Sida Evaluation 00/33

# The Swedish Energy Support to Nicaragua, 1981–1999

ORGUT Consulting AB

Department for Infrastructure
and Economic Cooperation

# The Swedish Energy Support to Nicaragua, 1981–1999

**ORGUT Consulting AB**

**Sida Evaluation 00/33**

**Department for Infrastructure and Economic Cooperation**

This report is part of *Sida Evaluation*, a series comprising evaluations of Swedish development assistance. Sida's other series concerned with evaluations, *Sida Studies in Evaluation*, concerns methodologically oriented studies commissioned by Sida. Both series are administered by the Department for Evaluation and Internal Audit, an independent department reporting directly to Sida's Board of Directors.

Reports may be *ordered* from:
Infocenter, Sida
S-105 25 Stockholm
Telephone: (+46) (0)8 795 23 44
Telefax: (+46) (0)8 760 58 95
E-mail: info@sida.se,

Reports are also available to *download* at:
http://www.sida.se/evaluation

Author: ORGUT Consulting AB.



Sida Evaluation 00/33
Commissioned by Sida, Department for Infrastructure and Economic Cooperation



Registration No.: INEC 2000-00585
Date of Final Report: November, 2000
Printed in Stockholm, Sweden 2000
ISBN 91 586 8876 5
ISSN 1401–0402

SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
Address: S-105 25 Stockholm, Sweden. Office: Sveavägen 20, Stockholm
Telephone: +46 (0)8-698 50 00. Telefax: +46 (0)8-20 88 64
Telegram: sida stockholm. Postgiro: 1 56 34–9
E-mail: info@sida.se. Homepage: http://www.sida.se

# Table of contents

# Preface

## With the Benefit of Hindsight

This evaluation was commissioned by Sida to look at two decades of support to the energy sector in Nicaragua and has been carried out after the program was completely phased out. The intention is, rather than evaluating individual components in detail, to extract some overall lessons about implementing energy sector support.

The evaluation team has tried hard to look at the decisions concerning the support in the context of the times in which they were made. We would like to emphasize to anyone involved in the program that it is easy to see the overall picture with the benefit of hindsight. Our general impression is that the decisions taken on both sides were made in good faith and with an insight into the realities of the time. It is not to be expected that government decision-makers or consultants have access to a crystal ball.

One analyst of the 1980's making the macro-economic case for large investments in hydropower plants wrote:

> *…all that can be said with certainty is that Nicaragua will continue to face a severe balance of payments situation during the rest of this century. The foreign debt will not be serviced, even under the most optimistic political and economic forecasts. The decline in availability of foreign exchange – from exports, grants and loans – that has taken place in recent years is likely to continue.* ***Unless a miracle happens*** *– such as genuine peace in all Central America. . .a reactivation of the Central American Common Market, extraordinarily high coffee prices plus massive foreign economic assistance… the reduction in imports that has started is likely to continue.*

With the benefit of hindsight, we can say that the miracle happened, oil prices remained low and the strong macro-economic arguments for promoting hydropower faded, at least in the short term.

Peace has put an end to years of serious instability in El Salvador, Guatemala and Nicaragua. The Central American Common Market may not be functioning perfectly, but many initiatives are being taken to coordinate intellectual and economic activities at a regional level and the countries are trading at record levels with each other. Coffee prices have been steadily increasing and the influx of massive foreign assistance to Nicaragua (plus the influx of considerable private capital) has helped to finance booming economic growth.

Nicaragua's foreign debt was reduced by over 50% in the first six years of the 90's, (and has since been further reduced). In short, all of the conditions which looked miraculous in the late 1980's were a reality in the late 1990's, although the long-term structural problems generated by a high level of imports still form a nagging cloud on the horizon of economic development.

In addition to the relative unpredictability of the macroeconomic situation, neither has the technical development of the energy sector been easy to foresee. The 1991 Energy Sector study stated that:

The obvious conclusion is that oil-fired power stations will not remain one of the corner-pillars of the Nicaraguan power supply.

The ever-increasing prevalence, in the past few years, of oil-fired power stations in Nicaragua is a source of continuing concern.

While the present team can comfortably view the past two decades in perspective, we are as ill-equipped as any of our colleagues to predict the future. Fortunately for us, predicting future economic and political trends in Nicaragua is not part of our present assignment. We wish to convey our profoundest respect for those whose job it was in the twenty years of Sida support to the energy sector in Nicaragua.

Photo: Evaluation Team at Las Canoas mini-hydro power plant

The evaluation was carried out by Melinda Cuellar from Orgut Consulting and Anders Gustafsson from VBB Anläggning AB.

# 1. Executive Summary

Early on in the 1980's, the Nicaraguan government expressed an interest in small-scale hydroelectric power plants. Studies, financed by Sida, were carried out to identify possible sites and two installations were built with Sida support. The interest in hydropower on the part of the government expanded to include medium size installations as a part of an energy diversification strategy.

Worsening macro-economic conditions, civil war and a trade embargo contributed to the pervasive energy shortages of the late 1980's. The attention of the government was thus diverted from long-term development considerations to short term emergency measures. Sida support followed suit and energy sector support became implemented as the physical rehabilitation of an important thermal power plant "Planta Nicaragua", which included import support for fossil fuel.

The interest for hydropower development remained strong and the Rio Viejo studies became the focus of energy sector support in the early 1990's. The new government, elected in 1990, embarked on a path of privatization in the electric power sector. This made the prospects of government/donor financing for hydroelectric plants less likely and brought another urgent need to the fore – institutional restructuring.

Swedish aid once more followed suit, and the institutional support to INE/ENEL, including a gender component, became part of the energy sector support as it became clear in the mid-1990's that Sida was reluctant (and unable) to fund any more important hydropower development.

The institutional support program fizzled out for a number of reasons and the changing priorities for Swedish development cooperation with Nicaragua led to a phasing out of Energy Support in 1999.

**Summary of Sida Support to the Energy Sector 1981–1999**

| Project Name | Implementation Period | Implementing Bodies | Consultants | Total Sida Funds |
|---|---|---|---|---|
| Small-scale hydropower | 1981–1990 | SIDA/ INE | SWECO | 42MSEK |
| Rio Viejo Studies<br>• Master Plan<br>• Feasibility Studies<br>• La Sirena Study | 1993–95 | SIDA/INE | SWECO<br>SWEDPOWER<br>NORKONSULT | 20MSEk<br>(+!0MSEK NORAD) |
| Planta Nicaragua Rehabilitation | 1987–1999 | Sida- INE/ ENEL | ABB-STAL<br>AF EnergiKonsult | 150 MSEK<br>(97) |
| Inst. Strengthening INE | 1993–95 | SIDA/INE | Sydkraft | 6.4 MSEK |
| Gender activities at INE/ENEL | 1987–96 | Sida- INE/ENEL | Local consultants | 2.5 MSEK<br>(93–96) |
| Briquettes of cotton by-products | 1986– | Sida-NATUR | SWEDIND<br>Prosolvia AB | 6.5 MSEK |
| Oil import<br>Complementary drilling at geothermal plant | | | | +25 MSEK |

The purpose of the present evaluation is to summarize program results and sector impact over two decades of implementation. It is not meant to be an in-depth analysis of each separate activity but more of an overall analysis of the congruence between sector strategy and results achieved.

## The Impact of Energy Sector Support

### Program Effectiveness

The goals for Swedish development assistance to the energy sector reflected the overall political and development priorities which characterized the relations between Sweden and Nicaragua. Thus, roughly speaking, energy sector support took place in two distinctly different climates that can be separated into the decade of the 1980's and the decade of the 1990's. The assistance of the 1980's was marked by the priority of 'economic recovery' and the assistance during the 1990's was judged more on the criteria of its effectiveness in increasing democratization and reducing poverty.

The support to Planta Nicaragua, including import support to purchase Venezuelan petroleum to fuel it once the Sida project renovated the turbines and trained personnel, can be said to have fulfilled the goal of promoting economic recovery.

The energy sector has been the subject of a successive decentralization and privatization during the 1990's, partly based on the ideas generated within the framework of the institutional support to INE/ENEL financed by Sida. If the purpose of the support was to finance studies to "propose a modern structure for the energy sector that allows private enterprise to invest in generation facilities", then this was achieved. These proposals were greatly modified, however, in the implementation phase where the Swedish funded institutional support played no further role.

### Program Impact

Overall, the Sida-funded energy support program has had a significant impact on the Nicaraguan capacity to develop its energy sector, especially in the early years.

### Small-scale Hydropower Plants

In spite of what might be viewed as a limited impact in terms of power generation, the initial studies and construction of small-scale hydropower plants has left behind documentation and trained personnel. These assets are currently becoming more valuable than previously thought in an economic and political situation that allows a focus on the development of remote rural areas and local resources.

### Rehabilitation of Planta Nicaragua

The Swedish support to Planta Nicaragua played a crucial role in maintaining electricity supply during a critical period in the country's economic and political history. Many observers believe that Nicaragua would have 'gone under' without this support.

### Institutional Support to INE/ENEL

The component of institutional support had an impact when it was in the form of technical assistance stationed in the country, monitoring and facilitating a process of change. It can be said that the institutional support was most effective in generating ideas and promoting the feeling within the organization that the opinions of the employees were valuable inputs. In terms of actually putting into practice the ideas generated, the support fell short of success.

### Rio Viejo Hydropower Investment Studies

The intention behind the Rio Viejo studies was to design a medium-size hydroelectric power plant for Sida (together with Norad) financing. While not an intended consequence, the end result of the Rio Viejo Master Plan was to make Sida decision-makers hesitant about the viability of any power plant built in this catchement area. Security considerations, and a highly structured terms of reference for the studies, restricted the maneuverability of consultants in shifting to what they could predict would be more economically interesting alternatives.

There is still a significant body of knowledge available to decision-makers in the form of these studies, and there is a positive impact even when the then financial viability of the project studied was not sufficient to attract investment.

### Environmental Impact

The actual environmental impact of the Swedish inputs in the energy sector has been minimal as most of the work carried out was in the form of studies, rehabilitation of existing facilities and institutional support.

### Participation and Ownership

It has been clear on the part of all of those involved from the very beginning that Sida-funded Energy Sector Support was based on an assessment of Nicaraguan priorities. More than that, the momentum of the support has been guided by Nicaraguan institutions. There was little pressure from the Swedish government side to 'force' a particular activity or type of assistance on an unwilling recipient.

### Gender Needs

Gender considerations do not seem to have played a significant role in the construction of small-scale hydropower installations, the design of medium and large-scale hydropower plants or the physical rehabilitation of the thermal Planta Nicaragua. Nor were they any instructions or ambitions to focus on gender needs in any of these activities. Socio-economic studies focused on individual households, but were not instructed by the terms of reference, to differentiate between assets, incomes or functions in terms of gender roles.

Gender needs were specifically addressed in the Institutional Support to INE/ENEL. This program, which combined awareness raising with specific technical and career-oriented training, has certainly had a marked and sustained effect on INE/ENEL as an organization.

### Program Relevance

In terms of direct beneficiaries, these have been the institution INE/ENEL, its personnel and electricity consumers. Indirect benefits have been felt by the national government, the macroeconomic framework of the country, the population and the environment.

Certainly from the point of view of these groups, the sector support has been highly relevant. The question of which groups should be the primary beneficiaries for Sida energy sector support did not begin to be asked until the preparations began for a new country strategy in the mid 1990's.

### Implementation Efficiency

The efficiency of program implementation is a complicated issue in the case of some of the inputs of the energy sector support. Early activities involving small-scale hydro power plants and the rehabilitation of Planta Nicaragua can be characterized as efficient, largely because they achieved their original objectives at an acceptable cost. It is more difficult to say this for later efforts in Institutional

Support and the feasibility studies of Medium-Size Hydropower plants as neither of these activities led to the intended consequences.

This is not to say that the means used were not cost effective in themselves, or that any inappropriate technology was employed. However, with hindsight it can be said that, in spite of certain benefits that are mentioned in earlier sections, both the institutional support program and the feasibility studies for Rio Viejo yielded disappointing results.

### Lessons learned to improve implementation

On the whole, the conclusion of the evaluation is that the Sida-financed Energy Sector Support program implemented during the 1980's and 90's, was a reasonable program which followed (albeit lagged behind at times) Nicaraguan government priorities. There are no spectacular failures or shortcomings to report.

### Crucial Role of Government Support

In this context it is important to distinguish between government support and enthusiasm and individual support and enthusiasm. The political ideology of the government in power is not always identical with that of certain key individuals who implement the technical aspects of government policy.

This has had the consequence that the ideology of the current government has constrained the ability of certain individuals in the Nicaraguan institutions to carry out technical/institutional activities that are not considered politically high priority. This has not constrained these individuals, however, from promoting donor/consultant support to such activities.

### Stronger Sida presence can improve the congruence between development policy and implementation

If Sida is willing to leave most of the interactive process determining program details and options to the implementing consultant, then it is sufficient with a program desk officer stationed in Stockholm. If Sida wants to take a more active role in program formulation and design, then they should station a desk officer at the Embassy.

### Good Ideas do not sell themselves

An important lesson learned from the institutional support to INE/ENEL is that even good ideas with plenty of support can fail to win ground if they are not effectively presented.

The primary pragmatic failure in implementing the support to the privatization process was the lack of language ability (in Spanish) on the part of the technical assistance personnel. They were not able to penetrate the workings of the host institution and 'sell' their ideas due to language constraints.

### Security Considerations distort economic and technical rationality

The means used to study the Rio Viejo medium and large-scale hydropower project alternatives could perhaps have been better used to study the technically more promising Rio Grande de Matagalpa, if it hadn't been for security considerations.

*The lesson to be learned from this experience is that when there is a civil war going on it is difficult to make economically and technically rational investment decisions. This may sound banal, but there are many cases of donor involvement in development investments that, in trying to make the best of difficult circumstances, prove to be irrational when security conditions improve.*

### Supervision of Consultants

If the terms of reference for the planning process for Rio Viejo had focused more on specifying the overall goals for the studies, rather than specifying in detail each step to be taken, a more suitable framework for change would have been obtained. Of course that would have required a greater input on the part of Sida in order to be able to take an active part in the discussions and decisions as the studies progressed. This greater input would also have made it possible to shift from Rio Viejo to other river basins when evidence of the meagre economic benefits of the studied projects emerged and the security situation was changing.

# 1. Resumen Ejecutivo

A principios de los años 80, el Gobierno de Nicaragua expresó un interés en pequeñas plantas hidroeléctricas. Los estudios, financiados por Asdi, fueron llevados a cabo para identificar posible lugares y dos instalaciones fueran construidas con el apoyo de Asdi. El interés hidroeléctrico de parte del Gobierno se expandió como parte de una estrategia de diversificación de energía, para incluir instalaciones de tamaño mediano.

Las condiciones de la agravación de la macro-economía, la guerra civil y el embargo económico contribuyó, a la penetrante falta de energía en los años 1980's. La atención del Gobierno se desvió por consideraciones de largo-plazo a medidas de emergencia a corto-plazo. Asdi viene a convertirse en el apoyo y el apoyo para el sector de energía se implementó como la rehabilitación física de una planta térmica importante "Planta Nicaragua", de la cual incluyo la implementación de gas fósil.

El interés para el desarrollo de la hidroeléctrica permaneció fuerte. En el Río Viejo viene hacer el centro de apoyo de los estudios para la energía en los principios de los años 90. El nuevo Gobierno, elegido en 1990, lleva curso de privatizar el sector de las plantas de energía. Esto hace que la perspectiva de financiamiento donante/gobierno para la planta hidroeléctrica se vuelve menos posible y se busca otras necesidades prioritarias como la reestructuración institucional.

La ayuda de Suecia una vez más da seguimiento, y el apoyo institucional a INE/ENEL, incluyendo un componente de género, se convirtió parte del apoyo al sector energético. A mediados de los años 1990's Asdi no estaba seguro y no era capaz de financiar más desarrollo hidroeléctrico importante.

El Programa de apoyo institucional fracasa por varias razones, y las cambiantes prioridades de la cooperación Sueca llevo aun cambio en la fase de apoyo energético en los 90's.

**Resumen de ASDI en el Apoyo al Sector Energético 1981-1999**

| Nombre Proyecto | Periodo Implementa-ción | Encargado Implementación | Consultores | Total Fondos ASDI |
|---|---|---|---|---|
| Escala-menor hidroeléctrica | 1981–1990 | ASDI/INE | SWECO | 42MSEK |
| Estudios Rió Viejo<br>• Plan maestro<br>• Estudios Viabilidad<br>• Estudios La Sirena | 1993–95 | ASDI/INE | SWECO | 20MSEK<br>(+!0MSEK NORAD) |
| Rehabilitación Planta Nicaragua | 1987–1999 | Asdi-INE/INE | ABB-STAL<br>AF Consultores Energía | 150 MSEK (97) |
| Fortalecimiento Institucional INE | 1993–95 | ASDI/INE | Sydkraft | 6.4 MSEK |
| Actividades de Genero para INE/ENEL | 1987–96 | ASDI-INE/ENEL | Consultores Locales | 2.5MSEK (93–96) |
| Bloques de rastros de algodón | 1986– | ASDI-NATUR | SWEDIND<br>Prosolvia AB | 6.5MSEK |
| Importación de Petróleo<br>Perforación para la planta geotérmica | | | | |

El propósito de la presente evaluación es resumir los resultados del programa y el impacto del sector de dos décadas de implementación. Esto no es un análisis profundo por separado por cada

actividad pero más de un conjunto congruente de análisis entre la estrategia del sector y los resultados obtenidos.

