Report Number: ICRR0021573

1. Project Data

Project ID	Project Name
P049290	LA - Nam Theun Social & Environment
Country	**Practice Area(Lead)**
Lao People's Democratic Republic	Environment, Natural Resources & the Blue Economy

L/C/TF Number(s)	Closing Date (Original)	Total Project Cost (USD)
IDA-H1550	31-Dec-2017	19,969,076.54
Bank Approval Date	**Closing Date (Actual)**	
31-Mar-2005	31-Dec-2017	

	IBRD/IDA (USD)	Grants (USD)
Original Commitment	20,000,000.00	0.00
Revised Commitment	20,000,000.00	0.00
Actual	19,969,076.54	0.00

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2. Project Objectives and Components

a. Objectives

Project Appraisal Document (PAD): To generate revenues, through environmentally and socially sustainable development of NT2's hydropower potential, which will be used to finance priority poverty reduction and environmental management programs.

Legal Agreement (LA): To assist the Recipient to implement priority poverty reduction and environmental programs by generating revenues through environmentally and socially sustainable exploitation of the resources potentially generated from the Nam Theun 2 Hydroelectric Power facility.

While the objectives are not stated identically between the PAD and the LA, they both cover the same goals making them consistent. The PAD more clearly indicates that the goal is to "finance poverty reduction and environmental management programs" while the LA states the same objective as "to assist the Recipient implement poverty reduction and environmental management programs" by "generating revenues", which is equivalent to "financing" (i.e. channeling funds raised through the NT2 project as the assistance provided by the project to the GoL to implement poverty reduction and environmental management programs). The project preparation work and design as well as the results framework (RF) also validate this understanding, although the objectives as stated in the PAD more accurately depicts the goal commensurate to the designed scope of the project.

b. Were the project objectives/key associated outcome targets revised during implementation?
No

c. Will a split evaluation be undertaken?
No

d. Components
The NT2 Project comprised three main components as described in the PAD:

Component 1: NT2 Hydropower Facility. (Estimated Cost: US$722.2million; Actual Cost US$736.1 million)

Construction of a hydropower facility with a capacity of 1,070 MW, providing 995 MW for export to Thailand and 75 MW for domestic use. The facility comprised a 39m high dam and a 450 km2 reservoir on the Nam Theun River and Nakai Plateau. It also included 138 km transmission line to the Thai border and 70 kms of transmission lines to the national grid.

Component 2: Management of Environmental and Social Impacts of NT2(Estimated Cost: US$48.8 million; Actual

Cost: US$78.6 million) in four main areas: (i). implementation of a Social Development Plan (SDP) comprising the construction of resettlement villages for 6,300 project affected persons (PAPs) on the Nakai Plateau, design and delivery of livelihood programs for PAPs, design and implementation of measures to restore and enhance household income, and technical assistance to strengthen the Government's capacity in areas related to resettlement; (ii) implementation of an Environmental Assessment and Management Plan (EAMP) in the Nakai Plateau and downstream areas comprising

mitigation measures, wildlife management programs, water quality monitoring and management programs, flood control measures, supervision and monitoring of construction contractor's environmental mitigation and monitoring plan, and technical assistance to strengthen the capacity of the Government's environmental management unit; (iii) implementation of Downstream Program for fisheries and fishing impacts of river diversions; and (iv) implementation of the *Social and Environment Management Framework and First Operational Plan* (SEMFOP) for the NT2 watershed.

Component 3: Monitoring and Evaluation. (Estimated and actual costs are not available.) These arrangements included the design and adjustment of the RF to ensure compliance with all project fiduciary requirements. It included: (i) supervision of physical implementation; (ii) independent review of key project components through the Dam Safety Review Panel (DSRP) and Panel of Environment and Social Experts (POE); (iii) systematic monitoring of technical, and environmental and social (E&S) safeguards by a professional firm; (iv) an Independent Advisory Group (IAG) to advise World Bank senior management on project implementation; and (v) supervision by World Bank staff, other International Finance Institutions (IFIs), and bilateral agencies (The PAD notes that, due to IDA's "extraordinary preparation costs" the Bank will charge NTPC a processing fee of US$5 million in five annual installments beginning at financial close.)

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost. The total project cost at appraisal was estimated at US$1,450 million including US$200 million designated for contingencies. The actual total project cost at closing was US$1,308 million.

Project Financing. The project was structured as a public-private partnership (PPP) with the World Bank financing (IDA) was US$20 million (actual at closing was US$19.97 million) in grants, plus an IDA guarantee of up to US$50 million that backstopped various risk that were guaranteed by the Government of Lao PDR (GoL) to private lenders. In addition to the World Bank, the project was financed by other IFIs (including the Asian Development Bank (ADB) and the European Investment Bank (EIB)), bilateral financiers, export credit agencies along with a consortium of 14 international private commercial banks (including seven from Thailand). The total debt raised at appraisal for base cost was US$950 million, and comprised 72 percent of overall project financing. The project sponsor was the Nam Theun Project Company (NTPC) that provided the overall equity of 28 percent or US$350 million of base cost through its corporate shareholders that included Electricité de France International (EDFI), Italian-Thai Development Public Company Limited (ITD, Thailand), Electricity Generating Public Company Limited (EGCO, Thailand) and Lao Holding State Enterprise (LHSE).

Borrower Contribution. The LHSE was a newly created state-owned enterprise that served as the vehicle for the GoL equity in NTPC. There was no direct Borrower contribution in terms of financing although NTPC under the Concession Agreement paid the GoL US$30 million as reimbursement for its development expenses, loss of biodiversity, and in consideration for granting the concession, some of which was expected to be used as a GoL equity contribution).

Dates. The NT2 project was approved on March 31, 2005, became effective on June 10, 2005, and was closed as planned on December 31, 2017 without any extensions or formal restructuring during the implementation period.

3. Relevance of Objectives

Rationale

At the time of appraisal, the PAD indicated that the NT2 project was consistent with the "GOL's strategy for promoting growth through private sector development, regional integration and the sustainable development of Lao PDR 's natural resources." The NT2 project is designed to promote export-led growth through regional integration with 93% of the capacity dedicated to supplying electricity to neighboring Thailand, and the remainder confirmed as a least-cost solution for supplying the domestic market. The PPP approach prioritizes a consortium led by a reputable private operator, with the project design directly addressing the sustainable exploitation of its hydro resources. The World Bank Country Assistance Strategy (CAS) under which the project was appraised had a specific objective dedicated to supporting the NT2 project as an "area-based, sustainable natural resource development project that can contribute to growth and capacity development and that has been designed with thorough consideration for environmental and social aspects".

According to the ICR, the latest World Bank Systematic Country Diagnostics (SCD) for Lao PDR, the first of three priority development pathways is the 'sustainable and efficient management of natural resources' and noted that 'promoting the strategic use of natural resources and protecting the environment' should remain a 'top priority' for the Government and an integral component of the CPF. Accordingly, two of the three World Bank Country Partnership Framework (CPF) priorities for Laos are to support "inclusive growth and protection of the Environment". Furthermore, the ICR states that poverty alleviation and natural resource management remain central to the 8th National Socio-Economic Development Plan (NSEDP) of the country. More specific to the NT2 project, a key objective of the CPF is "Investing in Infrastructure for growth and inclusion" to "sustain investment in poverty reduction using the resources generated by the further development of the country's hydropower potential". Therefore, it can be concluded that the objective of this major project was and remains a high development priority for the government of Lao PDR and the World Bank.

The overall PDO, while comprehensive and ambitious, could be achieved with an appropriate scope for its activities. The objective is also consistent with the recommendations from the 2000 report of the World Commission on Dams (which were formally adopted by the World Bank through its 2010 *Directions in Hydropower*) to more comprehensively ensure the benefits of hydropower projects. The project had a highly qualified hydropower developer as the key sponsor, although the institutional capacity of the borrower to implement a comprehensive set of environmental, social, and public financial management (PFM) reforms may have extended beyond its capacities, especially given that some institutions were being newly set-up with limited experience. The extended and well-resourced preparation period of nearly a decade and a thorough assessment of demand for electricity in Thailand, a key risk to project success, was well mitigated.

Rating

High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

Exploitation of hydro resources to generate electricity and related revenues from the NT2 hydroelectric power facility.

