

Project Name Chile-Chacabuguito Hydroelectric Power Project...  
Proposed Purchase of Emisión Reductions (PCF)

Region Latin America and the Caribbean Region

Sector Energy

Project CLPE74619

Borrower(s) Republic of Chile

Implementation Agency(ies) Hydroelectrica Guardia Vieja, S.A.

Environment Category

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#### 1. Country and Sector Background

##### Power sector

Chile was the first country in Latin America to implement far-reaching power sector reforms, including vertical separation of sector activities and privatization, under the principles of the 1982 General Electricity Law. Subsequently, the Chilean power sector has served as a model for sector reforms and privatizations in the rest of the region. The Chilean power sector is currently characterized by an unregulated competitive generation (with no entry restrictions), open access to transmission and distribution networks, and private participation at all levels. The sector has a sound legal and regulatory framework and well established regulatory and oversight agencies. Currently 26 generation, 5 transmission, and 36 distribution companies are operating in Chile, all of them private. The 1980s reforms were successful in setting ground for a continuous, private sector-led expansion of the generation capacity, as well as transmission and distribution networks, capable of keeping pace with the fast demand growth, averaging 7.5% p.a.

##### Environment

Environment-related issues continue to present important challenges for the power sector, as a large proportion of the energy sold still proceeds from highly polluting coal-fired plants, even though these are being slowly displaced by newer (more efficient and less expensive) technology based on natural gas (combined cycle plants). Still, in SIC (central interconnected system, where the project will be located), energy from coal-fired plants accounted for approximately 12 % (3,750 GWh) of total electricity produced during the year 2000. This figure was even higher in the 1997-99 period, due to severe drought. This production from coal-fired plants results in over 3,500,000 tCO<sub>2</sub> emitted to the air per year. This situation is

unlikely to change in the near future, as the coal plants are expected to be needed in order to meet fast demand growth, estimated to be an average 8% p.a. in the next decade. In addition, the most important coal plant, Guacolda, is relatively new and efficient, built only in mid 1990s.

## 2.Objectives

The objective of the project is to support development of the international market mechanism for the new commodity known as "Emission Reduction" (ER), developed in the framework of the Kyoto Protocol. In this particular case, the project will facilitate reduction of CO2 emissions in Chile through substituting electricity produced by thermal plants with electricity from a Chacabuquito run-of-the-river hydro plant.

The project is supported by the Prototype Carbon Fund (PCF). PCF supports projects that produce high quality greenhouse gas ER which could be registered with the United Nations Framework Convention on Climate Change (UNFCCC) for the purposes of the Kyoto Protocol.

## 3. Rationale for Bank's involvement

The PCF was established with the objective to pioneer the ER purchase transactions. The Bank's involvement was seen critical in terms of ensuring quality of the first projects, as well as institutionalizing experiences and ensuring replicability of the projects, while providing necessary project due diligence and other fiduciary responsibilities.

The value-added of Bank support also includes the availability of in-house expertise in managing energy and environmental projects, ability to mobilize global experts with long experience in the field, technical support for project preparation and supervision capacity.

## 4.Description

The Chacabuquito Project is being developed by Hidroeléctrica Guardia Vieja (HGV), a Chilean private company, and consists of a run-of-the-river power plant of 25 MW capacity that utilizes the waters of the Aconcagua river and will produce an average annual generation of 160 GWh. The project is located in the 5th Region of Chile, near Los Andes, about 100 km Northeast from Santiago. The project's construction time is approximately 15 months and is expected to be completed in 2002. The construction is financed fully by HGV.

The project will consist of hydroelectric generation that will displace thermal generation, therefore producing ER. For the purposes of the project, the Emission Reduction Purchase Agreement (ERPA) will be signed between PCF and HGV, the implementing party ("project sponsor"), accompanied by the Monitoring and Verification Protocol (MVP) that will specify

rules and procedures for calculation and certification of the actual ER produced. The quantity and price of ER are negotiated between the two parties, but the quantity is based on the estimates of the baseline study, implemented and verified by independent experts. PCF and HGV have agreed to contract ER of one million tCO<sub>2</sub> at a price of US\$3.5/tCO<sub>2</sub>.

It is expected that the Chacabuquito plant will become operational in 2002 and the same year the first ER should occur. The actual amount of the annual ER will depend on the type of power generation displaced by the Chacabuquito project (more polluting coal vs less polluting natural gas). PCF will purchase the total of 1 million tCO<sub>2</sub>, corresponding to US\$3.5 million, in the period of 7-15 years. After reaching one million tCO<sub>2</sub> target, PCF has an option to purchase additional 500,000 tCO<sub>2</sub> of ER at the agreed price.

## 5. Financing

The project consist in the purchase of ER by the PCF. The payment is only against the delivery of the certified ER. Apart from this PCF support, the project does not include any World Bank or IFC financing. The construction of the Chacabuquito plant is fully financed by HGV, the project sponsor.

## 6. Implementation

Prototype Carbon Fund (PCF):

The Bank established PCF in July 1999, with the operational objective of mitigating climate change. PCF supports projects expected to generate greenhouse gas ER while complying with requirements of Joint Implementation (Art. 6) and the Clean Development Mechanism (Art. 12) of the Kyoto Protocol.