## Impacto del Apoyo en el Sector Energético

### Eficacia del Programa

Las metas de la asistencia Sueca de desarrollo para el sector energético reflejan la política de Asdi conjunto con la prioridad en el desarrollo de Nicaragua. Así de esta manera, ásperamente hablando, el apoyo al sector de energía formó parte en dos diferentes climas que puede ser separada en la década de los 80's y la década de los 90's. En 1980's la asistencia estuvo marcada por la prioridad de recuperación económica y la asistencia durante 1990's, fue juzgada más sobre el criterio de su efectividad en aumentar la democratización y reducir la pobreza.

El apoyo para la Planta Nicaragua, incluye en apoyo a la importación para la compra de petróleo Venezolano una vez el proyecto de ASDI renovara las turbinas y el entrenamiento del personal. Se puede decir que se han llenada las metas de promover la recuperación económica.

El sector energético ha sido el objeto de una descentralización sucesiva durante la privatización de los 1990's, en parte basado en ideas generados dentro del marco de trabajo del apoyo institucional INE/ENEL financiado por ASDI. Si el propósito de apoyo era de financiar estudios para "Proponer una estructura moderna para el sector de energía que permita a las empresas privadas invertir en instalaciones generadoras", entonces esto fue obtenido. Esta propuesta fue modificada grandemente, sin embargo, en la fase de implementación.

### Impacto del Programa

En conjunto, el apoyo energético financiado por ASDI había tenido un impacto significativo sobre la capacidad nicaragüense de desarrollar su sector energético especialmente en los primeros años.

### Plantas Hidroeléctricas de Pequeña Escala

A pesar de, poder ver como un impacto limitada la facultad en términos de generación, el estudio de electricidad inicial y construcción de plantas hidroeléctricas de pequeña escala, ha dejado atrás documentos y un personal capacitado. Estos activos actualmente vienen a ser más valuables que antes, en una situación económica y política que permita enfocar en el desarrollo de áreas rurales remotas y recursos locales.

### Rehabilitación de la Planta Nicaragua

El apoyo de Suecia para la Planta Nicaragua jugó un papel crucial en mantener el suministro de electricidad durante el período crítico de la historia económica y política del país. Muchos observadores creen que Nicaragua "hubiera fracasado" sin este apoyo.

### Apoyo Institucional para INE/ENEL

El componente del apoyo institucional tuvo un impacto cuando fue en la forma de asistencia técnica estacionada en el país, monitoreando y facilitando un proceso de cambio. Se puede decir que el apoyo institucional fue más efectiva en generar ideas y promover el sentimiento dentro la organización que las opiniones de los empleados eran valiosas. El apoyo al éxito fue menos, al no poner en práctica las ideas generadas.

### Estudios de Inversión en la Hidroeléctrica en el Río Viejo

La intención de Asdi (junto con Norad) era financiar un estudio de diseñar una planta hidroeléctrica tamaño-mediano para el Rió Viejo. Aunque no fue la intención, en varios ocasiones los resultados finales del Plan Maestro Río Viejo hizo que Asdi vacilara acerca de la viabilidad de una planta hidroeléctrica construida en la área de captación. Por consideraciones de seguridad, y el hecho que los términos de referencia eran altamente estructurado, impidieron los consultores en cambiar para una mejor alternativa económica.

En la forma de estos estudios todavía permanece un significante conocimiento disponible, y existe un impacto positivo incluso cuando el rendimiento identificado por los estudios de este proyecto no era suficiente para atraer la inversión.

### Impacto Ambiental

El impacto actual ambiental de la ayuda Sueca en el sector energético ha sido mínimo ya que la mayoría del trabajo llevado a cabo fue en la forma de estudios, de rehabilitación de instalaciones existentes y de apoyo institucional.

### Participación y Propietario

Ha sido claro que la parte de los interesados que desde un comienzo estuvieron tomando parte de este Apoyo al Sector Energético estaba basado en la valoración de las prioridades nicaragüenses. Es más que, el apoyo momentáneo ha sido guiado por las instituciones nicaragüenses. Hubo poca presión por el lado del Gobierno de Suecia "forzar" a una actividad particular o tipo de asistencia en un receptor no deseoso.

### Necesidades de Genero

Consideraciones de genero no se ha percibido como teniendo un papel significante en la construcción de plantas hidroeléctricas de pequeña escala o en la rehabilitación física de la Planta térmica de Nicaragua. Tampoco hubo instrucciones para enfocar las necesidades de género. Los estudios socio-económicos se enfocan en cada familia, pero no da instrucción en sus términos de referencia para diferenciar entre bienes, ingresos o funciones en términos de género.

Las necesidades de género fueron con dirección especifica de Apoyo Institucional para INE/ENEL. Este programa con su combinación aumentó la capacidad técnica y administrativo ha dejado marcado desde luego un efecto continuo en INE/ENEL.

### Relevancia del Programa

En términos de beneficiarios directos, estos han sido la institución INE/ENEL, su personal y los consumidores de eléctricidad. Los beneficiarios indirectos han sentido por el gobierno nacional, en la estructura microeconomía del país, la población y en el medio ambiente.

Desde luego desde el punto de vista de estos grupos, el apoyo del sector ha sido de alta relevancia. La pregunta es cual de estos grupos deberían ser los primeros beneficiarios para el apoyo del sector de energía de Asdi. No se empezó hacer la pregunta hasta que la preparación empezara para una nueva estrategia del país a mediados de 1990's.

### Eficiencia en la Implementación

La eficiencia de implementación de un programa es un tema complicado en el caso de algunas atribuciones en el apoyo del sector de energía. Las actividades que se encuentran en las plantas hidroeléctricas de pequeña escala y de la rehabilitación de la Planta Nicaragua pueden ser caracterizadas como eficiente, por que largamente lleva a cabo los objetivos originales a un costo acepta-

ble. Es más difícil decir que los esfuerzos últimos en apoyo institucional y los estudios de factibilidad para una planta hidroeléctrica de tamaño mediano llegaron a las consecuencias pretendidas.

Esto no quiere decir que los métodos no eran efectivos en términos de costo, o que la tecnología fue empleada inapropiadamente. Sin embargo, se puede decir que a pesar de ciertos beneficios se mencionan anteriormente, el apoyo institucional los estudios de viabilidad para el Río Viejo, salieron resultados decepcionantes.

### Lección aprendidas para mejorar la implementación

En general, la conclusión de la evaluación, es que el programa de Asdi en el Sector de Apoyo de Energía implementado durante los años 1980's y 90's fue un programa razonable seguido con las prioridades del gobierno nicaragüense. En esto no hubo perdidas espectaculares o resultados defectuosos.

### Apoyo Gubernamental Juega un Papel Crucial

En este contexto es importante distinguir entre apoyo y entusiasmo gubernamental y apoyo y entusiasmo individual. La ideología política de los gobiernos en el poder no siempre es idéntico con ciertas personas (claves) que implementan los aspectos técnicos de la política del gobierno.

Esto ha tenido como consecuencia que a veces las instituciones llevan a cabo las actividades técnicas/institucionales que no son consideradas políticamente de gran prioridad.

Sin embargo, esto no ha impedido a estas personas promover el apoyo de donantes/consultores a estas actividades.

### Presencia fuerte de ASDI puede mejorar la congruencia entre la política de desarrollo e Implementación

Sí Asdi esta deseosa de dejar detalle del proceso del programa y las opciones a un consultor, pueden implementar entonces con un oficial en la oficina de Estocolmo. Sí Asdi quiere tenerlo en vigencia el programa de formulación y diseño, entonces ellos tendrían que poner un oficial en la Embajada en Nicaragua.

### Buenas ideas no se venden por sí mismo

Una lección aprendida al apoyo institucional a INE/ENEL es que buenas ideas con mucho apoyo pueden fracasar si no son presentadas eficazmente.

La pragmática en la implementación del falló primario en el proceso de apoyo a la privatización fue la falta del lenguaje (español) por parte del personal técnico no pudieron penetrar el trabajo de la institución anfitrión y vender sus ideas debido a barrera del lenguaje.

### Distorsión económica y racionalidad técnica en consideraciones de seguridad

Los medios usados para estudiar el proyecto de hidroeléctrica del Río Viejo a mediano y largo plazo pueden haber sido mejor utilizados para el estudio en el Río Grande de Matagalpa, si no hubiera sido por consideraciones de seguridad.

Una de las lecciones que deben de ser aprendida de estas experiencias es cuando hay una guerra civil, es difícil de tomar una decisión económicamente y técnicamente razonable de invertir. Esto se puede escuchar trivial, pero en muchos casos para los donantes se complica hacer estas inversiones de desarrollo, en demostrar en a ser lo mejor en circunstancias difíciles, a demostrar ser irracional cuando mejoran las condiciones de seguridad.

### Supervisión de Consultores

Sí los términos de referencia se hubieran enfocado específicamente más en los estudios globales para el proceso de planificación para el Río Viejo, se hubiera obtenido con un cambio mejor en la estructura en vez de especificar en detalle cada paso. De seguro esto hubiera sido muy bueno de parte de Asdi de tomar parte en las actividades de discusiones y decisiones a medida que los estudios progresaran. Esto hubiera sido posible de cambiar de Río Viejo a otras cuencas de otros ríos cuando hay evidencia que los beneficios económicos es poca de los proyectos estudiados y la situación de seguridad va cambiando.

# 2. Background

The present evaluation covers the period 1981–1999. During this time the evolution of Swedish development cooperation in its relationship with the Nicaraguan government policies can be divided into two distinct periods. The first period was characterized by solidarity and working together towards economic recovery. The second was characterized by a 'wait and see' attitude on the part of Sida in the face of political upheaval and structural change in the Nicaraguan economy. For the sake of simplicity, we divide these two periods into 'the 80's' and 'the 90's'.

The comments made below are based on Sida internal reports of the economic and political situation in Nicaragua and interviews with Nicaraguan sources close to the various governments. While a number of the conclusions drawn below can be applied generally to all of the development cooperation with Nicaragua, we have limited ourselves to mentioning the specifics of how cooperation in the energy sector was affected by the political and economic milieu in which it took place.

## 2.1 Sida and Nicaragua in the 1980's

Sweden began its bilateral development cooperation program with Nicaragua in response to the Sandinista revolution of 1979 which put an end to the 45 years of increasingly autocratic rule of Anastasio Somoza. The country was devastated, especially by the final years of the bitter struggle. It was estimated that as many as 20,000 people were killed. The widespread material destruction and massive flight of capital and moveable assets left the incoming Sandinista regime with the grim task of rebuilding the country from the ashes of war. Reconstruction proved to be difficult as Nicaragua continued to suffer the effects of a foreign-financed guerilla war carried on by the opposition "contras" and an economic embargo by the United States and the international financial institutions. In this atmosphere of domestic political instability and macroeconomic crisis, the emphasis in Sida support, not surprisingly, was on *economic recovery*. It was felt that once the Sandinistas showed some substantive economic gains for the majority of the population, the political instability would subside.

The normal first step in any economic recovery process, be if after war or natural disaster, is the rehabilitation and/or construction of all types of infrastructure. In Nicaragua, electric power shortages, manifested in power cut-offs and periodic rationing, were viewed as major infrastructural bottlenecks in the overall process of economic recovery and development.

Thus, once the priority of improving electricity supply was established, the logical first step was to rehabilitate existing power generation infrastructure. In Nicaragua this was especially relevant as, in the case of Planta Nicaragua, the existing power plants were producing at roughly half of their installed capacity.

The rehabilitation site selected was a thermal power plant, Planta Nicaragua, which supplied about 30% of Nicaragua's energy supply at the time.

The economy did not improve overall during the 1980's, however, although the political situation began to move away from the heavily centralized, authoritarian style of the early Sandinista period to a more pluralistic and democratic society. This was the epoch when the transition from one party states to multi-party democracy was taking place in many developing countries around the world.

Nicaragua's macro-economic situation for much of the 1980's was extremely unbalanced. The trade embargo enforced by the United States added to the production woes of an export agriculture sector characterized by structural changes in the shape of land reform and capital flight, in addition to armed conflict. The balance of payments deficit was attributed primarily to the costs of importing petroleum, which during the mid-80's was consuming well over half of the total export revenues.[1]

In this context, the long-term solution to both energy shortages and macroeconomic imbalance appeared, to both the Swedish and Nicaraguan analysts, to be hydroelectric power. Nicaragua already had two functioning hydroelectric plants (America Central and Santa Barbara) accounting for almost 30% of the electric power supply. The physical potential for hydroelectric power in Nicaragua was judged to be good, if not massive, and Sweden boasts an internationally renowned competence in the field. Only the siting, design and economic feasibility of a specific project remained to be studied.

## 2.2 Sida and Nicaragua in the 1990's

The political situation changed dramatically as a result of the elections held in 1990. Tired of a lack of personal and economic freedom and years of war, Nicaraguans elected the unifying figure behind the coalition of opposition parties, Violetta de Chamorro, as their next president. The Sandinistas were caught totally by surprise and, in the months between the elections and the formal transfer of power to the UNO (Union Nacional Opositora) coalition, instigated a number of hastily prepared legal reforms that would plunge the country into political and economic chaos once again.

Assistance to large-scale hydropower development was proposed in the 1988 Energy Sector study. It is not surprising, however, that Sida's interest in exploring the feasibility of large-scale hydropower did not mature until some years later, given the economic instability and political upheaval of the early 90's. A rapidly changing perspective on the role of the state, hyperinflation and multiple devaluations did not provide a conducive atmosphere to designing large-scale investment projects with their primary benefits in the long term. The surplus of foreign aid funds to Nicaragua and their rather chaotic administration made Sida hesitant to make major commitments in the early 90's.

When the time was judged to be ripe (i.e. when the immediate turmoil after the elections died down and the economic reform programs instituted by the Chamorro government began to show some positive effects) the studies were eventually undertaken.

Sida's policy was already changing from one of supporting economic recovery to one of supporting economic development with a more clearly defined social perspective.[2]

However, in the first half of the 90's, the situation began to change. Falling oil prices made hydropower less attractive in comparison with thermal power and the overall structure of the energy sector in Nicaragua began to change. However, the projects continued in the face of this change even though the actual process of change itself was also supported by Swedish technical assistance. It should be said that from the point of view of diversification, however, hydropower was then, and continues to be, a viable investment.

---

[1] Beijer Institute, Energy Sector Review 1988

[2] Utvecklingssamarbete med Nicaragua, August 1994

It is interesting to note that the original concentration on the Rio Viejo catchment area was partly based on security considerations. Thus, the technically more interesting Rio Grande de Matagalpa was not put forward in the original discussions because it was located in a less secure area. When the studies were finally carried out in the mid 90's the security situation was improving.[3]

At the same time as the go-ahead was given for the Rio Viejo Master Plan, Sida rejected Nicaragua's request for gas turbines. Thus Nicaraguan priorities appeared to be changing faster than Sida's. It was also notable that the further exploitation of hydropower, so important during the 80's as a measure to reduce dependence on imported petroleum, was becoming less important to the Nicaraguan government. This is not surprising given the increasing interest in privatization, where the priority was on minimal investments and short-term paybacks. Hydropower is by nature a large investment with a long-term payback.

A new direction for Sida development cooperation with Nicaragua was taking shape in the mid-90's, culminating in the Country Strategy 1998–2002.

The elections in 1996 brought yet another party to power, the Liberal Alliance, led by Arnoldo Aleman. The transition of power from one government to another brought, yet again, a period of intensive law-making and manoeuvring with the spoils of political power. These transition periods, and the insecurity that has characterized Nicaragua during the last two election processes, led to periods of economic stagnation and political chaos. Each successive government after 1990, however, has managed to ride out the difficult period and enjoy an ensuing upswing of economic activity.

Against this background, it is understandable that Sida decision-makers concluded that support to democracy and human rights, including gender equality, is a top priority in development cooperation with Nicaragua. In the economic sphere the priority has changed also, from one of economic recovery, to one of poverty reduction, reflecting a desire to use economic cooperation to address one of the sources of political instability.

Thus, the focus on infrastructure so valid in a period of recovery, is no longer valid for the overall development cooperation between Sweden and Nicaragua. It is notable that the assistance provided for reconstruction after hurricane Mitch was very strictly limited to a two year period, with programs originally intended to start the year that the hurricane struck, put back on track at the end of the rehabilitation program.

The new focus on poverty reduction is more likely to lead to rural development programs targeted to the poorer segments of the population than to major infrastructural works. One sign of this is the rejection by Sida of Nicaragua's request to finance a study of the hydroelectric potential of Rio Grande de Matagalpa in 1998 and the overall phasing out of support to the energy sector.

## 2.3 Other donors in the Energy Sector

Nicaragua has received energy sector assistance in many ways during the last two decades. A number of other, both bilateral and multilateral, donors have given support to the energy sector. Political changes over the time have led to important shifts in the donor country presence. Sweden

[3] Indeed, the final request from Nicaragua after the results of the final prefeasiblity study for La Sirena was exactly to study the Rio Grande de Matagalpa catchment area. Sida, by that time, had decided to discontinue its support to the energy sector.

has been one of the major donors and been continuously active during a long period with shifting political situation.

In the 80's international development support was mainly directed towards development of the electrical generation and transmission system. During the second part of the 1980's Nicaragua was subject to a political blockade by IDB and IBRD. At this time other western European countries reduced their support. Instead support was increased from Soviet Union and other countries of the former socialist block. Among other donor supported activities during the 1980's in the field of electricity generation were:

- Geothermal energy (Italy, Canada)
- Hydro power studies (Soviet Union)
- Wind energy (Netherlands)

Major support from socialist countries was also given in form of Crude Oil and Storage Equipment.

