

CHUGACH ELECTRIC ASSOCIATION, INC.
Anchorage, Alaska

BOARD OPERATIONS COMMITTEE MEETING
AGENDA ITEM SUMMARY

August 2, 2006

ACTION REQUIRED

AGENDA ITEM NO. VIII.

Information Only
 Motion
 Resolution
 Executive Session
 Other

TOPIC

Alternative Energy Citizen Task Committee

DISCUSSION

(Note: This item had been postponed from the June 7, 2006, Operations Committee meeting.)

Director Christopherson has made a proposal to establish a Citizen Task Committee consisting of two staff members and up to three outside interested Alaskan citizens to investigate alternative energy options for Chugach.

The motion is to approve the formation of a Citizen Task Committee to outline alternative energy sources to replace some of Chugach's gas turbine generation needs, most specifically tidal which has not been addressed by Chugach. Further, this action is based on correspondence and calls from citizens over the last year, many of which have presented good ideas. The letters (attached) of April 26, 2006, and May 4, 2006, from member Bruce Campbell contained information and several alternative energy ideas. The motion is also to enlist the part-time use of two staff members and Bruce Campbell along with other volunteers to perform an independent assessment of Chugach's alternative energy options. The committee would provide preliminary recommendations or comments to the Board by August 31, 2006.

14104 Hancock Drive
Anchorage, AK 99515
April 26, 2006

Mr. Alan Christopherson, Chairman
Chugach Electric Board of Directors
P.O. Box 196300
Anchorage, AK 99519-6300

Dear Chairman Christopherson,

Last year I applied to be a Chugach director. During my interview I alluded to the need to investigate ocean forces as possible alternative sources of energy to eventually replace gas turbine generation. My concern centered around the decreasing supply of natural gas in the Cook Inlet area and attendant increased costs. This escalating cost of generation by gas turbines should, in our opinion, be the main focus of the board at this time.

I am not alone in my concern about alternative energy sources as witnessed by a recent article in Civil Engineering which describes efforts in Great Britain to harness tidal flow as a generation potential. (Copy attached.)

Since Turnagain Arm has the second largest tide range in North America and, given the billions of foot-pounds of kinetic energy available at each change in tide, it is a natural for power generation. Turnagain Arm is not an especially environmentally sensitive area, which should make experimentation and future development a distinct possibility. There is no shipping in Turnagain Arm, which erases a big concern.

Underwater turbines would act the same as boat propellers except in reverse. Generators could be located either underwater with direct connection to the turbine or on a semi-floating platform.

Presently there is conversation in Anchorage about wind power as a possible energy source. A review of the potential of wind and water discloses the following:

1. Energy

Kinetic energy is determined by mass and velocity and expressed as $KE = 1/2mv^2$. Water has a mass 800 times that of air, however, wind (air) generally has a higher velocity of flow. The average flow velocity of the tide in Turnagain Arm is in the range of 4-6 feet/second. Anchorage wind speeds are highly variable, but might average 25 -30 feet/second.

Using the same diameter blade, the tidal turbine would produce up to 25 times the energy of a wind turbine. A blade of one half the diameter would result in a factor of up to 6 times in favor of the tidal turbine. These figures are very approximate but nevertheless show a distinct advantage for the tidal turbine.

It should be noted that the tidal velocity in Turnagain Arm is higher than that in more open waters.

2. Dependability

Tides are absolutely predictable as to size and time of occurrence. Winds, on the other hand, are essentially unpredictable, which necessitates that the latter have 100% back up while the former could have substantially less.

The disadvantage of the tidal turbines, of course, is the slack tide period when essentially no power could be generated. Here is where Anchorage is in a unique

position. Passage Canal (Whittier) is a scant 20 miles from Turnagain Arm and has a tidal offset of several hours. Inclusion of tidal turbines in Passage Canal and a short transmission line would cover at least the major portion of slack tides in Turnagain Arm giving continuous power production.

3. Costs

Costs of a tidal system should be less than a wind system, since fewer units would be required. Remember there is no energy cost - tide and wind are free, hence construction and maintenance become the controlling factors.

