CHILE

SUPPORT TO MARINE ENERGY PILOT PROJECTS IN SOUTHERN CHILE (CH-T1139)

SUPPORT FOR TECHNICAL EVALUATION OF PROPOSALS RECEIVED

TERMS OF REFERENCE

I. BACKGROUND

Marine energy systems – wave energy and tidal current converters for electricity generation – are mostly at the pre-commercial stage of development. The leading wave and tidal energy concepts have in recent years reached full scale demonstration stage and in the next 1-2 years will reach a first farm deployment stage. These concepts still require research and pilot testing to be undertaken along the path to commercialization. Huge potential for cost reductions exist which can be achieved as a result of experience and economies of scale as installed capacity increases. Tidal current is currently the more mature technology as its devices are approaching a convergence of design*1* and there are more developers at full-scale demonstration stage. Activities are mainly concentrated in Europe, the US and Canada with increasing activity in Asia

Chile has one of the largest endowments of marine energy in the world. This resource could represent a significant and world-class opportunity for the development of low carbon power. The potential for marine energy (wave and tidal current) in the country has been characterized in the range of 100-200 GW[2], whereas installed capacity in Chile's four electricity systems (SIC, SING, Magallanes and Aysen) is around 17GW*3*. Marine energy would, in theory, be enough to supply current and future electricity needs several times and would in fact be sufficient to make Chile a net zero carbon power exporter.

Chile also provides a strong regulatory and business environment, incentives for new businesses, a stable and liquid local financial market, a suitable legal framework for start-ups and a macro-economic stability that could be the foundation for future investments in this field. The government of Chile (GoC) through the Investment Development Corporation (CORFO, acronym in Spanish for *Corporación de Fomento a la Inversión*) and the Ministry of Energy (MINENE, acronym in Spanish for *Ministerio de Energía*) wants to promote conditions for local and foreign companies, research entities and universities, to work jointly in order to create knowledge and experience, help further develop the technology and adapt it to local conditions and bring down its costs. Within this effort several activities are currently being implemented or planned (see table 1).

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1 Most concepts are based on bottom mounted horizontal axis turbines.

2 2009, IDB, Preliminary site selection for marine energy projects in Chile

3 2012, Comision Nacional de Energia

Table 1. GoC activities to foster marine energy development

Activity	Responsible	Timeline
Green Paper Marine Energy	MINENE	Finished by April 2013
Bidding for installation of a marine energy center of excellence	InnovaChile	Bidding to be launched in July 2013
National Marine Energy Strategy	MINENE	November 2013
Roadmap Marine Energy including public consultation of green paper	Aquatera	Finished by September 2013
Study on modification and/or possible revision of marine regulatory framework	MINENE	Bidding to be launched in May 2013
Development of environmental guidelines for project developers	MINENE	Bidding currently open until October 2013
Marine Energy Explorer (Explorador marino)	Universidad de Chile	Bidding to be launched in second quarter 2013
Study about GIS referenced use of coastal zones and marine energy potential	MINENE	Bidding to be launched in July 2013
Study about existing supply chain infrastructure	MINENE	To be initiated in May and finished by end of 2013
Marine energy pilot projects	MINENE/CORFO	Bidding to be launched in fourth Quarter 2013

Activities 1 and 10 were supported by IDB and the consultant WavEC as part of IDB's technical cooperation CH-T1122. Within activity 1 IDB provides input for the development of a Green Paper on Marine Energy. Within activity 10 two separate international competitive bidding processes will be prepared by MINENE and implemented by CORFO. A capital grant (CG) of up to USD10 million will be provided for one full scale tidal current energy project with a target rated capacity of 1MW and up to USD3.4 million for one small scale wave energy pilot project. The CGs are limited with up to 50% of the CAPEX for each of the pilot projects. The geographical project locations are open and will be defined by the winning bidder in their proposal. It is envisioned that a private sector company or companies (PSPC) be the bidders. IDB has been actively involved in the design of the bidding process and related bidding documents and will also be supporting the evaluation of proposals received.

