



ANNUAL REPORT 2013

2/25/2014

Collaborating for Ocean Renewable Energy in Southeast Asia – An Overview

This is a report of what has been done since the formation of the Southeast Asian Collaboration for Ocean Renewable Energy (SEAcORE) last February 2013. The first year of SEAcORE has been focused in establishing and strengthening the network of the key crucial stakeholders of ORE in SEA. This report includes what SEAcORE is about, Project Activities and Country Reports: ORE Status in SEA.

SEAcORE Annual Report 2013

For more information, please contact: Ms. Mary Ann Joy Quirapas, Lead SEAcORE Secretariat (mquirapas@ntu.edu.sg)

Editorial Board: Dr. Srikanth Narasimalu, Program Director (Wind and Marine Renewable, ERI@N); Dr. Michael Lochinvar Sim Abundo, Research Fellow (W&M Renewable, ERI@N) and Mr. Ravindran Pallaniappan, Research Scientist (ERI@N)

Contributors:

Dr. Chee Ming Lim, UBD
Dr. Mukhtasor, INOCEAN
Dr. Lim Yun Seng, UTAR
Dr. Omar Yaakob, UTM
Ms. Farah Ellyza Binti Hashim, UTM
Dr. Myat Lwin, MMU
Mr. Htun Naig Aung, UM FCCI
Dr. Laura David, UP
Prof. Michael Escoto, UP
Ms. Mariane Catanyag, UP
Dr. Worachat, JGSEE
Dr. Chaiwat, JGSEE
Mr. Nguyen Binh Khanh, IES

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Annual Report 2013

COLLABORATING FOR OCEAN RENEWABLE ENERGY IN SOUTHEAST ASIA – AN OVERVIEW

INTRODUCTION

The Energy Research Institute @ NTU

The Energy Research Institute at NTU (ERI@N) focuses on the areas of sustainable energy, energy efficiency/ infrastructure and socio-economic aspects of energy research. One of its missions it to advance the research enhancing the efficiency of energy systems while maximizing the synergies of alternative energy sources.

The Institute and its research centres have considerable expertise and strength in areas of fuel cells, wind & tidal energy, charge storage devices, photovoltaic, micro grids and smart energy systems, and collectively provide an integrated set of expertise from materials design & synthesis, device fabrication and modelling, and systems integration and optimization.

Wind and Marine Renewables Team

The Wind and Marine Group at ERI@N focuses on the following areas of research: 1. Fluid/structural and fluid-structure interactions; 2. Novel materials and coatings; 3. Condition monitoring and fault tolerance control through sensors and integrated networks; 4. Generators, power electronics and control schemes and; 5. Wind and marine resource assessment. The group has initiated wind and tidal current resource assessments for Singapore and an ocean renewable energy project feasibility tool. It has also committed to the development of technology to meet the challenges of the wind and marine sector.

ERI@N Wind and Marine and SEAcORE

The regional conditions in Southeast Asia such as “rapid economic growth, increasing energy demand, rising fossil fuel imports, growing environmental pressures, low rural electrification levels, and heavy reliance on fossil fuels and traditional biomass”, as mentioned by International Energy Agency (IEA) [1], are favorable for renewable energy. Although natural energy resources vary significantly among Southeast Asian countries, the substantial amount of renewable energy available in the region is not much utilized yet [1]. One of the renewable energies that is relatively significant in the region is ocean renewable energy (ORE) [2].

With this, the Wind and Marine Team of ERI@N has taken the initiative to explore the possibility of having a Southeast Asian-wide collaborative framework for increasing the uptake

of ocean renewable energy (ORE) in the region (or the Southeast Asian Collaboration for Ocean Renewable Energy, SEAcORE).

SEAcORE Rationale

There are a number of on-going studies and activities that suggest the potential for utilization of ocean renewable energy (ORE) in Southeast Asia [3 -16]. These studies cover resource assessment and the possible technology development for ORE for each ASEAN country. However, ORE is not yet part of the renewable energy mix of ASEAN.

A collaborative framework and network should be established specifically for advancing the development of ocean renewable energy and increasing the uptake of ocean renewable in the regional hence, the proposal for the South East Asian (SEA) Collaboration for Ocean Renewable Energy (SEAcORE) initiative.

SEAcORE is envisioned to be a platform for exchange of status, plans, ideas, initiatives, & experiences from R&D, policy, and industry forming a collated and active core network of expertise and technical know-how in Southeast Asia to set, assist, augment, or facilitate adoption of ocean renewable energy in the region.

Offshore Renewables

SEAcORE as a platform of different stakeholders in ocean renewable energy also looks at the importance of offshore renewables and its expanding market around the world. The Southeast Asian region is seen to be one of most promising avenues for cutting-edge research work and technology development in the offshore renewables. The SEAcORE network is open to potential expansion through collaborative projects in this field.