In the 1990's new donor actors entered into the energy sector. In this decade much of the support has been directed towards expansion of the transmission, and distribution system, where a number of European and North American countries have been involved.

In the area of power generation much of the support has been directed towards rehabilitation of thermal plants. In the field of new generation facilities few donors were active beside the Sida/NORAD support for hydropower studies. Among the more important activities in the field of power generation during the 1990's have been:

- New thermal power (Finland)
- Rehabilitation of thermal plants (Denmark, Italy, Spain, Switzerland)
- Rehabilitation of geothermal plant (Venezuela, Israel)
- New geothermal plant (Russia, USA)

During both decades many efforts have been made to develop geothermal power in order to utilize the energy from volcanic activities found in Nicaragua. This energy source has been regarded as an important form of renewable energy, complementary to hydropower in a strategy to develop domestic energy resources in order to diversify away from oil based thermal power. The activities have involved a large number of both aid donors and foreign private investors. However, results thus far have been disappointing, both in the case of the rehabilitation of the existing Momotombo plant and in the case of the large investments made trying to develop the new San Jasinto Tizate site.

In the 1990s the multi-lateral institutions returned to Nicaragua, among them IDB, EU and BCIE. A key activity for energy sector development during the 90's has been the IDB involvement in institutional strengthening and public sector reforms.

During the 1990's EU has been giving support to power distribution. EU was also involved in institutional strengthening of ENEL. That activity begun in the time when Sweden was withdrawing its support in the late 1990's, but had to closed down shortly after project start due to co-operation difficulties.

## 2.4 Energy Sector in Nicaragua

The Swedish support to the energy sector in Nicaragua has primarily been focused on the development of the electricity generation system. The supply of electricity has been thought to have a

key role in creating enabling conditions for economic and social development. Other important aspects of the energy sector such as fuel for transport and domestic uses have not been in focus for the Swedish energy sector support.

In the following chapter a short overview is given of the development of the electricity generation system, electricity use and the institutional development during the actual period.

### 2.4.1 Electricity Generation

In the 1980's the power generation system in Nicaragua was largely made up of two hydropower plants and some oil fired thermal plants. All these facilities had been constructed during previous decades.

The development of the installed generation capacity over the 1980's and 90's is presented below in Table 2.1. The data correspond to the installed capacity in the national grid that is the property of ENEL.

**Table 2.1: Installed capacity in the national grid in 1985,1995 and 2000**

| INE/ENEL | 1985 | 1995 | 2000 |
|---|---|---|---|
| *Hydropower* | | | |
| Centroamerica | 48 MW | 48 MW | 48 MW |
| Santa Barbara | 46 MW | 46 MW | 46 MW |
| Wabule, Las Canoas | | 3 MW | 3 MW |
| *Geothermal* | | | |
| Momotombo | 35 MW | 40 MW | 15 MW |
| *Oil fired thermal* | | | |
| Nicaragua | 100 MW | 100 MW | 100 MW |
| Managua | 75 MW | 66 MW | 57 MW |
| Las Brisas (GT) | | 25 MW | 60 MW |
| Chinandega | 15 MW | 15 MW | 14 MW |
| **TOTAL INE/ENEL** | **319 MW** | **343 MW** | **343 MW** |
| Private sector | | | |
| Oil fired themal | - | - | 143 MW |
| **TOTAL** | **319 MW** | **343 MW** | **486 MW** |

Sources: Sida Energy Sector studies for 1985, 1995, INE for 2000

The only major power plant constructed during the 80's was the Momotombo geothermal plant. The formal installed capacity of Momotombo is 70 MW, however due to maintenance problems and lack of renewed drilling of wells, the actual capacity has been reduced during the years and today the plant can only generate some 15 MW. There have been several attempts to get the plant in order; since June of 1999 an Israeli company has taken over the management of the plant under an agreement with ENEL and is trying to refurbish it.

As seen above, no new hydropower or geothermal power plants have been added to the system during the last decade. All new plants have been oil-based thermal ones. This has led to a gradual decline in the share of renewable energy sources from 40% of the installed capacity in 1985 to 23% of the capacity today (see Table 2.2 below).

**Table 2.2: Installed capacity (MW) according to type of generation plants**

| | 1985 | | 1995 | | 2000 | |
|---|---|---|---|---|---|---|
| | MW | % | MW | % | MW | % |
| Hydropower | 94 | *29%* | 97 | *28%* | 97 | *20%* |
| Geothermal | 35 | *11%* | 40 | *12%* | 15 | *3%* |
| Oil fired thermal | 190 | *60%* | 206 | *60%* | 374 | *77%* |
| TOTAL | 319 MW | | 343 MW | | 486 MW | |

Sources: Sida Energy Sector studies for 1985, 1995, INE for 2000

Looking at the actual energy production, the decline in the share of renewable energy sources is even greater. In 1985 renewable energy sources represented more than half of the production. In 1995 they only represented about 30%. The share of oil-based generation has increased to compensate this decline.

**Table 2.3: Electricity Production according to type of plant (GWh)**

| | 1985 | | 1995 | | 1998 | |
|---|---|---|---|---|---|---|
| | GWh | % | GWh | % | GWh | % |
| Hydropower | 255 | *27 %* | 399 | *25%* | 296 | *15%* |
| Geothermal | 285 | *31%* | 281 | *17%* | 334 | *16%* |
| Other thermal | 392 | *42%* | 932 | *58%* | 1404 | *69%* |
| Total | 932 GWh | | 1612 GWh | | 2034 GWh | |

Sources: Sida Energy Sector studies for 1985, 1995, INE for 1998

Another change that has occurred during the last 5 years is the introduction of private investments in the energy sector. So far, however, private investment has only been in new thermal plants. At present time the whole sector is undergoing a privatization process. The intention is that all state owned power generation facilities shall be privatized and in the future only the national transmission system will be under state ownership.

### 2.4.2 Energy Use

During the two decades the electricity consumption in Nicaragua has been more than doubled, see Table 2.4 below. Taking into account the population growth during the period (about 3.2% annually), the increase is more modest. During this period there have also been long periods of power shortages in the country.

**Table 2.4: Energy use (GWh)**

| | 1985 | | 1995 | | 1998 | |
|---|---|---|---|---|---|---|
| | GWh | % | GWh | % | GWh | % |
| Residential | 297 | *31%* | 410 | *36%* | 460 | *31%* |
| General | 178 | *18%* | 271 | *24%* | 405 | *27%* |
| Industry | 298 | *31%* | 231 | *20%* | 338 | *23%* |
| Public light | 22 | *2%* | 21 | *2%* | 34 | *2%* |
| Irrigation | 110 | *11%* | 88 | *8%* | 85 | *6%* |
| Water pumping | 67 | *7%* | 108 | *10%* | 155 | *11%* |
| Sub total | 973 | | 1130 | | 1477 | |
| System losses | 191 | | 487 | | 557 | |
| Total | 1164 | | 1617 | | 2034 | |

Sources: Sida Energy Sector studies for 1985, 1995, INE for 1998

### 2.4.3 Institutional Set-up ENEL/INE

Prior to the Sandinista revolution, no institution in Nicaragua had any global responsibility for the energy sector, although in the electricity sub-sector the state played a major role through its National Power & Light Company – ENALUF.[4]

From 1979 until the end of 1994, Nicaragua's electric power (and, a few years after its creation, the petroleum sub-sector as well) was managed by INE (Instituto Nicaragüense de Energía) which functioned as ministry, regulatory body and power company. It's formal status was that of a Ministry and the head of INE was Minister of Energy with a seat in the cabinet.

INE, in spite of its dominant role, was always subordinate to the National Planning Council, chaired by the President of the Republic. Neither was INE always able to influence the actions of other ministries in activities that included energy-related activities, notably in the agricultural sector.

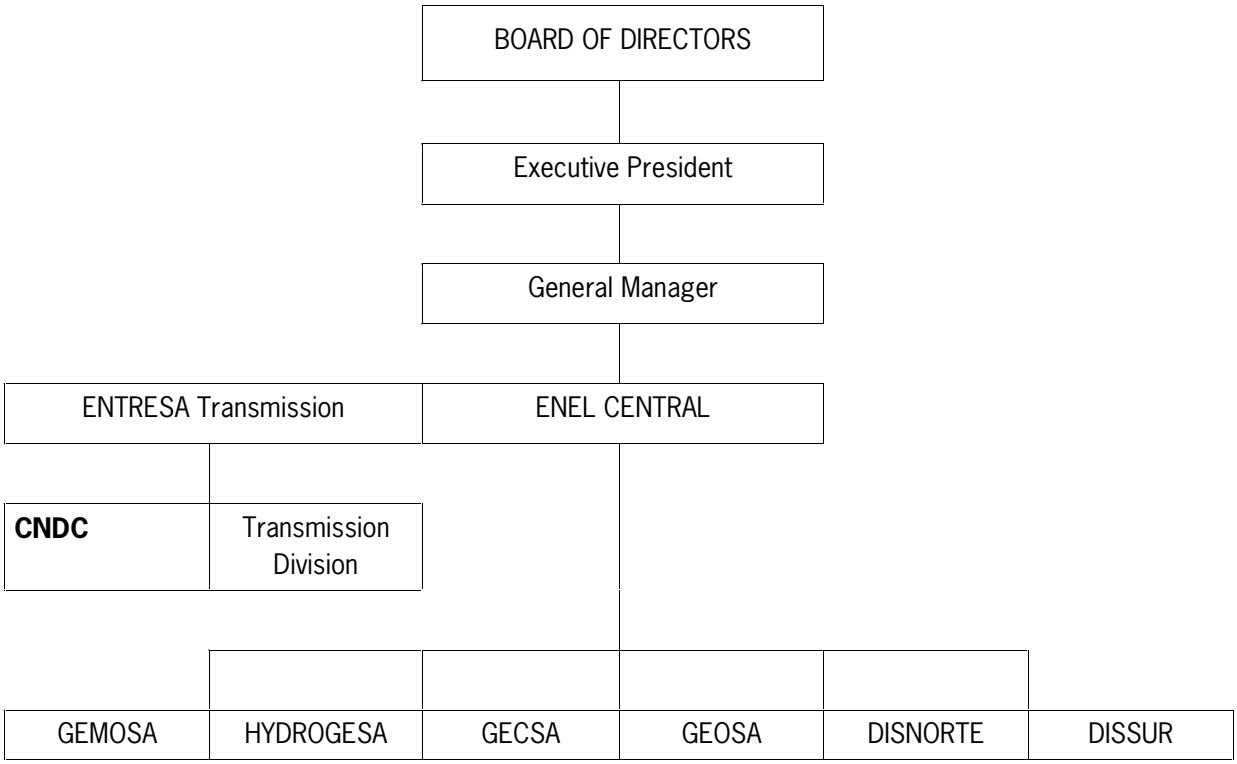
Along with the political changes in the country that followed the fall from power of the Sandinistas came the increasing deregulation of the economy in general. The energy sector was no exception to this trend.

In 1995 INE was divided into two institutions: INE and ENEL (Empresa Nicaragüense de Electricidad). INE retained its ministerial functions (policy-making, strategic planning and regulatory activities) while ENEL assumed the technical and entrepreneurial responsibility for power generation, transmission and distribution throughout the country.

One month prior to the arrival of the evaluation team, ENEL was formally decentralized into the seven different 'companies', or semi-autonomous entities. As a result of the latest changes, the new organizational structure looks as follows:

[4] Detailed historical background can be found in the 1988 Energy Sector Study

**Table 2.5 Institutional Structure of ENEL**




During the field visit, many ENEL employees appeared to uncertain how these newly implemented reforms will affect them personally. While the companies have been created, they are not companies in the sense that they have control over their incomes or budgets. They are merely decentralized units within ENEL, however this is a necessary first step in the process of selling them to private investors.

The policy-making and strategic functions of a Ministry are now located in the newly created CNE (Commissión Nicaraguense de Energía). ENEL will retain responsibility for transmission after selling off the other entities to the private sector and INE is now a regulatory agency.

These changes have been discussed since the mid-90's, and are currently implemented during the Alemán presidency. It remains to be seen if this trend will continue after the presidential elections of 2001.

# 3. Methodology and Approach of the Evaluation

The purpose of the evaluation is to summarize program results and sector impact over a period spanning two decades. It is not meant to be an in-depth analysis of each separate activity but more of an overall analysis of the congruence between sector strategy and results achieved. In looking at the results achieved, attention is also given to effectiveness and efficiency in the use of development assistance funds.

While many of the conclusions drawn are specific to the Nicaraguan situation, it is hoped that the general lessons learned from the support can be applied to energy sector support in other countries.

The evaluation was composed of archive searches for relevant documents, field visits to the institutions and sites in Nicaragua and extensive interviews with Sida personnel, consultancy firms and Nicaraguan personnel (see Appendix I and II).

## 3.1 General Obstacles

There are a number of difficulties involved in evaluating activities spanning over such a long time period. The first is that many of those involved in the early stages of program implementation are retired from professional life. In the case of Nicaragua, many of these people are also physically located in other countries. While the evaluation team has made intensive efforts to locate those involved, it was not always possible to locate them and/or interview them. Fortunately, some of the earliest projects (the mini hydro-power plants in Wabule and Las Canoas) have already been evaluated and the young engineers who worked on them have gone on to higher positions in the electricity sector.

The second difficulty is that many documents have been lost or become difficult to access. At Sida headquarters, all documents older than 10 years are routinely sent to the National Archives and it is to be assumed that many documents are not considered important enough for this final storage place.

Documentation is much more limited on the Nicaraguan side, being generally confined to Agreed Minutes, Project Documents and financial reporting, all of which can be found in the Swedish archives. Internal memos and discussion papers that could be found in individual collections have long since been thrown away as that individual has moved on to other fields.

## 3.2 Comments on the Terms of Reference

The Terms of Reference (Appendix III) for this assignment contains a list of eleven issues that the evaluation should address:

1. Which have been the objectives, targets and rationale set out by Sida for the Swedish support to the sector?

2. To what extent have objectives and results been achieved in the various programmes, in relation to Sida's sector objectives? What have been the causes of high or low achievement?

3. Has the Swedish support been relevant over the years in relation to the (changing) needs and problems as identified and experienced by the recipient.

4. What results and what impact on the development of the sector has the Swedish support had, positive as well as negative? What role and significance has the Swedish support played?
5. To what extent has the support contributed to permanent and sustainable changes or improvements in Nicaragua's capacity to develop its energy sector?
6. Have any unforeseen effects from the development occurred, positive or negative?
7. What environmental considerations have been taken in the development of the Nicaraguan energy sector.
8. What are the results and benefits of the support for the entire sector, in terms of the reliability and quality of supply of electric power, as well as in relation to capacity building and the liberalisation and restructuring within the energy sector?
9. What are the total contributions through Sida to the sector, economically and in terms of power supply and reduced import of primary energy?
10. Have the resources been utilised efficiently? Could the same or better results have been achieved with less resources? Could the allocated resources have been utilised more efficiently?
11. What are the important lessons to be learned from the Swedish involvement – both general experiences in terms of development cooperation, and specifically, with regard to energy sector support.

Most of the issues raised above in the Terms of Reference are straightforward questions usually raised in any evaluation.

We have attempted to address all of the issues above in the text of the report, using the specified Sida format. However, we were aware from the beginning that it would be difficult to be very specific on the global issues which are raised in points 4, 5, 8 and 9. This is partly due to the time allotted for field work, but mostly a result of the difficulties in tracking down information where the 'scent' is cold, i.e. much of the information about other donors activities is even more difficult for us to locate than for Sida's own programs.

# 4. The Swedish Energy Sector Support 1981–1999

Sida Energy Sector support in Nicaragua evolved in response to the Nicaraguan priorities and needs of the different and distinct time periods in which it was implemented. The development is full of nuance and detail, and is sometimes difficult to get a firm overview of. The following paragraphs are meant to sketch a broad and generalized picture as an introduction to the detailed comments provided for each input. There is also a summary table at the end of the section to provide basic facts at a glance.

Early on in the 1980's, the Nicaragua government expressed an interest in mini-hydro power plants. The studies that were carried out to identify possible sites for these were hampered by poor security conditions. Two installations (Wabule and Las Canoas) were built with Sida support, and the interest in hydropower on the part of the government expanded to include medium size installations as a part of an energy diversification strategy.

Worsening macro-economic conditions and a trade embargo contributed to the pervasive energy shortages of the late 1980's. The attention of the government was thus diverted from long-term development considerations to short term emergency measures. Sida support followed suit and energy sector support became implemented as the physical rehabilitation of an important thermal power plant "Planta Nicaragua", which included import support for fossil fuel.

The interest for hydropower development remained strong and the Rio Viejo studies became the focus of energy sector support in the early 1990's.

The new government, elected in 1990, embarked on a path of privatization in the electric power sector. This made the prospects of government/donor financing for hydroelectric plants less likely and brought another urgent need to the fore – institutional restructuring.

Swedish aid once more followed suit, and the institutional support to INE/ENEL, including a gender component, became part of the energy sector support as it became clear in the mid-1990's that Sida was reluctant (and unable) to fund any more important hydropower development.

The institutional support program fizzled out for a number of reasons that are detailed below, and the changing priorities for Swedish development cooperation with Nicaragua, led to a phasing out of Energy Support in 1999.

