

ERASMUS UNIVERSITEIT ROTTERDAM

ORET Evaluation 2007-2012 – Case Study of the Rehabilitation of Power Plants in Indonesia (ORET Transactions ID00025 and ID00030)

Rehabilitation of Power Plants in Indonesia



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April 2015

Table of Contents

- Executive Summary..... 5
- 1. Introduction 8
- 2. Project Overview..... 8
 - 2.1. Context..... 8
 - 2.2. The Project and the ORET Transactions..... 9
 - 2.3. The Stakeholders and the Client 10
 - 2.4. Financing..... 12
- 3. Methods of Evaluation..... 13
 - 3.1. Theory of Change..... 13
 - 3.2. Evaluation Criteria..... 13
 - 3.2.1 Efficiency 13
 - 3.2.2 Effectiveness 14
 - 3.2.3 Sustainability 14
 - 3.2.4 Relevance 14
 - 3.2.5 Additionality 14
 - 3.2.6 Coherence 14
- 4. Results..... 15
 - 4.1. Efficiency..... 15
 - 4.1.1 The Application Process 15
 - 4.1.2 Procurement..... 15
 - 4.1.3 Implementation..... 16
 - 4.2. Effectiveness..... 17
 - 4.3. Sustainability 18
 - 4.3.1 Financial 18
 - 4.3.2 Maintenance 18
 - 4.3.3 Institutional..... 19
 - 4.4. Relevance..... 19
 - 4.5. Additionality..... 20
 - 4.6. Coherence 20
- Annexes 21
 - Interviews 21
 - Sources of Information 22
 - Procedure for Processing a Foreign Grant and Loan in Indonesia 23

Tables

Table 1: Electrification Rates in Indonesia (in percentages)9
Table 2: Power Stations Selected for Rehabilitation and Up-grading 10
Table 3: Total Transaction Costs and Contribution from ORET 12
Table 4: Results Chain 13
Table 5: Engines Delivered by Location 16
Table 6: Current Status of the Diesel Engines 17

Figures

Figure 1: Map of PLN Regions in Indonesia covered by the ORET Programme 11
Figure 2: Planning Mechanism of Foreign Loan and/or Grants 23

Executive Summary

Transactions

1. The transactions (ID00025 and ID00030) involved the rehabilitation and upgrading of respectively four and eight diesel power plants in different regions in Indonesia, management support and training of local staff of the recipient organisation, the national electricity company (PT PLN). The total transaction values amounted to € 13,734,000 (ID00025) and € 11,098,329 (ID00030). Grant amounts were respectively € 4,606,000 and € 3,792,065, which makes the grant element of both transactions 34%. As part of the Technical Assistance Facility under ORET the transactions included a credit line of somewhat more than € 1 million for the provision of spare parts for a period of five years.

2. The main objective of the transactions was to improve the electricity supply in a number of remote areas in Indonesia, both quantitatively and qualitatively. This was to be done by improving the energy yield of the existing power plants and reducing their environmental pollution burden such as other spills, odour and noise nuisance (internal and external). Another objective was to enhance the sustainability of the plants through the transfer of knowledge and know-how about the technical and financial management of diesel power stations.

3. The evaluation of this case study is based on the following sources of information:

- Relevant documents in the ORET archives administered by ORET.nl, such as the grant agreement, feasibility studies and appraisal documents, progress reports, technical reports and monitoring reports.
- Documents and data provided by the Indonesian authorities and other stakeholders in the country.
- Various publications on the situation of the electricity sector in Indonesia.
- Interviews with stakeholders in the Netherlands and Indonesia during the period April–August, 2014.
- Field research during on-site visits to the power stations in Kalimantan.

Efficiency

4. **Application.** In 2003 it was decided that the first transaction qualified for support from the environmental facility MILIEV, which at the time still existed within ORET. The reasons were because the application was particularly focused on reducing fuel consumption of the power plants and on a reduction of the environmental impacts of the plants. The application procedure took about 11 months, which compares relatively short to the average length of the applications for ORET support. The second application in 2004 was, apart from increasing the number of power plants (eight compared to four in the first transaction), identical to the first. Nevertheless, the approval process took longer because it was decided to wait for the first results of the first transaction. In both transactions the power plants involved were selected jointly by PT PLN and Wärtsilä on the basis of the need for rehabilitation (the technical status of the plant) and the expected demand for electricity in the relevant regions. The applicant and the officials of the client interviewed in Indonesia regarded the application process as reasonably efficient.

5. **Procurement.** PT PLN headquarter was responsible for the procurement process, including the negotiations about technical specifications, prices and financing. It followed the company's internal procurement regulations, which comply with the national public procurement regulation in Indonesia. This allowed PT PLN to directly appoint a single supplier, Wärtsilä Nederland, to rehabilitate the diesel engines. Since the engines that were to be rehabilitated, came from Stork, PT PLN did not have much choice in the matter. In collaboration with its local subsidiary, Wärtsilä was able to provide and guarantee the availability of fully compatible components and spare parts and to mobilise the technical expertise for the rehabilitation. Other diesel engine suppliers could not match this offer. According to the staff of PT PLN, the prices of the rehabilitated engines were acceptable, also taking into account the favourable grant element of the ORET Programme. In addition, Wärtsilä could provide training and technical assistance focused on the particular features

of the engines. The prices of the various components of the transaction were also checked by an independent expert hired by FMO, who concluded that they were market-compatible.

6. **Implementation.** It took about two years to finalise the first transaction; this was in line with the planning in the original application. It has been confirmed that this transaction was completed and has achieved its expected outputs on schedule and within budget. The execution of the second transaction (ID00030) was delayed for a couple of months because the specifications of the supplies were changed during its implementation. The client stated that it was satisfied with the rehabilitation process and the engines rehabilitated by Wärtsilä.

7. The company provided the agreed training, which contributed to enhancing the knowledge and skills of technicians and local staff in PT PLN regional office. It not only familiarised local technicians with the details of the engines, but it also provided participants with the skills to maintain and repair the engines if needed, The client considered this to be very relevant for the operation of the plants.

Effectiveness

8. PT PLN confirmed that the rehabilitation of the engines succeeded in enlarging the capacity and improving the performance of the local PT PLN power stations. As a result the engines have considerably improved the reliable supply of electricity in the relevant regions. The training has resulted in better maintenance of the engines, which has contributed to a more stable electricity supply to the end-users in the regions. The new rehabilitated engines also perform better in terms of fuel consumption and environmental impact. Regular air emission checks by PT PLN Regional Office confirm that the rehabilitated engines produce less emissions and stench than before and that leakage of oil has also been reduced.

9. At the end of 2014, ten after completion of the first transaction and five years after the second, ten of the twelve plants were still operational. However, some engines in operation are not fully utilised. In Sumatra (Aceh, Jambi, and Lampung) the rehabilitated engines are currently not utilised as the main source for electricity production but are only used to meet demand from residential areas during peak hours. The engines in Kalimantan, Maluku, and Papua are still used as main source for providing electricity in the area. Two rehabilitated engines are out of service: one engine in West Kalimantan and one in Maluku.