Rationale

The ICR indicates that the construction of the NT2 hydropower facility was completed in 2010, in 58.5 months, which is 4.5 months longer than the timeframe estimated at appraisal. This is significantly less than the average 14 months of time overruns experienced by a sample of World Bank financed hydropower projects evaluated recently by IEG, especially given the large-scale and complex nature of the NT2 development. The NT2 power plant achieved its targeted list rating of 1,070 MW, and the ICR confirms that the facility has been operating successfully since its commissioning in 2010. Data indicates that the electricity produced by NT2, which is the key determinant of revenues, has "consistently exceeded" the 5,000 gigawatt hour (GWh) target for electricity exports to Thailand and the 200 GWh target for electricity supply to the domestic market in Lao PDR [The World Bank team informed IEG that there was a typographical error in one instance in PAD RF incorrectly indicating a domestic supply target 600-800 MWh, which was documented and corrected through the ISR process (ISR #6 dated June 29, 2014)]. There is evidence that the performance of the NT2 hydropower facility will continue, at the least, due to the fact that its list capacity is consistent with the envisioned design, and it has exceeded the operational outcome targets to date. Even in NT2's lowest performing year prior to project closing, when it experienced low water levels, the total electricity production was 5,315 GWh exceeding the target. The NT2 reservoir volume loss due to silting was targeted to be no more than 2 million cubic meters (M3) whereas the actual volume loss by 2017 according to the World Bank team was far below at 0.02 M3, confirming an important parameter for maintaining sustainable operations. In addition, NTPC, the company that operates the facility, is a consortium experienced in construction and operation of hydropower; and having concession rights to NT2 until 2034, there is ample incentive for them to continue to operate NT2 efficiently. The ICR also indicates that the timeframe of the concession provides adequate time for preparing for the transfer of NT2 operations to the Lao PDR electricity utility, Electricité du Laos (EDL), at the conclusion of the build-own-operate-transfer (BOOT) arrangement. While an orderly transfer is important and there is indeed sufficient time to prepare for this eventuality, the analysis at appraisal conservatively assumed US$0 residual value for its operations at the end of the concession period. Therefore, a sustained operation through the concession period until 2034 would fully meet the revenue targets envisioned for the project.

The adequate construction of the NT2 power facility and sustained operation at levels envisaged are pre-conditions for generating revenues from the project that was successfully achieved by project closure, as previously noted. The revenues need to be better defined since there are different entities that can accrue revenue from the electricity produced from NT2 (NTPC, GoL, EDL). However, based on the DO of the project, it can be inferred that the revenue accrual refers to the GoL, since these are expected to subsequently be channeled to "priority poverty reduction and environmental programs" through the public

expenditure mechanism of the country. The primary sources of revenue from NT2 to the GoL were from: 1) water resource user charges, 2) taxes, and 3) dividends from the 25% equity share of NTPC by GoL through LHSE. The net revenue that is available would be subject to any GoL repayments of funds used to secure its equity in NTPC (i.e., repayment of EIB and ADB debt). Although none of the project outcome indicators include a specific revenue target, the PAD estimates that the average annual nominal revenue to be US$30 million until 2020 (i.e., covering the period until close of World Bank project in 2017), to increase substantially to approximately US$110 million average annually (nominally) thereafter until the end of the concession period in 2034 following the completion of the major debt-service obligations. The ICR indicates that, during the operational period from 2010-2017, total net revenues from NT2 to the GoL were US$180 million, which, when adjusted for 2010 commissioning year when the power plant operated only part of the year, is US$25 million annually, thus achieving most of the annual target of $30 million estimated in the PAD for these initial years up to 2020 (In fact, the PAD clarifies that the target of US$30 million should be reduced to reflect the repayments to ADB and EIB for loans that constituted the 25% equity in NTPC by the GoL (information that the World Bank team was unable to provide to IEG at the time of the review). It is possible that the actual revenues were even closer to or exceeded the goal if the US$30 million target were adjusted for potential loan repayments. It will be important to monitor progress post 2020, when the net revenues are expected to increase substantially following repayment of major debt by NTPC, to an estimated US$110 million for the GoL.

OUTCOME INDICATOR: Generation capacity of hydropower plant constructed/rehabilitated under the project (MW) – Fully Achieved

The achievement of PDO 1 is rated **substantial** when considering the electricity produced by NT2 and revenues generated for the GoL as a result.

Rating
Substantial

OBJECTIVE 2

Objective
Exploitation of resources for the Nam Theun 2 Hydroelectric Power facility in an environmentally sustainable manner.

Rationale
The environmental impacts from the NT2 project, according to the PAD, are primarily in the following four areas to varying degrees: (i) the Nakai Plateau where most of the resettlement will occur; (ii) the NT2 watershed; (iii) the downstream area along the Xe Bang Fai River and its tributaries; and (iv) the downstream area along the lower NT River and its tributaries. As the ICR states, the physical works associated with NT2 were extensive, ranging from road construction to dam construction, impoundment of the reservoir and changes in river flows, and establishment of resettlement villages, with an equally wide range of environmental impacts and potential for environmental damage, including loss of fauna and flora, water quality, waste management and abandoned construction sites. The mitigation of these impacts requires the successful implementation of the

Environmental Assessment and Management Plan (EAMP) including meeting the requirements of the Head Construction Contract Environmental Management Plan (HCCEMP) and to manage the watershed by implementing the Social and Environment Management Framework and First Operational Plan (SEMFOP).

Following construction of the NT2 hydropower facility, the land used for all of the 348 sites have been decommissioned and restored back to its natural slope and vegetation in accordance with the provisions in HCCEMP, according to the ICR. The World Bank team indicated that flood control measures were undertaken especially in downstream areas including through controlled inundation of the reservoir. The ICR also confirmed that the project complied with all riparian release measures including international waterways (OP 7.50). During the construction and resettlement period, the work of the NTPC as a result of project activities were overseen by the GoL's Environmental Management Unit (EMU), whose responsibilities transferred upon the establishment of the Ministry of Natural Resources and Environment (MONRE).

Since the construction of the NT2 hydropower facility would affect water flows and impact its quality, water quality monitoring and management programs were implemented in the reservoir and downstream areas. The ICR notes initial issues with low water quality after impoundment, but that it was subsequently stabilized, and at project close, the water quality was adequate to ensure sufficiency and diversity of fish stock in the reservoir as well as the Xe Bang Fai and Nam Theun rivers. Various aspects of water quality were tracked and the Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand – all were measured to exceed the guidelines. While Total Suspended Solids and Total Phosphorous exceeded the guidelines, the E&S Progress Reports indicated that it was related to high sediment laden increase in rainfall or other activities such as mining, and not associated with the release from the NT2 project. The ICR notes that the water quality was deemed to pose no threat to public health. It is worth noting that the NT2 project only diverts the flow and does not abstract water from the Xe Bang Fai and Nam Theun rivers. Furthermore, the ecological impacts of NT2 along the downstream tributaries (i.e., Mekong) are "insignificant", as noted in the PAD, and cannot be attributed to the project given the significant volume of other agriculture and hydropower activities that occur in the Mekong Basin.

As a part of environmental mitigation action, the NTPC implemented a Wildlife Program that included various wildlife management activities and monitoring of the reservoir area especially during construction and commissioning of the NT2 hydropower facility, with some undertaken in partnership with several non-governmental organizations (NGOs). The program managed by NTPC also included patrolling the area, turtle conservation and environmental education, wetland conservation, invasive species management, an elephant program, and monitoring of key species. All activities were endorsed by the Panel of Environmental and Social Experts (POE). According to the ICR, 268 individual animals from 49 species were captured and released, which was made feasible due to the deliberate slow filling of the reservoir. It notes that none of the 140 elephants were lost during inundation/translocation, and that the Elephant Management Plan adapted to focus more on human-elephant conflict (HEC) mitigation. Additionally, 316 out of 420 turtles were successfully captured and released, exceeding the target in some species. While an independent study (Streicher, 2016) concluded that the translocation program was "an outstanding success", the post-translocation monitoring of data is limited, according to the ICR, to fully assess stabilization or improvement in the reservoir area during the period following the construction/commissioning of the power plant.