**Table 4.1: Summary of Sida Support to the Energy Sector 1981–1999**

| Project Name | Implementation Period[5] | Implementing Bodies | Consultants | Total Sida Funds | Characteristics |
|---|---|---|---|---|---|
| Small-scale hydropower | 1981-1990 | SIDA/ INE | SWECO | 42MSEK | Wabule, Las Canoas studies for some 20 projects. |
| Rio Viejo Studies<br>Master Plan<br>Feasibility Studies<br>La Sirena Study | 1993-95 | SIDA/INE | SWECO<br>SWEDPOWER<br>NORKONSULT | 20MSEk<br>(+!0MSEK NORAD) | Incl. Design review/Los Capules + pre-feasibility, Los Capules 2 & La Sirena |
| Planta Nicaragua Rehabilitation | 1987-1999 | Sida- INE/ ENEL | ABB-STAL<br>AF EnergiKonsult | 150 MSEK<br>(97) | |
| Institutional Strengthening INE | 1993-95 | SIDA/INE | Sydkraft | 6.4 MSEK | Initiative taken over by IDB |
| Gender activities at INE/ENEL | 1987-96 | Sida – INE/ENEL | Local consultants | 2.5MSEK<br>(93-96) | Some training and scholarships taken over by ENEL |
| Briquettes of cotton by-products | 1986- | Sida-NATUR | SWEDIND<br>Prosolvia AB | 6.5MSEK | Not mentioned in the ToR for the present evaluation |
| Other support<br>Oil import<br>Complementary drilling at geothermal plant | | | | +25 MSEK | Not mentioned in the ToR for the present evaluation |
| **TOTAL** | | | | **about 250 MSEK** | |

[5] time periods include preparatory work

Photo: Technicians outside of the Wabule plant

## 4.1 Small-Scale Hydropower

The support to develop small-scale hydropower was initiated in 1983 and lasted until 1990. The purpose of the program was to increase Nicaraguan self-reliance in the field of small-scale hydropower by developing human resources, by starting up domestic production of essential equipment and by constructing a few pilot projects.

For the implementation of the program the Swedish consultant firm SWECO was contracted. The work was performed in Nicaragua together with technicians from the INE organization.

### 4.1.1 Project Activities

The program comprised the following main activities:

- Studies for some 20 potential small hydro-electric power sites primarily in the northern mountainous part of the country.
- Construction of the two small hydro-electric power stations Las Canoas and Wabule.

(The program also included some studies on the Rio Viejo, see section 4.3 below )

The Las Canoas power plant was constructed in connection with an existing dam that had been built for irrigation purposes in the early 80's with Cuban support. The plant is equipped with three generating units with a total installed capacity of 1.7 MW. The expected generation was calculated to 8.4 GWh/year. Construction work was initiated in 1988 and the plant was put into operation in 1990. The total cost including engineering was approximately 15 MSEK.

The Wabule plant was constructed in place of an older station that had been destroyed by lightening. The plant has one 1.5 MW generating units. In the studies the expected generation was calcu-

lated to 7.1 GWh/year. Construction work began in 1988 and the plant was put into operation in 1990.The total cost including engineering was approximately MSEK 24.

### 4.1.2 Results

The present evaluation takes place 10 years after the termination of the Swedish support to the small-scale hydropower plants. It has therefore been difficult to locate key people involved in the activities. Today there is no unit within INE or INEL involved with carrying out hydro-power studies, either for small-scale or more large scale power ones. However, many of those who worked in the INE hydropower department are still active within the energy sector, holding other positions.

The experience and results of the program are presented in the final report prepared by SWECO in 1990. In addition to the construction of the two plants, technology transfer, training and on-the-job experience for INE personnel are among the reported benefits. The project also included the donation of construction equipment, vehicles etc.

A number of problems are identified. The main obstacles were the lack of local resources and the war activities that made many of the study sites impossible to reach. The starting up of domestic national production of essential equipment for small-scale hydro power plants was not possible to achieve, although efforts were made to identify a type of turbine suitable for local production.

The Las Canoas and Wabule stations were included in an evaluation launched in 1997, which was to examine the results and effects of four small-scale hydro power stations financed by Sida. Although the evaluation could not be formally completed, the data obtained was presented in a Sida report. The main findings of the report are summarized below. Some complementary findings from the present evaluation are also presented.

*Wabule*

As of 1997 the Wabule plant had only generated 31% of the theoretical electricity production that was used in the calculations to justify the investment. The total actual generation cost including operation, maintenance and capital cost was calculated at 1.9 SEK/kWh which was considered clearly above what is acceptable in Nicaragua. The reasons for this low performance were not completely clear, however reference was made to ENEL claims that there was a decreased flow in the river due to deforestation. Other possible explanations mentioned were unreliable hydrological data used in the studies and generation losses due to outages of the transmission line that connect the station to the national grid.

The Wabule plant was damaged during Hurricane Mitch. The plant was completely submerged due to extremely high water levels in the adjacent river. Fortunately the plant was insured by ENEL and the generating equipment has been repaired or replaced. At the time of the present evaluation, the generator had been reinstalled and a re-commissioning test was about to start.

Actualized generation data for Wabule shows a considerable improvement since 1995. This was the year when the plant operation responsibility was transferred from the department of INE responsible for the electricity distribution system in the area to the department responsible for operation and maintenance of INEs two large-scale hydropower plants in Rio Viejo.


Photo: Wabule turbine and generator

*Las Canoas*

According to the 1997 Sida report, power generation at Las Canoas until that time had been less than anticipated. The plant had only generated about half of what had been expected in the studies. The total actual generation cost including operation, maintenance and capital cost was calculated to be 0.7 SEK/kWh. This was considered as no economic success but within the reasonable limits of generation costs for Nicaragua. The reasons for the under-performance were cited as technical problems and lack of water availability. The production calculation made during the design of the plant was based on what proved to be an overly optimistic estimate of the possibility to persuade the irrigated sugar cane plantation to manage the release of water from the reservoir in accordance with hydropower interests.

Hurricane Mitch also affected the Las Canoas plant, putting one of the three units under water. This happened due to high tail water levels at the main dam caused by heavy erosion during the spilling of the flood. As in the case of Wabule, the generator has been repaired although not yet re-installed. In this case other electrical equipment was also destroyed and replacements have not yet arrived to the site. The future of the third unit is rather unclear at the moment.

Actualized generation data for Las Canoas shows the same improvements of generation performance as in Wabule from 1995 when operations were taken over by the INE hydropower department from the local distribution department.

### 4.1.3 Overall conclusions

Among the general conclusions of the Sida 1997 report are that it would have been very useful to included a component of follow-up and internal evaluation in each projects. After commissioning the Swedish counterparts should have been requested to return to the site, go through the plants, check out technical and financial performance and report the findings to Sida.

Another conclusion was that whatever the scale of the hydropower resources to be developed (mini, small or medium size), each project should be evaluated in accordance with relevant criteria of viability and sustainability.

In addition, the Wabule and Las Canoas cases show the importance of taking the operation phase into consideration in the planning of the project. This way it can be assured that the plant will be managed by competent staff and by an organization giving priority to the task.

Obviously the intended expansion of small-scale hydropower in Nicaragua never became a reality during the 90's and after the termination of the Swedish support. During many years there were virtually no activities in the field. Whether or not this was due entirely to the security problems in the areas originally studied by SWECO is difficult to say.

Looking at the overall outcome of the small-scale hydropower program it can be concluded that the program aims included overoptimistic assumptions regarding the potential for small-scale hydropower in Nicaragua. It was certainly not large enough to support the development of a local manufacturing industry for hydropower equipment.

However, a renewed interest in developing small-scale hydropower in Nicaragua has emerged recently. These projects are not implemented by INE/ENEL but instead by NGOs, municipal authorities and private investors. During the visit to Nicaragua information was received that two small plants, in the range of 30–900 kW, have recently been constructed with NGO support and that a third NGO-supported plant is on its way. Another project under way is the 1 MW Wiwili plant implemented by municipality authorities with support from UN.

A larger project, Pantasma 10 MW, is also reported to be under planning involving private investment capital. Studies for these projects were all, in one way or another, included in the Swedish program, although in some cases they were not possible to complete due to the war activities at that time.

## 4.2 Rehabilitation of Planta Nicaragua

Planta Nicaragua is an oil-fired condensing power plant equipped with two generating units. The total installed capacity is 2 x 50 MW. The plant was built on a turnkey basis by an Italian consor-

tium and was commissioned in the mid-1970's. Until the mid-90's the plant represented about one third of the total installed generating capacity in the country.

During the mid-80's the availability of the plant begun to decline, creating severe problems for the national energy supply. The rehabilitation of the plant was seen as a top priority by the Nicaraguan government in order to overcome the difficult energy supply situation. A request for assistance was presented to Sida, accepted, and the project could start in 1988.

For those familiar with Sida's energy sector support policy (prioritizing the use of renewable energy sources and environmental considerations) it may be difficult to understand a Sida commitment to finance heavy machinery and technical assistance for an oil-fired thermal power plant.

The cordial political relations between the governments of Nicaragua and Sweden and the atmosphere of urgency surrounding the 50% reduction in the capacity of the single largest power generation source in Nicaragua, came together to make this rather unlikely candidate for Sida assistance possible. Only by placing the request for rehabilitation assistance to the Planta Nicaragua's in its political and economic context, is it possible to understand why this rather unusual (although highly pragmatic) decision was taken by Sida.

Sida's support to the rehabilitation of Planta Nicaragua is viewed by many of those involved on the Nicaraguan side as being crucial to the nation's survival. Faced with a sagging economy, power shortages, civil war, political instability and the economic embargo by the United States, the Swedish assistance could not have come at a more opportune moment. The plant would have suffered irreparable damage had it been allowed to deteriorate further.

The Nicaraguan government erected a monument outside the entrance to the plant that states simply:

> *El pueblo y gobierno de Nicaragua y el Instituto Nicaraguense de Energía agradecen al pueblo y gobierno de Suécia y a la Autoridad Sueca para el Desarollo Internacional por su valiosa e incondicional contribución que hizo posible la rehabilitación de esta planta termoeléctrica. 1989-1992*
>
> (The people and government of Nicaragua and INE thank the people and government of Sweden and Sida for their valuable and unconditional contribution that made the rehabilitation of this thermoelectric plant possible.)


Photo: The monument

### 4.2.1 Project Contents

The rehabilitation of Planta Nicaragua included the following main activities:

- Rehabilitation of the two generation units, including boilers, turbo-generator and auxiliary system
- Training in operation, maintenance and management of the power plant
- Preparation of proposals for efficiency improvements and environmental protection measures

Project work started in 1988. The main rehabilitation activities were completed by 1992, however the project continued until 1997 with training activities, warranty issues, efficiency improvements and the environmental protection program.

### 4.2.2 Results

The rehabilitation work, although not problem-free, was carried out successfully. A furnace explosion occurred in the unit 1 boiler just before the commencement of the on-site construction activities that resulted in a considerably extended scope of work.

After rehabilitation, the plant has showed a considerable recovery in generation output and plant availability, see table 4.2 below:

**Table 4.2: Electricity Generation and Availability**

| Year | Net Electricity production ($10^6$ x kWh) | Availability Unit 1 (%) | Availability Unit 2 (%) |
|---|---|---|---|
| 1985 | 214 | 39 | 63 |
| 1986 | 321 | 73 | 68 |
| 1987 | 280 | 63 | 43 |
| 1988 | 262 | 36 | 52 |
| 1989 | 142 | 41[1)] | 63 |
| 1990 | 239 | 75[1)] | 78 |
| 1991 | 321 | 76 | 78[1)] |
| 1992 | 465 | 85 | 84[1)] |
| 1993 | 482 | 75 | 81 |
| 1994 | 667 | 94 | 84 |
| 1995 | 637 | 88 | 86 |
| 1996 | 681 | 93 | 94 |
| 1997 | 583 | 67 [1)] | 90 |
| 1998 | 672 | 93 | 82 |
| 1999 | 552 | 72 | 80 |

1) Unit stopped for rehabilitation during part of the year

Sources: period 1985–93 ÅF, period 1994–99 Enel

The overall net efficiency of the plant also improved from about 27% before rehabilitation to 32% after rehabilitation in 1994.

Planta Nicaragua played an important role in the energy sector, producing about 1/3 of all electricity in the county during the first half of the1990's. The plant has, to a great extent, been used for base load production, with a plant factor in the range of 63–83% during the post rehabilitation period.

A shortcoming is that rewinding of the generator stator was not included in the project. Defects was discovered in 1997, and in the 1999 ÅF report it is stated that rewinding is necessary in order to restore long term reliability.

Concurrently with the rehabilitation support, import support of 25 MSEK was provided for fuel imports. While not directly related to the rehabilitation support, the Nicaraguan Minister of Energy at the time related that fuel valued at close to 1 MUSD was used to run Planta Nicaragua.

No overall final economic evaluation of the project has been made, but in 1994 ÅF presented a financial evaluation of the project. The evaluation was based on an estimated final project cost of 145 MSEK and some assumptions on values of future fuel costs and energy sales prices. The ÅF evaluation stated that:

- The rehabilitation of Planta Nicaragua was a least cost alternative. The rehabilitated plant was, at the time of the evaluation, able to produce 100 MW of electricity at 6 US cents/kwh with an investment considerably lower than other alternatives.
- The straight pay-back period for the rehabilitation investment was calculated at roughly 1.7 years.

In an ÅF report from 1999, new figures on project costs are presented corresponding to the situation in 1997. The investment costs correspond to 124 MSEK in foreign currency covered by Sida and, in addition to that, some 4 MUSD in local costs covered by the Nicaraguan side.

Within the scope of the present evaluation, it has not been possible to review the calculations and underlying assumptions made in the ÅF financial analysis in detail, nor to make any new calculations based on actual values of fuel costs and energy sales prices. It would certainly be interesting if such a post project economic follow up could have been done now some years after the project completion.

During the visit of the valuation team one of the units was out of operation due to a mechanical breakdown in the turbine. The unit was dismantled in order to make repair possible.

At present, the future of the plant is somewhat uncertain. According to the Nicaraguan Power Development Plan from 1999, unit 1 should be taken out of operation in the year 2007 and the unit 2 in 2008, but high prices on the international oil market are currently putting constraints on the economic viability of Planta Nicaragua.

Since April 2000 operation costs at the plant are not covered by the electricity tariffs established by the government, thus the plant is operating with an economic deficit. It may therefore happen that the plant will be put on the standby list before its technical lifetime has been reached.

It is not fully clear what is the determining factor in the current negative economic situation for Planta Nicaragua. On the one hand, it could be that the plant is unable to compete, in terms of efficiency, with the more modern diesel generation plants installed during recent years. However, the lack of competitiveness could also be due to the fact that the private owned power plants have reached more favourable contractual conditions concerning the price at which they sell electricity to the transmission system.

Regarding the training program, a separate evaluation was carried out in 1996. In general terms the evaluation led to the following main conclusions:

- The consultancy support to Planta Nicaragua has, to a large extent, been relevant and useful. The consultant did a good job with ample documentation.
- The majority of the courses have, although well prepared and carried out, been too general and not really appropriate for ENEL's needs. More emphasis should have been put on "training of trainers" and/or training of specialists.

- The computerized maintenance management system is not fully accepted by ENEL. It should be assessed taking ENEL's requirements into full account, and compared with other similar systems that are in use in the region before any further expenditures are made on it

During our short site visit at Planta Nicaragua it seemed that the computerized maintenance management system had been accepted by the ENEL personal and that it was being put to good use.

Photo: Computer use at Planta Nicaragua

## 4.3 Rio Viejo Hydropower Studies

The Rio Viejo river basin is located north of Managua and the river has its outlet in Lake Managua. Hydropower studies on Rio Viejo started as early as the 1950's. In the 1960's the studies included Centroamerica, Santa Barbara and Montegrande by Italian ELC, followed by Larreynaga by Canadian Shawinigan in the 1970's.

A general Master Plan for potential hydroelectric power projects in all of Nicaragua was carried out by Lahmeyer of Germany in 1980. The plan included Larreynaga on rio Viejo.

Two hydropower plants were actually built; Centroamerica in 1965 and Santa Barbara (or Carlos Fonseca as it is also referred to) in 1972. These two plants, both financed by the World Bank, represent an exploitation of about 50–60% of the available potential in the river. In 1988 a complementary reservoir to benefit existing and future power plants on Rio Viejo was created in the upper part of the river at Lago Asturias.

Hydropower studies in the Rio Viejo catchment area as a part of Swedish support to the energy sector in Nicaragua, began during the Sweco small-scale hydropower contract in the 1980's. After that time the support followed on recommendations given in the successive energy sector studies carried out in 1988, 1991 and 1996. The 1988 sector study recommended a shift from small-scale hydropower to full-scale projects. The 1991 sector study confirmed that recommendation and identified Rio Viejo as the river to be studied by INE and Sida.

### 4.3.1 Project Contents

During the Sweco contract, a prefeasibility study was carried out on the upper reach of the river in 1983. The four sites studied were Los Calpules, Los Potrerillos, Isla la Majada and Paso Marino. Further studies were carried out in 1985–86 that also included some other possible sites. In the final feasibility report three sites, Los Calpules, Los Potrerillos and Paso Marino, were recommended, all with an installed capacity in the range of 10–17 MW.

After that, detailed design and Environmental Impact Assessments for the three projects were performed in 1987–89. Sweco also carried out some studies on the lower part of the Rio Viejo but no projects were found to be feasible. In 1990 the Sweco contract was finished and the team left Nicaragua.

A short time after the termination of the Sweco studies, elections were held in Nicaragua and a new government was installed. After a brief lull in activities, INE and Sida decided to go ahead with the Rio Viejo projects. An appraisal of Los Capules project was made in the beginning of 1992 by Sydkraft International, after which Sweco presented an addendum to the existing project documents including a review of the size of the power plant. This was due to a decision to decrease the reservoir size at the planned Lareynaga plant upstream from Los Calpules. Regarding the Potrerillos and Paso Marino projects, INE wanted to study another option called Montegrande that would make it possible to utilize the total head in just one power plant.