4. Environment

The tidal system would present little visual impact, while a wind farm is highly visible and not in concert with the natural beauty of Alaska - in other words, ugly.

The tidal turbine technology has emerged and is very encouraging. It would seem that Chugach is in a position to be in the vanguard for once. Toward this end, consideration should be given to at least send a representative to the All-Energy Exhibition and Conference being held in Aberdeen Scotland on May 24-25, 2006 (Flyer attached) to learn more about Great Britain's experiences in general and the technology in detail.

A trial installation could be installed in 2 or 3 years after which, if successful, additional units could be added in rapid succession.

In my opinion, the ever increasing cost of remote gas turbine generation is the most important issue facing the board. I hope that the board makes alternative energy its number one priority and does not get mired down in items of far lesser cost impact.

My advise is: do something now because the problem will not go away and will only get worse.

Sincerely yours,


Bruce A. Campbell
Chugach member

cc:
Dave Cottrell
Bruce Davison
Uwe Kalenka
Ray Krieg
Jeff Lipscomb
Elizabeth Vazquez

Turbine System Developed to Harvest Energy of Deep Tidal Streams

Engineers are developing a semisubmersible turbine system designed to harvest the energy of deep tidal currents and hope that within five years they will begin constructing such systems in the Pentland Firth, in northern Scotland. It is estimated that such a system could generate at least as much energy as a 1,200 MW nuclear power plant, or 3 to 4 percent of the total electricity consumption of the United Kingdom.

The Pentland Firth system would consist of four 20 m diameter rotors attached to a large cylindrical tank that in turn would be connected to a long arm. The arm would pivot on a gravity base—a weighted concrete or steel foundation placed on the seabed. The arm would swing with the currents, allowing the system to respond naturally to turbulence in the estuary.

The system has been developed by TidalStream, a London-based partnership dedicated to exploiting renewable energy sources that is currently seeking industrial partners to help it complete the Pentland Firth project. The company estimates that £25 million

(U.S.\$44 million) would be needed for this endeavor.

Tidal streams are more predictable sources of energy than offshore wind, according to John Armstrong, Ph.D., a partner of TidalStream and the designer of the system. Generating systems for shallow tidal waters are in the prototype phase, but deepwater systems are still in the concept stage, he says. He adds that two-thirds of the potential tidal energy in the United Kingdom is in water deeper than 40 m, and about half of that is located in the Pentland Firth, which is characterized by rough waters that reach a depth of 60 m.

The buoyant cylindrical tank would make it possible for the entire unit to be floated to its location and then flooded with seawater so that it would partially sink and swing into a vertical operating position. Each rotor in the system would drive a speed-increasing gearbox, which in turn would drive a 1 MW generator. As in an offshore wind farm, the energy would be conveyed to the mainland through high-voltage submerged cables. For maintenance,

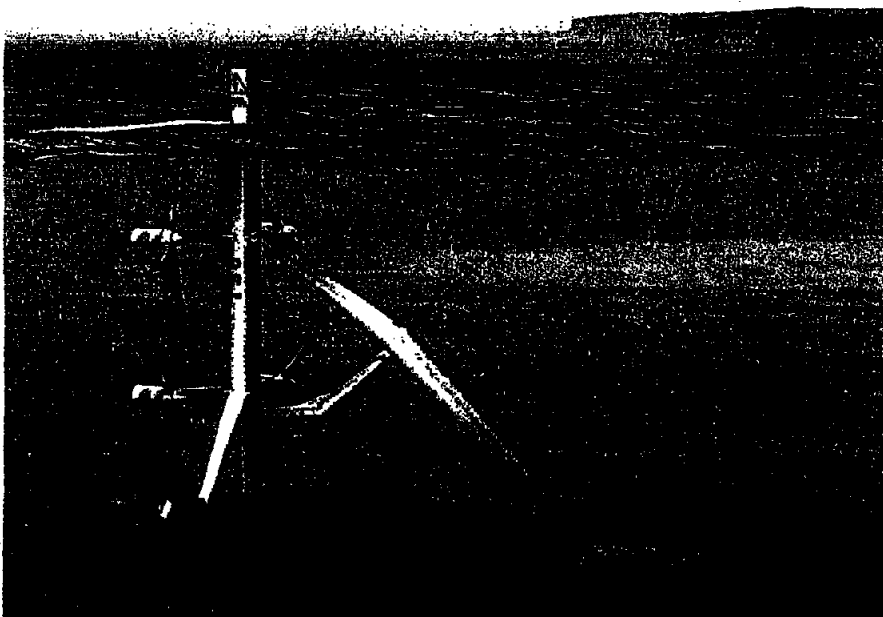
the tank would be floated to the surface, where it would act as a stable platform for access.