II. OBJECTIVES

The general objective of this Consultancy is to support the government of Chile in the implementation of the marine energy pilot projects as part of the investment grant (CH-G1002) and this technical cooperation (CH-T1139). The specific objective is to provide specialized technical knowledge during the bidding process.

III. DESCRIPTION OF ACTIVITIES

The consultant will provide technical advisory services for the government of Chile during the whole bidding process staring form publication of the bidding documents until announcement of the winning bidders. This will include at least:

- Provision of technical support including analysis and preparation of responses for questions received during the consultation phase
- Review of documentation, permits and concessions received from bidders
- Verification of project specific technical data, design concepts and marine infrastructure included in the bidding documents
- Provision of technical support to the governments technical evaluation commission including supporting documentation to facilitate the evaluation process
- Evaluation of proposals received in both bidding processes according to bidding documents published
- Provision of technical support for the government and IDB during negotiation of legal agreements with the winning bidders

IV. PRODUCTS AND SCHEDULE

It is expected that the consultant provide at least three (3) copies of the following reports in Word and pdf format in Spanish language. The government and the IDB will comment on the content and format of the documentation in a draft version. Comments have to be included in the final version two weeks after receipt of comments by all parties. The final version of all products can only be accepted when all technical comments and suggestions have been incorporated in the final text and documents are endorsed by all parties officially (should be satisfactory to the IDB). The deliverables shall include:

V. COORDINATION

This contract will be implemented by the Climate Change and Sustainability Division (INE/CCS) in coordination with the IDB office in Chile and the Ministry of Energy.

VI. CHARACTERISTICS OF THE CONSULTANCY

Type of Consultancy: Consulting Firm.

Starting date and duration: 12 months.

Place of work: Chile

VII. QUALIFICATION:

The consulting firm should have at least 5 years of proven experience in in planning, design, construction, operation and evaluation of tidal and wave energy projects. Profound knowledge of

marine energy technologies for both wave and tidal energy, as well as knowledge of the related industries is required. Working knowledge of Spanish by project team is required.

- Technical evaluation report: The consultant will present a report with the evaluation results for both bidding processes
- Results Presentation: The consultant will present either during a meeting or through electronic a PowerPoint presentation to all the parties involved in the project, including but not limited to the government and IDB personnel from INE/CCS
- Final Report: The consultants will submit their Final Report including all activities performed in the consultancy two weeks after the last activity has been performed and reported accordingly by the Consultant to the Government and the IDB.

CHILE

SUPPORT TO MARINE ENERGY PILOT PROJECTS IN SOUTHERN CHILE (CH-T1139)

DEVELOPMENT OF AN ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

TERMS OF REFERENCE

I. BACKGROUND

Marine energy systems – wave energy and tidal current converters for electricity generation – are mostly at the pre-commercial stage of development. The leading wave and tidal energy concepts have in recent years reached full scale demonstration stage and in the next 1-2 years will reach a first farm deployment stage. These concepts still require research and pilot testing to be undertaken along the path to commercialization. Huge potential for cost reductions exist which can be achieved as a result of experience and economies of scale as installed capacity increases. Tidal current is currently the more mature technology as its devices are approaching a convergence of design*4* and there are more developers at full-scale demonstration stage. Activities are mainly concentrated in Europe, the US and Canada with increasing activity in Asia

Chile has one of the largest endowments of marine energy in the world. This resource could represent a significant and world-class opportunity for the development of low carbon power. The potential for marine energy (wave and tidal current) in the country has been characterized in the range of 100-200 GW[5], whereas installed capacity in Chile's four electricity systems (SIC, SING, Magallanes and Aysen) is around 17GW*6*. Marine energy would, in theory, be enough to supply current and future electricity needs several times and would in fact be sufficient to make Chile a net zero carbon power exporter.

Chile also provides a strong regulatory and business environment, incentives for new businesses, a stable and liquid local financial market, a suitable legal framework for start-ups and a macro-economic stability that could be the foundation for future investments in this field. The government of Chile (GoC) through the Investment Development Corporation (CORFO, acronym in Spanish for *Corporación de Fomento a la Inversión*) and the Ministry of Energy (MINENE, acronym in Spanish for *Ministerio de Energía*) wants to promote conditions for local and foreign companies, research entities and universities, to work jointly in order to create knowledge and experience, help further develop the technology and adapt it to local conditions and bring down its costs. Within this effort several activities are currently being implemented or planned (see table 1).