The responsibility for the management of the overall NT2 watershed rested with the Watershed Management and Protection Authority (WMPA), which was a first-of-its-kind agency in Laos established specifically for the NT2 protected area 'to execute

all the designated managerial functions to support conservation and community well-being in a technically sound, transparent and professional manner." This was an important assignment since protection of the watershed was assessed by the World Bank at appraisal to be "one of the main challenges for successful conservation" as the area is "nationally and internationally recognized as one of the most important biodiversity sites in Southeast Asia". In addition to the conservation work carried out by the NTPC in the reservoir area, the WMPA was expected to ensure that there would be no further degradation of habitats or declines in populations of threatened species in the overall watershed. NTPC completed initial surveys of the plateau/reservoir areas prior to the planned handover to WMPA in 2011.

While a total of 400,000 hectares (ha) have been preserved by bringing it under enhanced biodiversity protection and forest cover with a decree (#39) issued that prohibits mining, logging and other commercial extractive activities within the watershed, there continues to be pressures from illegal logging and poaching, according to the ICR. While organized poaching and logging predates the WMPA and the NT2 project, greater access to the area provided as a result of the NT2 project may have further contributed to the situation. According to the ICR, while the WMPA fielded patrols in the watershed and reservoir, its mandate to monitor and account for biodiversity has lagged behind due to weaknesses in institutional capacity. The ICR concludes that, while the initial phase impacting the reservoir area was well managed by the WMPA, which introduced controls, the area has experienced a loss of biodiversity, such as large mammals including threatened species. The ICR did, however, indicate that recent reforms were implemented to raise the capacity of the WMPA to international management standards covering staffing, including the addition of a full-time Consortium of Experts (COTE), administration (Board approval of a Five-Year Plan), wildlife protection technologies and approaches supported by new GoL policies for natural resource management (i.e., logging legislation). This effort was to receive support from the International Union for the Conservation of Nature (IUCN) since the NT2 protected area is being converted to Laos' first national park, which provides the legal basis for greater protections in the area and upgrades the IUCN conservation classification. Furthermore, the World Bank's Second Laos Environment and Social Project (LENS2) will also provide funds to augment current funding from NTPC (until close of concession in 2034) to upgrade the currently protected area to a National Park and professionalize the agency. The July 2018 report by the POE indicated that the progress with watershed management was a cause for "cautious optimism". Nevertheless, the phase 2 objectives with respect to management of the watershed was only partially achieved, and there remains risks as to whether these new initiatives will be successfully implemented and the conservation goals within the NT2 watershed will be fully achieved.

INDICATORS:

- *Water quality adequacy in Nam Theun reservoir and Xe Bang Fai River – Fully Achieved*
- *All construction sites have been decommissioned and restored in accordance with provisions of the HCCEMP – Fully achieved*
- *Populations of elephants and other terrestrial and aquatic species have stabilized or improved on the plateau – Almost Fully Achieved*
- *Watershed environmental protection conservation and management of the NT2 watershed results in no further degradation of habitats or in declines of threatened species – Partially Achieved.*

On balance, the achievement of PDO 2 is rated **substantial.**

Rating
Substantial

OBJECTIVE 3
Objective
Exploitation of resources for the Nam Theun 2 Hydroelectric Power facility in a socially sustainable manner.

Rationale
The impacts of the NT2 hydropower project on three specific community groups would need to be sufficiently addressed in order to develop the hydropower resources in a socially sustainable manner: people resettled from the reservoir area, communities residing in the watershed area, and downstream project affected people (PAPs). This required successfully implementing the Social Development Plan (SDP) for the project and its various provisions.

The ICR indicates that 6,300 people were resettled (consistent with estimate at appraisal of 6,200) from the reservoir area through a process of 'extensive consultation'. This was done with the concurrence of the POE since the NT2 project design linked the construction tasks with related Environmental and Social (E&S) activities. The resettled households also achieved at a minimum the rural poverty level of income that is approximately double the pre-project incomes (estimated at US$820 per capita per year, which equates in local currency to 192,200 LAK per month when inflation adjusted). This target was surpassed with actual median incomes of 220,000 LAK per capita per month. According to the ICR, 97 percent of the household met income targets directly while the remaining three percent receive in kind support through social safety nets or special programs. The ICR reports that the village income targets were also met, although it did not make clear whether levels specifically reached US$1200 at a minimum as targeted in the PAD RF. Other indications of improved quality of life are noted as increased savings (from 21 percent to nearly all households), land titles for new property (none had them previously), increased access to infrastructure (1,330 houses, 270 km of roads), improved health with support from two new health centers and upgrades to district hospital (childhood mortality dropped from 120 to 50 per 1000, stunting is down from 43 percent to 34 percent, and 90 percent of children under five are immunized), and the construction of 17 primary and 16 nursery schools contributed to primary enrollment to surpass national rural average (in resettled villages, enrollment increased from 31 percent to 91 percent). According to the ICR, 99 percent of families say their life now is good or better [2014 Socio-Economic Survey]. In its 28th report (July, 2018), the POE confirmed that the project achieved a "basis for sustainability", as required in the Concession Agreement (CA), and that they had "confidence that the project is on the road to overall sustainability".

There was also an effort to improve quality of life for the enclave communities within the watershed as they faced potential reduction in access imposed by conservation efforts of NT2. The aim was to provide them with higher incomes, better access to basic services and enlist their active involvement in conservation, since the population is likely to face limitations on their access to resources including wildlife in the area as a result of the legislative and physical restrictions in place due to the NT2 project. These communities also stood to "benefit from enhanced land and resource use rights, improved access to basic services, health facilities and schools" that were developed as a result of NT2. Furthermore, these communities benefited from enhanced

resource use rights encompassed in participatory land-use planning, village forestry, and fishing associations. A 2018 study found 90 percent of those surveyed had improved lives (including due to access to education and health services) with 75 percent attributing it to the activities of WMPA despite the previously noted challenges faced by the organization in its conservation efforts. The ICR also noted that while communities are involved in some remunerated conservation activities such as patrolling the watershed area, it has not been formalized as envisaged at appraisal. Such inaction likely contributed to the shortcomings in natural habitat and species conservation previously cited in the environmental impacts.

According to the ICR, approximately 100,000 people live in areas downstream of the NT2 dam and powerhouse, and they are vulnerable to changes in river flows that can result in loss of land, changes in income from fisheries, protein intake, and water quality. The NT2 project was designed to compensate for lost property and develop alternative livelihoods to address income loss due to loss of fisheries and potential protein deficiencies through nine different initial options that were developed and discussed with affected villages. For the expected increased flooding of agricultural land in the lower Xe Bang Fai, the project aimed to raise riverbanks to protect paddy fields, complemented by development assistance where needed, through some of the same alternative livelihood models proposed for fisheries losses. The World Bank team informed IEG that nine options were offered based on consultations and feasibility studies. They included integrated rice-fish farming, fish pond culture, integrated livestock-fish farming, livestock rearing, and alternate livestock production as compensation. The ICR highlights that the last formal Downstream Socio-Economic Survey in 2014 concluded that the dietary consumption has increased and diversified while sustaining protein levels, there is increased assets and improved housing, and an overall reduction in poverty. The ICR further notes that there was adequate water quality and a diversity of fish stocks, posing no threat to public health (based on water quality tests). The ICR did note that there were concerns in 2015 regarding income sustainability and livelihoods of some vulnerable households (especially in downstream areas) that led to the preparation of livelihood plans for 92 most affected villages with business plans for individual households. It stated that assessment of income levels in the downstream area suggests most households have exceeded pre-project incomes, although some of the very poor may not have met that average, resulting in additional measures and monitoring by local government. The POE confirmed that progress was made to "materially improve resettler livelihoods on a sustainable basis", which led to them recommending closure of the resettlement program. The POE also stated that the overall project achieved a "basis for sustainability", as required in the Concession Agreement (CA), and that they had "confidence that the project is on the road to overall sustainability".

INDICATORS:

- *Household income targets of resettled households on Nakai Plateau (100%) – Fully Achieved.*
- *Resettled villages meet village income targets (100%) – Fully Achieved.*
- *Basic public and social services are provided and improved in all resettlement villages on the Nakai Plateau – Fully Achieved.*
- *Maintenance of pre-project levels of income and protein equivalent in affected villages in the Xe Bang Fai river and Nam Theun river – Almost Fully Achieved.*
- *Quality of life in enclave villages (villages located in the watershed protected area) – Almost Fully Achieved.*

On balance, the achievement of PDO3 is rated **substantial**.

