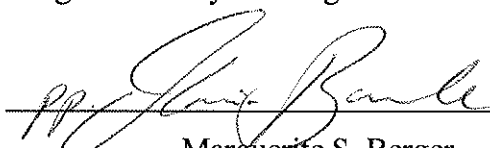


ATACAMATEC
SUPPORT FOR LARGE SCALE SOLAR POWER IN NORTHERN CHILE

CH-T1122

CERTIFICATION

I hereby certify that this operation was approved for financing under the Sustainable Energy and Climate Change Initiative (SECCI-SCI) through a communication dated on September 15, 2011 and signed by Gerhard Lair (VPC/GCM). Also, I certify that resources from the Sustainable Energy and Climate Change Initiative (SCI) are available for up to \$650,000 in order to finance the activities described and budgeted in this document. This certification reserves resources for the referenced project for a period of 12 (twelve) calendar months counted from the date of signature below. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US Dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this KCP. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, for which the Fund is not at risk.

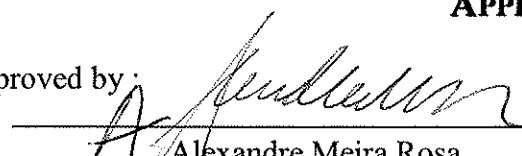


Marguerite S. Berger
Chief
Grants and Co-Financing Management Unit
VPC/GCM

10/07/2011
Date

APPROVAL

Approved by :



Alexandre Meira Rosa
Sector Manager
Infrastructure and Environment Sector
INE/INE

12/12/11
Date



Knowledge and Capacity Building Products (KCP) Proposal

Policy and Capacity Development

I. General Information

KCP Title:

ATACAMATEC-Support for large scale solar power in northern Chile and marine energy in southern Chile

OPUS Number:

CH-T1122

Date of Proposal:

9/8/2011

Linked to project:**Team Leader / Unit:**

Walter Vergara (INE/ECC)

Peer Reviewer 1:

Maria Netto (INE/ECC)

Peer Reviewer 2:

Ivan Nunez (SCF/CFI)

Joint Proposal:

Proposed amount, without counterpart in USD equivalent (enter whole number only): USD650,000

Must match total of budget table on section VI, and of OPUS

Proposed amount including counterpart (if applicable) in USD equivalent:

USD812,500¹

Proposed Fund: Sustainable Energy and Climate Change Fund

Unit of Technical Responsibility:

INE/ECC

Unit of Disbursement Responsibility:

INE

Execution:

Bank

Letters of Request available (or equivalent)

Yes

Non-objection available:

No (Underway)

No objection has been requested DIPRES

Doc# (IDBdocs): 36442790**Doc# (IDBdocs):****Execution period:** 24 months**Disbursement period:** 26 months**Required Start Date:** 12/12/2011

Please provide justification why the Bank is the Executing Agency:

IDB will execute this KCP because it was originated internally and at the same time the government of Chile requested the IDB to be executing agency.

Beneficiary Countries:

CHILE

Beneficiary entity:

Energy Ministry - MINENERGIA

Sector: ENERGY

II. KCP Type

Origination

Originated in Bank: KCP is the result of initiatives generated within the Bank.

These initiatives may include deepening the Bank's knowledge in new subjects, interpreting new economic and social phenomena, generating new databases and diagnostic tools, or organizing a seminar, workshop, a regional policy dialogue, training, a publication.

Scope

¹ The counterpart will be US\$162.500 in kind, equivalent to 20% of the total cost of the project.

Forward-looking purpose:

Demand for this KCP serves a longer-term, forward-looking purpose that may require the accumulation of new knowledge and experience. These products usually require a longer deployment time.

III. Alignment of the KCP proposal with IDB's Institutional Priorities (GCI9).

2. Infrastructure for Competitiveness and Social Welfare

Energy

3.1 Explain how the knowledge produced with this KCP will be used (policy advice, institutional strengthening, input for programming and strategy, pipeline development, input for other KCPs):

The proposed KCP (ATACAMATEC) will be used to build upon previous studies like 1. A Global Environment Facility (GEF) funded project for Chile (CH-X1007) that contributes to identify and overcome barriers for the development of solar energy in Chile; 2. The IDB financed study on Chilean Marine Energy Resources² which identified high marine energy (wave- and tidal energy) potential on the Chilean coastline.