As explained on the company's Web site, www.tidalstream.co.uk, tidal stream turbines behave like wind turbines underwater. However, since seawater is 800 times denser than air and flows more slowly, the rotor diameter for a tidal turbine can be roughly half that for a wind turbine of the same capacity, Armstrong says. In the Pentland Firth, an array of 22 turbines, each with a capacity of 4 MW, would be installed per square kilometer. According to Armstrong, such an arrangement would occupy only a quarter of the area of a similarly rated offshore wind farm. Moreover, says Armstrong, in contrast to offshore wind farms, the system's turbines would operate silently and predictably and would cost 10 percent less than wind turbines.

Units intended for U.K. waters would most likely be built in the Scottish construction yards that have produced many offshore oil structures for the North Sea, but they could also be built elsewhere by construction facilities with marine experience, Armstrong says.

Concerns about interference with shipping are already being addressed by authorities. "Fortunately, the government has taken marine renewables seriously and has commissioned a new marine bill that will dictate how inshore waters are used for the foreseeable future," says Armstrong, who predicts that this legislation could be in place in time for the installation of the Pentland Firth turbines.

—Karen Trimboth



A semisubmersible turbine system has been designed by British engineers to harvest the energy of deep tidal currents. It consists of four 20 m diameter rotors attached to a large cylindrical tank that in turn would be connected to a long arm. The arm would swing with the currents, allowing the system to respond naturally to turbulence.



Tidal stream - 5% of UK electricity renewably, silently, predictably and almost invisibly from just one small coastal area of the UK

The Pentland Firth fills and drains the North Sea twice a day - water flows of up to 3 million tons a second.



This website shows how tidal stream at this one location could be a major boost to UK renewable energy, providing 5% of UK electricity demand

Home

Who We Are

About Tidal Stream

- the resource
- the turbines
- installation
- operation
- maintenance
- removal

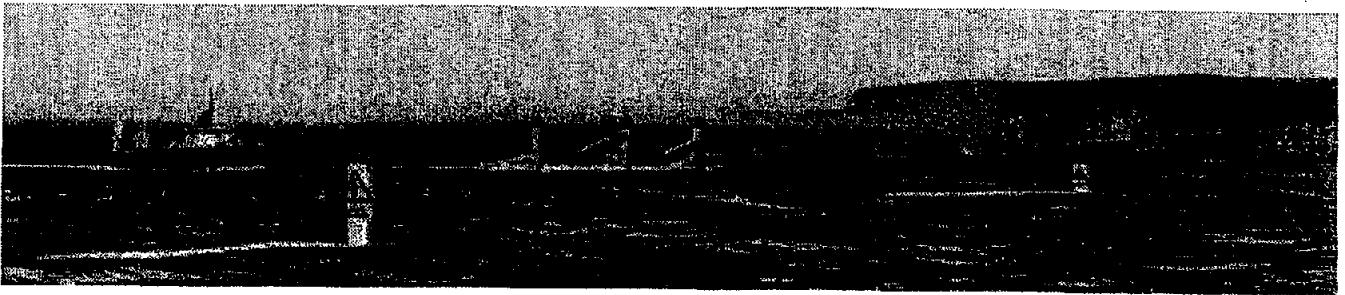


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 Links

 Contact Us



To see how, click [here](#)

ALL-ENERGY

The renewables show in the Energy City
EXHIBITION & CONFERENCE ABERDEEN 24 - 25 MAY 2006

Come and meet us at the All-Energy show in Aberdeen, 24/25th May 2006 where we can tell you more about this unique technology and its potential

Contact Us

The TidalStream office is in Chiswick, West London.