10. Large differences exist in power generation between the eastern and western parts of Indonesia. PT PLN has established an interconnected electricity grid system in the western part of the country (Sumatera-Java-Bali). In east Indonesia (Kalimantan, Sulawesi, Nusa Tenggara, Maluku, Papua) no interconnected grid is yet in place and therefore these regions rely fully on power generation by local plants with diesel engines. The rehabilitation of the Stork Wärtsilä Diesel engines in Kalimantan, Maluku, and Papua has therefore been very beneficial to the people in the area.

11. Wärtsilä has long-term business relationship with PT PLN. The ORET transactions supported a continuation of the relationship, which is evidenced by follow-up orders that are not only related to the rehabilitation of diesel engines but are also in the field of alternative energy sources. A threat to Wärtsilä as an important supplier to PT PLN is the decision of the Board of Directors of PT PLN that it will also purchase engines and spare-parts from non-original equipment manufacturers (non-OEMs), if available. For the purchase of main engines and main spare-parts, PT PLN will continue to rely on OEMs, among them Wärtsilä.

Sustainability

12. **Financial.** PT PLN periodically allocates funds for regular maintenance of the engines and training of field technicians. The allocated budget is sufficient for regular maintenance of the engines. The rehabilitation of the engines saved PT PLN money because the plants now operate more efficiently, as a result of lower production cost and higher utilisation rates. However, electricity prices are determined by the Government of Indonesia and are lower than what they would be if based on the real production costs. The government covers the difference with subsidies to PT PLN.

13. **Maintenance.** The transactions included a warrantee for maintaining the rehabilitated engines from the subsidiary company PT Wärtsilä Indonesia. After the warrantee period lapsed, PT PLN purchased major spare parts from Wärtsilä, making use of the ORET credit line for that purpose. Today PLN pays from budget funds earmarked for maintenance. PT PLN staff confirms the

company's strong commitment to maintaining the engines because the local power plants in the targeted regions are the main source of electricity.

14. For regular maintenance, PT PLN uses internal staff trained as part of the transactions. The technical and operational staffs at the power plants have to participate in regular training courses at the PT PLN training institute.

15. **Environmental.** For environmental reasons the Government of Indonesia has decided that in the near future the supply of electricity should be based upon local natural resources, particularly on renewable energy resources. It will therefore discontinue the development of power plants with diesel engines. As soon as non-diesel power plants have been built in the areas or when these areas are connected to the national grid, diesel power plants will be closed down. This policy will also apply to the plants rehabilitated with ORET support.

16. According to PT Wartsilä Indonesia, the company has anticipated the new energy policy and has started to introduce non-diesel engines manufactured by Wartsilä to PT PLN. As a consequence, future transactions of Wartsilä and PT PLN will probably consist of supplying other types of power engines except for the delivery of spare-parts and the servicing of the existing diesel engines.

Relevance

17. **Relevance.** The rehabilitation and upgrading of the power plants was on the List of Medium-Term Planned External Loans and Grants, the so-called Blue Book. As such, the transactions were in line with Indonesia's medium and long term development plans.

Additionality

18. **Additionality.** In order to maintain electricity supply in the remote areas, PT PLN would still have rehabilitated the engines even in the absence of ORET funding. The alternative would most likely have been a less sophisticated rehabilitation of less than the current 12 plants that were rehabilitated with these transactions. The rehabilitation of the power plant engines would then have been financed from internal PLN funds earmarked for maintenance or for investment. Since the financial capacity of PT PLN was and is limited, the scope of the operation would have been much smaller.

Policy Coherence

19. **Coherence.** The transactions also fitted well within the Netherlands' policies to strengthen its economic relationships with emerging markets. Indonesia as one of the larger countries of South-East Asia is considered an important business partner. These transactions can be seen as an example of expanding the business relationships with this country since it also resulted in follow-up activities in the shipbuilding sector.

20. The transactions were also focused on environmental protection, which is consistent with the recently increasing worldwide interest in environmental issues and Dutch environmental policy.

1. Introduction

This document presents the results of the evaluation of two ORET supported transactions to Indonesia in the power generation sector. Both transactions (ID00025 and ID00030) involved the rehabilitation and upgrading of respectively four and eight diesel power plants in different remote regions in Indonesia. The transactions further included a technical assistance component providing management support and training of local staff of the end-user: PT PLN, the national electricity company. The technical assistance was in particular focused on improving the management and maintenance of the diesel power plants.

The main objective of the transactions was to improve the electricity supply in a number of remote areas in Indonesia, both quantitatively and qualitatively. This was to be done by improving the energy yield of the existing power plants and reducing the environmental burden of the power plants such as spills, odour and noise nuisance (internal and external). Another objective was to enhance the sustainability of the plants through the transfer of knowledge and the know-how to the management and staff of the diesel power stations.

The evaluation of this case study is based on the following sources of information:

- Relevant documents in the ORET archives administered by ORET.nl, such as the grant agreement, feasibility studies and appraisal documents, progress reports, technical reports and monitoring reports.
- Documents and data provided by the recipient organisation, Indonesian authorities and other stakeholders in the country.
- Various publications on the situation of the electricity sector in Indonesia.
- Interviews with stakeholders in the Netherlands and Indonesia during the period April - August, 2014.
- Field research during on-site visits to the power stations in Kalimantan.

The structure of this report is as follows. After this introduction the second chapter describes the transactions, the context in which these transactions took place and the main stakeholders. The third chapter discusses the results chain and the methods applied to evaluate the activities, outputs and effects of the transactions. The final chapter assesses the transactions according to the evaluation criteria efficiency, effectiveness, sustainability, relevance, additionality and policy coherence.

2. Project Overview

2.1. Context

Since 1999, the demand for electricity in Indonesia has been increasing with about 10% per year. In order to avoid an energy shortage or even worse an energy crisis, the state owned electricity company (PT PLN: Perusahaan Listrik Negara PT) needs to invest massively in new power plants, rehabilitation and upgrading of old electricity generating plants, and distribution networks. As a consequence of the economic crisis in Indonesia during the second half of the 1990s maintenance and upgrading of local power plants were inadequate and lagged seriously behind what was needed. Due to the lack of adequate maintenance, particular plants in remote areas had to stop operations quite often which in some regions resulted in daily power cuts.

Against this background Indonesia faced and still faces great challenges in providing sufficient electricity in general and to its peripheral regions in particular. In general, power plants function best if they supply electricity to large integrated grids. Then peak and minimum loads can be evened out and failure of one plant can be compensated by increasing production of other plants. Moreover, the more efficient and clean gas-operated power stations can only run effectively if they can serve large population concentrations. Except for the islands of Java and Bali and recently for some regions on Sumatra such conditions are absent in the country. The other islands are served by relatively small power stations that are not connected to an integrated power grid. They depend mainly on diesel-operated power stations, each of them usually servicing its own autonomous local grid. This puts great strain on the local power stations, which have been deteriorating due to the inability to properly maintain many of them after the financial crisis in the 1990s.