Parallel to the Sida/INE efforts to define the scope of work for further studies, a consortium of Skanska, ABB, Kvaerner, Sweco and Norconsult presented a proposal to build the Los Calpules and Montegrande plants on a turn-key basis. This proposal was not supported by Sida and was finally rejected.

At the end of 1992 tenders for consulting services were announced and the contract won by a consortium of SwedPower from Sweden and Norconsult from Norway. The services included preparation of tender documents for Los Calpules, a feasibility study for Montegrande and a Masterplan for Rio Viejo.

As a first step, new tender documents for Los Calpules were produced. While entering into the feasibility study of Montegrande it became obvious that Montegrande was not an economically viable project. Instead a new site, called La Sirena, was screened. The La Sirena site indicated greater economic benefits and the feasibility study for the project was carried out for that site instead of Montegrande. As a consequence of the emergence of the La Sirena project, the Los Calpules project was cancelled, as the head of Los Calpules was incorporated in the La Sirena project.

The feasibility study on La Sirena project was completed in August 1995. The conclusions of the feasibility study were that the project was feasible from a technical, economic and environmental point of view. These conclusions were confirmed by an independent international appraisal team. The economic analyses indicated that La Sirena project would give an economic internal rate of return of about 8% at a tariff level of 9 US cents/kWh. This rate of return was regarded by Sida as acceptable, although not excellent.

While SwedPower/Norconsult was terminating the La Sirena feasibility study, the panorama of the energy sector in Nicaragua was changing. It became increasingly clearer that the sector would go through some kind of privatization process and the Nicaraguan government began to negotiate with private investors about the installation of new thermal power plants. At the same time Sida began to have doubts about the feasibility of the La Sirena project, resulting in the adoption of a "wait and see" strategy.

When, finally, a formal financing request for the La Sirena power plant was presented by the new Nicaraguan government in 1997, the time was past for the project. The Swedish Government undertook a reorientation of its bilateral aid to Nicaragua at the same time as it became more and more obvious that the government of Nicaragua intended to privatize all state owned power plants. La Sirena simply did not fit into the new situation.

### 4.3.2 Results

Considerable efforts have been made to find feasible hydropower development projects on the Rio Viejo. First during the 80's as a part of the SWECO contract for small-scale hydro power and then in the 90's as independent contracts for studies performed by SwedPower/Norconsult.

Looking at the results of the studies on Rio Viejo from a strict goal achievement point of view, it can be concluded that the main objectives have been reached. The feasibility of different project alternatives on the river have been thoroughly investigated which means that the technical, economic and environmental features of the different project alternatives are well known today. In addition, a Master plan for the entire river basin has been developed, that will constitute a valuable base for future decision-making in terms of water use and development activities in the area.

However, the Rio Viejo studies must also be evaluated from the perspective of how well they contributed to achieving the overall goals of Swedish/Nicaraguan cooperation in the energy sector. At the beginning of the sector program, there was a strong commitment from the Nicaraguan side to develop renewable energy resources. During the late 80's the focus shifted from small-scale hydropower to an emphasis on medium and large-scale hydropower. Accompanying this shift was a growing preparedness on the part of Sida to finance the implementation of a suitable project. From that point of view, the Rio Viejo studies were launched with the intention to find a suitable project. The question then arises if the process has been efficient in finding a suitable hydropower project to be financed with Swedish aid. In the context of this objective, some of the features of the process are discussed below.

A key decision was made to go ahead with the Rio Viejo or further studies after the SWECO studies had been completed. There were some rational arguments for that. The river was already exploited, which implied that benefits could be expected from the already existing regulation reservoir at the Centroamerica plant. Also, any possible negative environmental impacts could be expected to be fewer than in a previously unexploited river. Another crucial factor was the security situation at that time that limited the number of alternatives to Rio Viejo.

Looking at how the planning process for Rio Viejo was carried out during the 90's, it can be seen that it was directed by a rather strict framework that included highly detailed terms of reference for the specific projects that had been identified during previous phases. Although the process shows that all parties had a great preparedness and sometimes even the courage to change study objectives when evidence showed that selected alternative was less attractive, it can be supposed that a more flexible framework for the studies would have been preferable.

A consequence has been that the technical studies sometimes, as in the case of Los Calpules, progressed too far and was made in too much detail, including complete tender documents based on detailed design, before the financial viability of the project was determined.

If the terms of reference had focused more on specifying the overall goals for the studies, rather than specifying in detail each step to be taken, a more suitable framework for change would have been obtained. Of course that would have required a greater input on the part of Sida in order to be able to take an active part in the discussions and decisions as the studies progressed. This greater

input would also have made it possible to shift from Rio Viejo to other river basins when evidence of the meagre economic benefits of the studied projects emerged and the security situation was changing.

A decision to exclude the Larreynaga project, (that had been identified as the most promising alternative of the remaining ones on Rio Viejo in the 1980 master plan), from the scope of work for the SwedPower studies, also limited the possibilities to find attractive project proposals. (The Nicaraguan government decided that Larrenyaga would be assigned to the Japanese to develop and it was excluded from the Sida-financed studies for that reason).

Even if it is difficult to judge whether the Swedish cooperation would have been more efficient than the Japanese to overcome the security problems connected to that project, it is clear that the Master plan studies and feasibility studies suffered from the exclusion of the Larrenyaga project. Since no progress was made on the Larreynaga studies while the Swedish studies were being carried out, (the Japanese refused to go into the area at all without an American led de-mining operation which never materialized) no coordination to find best options to develop the river basin was possible.

Another key issue in the planning was the practical arrangement for the construction phase of the project. The normal method to finance this type of project at that time would have been a mixture of grants and soft loans. The documentation of steps taken during the process is somewhat meagre, but evidently conversations were held with other donors to assist in co-financing a suitable project. Financial resources were also made available for a hydropower plant in Nicaragua in the overall Swedish aid budget in the beginning of the 90's.

With the view of finding a project suitable for financing, the Los Calpules project had some disadvantages. The project was too small to be able to fully justify the costs of an international civil contractor, but too large to implemented with local contractors in the same way as the small hydropower plants Wabule and Las Canoas. The construction process, therefore, seems to have been limited by the financial options of that time.

Also the turn-key offer (put forward by a consortium of private companies parallel to the studies being carried out) seems to have created some disturbance in the process and led to some controversies in on both the Swedish and Nicaraguan side. A more interactive process between the interested parties regarding financial issues, taking more into account the planned construction phase, would have been beneficial.

The Master Plan included a review of options for irrigation. The aim was to define the conflict between existing irrigation and power interests at Sebaco Valley, located upstream of the existing Santa Barbara plant, and to study the possibility to increase irrigation at Llanura Grande in the lower part of the river where no conflicting interests exist. Although some studies on irrigation were carried out, they never became an integrated part of the Master Plan and the involvement of the local population in the proposed irrigation area was never achieved in the studies. Still today, the determination of water use has not been established.

One problem for the irrigation component of the studies was the lack of institutional arrangements in Nicaragua. INE, as the client for the studies, had full responsibility for the hydropower component but there was no participation of the part of any institution representing the irrigation interests. It seems, even today, that there is a significant reluctance on the part of Nicaraguan institutions to pay the political price of entering into discussions which might affect the interests of the farmers who are extracting water from Rio Viejo to the Sebaco Valley. It may be the case that the failure to integrate the irrigation component into the Master Plan has resulted in that some poten-

tial socio-economic development opportunities complementary to hydropower were overlooked in the studies.

Capacity building and training of local personnel in the field of hydropower has been among the goals of the Rio Viejo studies. Although today there is no department within INE or ENEL carrying out hydropower studies, the experiences gained during the Rio Viejo studies has helped to train a number of professionals, who today hold important positions within INE and ENEL, albeit working with other issues in the power sector.

When the studies were carried out and final results presented, Sida decided in 1997 not to finance La Sirena. The following reasons were given:

1. the country frame was inadequate to finance such an expensive project
2. the conditions for development credit ('soft' credit lines given by Swedish institutions other than Sida), also because of the size of the project
3. financing hydropower infrastructure did not fit well with the Sida priorities for development cooperation in Nicaragua (poverty alleviation and democratic consolidation)

## 4.4 Institutional Support to INE/ENEL

The idea of institution support to INE/ENEL came during the early 90's as a response to the need to make INE more efficient and to consolidate the different parts of the organization before the split up of the INE organization that was in the pipeline at that time. The Swedish experience of public owned energy utilities run in a business-like way was regarded as attractive by INE. A sister company kind of cooperation, or 'twinning' was then arranged between INE and Sydkraft. This marked the first time that Sida supported this particular kind of institutional support within an energy sector cooperation.

Sida was not alone in wanting to strengthen the INE organization prior to its decentralization and privatization. The Inter-American Development Bank (IDB) had been pushing a the idea of decentralization and effectivization of the electric power sector in Nicaragua for some time previous to the Swedish initiative.

There were a number of other initiatives taken at that time by other bilateral donors, however the most important in terms of institutional support was the initiative taken by the IDB. This initiative was also supported by the World Bank which was partner in an active dialogue at the time with the Nicaraguan government on the overall subject of structural adjustment and reducing the role of the state in the economy.

While it has not been possible to receive an exact breakdown of the IDB contribution over the years[6], the initiative was well known to Sida, the Swedish consultancy firms and INE/ENEL personnel who have described it input and impact in great detail.

### 4.4.1 Project Contents

The Sydkraft/INE cooperation has been divided into two phases. The first phase, implemented 1993–94, included training on both technical issues as well as administrative ones. The second

[6] The IDB representative was, unfortunately, not present in Nicaragua during the entire time the evaluation was carried out.

phase was executed during 1995, after the decentralization of the old INE into the new INE and ENEL. The second phase resulted in proposals for the reorganization and strengthening of business principles within ENEL. Terms of reference for the second phase were prepared by the IDB.

During the first phase different teams of experts travelled from Sweden to Nicaragua to give lectures and to work together with INE staff members. Courses were held on themes such as load forecast, generation and transmission cost analysis, tariff setting, business control, internal auditing, etc. During each visit the Sydkraft personnel stayed about two weeks in Nicaragua. In the beginning the cooperation obviously suffered from some problems, as only about 20% of the original budget was spent during the first phase.

During the second phase it was decided that Sydkraft should be more permanently represented at the ENEL office in order to achieve a continuously impact. During that phase one person from Sydkraft worked together with the ENEL personnel in the preparation of the reorganization proposal. During the process support was given from the Sydkraft home office on specific issues. The working methods used had a participatory focus aimed at achieving the involvement of personnel and included interviews with a large number of staff members, questionnaires, workshops, group discussions and team work on specific topics. Coordination meetings were held with top management of ENEL and IDB representatives during the project.

The final proposal was elaborated on the basis of the participatory process but was mostly based on the restructuring experience of Sydkraft and other international corporations. Among other things the plan included:

- Change of management style and company culture towards more business-like behaviour
- Introducing the concept of internal buying and selling of services in order to increase efficiency
- Separation of certain parts of the organization from the company establishing them as separate profit centers
- Establishing a new business control system
- Establishing a new customer information system
- Elimination or reduction of political influence necessary to transform ENEL into a business and market oriented company.

In the final report, prepared by the Sydkraft representative, emphasis was given to the need for implementing the proposed changes before any possible further decentralization of ENEL into different companies.

### 4.4.2 Results

There are widely differing perspectives as to the role of Swedish institutional support in the overall institutional development of the electricity sector.

Some saw it as a shield to protect them against IMF/IDB's frightening plans for complete decentralization and privatization. It would lead them to an effectivization of the company but not by inviting in the private sector into every type of operation.

The Nicaraguan perception of the choice of consultant (Sydkraft is a joint state-private owned power company) reinforced the general belief that the consultants proposals would not have priva-

tization as the ultimate goal. Even those who favoured a degree of public control realized that the companies must be run in a business-like fashion.

Others saw it as a necessary first step to introducing sweeping changes. It was good to have participatory workshops with personnel to make everyone feel good about the coming changes. It made the break-up of ENEL into distinct units a more workable possibility, even though there was ideological opposition to privatization in high places at the time. Once the units were in place, it would be easier to sell some or all of them to private interests.

Both of these interpretations can have some validity. The fact remains that the Sida desk officers made various visits to the IDB in Washington in efforts to coordinate the inputs of Sida/Sydkraft with those of IDB. In addition, the Terms of Reference for the work carried out by Sydkraft were drawn up by IDB and approved by INE. Internal Sida documentation refers to the purpose of the studies as being to propose a 'modern structure for the energy sector that allows private enterprise to invest in generation facilities'.[7]

However, it seems that allowing the private sector to invest in generation facilities that are at least in part owned by the state, or allowing private investment in certain types of generation facilities but not others; and complete privatization including selling off state-owned assets to private interests; were perceived as two radically different alternatives within ENEL.

The Swedish side expressed impatience that reforms were not implemented more quickly. This was wrongly interpreted as opposition within ENEL to restructuring when it actually reflected the power struggle between those who favoured private sector participation in public owned companies and those who were in favour of 'complete decentralization', i.e. all-out privatization.

While the outside world happily talked about donor coordination and strengthening private sector input, a tug of war was going on within INE/ENEL to shape the final outcome. As has been the case in other Sida inputs in the energy sector, however, it is the political support of the government (or lack of it) which finally determines the outcome possible. In this case the winds of total privatization have been blowing in Nicaragua since 1996 and this has shaped the current privatization process.

The Sida documentation concludes that while INE implemented some of the suggested reforms (dividing INE into ENEL), the studies for structuring ENEL were paralyzed after the proposal stage. The probable reason given for this inability to implement the proposals coming out of the Swedish input is 'varying political inclinations'[8]

An important contributory factor explaining the inability to implement the Sydkraft proposal was also the nature of the technical assistance personnel input. At first there were only sporadic inputs (backstopping missions and meetings) and even when a person was stationed at ENEL, he was only there for one year. There was widespread criticism within ENEL on the lack of Spanish language ability in the technical assistance input in general and more specifically for the institutional support component.

It has already been argued in terms of hydropower development, that one important lesson learned in the course of Sida-financed energy sector support has been the crucial role of government support and enthusiasm. Below, it is argued that this support was present *in the beginning* of the Swedish support to institutional change. The other important lesson learned in this case, then, is

[7] ToR Energy Sector Analysis, 1997.

[8] Tor Energy Sector Analysis, 1997-10-14

that even good ideas with plenty of support can fail to win ground if they are not effectively presented.

Development work often calls for a certain fundamental idealism (i.e. that change is a good thing). However optimistic one may be about the potential for and desirability of the transfer of ideas and technology, this does not preclude a pragmatic approach to implementation. The lack of pragmatism in promoting the 'Swedish Model' rather than any faults in the model itself, was the major reason for its failure to affect the course of privatization in Nicaragua.

Early on complaints surfaced about the use of English (instead of Spanish) in certain training courses. The recommendation to improve on this weakness was to confine the Swedish technical advisors to training of trainers, rather than to give short courses directly to participants from the operational divisions in ENEL.

The aim of the Sida-funded institutional support was to use participatory methods to create broad-based internal support for the coming organizational changes. Already at an early stage, in the training courses, it was obvious that the lack of language ability limited the effectiveness of the Swedish personnel in being part of attitudinal changes within the organization. With hindsight it is surprising that language ability was not given a more prominent role in the recruitment process.

It is not clear that the IDB was, in the early 90's, actually supporting the position of an all out privatization. The Swedish experience was viewed as extremely interesting and potentially definitive for the development of the Nicaraguan electricity sector, both by INE/ENEL and some IDB staff. There was strong support at the highest levels of ENEL for the Swedish input.

Still, the support ended abruptly in 1995 and the considerable and participatory efforts to bring forth concrete proposals resulting in nothing more than the documents themselves.

In 1995 the IDB, which had been guiding the process from the sidelines previously, stepped into the leading role. Here it must be pointed out that the IDB was 'behind the scenes' with a team of five experts[9] all recruited from the region, fluent in Spanish and experienced in dealing with institutional change in a Latin American context. The Sydkraft support consisted of one Swede with mediocre language ability. Given his necessity of producing documents in English, while those circulated by IDB were in Spanish, it is not difficult to understand why the Swedish initiative was not able to lead the process of change.

Shortly thereafter, the EU entered into an institutional support program for ENEL in what must be characterized as one of their most problematic programs in Nicaragua and which began to be phased out a year and a half after implementation began.

During the time when this evaluation was being carried out, the actual break-up of ENEL into 7 sub units had taken place a month earlier. While the units are called 'companies' they are not companies in the strict sense of the word as they have no control over their revenues or the ability to determine the size of their budgets. This is still done by ENEL.

## 4.5 Gender component of Institutional Support to INE/ENEL

The gender component of the Institutional support to INE/ENEL arose out of an initiative taken by INIM (Instituto Nicaraguense de la Mujer, the Nicaraguan Institute for Women) in its efforts to

[9] This is the estimate of the then Minister, and was not confirmed by the IDB.

encourage women to enter into fields traditionally dominated by men. INIM was attracted to INE because of its very low percentage of female employees in technical posts and its image of carrying out activities that were considered by their very nature to be masculine.[10]

Based on the Constitution of 1980, eliminating discrimination against women was an important political objective and it can be said that the initiative for the program came very much from the Nicaraguan side, although not from the focal institution for Sida support to the energy sector, INE.

Project design was hampered by two serious weaknesses:

1. there was no consultation or survey of the needs and priorities of potential beneficiaries, and
2. although statistics showed that there were few female employees at the time, no analysis was carried out of the underlying reasons for this poor representation

The program went through three phases with a slightly different emphasis and goals in each phase. Initially financed and administered as gender support by Sida during the first phase (1987–88), it was incorporated into the overall energy support for the remainder of implementation (1989–96).

