest reliable series of Net Basin Supply (or net inflow into the lake) that should be used for the evaluation of energy generation of the existing and foreseen hydro power projects on the Victoria Nile* [...]." The second objective was to investigate the causes of the recent drop in lake level because this analysis would be "[...] *helpful in understanding the key drivers in the hydrological performance of Lake Victoria.*"[176]

214. **Hydrology scenarios and their probabilities:** as noted earlier, the Economic Study concluded that "[...] *the whole period of record from 1900 should be used to determine the future dependable flow for power generation at hydro power stations on the Victoria Nile.*"[177] To reflect the variations in Net Basin Supply among the three key periods since 1900, the study defined two hydrology scenarios for the 20 year period that would follow the commissioning of Bujagali: the *Low Hydrology Scenario* (average net inflow 660 m^3/s) and the *High Hydrology Scenario* (average net inflow 1200 m^3/s). The analysis assessed the probability of their occurrence at 79 percent for the Low Hydrology Scenario and 21 percent for the High Hydrology Scenario.[178] The evaluation of the generation alternatives used these scenarios and probabilities.

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[175] Economic Study, Appendix B

[176] Economic Study Main Text, ¶3.1, p.41.

[177] Economic Study, Executive Summary, p. 4.

[178] Economic Study Main Text, p. 45. The process, which averages the results of two different approaches, is set out in Economic Study, Appendix B.5.2, pp. 38–41.

215. With respect to **Agreed Curve** the PAD states that, "***The planning of the proposed Private Power Generation (Bujagali) Project and the assessment of the energy output have been based on the flow released from Lake Victoria through the Nalubaale/Kiira dam complex in accordance with the Agreed Curve*** *(Annex 10).* [...] *The proposed project is designed to be viable with water flows in accordance with the Agreed Curve release rule, since the Nalubaale/Kiira dam complex regulates the flow of water from Lake Victoria.*"[179] (emphasis added)

216. The Economic Study explains that operating according to the Agreed Curve means that "*the lower the lake level, the lower the release, and the higher the lake level, the higher the release.*" This in turn has a "*diminishing*" effect in long dry periods because if the net inflow is lower than the long term average, and the release is higher than the net inflow, the lake level drops faster and the departure from the Agreed Curve is augmented, all of which occurred in the period 2003–2005.[180] The Economic Study goes on to state that reservoir operation modelling was carried out to calculate the "firm" release and the "firm" energy generation in each of the hydrology scenarios. The main options were: "*(i) to return to the strict commitment to the Agreed Curve, and (ii) to follow the Agreed Curve but in a broader sense, allowing for a constant release to be applied when the lake level fluctuates within a certain range.*" It also suggests that the advantage of the "Constant Release" rule is that it "*allows for a better planning of additional means of power generation in the country* [...]".[181]

217. After describing several features of this Rule, including "*the fact that the firm energy of the "Constant release" rule is much higher than for the "Agreed Curve" rule, although the mean outflow and mean energy of both operations are identical,*" the Economic Study states that, "***Owing to all these advantages, for the purpose of the economic evaluation of Bujagali, the "constant release" (or "Agreed Curve by steps") rule was adopted to determine the energy generation capability of each of all hydro options on the Nile downstream of Owen Falls.***"[182] (emphasis added) The Economic Study then summarises the results of the reservoir modelling and estimates of firm energy generation for Bujagali and Karuma for the Low and High Hydrology scenarios in Table 3-1, reproduced as Table 10.1 in the PAD. The Economic Study and the PAD confirm that these figures, modified for maintenance (Economic Study Table 7-6), were "*used in the economic evaluation and expansion plan modelling.*"[183]

218. On the one hand, the PAD states that the planning of the Bujagali Project and the assessment of the energy output was based on flows released in accordance with

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[179] PAD, p. 37.
[180] Economic Study, Main Text, p. 47.
[181] Economic Study, Main Text, p. 47.
[182] Economic Study, Main Text, p. 50.
[183] PAD, Annex 10, p. 99. See also Economic Study, Main Text, p. 51.

the Agreed Curve. On the other hand, the Economic Study states that the economic evaluation of the Bujagali Project to determine energy generation capability was based on the Constant release rule. **The Panel notes that this discrepancy between key Project documents brings into question the data basis for the Project's economic analyses, and is likely to have resulted in a more positive conclusion to the Economic Study than would have been the case under the Agreed Curve scenario. This is inconsistent with OP 10.04.**

219. In March 2007 an internal Management Review had proposed that the PAD should confirm that the plant would be operated under Lake Victoria's Agreed Curve release strategy, rather than under a constant release regime, "*and should confirm that this regime does not affect the conclusions of the economic evaluation of the project*;"[184] **The PAD does not appear to have followed this latter recommendation. In the Panel's view, the provisions of OP 10.04[185] require Management to provide an accurate picture of the economic analysis (based on the Agreed Curve), and indicate whether this affects the relevant conclusions.**

220. **The Panel notes that this contradiction in Project documents has a material impact not only on the economic viability of the Project and the provisions of OP 10.04, but also on the lake levels of Lake Victoria, since different operational rules result in different time-profiles and variance of water levels.** While the Panel recognizes that, over a certain period of time, the mean outflow under the "Constant release" rule will be identical to that under the "Agreed Curve" rule, the variation in lake levels under the two regimes will be different. These issues are discussed further in Section D below.

D. Potential Impact of the Project on Lake Victoria

221. The Requesters are concerned about over-draining of Lake Victoria, which they state causes misery and economic loss to Uganda and neighboring countries. They believe that the issue of the long-term health of the Lake has not been addressed in Project documents "*other than to assert that Bujagali Dam could lead to more sustainable flows out of the lake as it will 'make use of the same water' released by the existing dams.*" However, they argue that neither the SEA nor other documents take into consideration the possibility that the opposite will happen because a new dam may create incentives to release higher flows.