4 Most concepts are based on bottom mounted horizontal axis turbines.
5 2009, IDB, Preliminary site selection for marine energy projects in Chile
6 2012, Comision Nacional de Energia

Table 1. GoC activities to foster marine energy development

Activity	Responsible	Timeline
Green Paper Marine Energy	MINENE	Finished by April 2013
Bidding for installation of a marine energy center of excellence	InnovaChile	Bidding to be launched in July 2013
National Marine Energy Strategy	MINENE	November 2013
Roadmap Marine Energy including public consultation of green paper	Aquatera	Finished by September 2013
Study on modification and/or possible revision of marine regulatory framework	MINENE	Bidding to be launched in May 2013
Development of environmental guidelines for project developers	MINENE	Bidding currently open until October 2013
Marine Energy Explorer (Explorador marino)	Universidad de Chile	Bidding to be launched in second quarter 2013
Study about GIS referenced use of coastal zones and marine energy potential	MINENE	Bidding to be launched in July 2013
Study about existing supply chain infrastructure	MINENE	To be initiated in May and finished by end of 2013
Marine energy pilot projects	MINENE/CORFO	Bidding to be launched in fourth Quarter 2013

Activities 1 and 10 were supported by IDB and the consultant WavEC as part of IDB's technical cooperation CH-T1122. Within activity 1 IDB provides input for the development of a Green Paper on Marine Energy. Within activity 10 two separate international competitive bidding processes will be prepared by MINENE and implemented by CORFO. A capital grant (CG) of up to USD10 million will be provided for one full scale tidal current energy project with a target rated capacity of 1MW and up to USD3.4 million for one small scale wave energy pilot project. The CGs are limited with up to 50% of the CAPEX for each of the pilot projects. The geographical project locations are open and will be defined by the winning bidder in their proposal. It is envisioned that a private sector company or companies (PSPC) be the bidders. IDB has been actively involved in the design of the bidding process and related bidding documents and will also be supporting the evaluation of proposals received.

II. OBJECTIVES

The general objective of this Consultancy is to support the government of Chile in the implementation of the marine energy pilot projects as part of the investment grant (CH-G1002) and this technical cooperation (CH-T1139).

The specific objective is to support the implementation of an environmental and social risk management system for the development of the two pilot projects mentioned above which include a one full scale tidal and small scale wave energy projects. The purpose is to enhance the overall management of environmental and social risk of the project through the implementation of an Environmental and Social Management System (ESMS).

III. DESCRIPTION OF ACTIVITIES

In order to achieve the objectives of the consultancy, the consultant will carry out the following activities:

a. Review of the structure and local installed capacity in socio-environmental issues of the development companies and the Ministry of Energy;

b. Analysis of the flow of decisions and operation of the development company and if they have existing environmental and social risk management systems;

c. Analysis of the resources available to manage environmental and social risks in the local context.

d. Proposal for a strategy and institutional approach for the developers of both projects to implement an effective ESMS, including specifications for the types of policies, procedures, human and financial resources and information and documentation systems necessary to implement and monitor its effectiveness;

e. Development of ESMS taking into account siting issues and specific *"no go areas"* such as natural protected areas, fishing areas, and special archeologically relevant sites.

IV. PRODUCTS AND SCHEDULE

The consultant will deliver a report with diagnostic, identification and proposal for an ESMS suitable for the developers and the interaction with different clients.

V. COORDINATION

This contract will be implemented by the Climate Change and Sustainability Division (INE/CCS) in coordination with the Environmental and Safeguards Unit (ESG) and the IDB office in Chile. Frequent coordination with the Ministry of Energy and the Developers of both projects mentioned above will be also required.

VI. CHARACTERISTICS OF THE CONSULTANCY

Type of Consultancy: Individual consultant

Starting date and duration: The main activities to be carried out under this Terms of reference are expected to take at least 6 months.