To contact us, mail info@tidalstream.co.uk

14104 Hancock Drive
Anchorage, AK 99515
May 4, 2006

Mr. Alan Christopherson, Chairman
Chugach Electric Board of Directors
P.O. Box 196300
Anchorage, AK 99519-6300

Dear Chairman Christopherson,

Reference my April 26, 2006 letter to you regarding tidal power generation. I have made queries to firms involved in the development of the technology for this alternative power source. For your information, attached are copies of the information received to date.

Sincerely yours,



Bruce Campbell

cc:
Dave Cottrell
Bruce Davison
Uwe Kalenka
Jim Nordlund
Jeff Lipscomb
Elizabeth Vazquez

From: John Armstrong <johnarmstrong1@blueyonder.co.uk>
Subject: Re: Tidal Generation
Date: April 28, 2006 1:45:29 PM ADT
To: Marl Campbell <mcmarl@alaska.net>
Cc: miketodman@tiscali.co.uk

Bruce

For us, deep water is anything of 40m or more - we reckon this is about the limit for mounting turbines on a tower fixed in the seabed. For water deeper than this, and perhaps not so deep, a floating system will be more practical and economic than a fixed one.

I assume your channel is not so deep as you talk about piles anchored in the seabed. However, a floating platform riding up and down on piles could see heavy wear; the thrust from tidal turbines can be huge (4-5 times that of equivalent rated wind turbines), and the platforms will tend to bind on the piles or in time wear them away. When the turbines are running, they load up as they would if they were solid discs, and in a 4-5 knot tide, the forces are massive. In our design, we react the forces back down to a swivel bearing that sits on the seabed.

300-600 MW is a serious tidal farm, occupying a large sea area (how much depends on the current). Maintenance is a major factor in the design, as these things are difficult to access, especially with a high tide range. MCT slide their turbines up the tower and out of the water for maintenance; we rely on buoyancy control to turn them over and bring them to the surface - we have yet to see how this will work in practice. We are probably 5 years away from putting turbines into the Pentland Firth, which is the goal of most tide-millers!

We will certainly be at the All Energy Show and would be pleased to see you on our stand (B17). You should look at the programme <http://www.all-energy.co.uk/home.html> to be sure there are enough items to make it worth the trip!

Best regards,
John Armstrong

----- Original Message -----

From: "Marl Campbell" <mcmarl@alaska.net>
To: "John Armstrong" <johnarmstrong1@blueyonder.co.uk>
Sent: Friday, April 28, 2006 8:24 PM
Subject: Re: Tidal Generation

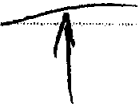
Hi John,

Thank you for your reply.

You mentioned "very deep water" --could you give me some idea of what you consider deep water in either meters or feet?

Since Turnagain Arm is several miles across a dam is not feasible hence we are looking at variable head flow if we anchor to the sea bed. A floating platform that rides up and down on 3 anchor piles is a possibility.

We are looking at power development in the 300-600 megawatt area. Since ice floats I do not see that as much of a problem and one



that we deal with on almost a daily basis.

Muddy waters (caused from rock flour in glacier run-offs) would be a concern with regard to erosion of the blades.

Wild was perhaps an inaccurate term-- The fetch is not great but boar tides occur as one would expect in confined water bodies with extreme tide fluctuations.

Would it be worth while to attend the conference in Aberdeen on May 24-25?

Again thanks for responding

Bruce Campbell

On Apr 27, 2006, at 11:42 AM, John Armstrong wrote:

Bruce

The problem with a high tidal range is the difficulty of locating run-of-stream turbines with the constantly changing level of the water. On

the other hand with a high tidal range it becomes easier to dam the outlet

and let the reservoir so formed be refilled every time the tide is high, and

then-run out through fixed head turbines. Of course if you only want a small amount of power, this would be too expensive an option.