Table 1 gives a broad overview of the status of electrification rates in the main regions of the country at the time the transactions were initiated and implemented. It clearly shows that Java and Bali were relatively well served. During the last decades an integrated electricity network has been created in this region which largely runs on steam and gas power generators. Recently this network has been expanded to Sumatra. The table also shows that the regions outside Java and Bali, in particular the islands in the eastern part of Indonesia, lag considerably behind the Java/Bali region. Most of the islands of the archipelago were and still are not interconnected by power cables. Interconnecting these islands spread over an area of thousands of square kilometres would require immense investments what the country can ill afford. Consequently remote regions continue to depend on rather small local power plants for the coming years.

Table 1: Electrification Rates in Indonesia (in percentages)

Region:	2005	2006	2007	2008	2009
Java/Bali	63.1	63.9	66.3	68.0	69.8
Sumatra	55.8	57.2	56.8	60.2	63.5
Kalimantan	54.5	54.7	54.5	53.9	55.1
Sulawesi	53.0	53.2	53.6	54.1	54.4
Eastern Indonesia	30.1	30.6	30.6	30.6	31.8
Indonesia	58.3	59.0	60.8	62.3	65.0

Source: PT PLN, Rencana Usaha Penyediaan Tenaga Listrik PT PLN (Persero) 2010-2019 (PT PLN Corporate Plan for Electricity Supply 2010-2019), <http://www.PT.PLN.co.id/dataweb/RUPTL/RUPTL%202010-2019.pdf>

The price of electricity is a politically sensitive issue in Indonesia. The current low and subsidized electricity price creates a rather difficult financial situation for PT PLN, because it limits its capacity to invest in the power system. The current pricing policy aims at increasing access to electricity for all segments of the population. In order to achieve this objective, the national pricing policy determined by Presidential Decree, prevents PT PLN to increase its prices which are now kept artificially low to make electricity consumption affordable for the lowest income groups. Another factor which limits PT PLN's financial capacity is that an important share of the production costs of electricity is determined by US-dollar denominated inputs. As a result, with the depreciation of the Rupiah vis-à-vis the US-dollar during the economic crisis in 1998, production costs increased considerably in the local currency, which could not be compensated with higher output prices.

2.2. The Project and the ORET Transactions

The large political influence on the electricity pricing policy in combination with the depreciation of the Rupiah considerably limited the financial scope of PT PLN to invest in new power stations or rehabilitate existing power stations, in particular in the remote regions (outside Java/Bali). As a result the number of breakdowns of power plants is growing with corresponding negative consequences for economic activities in these regions. Against this background the two ORET supported transactions ID 00025 and ID00030 were very helpful in coping with at least some of these problems.

Both transactions aimed at improvement of the power supply in peripheral regions that are not connected to the Java/Bali power grids. In total twelve diesel power stations have been rehabilitated, four in the first and twelve in the second transaction. The expected direct effects were an increase in efficiency and electricity production of the stations; reduction of power outages; reduction of pollution (especially reduction of soot emissions) and stench produced by the stations; and reduction of leakages (especially of oil). Although the fuel delivered by the national oil company Pertamina to PT PLN for the local stations is of high quality and contains very little sulphur, soot emission is a serious problem due to incomplete combustion when engines are not well maintained and do not run at full power. The rehabilitation was expected to drastically reduce these emissions to a level that meets the international and national standards. Technical assistance, including training of the staff operating the plants was offered to make these impacts sustainable, and to ensure proper use and maintenance of the power plants.

The power stations supported by the projects were selected by PT PLN in collaboration with a survey team. Main criteria were the need for rehabilitation thereby also taking into account the expected growth in the demand for electricity. The survey team consisted of a mechanical and electrical engineer for the technical aspects, a financial engineer for budgetary affairs, a work

planner and a representative from the local management of each plant. The transactions included only the rehabilitation of engines that had been supplied and installed by Stork Wärtsilä in the past.

The transactions rehabilitated and up-graded small local stations that had been powered with Stork Wärtsilä Diesel engines installed during the 1970s-1980s. At that time PT PLN used Stork Wärtsilä Nederland BV as the supplier of power engines. In addition to the rehabilitation and upgrading of the diesel generators the transaction included in-house training and training in the PLN training institute, and technical assistance to local staff in the head quarter of PT PLN. The training activities focused on handling and maintenance of the Stork Wärtsilä Diesel engines. The transactions further included the supply of spare parts for a relatively long period. The first transaction was focused on four power plants in Kalimantan and Papua. Because of the success of this first transaction, a follow-up transaction was initiated to rehabilitate another eight diesel engines. The stations selected in both ORET transactions are listed in Table 2 and shown on the map in Figure 1.

Table 2: Power Stations Selected for Rehabilitation and Up-grading

<p>Transaction ID00025</p> <p>East Kalimantan:</p> <ol style="list-style-type: none"> 1. PLTD Karang Asam, Samarinda 2. PLTD Gunung Malang, Balikpapan <p>Central Kalimantan:</p> <ol style="list-style-type: none"> 3. PLTD Trisakti, Banjarmasin <p>Papua:</p> <ol style="list-style-type: none"> 4. PLTD Yarmokh, Jayapura 	<p>Transaction ID00030</p> <p>Nanggroe Aceh Darussalam:</p> <ol style="list-style-type: none"> 1. PLTD Pulo Pisang, Sigli 2. PLTD Ayangan, Takengon 3. PLTD Kuning, Kutacane <p>Jambi:</p> <ol style="list-style-type: none"> 4. PLTD Kasang Jambi <p>Lampung:</p> <ol style="list-style-type: none"> 5. PLTD Teluk Betung, Lampung <p>West Kalimantan:</p> <ol style="list-style-type: none"> 6. PLTD Sudirman, Singkawang 7. PLTD Siantan, Pontianak <p>Maluku:</p> <ol style="list-style-type: none"> 8. PLTD Hative Kecil, Ambon
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2.3. The Stakeholders and the Client

The transactions were conducted as a special programme of PT PLN (Persero), which was the client of these transactions. Perusahaan Listrik Negara PT (PT PLN) is a state-owned public utility company in the Indonesian electricity generation sector. The company is responsible for the lion's share of electricity generation, transmission and distribution of electricity in the country. The special PT PLN programme was focused on the improvement of power availability and supply in remote and less developed regions in Indonesia. Rehabilitation and refurbishment of existing power plants were considered the best solution to deal with the regular power shortages in these regions.

PT PLN is the main producer of electricity but its production capacity is insufficient to meet total demand in Indonesia. Therefore, it also buys electricity from so-called Independent Power Producers. These producers filled a significant part of the gap between supply and the rapidly growing demand for electricity in the late 1990s and the early years of the 21st century. Today, the Independent Power Producers play a less important role because of the poor financial position of PT PLN. It simply lacks the resources to buy electricity at higher prices than the fixed prices it is allowed to charge for its sales to the end-users.