Rating
Substantial

OBJECTIVE 4

Objective
Assist the recipient with implementation of priority poverty reduction and environmental programs from revenue generated from Nam Theun 2 Hydroelectric Power facility.

Rationale
The aim of this objective is to (i) redirect all (100%) of the revenues generated for the Government from the NT2 hydroelectric power facility, (ii) utilize the revenues in eligible poverty reduction and environmental activities while ensuring that the activities funded from NT2 revenues are 'additional', and (iii) transparently report the generation and application of NT2 revenues. As previously noted, the primary sources of revenue from NT2 to the GoL were from water resource user charges, taxes, and dividends from the equity share of NTPC by GoL (less loan repayments for the borrowed funds that were used as equity in NTPC). From 2010-2017, total net revenues from NT2 to the GoL were estimated at US$180 million in total or an annual average of about $25 million according to the ICR adjusting for 2010 commissioning year when the power plant was in operation for less than 12 months.

The ICR reports that 100 percent of the net revenues of US$180 million generated from the NT2 project from 2010-17 were allocated to eligible programs, although it notes that from 2010-14 a specific NT2 Designated Account was not set-up by the MOF as per the Development Grant Agreement. A functional equivalent approach was agreed to only in 2015, for the GoL to assign account codes to all NT2 revenue sources across all bank accounts that received NT2 revenues. For the revenues accrued previously (2009/10 – 2014/15), they were consolidated manually and verified by the State Audit Organization (SAO) and published and posted albeit with a 2-3 year delay. The team indicated that these figures were further validated by the PFM specialist through a cross-check with the financial accounts of NTPC.

The revenues generated from the NT2 hydropower project were allocated for poverty reduction and environment activities utilizing the Public Expenditure Management Strengthening Program (PEMSP), which was designed to "improve policy consistency, efficiency, transparency and accountability in public expenditure management by strengthening institutional systems and making progress towards appropriate international financial management standards" according to the PAD. The allocation of NT2 revenues for 2010-17 was as follows: a) 74 percent for education and health-related investments, and the Poverty Reduction Fund; b) 25 percent for public works and transport (rural road construction and maintenance in poorer provinces), energy and mining (primarily to support rural electrification), and projects implemented by provinces, and c) one percent for natural resources and environment. Three fourth of the revenues are channeled to address health, education and other poverty alleviation-related activities. Additionally, infrastructure investments funded from revenues also have a poverty focus aiming for greater rural access through transport and energy. The environment related funding was by far the smallest. This does not necessarily reflect a shortfall towards a major objective (to support environmental activities), as explained in the

ICR; instead the low share reflects separate support by the World Bank to the Environment Protection Fund totaling additional IDA funding of over US$39 million approved in FY 2011 and FY2014 as well as nearly US$7 million in trust funds approved in FY2014. A need for such "allocational flexibility" was anticipated at appraisal, according to the PAD, on the basis that "development policies and needs are likely to change before and after COD in 2009", as was the case in Laos. As such, the shift in the utilization of the NT2 revenues with a lower share on environmental protection can be acceptable on the account of increased funding for this purpose from other sources.

The overall expenditure allocation and management relied on the existing PEMSP and the GoL budgeting process, which was vetted during appraisal. However, the PEMSP project closed shortly after the revenue management program started, and PFM reforms largely came to a halt, according to the World Bank team, primarily due to political reasons. They indicated that a new round of reforms started in 2018, which may better support the channeling and utilization of revenues going forward, especially since it is forecast to increase substantially in 2020 when major debt repayments are completed. The ICR also cites 'additionality' of NT2 revenue allocation as a guiding principle, but indicates that verifying that the expenditures funded by NT2 revenues were in addition to the overall budget increase in a given year proved to be difficult (due to lack of baselines, changes in budget classification, and lack of timely data availability). While the ICR claims that "tangible progress has been made in building transparency and accountability in how NT2 revenues are managed and allocated" the lapse of a designated account for NT2 revenues until 2015 was a shortcoming that certainly made for inadequate reporting and opaqueness requiring manual aggregation and the need to further cross-check data for accuracy. The ICR does state that NT2 revenue statements were shared with the World Bank and forwarded to State Audit Organization (SAO) for use in audits (although they were not published separately), a sample of programs and projects financed with NT2 revenues were audited (which were published), and MoF reporting on implementation and consultation has been carried out annually since 2012 with all IFIs including the World Bank.

INDICATORS:

- *Allocation and utilization of NT2 revenues for poverty reduction and environmental management purposes (100%) – Fully Achieved*
- *Financial statements (of NT2 revenues) are published – Almost Fully Achieved*
- *Audit reports for eligible programs (financed with NT2 revenues) are published (annually) – Almost Fully Achieved*
- *Ministry of Finance reports on implementation of revenue management arrangement and holds annual consultation with NT2 partners – Fully Achieved*

On balance, the achievement of PDO4 is rated **substantial**.

Rating
Substantial

Rationale

The project development objective can be parsed into four (4) distinct sub-objectives: the 1) generation of revenues from the sale of electricity produced by exploiting the hydropower resources through the NT2 power plant constructed with project funds; doing so in an 2) environmentally and 3) socially sustainable manner; and to 4) implement priority poverty reduction and environmental programs from revenue generated from NT2 Hydroelectric Power facility.

The project's Theory of Change (ToC) as described in the ICR provides a logical causal chain from the key project inputs (the financing to construct the power plant, support to environmental and social activities including safeguards, and the monitoring and evaluation assistance) contributing to outputs (generation of electricity, adherence to good practice environmental and social practices including its independent monitoring the evaluation, and establishment of processes and procedures for accountability and transparency in revenue allocation and management) that would lead as a result to the key outcomes of the project (generating and allocation of revenues to the poverty alleviation and environmental management programs, and the environmental and socially sustainable exploitation of the hydropower resources). The ToC would have benefitted from the inclusion of key complementary, parallel efforts that the project design relied on for achieving its outcomes (i.e. assumptions). This could include the depiction of parallel projects in PFM and the successful implementation through country systems of select poverty alleviation and environmental management projects funded by NT2 revenues.

OTHER OUTCOMES

Kick-Starting what has turned out to be a scale-up of developing Laos' hydropower potential. At the time of appraisal, NT2 at 1,070 MW was larger than the total domestic installed capacity of 630 MW, and was initiating a PPP approach to scaling-up development of hydropower in Laos' extensive hydropower potential. The present installed capacity in Laos is over 7,000 MW, with hydropower making up around 4,000 MW from 63 projects (40 IPPs) – supplying the domestic as well as regional markets in the Greater Mekong Subregion (GMS).

Demonstrating a PPP modality including establishment of LHSE for large scale hydropower development. NT2 was the first large-scale IPP that was developed through an international consortium under a PPP arrangement including the associated legal structures. The Laos Holding State Enterprise (LHSE), established specifically as a vehicle for GoL ownership in the PPP, has continued to represent the GoL's equity in several hydropower projects since NT2 under similar schemes.

Mobilizing a consortium of private financiers and investors to develop a large-scale hydropower project – a first-of-its-kind in Laos using guarantees. As the PAD notes, international dollar lenders were not willing to extend the sizable financing needed for NT2 to NTPC without adequate political risk mitigation, which was provided through a World Bank (IDA), ADB, and MIGA guarantees. NTPC has continued to service all of its debts, and the potential risks that were guaranteed have not materialized to date. This may have provided sufficient confidence to financial markets for not requiring similar counter-guarantees to backstop the GoL in subsequent hydropower projects.

Establishing an E&S Framework for sustainable hydropower development in Laos, although the project also highlights challenges in implementation. Many of the efforts undertaken in NT2 to support environmental sustainability and social inclusion were formalized country-wide including decrees on resettlement and compensation (#192/PM) and environmental impact assessment

(#112/PM), the creation of the Environmental Protection Unit, and policies on sustainable hydropower development. The World Bank team indicated that this E&S framework continue to be adapted and applied to in hydropower projects developed after NT2.

Developing institutional and human capacity in Laos for expanding the utilization of hydropower resources. NT2 seem to have played an instrumental role in building or strengthening various government and sector agencies. The ICR states that through the NT2 operation, the GoL has nurtured a group of officials commonly referred to as "graduates of 'University of NT2'". They include senior managers, public servants and sector specialists who now have greater experience in large, complex project preparation and implementation consistent with industry and international standards for hydropower. Such skill would have benefitted the country as it underwent a substantial scale-up of hydropower capacity since NT2.