The first phase (1987–88) emphasized technical training for women in energy-related fields through training courses with about 2,000 participants, 88% of whom were women.

In the second phase (1989–92) emphasis shifted from technical energy training to technical administrative training. Instead of preparing women to break down barriers in male dominated work categories, the program focused on upgrading the skills of the predominantly female administrative staff. 3,300 workers were trained, 71% of them women. Awareness raising was also a program goal.

The third phase (1993–1997) marked the reactivation of the project in terms of training where workers could be made more efficient and cost-effective rather than any overt efforts to promote equality. Over 3,000 workers were trained in this period, 78% of them women. 'Awareness raising' became promoting attitudinal changes.

The program also facilitated special Gender Fora (1988, 1989, 1994), changes in administrative rules eliminating gender discrimination, newsletters and scholarships for primary, secondary and higher education.

It is noteworthy that, while appreciated by those within INE/ENEL who participated in the training, the gender component is not one that is clearly remembered by those occupying positions of middle and upper management at the time.

The evaluation report for the Gender component makes no secret of the author's disappointment with the changing focus of the program. Seen against the backdrop of the changes in Nicaraguan government policies, however, this changing focus seems inevitable. As with the other energy sector programs, what was possible to do with Sida support was largely determined by the prevailing political climate and government priorities.

Many of the efforts made by the gender program to 'mainstream' its activities into the overall human resources activities at INE/ENEL were viewed in the evaluation as efforts to 'dilute' the program and perhaps reflect the author's hope that the original program goals would be valid once again.

[10] Most of the information for this section is taken from the Evaluation report, August 1997

The gender component of the institutional support, while not memorable for its achievements in ensuring greater equality, does not deserve the image it has of being a fiasco. It offered training or access to higher education to over 8,000 employees of INE/ENEL, (78% of who were women) and, for whatever ultimate goal or purpose, achieved a definite upgrading of skills within the organization and lasting improvements in the lives of the individuals who participated.

It did not lead to breaking down the barriers which prevent women from entering employment traditionally reserved for men, but the question remains whether or not this would have been possible in the face for little support for such a strategy within the host institution and the Nicaraguan government.

## 4.6 Other Sida Energy Sector support

A number of inputs into the Energy Sector support not included in the Terms of Reference, are mentioned here. The import support played an important role in making other inputs, particularly the rehabilitation of Planta Nicaragua, function efficiently. Support to maintenance drilling at a geothermal plant and studies to determine the technical and economic viability of using cotton waste to make fuel briquettes, while not highly significant in themselves, at least point out a willingness on the part of Sida to explore alternative energy sources. This willingness was never taken further, however, and the energy support program remained essentially an *electricity* support program.

### 4.6.1 Import Support

Nicaragua has received some 25 MSEK of Swedish support for oil import during the period. No information has been found on the support in the documentation on the Swedish energy sector support. Although it may have been regarded primarily as a balance of payment support, it must indeed have had an important impact on the energy supply situation in Nicaragua.

### 4.6.2 Maintenance Drilling at Momotobo Geothermal Plant

Some support was also given by Sida to perform complementary drilling of wells at the troublesome geothermal plant Momotombo. No further information has been found on that activity.

### 4.6.3 Fuel Briquettes from Cotton Waste

Studies were carried out on the technical and economic viability of using cotton waste to produce fuel briquettes. A machine was imported and pilot production of the briquettes was carried out and evaluated. While the production did show some economic promise, the production of cotton, so important in the late 1980's and early 1990's, has almost disappeared completely from Nicaraguan agriculture.

There is always the possibility that other agricultural by-products may be interesting for fuel use, however, the initial investment in machinery and the alternative uses for agricultural by-products in soil improvement result in making this an area which may only contribute to energy use under special conditions.

# 5. Implementation of Energy Sector Cooperation

## 5.1 Sida's Definition of the Energy Sector

It is important to remember that the Sida support to the energy sector has primarily been support to the *electricity* sector. While there was a small study and pilot activities looking at the use of cotton waste for making fuel briquettes, the focus has been on electricity. This is unfortunate, perhaps, because there was never much of an impulse to look at other energy sources, especially biomass. Interesting connections could have been made with the then on-going forestry program both in terms of biomass and catchment management.

## 5.2 Division of Responsibilities Sida-Nicaragua-Consultants

The combination of three different groups of institutions (Sida, Consultants and Nicaraguan government) is common to most development cooperation programs. This section looks at how the particular mix of institutional resources from these three sources affected program implementation.

Energy support to Nicaragua is unusual compared to other sector support programs in Nicaragua in that there has never been a Program Officer for Energy stationed at the Sida Office/Swedish Embassy in Managua.

Responsibility for monitoring the energy sector support was assigned to the Macro Economist during the 1980's and a large part of the 1990's. Responsibility was transferred to the Agriculture/Forestry/Natural Resources Program Officer during the later part of the 1990's.

While other sector support programs in Nicaragua had their respective Program Officers, energy sector support programs in all Sida program countries are centralized to the Infrastructural Division (which has had various names and acronyms over the 20 year period in question) at Sida Stockholm. This construction has its strengths and weaknesses.

On the one hand it has ensured easy access to a range of inputs able to bring diverse fields of technical competence to the monitoring and appraisal of on-going program activities. It has also probably ensured a greater adherence to overall Sida policy for the energy sector.

The centralization of Sida program supervision to Stockholm has, however, had one serious disadvantage from Sida's point of view. The fact that the technical competence from Sida has been located in Stockholm has made it necessary for the Nicaraguan personnel to rely heavily on the insights and opinions of the consultants actually based in Nicaragua. While relations were always cordial between the different Nicaraguan institutions and the Sida office in Managua, the bulk of activity identification and development was carried out between consultants and Nicaraguan personnel. This means that alternative proposals had already been discussed and screened before they reached the series of regular meetings with Sida officials to plan future activities.

Energy Sector studies were used to prepare new activities and follow up on existing efforts. This could be viewed as a compensatory mechanism in terms of not having a desk officer present. These studies provided a continuity and closer look at problems and potentials.

# 6. The Impact of Energy Sector Support

## 6.1 Program Effectiveness

As discussed in Section 1, the goals for Swedish development assistance to the energy sector reflected the overall political and development priorities which characterized the relations between Sweden and Nicaragua. Thus, roughly speaking, energy sector support took place in two distinctly different climates that can be separated into the decade of the 1980's and the decade of the 1990's. The assistance of the 1980's was marked by the priority of 'economic recovery' and the assistance during the 1990's was judged more on the criteria of its effectiveness in increasing democratization and reducing poverty.

Nicaraguan priorities, as expressed in the actions of successive governments rather than in their policy statements, have consistently kept to the path of economic recovery and growth. Nor is this surprising given the very serious economic problems that characterized the Nicaraguan economy during the 1980's and the pressure of rising expectations which has hounded governments in the 1990's.

The support to Planta Nicaragua, including import support to purchase Venezuelan petroleum to fuel it once the Sida project renovated the turbines and trained personnel, can be said to have fulfilled the goal of promoting economic recovery.

The energy sector has been the subject of a successive decentralization and privatization during the 1990's, partly based on the ideas generated within the framework of the institutional support to INE/ENEL financed by Sida. If the purpose of the support was to finance studies to "propose a modern structure for the energy sector that allows private enterprise to invest in generation facilities", then this was achieved. These proposals were greatly modified, however, in the implementation phase where the Swedish funded institutional support played no further role.

## 6.2 Program Impact

Overall, the Sida-funded energy support program has had a significant impact on the Nicaraguan capacity to develop its energy sector, especially in the early years.

### 6.2.1 Small-scale Hydropower Plants

The support to small-scale hydroelectric power plants was a response to Nicaraguan priorities. The poor security conditions resulting from the war and overly optimistic views on the part of Nicaraguan policy-makers as to the local capacity to pay for electric power generation, limited the ultimate success of the program.

In spite of what might be viewed as a limited impact in terms of power generation, the initial studies and construction of small-scale hydropower plants has left behind documentation and trained personnel. These assets are currently becoming more valuable than previously thought in an economic and political situation that allows a focus on the development of remote rural areas and local resources.

### 6.2.2 Rehabilitation of Planta Nicaragua

The Swedish support to Planta Nicaragua played a crucial role in maintaining electricity supply during a critical period in the country's economic and political history. Many observers believe that Nicaragua would have 'gone under' without this support.

Ironically, this support ensured a more stable transition from government owned thermal generation facilities to those owned and managed by private sector interests. This was probably not an intended result, given the nature of the support to hydropower studies and institutional/structural change at INE/ENEL.

### 6.2.3 Institutional Support to INE/ENEL

The component of institutional support had an impact when it was in the form of technical assistance stationed in the country, monitoring and facilitating a process of change. It can be said that the institutional support was most effective in generating ideas and promoting the feeling within the organization that the opinions of the employees were valuable inputs. In terms of actually putting into practice the ideas generated, the support fell short of success.

Special courses on management or theoretical subjects were not highly effective, especially given the often limited knowledge of Spanish on the part of the Swedish technicians. This said, however, the on-the-job training provided in several of the generation facilities by Sida-funded technicians was highly appreciated and is credited with improving technical knowledge on a broad scale within the organizations. Equally so, the many scholarships offered by the program had a significant impact on the skills level.

### 6.2.4 Rio Viejo Hydropower Investment Studies

The intention behind the Rio Viejo studies was to design a medium-size hydroelectric power plant for Sida (together with Norad) financing. While not an intended consequence, the end result of the Rio Viejo Master Plan was to make Sida decision-makers hesitant about the viability of any power plant built in this catchment area. Security considerations, and a highly structured terms of reference for the studies, restricted the manoeuvrability of consultants in shifting to what they could predict would be more economically interesting alternatives.

There is still a significant body of knowledge available to decision-makers in the form of these studies, and there is a positive impact even when the then financial viability of the project studied was not sufficient to attract investment.

## 6.3 Environmental Impact

Environmental impact analysis or environmental auditing has been a part of the Sida support to the energy sector during the 1990's. Prior to that, in the case of the small-scale hydro power plants, environmental considerations were not a standard part of the terms of reference.

The actual environmental impact of the Swedish inputs in the energy sector has been minimal as most of the work carried out was in the form of studies, rehabilitation of existing facilities and institutional support.

### 6.3.1 Planta Nicaragua

One existing oil-fired thermal power plant located along the Pacific coastline was partially renovated. Any plant using fossil fuels will, of course, cause local pollution in the form of sulphur dioxide

emissions. In connection with the rehabilitation of Planta Nicaragua, a study of 'Energy Efficiency and Environment Improvement' was carried out by a team of Swedish consultants.

The physical rehabilitation of Planta Nicaragua included a number of measures designed to both improve energy efficiency and reduce emissions. It was calculated that these measures would pay for themselves (in terms of energy savings) within two years. In addition, they would result in a 430 ton per year reduction in sulphur dioxide emissions, 70 ton reduction for nitrogen oxides, 25,000 ton reduction in carbon dioxide and a 3.4 ton reduction in vanadium emissions.

The evaluation team was able to follow up that the measures recommended, except for the installation of hydropower units in the cooling water system, were implemented. The oxygen analysers, although installed, have never functioned. Nor has there been any follow up that the intended environmental improvements became a reality.

At the time when the emissions were measured, their total effect was considered small in comparison to the emissions from the volcanic activity in the nearby area.

The fuel used to power Planta Nicaragua is heavy oil (what is left after the refining process for gasoline). Although the plant is located next to a Petronic unloading station, fuel is not imported in tankers as the quality of these fuels has been inferior to what can be delivered by truck overland from the refineries in Managua.

Infrastructure was improved to ensure protection against oil spills (and greater fuel efficiency) within the plant. There are no treatment facilities for waste water (mostly from boiler cleaning operations) and this sooner or later makes its way into the sea.

### 6.3.2 Small-scale hydropower units

The only new construction financed by Sida has been that of two mini-hydro power plants in a mountainous area to the north of Managua.

Even in the case of the new construction, one dam and turbine/generator installation replaced a previously damaged and smaller unit (Wabule) and at the other (Las Canoas) the dam had been previously constructed for irrigation purposes.

Photo : Dam at Wabule

### 6.3.3 Feasibility Studies for Medium Size Hydropower

Environmental considerations, although not a standard part of Sida ToRs, were part of the early RioViejo studies carried out in the 1980's.

The state-of-the-art environmental impact assessment carried out in connection with the La Sirena feasibility study is one positive contribution in terms of the development of methods and on-the-job training of Nicaraguan personnel. The study was designed by Swedpower and Norconsult, however much of the field work was carried out in cooperation with a Nicaraguan subconsultant, CMC.

There are a number of, perhaps unintended, benefits with carrying out a high quality field study such as the environmental impact assessment for La Sirena. The detailed information collected for the report on the physical and socio-economic characteristics of the area, including an in-depth study of 'quality of life' indicators, provides a valuable baseline for projects in other sectors outside of hydroelectric power development. The study provides an insight into land tenure controversies, for example, and the changing sources of household income. It also provides archeological data and all this in addition to the valuable data on quantity and quality of flora and fauna in the area at that time.

Photo: Water hycinth at Lago Apanas reservoir

## 6.4 Socio-economic Impact

There are a number of aspects that can be taken into consideration in terms of socio-economic impact. As efficiency and sustainable development issues are covered in other sections, this section focuses on two aspects of socio-economic impact, namely, (1) participation and ownership and (2) gender needs.

### 6.4.1 Participation and Ownership

It has been clear on the part of all of those involved from the very beginning that Sida-funded Energy Sector Support was based on an assessment of Nicaraguan priorities. More than that, the momentum of the support has been guided by Nicaraguan institutions. This is not to say that there are not conflicting and changing priorities on the part of the Nicaraguan institutions, but that there was little pressure from the Swedish government side to 'force' a particular activity or type of assistance on an unwilling recipient.

While not all of the energy sector activities could be classified as unqualified successes, it must still be said that the content of Swedish energy support reflected and followed the (albeit changing) Nicaraguan priorities for their energy sector development.

### 6.4.2 Gender Needs

Gender considerations do not seem to have played a significant role in the construction of small-scale hydropower installations, the design of medium and large-scale hydropower plants or the physical rehabilitation of the thermal Planta Nicaragua. Nor were they any instructions or ambitions to focus on gender needs in any of these activities. Socio-economic studies focused on individual households, but were not instructed by the terms of reference, to differentiate between assets, incomes or functions in terms of gender roles.

Gender needs were specifically addressed in the Institutional Support to INE/ENEL. A detailed review of this program is presented in section 4.4. This program, which combined awareness raising with specific technical and career-oriented training, has certainly had a marked and sustained effect on INE/ENEL as an organization.

Currently, 29% of total ENEL staff are women, 20% of the managerial staff, 36% of technical/professional, 86% of the administrative and 4.5% of the operational staff. In the leading positions, about 90% of those women were trained in the Sida supported program. Women have also continued to pressure the organization for improvements. As a result, ENEL has carried out its own scholarship and training program after the Swedish support was phased out.

There is evidence that a number of the women professionals leaving the state run enterprises are obtaining responsible positions in the private sector. As an example, one private company (of the four currently generating electricity for the national grid) is headed by a woman. In addition, there are a number of women working as technicians in other companies.

## 6.5 Program Relevance

If we try to answer the question, Did the support correspond with the priority needs of the beneficiaries?, then we must first look at who the beneficiaries have been. In terms of direct beneficiaries, these have been the institution INE/ENEL, its personnel and electricity consumers. Indirect benefits have been felt by the national government, the macroeconomic framework of the country, the population and the environment.

Certainly from the point of view of these groups, the sector support has been highly relevant. The question of which groups *should be* the primary beneficiaries for Sida energy sector support did not begin to be asked until the preparations began for a new country strategy in the mid 1990's.

In terms of the overall program, the focus of Sida-financed activities has followed (albeit at times lagged behind) the changing priorities of the Nicaraguan government in terms of electric power generation. From the Nicaraguan perspective, then, the energy sector support has been highly relevant.

The implementation of a support program always implies a certain amount of compromise on the part of the donor and the host government, as the development policies and priorities of these two different entities are seldom identical. In the case of Nicaragua it can be said that the congruence between policies and priorities of the government and those of Sida has been decreasing steadily during the 1990's. From its inception, the degree of unanimity as to type of activity, was very pronounced in the energy sector support. As time has gone on, the priorities of Sida and the Nicaraguan have been changing in fairly different directions.

When priorities and policies change, then what is relevant for the government to promote may no longer be attractive for the donor to support. In this case, the only option is to phase out the sector support program, which is exactly what has occurred.

Certainly, the rehabilitation work carried out for Planta Nicaragua was relevant for the economic survival of the country. When Sida was no longer able to support what it viewed as energy sector programs relevant to alleviating poverty in Nicaragua, it had no other option than to close down the on-going support.

## 6.6 Implementation Efficiency

The efficiency of program implementation is a complicated issue in the case of some of the inputs of the energy sector support. Early activities involving small-scale hydro power plants and the rehabilitation of Planta Nicaragua can be characterized as efficient, largely because they achieved their original objectives at an acceptable cost. It is more difficult to say this for later efforts in Institutional Support and the feasibility studies of Medium-Size Hydropower plants as neither of these activities led to the intended consequences.

This is not to say that the means used were not cost effective in themselves, or that any inappropriate technology was employed. However, with hindsight it can be said that, in spite of certain benefits that are mentioned in earlier sections, both the institutional support program and the feasibility studies for Rio Viejo yielded disappointing results.

