



新型海流電廠的結構設計與佈放程序

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簡歷：(可列出相關連結，例如系所、研究室網頁)

<http://www.iam.ntu.edu.tw/zh/component/content/article/166-member/professors/professor-info/1212-falin-chen?Itemid=819>

市場及需求：

根據國際能源總署評估，具有經濟價值、值得開發的海流，可將其動能轉換成電能的蘊藏量，其開發潛能估計將超過 200GW。本專利提出一款工時短、成本低，適合在深海或淺海具有穩定海流的海域中，建置海流發電廠的技術。

技術摘要(含成果)：

本專利提出一款電廠結構嚴謹、佈放程序簡便的海流電廠，適合佈放在深海或淺海、具有穩定海流的海域中。因結構嚴謹，建置電廠的可行性高；因程序簡便，建置電廠的工時短且成本低。另外，構成電廠的主要機件，均為市場現有的主流產品，建置電廠的程序清楚完全，建置過程中會發生錯誤的可能性甚低。

優勢：

本專利具有以下六點優勢：

1. 電廠結構簡單：由數組渦輪發電機組所組成。每組渦輪發電機組則是由五項主要機件構成：渦輪發電機、二向浮球、三向接頭、海床錨錠、纜繩，都是市場現有產品。
2. 電廠結構嚴謹：在渦輪發電機組間，將以具有萬向接頭的剛性機構隔開，可增強整體電廠結構的聚合性，同時可避免渦輪機因海流作用而相互碰撞。
3. 海洋佈放程序簡明，只含三個主要程序：(1) 由施工平臺將渦輪發電機組拖至預定佈放海域，任其隨海流漂浮 (2) 將事先已經錨固於海床的海下電纜，與渦輪機組的三向接頭銜接 (3) 鬆綁施工平臺與渦輪機組的纜繩。
4. 在完成第 (3) 項程序時，整體渦輪發電機組將因海流的作用，往下游沉至預定的海下空間位置，整體機組將因力平衡作用而安穩地佈放在海流中。
5. 同時，可依設計需要，一次可佈放數組渦輪機組。
6. 此款電廠設計因結構簡單、佈放程序簡便、發生錯誤機率低，因此建廠時間短、建廠成本低。

競爭產品：

潮流電廠 (tidal power plant)：如 MCT Co., OpenHydro Co., Atlantis Co. 等所設置的潮流電廠，只適合在淺海興建。

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黑潮電廠 (Kuroshio Power Plant：中華民國專利證號：I-591236；美國專利證號：US9169882-B2) 因設有中繼平臺，故組成電廠機件多、施工程序複雜

專利現況：

(1)本技術已有相關專利：

中華民國專利證號：I-591236；美國專利證號：US9169882-B2

(2)本研究團隊具有數十年研究經驗：

專利發明人陳發林教授，在過去十年間曾發表以下科學專書與論文：

Book:

- Falin Chen, The Kuroshio Power Plant, Springer, London, pp 1-256, 2013

Referred Paper:

- Ling-Yuan Chang, Falin Chen & Kuo-Tung Tseng, "Dynamics of a marine turbine for deep ocean currents," J. Marine Science and Engineering, 4, 59-77, DOI:10.3390/jmse4030059, 2016.
- J. S. Tsai & Falin Chen, "The conceptual design of a tidal power plant in Taiwan," J. Marine Science and Engineering, 2, 506-533, DOI:10.3390/jmse2020506, 2014.
- Falin Chen, "Kuroshio power plant development plan," Renewable and Sustainable Energy Reviews, 14, 2655-2668, 2010.

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The Power Plant Structure and Deployment of Ocean Current Power Plants

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Market Needs:

According to International Energy Agency, the potential capacity to convert the momentum of ocean current into electricity worldwide is more than 200GW. The present invention proposes a technology which may construct the power plant in ocean currents with short working hours and low construction cost. This technology is suitable to apply in the ocean of stable current in both the deep or shallow water.

Our Technology:

The present patent proposes an ocean current power plant with a rigorous power plant structure and simple deployment procedures, which is suitable for deployment in deep or shallow seas with stable currents.

Due to the rigorous structure, the feasibility of constructing a power plant is high; because of the simple deployment procedures, the working hours of construction are short, and the construction cost is low.

The main components of the power plant are all mainstream products available in the international market. Consequently, the procedures of construction are clear and complete, and the possibility of causing errors during the construction process is low.

Strength:

The present patent has following strengths:

1. The power plant has a simple structure: A turbine combination consists of five major components: a turbine generator, a bi-polar float, a tri-polar joint, a seabed anchor, and four cables. A power plant consists of multiple turbine combination.
2. The power plant has a rigorous structure: Two turbine-combinations are connected with a flexible rod containing two rigid rods and a universal joint. The flexible rod can strengthen the power plant structure and prevent the collision between neighboring turbines.
3. The deployment procedure contains only three steps: (1) the combination of the turbine generator, the bi-polar float, and the tri-polar joint, or the turbine combination, is towed to the designated area by a barge. (2) The cable connected with the anchor on the seabed is hooked

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on the tri-polar joint. (3) To release the cable connecting the barge and the turbine combination.

4. When the procedure (3) completes, the turbine-combination will be towed to downstream and sink into the ocean due to the action of ocean current. And it will be placed in the current stably.
5. One may deploy multiple units of turbine-combination at the same time.
6. The present power plant has a dull and rigid structure, a simple and reliable construction procedure, and a low probability of errors, resulting in that the construction hours are short and the construction cost is low.

Competing Products:

1. Tidal power plants, such as the power plants constructed by MCT Co. (England), OpenHydro Co. (France) or Atlantis (England), are suitable for the ocean of shallow waters.
2. The Kuroshio Power Plant (patent No. I-591236TW and US-9169882-B2) contains a design of relay-platform, which makes the design complicated and the deployment procedure tedious.

Intellectual Properties:

- (1) The present patent has two related patents: (patent No. I-591236TW and US-9169882-B2).
- (2) The present patent inventor, Prof. Falin Chen, has published the following book and referred papers in the past decade:

Book:

- Falin Chen, The Kuroshio Power Plant, Springer, London, pp 1-256, 2013

Referred Paper:

- Ling-Yuan Chang, Falin Chen & Kuo-Tung Tseng, "Dynamics of a marine turbine for deep ocean currents," J. Marine Science and Engineering, 4, 59-77, DOI:10.3390/jmse4030059, 2016.
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- Falin Chen, "Kuroshio power plant development plan," Renewable and Sustainable Energy Reviews, 14, 2655-2668, 2010.

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