222. The Response acknowledges that "*since 2003 the GoU over-abstracted water for power generation*" but notes that the government has in the past few years "*steadily decreased hydropower generation in an effort to return to the Agreed Curve operating regime. Water flows for power production are being scheduled so as to return to the Agreed Curve as soon as reasonably possible.*" Management also indicates that with the operation of the Bujagali/Kiira/Nalubaale system

[184] QER Review, March 2 2007 (hereinafter "QER 2007").
[185] Which address acceptability, the analysis of alternatives and sustainability.

"generation of the same energy output as currently generated by Nalubaale and Kiira would only require 45% of the current water release from Lake Victoria." Though BEL does not control the release of water, in Management's view, *"it is in the interest of the GoU to ensure that Bujagali and the Nalubaale/Kiira dams are operated efficiently."* [186]

223. The Bank policy on Environmental Assessment requires a Project EA to evaluate *"a project's potential environmental risks and impacts in its area of influence."* A project EA "[p]*redicts and assesses likely positive and negative impacts in quantitative terms"* and *"identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions...."* The area of influence is defined in OP 4.01, Annex A (Definitions) as

> *The area likely to be affected by the project, including all its ancillary aspects, such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the project... The area of influence may include, for example, (a) the watershed within which the project is located; (b) any affected estuary and coastal zone; ... (e) migratory routes of humans, wildlife, or fish, particularly where they relate to public health, economic activities, or environmental conservation ...*

224. The Panel notes that the SEA study was based on the assumption that the Project's upstream area of influence ends downstream of Kiira–Nalubaale dams. The SEA does not take into account the Project's potential impacts on Lake Victoria.[187]

225. The SEA states that "... *it is expected that the flow of the Nile downstream of Bujagali will be very similar to the flow downstream of Nalubaale/Kiira, which itself is still regulated, as it has been since the construction of Owen Falls dam in 1954, by the agreed curve.*"[188] As noted earlier, the PAD adds that the ***"project is designed to be viable with water flows in accordance with the Agreed Curve release rule****, since the Nabulaabe–Kiira complex regulates the flow of water from Lake Victoria.*"[189] (emphasis added)

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[186] Management Response, p. 18.

[187] HPP-SEA, p. 55, Section 3.2 Project Area of Influence, defines the Project's area of influence as *"including areas affected by: (i) the primary project site, (ii) associated facilities; (iii) cumulative effects, and (iv) unplanned but predictable developments."* A subsequent table (Table 3.1 Bujagali Hydropower Project Area of Influence) lists ten *"primary project sites"* as follows: *"1. Land/water areas for dam, its facilities & reservoir; 2. Land for resettlers' houses & livelihoods, as specified, for # 1 (above); 3. Resettlers' houses, if any; 4. Off-site facilities (quarries, storage, waste disposal, access roads), if any; 5. Air quality & noise effects radii (off-site); 6. Upstream water areas (below Nalubaale/Kiira; mainly in Bujagali reservoir) & users; 7. Downstream water regime (water quality & flows); 8. Communities (including host communities) as specified in PCDP; 9. Stakeholder groups (including vulnerable groups) as identified in PCDP; 10. Project personnel when off-site in project vicinity/region..."*

[188] HPP-SEA, p. 361.

[189] PAD, p. 37.

226. The Panel notes that these statements assume that the natural conditions of lake level will be maintained in the future. This in some way may argue for restricting the Project area of influence upstream at Kiira–Nalubaale and not studying the impact on Lake Victoria changing levels. However, the Panel also notes that this approach—reduced Project area of influence—does not take into account two important factors: (1) the contradiction between the PAD and the Economic Study regarding the Project's operation rule discussed in the previous section, and (2) the recent history of 2003-2005 when the Nalubaale–Kiira system was operated above the Agreed Curve, which contributed to a severe depletion of the Lake.

227. The Panel notes that the operation policy of Lake Victoria could be other than the Agreed Curve, using the lake as reservoir regulating the flow. However, the Panel observes that any such change in operating regime and its impact upstream and downstream need to have been assessed in the Project's EA. The Panel also notes that not following the Agreed Curve, with releases greater than the Agreed Curve, could lead to a decrease in the lake's level during a drought period, as happened during 2003–2005. **The Panel notes the importance of assessing such a situation and extending the area of influence of the Project to the Lake Victoria.** As indicated in Chapter II, the lowering of water levels in Lake Victoria brings significant social and environmental impacts upon the Lake ecology and the people and countries that rely on it for resources and livelihoods.

228. In this context, the Panel notes a recent Project Performance Assessment Report for the Uganda Power III Project (Owens Falls Extension – Kiira), prepared by the Bank's internal Independent Evaluation Group (IEG). The Report determined that the project appraisal for Kiira underestimated the criticality of the hydrological risk related to water level in Lake Victoria. According to the Report, the appraisal concluded that ". . . *the likelihood of this risk was less than 1 percent.*" The Report adds that *"[t]his risk has now been realized.*[190]"

229. **The Panel notes that the SEA study considered that the Project's area of influence ends downstream of the Kiira–Nalubaale dams.**[191] **As a result, the Panel finds that the SEA analysis did not comply with OP 4.01 in defining the area of influence of the Project because the Project impacts on the changing levels of Lake Victoria were not assessed.**

230. **In light of its relevance to the analysis of the Bujagali Project, the Panel notes the importance of making the structure for governance of water releases from Lake Victoria clear and transparent to all stakeholders.**[192]

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[190] Independent Evaluation Group (World Bank), Project Performance Assessment Report Uganda Third Power Project (Credit No. 22680-UG); and Supplemental to Third Power Project Credit (No . 22681-UG) June 26, 2008 *Independent Evaluation Group (World Bank)*

[191] HPP-SEA, p. 55.