PCF purchases high quality greenhouse gas ER which could be registered with the UNFCCC for the purposes of the Kyoto Protocol. PCF enters into irrevocable ERPA and accompanying MVP with "project sponsors" - in this case HGV, defining the quantity, price and other delivery conditions of ER to be purchased by PCF, as well as accompanying institutional arrangements, including the monitoring and verification systems and methods. Independent experts provide baseline validation and verification/certification procedures for emissions reductions that respond to UNFCCC rules as they develop.

Project sponsor: Hidroeléctrica Guardia Vieja, S.A. (HGV):

HGV is a subsidiary of Minera Valparaiso, SA, a public and diversified holding company controlled by Grupo Matte. Minera Valparaiso began operations in 1906 and has become one of Chile's strongest economic groups. This diversified organization has activities in energy generation and retail, port services, forestry pulp and paper industry, and in real

state investment and development. HGV is fully controlled by Minera Valparaiso and has been involved in ownership, development and operation of hydro-power plants since 1939. HGV has successfully owned and operated two other run-of-the-river plants: Los Quilos (39MW) and Aconcagua (72MW) on the Aconcagua river.

The Government:

The role of the Government in the implementation of the project will be limited and will concentrate on two areas:

- (i) ratification of the Kyoto Protocol and setting the rules and mechanisms allowing both public and private entities (including HGV) to produce and sell ER, in accordance with mechanisms established by the Kyoto Protocol and related negotiations;
- (ii) regulatory and oversight responsibilities of the respective power sector and environmental agencies as described below.

## 7. Sustainability

The project is expected to be sustainable. The power sector in Chile is well developed, mature, liberalized, with efficient regulatory agencies. The Chilean power sector was reformed already in 1982 through the General Electricity Law, which introduced privatization and unbundling of generation, transmission and distribution activities. Since then, the sector has been performing well, even though certain adjustments and fine-tuning are still needed. Overall, the sector and regulatory risks are minimal.

On the technical side, the feasibility of the technical design was confirmed and emission reductions were estimated in the baseline study, and verified by an independent validator. The project will be developed by a private entity (HGV), experienced in construction and operation of similar run-of-the-river plants on the same river. HGV has a strong and experienced management team with a successful track record. HGV's existing hydro-power plants are modern, well maintained and operated efficiently, according to the highest technical standards. HGV's financial management has been prudent and profitable, as evidenced by its conservative balance sheet and stable profit record. Financial analysis of the project confirmed its financial viability.

## 8. Lessons learned from past operations in the country/sector

The proposed Chacabuquito project is one of the first projects of the PCF portfolio that is implemented by the private sector. This private sector orientation is essential in the case of Chile where all power sector activities are in the hands of the private sector. The experience with similar type

of project that could be reflected in the project design is therefore very limited. Nevertheless, the project has benefited from the coordination and consultations with parallel PCF projects that are being developed in Latin America (Costa Rica, Colombia, and Nicaragua).

9. Program of targeted intervention (PTI) n or ye?  
Not applicable

10. Environment Aspects (including any public consultation).

This category B project complies with the World Bank's environmental and social safeguard policies

The project area is not highly complex particularly from the socio-economic and ecological perspective. The watershed has been long intervened by human settlements, mining activities and hydroelectric projects that date over 40 years. The region is served by an international highway with heavy traffic (3,600 vehicles per day on average). Camp sites, hotels and other recreational areas have sprawled along the highway. In addition to the highway, the area is crisscrossed by power transmission lines, a railroad from the copper mines upstream, and irrigation canals that feed agricultural activities in the valley downstream. Neither Chacabuquito plant nor any of the upstream plants operated by HGV entail any physical construction such as dams and dikes, or cause reservoir-like impoundments on the Aconcagua River or any of its branches. Low height diversion weirs are placed on the river bed to ensure adequate diversion of water and hydraulic heads during the low-flow winter months.

An environmental assessment was carried out to highlight locations of highest potential impact. The Environmental Assessment Report (EAR) was submitted to the World Bank by HGV and was found to conform fully with Bank policy guidelines regarding environmental and social concerns. Environmental Management Plan (EMP) was established with the following main provisions:

Minimum Ecological Flow: The most important environmental measure for the project is the requirement by law to keep a minimum flow of 3 m<sup>3</sup>/s in the stretch of Aconcagua river affected by the project. This requirement will be monitored by DGA.

Reforestation Plan: The density of trees is quite low. Any tree removed due to construction activity needs to be compensated for by planting three trees for every tree cut. All reforestation will be with native vegetation, including species of concern, for a total estimate of 28,000 trees to be planted. The Plan establishes the protection of riverine vegetation along two streams that cannot be cleared during construction activities. Cutting of algarrobo and guayacan will be avoided as possible, and these trees will have to be clearly identified prior to initiation of construction activities.

Environmental Management during Construction:

Environmental and social mitigatory measures to be implemented during the construction phase are included in technical specifications that will be included in bidding documents and construction contracts.

The Environmental Management Plan will be implemented by HGV through its contractors and will be enforced by a construction inspection firm.

Social impact and consultations. The host environment of the Chacabuquito project is relatively thinly-populated. No extensive agriculture is practiced in the area and there are no indigenous people. Careful selection of Right-of-Way alignments for all canals, penstock and transmission line avoided any major need for resettlement of families. Only one dwelling will have to be relocated and the project will build a new brick house on a site within the same lot. There have been extensive consultations and negotiations with all land owners and land uptake has been kept to a minimum. All negotiations on land acquisition/compensation have been completed. There have been also extensive consultations with the owners of the Los Quilos Canal, the downstream farmers which resulted in several reroutes of the canals and relocation of the compensatory reservoir.

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