This KCP will facilitate the advancement of the solar energy agenda by focusing on the identification of barriers and options for their removal in the specific context of technologies such as Photovoltaic (PV) and Concentrated Solar Power (CSP) in the country's northern region. Chile is the focus of the activity, given its very large endowment of solar energy (estimated by the Government to be in the neighborhood of 200 GW). The analysis and options identified will be germane to the eventual deployment of solar energy-based power generation capacity. This will require: (i) an energy framework that enables and encourages the use of solar energy; (ii) substantial capital investment; (iii) upgrade of technology, regulatory and financial skills, both in public and private sector (including banking); and (iv) a suitable set of financial mechanisms, including climate finance, to articulate the above mentioned subject in a harmonious, transparent and coherent way to achieve large-scale technology deployment.

At the same time this KCP will support the government in its long term strategy of building a local marine energy industry by providing technical assistance for the design and implementation of a bidding process for the deployment of two pilot projects. Given the very early development stage of marine energy technology this support is crucial to set up the pilot projects properly in order to build a base for further local development of this technology.

IV. OBJECTIVES, EXPECTED RESULTS AND ACTIVITIES (Maximum 4 pages)

4.1 Describe the challenge that this KCP addresses (e.g. policy, institutional, technical):

The main challenge this KCP intends to address is of technical nature. The development of large-scale solar energy technology applications in Chile is hampered by a number of barriers. Such barriers include a better understanding of the different technologies to harvest local energy resources (centralized vs demand specific), technology options (tower, parabolic through, Fresnel, others); the regulatory gaps regarding inter-linkages among the current sub-sector stakeholder built upon an apparently no favorable regulation environment, which not create enough incentives for solar technology deployment; the financial conditions that would make the solar option competitive with currently existing technologies (e.g. coal, gas fired thermal plants) and the infrastructure gaps that prevent wider use of the solar option to the regional and national grids. Also, there is a need to better understand the conditions under which private capital would find investments in solar power attractive in the Chilean market.

On the other hand, Marine energy technology is still in an early development stage and has not been commercialized yet. A limited number of projects have been deployed worldwide focusing on Research and Development in order to further develop the technologies and as pilot project to test already developed ones. As a consequence investment costs are very high and can vary considerably between technologies and deployment sites.

4.2 Describe lessons learned from previous similar KCP:

Solar resource availability has already been studied to some extent in northern Chile. Long term estimations have been performed by Universidad Técnica Federico Santamaría (UTFSM) and the Ministry of Energy (ME); also the Comisión Nacional de Energía (CNE) jointly with the Geo-physics Department, of the Universidad de Chile developed an on-line tool for wind and solar resource assessment on behalf of CNE using remote sensing information available (the Explorador Eólico Solar del Norte de Chile) <http://condor.dgf.uchile.cl/EnergiaRenovable/Norte/>. The government of Chile plans to tender a grid connected PV farm (0.5 MW) and a Concentrated Solar Power (CSP) of at least 5 MW_{electric} installed capacity. To this end, the selected investor will receive an incentive from the government to cover the investment cost difference between the conventional energy supply solution (fossil-fuel based) and the low carbon technology selected. According to these and other studies, the north of Chile (Atacama

² Preliminary Site Selection-Chilean Marine Energy Resources, Garrad Hassan, 2009

Desert) has one of the highest levels of solar irradiation in the world but until now no large scale solar power plants are making use of this resource in the region. Only recently has been announced the development of a couple of new CSP plants with a thermal potential of 5MW and 7MW to provide thermal energy to a mine and a coal fired power plant respectively. The state-owned Chilean mining company CODELCO announced the construction of a 1MW solar PV plant "Calama Solar 3" project. Also, the Commission for Environmental Assessment (CONAMA) through its Environmental Assessment System (Sistema de Evaluación de Impacto Ambiental - SEIA) approved the projects "Lagunas" (30MW PV) and "Pozo Almonte Solar 2" (7.5MW PV). However, it is unclear whether these SEIA approved projects will actually be built and are financially viable with current technology prices, electricity regulations, and energy prices. At the same time electricity consumption levels are very high in northern Chile, due to an economic development concentrated around the mining sector. Installed capacity in the northern interconnected System (Sistema Interconectado del Norte Grande, SING) is 3,575MW with an annual electricity production in 2010 of 15,100GWh (57.9% coal, 26.8% gas, 15.0% diesel, 0.4% others) of which 90% can be attributed to mining and industry. The mining process also requires large amounts of low temperature thermal energy input which is currently provided by fossil fuels (mainly diesel which requires huge logistical efforts to reach the usually remote mines) and could be replaced by solar thermal power. In 2009, copper producers in that region estimated that energy costs went from only 10% of total production costs to a steep 16-18%. In addition, where desalinated water has to be pumped over large distances conveyance cost represents a significant component of the total energy bill for companies and consequently the region. Despite this favorable environment (solar resource and energy demand in close proximity) financial, regulatory, knowledge and technological barriers, among others, still prevent large scale deployment of solar power in northern Chile. A detailed assessment of these challenges in order to create cost-efficient solutions is urgently needed. As mentioned before, this KCP complements the GEF funded project CH-X1007 which uses local co-financing of USD\$15 million earmarked by the Government of Chile for promoting instruments such as solar energy-related incentives. These shall consider all solar energy technologies commercially available.