VII. QUALIFICATIONS

Place of work: Chile

Consultants Experience: 10-15 years of professional experience, including: (i) environmental and social impact assessments; (ii) environmental social and health and safety management systems; (iii) supervision and monitoring systems; (iv) regulatory compliance auditing; (v) public consultation; (v) experience with the analysis of compliance and reputational risks for companies and/or financial institutions; (vi) experience with marine infrastructure

CHILE

SUPPORT TO MARINE ENERGY PILOT PROJECTS IN SOUTHERN CHILE (CH-T1139)

DEVELOPMENT OF A KNOWLEDGE DATABASE AND INFO PORTAL

TERMS OF REFERENCE

I. BACKGROUND

Marine energy systems – wave energy and tidal current converters for electricity generation – are mostly at the pre-commercial stage of development. The leading wave and tidal energy concepts have in recent years reached full scale demonstration stage and in the next 1-2 years will reach a first farm deployment stage. These concepts still require research and pilot testing to be undertaken along the path to commercialization. Huge potential for cost reductions exist which can be achieved as a result of experience and economies of scale as installed capacity increases. Tidal current is currently the more mature technology as its devices are approaching a convergence of design*7* and there are more developers at full-scale demonstration stage. Activities are mainly concentrated in Europe, the US and Canada with increasing activity in Asia

Chile has one of the largest endowments of marine energy in the world. This resource could represent a significant and world-class opportunity for the development of low carbon power. The potential for marine energy (wave and tidal current) in the country has been characterized in the range of 100-200 GW[8], whereas installed capacity in Chile's four electricity systems (SIC, SING, Magallanes and Aysen) is around 17GW*9*. Marine energy would, in theory, be enough to supply current and future electricity needs several times and would in fact be sufficient to make Chile a net zero carbon power exporter.

Chile also provides a strong regulatory and business environment, incentives for new businesses, a stable and liquid local financial market, a suitable legal framework for start-ups and a macro-economic stability that could be the foundation for future investments in this field. The government of Chile (GoC) through the Investment Development Corporation (CORFO, acronym in Spanish for *Corporación de Fomento a la Inversión*) and the Ministry of Energy (MINENE, acronym in Spanish for *Ministerio de Energía*) wants to promote conditions for local and foreign companies, research entities and universities, to work jointly in order to create knowledge and experience, help further develop the technology and adapt it to local conditions and bring down its costs. Within this effort several activities are currently being implemented or planned (see table 1).

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7 Most concepts are based on bottom mounted horizontal axis turbines.

8 2009, IDB, Preliminary site selection for marine energy projects in Chile

9 2012, Comision Nacional de Energia

Table 1. GoC activities to foster marine energy development

Activity	Responsible	Timeline
Green Paper Marine Energy	MINENE	Finished by April 2013
Bidding for installation of a marine energy center of excellence	InnovaChile	Bidding to be launched in July 2013
National Marine Energy Strategy	MINENE	November 2013
Roadmap Marine Energy including public consultation of green paper	Aquatera	Finished by September 2013
Study on modification and/or possible revision of marine regulatory framework	MINENE	Bidding to be launched in May 2013
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Study about GIS referenced use of coastal zones and marine energy potential	MINENE	Bidding to be launched in July 2013
Study about existing supply chain infrastructure	MINENE	To be initiated in May and finished by end of 2013
Marine energy pilot projects	MINENE/CORFO	Bidding to be launched in fourth Quarter 2013

Activities 1 and 10 were supported by IDB and the consultant WavEC as part of IDB's technical cooperation CH-T1122. Within activity 1 IDB provides input for the development of a Green Paper on Marine Energy. Within activity 10 two separate international competitive bidding processes will be prepared by MINENE and implemented by CORFO. A capital grant (CG) of up to USD10 million will be provided for one full scale tidal current energy project with a target rated capacity of 1MW and up to USD3.4 million for one small scale wave energy pilot project. The CGs are limited with up to 50% of the CAPEX for each of the pilot projects. The geographical project locations are open and will be defined by the winning bidder in their proposal. It is envisioned that a private sector company or companies (PSPC) be the bidders. IDB has been actively involved in the design of the bidding process and related bidding documents and will also be supporting the evaluation of proposals received.