[192] The Panel was variously informed that at present the ultimate authority for determining water releases was: (a) The Commissioner for Water Resources Management; (b) An Inter-Ministerial Committee; (c) The

E. Climate Change Risks

231. The Requesters aver that the project preparation and assessment reports do not address climate change and its possible impact on power production at Bujagali. They also hold the view that climate models indicate hotter, drier conditions, lower lake levels and lower river flows. Management counters this, stating, "*the broader climate change (and hydrology) aspects were addressed in different studies which have also been publicly disclosed.*"[193] Management states that the SSEA includes a detailed analysis of the impacts of climate change in the Nile Equatorial region comprising Bujagali.[194]

232. The Requesters also suggest, that "*No study released to date analyses the risks to Bujagali performance from climate change-induced drought and other hydrological changes.*"[195] Management states, however, that the analyses: "*Assessed the impacts of both low and high hydrology scenarios, and separately determined that climate change is not predicted to have a negative impact on water availability.*"[196]

233. Climate change risk analysis is important under various Bank policies. OP 4.01 requires that the Project EA evaluate potential environmental risks and impacts in its area of influence,[197] paragraph 5 of OP 10.04 provides that "[t]*o obtain a reasonable assurance that the project's benefits will materialize as expected and will be sustained throughout the life of the project, the Bank assesses the robustness of the project with respect to economic, financial, institutional,* ***and environmental risks.***" (emphasis added).

1. The PAD

234. On the question of climate change, the PAD states that, "*The risk of climate change on the hydrology of Lake Victoria was taken into consideration: the conclusion of both the economic study and the Strategic/Sectoral, Social and Environmental Assessment (February 2007) under the Nile Basin Initiative, is that there will be no adverse effect on water release due to climate change during the life of the proposed project.*"[198]

2. The Economic Study

Department for Water Development; (d) The Ministry of Water and Environment; (e) The Ugandan Minister of Water Affairs.

[193] Management Response, Annex 1, Section 4, p. 19.

[194] Management Response, p. 6.

[195] Request, p. 4.

[196] Management Response, p. 12

[197] OP 4.01 ¶2.

[198] PAD, p. 28.

235. In relation to climate change and whether and how it was taken into account in the economic study and modelling, the Economic Study Main Text states boldly that, "*The possible influence of climatic changes was found not to be significant enough in the medium term (to 2030) to influence* [in] *one way or the other the hydrological scenarios.*"[199] The further discussion of climate change in the Economic Study is in Appendix B, where it occupies only one page and two tables. Drawing on papers by Tate, Sutcliffe *et al.*,[200] it concludes, "*For both baselines, the 2021–2050 future climatic conditions result in average future outflow smaller than observed outflow* [...]. *Conversely, the 2070–2099 future climatic conditions result in average outflow greater than observed outflow* [...]. *For the overall period 2000–2099, the Lake Victoria outflow would be of the same order than the present outflow;* [...] *Thus, taking the whole of the 1900–2005 period of record to define hydrological scenarios is acceptable for modelling of future hydrological conditions.*"[201] **In the Panel's view, the brevity of this discussion of a highly complex issue with the potential to influence significantly the Project's economic outcomes does not demonstrate compliance with OP 10.04's paragraph 5, which requires proper assessment of the robustness of the Project with respect to environmental risks.**

3. The SSEA

236. The scope of work of the SSEA, as defined in the terms of reference, includes the following key task: "*...(7) Assessment of the potential impact of climate change.*"[202] Further, one of the key-elements in the analytical approach adopted in the SSEA was "*Assessment of (calculated/forecasted) climatic changes and runoff due to climate change.*"[203] According to the SSEA, this was done because one of the major risks that were identified was climate change and its possible impact on runoff, which in turn affects the output of the hydropower development options.[204] The PAD says that, "*The SSEA undertook a thorough analysis of the possible climate change impacts on power development options in the Nile Equatorial Lakes Region, including Bujagali.* [...] *It used the best available general circulation models to assess the potential changes in temperature and precipitation in 2050 and 2100 relative to 2000.* [...] *Overall, for the northern and central-west regions of the study area, including Bujagali, there is a high probability of increases in runoff, and thus power generation potential, compared to historic data. Staff believes that the SSEA incorporated the best currently available climate change science and data in its analysis.*"[205]

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[199] Economic Study, Main Text, p. 45. See also PAD, Annex 10, p. 97.
[200] E. Tate, J. Sutcliffe, D. Conway & F. Farquharson, *Water balance of Lake Victoria: update to 2000 and climate change modeling to 2100*, 49(4) Hydrological Sciences–Journal–des Sciences Hydrologiques, 563, 572 (2004).
[201] Economic Study, Appendix B.4, p. 33.
[202] SSEA, p. 1-2.
[203] SSEA, Executive Summary, p. S-5.
[204] SSEA, p. 2-3.
[205] PAD, p. 46. See also PAD, Annex 15, p. 156.

237. In contrast with the Economic Study, section 12 of the SSEA presents a 12-page assessment of, "*the potential impacts on hydroelectric generation that could result from climate change, and consequently whether any such impacts could affect the selection and scheduling of new power options in the portfolios being evaluated in the SSEA study.*" [206] This section draws on Appendix K of the SSEA, which contains a detailed 50-page assessment and modeling, carried out by the Stratus Consulting team, drawing on results from the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The final section of Appendix K includes this statement, "*There are few clearly identified hydrological risks to the hydro options included in the indicative plan, and overall for the Northern and Central West regions there is a high probability of increases in runoff, and thus generation, than presently identified from historic flow data.*"[207] The Executive Summary of the SSEA repeats the second phrase and goes on to state: "*As most of the power development options that have been retained are located in the northern part of the region, the impact of climatic change will be positive for the development of the portfolios of generation options. No sensitivity analyses for climate change will be carried out, since they would only present higher energy availability than current conditions indicate.*"[208]

238. The Panel has examined the SSEA. The sixteen Global Climatic Models in the NCAR[209] suite of models were examined and seven were selected[210] as they provided the most representative results to estimate potential changes in temperature and precipitation for the Nile Equatorial Lakes region.[211] The main conclusions from the outputs predictions were that temperature, rainfall, evaporation and runoff are all predicted to increase. The study mentions similar results obtained using other models.[212]

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[206] SSEA, p. 12.

[207] SSEA, Appendix K, p. K-49.