Regarding marine energy, the above mentioned study² on Chilean Marine Energy resources identified priority locations for the deployment of wave and tidal energy projects and estimated the marine energy resource at 165GW for wave- and 600-800MW for tidal energy respectively. Based on these results the government of Chile now plans to set up one pilot project for wave- and one for tidal energy.

4.3 State the KCP objectives:

The objective is to promote the conditions that would allow large scale deployment of solar energy technologies in the north of Chile and deployment of a marine energy pilot in the south. Specific objectives of this KCP for solar energy are: (i) The estimation of the infrastructure required to promote the development of solar energy solutions; (ii) the analysis of the existing regulatory framework gap to define concrete actions toward the support required within the framework to enhance the conditions for solar technology deployment; (iii) the study and design of suitable financing mechanisms and its business models to allow the energy market access to solar technologies and finance for its implementation

The specific objective of this KCP for marine energy is to adequately design the bidding process for two marine energy projects through the technical support for the preparation of technical background information, terms of reference and technical support for the evaluation process for the bidding process.

4.4 State the KCP expected results:

Expected results for solar energy are: (i) the necessary country-specific actions in terms of energy policy and regulatory framework to create proper conditions for large-scale investments in solar energy; (ii) the design of suitable incentive mechanisms to reduce technological risks perceived by investors and other Chilean stakeholders in the energy market through public instruments and private engagement; (iii) the identification of a large-scale solar energy pipeline project for northern Chile; (iv) three pre-investment study for the deployment of CSP or PV plants; (v) the dissemination of the results of relevant studies and the creation of awareness about solar energy; (vi) the design of a draft tender for a utility or mining company to purchase solar energy; and (vii) the development of business models for solar technologies including different subsectors like industry, mining, utilities.

The expected results for marine energy are; (vii) the preparation of the bidding process and the evaluation process for a marine energy pilot project.

4.5 Provide a description of the main outputs and related activities expected to be carried out:

The main output will be a detailed assessment of barriers and the options to overcome them, in order to facilitate market entry of the CSP and PV technologies in Chile. The assessment will include an evaluation of the regulatory framework; incentive mechanisms; technical, financial, economic and environmental criteria for appropriate new solar energy plants in northern Chile; a study of the water requirement for CSP facilities; assessment of required

infrastructure, as well as an identification of different options (scale, location, technology) for the deployment of solar technology. At least one full feasibility study and draft tender will be developed. The studies will be divided into three main areas of focus: (i) legal and regulatory and incentive mechanisms; (ii) prefeasibility and cost benefit studies for large-scale solar energy pipeline project development; (iii) Stakeholder meetings and events for dissemination.