As a result of the pricing policy of the Government of Indonesia and the inefficiencies in PT PLN itself, the company is in a rather poor financial position and often delays payments to its main suppliers. By far the most important supplier is Pertamina, the state oil company, which supplies the fuel and oil for the power stations. The government is significantly involved in the management of both enterprises.

The applicant of the ORET transactions was Wärtsilä Netherlands B.V., Zwolle, the Netherlands, which is a Dutch holding company. Today Wärtsilä-Netherlands is a wholly owned subsidiary of the Wärtsilä Corporation in Helsinki, Finland. At the date of the first application in 2003 Wärtsilä-Netherlands had a turnover of € 173 million, € 114 m of which was earned with exports. It employed approximately 570 people. Up to the moment of the merger between Wärtsilä and the Dutch firm Stork, Wärtsilä did not have a presence in the Netherlands. With this merger it got access to the Stork Diesel know-how in the field of marine engines and power station. In the past Stork had sold a large number of these diesel engines abroad including Indonesia.

Figure 1: Map of PLN Regions in Indonesia covered by the ORET Programme



Source: PLN Statistics 2012 (adjusted by LPEM’s team for the location of ORET programme)

★ = Location of ORET supported power plants ● = capital city of the province.

Stork sold its share in the joint venture to Wärtsilä in 1997 leaving behind its know-how and the Stork Diesel brand. This was important for the transactions since the engines of the power plants that were to be rehabilitated were Stork diesels. The new firm Wärtsilä inherited also Stork’s long-term relationship with Indonesia. Therefore the applicant had experience with transactions with Indonesia. It has a local presence in Indonesia with a fully owned subsidiary PT Wärtsilä Indonesia. Wärtsilä and its predecessor Stork have both supplied diesel engines to Indonesia for decades. It had sold diesel engines and rehabilitated diesel power plants under similar PT PLN programmes.

Bappenas, the National Planning Agency of Indonesia, plays a crucial role in the approval process of all internationally (co-)financed investment projects in Indonesia. The relevant organisation, in this special case PT PLN, had to submit a project proposal, including financing modalities, to Bappenas. The Agency evaluated the proposal taking into account the country’s development priorities as formulated in the medium term national development plan (Rencana Pembangunan Jangka Menengah Nasional- RPJMN). Proposals that meet the qualification criteria are included in the List of Medium-Term Planned External Loans and Grants (Daftar Rencana Pinjaman dan Hibah Luar Negeri Jangka Menengah--DRPHLN-JM), or the Blue Book. Projects that meet the readiness criteria and that receive funding from international development partners are listed in the Priority List of Planned External Loans and Grants (Daftar Rencana Pemanfaatan Pinjaman Luar Negeri—DRPPT PLN), or the Green Book. The ORET transaction followed all stages of this process and was approved, establishing thereby that it was in line with the country’s development priorities.

As an exception to the rules these transactions were not submitted to the Ministry of Finance because PT PLN paid for the non-grant part of the ORET transaction itself. Due to PT PLN’s financial constraints, the transactions could not be executed under normal commercial conditions. Hence they were submitted to Bappenas to be evaluated and included in the “Blue Book”, making the projects eligible for the international lending programme.

2.4. Financing

The total transaction amounts of ID00025 and ID00030 were € 13,734,000 respectively € 11,098,329, with the latter including financing costs to an amount of € 632,605. The first transaction did not require export credit insurance for the non-grant funds and therefore the transaction amount did not include financing costs. The assessment of the second transaction concluded that the financing costs were too high (larger than 5% of the transaction amount) but it was decided to give a waiver for this. With 75% of the financing costs compensated from the grant, and a grant of 30% of the transaction amount, the total grant amount of ID00025 was determined at € 4,606,000, or 34% of the transaction amount. For the second transaction the grant was determined at € 3,792,065 or 34% of the transaction amount.

Table 3: Total Transaction Costs and Contribution from ORET

	Transaction Amount	ORET Grant	Grant Share
ID00025	13,734,000	4,606,000	34%
ID00030	11,098,329	3,792,065	34%
Total	24,832,329	8,398,065	34%

The non-grant share of the transaction was financed from PT PLN’s own resources. A Letter of Credit (L/C) was opened with the Mandiri Bank in Jakarta advised by the ING Bank. The credit risk of the extended L/C (actually a short

supplier's credit) was covered with an Atradius DSB insurance policy. During the assessment of the first transaction it was advised to include in the contract a Credit Line for Spare Parts with a maturity of five years. The total amount for this credit line was estimated at € 1.1 million. This facility was created in addition to the spare parts already included in the contract. The Credit line was a prepayment for spare parts, on which the customer could draw if needed. Main reason for including this facility was that with the availability of extra spare-parts, maintenance was secured as much as possible thereby contributing to the sustainability of the power plants.

3. Methods of Evaluation

3.1. Theory of Change

The results chain presented in Table 4 summarizes the main elements of the transactions that have been investigated in this evaluation. The ultimate objectives of the transactions were to improve the electric power supply, both in quantity and quality, in a number of remote areas in Indonesia. Goal was to improve the energy yield of the these power stations and reduce their environmental pollution, oil and other spills, stench and noise nuisance. Another goal was to enhance the sustainability of the plants through the transfer of knowledge of technical and financial management of diesel power stations. These improvements should lead to an increase in economic activities in the relevant regions and to a reduction in pollution. Since the plants were rehabilitated according to the latest technology and standards it was also expected that their operational costs would be lower, because they would use less fuel, and be more environment-friendly than the old diesel generators.

Table 4: Results Chain

Inputs	Activities	Outputs	Outcomes	Long-term Impact
<ul style="list-style-type: none"> ▪ ORET grants for ID00025 and ID00030 ▪ Materials for the rehabilitation and upgrading of power plant engines ▪ Technical assistance, training and supervision ▪ Materials for spare parts 	<ul style="list-style-type: none"> ▪ Repairing cooling facilities ▪ Revising and overhauling the engines and other parts in the power plants ▪ Providing technical assistance ▪ Providing training to the operators on how to deal with the engines 	<ul style="list-style-type: none"> ▪ 12 working and upgraded diesel power plants in selected regions in Indonesia ▪ TA and training delivered to the operators of the plants ▪ Spare parts for at least three years ▪ TA and management support delivered local PLN offices 	<ul style="list-style-type: none"> ▪ Better power availability for residents and firms in selected regions in Indonesia ▪ Fewer power outages ▪ Higher efficiency of power plants ▪ Reduction of pollution and stench ▪ Well-trained personnel of PT PLN regional technicians that can correctly use and maintain the power stations 	<ul style="list-style-type: none"> ▪ Increase economic activities of companies and households ▪ Private sector development ▪ Cleaner environment, less noise and less oil spills

3.2. Evaluation Criteria

The evaluation of the transactions was conducted applying the following criteria: Efficiency, Effectiveness, Sustainability, Relevance, Additionality and Coherence. These criteria were defined as follows:

3.2.1 Efficiency

Efficiency concerns the outputs of the transactions, i.e. the supply of 12 upgraded diesel power plants in selected regions in Indonesia and related training and management support. It measures the extent to which these outputs have been realized by the inputs as agreed and at the lowest possible cost.