[208] SSEA, Executive Summary, p. S-20. SSEA also notes that: "Results show that for all regions flood flows may increase significantly, thus designs for flood discharge during construction and over a permanent spillway should take this potential into account. Project costs would also be affected." (p. 12-12).

[209] National Centre for Atmospheric Research, Boulder, Colorado, USA.

[210] The seven models selected were:

- CERG – The European Centre for Research and Advanced Training in Scientific Computation (CERFACS), France;
- CCSR – National Institute for Environmental Studies, Japan;
- CSIRO – Commonwealth Scientific Industrial and Research Organization, Australia;
- ECHAM3 – Max Planck Institute for Meteorology, Germany;
- ECHAM4 – Max Planck Institute for Meteorology, Germany;
- HadCM2 – Hadley Model, United Kingdom Meteorological Office;
- HadCM3 – Hadley Model, United Kingdom Meteorological Office.

[211] This determination was based on a statistical comparison of model ability to simulate current climatic conditions. For the seven selected models a spatial correlation of 0.94 with a root mean square error of 0.416 and a difference from the mean of –0.228 was achieved. This is a better correlation and smaller error and difference from the mean than for all 16 GCMs taken together.

[212] Grijsen (2007) presents the results of climate analysis for the Lake area taking into account the baseline series of 1956-1978 and for a drought scenario of 40 percent of the long term NBS. Rainfall increased by

239. Using the mean output of the seven selected models, general directions and magnitudes of expected variations were estimated. The expected impacts on power outputs were then considered by assessing the risk that hydrological conditions would be less favorable than conditions estimated using conventional hydrological analyses based on past records of climatic conditions.

240. Chapter 12 of the SSEA provides an assessment of the potential impacts on hydroelectric generation that might result from climate change, and examines whether such impacts might affect new power options being evaluated. The objective was not to define whether global warming will take place, but rather to use the results of existing analyses and predictions in a risk analysis to allow plausible changes from climate change to influence planning.[213]

241. The results of this climate change risk assessment show that there are few identifiable hydrological risks to the hydro-power options studied, and overall for the Northern and Central West regions of the Nile Equatorial Lakes there is a higher probability of increases in runoff, and thus power generation, than determined from historic flow data.[214] The peer review analysis of the Economic Study, prepared by Juan Valdés and referred to earlier, in its analysis of the climate change simulation, notes that most of the models showed an increase between 7 and 12 percent for precipitation, and temperature increases from 2°C to 3.5°C in the region for 2100, but concluded "*There is considerable variability in the results of the individual models and caution should be used when applying these results to make operational decisions.*"[215]

4. Other Documents

242. The Panel examined the Regional Analysis of the IPCC. Climate Change 2007 presents three working reports: I. The Physical Science; II. Impacts, Adaptation and Vulnerability; III. Mitigation of Climate Change.[216] In report II, Impacts, Adaptation and Vulnerability, there are two important chapters: Freshwater Resources and their Management[217] and Africa.[218] The Freshwater report includes

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10 percent in both scenarios and NBS increased 32 percent for the historic scenario and 83 percent for the drought scenario.

[213] Details of the approach and methods used are provided in Appendix K of the SSEA.

[214] SSEA, p. 12-12

[215] Valdés, Juan B. "Evaluation of Hydrology of Bujagali (Uganda) Hydropower Project, September 17, 2006, p. iv.

[216] Available at: http://www.ipcc.ch/ipccreports/assessments-reports.htm (accessed July 31, 2008).

[217] Z. W. Kundzewicz, L. J. Mata, N. W. Arnell, P. Döll, *et al.*, *Freshwater Resources and their Management* in *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 173–210 (M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson, eds., Cambridge University Press 2007).

[218] M. Boko, I. Niang, A. Nyong, C. Vogel; *et al.*, *Africa*, in *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the

an index of vulnerability or stress to water scarcity: according to the report, the study area of Lake Victoria is not under stress. The Panel notes that the report does not mention any major stress for the Lake Victoria basin as a result of climate change. In addition, in its specific section related to Africa the report mentions the inability of the climate models to represent the observed rainfall in the continent.[219]

243. The Panel also examined the Climate Change Impact Assessment carried out as part of the Study of Water Management of Lake Victoria by Water Resources and Energy Management International Inc. (WREM), which was cited by the Requesters. This study, which used an integrated assessment methodology, concluded that "*the future climate implies drier hydrologic conditions, lower lake levels, lower outflows, less energy generation, smaller wetland areas, and lower downstream river flows.*"[220] However, the Panel's expert on hydrology has pointed out that the study was based on observed data from 1960–1980, a period during which most years were high rainfall/high flow years as compared to the 1900–1960 period. This biases the conclusions of the study, because climate change assessments put forward a relative rather than an absolute scenario, and in this case the relative analysis put forward is with respect to a period of high flow. The other analyses used in the SSEA were carried out for the full 1900-2005 series.

5. Conclusions on Climate Change Risks

244. The Panel finds that the possible effect of climate change on hydropower projects on the Victoria Nile have been considered and well evaluated in the project documents. However, the Panel reiterates that in the context of climate change, the Bujagali SEA does not refer to the Nile Basin SSEA and does not direct the reader's attention to this important parallel study. **In addition, as noted earlier, the brevity of the discussion of climate change in the Economic Study does not demonstrate compliance with paragraph 5 of OP 10.04.**

245. **The SSEA appraisal appears to be the result of a thorough, detailed study that draws on its own analysis and a range of other international studies.[221] The Panel finds that the possible effect of climate change on hydropower projects on the Victoria Nile has been seriously considered in the SSEA. This analysis meets the requirements OP 4.01. As noted above, however, the SSEA was not properly disclosed a Project document.** While both the Economic Study and the SSEA reviewed the potential influence of climate risks, and

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Intergovernmental Panel on Climate Change, 433–467 (M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden and C. E. Hanson, eds., Cambridge University Press 2007).

[219] It should be noted, however, that regional simulation analyses, as in the report SSEA (2007), have more specific simulation and output data than the IPCC reports.