Overall Efficacy Rating

Substantial

5. Efficiency

The ICR reassessed the economic and financial analyses of the project to compare it with similar analyses from the time of appraisal. First and foremost, the demand scenarios in Thailand, which were a key driver for off-taking power from NT2, was more than fully realized at project closure, as higher than expected power production from the project (6-19 percent over 5,000 GWh on a yearly basis) is being absorbed into the Thai power market. Similarly, NT2 is consistently supplying more than the estimated 200 GWh of electricity to the Lao domestic market. The absorption of all of the electricity produced by NT2 implies that it is a least-cost option for EGAT to supply its customers in Thailand and for EDL in Laos. Higher than expected electricity production also enhanced the value-for-money proposition of NT2. In addition to the realization of the market for power from NT2, the other key drivers of economic performance are the actual investment and operational cost of NT2, the economic benefits of the electricity including the water resource usage benefits, and the value placed on externalities that include local (for Laos and Thailand) and global environmental impacts of NT2.

As previously noted, the overall costs of the NT2 project, while higher than the base case estimate at appraisal, was well within the contingency allocation. The initially estimated cost at appraisal excluding contingency was US$1,250 million, while the actual costs were US$1,308 (over 40 percent of this increase was due to environmental and social safeguard considerations), within the contingency allocation of US$200 million (i.e. total cost allocation including contingencies of US$1,450 million). Additionally, construction delays extended the estimated 54 month period by an additional 4.5 months. This is well within bounds especially for a project with the complexity and scale of NT2, given a recent IEG finding that World Bank financed hydropower projects experience cost overruns of over 30 percent beyond the allocated contingencies(on a weighted average basis, while NT2 was only 4 percent of base costs), and time overruns of 14 months on average.

The World Bank team informed IEG that the NT2 project's benefits were estimated from a global perspective rather than from the viewpoint of Laos. The ICR estimates a net (of costs) positive economic return of US$2,176 million in net present value (NPV) terms discounted at 10%, which is significantly higher than the appraisal stage estimate of US$523 million. The difference

according to the ICR is primarily due to the counterfactual valuation of the avoided cost of using LNG in an alternative combined-cycle gas turbine (CCGT) power plant; and local and global environmental benefits. According to the ICR, 80 percent of the higher NPV is attributable to the actual commodity price of LNG from 2010-18 based on World Bank Commodity Forecasts, which were much higher than the proxy value of US$2.27 MMBTU applied in the appraisal estimate. However, since the electricity in this specific project is a tradeable commodity, it would be more appropriate to estimate the energy benefits at the export tariff adjusted for any economic distortions (i.e., taxes, duties, subsidies). Furthermore, it would also better reflect the economic benefit to Laos of developing NT2 and exporting electricity – an important consideration given that they were the borrower of World Bank funds.

The remaining 20 percent of the project benefits is due to the local and global environmental benefits of utilizing hydropower instead of CCGT. The local environmental benefits reflected the avoided nitrogen oxide (NOx), Particulate Matter (PM), and Sulfur Oxide (SOx) emissions of gas-powered generation for a total NPV of US$84 million. Here again, it would have been useful to proportion the local benefits to Thailand (which receives the lion share) and Laos based on the electricity consumption from NT2. A similar avoided cost estimate for global greenhouse gases (CO_2, in this case) for a CCGT plant is estimated based on information from the Intergovernmental Panel on Climate Change (IPCC) at 360 gCO_2/kWh, which totals 163 million tons of CO_2 on a lifecycle basis equivalent that can be attributed as a global benefit from NT2. NT2 itself is estimated to emit 36 gCO_2/kWh from the reservoir (and 2.5 gCO_2/kWh during construction) for a total of 8.9 million tons of CO_2 on a project lifecycle basis. Therefore, the net CO_2 avoided as a result of NT2 is 154 million tons of CO_2 on a lifecycle basis, which, at a price of US$37 per ton of CO_2 in 2017 increasing to $78 per ton of CO_2 by 2050 amounts to an estimated net global environmental benefit of approximately $350 million.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	◻	16.30	○ ◻ Not Applicable
ICR Estimate		○	○ ◻ Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The NT2 project remains highly relevant as a flagship hydropower operation in Laos. The power infrastructure including the dam was constructed as envisaged, and its operations are exceeding expectations, and the revenue generated to the GoL as a result broadly meets envisaged goals. The GoL revenues from NT2 are being fully allocated to poverty alleviation and environmental management activities, as per the objectives. In addition to the social benefits arising from the use of GoL revenues, the project also broadly met its obligations for resettling and adequately compensating affected people in the NT2 reservoir and watershed areas; and also undertook activities that improved incomes and nutritional intakes due to impacts from the project. With regards to environmental management, despite a successful effort of addressing the biodiversity impacts including protection of species during the construction of the dam and power facilities, the subsequent handover to the WMPA for protecting the overall watershed faced numerous challenges. Therefore, while there were shortcomings, in total, the efficacy is Substantial. The NT2 project was constructed with only minor delays and very modest cost overruns, while it has substantial global benefits including carbon offsets. Thus, the efficiency is also Substantial.

a. Outcome Rating
Satisfactory

7. Risk to Development Outcome

Achieving and sustaining the ambitious conservation of biodiversity goals within the NT2 watershed. While the evidence suggests an orderly approach at the early stages to offset habitat decline and ensure protection of species during the construction stage, particularly during reservoir inundation, protection of the larger NT watershed was less successful in the following years. The threat of illegal logging and poaching, which predates the NT2 project, appear to extend beyond the capacity of the nascent WMPA. The project closed with some optimism since the NT2 watershed was classified as Lao PDR's first national park which upgraded its IUCN rating from category IV to II (protect large-scale ecological processes for biodiversity conservation, research, and recreation). As such, there would be IUCN supported enhancement of management standards including "institutional reforms, resources, and technical upgrading" according to the ICR, which provide some optimism for better achievement of conservation objective in the future. Furthermore, it is noted that the World Bank's Second Lao Environment and Social project is expected to provide funding to augment current NTPC funding to the WMPA, focus on upgrading the current protected area to a National Park, and professionalize the WMPA into a National Park Office. However, these reforms have not taken place yet, and its outcome on the conservation of natural habitats and threatened species remain uncertain.

Continued revenue allocation and management in light of the expected steep increase in GoL revenues post 2020. US$180 million has been generated and allocated towards relevant development activities, falling only modestly short of the estimates at appraisal (US$30 million per annum). The modest shortfall masks a significant reduction in dividend income retained by LHSE (to invest in other hydropower projects, according to World Bank team) that was partly offset by tax income from NT2. The annual revenue to GoL is expected to increase significantly to US$110 million after 2020 partly due to higher dividend income since most debt-servicing would be completed by then. With over US$1.75 billion of revenues (nominal) estimated to

materialize in the future, continued withholding of dividend income by LHSE would undermine the funding for longer-term poverty alleviation and environmental management activities. Nevertheless, the ICR indicates some confidence in GoL's multi-decade demonstrated commitment to poverty alleviation (including its prioritization under the 8th NSEDP) and its legal obligations under the Government Letter of Information Policy (GLIP) until 2035, as factors that may mitigate this risk.

8. Assessment of Bank Performance

a. Quality-at-Entry

The NT2 project went through an extensive preparation period given its scale, complexity, the ecological sensitivities in the area that needed to be considered, and potential for negative social impacts if they are not adequately addressed. After commissioning a "comprehensive review" of the NT2 project in 1995, and then adapting to impacts of the Asian Financial Crisis that began in 1997, project preparation resumed in 2001 when markets began to stabilize with the project being approved by the World Bank Board in 2005. During this extended preparation period, lessons were drawn from other hydropower projects; the latest approaches to sustainable hydropower development were taken into account, including key recommendations from the World Commission on Dams (which the World Bank later adopted as the *Directions in Hydropower*) and others (i.e., Extractive Industries Review, Worldwide Fund for Nature Study); extensive consultations with stakeholders in developing solutions were held; the channeling the GoL revenues from NT2 towards poverty alleviation and environmental protection was agreed; and a PPP arrangement for realizing the project was structured. Taken together, the design of NT2 was comprehensive and ambitious.