II. OBJECTIVES

The general objective of this Consultancy is to support the government of Chile in the implementation of the marine energy pilot projects as part of the investment grant (CH-G1002) and this technical cooperation (CH-T1139). The specific objective will be to develop a knowledge database and info portal using information provided by two pilot projects, supervision consultants, the IDB and the government of Chile.

III. DESCRIPTION OF ACTIVITIES

The project encompasses five main steps to develop a knowledge management platform and information portal:

a. Define detailed requirements (IDB project team and the Ministry of Energy of Chile).
b. Design User Interface.
c. Design Database.
d. Develop web based analysis system to integrate indicators and projects.
e. Implementation, piloting and testing.
f. Develop documentation and delivery of source of code.

IV. PRODUCTS AND SCHEDULE

The consultancy shall have the following products:

(i) **Knowledge Database up and running:** The database will be up and running with initial set of data loaded and ready to receive more records from users.

(ii) **Web Interface up and running:** The user interface must be web-based and available by internet. The webpage must have a public area and areas with access control (which will require previous login authorization).

(iii) **Training to Ministry of Energy and helpdesk:** The consultant will train the Ministry of Energy and its personnel to use the database and web interface. This includes provision after development services for at least 6 months.

V. COORDINATION

This contract will be implemented by the Climate Change and Sustainability Division (INE/CCS) in coordination with the IDB office in Chile. Frequent coordination with the Ministry of Energy will be also be required.

VI. CHARACTERISTICS OF THE CONSULTANCY

Type of Consultancy: Individual Consultant, lump sum.

Starting date and duration: 60 non-consecutive days.

Place of work: Chile.

VII. QUALIFICATIONS

Experience: The consultant must have experience with all the following: (i) SQL databases; (ii) Java, Dot Net platform, DRUPAL, WordPress etc; (iii) Extensive experience in Content Management Systems with a proven record of previous implementation on regional or global

portals; (iv) Knowledge on data mining and data warehouse concepts, in order to build a database that is able to optimize searches and mining; (v) Previous experience working with regional statistical database and regional public good information system is a plus; (vi) Proven experience on developing integration between different portals is highly desirable.

CHILE

SUPPORT TO MARINE ENERGY PILOT PROJECTS IN SOUTHERN CHILE (CH-T1139)

DESIGN AND CONSTRUCTION SUPERVISION AND COMMISSIONING

TERMS OF REFERENCE

I. BACKGROUND

Marine energy systems – wave energy and tidal current converters for electricity generation – are mostly at the pre-commercial stage of development. The leading wave and tidal energy concepts have in recent years reached full scale demonstration stage and in the next 1-2 years will reach a first farm deployment stage. These concepts still require research and pilot testing to be undertaken along the path to commercialization. Huge potential for cost reductions exist which can be achieved as a result of experience and economies of scale as installed capacity increases. Tidal current is currently the more mature technology as its devices are approaching a convergence of design*10* and there are more developers at full-scale demonstration stage. Activities are mainly concentrated in Europe, the US and Canada with increasing activity in Asia

Chile has one of the largest endowments of marine energy in the world. This resource could represent a significant and world-class opportunity for the development of low carbon power. The potential for marine energy (wave and tidal current) in the country has been characterized in the range of 100-200 GW[11], whereas installed capacity in Chile's four electricity systems (SIC, SING, Magallanes and Aysen) is around 17GW*12*. Marine energy would, in theory, be enough to supply current and future electricity needs several times and would in fact be sufficient to make Chile a net zero carbon power exporter.

Chile also provides a strong regulatory and business environment, incentives for new businesses, a stable and liquid local financial market, a suitable legal framework for start-ups and a macro-economic stability that could be the foundation for future investments in this field. The government of Chile (GoC) through the Investment Development Corporation (CORFO, acronym in Spanish for *Corporación de Fomento a la Inversión*) and the Ministry of Energy (MINENE, acronym in Spanish for *Ministerio de Energía*) wants to promote conditions for local and foreign companies, research entities and universities, to work jointly in order to create knowledge and experience, help further develop the technology and adapt it to local conditions and bring down its costs. Within this effort several activities are currently being implemented or planned (see table 1).