Efficiency of the transaction was determined on the basis of documents of implementing agencies (e.g. dossiers ORET.nl, documents provided by PT PLN, official documents of the Indonesian authorities, etc.) and information on realized outputs (the 12 diesel engines, management support, training and capacity building), budget, delays and their causes. In addition, interviews were held with the main stakeholders in the period April – September 2014.

For evaluating the technical aspects under this criterion, the following indicators were used concerning the functioning of the power stations. These indicators are also important to analyse the technical sustainability of the project:

- Availability of the power stations;
- Present quality and status of the power stations that were rehabilitated and upgraded;
- Number of staff trained;
- Status of the PT PLN.

The institutional analysis was based upon information from PT PLN headquarters and regional PT PLN offices.

3.2.2 Effectiveness

Effectiveness is the extent to which the transaction has contributed to the achievement of the project's expected results or objectives. Here a distinction can be made between direct effects and intermediate/long-term effects on the recipient country's economy and Dutch companies.

Effectiveness was determined on the basis of in-depths interviews with the stakeholders and relevant documentation. The responsibility for the supply of electricity is with PT PLN and its regional units. The interviews also covered technical, financial and administrative aspects of the power plants and shed light on whether these plants are still working properly. The effectiveness of this transaction refers also to the effects on beneficiaries and the Indonesian economy, in particular the local economy of the remote areas where the rehabilitated power stations are located.

3.2.3 Sustainability

Sustainability is defined as the extent to which the rehabilitated and updated power plants can operate without support from the supplier, in this case Wärtsilä. The evaluation covers the following 3 aspects: technical, financial and institutional.

The information collected in the interviews supported the analysis of these different aspects of sustainability. In this case environmental sustainability was closely related to the maintenance of the plants. Financial sustainability is analysed on the basis of the financial situation of PT PLN, whereas institutional sustainability is explored by disentangling the operational process of the services provided.

3.2.4 Relevance

The OECD/DAC defines relevance as a criterion indicating whether the objective of an intervention is consistent with beneficiaries' requirements, country needs, global priorities and partners' and donors' policies. Relevance should further demonstrate whether the transaction has made a sustainable contribution in achieving the ultimate objective (the impact). This point has been evaluated throughout the study by assessing whether the transaction has indeed contributed to a more stable and efficient supply of electricity in the regions where the power plants are located.

3.2.5 Additionality

The evaluation has assessed whether the transaction would have been implemented without ORET support and whether the support to the transaction has fulfilled a catalytic role in mobilizing additional finance in Indonesia that would otherwise not have taken place and whether ORET triggered other funding sources.

3.2.6 Coherence

Under the criterion of coherence the evaluation has analysed to what extent the ORET programme and the ORET transactions have complemented or contradicted other instruments of Dutch development cooperation and foreign (economic) policy in Indonesia.

4. Results

4.1. Efficiency

4.1.1 The Application Process

The application for ORET support for the first transaction ID00025 was submitted in January 2003. It was decided that this transaction qualified for support from the environmental facility MILIEV, which at the time still existed within ORET. The reason was that the transaction focused on reducing fuel consumption of the power plants and their environmental impact. It took about 11 months before the grant agreement was signed (13 December 2003), which is a relatively short period compared to other applications under the ORET programme. At the request of FMO, the executing agency of the ORET programme at the time, KEMA (Dutch testing and certifying body for the electricity sector) conducted a detailed feasibility study, in particular on the technical, financial and economic sustainability of the plants. During this process ECORYS was asked to recalculate the rate of economic return on the basis of the OECD methodology.

The second application (ID00030) in 2004 was, apart from increasing the number of power stations, (eight compared to four in the first transaction) identical to the first. The same reasons for the transaction were given and the assessment was similar to that of the first transaction. Nevertheless the approval process took somewhat longer than the first application because it was decided to await the first results of the first transaction. Again the power plants involved were selected jointly by PT PLN and Wärtisilä on the basis of the need for rehabilitation (the technical status of the plant) and the expected demand for electricity in the relevant regions.

The applicant and the officials of the client interviewed in Indonesia regarded the ORET application procedures as reasonable and efficiently.

4.1.2 Procurement

PT PLN considered the rehabilitation and upgrading of the plants as a new investment, which falls under the authority of PT PLN headquarter. PT PLN headquarter was responsible for the procurement process, including the negotiations about technical specifications, prices and financing. According to the staff from PT PLN headquarters responsible for the procurement, the negotiation process was relatively straight forward. PT PLN has internal procurement regulations, which comply with the national public procurement regulation in Indonesia (at that time the Presidential Decree No. 80/2003)¹. This allowed PT PLN to appoint a single supplier, Wärtisilä Nederland, to rehabilitate the engines.

However, since the engines that were to be rehabilitated, were made by Stork Wärtisilä Diesel, PT PLN did not have much choice in the matter. According to PT PLN, they did not request other companies to give quotes for the rehabilitation of the engines, since other companies could not provide the required parts and their parts were not fully compatible with the Stork Wärtisilä Diesel engines. In collaboration with its local subsidiary PT Wärtisilä Indonesia, Wärtisilä was also able to provide and guarantee the availability of spare-parts and mobilise the technical expertise for the rehabilitation. PT PLN has long-term experience in working with PT Wärtisilä Indonesia in the area of power plants, and hence it had great confidence in the quality of the services of the company.

This direct award procedure could have had an upward effect on the prices of the purchased goods. According to staff in PT PLN headquarters, the prices of the rehabilitated engines were acceptable, particularly taking into account the grant element of the ORET Programme. He further stated that under normal commercial conditions PT PLN would never have realized a rehabilitation of such a scale given the substantial reduction on prices. Other suppliers would not exceed a price reduction of 10% to 15%. Moreover, based on experiences of PT PLN, there were no grants available from international agencies or other donors that offered such a large grant element as the ORET programme. In addition, the transactions also included an in-house training and technical assistance programme to enhance the knowledge and skills of PT PLN employees which was not readily available from other suppliers. In conclusion, PT PLN considered the prices offered by

¹ The current internal procurement regulation in PT PLN (Regulation of PT PLN Board of Directors No. 305/2012) has to comply with the current public procurement regulation (Presidential Decree No. 70/2012) and procurement regulation from the Ministry of State Own Enterprises issued in 2009/2009.

Wärtsilä to rehabilitate the engines as reasonable, especially because of the "price reduction" due to the ORET grant. This might be the case for PLN but, although the ORET grant might be extremely relevant for PT PLN, it is not for the ORET programme. As a rule the ORET programme requires the prices of the various components of the transaction to be checked by an independent expert, which was done for both transactions. The independent expert concluded that the prices were market-compatible.