Our own run-of-stream turbine concept is aimed at very high flows with limited tidal height range and very deep water, such as the Pentland Firth

(see our website at www.tidalstream.co.uk). We are probably furthest ahead

in developing designs for these particular conditions, which are very different from those you describe. If you have shallow water, then you could

well be interested in what Marine Current turbines are doing - see their

website at www.marineturbines.com.

There are also tidal turbine developers in Canada - Blue Energy is one

have heard of.

'Wild muddy water with ice flows' would also make me pause and wonder what

solid matter might be getting into the rotating parts of the turbines!

Hope this isn't too negative, and good luck with your researches.

Kind regards,

John Armstrong

----- Original Message -----

From: "Marl Campbell" <mcmarl@alaska.net>

To: <info@tidalstream.co.uk>

Sent: Thursday, April 27, 2006 9:54 PM

Subject: Tidal Generation

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South Central Alaska is served by Chugach Electric which presently is using natural gas turbines for its primary generation. The gas fields are rapidly declining.

Turnagain Arm is adjacent to Anchorage and has a tide range second only to the Bay of Fundy in N. America--high of 36ft. and a low of -5ft. There is no shipping in the arm and really no recreation use or environmental concern to speak of. It's a wild muddy water body subject to some ice flows. It would appear that it's a natural for tidal turbine generation.

Portage Canal at Whittier is only 20 miles away over a low mountain pass and has a 6.5 hour tide offset making it possible to generate tidal power at slack tide in Turnagain Arm which would allow for 24 hour supply.

We are interested in comment, ideas, information etc. on the feasibility of developing a tidal power source.

Our only knowledge at this point in time is what we gleaned from a recent article in Civil Engineering Magazine which listed your firm as the leader in this field.

Chugach is a Cooperative of which I am a member.

Thank you for any enlightenment you can provide.

Bruce A Campbell
14104 Hancock Drive
Anchorage, Alaska 99515

email mcmari@alaska.net
Phone (907) 345-3129

(1)



Marine Current Turbines

Running with the tide of renewable energy

The Manor House, Chineham Court, Lutyens Close, Chineham, Basingstoke,
Hampshire, RG24 8AG, United Kingdom

Tel: +44 (0) 1256 470149 Fax: +44 (0) 1256 403129
Email: Info@marineturbines.com Website: www.marineturbines.com

16 June 2003

PRESS RELEASE

WORLD'S FIRST OFFSHORE TIDAL CURRENT TURBINE SUCCESSFULLY INSTALLED

A completely new kind of energy system, which uses the almost limitless energy of flowing sea currents has been successfully, installed approximately 3km to the NE of Lynmouth in North Devon.

Heralded by MCT as a "World First" it is the most powerful device of its kind so far installed with a rated power of 300kW - making it potentially capable of meeting the average electricity needs of about 200 typical UK households. It is also the world's first marine renewable energy system of significant size to be installed in a genuinely offshore location as previous marine renewable energy systems, whether for tidal or wave energy, have either been located on-shore or in sheltered, largely land-locked waters.

This project marks the stage at which the technology for exploiting marine energy has moved for the first time into the harsher energy-rich environment in which it needs to operate.

The turbine is the culmination of the "Seaflow" project, a £3.5 million project that is being conducted by an industrial consortium of UK and German companies and supported by the UK Department of Trade and Industry, the Joule Programme of the European Commission, and the German Government. The project is aimed at testing the prototype turbine, and demonstrating technology, which will be further developed to a commercially viable stage by Marine Current Turbines Ltd over the course of the next few years.

Martin Wright, Managing Director of MCT said,

"The development of this technology is of great importance in helping us all to move towards the use of clean, non-polluting energy resources. It taps into a huge, predictable and clean energy resource, namely fast tidal stream currents, which are to be found at many locations around our coast. It has the potential to make a major contribution to future energy needs without causing pollution or any significant environmental harm.

The project itself owes much to the vision, close co-operation and commitment of both the partners and funders without which many of the significant challenges we have encountered would not have been overcome. This bodes very well for the future."