Lessons from good-practices experiences for sustainable development of hydropower: The design for NT2 reflected lessons from various other regional examples as the 1,000 MW scale was larger than the total installed capacity of hydropower in Laos at the time. In particular, the NT2 project design adhered to the *Directions in Hydropower,* which was endorsed but yet to be formally adopted by the World Bank at the time, by addressing all its five key recommendations: *scale-up financing* by addressing barriers through a guarantee; *promote good practices* through environmental management and social inclusion that were direct objectives of the project; *strengthen planning* to realize the strategic value of hydropower, in this instance, by exporting electricity to Thailand to drive economic growth in Laos; *leverage regional development* for the benefit of local communities through measures to improve livelihoods including infrastructure services such as electricity access and rural roads; and, *build partnerships* to strengthen financing options and dialogue on sustainability through the engagement with multiple development partners and financiers as well as with civil society. A recent IEG analysis found a strong correlation between successful hydropower project outcomes and the number of key recommendations in *Directions in Hydropower* that are incorporated into project designs. The NT2 project applied best practice approaches to designing hydropower developments by incorporating all five key recommendations.

Extensive consultation influenced design reflecting stakeholder interests: The preparation of NT2 incorporated 'extensive and fruitful" consultations with an array of local and international stakeholders, especially the populations of all project affected areas (watershed, Nakai plateau, and downstream areas). The PAD indicated that local consultations and

international workshops included the siting of resettlement locations, layout designs of these resettled villages, options in a menu of livelihood programs as well as the design features for mitigating environmental impacts. The project was designed so that consultations will continue during the project's construction and initial implementation period. A range of international stakeholders and advocacy groups who supported and opposed the project were also consulted.

Selection of an experienced and qualified developer to work under a PPP arrangement: The NT2 project was implemented by Nam Theun 2 Power Company Limited (NTPC), where the majority shareholder (with primary responsibility for construction and operation of NT2) was the experienced hydropower developer - Electricité de France (EDF) - with a minority stake by the GoL. The GoL, with its stake in NTPC (which was also a key source of GoL revenue from the project) had incentives to facilitate the various government approvals and clearances that are required in developing a hydropower facility in-line with industry standards. For this purpose, the NT2 project led to the establishment of the Lao Holding State Enterprise (LHSE), which was used as a vehicle for GoL participation in subsequent projects as well. The guarantees were provided by development partners including the World Bank Group (for equity and debt by IDA, and political risk cover by MIGA). The GoL's commitment to the project and its obligations were further reinforced through IDA Partial Risk Guarantee (PRG), which was issued to "mitigate specific risks relating to political, regulatory and governmental performance in Lao PDR" as it related to NT2. The political risk insurance was a requirement for international lenders to extend financing to NT2, and the IDA PRG (and ADB guarantees) reinforced the GoL's commitment to honor key agreements with NTPC that were vital to the project (the project team informed IEG that subsequent hydropower projects have not required such counter-guarantees, possibly indicating increased market confidence in GOL-made commitments). The legal and institutional framework developed for NT2 has been replicated in other hydropower developments in Laos.

Comprehensive approach to support poverty reduction and environmental conservation through an energy sector transaction: Not many hydropower projects are designed to influence such a wide array of development objectives within a single operation. While such an ambitious design carried with it risks and the possibility of overstretching the capacity of an individual project, it also presents the possibility of a greater development impact from the exploitation of the resource. In a subsequent IEG review, the government and private stakeholders did however have a perception that the NT2 project may have been too "gold plated" to be a model for future development of the country's large hydropower potential (CASCR FY2005-FY2011). Despite this perception, many aspects of NT2 appear to have contributed to the approaches adopted in subsequent hydropower investments, as previously noted.

Readiness of project for implementation and assessment/addressing of risks: The key elements of the project were ready to implement following Board approval, primarily due to the extensive project preparation period of about a decade. During this time, much of the contours of the project were firmed up including the selection of a qualified developer, the offtake assessment and agreements, the design of the LHSE that would represent GoL within NTPC, the establishment of NTPC itself under Lao PDR law as the entity through which the project would be implemented, funding (including for ongoing activities) secured/earmarked for implementing the environmental and social safeguards, and the agreement and criteria as to how the revenue generated by the GOL would be utilized. Risks related to the hydropower facility (geological, energy production, flood damage), social development (plateau resettlement, downstream livelihoods), environmental, and revenue allocation were mostly adequately assessed. However, the capacity of WMPA to carry out its responsibilities

(rated modest) were underestimated even though it was recognized in the PAD that there was a Substantial likelihood that conservation goals articulated under the project could be "compromised" by cross-border wildlife trade and commercial activities (such as illegal logging). In addition, the project faced challenges in reporting and disclosure of revenue and expenditures management, as noted in the ICR, which impacted the transparency and accountability of allocating GoL revenue from NT2 through the PFM. The magnitude of these risks may have been underestimated at project design.

Quality-at-Entry Rating
Highly Satisfactory

b. Quality of supervision
The NT2 project was regularly supervised throughout its duration with support from the field office in Laos as well as specialists from headquarters of the World Bank in Washington DC. In order to coordinate as many as 27 lenders, the ICR notes that the World Bank took the lead in designing a broad framework for implementation support, since it was contractually agreed that at least the IFI lenders would participate in joint support oversight visits to Laos. These missions were fielded annually and was led by a World Bank Director, to ensure high-level corporate oversight. Given the significance of the project, an International Advisory Group (IAG) was established to advise the World Bank's President on project implementation. The project also had the benefit of oversight from several independent groups that were established including a Dam Safety Review Panel (DSRP), Independent Monitoring Agencies (IMAs), and a Panel on Environment and Social Experts (POE).

IEG reviewed the Laos country program (CASCR FY2005-FY2011), covering the implementation of NT2 project during the period of dam and power plant construction and the initial years of operations (since NT2 was a specific strategic pillar in the Country Assistant Strategy). In its review, IEG stated that 'Lao PDR is implementing NT2 successfully, without any significantly adverse social or environmental impacts' and rated the outcome as highly satisfactory. Subsequently, the ICR notes that several monitoring mechanisms were concluded in compliance with guidance on fully disbursed projects (e.g., DSRP, ISR), while other reports such as updates to the Board, POE reports, mission aide memoires etc. continued, which supposedly enabled uninterrupted oversight. However, by 2014, two key areas of shortcomings that required remedies were identified: a) a significant portion of NT2 revenues were being deposited directly into the Treasury rather than being channeled through a special account, as agreed, to ensure revenues are allocated for poverty reduction or environmental management programs; (ii) several safeguards were either in partial compliance or non-compliance with World Bank policies. First, a significant portion of the GoL's NT2 revenues were being deposited to the general treasury account rather than specifically being earmarked for poverty alleviation and environmental management programs, as was agreed. As previously noted, the agreement on a functional equivalent approach for tracking NT2 revenues to ensure they were appropriately channeled for its intended purposes was reached by 2015. The second shortcoming was that the NT2 project was not compliant with two safeguards while it was only in partial compliance with three others. These were primarily related to natural habitats and forestry, and resettlement especially of indigenous peoples. The ICR informs that from 2015-17, the World Bank participated in a Joint Working Group that focused on sustainable livelihoods in the resettlement, and an NT2

Steering Committee was established to ensure senior sector and country management were fully engaged in developing consensus-driven resolution of outstanding matters (included 11 Directors from different global practices and country management unit). The ICR notes that 11 specific actions were proposed to bring all safeguard policies into compliance, which was achieved by project closure in December 2017. As previously noted, the POE confirmed that the project achieved a "basis for sustainability" and expressed "confidence that the project is on the road to overall sustainability". While the World Bank team should be commended for responding to the project shortcomings, some of the key challenges faced by the project with respect to issues such as the protection of the wider watershed and some of the PFM activities were only partially addressed.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

Given the complexity and scale of the investment together with its high, external visibility, the M&E design for NT2 consisted of a multi-layer framework covering a comprehensive set of indicators supported by various data sources. The monitoring mechanisms employed for the project included independent monitors, World Bank oversight (implementation support), and information/data from various project and GoL reports. Given the extended 12-year project implementation period, the NT2 key performance indicators included an initial set of indicators for 2009 when the power plant was expected to be commissioned, and then a final set of (ultimate) indictors that reflected the expected outcomes at project close. This was an appropriate approach since the successful development of the dam and power plant (including E&S safeguards compliance) was fundamental to all final project outcomes, which was measurable with the 2009 indicators (equivalent to intermediate outcome indicators). However, project implementation would continue for another approximate eight years. During this time, measures would be implemented to restore livelihoods and improve other social conditions for project affected people (PAPs), sustainable environmental management, and channeling of revenues for helping finance poverty alleviation and environmental management activities. These outcomes that correspond directly to the overall development objective of NT2 were to be measured through the closing (ultimate) indicators to ensure sustainability.