Nowadays direct award by PT PLN as a state owned enterprise to PT Wärtsilä Indonesia for the transactions under ORET would no longer be possible. The new procurement regulation no. 10 of 2011, which revised regulation no. 2 of 2006, requires that loans and grants from foreign governments, international development agencies, international organizations, and foreign individuals have to be recorded in the Government Financial Report and agreed by the Ministry of Finance first. In the case of loans to state owned enterprises, a sub-lending agreement between the government and the enterprise has to be concluded.

4.1.3 Implementation

The certificate of completion of the first transaction was issued on 8 March 2006. So it took about two years to finalize the first transaction, which was in line with the planning. The final decision about the grant was dated 4 October 2007. Both PT PLN and PT Wärtsilä Indonesia confirmed that the first transaction was completed and achieved its expected outputs on schedule and within budget. There was, however, a delay during the execution of the second transaction (ID00030) because the specifications of the supplies were changed during implementation of the transaction. Both these changes and the delays were approved by parties. The Certificate of Completion was signed about two years after the grant agreement.

PT PLN stated that it was and still is satisfied with the rehabilitation process and the engines that were rehabilitated by Wärtsilä. Table 5 gives an overview of the diesel engines at the various power plants that were rehabilitated and upgraded.

Table 5: Engines Delivered by Location

Location	Engine Type**	Capacity**	Date of Completion**
Transaction 1: ID00025			
<i>East Kalimantan</i>			
Karang Asam, Samarinda,	1 engine	9,080 KW	8 March 2006
Gunung Malang, Balikpapan	1 engine	11,480 KW	8 March 2006
<i>Central Kalimantan</i>			
Trisakti, Banjarmasin	1 engine	33,700 KW	25 January 2006
<i>Papua</i>			
Yarmokh, Jayapura	1 engine	3,042 KW	31 August 2005
Transaction 2: ID00030			
<i>Maluku & North Maluku</i>			
Hative Kecil	2 engines 12 TM 410 3 engines 6 TM 410	18,456 KW	18 April 2007
<i>West Kalimantan</i>			
Siantan	1 engine 9 TM 410 (original engine from 1977)	4,040 KW	23 May 2007
Sudirman	1 engine 6 TM 410 (original engine from 1988)	3,280 KW	23 May 2007
<i>Southern Sumatra</i>			
Teluk Betung	1 engine 9 TM 410	4,040 KW	21 August 2007
Kasang Jambi	1 engine 6 TM 410	2,296 KW	21 August 2007
<i>Aceh</i>			
Sigli	1 engine 6 TM 410	3,280 KW	29 May 2007
Takengon	1 engine 6 TM 410	3,280 KW	29 May 2007
Kutacane	1 engine 6 TM 410	2,296 KW	29 May 2007

The transactions also included technical assistance and training for the local staff of PT PLN. According to PT PLN the training given by Wärtsilä was effective and contributed significantly to enhancing the knowledge and skills of the technicians and local staff in the PT PLN regional offices. The technical assistance included both class room teaching and on-the-job trainings. It not only familiarised local technicians with the details of the engines but also provided participants with the

skills required to maintain and repair the engines if needed. Interviews with staff at PT PLN headquarters and the regional stations visited revealed that the training was indeed extremely helpful for the operation of the plants and instrumental in reacting to problems of the engines.

4.2. Effectiveness

PT PLN confirmed that the rehabilitation of the engines with financial support of the ORET Programme was successful in enhancing the capacity and improving the performance of the local PT PLN power stations. As a result, the stations are able to use their capacity more efficiently and have considerably improved the supply of electricity in the relevant regions. As an illustration the Manager Operation of PT PLN Region West Kalimantan stated that before rehabilitation, the engines in West Kalimantan (in Siantan and Sudirman) could perform at only 85% of their maximum capacity. After rehabilitation, the engines could perform at 100% of their capacity. As a result of the training, the engines are also now maintained much better, shut down less than before and offer a more stable electricity supply to end-users in the region. In addition, according to PT PLN, the rehabilitated engines perform better in terms of fuel consumption and environmental impact. The regular checks by the PT PLN Regional Office confirm less pollution in the form of emission, odour and oil spills.

Table 6 summarizes the current condition and utilisation of the 12 rehabilitated power plants, about ten years after completion of the first transaction and five years after the second. Some engines are not being fully utilised. In Sumatra (Aceh, Jambi, and Lampung) the rehabilitated engines do currently not function as the main source for electricity production. Since PT PLN has created an interconnected electricity system in the area Sumatra-Java-Bali, the local power plants in Sumatra are today only used to meet demand from residential areas during peak hours. The engines in Kalimantan, Maluku, and Papua are still used as the main source for electricity production.

Table 6: Current Status of the Diesel Engines

Location	Status of the Engines
Transaction 1: ID00025	
<i>East Kalimantan</i>	
Karang Asam, Samarinda,	The engines are still functioning and used as the main engines to provide electricity East Kalimantan.
Gunung Malang, Balikpapan	The engines are still functioning and used as the main engines to provide electricity East Kalimantan.
<i>Central Kalimantan</i>	
Trisakti, Banjarmasin	The engines are still functioning and used as the main engines to provide electricity Central Kalimantan.
<i>Papua</i>	
Yarmokh, Jayapura	The engines are still functioning and used as the main engines to provide electricity Papua.
Transaction 2: ID00030	
<i>Maluku & North Maluku</i>	
Hative Kecil	The engines are still functioning and used as the main engines to provide electricity in Maluku. One engine is out of order.
<i>West Kalimantan</i>	
Siantan	The engines are used as the main engines to provide electricity in West Kalimantan. From the eight engines in Siantan, there are four units Stork Wärtsilä Diesel engines. The unit that was rehabilitated under the ORET Programme is engine Stork Wärtsilä Diesel No. 2 which was established in 1977, and it is still functioning. One of the four Stork Wärtsilä Diesels, one unit was out of order since 2008 (engine No. 1). Since the engine in Sudirman cannot be utilised again, the power plant in Siantan is the main source of electricity in West Kalimantan.
Sudirman	The engine was established in 1988, and according to PLN Regional of West Kalimantan, it is currently out of order. In 2010, the engine burned down and major parts of the engine were broken. The engine has not been operated since that year, and needs major rehabilitation (or even replacement).
<i>Southern Sumatra</i>	
Teluk Betung	The engine is still functioning and used during peak hours (05.00 – 10.00 PM).
Kasang Jambi	The engine is still functioning and used during peak hours (05.00 – 10.00 PM).
<i>Aceh</i>	
Sigli	The engine is still functioning and used during peak hours (05.00 – 10.00 PM).
Takengon	The engine is still functioning and used during peak hours (05.00 – 10.00 PM).
Kutacane	The engine is still functioning and used during peak hours (05.00 – 10.00 PM).

Two out of the 12 rehabilitated engines are out of order: one engine in PLTD Sudirman, West Kalimantan and one engine in PLTD Hative Kecil, Maluku. Since the engine in PLTD Sudirman is currently out of order, the supply of electricity in the area has been taken over by the other rehabilitated plants in the region² even though PLTD in Siantan is currently sufficient to provide electricity for the region. PT PLN of West Kalimantan is giving extra attention to maintaining the engines in Siantan. If the engines in Siantan could not operate at full capacity there would be a shortage of electricity due to the lack of available back up engines in West Kalimantan.