Peter Clutterbuck, Construction Director of Seacore said,

"This device is located at a 'high energy' marine site, the construction activities have had to successfully overcome the 'high energy' currents, tides and waves in order to create a structure that will allow the harnessing of this energy.

This project has required Seacore to utilise the full range of their unique set of skills built up over many years of participation in challenging marine works. We are very pleased to have

been able to provide the practical marine skills to help turn this concept from a dream into reality."

END

Notes to the Editors

The Seaflow Project represents the first phase of a comprehensive R&D programme intended to develop pioneering technology for exploiting the energy of marine tidal currents. The technology consists of rotors mounted on steel piles (tubular steel columns) set into a socket drilled in the seabed. The rotors are driven by the flow of water in much the same way that windmill rotors are driven by the wind, the main difference being that water is more than 800 times as dense as air, so quite slow velocities in water will generate significant amounts of power. This project, in effect, involves the development of an "Underwater Windmill" which can generate a maximum of 300kW in a 2.7m/s current (5.5 knots). The energy generated, being derived from tides has the added significant advantage of being predictable.

Maintenance of the device while it is submerged in fast currents would be exceptionally challenging and expensive, so a key patented feature of the technology is that the rotor and drive train (i.e. gearbox and generator) can be raised completely above the surface. Once raised, any maintenance or repairs can readily be carried out from the structure attended by a surface vessel.

The project involves the design, manufacture, installation, testing and demonstration of the turbine, which will provide the essential information needed to design and build larger systems for commercial power generation, which will follow during the next few years. The prototype experimental unit was successfully installed 1km off Foreland Point (approximately 3km NE of Lynmouth, Devon, UK) on 26th May 2003 and is currently being commissioned prior to the start of an extensive test programme which will be conducted over the next 12 months.

The industrial consortium is made up as follows:

Marine Current Turbines Ltd (MCT) - The owner and developer of the technology.

Seacore Ltd - Specialist Offshore Engineers from Gweek, Cornwall.

Bendalls Engineering - A precision steel fabrication company from Carlisle - a division of Carrs Milling Plc.

IT Power Ltd - Renewable Energy Engineering Consultants from Basingstoke.

Corus UK Ltd - Steel suppliers - with numerous sites in the UK and the Netherlands.

ISET eV - Electrical power and control specialists - a spin off company from the University of Kassel in Germany.

Jahnel Kestermann GmbH - Leading manufacturer of marine and wind turbine gearboxes from Bochum, Germany.

Other key sub contractor companies associated with this project include **Atkins**, and **Aviation Enterprises Ltd**.

The project is partly financed, and supported by the UK Department of Trade and Industry's Renewable Energy Programme, by the European Commission's Joule Programme, by the

project partners listed above and through the investment of strategic partners such as the London Power Company, the generating arm of London Electricity Group.

Contacts:

All enquiries should be directed to the following contacts:

Martin Wright Managing Director
Peter Fraenkel Technical Director
Marine Current Turbines Limited

Tel: 01256 470149 Email: info@marineturbines.com
Website: www.marineturbin.es.com

Richard Reed Managing Director
Peter Clutterbuck Construction Director
Seacore Limited

Tel: 01326 221771 Email: info@seacore.co.uk
Website: www.seacore.co.uk

Background

Marine Current Turbines™ Ltd was set up to pioneer the technical and commercial development of tidal stream turbines. The company works with the support of strategic partner companies and has received significant financial support from the UK government through the DTI, and from the European Commission.

The basic requirements for cost-effective power generation from tidal streams using MCT's technology are a mean spring peak velocity exceeding about 2.25 to 2.5m/s (4.5 to 5 knots) with a depth of water of 20 to 30m - the red spots on the map (right) show some of the locations meeting these criteria around the UK and northern France.



Our technology represents a novel method for generating electricity from a huge energy resource in the sea. It is rare enough for an entirely new energy resource to be developed but even rarer if the technology, as in this case: -

- produces no pollution and has negligible environmental impact
- delivers energy to a predictable timetable
- has the potential to make a major contribution to future energy needs

Although the relentless energy of marine currents has been obvious from the earliest days of seafaring, it is only now that the development of modern offshore engineering capabilities coinciding with the need to find large new renewable energy resources makes this a technically feasible and economically viable possibility.