These areas will encompass with the following activities: (i) legal and regulatory and incentive mechanisms: (a) evaluation of regulatory barriers and recommendations for specific regulations that would promote large scale solar energy; (b) evaluation and recommendations for formulation of specific financial incentives to be used by both: private and public sector banks such as the Chilean Development Agency (CORFO) and Banco Estado; (c) evaluation and recommendations for formulation of appropriate financial mechanisms to reduce/share the risk associated with large scale solar energy; (d) organization of stakeholder meetings including the mining association (consejo minero), power generation water distribution companies and the Economic Dispatch Center-SING (Centro de Despacho Economico de CargaSING; CDEC-SING). (ii) Prefeasibility and cost benefit studies for large-scale solar energy pipeline project development: (a) identification and evaluation of optimal locations and if necessary assessment of solar resource;(b) assessment of required infrastructure for the implementation of large scale solar capacity in Northern Chile, (This assessment should identify the commercially and technically viable potential of CSP and PV projects; including but not limited to: distance to transmission line, availability of water, operating and maintenance cost, availability of service providers in case of damage or malfunction of the solar units, etc); (c) support for a pre-investment study for the deployment of three solar plants; (d) identification of potential market size for local thermal energy demand; identification of potential benefit for water management in the region; (e) identification of potential off takers and project sites for: (1) Centralized stand alone and distributed electricity production; (2) power augmentation for existing thermal power plants through thermal energy hybridization; (3) Integration of solar thermal energy at mining sites; (f) assessment of technological options and plant size, including thermal energy storage, water requirements, yield assessment, conceptual design, CAPEX, OPEX and Levelised Cost of Energy (LCOE); (g) identification of possible environmental and social issues and mitigation plans to avoid these risks; (h) development of a draft tender for a utility or mining company that wishes to purchase solar energy. (iii) Dissemination of results in at least two high level seminars/workshops

The outputs related to marine energy will be technical background information and terms of reference and evaluation process to be used by MINENERGIA for bidding of the pilot projects. These will be developed by the following activities: (i) demand and infrastructure assessment of selected sites and identification of possible locations for project deployment; (ii) definition of technical data relevant for bidding docs and preparation of terms of reference for two projects (iii) Technical support in the evaluation process.

4.6 Identify the main audience or expected users of knowledge generated or disseminated by this KCP

The studies developed, after Government's approval, will be of use by Chilean energy authorities, policy makers, private sector and civil society. The analysis will be instrumental on ascertaining the potential for concentrated solar power in northern Chile. This might help IDB to extend solar projects to other countries with sizable solar energy endowments. On the other hand, the IDB financed study on Chilean Marine Energy Resources³ which identified high marine energy (wave- and tidal energy) potential on the Chilean coastline. This study can also help extend marine energy to other countries in the region with important potential.

Beyond the region, the results of the analysis and the methodology used would be of interest to countries in northern Africa and the Middle East. Results will be disseminated in at least two high level seminars/workshops.

4.7 Additional technical information

If necessary, in an appendix please provide further technical details that you consider relevant to evaluate the technical quality of this KCP. Appendix Doc#(IDBDocs):

V. KCPs RESULTS FRAMEWORK. Main Outcomes and Outputs.

5.1 Results Matrix:

Please, in the first column fill in each outcome indicator with the relevant outputs. You can use the table of indicators here attached.

Results Matrix

³ Preliminary Site Selection-Chilean Marine Energy Resources , Garrad Hassan, 2009

	Unit	Baseline		Year 1		Year 2		Expected Completion Date	Data Source
		Value	Year	Planned	Actual	Planned	Actual		
Regulatory/incentive mechanisms									
• Number of reports produced	#	0	2011	2				12/21/2012	
Large-scale solar energy pipeline project development									
• Number of reports produced	#	0	2011	3		1		12/21/2013	
Event for dissemination									
• Number of participants	#	0	2011			15		12/21/2013	

Note: Please note that this outcome and output indicators will be the input for the PMR and will be monitored in the Quarterly Business Review.

VI. BUDGET (*):

6.1 Budget should be presented by outputs or groups of outputs (for example: three publications, three conferences, seminars or workshops; one database; one survey; two training courses), and the relevant activities. Total available funds from counterpart sources should be reported. Use whole numbers only.

Costs	Project Cost – IDB Financing					Counter-part Resources	Other Financing
	Consult.	Year 1 Travel (consultants only)	Other	Year 2	Total request		
Regulatory/incentive mechanisms	100,000	7,000	0	0	107,000	40,000	0
• Evaluation and formulation of specific financial incentives/mechanisms	70,000	4,000			74,000		
• Organization of Stakeholder meetings		3,000			3,000		
• Evaluation of regulatory barriers and formulation of specific regulations	30,000				30,000		
Large-scale solar energy project development	281,000	20,000		100,000	401,000	110,000	0
• Identification and evaluation of optimal location	20,000	5,000			25,000		
• Assessment of required infrastructure	20,000	5,000			25,000		
• Identification of potential market size for solar	50,000	5,000			55,000		
• Support for pre-investment studies for the deployment of three solar plants	100,000	5,000		100,000	205,000		
• Assessment of technological options and plant size including economic and financial assessments for different options.	71,000				71,000		
• Identification of possible environmental and social issues	20,000				20,000		
Marine pilot bidding docs and evaluation support	49,000				49,000		
Event for dissemination	0	3,000	10,000	0	13,000	12,500	0