PT PLN still utilizes many Stork Wärtsilä Diesel power plant engines that were installed during the 1970s and 1980s. In order to rehabilitate these engines, spare parts from Wärtsilä are perfectly compatible. For small spare parts, PT PLN can use products from other suppliers, however, major and specific spare parts of the Stork Wärtsilä Diesel engines have to come from Wärtsilä. Before the ORET Programme, the existing Stork Wärtsilä Diesel engines have not been completely re-hauled so that the engines cannot perform at optimal capacity.

Today large differences in power generation exist between the eastern and western parts of Indonesia. PT PLN has established an interconnected electricity grid in the western part of the country (Sumatera-Java-Bali). In eastern parts of Indonesia (Kalimantan, Sulawesi, Nusa Tenggara, Maluku, Papua) an interconnected grid does not yet exist. Therefore these regions fully rely on local power plant engines. The rehabilitation of the Stork Wärtsilä Diesel engines in Kalimantan, Maluku, and Papua under the ORET programme was very beneficial to the people in the area, since these engines are the main source of electricity in the area.

Prior to the implementation of the ORET programme, PT PLN already had a business relationship with Wärtsilä Nederland, through its subsidiary company PT Wärtsilä Indonesia in Jakarta. This business relationship still exists and will continue, especially for maintenance and rehabilitation of the main power plant engines and delivery of spare-parts. There have been follow-up orders from PT PLN to PT Wärtsilä Indonesia, especially for rehabilitation and spare parts of Stork Wärtsilä Diesels and Wärtsilä engines. Until now, PT PLN prefers to use original spare-parts from PT Wärtsilä for rehabilitation and maintenance of Stork Wärtsilä Diesels and Wärtsilä power plant engines.

4.3. Sustainability

4.3.1 Financial

PT PLN still maintains the engines that were rehabilitated under the ORET programme. The company periodically allocates budget for regular maintenance of the engines and enhancing the capacity of field technicians. According to PT PLN, the allocated budget is sufficient for the regular maintenance of the diesel engines. The rehabilitation of the engines saved PT PLN money, as a result of lower production costs and higher utilisation rates of the plants. Since the company is a state owned enterprise with a public service obligation to provide electricity in Indonesia, prices are set by the Government of Indonesia. As explained elsewhere, these prices are lower than what they would be if based on real production costs. The government covers the shortfall with subsidies to PT PLN.

4.3.2 Maintenance

The transactions included a warrantee for maintaining the rehabilitated engines from PT Wärtsilä Indonesia. The warrantee period for the engines ended in 2006 respectively 2007. According to PT PLN Region West Kalimantan there were no major problems with the engines and no support from Wärtsilä was needed during the warrantee period. When needed, PT Warsila Indonesia provided the services requested. After the warrantee time elapsed, PT PLN purchased major spare-parts from Wärtsilä. For a couple of years, these spare-parts were financed from the credit line that was part of the transactions. For relatively minor repairs that did not need Stork Wärtsilä spare-parts, PT PLN made use of other suppliers' parts.

For regular maintenance, PT PLN uses its own technical staff. Operational staff working at the sites of the rehabilitated power plants was trained as part of the ORET programme. In addition, PT PLN

² Based on the field visit of LPEM's team to West Kalimantan in 30-31 May 2014, there are eight power plants engines in PLTD Siantan. Four of them are Stork Wärtsilä diesel engines. One of these was rehabilitated under the ORET programme and is fully operational; three of these engines were not rehabilitated under the ORET programme, one of these is out of service, and the other two are fully operational.

runs a subsidiary organization for higher education for electricity engineering, namely *STT PT PLN – Sekolah Tinggi Teknik PT PLN* (School for Electricity Engineering) for training of PLN's staff. Most of the technical and operational staff of the regional plants is a graduate from this school. PT PLN also has an in-house training unit at PLN's headquarter. This unit provides technical, managerial, and strategic training in the context of its human resources development programmes. The technical and operational staff, which is in charge of the power engines, is required to follow the regular training sessions of the training unit of PT PLN. In addition, technical assistance is provided by the supplier if new engines are installed.

According to respondents, PT PLN is strongly committed to maintain the engines rehabilitated under the ORET programme. This is especially relevant for the regions in the Eastern part of Indonesia where the local power plants form the main source of electricity. The case of West Kalimantan is different because there are no further plans for major rehabilitation of diesel engines. PT PLN headquarter has planned to establish an inter-connected electricity grid across Kalimantan that will be using natural gas-based power plant engines. Hence, in the future the diesel power engines like as the ones rehabilitated under the ORET programme may be phased out and at best serve as standby engines during peak hours as is the case for the rehabilitated engines in Sumatra.

4.3.3 Institutional

Some current developments might affect the energy sector and consequently the business relations between Wärtsilä and PT PLN in the future. In 2010, the Ministry of Energy and Mineral Resources of Indonesia³ decided for environmental reasons to focus on the development of power plants in Indonesia that will utilize available local natural resources, in particular renewable energy resources. New power plants with diesel engines will no longer be developed. For areas with a shortage of electricity, a temporary solution was chosen by allowing PT PLN to rent power engines for a period of one or two years rather than to purchase them. As soon as non-diesel power plants have been built in the areas or the areas have been connected to the national grid, the use of diesel power plants will be discontinued. The production of electricity in the future will be provided by power plants using non-diesel fuel sources, such as gas, water, wind, etc.

As an example, in Kalimantan the region where five power plants have been rehabilitated, PT PLN will develop a new electricity production facility and distribution network based on natural gas with which it is well endowed. Natural gas will become the fuel for all power plants that will also be interconnected across the island. When this interconnected system is in place, the diesel power plants in the area, such as PLTD Siantan, will be phased out and only serve as back-up⁴.

According to PT Wärtsilä Indonesia, the company has anticipated these energy policy changes and has started to supply non-diesel based engines. As a consequence, future transactions between Wärtsilä and PT PLN will be determined by the maintenance of the current diesel engines and related spare-parts and services, and the supply of other engines.

In order to improve the efficiency of the company and create savings, the Board of Directors of PT PLN has issued a new regulation on the purchasing of spare parts and engines. It allows PT PLN to purchase engines and spare parts from non-original equipment manufacturers (non-OEMs) as well, if available. The non-OEM products are usually less expensive and can be delivered faster compared to the parts from OEMs. However, non-OEM products have a shorter guarantee period in comparison with OEM-products. This regulation might negatively affect the current business transactions between Wärtsilä and PT PLN, since PT PLN can now purchase spare parts of Stork Wärtsilä Diesel engines from non-OEM suppliers. For the purchase of main engines and dedicated spare-parts, PT PLN will continue to rely on OEMs, among them Wärtsilä. Even though the OEM products are relatively expensive, they do have the guarantee and after-sale services needed by PT PLN.