The rationale for developing this business is based on several robust arguments:

- In the face of Climate Change and Peak Oil, the world urgently needs to acquire different energy resources with ability to deliver clean renewable energy in line with the Kyoto Protocol (most governments world-wide are committed to this) and Marine Current Turbines can deliver a major and uniquely new contribution to this need.
- The scope for meeting future energy requirements solely from land-based resources will be constrained by conflicts over land-use; so large renewable energy projects will need to move away from crowded land areas, preferably out to sea. Fortunately, many potentially energetic marine current sites are not far from large electricity markets.
- Marine Current Turbines Ltd has a competitive lead in its field, together with the most efficient technology and uniquely practical methods for servicing it. Commercial viability is in sight and MCT owns proprietary concepts which are patent protected and should give significant competitive advantage in addition to having "first mover" advantage.
- Environmental impact is becoming a key issue in gaining consents for energy projects; MCT's technology is believed to have minimal environmental impact in that the physical footprint is very small, and rotor speeds are low enough to enable marine wild life to avoid being harmed by it.

In short we believe our technology meets a huge new need, and can deliver energy in future, as predictably as the tides that drive it and with minimal risk to the local environment.

Marine Current Turbines™

Running with the tide of renewable energy

- Home
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- Jobs
- Press
- Company
- Vacancies

Marine Current Turbines Ltd (MCT) is developing radically new technology, backed by the UK government, for exploiting tidal currents for large-scale power generation. We do not have any commercially available products at present, but we aim to achieve this by 2007-8.

▶ **Energy derived from the oceans' currents**

Our technology represents a novel method for generating electricity from a huge energy resource in the sea. It is rare enough for an entirely new energy resource to be developed but even rarer if the technology...



▶ **Technology under development**

The technology under development by MCT consists of twin axial flow rotors of 15m to 20m in diameter, each driving a generator via a gearbox much like a hydro-electric turbine or a wind turbine...



▶ **Meet the Team**

The board of Directors of MCT comprise a wealth of complementary and appropriate skills as well as experience to drive the business forward...



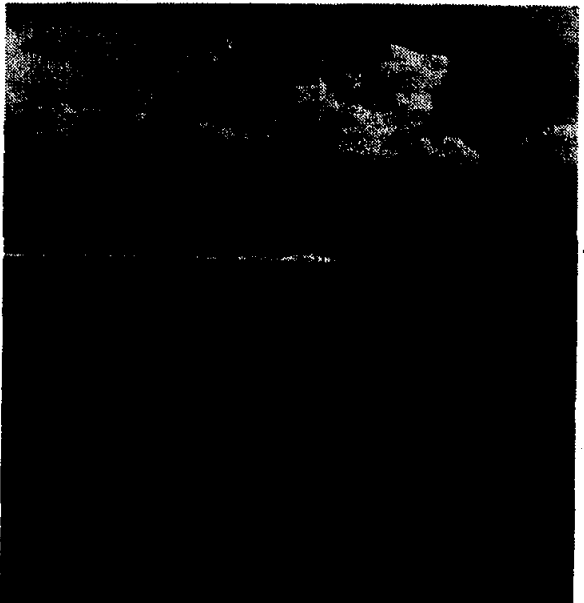
▶ **Our strategic partners**

MCT has a number of strategic partners and corporate shareholders



▶ **Latest News**

8 February 2006:
New impetus for tidal energy in Wales
 With funding from the Welsh Assembly Government, tidal energy firm Marine Current Turbines will identify locations around the Welsh coastline where its tidal stream technology could be suitable. ... [More](#)



Artist's Impression of SeaGen



can continue to roll out the technology in their regions under a license agreement.

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Projects

Main R&D programme

Marine Current Turbines™ Ltd has almost completed the first phase of a programme of tidal turbine development through research and development and demonstration phases, to commercial manufacture.

The company's plan is to complete the initial R&D phase known as Seaflow by 2006, and to install a commercial prototype at that time. The target is for 300MW of installations to be completed by 2010 and after that, there is far larger growth potential from a market literally oceanic in size.