[220] WREM International Inc. "Climate Change Impact Assessment – Technical Report 10," Study on Water Management of Lake Victoria, prepared by Water Resources and Energy Management International Inc. for the Uganda Ministry of Energy and Mineral Development, September 2005, p. v.

[221] Including the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

concluded that they would not exert a significant negative influence on the hydrological scenarios, the analysis of the Economic Study does not demonstrate the detailed, sophisticated analysis and modeling that underlay the SSEA appraisal. The Economic Study does not cite or draw on the results of the SSEA risk appraisal or the detailed reviews in Section 12 and the study in Appendix K that underlay them. **Management does not appear to have ensured that the Economic Study drew on the much more thorough analysis in the SSEA. The Panel finds that this does not comply with paragraph 5 of OP 10.04. Considering that the PAD draws on the authority of both studies, particularly the SSEA, the Panel finds it surprising that the PAD concludes that, "[...] *there will be no adverse effect on water release due to climate change during the life of the proposed project.*"**

246. **The Panel is aware of the limitation of the known technology in evaluating climate change scenarios** and that the analysis of climate change is an evolving science, where gaps remain. Indeed, **this situation makes all the more troubling the PAD's categorical assertion, without any reference to risk and uncertainty, that there will be no adverse effect on water release due to climate change during the Project life. This failure to express a risk factor is not consistent with OP 10.04. The Panel notes the importance of continued attention and analysis to the effect of climate change on flows and hydropower generation on the Victoria Nile.**

Chapter V

Economic and Environmental Analysis of Alternatives

A. Introduction

236. This chapter first addresses the economic analysis of alternatives, including the demand forecast, the consideration of supply alternatives, the project costs, the assessment of least cost options for expanding power generation and the economic rate of return on the Bujagali Project. It then examines macroeconomic impacts and environmental and social costs, and the environmental analysis of alternatives. Chapter VI addresses poverty reduction, power sector finances and sustainability, the PPA and associated risks.

237. In general the Requesters argue that energy alternatives to Bujagali were not adequately addressed in the SEA. For example, in the Requesters' opinion, a hydropower project at Karuma, downstream from Bujagali, would cause less social and environmental harm than Bujagali but was not appropriately taken into consideration as an alternative option. Furthermore, the Economic Study does not include an adequate assessment of the economic alternatives to support the statement that the Bujagali dam is the least costly option.

238. The Request describes eleven alternatives to the Project that were allegedly dismissed because of their costs and difficulties of connection to the national grid. These options are: bagasse (sugar cane); small hydro (less than 10MW); micro hydro (less than 100 kilowatts); geothermal; municipal solid waste; solar; efficient lighting and transmission losses as demand reducing options; wind power and efficient stove and biogas digesters. The Requesters believe that rather than dismissing options for the difficulty of connecting to the national grid, the analysis should have focused on reducing the burden on the national grid and on developing independent grids.

239. Management believes that the economic, financial, safeguard, technical, governance, and other required analyses meet high professional standards and are in compliance with applicable Bank policies. It adds that these analyses take into account the findings of the previous Bujagali Inspection Panel report and result from the overall project due diligence, which adequately takes into consideration best practice. Management is convinced that the analysis undertaken was appropriate and wide-ranging enough to identify and assess all potential alternatives for expansion of Uganda's power sector. Management indicates that the analyses "*Assessed a wide range of supply options, including alternative hydropower sources, such as geothermal power and thermal power (e.g., oil based); small-scale renewable options (e.g., mini-hydro and biomass); oil imports; and other supply options.*"[222]

[222] Management Response, ¶33.

240. The following paragraphs present the analysis and the Panel findings with respect to the Requesters' claims on the Project evaluation of alternatives. The analysis will examine first the economic evaluation of options and will follow with the environmental and social evaluation.

1. The Context: Power Sector Developments and the Power Supply Crisis

241. As noted in Chapter II, there have been significant developments in the Ugandan power sector since the prior attempt to develop and implement the Bujagali Hydroelectric Project: continuing demand growth; the acquisition of new high-cost stop-gap thermal generation; big tariff increases; part-privatization of distribution; and increased dependency of UETCL on Government funds. The Panel observes, however, that some conditions remain broadly unchanged, notably that only about 5 percent of the population is connected to an electricity supply and only about half the cost of electricity units sent out from power stations is recovered from customers.

242. The Project PAD states that while Uganda's main power source, the Nalubaale/Kiira dam complex, has a potential capacity of 380 MW, over recent years production has dropped to 120MW between August 2006 and 2007.[223] In response, in 2005 and 2006 the Government leased two 50 MW thermal plants and in 2007 IDA financed an extra temporary 50 MW.[224] The PAD sets out an Interim Generation Expansion Plan for 2006 to early 2011 (the commissioning year of the Bujagali Project). In this plan, about 44 MW of mini-hydropower capacity and 15 MW of co-generation (using bagasse) are scheduled for 2007–2009, while 150 MW of diesel and fuel oil power generation are required until 2011.[225]

243. The consultants reviewed thermal generation requirements for 2006–2010. The PAD states that "*The total cost of the fossil-fuel components of the 2006–10 interim power plan is about US$700 million. By comparison, the expected economic cost of the proposed project is about US$520 million.* [...] *if commissioned in 2011, the proposed project would immediately displace about 738 GWh of fossil-thermal production (about 35% of total 2010 generation)—a substantial portion of the proposed project's expected output, estimated at 1,165 GWh and 1,991 GWh for the low and high hydrology scenarios, respectively.*"[226]

244. The table below, extracted from the PAD,[227] shows some key aspects of power sector performance for 2001–2005. It illustrates challenges relating to technical and non-technical ("commercial") losses and to the collection of billed sales (indicating, as noted, that only about half of the electricity sent out from the grid was paid for during this period).

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[223] This contrasts with a 380 MW peak system demand and a 290 MW base load demand. 364 GWh of load were shed in 2006 (PAD, Annex 1, ¶¶7 & 11).
[224] Under the Power Sector Development Operation (PSDO).
[225] PAD, Annex 1, ¶8 and ¶83.
[226] PAD, Annex 9, p. 78.
[227] PAD, Annex 9, p. 79.