4.4. Relevance

Per instruction all Indonesian government programmes and projects financed by external loans and grants have to meet Indonesia's objectives as formulated in the medium term development plan. The rehabilitation and upgrading of the power plants was in fact on the List of Medium-Term

³ Master Plan of Electricity Development 2009-2014, the Ministry of Energy and Mineral Resources, 2009-2014.

⁴ Since PT PLN is a SOE, the company cannot write-off assets, such as damaged diesel engines or power plants, unless there is an approval from the Government of Indonesia.

Planned External Loans and Grants (DRPHLN-JM) or the so called Blue Book, a formal document issued by the Government of Indonesia. As such, the transactions were in line with Indonesia's medium and long term development plans.

With reference to its Annual Planning and Budgeting Document, PT PLN submitted a proposal to *Bappenas* for the rehabilitation of its plants as transactions that could be funded by external financing. The proposal was included in the "Blue Book" and later in the "Green Book", after the Dutch government indicated that the transactions would be partially funded by the Dutch government under the ORET programme. This reflects that the project fits within the national priorities. The follow-up arrangements of the transactions were managed between PT PLN and PT. Wartsilä Indonesia and considered as a business-to-business agreement that did not require any further involvement of government institutions such as of *Bappenas* or the Ministry of Finance.

4.5. Additionality

In order to maintain electricity production in the remote areas, PT PLN would still have had to rehabilitate the engines, even in the absence of ORET funding. Possible alternatives would include a smaller scope of the rehabilitation programme and not as comprehensive as was done under ORET. Other alternatives would have been to rehabilitate the engines by cheaper non-OEM suppliers or PT PLN prioritising only rehabilitation of the engines in eastern Indonesia since the engines form the main source of electricity in the area.

According to PT PLN, the rehabilitation of the diesel engines could have been financed from an internal fund earmarked for maintenance and from the investment fund of PT PLN. However, the financial capacity of PT PLN was and is limited as a result of which the rehabilitation could not be fully financed by the company. The grant from ORET programme, which financed more than 30% of the rehabilitation costs, assisted PT PLN to do a more comprehensive rehabilitation at relatively low financing costs. The non-grant part of the rehabilitation (65% of the total transaction amount) was funded from the operational and maintenance budget of PT PLN. The allocated budget could only cover the rehabilitation of some engines (not all 12).

4.6. Coherence

The transactions fitted well with the Netherlands' policies to strengthen the country's economic relationships with emerging markets. Indonesia as one of the larger countries of South-East Asia is considered an important business partner.

These transactions can be seen as an example of expanding the business relationships with this country, since it also resulted in follow-up activities in the shipbuilding sector.

Annexes

Interviews

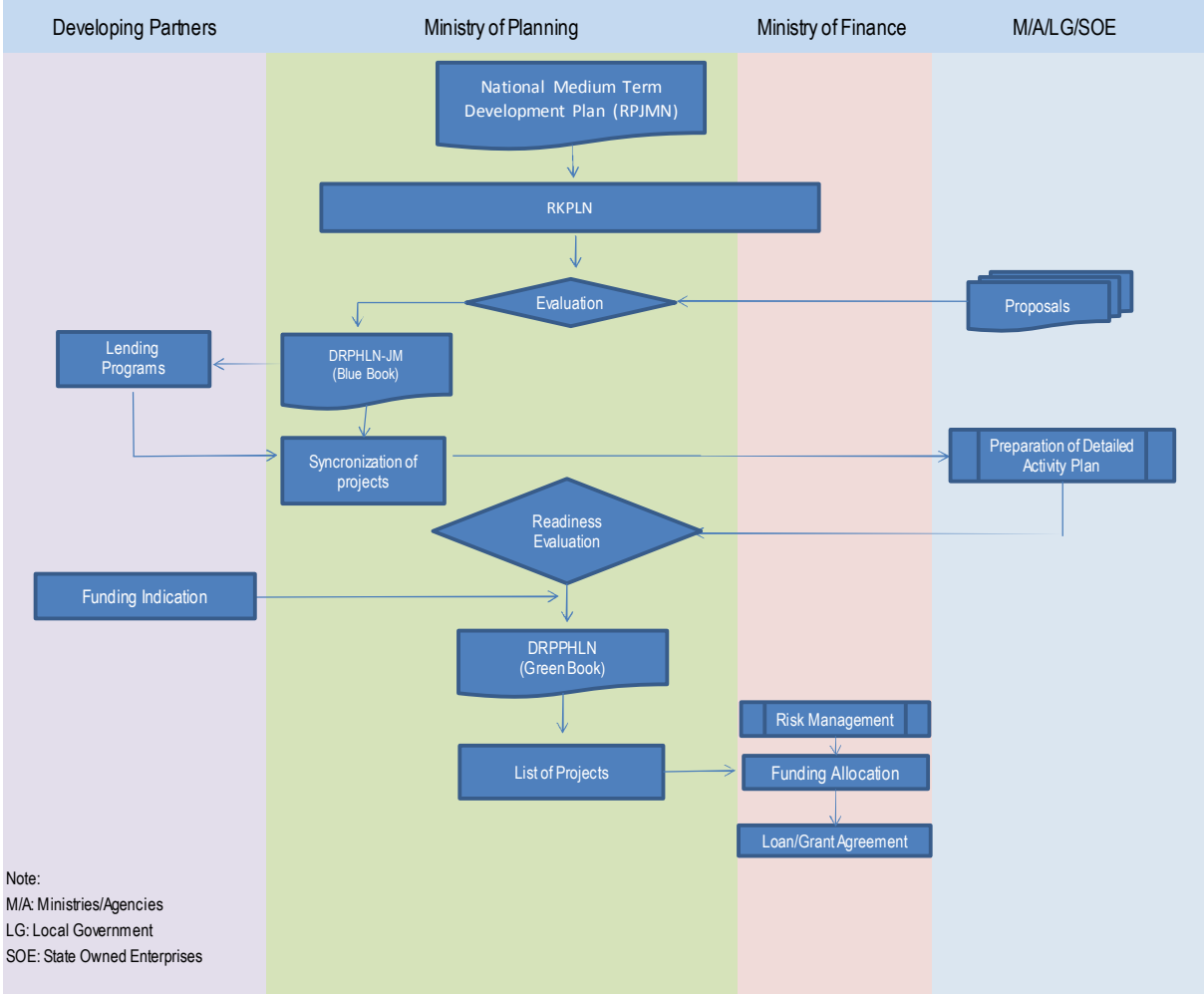
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12. Presidential Decree on Public Procurement in Indonesia no. 80/2003 and no. 70/2012

Procedure for Processing a Foreign Grant and Loan in Indonesia

Figure 2: Planning Mechanism of Foreign Loan and/or Grants



Source: Ministry of National Development/National Development Planning Agency, "List of Medium-Term Planned External Loans and Grants (DRPHLN-JM) 2011-2014; 1st Book"