• Organization of event		3,000	10,000		13,000		
Sub-total	430,000	30,000	10,000	100,000	570,000	162,500	0
Contingencies			20,000		20,000		
Project Manager			50,000		50,000		
Monitoring and evaluation			10,000		10,000		
Total	430,000	30,000	90,000	100,000	650,000	162,500	0
Approximate value of in-kind counterpart						162,500	

(*) More details may be required by donors (e.g. consultant cost per day);

6.2 Describe the source and type of counterpart resources

In kind resources such as data, time of local personal, logistics support, among others

6.3 Types of Consultants: Firms or individuals and main activities/outputs:

Type: Individual or Firm (if available)	Nationality (if available)	Estimated Cost	Main Activities / Outputs
Firms*	International	530,000	All as described above

* Selection and contracting of consulting services will be done according to GN-2350-9, March 2011, *Policies for the Selection and Contracting of Consultants Financed by the Inter-American Development Bank*. Method of selection will be Quality and Cost Based Selection (QCBS)

VII. Bank costs:

For the Bank's internal purposes, please provide information in Bank costs associated with the execution of this KCP:

7.1 Bank staff participation in KCP:

Staff Name	Bank Unit	FTEs
BOHORQUEZ COLOMBO, ANGEL	SCF/INF	0.1
GISCHLER BLANCO, CHRISTIAAN	INE/ENE	0.3
DOYLE, PATRICK GLENN	SCF/SMU	0.3
VERGARA, WALTER	INE/ECC	0.1
CULVERWELL, MALAIKA EBONY ANIETIA	SCF/CFI	0.1

VIII. Risks:

Fill-out the KCP's Environmental Screening and Classification using this link to the [Environmental Screening and Classification Toolkit](#). Then save it in IDBDOCS and record its number in the box below (*):

36395430

8.1 Implementation Risks:

Lack of ownership. There is a risk that the Government authorities and other stakeholders do not identify the Chilean market reality with the analysis and the results. To address this risk, discussions and consultations are being held and these have resulted in the scope here presented. In addition, high level contacts have been established with the Minister, including the Minister and Vice Minister. The results of the analysis will be prepared and reviewed in consultation with Government Authorities.

Barriers too tough to remove. There is a risk that the magnitude and scope of existing barriers prevent their removal; however the current trends in policy and action on the ground regarding the deployment of renewable energy resources point toward the entry of these resources in the energy matrices of all countries. Different regulatory options and financial and structural measures will be reviewed.

Results of this KCP not taken forward: There is a risk that this study will be shelved and not promote large scale deployment of solar technology. However, this risk will be minimized as the study will engage the private sector (the mining sector in particular), who due to rising energy costs and public attention regarding their environmental footprint, have a strong interest in promoting clean, affordable energy in the region.

8.2 Please identify key environmental and social risks and impacts, and the strategy to address them:
Depending on the technology chosen, the projects may have environmental or social issues related to water use. The project will assess these risks, accordingly.

IX. Coordination with other MDBs

9.1 Summarize collaboration or coordination with other MDBs, donors and other strategic partners (if any):

The KCP will be reviewed by a panel of external peers, representing at least one MDB as well as bilateral development institutions. The KCP will be led by staff from INE/ECC, INE/ENE and SCF.

X. Monitoring and evaluation plan.

Fill-out the KCP's Development Effectiveness Matrix (DEM) using this link to the PCD [DEM template](#). Then save it in IDBDOCS and record its number (*):36393725

10.1 Summarize the basic elements of the Monitoring and Evaluation plan, including key activities and associated budget:

This KCP will be implemented in close cooperation with Chile's ministry of energy. All activities including selection of consultants, project supervision, review and approval of final products will be coordinated with the ministry. All processes and products generated by this KCP will be executed and generated by the Bank with the concurrence of MINENERGIA.

Monitoring of the operation will be done on a constant basis via communications and site visits by INE/ECC, INE/ENE, SCF and CSC/CCH.

A final evaluation will be realized once all resources have been disbursed. The final evaluation will be done by an independent consultant and all costs will be funded through this operation.

10.2 Exceptions to Bank policies:

None

10.3 Contractual Clauses:

None

Terms of Reference Doc#(IDBDocs):

(*) All documents saved in IDBDocs must have read permissions granted to the group DOCS Users