The ICR claims that the results framework (RF) "retained an adaptiveness" that helped "identify specific concerns threatening PDO during implementation" and undertake "corrective action to address these concerns". Accordingly, the team also changed some elements of the RF outcome indicators although the overall structure was retained. The team should be commended for being flexible and refining the RF, although, as acknowledged in the ICR, it may have been more appropriate to undertake a corresponding formal restructuring of NT2, especially since the project was being carefully

monitored externally and by senior management of the World Bank. While most indicators were adequate for measuring results in the four key areas in the development objective, some could have been better designed to more accurately evaluate outcomes. For example, the indicator for revenue generated is the installed capacity of the power plant (MW). While an adequate power plant capacity is necessary to generate revenues, it is not a close proxy for revenues (more an output than an outcome indicator). Even with an appropriate capacity, revenues can deviate from expectations for several reasons that include the actual electricity produced, billing, payments and receivables, or potential adjustments in tariffs). Actual revenues versus estimates (US$30 million annually or a minimum target) would have been a more appropriate indicator. The absence of an adequate indicator for achieving revenue targets also negates the ability to measure the financial impact of the 100% revenue allocation target as well. Furthermore, the budgetary expenditure of NT2 revenues were meant to be "additional" to the general budget increase, but the ICR indicated that "verifying 'additionality' proved difficult, due to the lack of a baseline, changes in budget classification, and the unavailability of budget data on a timely basis." The indicators for environmentally and socially sustainable exploitation of NT2 resources were generally adequate to measure corresponding development objectives. However, the aim to ensure "no further degradation of habitats or decline of threatened species", while worthy, appear to have been beyond the capacity (of WMPA) and the timeframe of the operation (i.e. project closing by end of 2017) given the high risk from external threats identified at appraisal.

The NT2 project employed extensive monitoring through several data sources. The physical implementation of the hydropower scheme was supervised by independent engineering firms contracted by NTPC and GoL, with the lender's engineer also monitoring the implementation of construction as well as E&S activities. The following project specific independent panels were also established: Dam Safety Review Panel (DSRP); Panel of Environmental and Social Experts (POE); and, Independent Monitoring Agencies (IMAs). The World Bank also closely monitored the project through a project team that was partly based in the field and various inter-departmental oversight groups, as indicated in the Quality of Supervision section in this ICRR. Most of these groups produced reports, audits, surveys, safeguard documents and aide memoires, much of which were publicly disclosed including through a dedicated website established for NT2. As previously noted, IEG also carried out a review of the CAS period from FY2005-FY11, that extensively covered the results upon the commissioning and initial operation of the NT2 power plant.

b. M&E Implementation

During the initial implementation period (2005-10) when the dam, power plant, and associated infrastructure were being constructed, monitoring achievement of technical specification and safeguard compliance were fully implemented. The ICR notes that the data collected was timely enabling the team to monitor progress and take action when necessary. A public expenditure review was also carried out in 2010 providing insights into the readiness of the PFM system as revenue generation commenced. As previously noted, the IEG assessment of the CAS from FY2005-FY11 specifically focused on NT2 progress at the time.

Following the COD of the power plant including the resettlement of PAPs (2011-14), several oversight mechanisms were concluded including submitting Implementation Status Reports (ISRs) since Bank funds were fully disbursed. However, the ICR notes that other monitoring and reporting mechanisms such as risk reporting, supervision aide memoires, updates

to the World Bank Board, and NTPC reports continued to be produced. It is during this period that the project team identified that, while royalties were allocated to eligible activities, dividends and taxes were not being deposited in the NT2 account, which led to the agreement on a functional equivalent for revenue accounting. The continuing oversight also led to the identification of several safeguard issues by 2014 that subsequently led to a comprehensive review and actions. According to the ICR, the ISR reporting was also reinstated by 2014 due to a change in World Bank policy. It enabled the transition the RF from the PAD to the newer ISR RF, which according to the team, enabled them to take advantage of improvements in World Bank M&E methodologies while maintaining alignment with the original outcomes. However, the project was not restructured to formally reflect these changes.

Based on the findings from the initial operational period of NT2, the ICR notes that several operational programs were expanded based on monitoring of project progress (2015-17). They included the resolution for revenue allocation through a functional equivalent of assigning account codes; an extension of the RIP to address shortcomings including oversight through joint working group; and, an Action Plan for the WMPA. A comprehensive safeguards review in 2016 led to actions to ensure compliance by formal project closure at the end of 2017.

c. M&E Utilization

The extensive M&E set-up that was employed by the NT2 project was used by the various groups/institutions that were given the responsibility of monitoring and assessing various aspects of project implementation. The ICR cited that the close monitoring enabled the team to significantly increase the revenues allocated for poverty alleviation and environmental management. Since some project aspects such as dam safety and E&S were subject to the approval of independent monitoring groups (i.e. POE, DSRP) that relied on the information in various assessments that were carried out under the project, their work to hold the project accountable and eventual clearance related to project performance serve as evidence of M&E utilization. Other examples include the 2010 public expenditure review helping assess progress with PFM arrangements, and the extension of the RIP to complete activities based on M7E results. Similarly, independent review of construction would have justified the COD of NT2.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

The NT2 project, as a complex hydropower project in an ecologically sensitive area triggered all ten (10) World Bank safeguard policies that were applicable at the time of project appraisal and was classified as category A. The ICR emphasized that ensuring compliance was a major task of implementation, which was likely driven not only as a safeguard policy requirement but because several of them contributed directly to achieving the project development objective (i.e. exploration

of NT2 resources in an environmentally and socially sustainable manner). Two of the safeguard policies for projects in disputed areas (OP 7.60) and international waterways (OP 7.50) were addressed ahead of Board presentation (on March 21, 2005) and remained in compliance throughout the project implementation period. Following the construction of the dam and beginning of commercial operations in April 2010, the safety of dams (OP 4.37) was assessed annually by a Dam Safety Review Panel (DSRP) that found the project to be in compliance of this essential safeguard. Pest management (OP 4.09) and physical cultural resources (OP 4.11) requirements were also met, as confirmed by a 2016 a safeguards compliance review undertaken by the World Bank's Operations Policy and Country Services (OPCS). An IEG review in 2012 [CASCR for FY2005-11] shortly after the NT2 power plant was operational confirmed that the "integrity of the Nakai Nam Theun Watershed protected area has been maintained and the water quality in the NT2 reservoir is within acceptable levels" and that "impacted villages have been resettled into new close-by sites and progress has been made in establishing livelihoods for the resettled populations" with IEG observing that incomes for resettled families were "likely to double". With areas aimed at sustainable natural resource management progressing at high or substantial levels, the IEG review concluded that there was GoL and stakeholders' confidence that "successful development of the country's large hydropower and mineral resources is possible while maintaining sound social and environmental standards."