The main R&D programme is as follows:-

Phase 1 - Seaflow

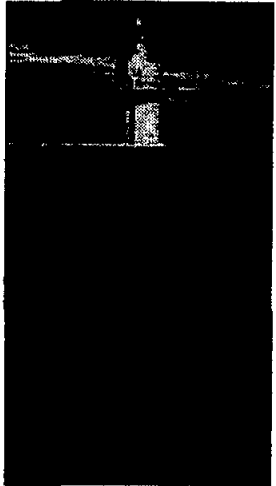
1999-2002 Preliminary development work
2002-2006 Installation and testing of the first commercial-scale monopile-mounted experimental 300kW single 14m diameter rotor system off Lynmouth, Devon, UK. This was successfully installed in May 2003 and uses a dump load in lieu of a grid-connection (to save cost) and will only generally operate with the tide in one direction. This phase cost £3.4 million and was financially supported by the partners together with the UK DTI, the European Commission and the German government.



[click thumbnail to view image](#)

Phase 2 - Seagen

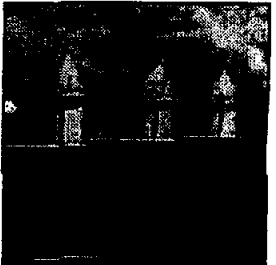
2004-2007 Design, manufacture, installation and testing of the first "full size" twin rotor system to be rated at 1MW. This will be grid-connected and will function with the flow in both directions - it will in fact be the prototype and test-bed for the commercial technology. This phase is expected to cost approximately £8.5 million including grid connection and is financially supported by the operating partners and the UK DTI who have awarded a grant of £4.27 million.



[click thumbnail to view image](#)

Phase 3 - Seagen Array and overseas demonstration projects

2006 onwards Installation of the first small "farm" of tidal turbines, probably involving up to 10 units to give an aggregate power for the system of around 10MW - the actual amount depending on how many units and the rated power for the site. This project will be partly self financing through revenue generated from sale of electricity. However, it will still be very much the final phases of the R&D programme as much will need to be learned from operating several machines together in an array.



It is also planned to install single systems in overseas locations to form the starting point for developing the technology in new markets. Areas of special interest include North America, S E Asia and Australia-NZ. These projects depend on finding suitable local strategic partners who

Projects

Supplementary R&D projects:-

Various research tasks are being carried through with various partners:-

QinetiQ

Design and Modelling programme for the Phase II Twin Rotor machine is being done in conjunction with QinetiQ as an important prelude to the detailed design of the Phase II machine. This programme is being managed by MCT, and is also specifically tasked to develop industrial partnerships to hasten the technology to market.

'Sea-Torque'

Research is planned into specialised generators and power trains.

'TideSource'

Research into the tidal stream resource at various locations. A detailed GIS database with specialist modelling tools is being developed.

Consultancies:-

MCT has successfully completed and will continue to carry through specialist consultancy studies in relevant areas. Past and present projects include:-

- Feasibility study into use of tidal currents in the Philippines (Involved some initial site measurements) - completed under Climate Change Challenge Fund grant from the UK Foreign and Commonwealth Office in cooperation with the Department of Energy and with NAMRIA in the Philippines (2001-2)
- Feasibility study into the possibility for using a new bridge structure planned for Montrose Harbour to generate power from currents passing underneath - completed for Angus County Council under sub-contract to Halcrow Crouch Ltd (2001)
- Assessment of the tidal stream potential for Scotland for the Scottish Executive under sub-contract to Garrad-Hassan Ltd (2001)
- Supplementary assessment of the tidal stream potential for the Scottish Western Isles for the Council of the Western Isles under sub-contract to Garrad-Hassan Ltd (2002)
- Contribution to study by Robert Gordon University for Scottish Enterprise on the energy potential of the Pentland Firth (2001)
- Assessment involving site measurements of the tidal stream energy potential for Northern Ireland in partnership with Queens University Belfast and with Seacore Ltd; for the government of Northern Ireland (2002)

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