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10 Most concepts are based on bottom mounted horizontal axis turbines.

11 2009, IDB, Preliminary site selection for marine energy projects in Chile

12 2012, Comision Nacional de Energia

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Marine energy pilot projects	MINENE/CORFO	Bidding to be launched in fourth Quarter 2013

Activities 1 and 10 were supported by IDB and the consultant WavEC as part of IDB's technical cooperation CH-T1122. Within activity 1 IDB provides input for the development of a Green Paper on Marine Energy. Within activity 10 two separate international competitive bidding processes will be prepared by MINENE and implemented by CORFO. A capital grant (CG) of up to USD10 million will be provided for one full scale tidal current energy project with a target rated capacity of 1MW and up to USD3.4 million for one small scale wave energy pilot project. The CGs are limited with up to 50% of the CAPEX for each of the pilot projects. The geographical project locations are open and will be defined by the winning bidder in their proposal. It is envisioned that a private sector company or companies (PSPC) be the bidders. IDB has been actively involved in the design of the bidding process and related bidding documents and will also be supporting the evaluation of proposals received.

II. OBJECTIVES

The general objective of this Consultancy is to support the government of Chile in the implementation of the marine energy pilot projects as part of the investment grant (CH-G1002) and this technical cooperation (CH-T1139). The specific objective is to provide supervision and facility commissioning during project implementation.

Commissioning services will include the documentation of all capacity building activities and operation training tasks to secure long-term sustainability of the project from the technical expertise perspective. This information shall be available for a case study for future reference with high dissemination content and replication potential.

III. DESCRIPTION OF ACTIVITIES

Tidal Stream and Wave Facilities project Supervision during construction and commissioning if applicable

- Verification of proper documentation, permits and concessions of the generating facilities including but not limiting to right of use at sea, dock permitting if applicable, connection to the grid, and compliance with environmental and social regulations.
- Verification of equipment-specific manuals and electronic equipment has to be included in the works protocol.
- Site report during preparation period before installation and first tests.
- Site report during the installation of the tidal stream turbines/arrays or wave devices and verification of electrical interconnection to the grid in the case of the former.
- Validation of the budget v. actual expenses and reporting any delay that could result in cost overruns.
- Commissioning of the tidal stream turbines/arrays or wave devices on site.
- Temporary Acceptance Certificate of the tidal stream turbines/arrays or wave devices.
- Technical witness and verification of operators training and delivery of all technical information to be documented, including capacity building and monitoring activities during test operation for 6 months.
- Final Acceptance Certificate facilities and witness of commercial operation.

IV. PRODUCTS AND SCHEDULE

It is expected that the consultant provide at least three (3) copies of the following reports for each of the components of this consultancy. The Company and the IDB shall comment on the content and format of the documentation in a draft version. Final version of the above mentioned reports can only be accepted when all technical comments and suggestions have been incorporated in the final text and documents are endorsed by all parties officially (should be satisfactory to the IDB). The deliverables shall include:

- Work plan: The consultants shall submit their work plan two weeks after the Kick-off Meeting took place.
- Results Presentation: The consultant will present either during a meeting or through electronic a PowerPoint presentation to all the parties involved in the project, including but not limited to the government and IDB personnel from INE/CCS

- Final Report: The consultants will submit their Final Report including all activities performed in the consultancy two weeks after the last activity has been performed and reported accordingly by the Consultant to the Government and the IDB.

V. COORDINATION

This contract will be implemented by the Climate Change and Sustainability Division (INE/CCS) in coordination with the IDB office in Chile. Frequent coordination with the Ministry of Energy and the Developers of both projects mentioned above will be also required.

VI. CHARACTERISTICS OF THE CONSULTANCY

Type of Consultancy: Consulting Firm, lump sum.

Duration: 18 months.

Place of work: Chile

VII. QUALIFICATION

The consulting firm should have at least 5 years of proven experience in in planning, design, construction, operation and maintenance of tidal and wave energy projects. Profound knowledge of marine energy technologies for both wave and tidal energy, as well as knowledge of the related industries is required. Working knowledge of Spanish by project team is required.