Despite this initial progress that appeared to be sustainable at the time of the IEG review (CASCR), by 2014 concerns emerged related to environmental and social aspects of the project, which led to an effort to take corrective action prior to the project closing date (December 31, 2017). The 2016 comprehensive safeguards review had confirmed ongoing compliance with five safeguard policies mentioned in the previous paragraph while it also detected that three safeguards were only in partial compliance (Environmental Assessment (OP 4.01), Indigenous Peoples (OP 4.21), and Involuntary Resettlement (OP 4.12)), while two safeguards were non-compliant (Natural Habitats (OP 4.04) and Forests (OP 4.36)). These primarily reflected additional work that needed to be completed with respect to the livelihoods of PAPs including those resettled and the environmental protection of watershed. The ICR notes that the review led to the recommendation of 11 corrective actions, including institutional re-alignment of forest and conservation agencies so as to bring more direct national guidance to the WMPA that was struggling to successfully perform all of its responsibilities, successful closure of the RIP that was extended to achieve originally intended outcomes, and the continuation of grievance redress mechanisms (GRMs) that had become less active following the commissioning of power plant. A joint Government/IFI/NTPC working group that was established helped with oversight, coordination and decision-making amongst key stakeholders. The ICR notes that the recommendations from this review led to an intensive implementation support effort throughout 2017 with 10 of the actions being completed when the project closed at the end of 2017 (the outstanding one was a staffing plan for management of watershed, for which, by 2018, the IUCN had begun advising on meeting international standards and a Consortium of Technical Experts (COTE) had been established to support WMPA). The subsequent report by the POE (28th report - July, 2018) indicated that the progress with watershed management was a cause for "cautious optimism", and sufficient progress has been made under the oversight of a joint Government/IFI/NTPC working group to "materially improve resettler livelihoods on a sustainable basis" recommending closure of the resettlement program. The POE also stated that the overall project achieved a "basis for sustainability", as required in the Concession Agreement (CA), and that they had "confidence

that the project is on the road to overall sustainability". At project close, all ten triggered safeguard policies were rated Satisfactory or Moderately Satisfactory.

b. Fiduciary Compliance

Financial Management (FM). FM was rated satisfactory or better throughout project based on the reviews carried out by the FM specialist of the World Bank. The reviews included project accounting and reporting arrangements, organization and staffing, internal control procedures, planning and budgeting, counterpart funding, funds flow and disbursement and external audits. According to the ICR, project financial audits were provided in a timely manner with unqualified (clean) opinions on the project financial statements, which were published within the SAO audits (instead of publishing them separately). The World Bank also received audited financial statements for NTPC and LHSE in a timely manner. In addition to the fiduciary responsibilities, overall financial management of the budget process and the expenditure of revenues to the GoL from NT2 was integral to achieving the project's development objectives. As previously noted, a specific designated account for NT2 was not set-up by MoF that was addressed by agreeing to a functional equivalent in 2015. The World Bank team informed IEG that previous to this agreement, the revenues from NT2 to GoL were calculated manually as a result (which were cross checked by the World Bank team using the NTPC and LHSE audited statements). The financial statements for funded programs and projects up until 2014 experienced 2-3 year delays, although GoL met over 80% of its audit requirements by project close while the audits for the FY15/16 program disbursement and full audit for FY2017 are pending.

Procurement. A detailed review of procurement by an independent firm as well as World Bank specialist during project preparation had confirmed that NTPC's procurement process was consistent with World Bank procurement guidelines for guarantee operations, which require that goods and works have been procured with due attention to economy and efficiency, that they are of satisfactory quality, that they are delivered in a timely fashion, and that they are priced so as not to affect adversely the economic and financial viability of the project. The major physical infrastructure construction was completed with only a modest 4.5 month delay beyond the estimated 54 months at a cost of $737 million, which was only 2 percent higher than the originally estimated cost of $722 million. The bulk of the IDA grant, which was managed by NTPC in coordination with the World Bank offices in Thailand (regional) and Laos, was also procured within a 20-month period by 2008, after which the grant was fully disbursed. Procurement was rated as satisfactory throughout the project, and the ICR indicates that the grant was efficiently managed between NTPC and the World Bank.

c. Unintended impacts (Positive or Negative)

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d. Other

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11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

1) While a comprehensive approach to hydropower development that was applied to NT2 is consistent with prevailing good practice, it may have also led to some targets that extend beyond the capacity of the project (implementing agencies) to deliver. Although the entire NT2 effort may be considered ambitious given the circumstances, establishing a new agency such as the WMPA and entrusting it to develop the capacity to carry out a mandate of "no further degradation of habitats or in declines of threatened species" may have been unrealistic. This is especially the case since illegal logging and poaching in the area pre-dated the WMPA, and eliminating these activities altogether may have been beyond the existing capacity of the newly established agency.

2) The NT2 appears to have 'spillover effects' that have contributed to transformational impacts in policies that may have paved the way for future hydropower investments in Laos Given the scale and complexity of NT2 and its first-of-its-kind nature in the country, the project provided a premise to impact the overall policy and institutional frameworks for sustainable hydropower development in Laos. The PPP and E&S frameworks in particular appear to be formalized and mainstreamed (although the design was thought by some to be 'gold-plated' and not conducive to replication), and being applied in many hydropower projects that have been developed in Laos since NT2.

3) The World Bank (and other IFIs) commitment at the early stage of a PPP program appeared to have provided the necessary confidence to the private sector, especially when attempting to undertake large-scale financing in a low capacity country. While the total IFI guarantees were modest in scale, it was a requirement for the international dollar financiers for extending loans to NTPC. The involvement of the IFIs through the guarantees seems to have provided the initial confidence to extend financing with the assurance that the GoL will honor its obligations under the project. The GoL honoring its obligations to date under NT2 may have contributed to investor confidence where such backstops were not as critical to developing subsequent hydropower IPPs.

4) The long 12-year World Bank 'implementation period' provided sufficient time to oversee the progress with key outcomes and adapt as necessary to improve performance. While such an extended implementation period is not

common for World Bank projects, NT2 had the benefits of a longer-than-typical 'implementation' period that was resourced by a charge to NTPC once the project was approved (i.e. after financial closure). This partially enabled the oversight and validation of the power plant operation and export potential (ability to absorb electricity in Thailand) since the project closing date was seven years past commissioning. In addition, it provided adequate oversight during the implementation of the E&S plan, which required several adjustments to deliver the final results. While the length of 'implementation' for NT2 may be exceptional, other infrastructure projects with long gestation periods may benefit from a longer period pf World Bank's implementation support.

5) Identifying a qualified developer and vesting GoL interests in the hydropower operation appear to have provided a smooth pathway to constructing the hydropower project in a timely and cost-effective manner. The selection of a well-qualified developer as the primary equity holder in the NTPC consortium appears to have played a major role in the efficient construction and operation of the dam and power facilities with very modest cost and time overruns. Additionally, the GoL, committing through its equity in NTPC (through LHSE) and the guarantees backstopped by the IFIs also provided incentive for it to honor its obligation in terms of policy and regulatory aspects.

6) Extended project preparation contributed to the initially quick start and efficient implementation of the project. While the NT2 underwent a preparation period of unusual length of about a decade, the significant work carried out in this effort led to numerous benefits. By World Bank Board approval, many necessary policies were issued and institutions established. The extended analysis and appraisal enabled informed risk taking such as the future offtake capacity of electricity exported to Thailand, a decision that has subsequently been validated. The project design and feasibility work were also fully completed by project approval with the selected developer ready to proceed with financial closure and implementation. As a result, the project was made effective less than two weeks following Board approval, and a large and complex hydropower facility was constructed within budget with only minor delays.

13. Assessment Recommended?

Yes

Please Explain

NT2 was a major initiative not only in Laos, to kickstart a substantial scale-up of its hydro resources, but also for the World Bank, as a vehicle for re-engaging in the hydropower sector attempting to apply key recommendations made by the World Commission on Dams (and later adopted through the *Directions in Hydropower*). Furthermore, the platform provided by the NT2 project appear to have had spillover effects that may have had a transformation impact. Therefore, a follow-up Project Performance Assessment Report (PPAR) is being planned following the ICR validation, to extract lessons from the NT2 project that can inform future hydropower and similar projects that aim to develop resources sustainably and contribute to poverty alleviation. It

would also be an opportunity to assess the role and contribution of the World Bank, and analyze the replicability of the project approach.

14. Comments on Quality of ICR

Overall, the ICR was an extensive document reflecting the scale, complexity, and comprehensive nature of the NT2 project. The ICR included a relatively robust ToC, and evaluated the project against its key objectives. This also included a reframing of key indicators into the final results framework consistent with the current ISR format. There were, however, some shortcomings that were material to the evaluation, which, if addressed, could be significantly beneficial in assessing the performance of NT2. Some of these areas include: a) evaluating the actual generation of revenue from exports and domestic supply against targets because it was an explicit objective. b) assessing the economic costs and benefits (i.e efficiency) from the perspective of Laos as the primary World Bank client/borrower, in addition to the global perspective, and c) some assessment of the guarantee and associated risks given it is one of the key instruments used by the World Bank. On a more minor level, there were a) multiple instances where various project outcomes are indicated without clear linkages with project activities that contributed/led to results, and d) sourcing of various data and information (surveys, for example). It should be noted that the World Bank team was very responsive in clarifying and providing additional information sought by IEG for completing the review/validation of the ICR. Similar collaboration is ongoing in advance of the pending field visit to carry out the PPAR.

a. Quality of ICR Rating

Substantial