Table 3 Power Sector Performance (2001-05)

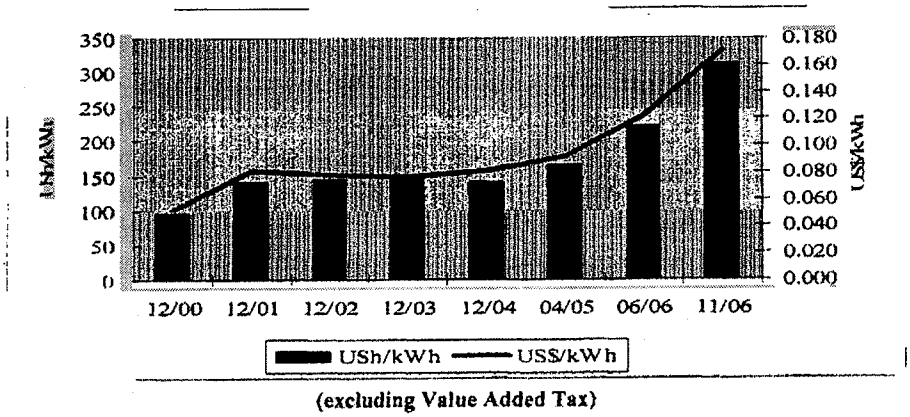
Table 9.2: Power Sector Performance (2001-05)

	2001	2002	2003	2004	2005
ɛt generation for domestic market (GWh)	1,425	1,426	1,542	1,687	1,827
lstem technical losses (GWh)	287	281	301	331	354
chnical losses (% of net generation)	19.7%	19.4%	19.5%	19.6%	19.4%
mmercial losses (GWh)	271	212	309	325	397
ɔmmercial losses (% of net generation)	19.0%	14.9%	20.0%	19.3%	21.8%
lled sales (GWh)	867	933	1035	1031	1075
llection ratio	83%	83%	77%	82%	86%
lled sales collected (GWh)	720	774	797	845	924
les collected as % of net generation	50%	54%	52%	50%	51%

245. The PAD's Figure 12.1 reproduced below,[228] illustrates how end-use customer electricity tariffs (exclusive of 18 percent Value Added Tax)[229] have risen since 2005, including a near doubling of 2006 average tariffs to accommodate the high cost of thermal generation. The PAD states that tariffs are expected to fall once Bujagali is commissioned "[...] *and the benefits of the loss reduction and efficiency improvements* [to be achieved by UMEME, the private distribution company that began work in March 2005] *are realized. In real terms, under the base case scenario, the projected weighted average electricity tariff declines from the present US$17.2c/kWh to US$13.8c/kWh by 2011.*" [230]

Figure 5 Weighted Average Retail Tariff December 2000 – November 2006

Figure 12.1: Weighted Average Retail Tariff December 2000 – November 2006



[228] PAD, Annex 12, p. 105.
[229] PAD, Annex 12, p. 105, fn 1.
[230] PAD, p. 7. See also PAD, Annex 12, Table 12.2, p. 106.

2. Demand Forecasts and Electricity Tariffs

246. The forecasting of the demand and its interaction with likely tariffs is a necessary element in the process of analyzing alternatives. Thus, the analysis of the future "expansion path" of an electric power system should explore both the likely evolution of the demand on the system and the least cost means of satisfying that demand through existing plant and new investments. This in turn carries implications for the tariffs needed to recover the costs and whether they are consistent with the forecast demand.

247. In the Requesters' opinion, the demand forecast analysis for the project is unrealistic. Only a small part of the population of Uganda can afford electricity that is unsubsidized. Therefore, the Requesters are convinced that even if the whole country is covered by the national grid, the electricity generated by Bujagali will not be affordable by the population. The Requesters maintain that the high cost of the Project will further limit the amount of subsidies for electricity tariffs for users connected to the grid, leading to even higher tariffs and pushing more people out of an already limited power market.[231]

248. Management notes that the risks related to future uncertainties of variables such as the level of electricity tariffs, the "*end user tariff path and its affordability*" have been evaluated. The Economic Study also projected three demand scenarios: base, low and high.[232] The Response indicates that these were developed taking into account data of the past several years and also the comments made by the Inspection Panel in its 2002 Investigation Report.[233]

249. OP 10.04 acknowledges that the Economic Study of projects is based "*on uncertain future events and inexact data*" and as such "*inevitably involves probability judgments*." The analysis must take into consideration the "*sources, magnitude, and effects of the risks associated with the project by taking into account the possible range in the values of the basic variables and assessing the robustness of the project's outcome with respect to changes in these values*." This analysis aims at identifying whether it is possible to improve the project design, increasing the expected value of the project and reducing the risk of failure.[234]

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[231] Request, pp. 8–9.

[232] Management Response, p. 7, reads: "[b]*y 2011, the base case generation requirement for the domestic market would be 2,208 GWh, with a spread around the base case of about 14 percent above (high case) and 18 percent below (low case). By 2015, the base case demand would be 2,959 GWh, with a spread around the base case of about 24 percent above (high case) and 30 percent below (low case).*"

[233] 2002 Investigation Report, ¶213, p. 62, reads, "In the Panel's view an analysis of the sensitivity of the key findings of the due diligence to a widening of the load forecast ranges would have been and could still be appropriate and valuable, and was needed in order fully to satisfy the requirements of paragraph 6 (Risk) of OP 10.04."