Considered as money spent to influence the future institutional structure of the electric power sector or as money spent to prepare an investment in a medium-size hydropower plant, both were inefficient. In the case of Rio Viejo, however, one must be prepared for the fact that the result of a feasibility study can be negative and that this is not necessarily money or effort wasted if compared to the amount that can be 'wasted' on an insufficiently studied investment. The institutional support program also had a number of generalized benefits in terms of greater capacity on the part of INE/ENEL personnel.

# 7. Conclusions and Recommendations

## 7.1 Lessons learned to improve implementation

On the whole, the conclusion of the evaluation is that the Sida-financed Energy Sector Support program implemented during the 1980's and 90's, was a reasonable program which followed (albeit lagged behind at times) Nicaraguan government priorities. There are no spectacular failures or shortcomings to report. Nonetheless, there are a number of areas in which implementation could have been made more effective and these are analyzed below.

### 7.1.1 Crucial Role of Government Support

It has already been argued in terms of hydropower development that one important lesson learned in the course of Sida-financed energy sector support has been the crucial role of Nicaraguan government support and enthusiasm.

In this context it is important to distinguish between *government* support and enthusiasm and *individual* support and enthusiasm. The political ideology of the government in power is not always identical with that of certain key individuals who implement the technical aspects of government policy.

This has had the consequence that the ideology of the current government has constrained the ability of certain individuals in the Nicaraguan institutions to carry out technical/institutional activities that are not considered politically high priority. This has not constrained these individuals, however, from promoting donor/consultant support to such activities.

In the process of keeping a close watch on government priorities, a high level policy dialogue, with mechanisms to ensure that this information filters down to desk officers and consultants, is essential. This is easier if the Sida desk officers are stationed in the country where this policy dialogue is being carried out. (see 7.1.2 below)

### 7.1.2 Stronger Sida presence can improve the congruence between development policy and implementation

If Sida is willing to leave most of the interactive process determining program details and options to the implementing consultant, then it is sufficient with a program desk officer stationed in Stockholm. If Sida wants to take a more active role in program formulation and design, then they should station a desk officer at the Embassy. Some bilateral donors even decentralize their desk officers out of the capital city and station them in provinces for closer contact with program beneficiaries.

In addition to the technical supervision of the program supplied by the desk officer, there is a critical need for the input of political and macro-economic information into program design.

The money spent on stationing a desk officer in Managua might have been a well-spent investment in terms of putting the brakes on technical studies which preliminary investigations already indicated might be of doubtful viability. The lag time between when realizations are made in the field and when they are processed at biannual or annual meetings with Sida might have been shortened.

In addition, the ability to keep a close watch on Nicaraguan government priorities, and to distinguish these from the priorities of individuals working within the government structure, could have been facilitated by the presence of a desk officer for the energy sector.

### 7.1.3 Good Ideas do not sell themselves

An important lesson learned from the institutional support to INE/ENEL is that even good ideas with plenty of support can fail to win ground if they are not effectively presented.

Development work often calls for a certain fundamental idealism (i.e. that change is a good thing). However optimistic one may be about the potential for and desirability of the transfer of ideas and technology, this does not preclude a pragmatic approach to implementation. The lack of pragmatism in promoting the 'Swedish Model' of jointly owned power generation facilities, rather than any faults in the model itself, was the major reason for its failure to affect the course of privatization in Nicaragua.

The primary pragmatic failure in implementing the support to the privatization process was the lack of language ability (in Spanish) on the part of the technical assistance personnel. They were not able to penetrate the workings of the host institution and 'sell' their ideas due to language constraints.

### 7.1.4 Security Considerations distort economic and technical rationality

The means used to study the Rio Viejo medium and large-scale hydropower project alternatives could perhaps have been better used to study the technically more promising Rio Grande de Matagalpa, if it hadn't been for security considerations.

The lesson to be learned from this experience is that when there is a civil war going on it is difficult to make economically and technically rational investment decisions. This may sound banal, but there are many cases of donor involvement in development investments that, in trying to make the best of difficult circumstances, prove to be irrational when security conditions improve.

### 7.1.5 Supervision of Consultants

Looking at how the planning process for Rio Viejo was carried out during the 90's, it can be seen that it was directed by a rather strict framework that included highly detailed terms of reference for the specific projects that had been identified during previous phases. A more flexible framework for the studies would have been preferable in terms of responding to preliminary information on project viability. The lack of this flexibility resulted in studies (such as Los Calpules) progressing too far and 'wasting' time on detail including complete tender documents, before the lack of financial viability was assessed.

If the terms of reference had focused more on specifying the overall goals for the studies, rather than specifying in detail each step to be taken, a more suitable framework for change would have been obtained. Of course that would have required a greater input on the part of Sida in order to be able to take an active part in the discussions and decisions as the studies progressed. (see point 7.1.2) This greater input would also have made it possible to shift from Rio Viejo to other river basins when evidence of the meagre economic benefits of the studied projects emerged and the security situation was changing.

## 7.2 Wider implications of the experience

Although the feasibility studies for medium-size hydropower plants along Rio Viejo never materialized in a project considered financially viable at the time, Nicaraguan society is paying the price of focusing on oil-fired thermal electricity generation.

The high oil price is not full reflected in the present tariffs. The electricity tariffs are subsidized by the state using the cheap generation in the two old hydropower plants to subsidize the use of thermal power. This practice will no longer be possible when the hydropower plants have been sold to the private sector. Thus the price on electricity will have to be raised even more unless there is a substantial decrease in the price of oil on the international market.

It can be argued that the long-term sustainability of the energy sector in Nicaragua lies in the *diversification* of power generation sources. The current emphasis on thermal power reflects the need of private investors to recoup their investments in the least possible time span rather than the long-term needs of the country.

As discussed above, there were strong rational arguments to rehabilitate the old oil fired Planta Nicaragua and cancel the Swedish support to the La Sirena hydropower project at the moments of taking the decisions. However, looking at the present situation of the energy sector with its high dependence on oil fired thermal plants combined with the present high prices on the international oil market, the energy sector of Nicaragua is not in a very favorable situation. Nicaragua, from an electricity supply point of view, would have been better off if the decision to go ahead with the construction of another hydropower plant had been taken.

From that point of view, an objection in hindsight can be raised against these key decisions. However, this would not be fair to those who made such decisions on the basis of the information available to them. It also disregards the fact that the present evaluation is equally unable to predict what may be necessary in a very uncertain future. The logical solution to unpredictability is to promote the *diversification* of energy generation sources for a sustainable production base under differing conditions. For this to be a part of a Sida-supported energy program, however, it must also be the held conviction of the cooperating government.

The Nicaraguan case raises a more fundamental question of whether or not it is desirable that the state (and in consequence the bilateral and multilateral development institutions) withdraw from the energy sector entirely, leaving all the investment responsibility to the private sector.

Private sector investment priorities focus on recouping investments in as short a time as possible, thus leading to a preference for oil-fired thermal plants to the disadvantage of other types of power plants, such as hydroelectric. The negative environmental, dependency and macro-economic aspects of focusing on oil-fired power plants will only be felt in the long run.

Is it not possible to promote a model that would reconcile the efficiency of private sector investment with the concern of the state for long-term national interests and a sustainable management of natural resources?

# Appendix I

## Reference list[11]


### Energy sector studies etc

Beijer Institute, "Nicaragua: Energy Sector Review" Per Johan Svenningsson and Stefan de Vylder, May 1988

Galaxicon AB, "The Nicaragua Power Struggle – Report from an Energy Sector Reconnaissance Mission," P.J. Svenningsson, September 1991

Galaxicon AB, "Energy Sector Study Nicaragua", Per Johan Svenningsson, April 1996

BID-Regional Consultative Group for Central America, The Electric Power Subsector in the Central American Isthmus Diagnosis, Prospects and Proposals, Background Paper (undated).

INE, Homepage www.ine.gob.ni, agosto 2000

ENEL, Homepage www.privatenel.com, july 2000

### Planta Nicaragua

Vattenfall Värmekraft, "Assessment of Training at Planta Nicaragua" Swedpower Report No. 600 8980 Nils-Olof Körner, September 1992

ÅF-Energikonsult Syd AB, Rehabilitation of Planta Nicaragua: Energy Efficiency and Environment Improvement Project, Edelborg, I., Eriksson, A., Johnson, I. & Wamsler, M. Final Report, July 1994

ÅF-Energikonsult Syd AB, Rehabilitation of Planta Nicaragua: Phase 1, 2 and 3.2 Edelborg, I., Johnson, M, Final Report, May 1995.

ÅF-Energikonsult Syd AB, Rehabilitation of Planta Nicaragua: Phase 3 Step 2, Ahbeck, B, Final Report, July 1995.

Sida Evaluation 96/48, Price Waterhouse/Galaxicon AB, "The Planta Nicaragua Rehabilitation Programme: Consulting Services" Judith Muller and Per-Johan Svenningsson. June 1996

ÅF-Energikonsult Syd AB, Rehabilitation of Planta Nicaragua: Phase 3.3 Final Report, March 1999.

ENEL, Informe Final: Proyecto Rehabilitación del Turbogenerador No. 1, Planta Nicaragua, Fase 3.3 PRENIC III Managua, May 1999

ENEL, Planta Nicaragua, Factor de Planta, Generacion de Energy, Disponibilida y Costos de Produccion 1994 – Junio 2000.


[11] The sources listed are written in English, Spanish or Swedish. However, the dates of publication are always given in English. Sources are listed alphabetically and under sub-headings for the principle institutions involved: ENEL, INE and Sida.

**Institutional support to INE/ENEL**
Sydkraft International, Re-engineering Program for ENEL, Mats Elerud, November 1995.

**Gender component of institutional support to INE/ENEL**
Informe de actividades de capacitación financiadas por el proyecto de capacitación de la mujer en ENEL durante el año 1995, July 1996

Evaluación "Proyecto de Capacitación de la Mujer INE/ENEL/ASDI": 1987–1996, Informe Consultoria, María Angélica Fauné, Managua, Agosto 1997 (in Spanish)

Executive Summary of the Evaluación "Proyecto de Capacitación de la Mujer INE/ENEL/ASDI": 1987–1996, Informe Consultoria, María Angélica Fauné, Managua, Octubre 1997 (in English)

**Small-scale hydropower**
INE/SWECO, Estudios de Pequeñas Plantas Hidroelectricas, Report, May 1983

(Including Wabule, Rio Tuma Shemes, San Jose de Bocay, Waslala, Pantasma, Wiwili Power Plants)

INE/SWECO, Small Hydropower Plants in Nicaragua, Phase II, September 1985

(Including Siempre Viva, Wabule, Las Canoas, Kukra Hill Power Plants)

INE/SWECO, Siempre Viva Power Plant, Feasibility Report, February 1987

INE/SWECO, El Aguacate Power Plant Renovation, Final Report, February 1987

INE/SWECO, El Enredo, Design, February 1987

INE/SWECO, Programme for Development of Small Hydroelectric Power Plants, Energy Cooperation with Nicaragua, Final Report, October 1990.

Sida-INEC, Experience from Four Sida-financed Small-Scale Hydro Power Stations, (undated, study performed in 1997)

ENEL-HIDROGESA, Estado Actual de los Equipos Electromecanicos y Obras Civiles de la Minicentral Hidroelctrica Las Canoas, Agosta 2000.

ENEL-HIDROGESA, Planta Hidroelectrica Wawule, Agosto del 2000

**Rio Viejo hydropower studies**
INE/SWECO, Prefeasibility Study Los Calpules, Los Potrerillos, Isla la Majada and Paso Marino 1983

INE/SWECO, Rio Viejo Feasibility Study Phase II, February 1985

INE/SWECO, Los Calpules, Los Potrerillos and Paso Marino Power Plants, Design, February 1987

INE/SWECO, Rio Viejo from rio Cacao to Sebaco Valley, revised feasibility study, February 1987

INE, Terms of Reference for Consulting Services, Los Calpules Hydropower Project Rio Viejo, Nicaragua, Design Review, Tender Documents and Bid Evaluation, Detailed Design, Supervision., October 1992

INE, Terms of Reference, Master Plan for Rio Viejo and Feasibility Study for Montegrande Hydropower Project, September 1992

Summary of Findings elaborated in Managua, November 1992 in cooperation between INE and Sydkraft, November 1992

Evaluation Report – La Sirena, April 1994. "Assessment of the Consulting Services for the Elaboration of Feasilbility Study, Tender Design and Tender Documents, Evaluation of Tenders, Contract Negotiations and Award of Contract for La Sirena Hydropower Project"

Rio Viejo Development: La Sirena Hydro Electrical Project in Perspective, undated

INE/Sida, La Sirena Hydropower Project Feasibility Study, Appraisal Report, Blaj S., Gresham P., Tisell U., Wolofsky L., June 1995

INE/Swedpower AB/Norconsult International, Proyecto Rio Viejo, Master Plan;

- Executive Summary Final Report, July 1996
- Volume 1: Final Main Report, August 1995
- Volume 3: Irrigation Study, Final Report, April 1994
- Volume 5. Water Rights Study,
- Volume 7: Prefeasibility Study of Lower Rio Viejo, Final Report, October 1995

INE/Swedpower/Norconsult, Proyecto Rio Viejo, La Sirena Hydropower Project, Feasibility Study:

- Volume 1–2: Final Main Report, June 1996
- Volume 3: Environmental Impact Assessment, Final Report, June 1995

INEL, La Sirena Hydropower Project, Project Document, June 1995, revised March 1997

**Sida**

Ekonomisk Halvårsrapport 1987/88

Energy Sector Cooperation between Sweden and Nicaragua, Agreed Minutes from the Semi-Annual Meeting 2–6 June, 1997

La Cooperación entre Nicaragua y Suecia, January 1991

La Cooperación entre Nicaragua y Suecia, November 1990

Landöversikt Nicaragua, August 1994

Reserapport, Infrastrukturbyrån 369/94, 1994-11-29

Reserapport, INEC/ENETEL, 352/96, 1996-05-15

Resultatredovisning Nicaragua, April 1994

Resultatredovisning Nicaragua 1991/92–1993/94, September 1994

Resultatredovisning Nicaragua 1993/94–1995/96, Underlag till landstrategi för Nicaragua, December 1997

Terms of Reference Energy Sector Analysis-Nicaragua, INEC/INFRA, 1997-10-14

Utvecklingssamarbete med Nicaragua 1995–1997, Sida, Regionavdelning för Latinamerika, August 1994.

Utvecklingssamarbetet med Nicaragua: Halvårsrapporter:

- oktober 1988 – mars 1989,
- oktober 1989 – mars 1990,
- april-september 1990,
- april-oktober 1991,
- oktober 1991 – mars 1992,
- april-september 1992
- april-oktober 1993
- oktober 1993 – mars 1994
- oktober 1995 – mars 1996
- april-oktober 1996
- oktober 1996 – mars 1997
- mars-oktober 1997
- oktober 1997 – mars 1998

# Appendix II

## List of Persons Contacted

| NAME | ORGANIZATION |
|---|---|
| Aurelio Acuña Vivas | ENEL Hidro SA, (Managua) Electromechanical Engineer |
| Gabriel Alvarado Pasquier | Planta Nicaragua, General Manager |
| Carlos Benavente | President, Fundación Sandino, (Ministry of External Cooperation 1984-1995) |
| Elmer Bervis | INE, Technical Advisor |
| Bennett Castro Altauran | ENEL Hidro SA Chief Mechanicer Planta Centro America |
| Emiliano Castro | ENEL Hidro SA Operator Wabule |
| Jose Dolores Centeno P. | ENEL Hidro SA, Industrial Mechanicer Planta Centro America |
| Björn Corlin | SWECO, Project Manager Small-scale Hydropower Studies |
| Mará Isabel Cornejo | ENEL, Assistant, Finance and Budget Division |
| Iván Cortéz | ENEL, Centro Nacional de Despacho de Carga |
| Mats Elerud | Sydkraft AB, |
| Annika Eriksson | ÅF Energikonsult |
| Gunnar Frostberg | Vattenfall AB (Nordic Power Invest, Miami, formerly Swedpower La Srena Feasibility Study Team Leader) |
| Anders Hagwall | Sida/INEC (Head of Development Cooperation Nicaragua, 1994-96 |
| Elvin Hernández | GEOSA, Planta Nicaragua<br>Operations Manager |
| María Horno | European Union Representation, Managua<br>Desk Officer for Energy Projects |
| Farhad Irani | Sida/INEC (former desk officer for energy sector in Nicaragua) |
| Mats Johansson | Reng Consulting HB (formerly Project Manager, ÅF Energikonsult) |
| Elías B. Juáry M. | GEOSA, Planta Nicaragua<br>Civil Engineering Department |
| Peter Lenmo | SWECO, Head of Supervision Wabule Hydro Power Plant |
| José Ley Lau | General Manager, ENCSA<br>(INE 1982-96, Vice Minister 1992-96) |
| Nelson Lopez | ENEL Hidro SA (Managua)<br>Head of Maintenance |
| Lennart Lundberg | SWECO (formerly Swedpower AB, Rio Viejo Master Plan Team Leader) |

Con't

| | |
|---|---|
| Antonio Montenegro Lopez | ENEL Hidro SA Operator Wabule |
| Donald Olivares | ENEL Hidro SA Managing Director |
| Junior Jose Ramírez | ENEL Hidro SA Operator Las Canoas |
| Emilio Rappacioli Baltodano | Consulting Enginner, (Minister of Energy, 1989-96) |
| Bayardo Rizo | ENEL Hidro SA Head of Production and Maintenance Planta Centro America |
| Santos Rivera | ENEL (ENTRESA) Director of External Cooperation |
| Per Johan Svenningsson | Consultant, Galaxicon AB, author of various energy sector studies |
| Orlando Torres | GEOSA, Planta Nicaragua,<br>Head, Maintenance Department |
| Javier Torres Cardoza | ENEL Hidro SA, Head Electrician Planta Centro America |
| Yader Vidal García Z. | GEOSA, Planta Nicaragua<br>Mechanical Programmer |

# Appendix III

## Terms of reference

April 1, 2000

# Terms of Reference for the Evaluation of the Swedish Support to the Energy Sector in Nicaragua

## 1. BACKGROUND

### 1.1 General

Since the beginning of the 1980s, Nicaragua has had a problematic energy supply situation. The consequences have been frequent power-cuts, with negative direct impact for local industry and agriculture as well as society in general, and costly import of electricity from neighbouring countries. Indirect negative effects upon the business confidence have also been created, as both domestic and foreign investors regard the energy crisis as a serious deterrent to long-term productive investment.