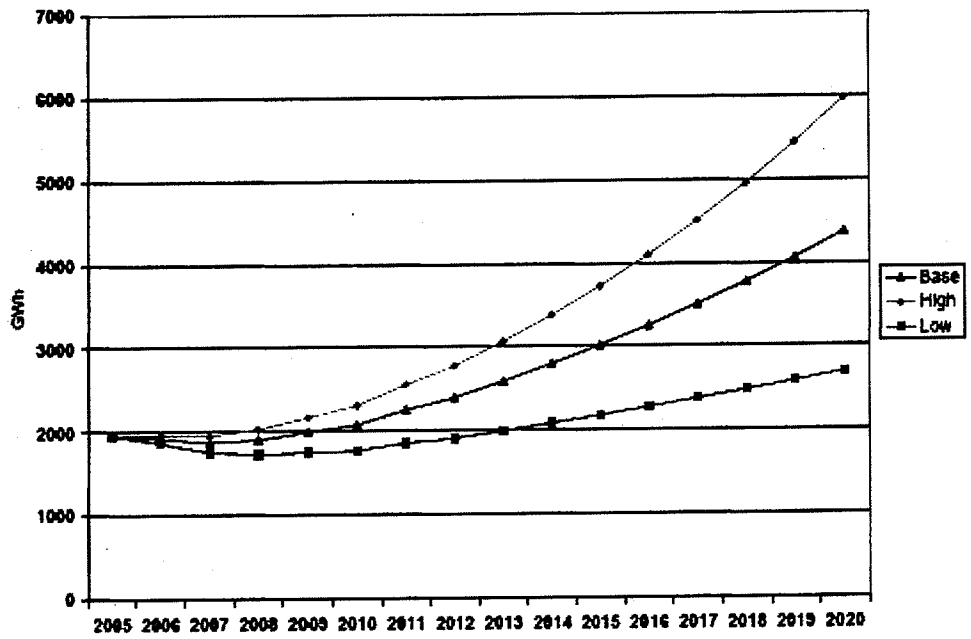
[234] OP 10.04 ¶6

250. As noted, the Inspection Panel Report on the first Bujagali project criticised some aspects of the load forecasts used for that project. **In the Panel's judgment, there is evidence that Management addressed demand forecasting for the current Project seriously, in that it commissioned a detailed, sophisticated review in 2004, which stressed the importance of a thorough revision of the load forecasts.**[235] One of the criticisms of the first Inspection Panel report related to the narrowness of the range on the prior project's forecasts, given the uncertainties relating to several of the key underlying variables. The forecasts for the current project show a much broader range between the high and the low cases, reflecting in particular significant variations around the base assumptions about residential connections and the rates of growth in household income and commercial and industrial GDP. It is noted, however, that all other assumptions remain the same as for the base forecast.

251. The two figures below, both extracted from the Economic Study[236] illustrate the base, high and low generation forecasts and the electricity sales forecasts and the ranges across them.

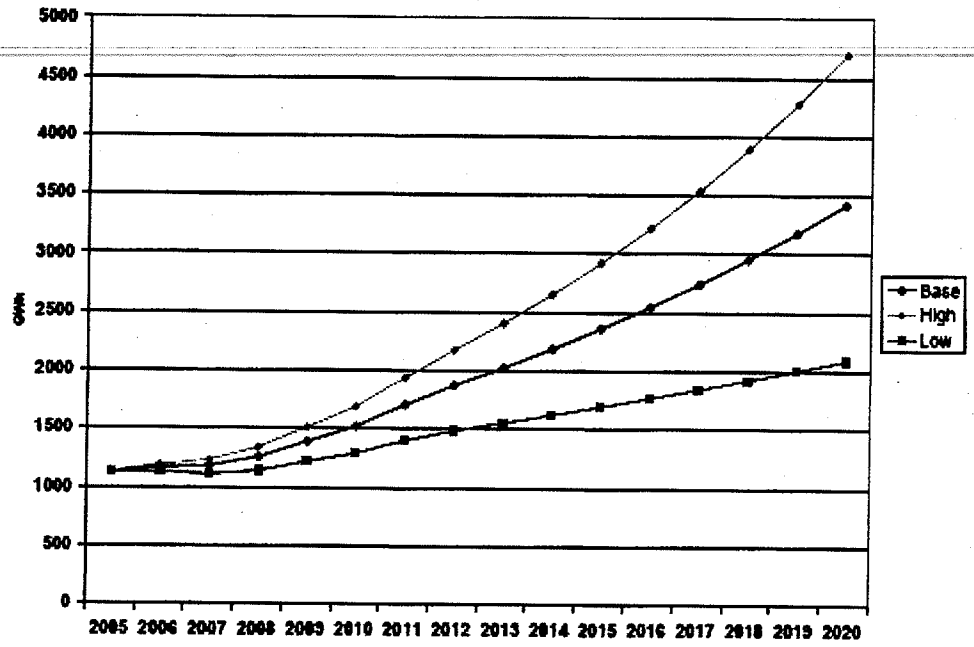
Figure 6 Generation Forecasts

Figure 2-4: Generation Forecasts (including committed exports – GWh net



[235] Bujagali Economic Review (BER), March 16, 2004 (hereinafter "BER 2004").
[236] Economic Study, Main Text ¶2.11, p. 38. A further figure illustrates forecast peak demand.

Figure 7 Sales Forecast for Uganda



252. In relation to new connections to the electricity grid, the Economic Study states that the growth rate in all connections over the period 2001 to 2005 was "*high, averaging 9.9% per year over the period. The average number of residential consumers added per year over the period is 21,000.*"[237] For the base forecast, the Economic Study indicates that for 2006–2010 inclusive they assume that new residential connections will be one fifth less than this—that is 17,000 per year. Of these, they assume that UMEME, the privatized distribution company,[238] will connect 12,000, their revised concession target, in urban and peri-urban areas, and that there will be 5,000 per year of grid-connected rural consumers from rural electrification programmes. The Economic Study states that "*Umeme is not expecting to connect more consumers than they are committed to in their concession in view of the shortages of generation and high tariffs that are likely to be experienced until Bujagali comes into service.*" [239] In June 2008 UMEME was reported to have made the, as yet unsubstantiated, claim to have already exceeded their concession target of 60,000 new connections in their first

[237] Economic Study, Main Text, ¶2.2, p. 26.