It was therefore considered an urgent priority to improve the energy supply situation as a means to stimulate the economic development of the country. The electricity supply from Planta Nicaragua, which constitutes almost a third of the installed electricity generation capacity in the country, was in the mid-1980s lower than 60% of the installed capacity. There was also a lack of studies on the hydro power potential of the country and the institutional and technical capacity was weak. Until the beginning of the 1990s, only a few donors provided support to the energy sector.

### 1.2 The Energy Sector and Power Sub-sector

#### 1.2.1 Energy production

The production of primary energy (hydro- and geo-energy, biomass, firewood and residues of vegetation) during 1994 was equal to about 1.5 million equivalent tons of petrol (toe). The importation of primary energy during 1994 consisted of petrol from Venezuela to the amount of 651,000 toe.

#### 1.2.2 Capacity, production and distribution of electrical power

The nominal installed electrical power capacity and gross amount of generated electrical energy in the national system was as follows in 1994:

| | | |
|---|---|---|
| Thermal plants (steam generators) | 160 MW | 761 GWh |
| Hydro-electrical plants | 103 MW | 383 GWh |
| Gas turbines | 42 MW | 115 GWh |
| Geothermal plants | 70 MW | 360 GWh |
| Isolated systems (diesel) | 12 MW | 24 GWh |
| Total capacity | 387 MW | 1,643 GWh |

The transmission and distribution system contains 230kV interconnections with Honduras and Costa Rica/Panama, and trunk lines connecting the main power stations and transformer sub-stations. The total capacity of the transmission transformers is 454 MVA. There are 328 km of 230 kV, 908 km of 138 kV, and 752 km of 69 kV transmission lines.

The distribution system is organised in three regions, which handles its own operation maintenance and sales. There is a total of 694 MVA installed in distribution transformers. The distribution lines have a total length of 9,511 km primary lines and 5,734 km secondary lines.

### 1.2.3 Consumption of electrical energy

The consumption of electrical energy in 1994 according to type of consumer was as follows:

| | |
|---|---|
| Residential | 401 GWh |
| Commercial | 191 GWh |
| Industrial | 212 GWh |
| Official | 58 GWh |
| Public lighting | 21 GWh |
| Irrigation | 102 GWh |
| Pumping | 104 GWh |
| Total | 1,089 GWh |

### 1.2.4 Organisation of the power sector

From 1979 until the end of 1994, Nicaragua's electric power was managed by Instituto Nicaragüense de Energía, INE, which had the function as ministry, regulatory body and power company. In 1995 INE was divided into two institutions: INE and ENEL. INE retained its responsibilities for setting policies, planning, developing natural and renewable resources and hydrocarbons and acting as regulatory body. A new organisation called ENEL, Empresa Nicaragüense de Electricidad, was established as the national power company, functioning as the technical and entrepreneurial entity responsible for generation, transmission and distribution of electric power in the country. An electricity bill was also prepared in 1995.

A new energy bill proposes an institutional organisation that covers the whole energy sector, both at the normative and the regulatory level, in order to maintain an integral and coherent vision of the sector. Normative functions are proposed to be carried out by a State Ministry or Organisation, while the regulatory functions would be the responsibility of INE.

The future deregulation scenario is that the structure of the electrical industry in Nicaragua will be separated into generation, transmission, distribution and commercialisation segments. Horisontal disintegration will be achieved by allowing the existence of several generation and distribution companies. Production of

electricity will be completely liberalised and transmission will be operated under open access. The rate system will combine free and regulated prices.

### 1.3 International Donor Support

At present, there are three main multilateral organisations providing support to the energy sector: IDB, BCIE and EU. The World Bank, which previously financed several major energy programmes in Nicaragua, has not been involved in this sector for several years.

Bilateral support to the energy sector has been provided by a number of countries, e.g. Austria, Canada, Denmark, Germany, Finland, Italy, Norway, Spain, Switzerland, Venezuela and USA. The support has primarily been directed to two areas: rehabilitation of thermal power plants and expansion of the transmission system.

Denmark has phased out its support. Changes have also occurred during the past years and since Sweden's energy support was discontinued.

## 2. SWEDEN's SUPPORT TO THE ENERGY SECTOR

The Swedish bilateral support to Nicaragua was initiated in 1979 and amount to over 3,000 MSEK. Since the beginning of the 1980s, roughly 250 MSEK has been directed to the energy sector.

The Swedish support to Nicaragua's energy sector comprises four main programmes:

- Hydropower development
- Rehabilitation of Planta Nicaragua, including technical assistance
- Institutional reinforcement of the energy authorities
- Gender activities to enhance women's opportunities in the sector

### 2.1 Hydropower development

There have been three major hydropower projects in the energy cooperation between Sweden and Nicaragua.

#### 2.1.1 Small scale hydropower development

The co-operation between Nicaragua and Sweden in the field of small hydro power plants was initiated in 1981. In 1983 a prefeasibility study, covering various projects in the range 0.2-15 MW was carried out. In 1985/86 the design of Las Canoas (1665 kW, 9.52 GWh) and Wabule (1500 kW, 7.12 GWh) was completed

The objective of the co-operation programme was to increase the amount of electric energy produced in hydro electric power plants, which would reduce the need for

imported hydro carbons and thus save foreign currency. Emphasising small hydro power plants would furthermore facilitate the creation of isolated networks in rural areas. Another important objective was to reinforce the technical capacity within INE in the fields of executing prefeasibility studies, feasibility studies, design and construction of small hydro power plants.

The small-scale hydropower development in Nicaragua was evaluated in conjunction with an assessment of similar projects in India and Ethiopia in 1998.

### 2.1.2. Rio Viejo Master Plan

In 1993-1994, a Master Plan of Rio Viejo was performed in order to investigate the most feasible location for hydropower generation development. At the same time, a design review and tender design for the Los Capules project was undertaken. During the cause of the work, the attractiveness the Los Capules project was questioned, as previously defined. It was therefore decided to extend the Swedish support to include a pre-feasibility study of the Los Capules 2 and the La Sirena projects. The Master Plan recommended the development of the La Sirena hydropower project

The Master Plan and the Los Capules project have been subjected to comments and second opinions by independent experts.

### 2.1.3 La Sirena Study

As a result of the Rio Viejo Master Plan, a feasibility study of the La Sirena hydropower plant was undertaken. The Draft Feasibility Report was issued in December 1994, and an addendum was issued in February 1995. The conclusion of the feasibility study was that the project would yield an acceptable benefit to society and show acceptable EIRR values. The project was also considered to be feasible from an environmental and social point of view.

The feasibility of the project was confirmed by an independent team of international experts in an Appraisal Report in June 1995.

## 2.2 The rehabilitation of Planta Nicaragua

Planta Nicaragua is an oil fired condensing power plant with a maximum capacity of 2x50 MW, supplying one-third of the electricity demand. Sida has supported the rehabilitation of the power station since 1988.

The first phase of the support covered rehabilitation of boiler unit No 1 and included some training of personnel.

The second phase included the rehabilitation of boiler unit No 2 and turbo generator No 2, as well as training.

The third phase comprised a major overhaul of turbo generator No 1 with auxiliaries and a comprehensive training programme for plant personnel, including implementation of computerised systems for planning and management routines for maintenance and efficiency monitoring of the plant.

The consulting services for capacity building during phase three have been subject to audit and evaluation in 1996.

### 2.3 Institutional reinforcement of the energy authorities

Sida has supported INE since 1993 in capacity building and restructuring of the energy sector organisation. Initially the support was directed to technical and administrative activities comprising business control, tariffs, cost analysis of generation/transmission, losses, distribution expansion and budget forecasting.

The second stage, which was carried out in 1995, was based on Terms of Reference outlined by the Inter-American Development Bank (IDB) with the objective to improve the sector as a whole.

### 2.4 Gender activities to enhance women's opportunities in the sector

Sida has supported INE/ENEL during the period 1987-1996 in their efforts to give equal opportunity for women and enhance the capacity building of female staff at all levels. This support was evaluated in 1997.

## 3. REASONS FOR THE EVALUATION

The Swedish support to the energy sector in Nicaragua was concluded in January 1998, with the exception of one project that was completed in 1999. Apart from Sida's general effort to concentrate its development assistance to a limited number of areas in the respective co-operating countries, the decision to discontinue the support to the energy sector in Nicaragua has been guided by the Swedish government policy to focus on poverty reduction, where other sectors were considered to be prioritised.

No comprehensive evaluation of the Swedish energy sector support to Nicaragua has yet been undertaken. In 1996 a partial evaluation and audit of the consulting support to Planta Nicaragua was performed. Four energy sector studies, with somewhat different scope, were made in 1983, 1988, 1991 and 1996. An assessment of the two mini hydropower plants was undertaken in 1997, and the gender activities were evaluated in 1997.

As the support to the energy sector now is concluded, there is a need to summarise the results and experiences of the assistance. Sida has therefore decided to undertake an evaluation of the major components of the support to the energy sector in Nicaragua.

## 4. PURPOSE AND SCOPE OF THE EVALUATION

The purpose of the evaluation of the Swedish support to the energy sector in Nicaragua is to summarise the programme results and sector impact of the support and to assess if the sector strategy has lead to the anticipated results. The evaluation should also assess the effectiveness and efficiency of the utilisation of development assistance funds. The lessons learned from of the evaluation should be possible to apply in other energy sector support programmes.

The evaluation should encompass the whole sector support. It should focus on the support that has not been subject to any previous comprehensive evaluation or assessment. Previously evaluated components should not be re-evaluated, but the conclusions from these evaluations or assessments should be incorporated into the evaluation in order to provide a complete picture of the sector support.

The following three programme components should be evaluated:

1. The hydropower development
2. The rehabilitation of Planta Nicaragua, including investment and capacity building
3. The institutional reinforcement of the energy authorities

These three components should be evaluated on a programme and sector level, rather than putting the focus on the individual projects within the programmes.

## 5. THE ASSIGNMENT

The evaluation shall address the following issues:

1. Which have been the objectives, targets and rationale set out by Sida for the Swedish support to the sector?

2. To what extent have objectives and results been achieved in the various programmes, in relation to Sida's sector objectives? What have been the causes of high or low achievement?

3. Has the Swedish support been relevant over the years in relation to the (changing) needs and problems as identified and experienced by the recipient?

4. What results and what impact on the development of the sector has the Swedish support had, positive as well as negative? What role and significance has the Swedish support played?

5. To what extent has the support contributed to permanent and sustainable changes or improvements in Nicaragua's capacity to develop its energy sector?

6. Have any unforeseen effects from the development occurred, positive or negative?

7. What environmental considerations have been taken in the development of the Nicaraguan energy sector?

8. What are the results and benefits of the support for the entire sector, in terms of reliability and quality of supply of electric power, as well as in relation to capacity building and the liberalisation and restructuring within the energy sector?

9. What are the total contributions through Sida to the sector, economically and in terms of power supply and reduced import of primary energy?

10. Have the resources been utilised efficiently? Could the same or better results have been achieved with less resources? Could the allocated resources have been utilised more efficiently?

11. What are the important lessons to be learned from the Swedish involvement - both general experiences in terms of development cooperation, and specifically, with regard energy sector support.

## 4. METHODOLOGY, EVALUATION TEAM AND TIME SCHEDULE

### 4.1 Methodology

It is envisaged that the evaluation shall commence with the studying of background documents and the interviewing of representatives from firms involved in studies, technical assistance and supplies for the projects, as well as relevant Sida officials. The major fact-finding shall take place on the respective project sites in Nicaragua, and by interviewing key officials at relevant authorities, as well as Sida's representatives in the country.

Relevant publications and reports will be made available from the Swedish Embassy in Managua and from Sida/INEC in Stockholm. Selected official data and statistics will also need to be collected in Nicaragua.

The evaluation should be carried out by the application of internationally recognised evaluation methods. The intended approach and methodology for the evaluation shall be specified in the tender, and will form part of the Contract between Sida and the selected Consultant

### 4.2 Evaluation Team

The evaluation shall be carried out by an Evaluation Team headed by a Team Leader. The Team Leader is to have documented experience of evaluation in a team leader position. The Evaluation Team shall be composed of professionals within necessary disciplines, preferably with evaluation experience. Sufficient knowledge and

experience of Swedish and/or international development assistance is also required within the Team.

The Team members should neither have been assigned by a company or as an individual within the Sida financed energy sector support to Nicaragua. However, experience from Latin America or other development countries is beneficial.

Proficiency in the English and Spanish languages is a requirement.

### 4.3 Time Schedule

The evaluation is expected to commence in early May 2000, and to be fully completed according to the agreed time schedule.

## 5. REPORTING

It is recommended that a preliminary draft evaluation report be produced while in the field. The Evaluation Team shall present at least a draft summary of the evaluation, covering the preliminary findings and conclusions, to relevant recipient representatives and to Sida officials before leaving Nicaragua.

A Draft Final Evaluation report shall be presented to Sida within four weeks after the completion of the visit to Nicaragua.

The Consultant shall present a Final Evaluation Report to Sida within 2 weeks after receipt of Sida's comments.

The Evaluation Report shall follow Sida's standardised format (Evaluation Manual for Sida, issue of 1994, Annex 3), and should be written in the English language. It should also include an Executive Summary in Spanish. Word for Windows or a compatible programme shall be used and the Evaluation Report should be presented in a way that enables publication without further editing. Sida shall be provided with ten copies of the Evaluation Report and on diskette. Subject to decision by Sida, the report will be published within the Sida Evaluation Series.

The evaluation assignment includes the production of a summary in English according to the guidelines for Sida Evaluation Newsletter, annex 6, and the completion of a Data Work Sheet, annex 7.

**Recent Sida Evaluations**

**00/20** **Regional Programmes FARMESA, Farm-level Applied Research Methods in Eastern and Southern Africa and RELMA, Regional Land Management Unit.** Jan Eriksson, Eva Tobisson, Ian Walton.
Department for Natural Resources and the Environment

**00/21** **The Protection, Promotion and Support of Breastfeeding. An evaluation of Dutch and Swedish support to organisations working in the field of breastfeeding. J**erker Carlsson, Ria Brouwers, Vivienne Forsythe, Sissel Hodne Steen.
Department for Democracy and Social Development

**00/22** **Fighting Poverty Strategically? Lesson fromSwedish Tanzanian development cooperation, 1997-2000**. Overseas Development Institute.
Department for Africa, Department for Evaluation and Internal Audit

**00/23** **Export Promotion of Organic Products from Africa. An evaluation of EPOPA.** Kim Forss, Emma Sterky.
Department for Infrastructure and Economic Cooperation

**00/24** **Sida Supported Environmental Research Projects in Tanzania**. Tom Alberts, Marcelo Dougnac.
Department for Research Cooperation, SAREC

**00/25** **Feeder Roads Programme, Mozambique**. Nils Bruzelius, Peter Bentall, José Luis Rocha Lobo
Department for Infrastructure and Economic Cooperation

**00/26** **Sida Supported Master of Science Program by Distance Education in Mozambique, Vietnam, Cambodia and Namibia**. Karlis Goppers, Björn Baaberg, Alicia Borges-Månsson, Richard Noonan
Department for Democracy and Social Development

**00/27** **MacroFinancial Support to Mozambique.** Nordic Consulting Group.
Department for Africa

**00/28** **AIDS, STD Health Action Project in Indica, Mumbai. An evaluation of ASHA.** Anjali Gopalan, S Sundararaman
Asia Department

**00/29** **Sustainable use of Groundwater Resources. An evaluation of SUWaR, Nicaragua.** Ingvar Åhman
Department for Natural Resources and the Environment

**00/30** **Cooperación para la Democracia y Derechos Humanos en Nicaragua, 1997-2000.** Almachiara D'Angelo, Fredrik Uggla, Juan Faroppa
Department for Latin America

**00/31** **Empowerment of Women through Panchayati Raj in Rajastahn and Orissa, India**. D.K. Manavalan
Asia Department

**00/32** **Support to the "We Plant Trees" Foundation.** Göran Haldin, Bert Koppers, Rosina Auren
Department for Natural Resources and the Environment


## Sida Evaluations may be ordered from:

Infocenter, Sida
S-105 25 Stockholm
Phone: +46 (0)8 795 23 44
Fax: +46 (0)8 760 58 95
info@sida.se

## A complete backlist of earlier evaluation reports may be ordered from:

Sida, UTV, S-105 25 Stockholm
Phone: +46 (0)8 698 5163
Fax: +46 (0)8 698 5610
Homepage:http://www.sida.se

SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
S-105 25 Stockholm, Sweden
Tel: +46 (0)8-698 50 00. Fax: +46 (0)8-20 88 64
Telegram: sida stockholm. Postgiro: 1 56 34–9
E-mail: info@sida.se. Homepage: http://www.sida.se