[238] UMEME is a company, originally owned by Eskom, South Africa (44 percent), who subsequently withdrew, and Globeleq, UK (66 percent), set up to manage the electricity distribution operation and maintenance concession. The 20-year concession began on 1 March 2005, with an option to exit pending an assessment of operations during its first 18 months (see, for example, http://www.eskom.co.za/annreport06/directorrep1.htm; accessed 15 July 2008)

[239] Economic Study, Main Text, ¶2.5, p. 28.

five years, by making 63,000 connections since taking over the distribution network in 2005.[240]

253. For the base forecast, from 2011 to 2020, the Economic Study assumes that connections will rise after the ending of "*generation capacity constraints, which will trigger an increase in the rate of connections, both urban and rural. Over this period it is assumed that 25,000 new residential consumers will be connected each year, including both urban and rural connections.*"[241] For the variants on the base forecast, the Analysis assumes that: for the 'high' variant, there will be 20,000 new residential connections per year to 2010 and 30,000 per year thereafter, that is 18 percent and 20 percent respectively above the base values; while for the "low" variant there will be 12,000 new connections per year to 2010 and 17,000 per year thereafter, that is 17 percent and 28 percent respectively below the base values.

254. For the base forecast, apart from the reference to the "ending of generation capacity constraints," the Economic Study does not explain how the study arrived at the sudden jump from 17,000 to 25,000 new connections per year between 2010 and 2011, a 47 percent increase in a year, which is then assumed to remain constant throughout the next decade. Such a sudden increase would surely prove extremely demanding for both management and workforce of UMEME, the distribution company. **The Panel notes that although the availability of reliable electricity supply at the time the Bujagali plant is commissioned might reasonably be expected to stimulate new connections, the Economic Study appears to assume a more sudden increase in connections than seems likely to occur. A more gradually phased trajectory of connections to the grid after 2011 would seem more plausible, both for the base forecast and the low and high variants.**

255. In relation to losses, the Economic Study states that in 2006 estimated total losses were 39 percent, consisting of 20 percent technical losses (transmission 4 percent, distribution 16 percent) and 19 percent commercial losses. The Economic Study assumes that technical losses will reduce to 16 percent for the base demand forecast, a target which it says UMEME have a "*strong incentive*" to exceed. The Study indicates, however, that "*Forecasting attainable levels of commercial losses is more difficult*," and that if UMEME's programmes are carried through and supported by the courts with strong penalties, this could lead to a big reduction in commercial losses: "*Residual levels of commercial losses of between 2% and 6% should be achievable, with a base demand forecast assumption of 5%, by 2012.*"[242] It is not explained why 5 percent was selected from within this range, rather than the central value of 4 percent.

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[240] *Demand Overwhelms UMEME*, New Vision (Kampala), June 12, 2008, Posted to the web June 13, 2008 (http://allafrica.com/stories/printable/200806130045.html; accessed 15 July 2008). In this report UMEME also said that: "*Demand for new connections from consumers has more than doubled from 1,400 a month to 3,000 currently*;" and (b) that UMEME had hired 1000 technicians in order to clear the backlog. This latter would represent about a doubling of UMEME's 2007 workforce, as recorded by the Electricity Regulatory Authority.

[241] Economic Study, Main Text, ¶2.5, p. 28.

[242] Economic Study, Main Text, ¶2.9, p. 35.

256. Table 2–9 of the Economic Study,[243] reproduced below, sets out their assumed future levels of technical and commercial losses for the base case forecast. They assume that, once reduced, losses will stay at their 2012 levels up to 2020.[244] For the load forecast sensitivity scenarios, however, it is stated without explanation that the assumed values for technical and commercial losses are "as for base forecast." The Analysis also states that the current collection ratio (i.e. the ratio of sales collected to sales billed) was 80 percent and that UMEME was committed under the concession agreement to improving the ratio to 92.5 percent by 2008. The Economic Study asserts that they based the demand forecast on achieving 90 percent by 2008 and 97.6 percent by 2011, remaining constant thereafter.[245] No reason is given why it was thought appropriate not to test the sensitivity of the "high" and "low" forecasts to potential variations in technical and commercial loss reduction (or in improvements to the collection ratio).[246]

Table 4 Forecasts of Technical and Commercial Losses

Table 2-9: Forecasts of Technical and Commercial Losses

	2005	2006	2007	2008	2009	2010	2011	2012
Technical losses	19.4%	20.0%	19.5%	18.8%	18.1%	17.4%	16.7%	16.0%
Commercial losses	21.7%	19.0%	17.0%	15.0%	12.0%	9.0%	7.0%	5.0%
Total losses	41.1%	39.0%	36.5%	33.8%	30.1%	26.4%	23.7%	21.0%

Source: Consultant's estimates.

257. The PAD confirms that the Government and UMEME renegotiated UMEME's distribution and supply license in December 2006, "*Since the lack of power severely hindered UMEME's ability to meet its performance targets* [...]."[247] The overall collection rate, which had risen from 80 percent on takeover to 92 percent by May 2006, fell to 82 percent in November/December 2006, after a substantial tariff rise in November 2006.[248] In its discussion of Critical Risks, the PAD also confirms that to address the risk that UMEME terminates its concession, IDA and MIGA are providing coverage for regulatory, non payment and breach of contract risks, and that the concession was modified to protect UMEME's ability to meet its concession obligations.[249]

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[243] Economic Study, Main Text, ¶2.9, p. 35.

[244] Economic Study, Main Text, ¶2.9, p. 35, also estimates that 70 percent of commercial losses will be converted into billed sales and the remaining 30% will drop out of the system. They say that, "*this assumption was adopted in deriving the base forecast and the high/low sensitivity forecasts.*"

[245] Economic Study, Main Text, p.31.

[246] QER 2007, p. 12, states: "*Comparing the start and end points of the Base Frame development* [...] *the ratios of paid end-use to generation are only about one-half, the other half consumed in losses and uncollected bills. The future evolution of this tremendous leakage and the impact on electricity use of its reduction are the most important factors determining generation requirements at least over the remainder of this decade.*"

[247] PAD, Annex 12, p. 104.

[248] PAD, Annex 12, p. 104.

[249] PAD, p. 23.