Who is SEAcORE?

The Signing of Agreement to Commit to SEAcORE has been signed last February 26, 2013 with the following organizations as the core founding members:

Brunei – Universiti Brunei Darussalam (UBD)

Indonesia – Indonesian Ocean Energy Association (INOCEAN);

Indonesian Counterpart for Energy and Environmental Solutions (ICEES)

Malaysia – Universiti Teknologi Malaysia (UTM); Universiti Tunku Abdul Rahman (UTAR)

Myanmar – Myanmar Maritime University (MMU); Myanmar Engineering Society (MES),

Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI)

Philippines – University of the Philippines (UP), UP Marine Science Institute (UPMSI)

Singapore – Nanyang Technological University (NTU)

Thailand – King Mongkut’s Institute of Technology Ladkrabang (KMITL);

King Mongkut’s University of Technology Thonburi (KMUTT)

Vietnam – Hanoi University of Science and Technology (HUST); Institute of Energy Science (IES)

A Secretariat has also been formed (one representative from each country), which is mainly responsible for the coordination, administration and organization of SEAcORE activities.

What has been done so far?

As the institute spearheading SEAcORE, the Energy Research Institute @ NTU (ERI@N) takes part on the technical know-how and expertise on ocean renewable energy technology development.

For the first six months of the year, SEAcORE through ERI@N has the following achievements:

- Database of ORE-related stakeholders, experts, institutions, agencies and industries in Southeast Asia
- ERI@N hosted the first two major events of SEAcORE where crucial stakeholders (academe, industries and government agencies) took part in discussing the viability of ORE to be used as an alternative source of energy in the region.
- Signed Agreement to Commit in SEAcORE by different SEA delegates - This establishes the core founding members of SEAcORE.
- Collated data, information (e.g. potential ORE resources) and technology capabilities from SEA experts on ORE
- Memorandum of Understanding among SEA institutions and universities, specifically focusing on ORE-related researches and studies
- Collaborated with different intergovernmental and international organizations related to energy (e.g. Ocean Energy Systems, Asian Wave and Tidal Energy Conference Series, Asian Development Bank, etc.)
- Initiated research collaboration discussions with different ASEAN Countries. As an example, a team of the researchers in ERI@N together with its Philippine counterparts has currently started the development of a web-based GIS platform for ORE Planning. A survey of ORE capabilities from each member institution of SEAcORE has also been gathered by ERI@N team in one database. Initial discussion on ORE resource assessment for their own country has also been made with the following institutions: Universiti Teknologi Malaysia (UTM), Institute of Energy Science-Vietnam (IES), Joint Graduate School of Energy and Environment - Thailand and Myanmar Maritime University (MMU).

PROJECT ACTIVITIES

Year 1 Activities and Achievements:

A. COUNTRY TRIPS TO DIFFERENT SOUTHEAST ASIAN COUNTRIES

are the initial meetings with the relevant stakeholders of ocean renewable energy. These trips are crucial meetings for the project as it identifies the right people to collaborate with for SEAcORE initiatives. The objectives of this activity is to 1) personally meet with ORE Experts in the region, 2) explain SEAcORE initiative and 3) invite the ORE

institutions and experts to the first SEAcORE Workshop (Please see Annex 1 for country visit reports)

Date of Visit (2013)	Country	Institute/Contacts
11-Jan	Malaysia	UTM, NOD
17-Jan	Thailand	KMITL, KMUTT, Chulalongkorn University
Jan 21-24	Philippines	UP, DoST, PNOC, Poseidon
29-Jan	Indonesia	INOCEAN, NEC
31-Jan	Vietnam	HUST, IES
Feb 4 to 5	Myanmar	MES, MMU, UMFCI
Mar 12-13	Brunei	PM Office-Energy Division, UBD

Table 1 – Country Visits for initial discussion on SEAcORE

Achievements: The country trips resulted to: 1) pin-pointed the right people from each SEA doing ORE, 2) established initial contact/ building of relationship with ORE institutions for the SEAcORE Network, 3) visited ORE facilities in each institution and 4) had successfully invited the ORE experts/institutions to the first SEAcORE Workshop.

Country	Promised Participation and Contribution to SEAcORE
Brunei	To collect data for resource assessment on ocean renewable energy potential
Indonesia	R&D with Indonesia universities (ITS, ITB, etc), Pilot Projects
Malaysia	Facility sharing in their Marine Technology Centre; OTEC Research Centre
Myanmar	Human Resource Training on ORE-related activities; (MMU) facility sharing; (MES) to be the focal point of contact in Myanmar; Kyite Ka Mei Tidal Stream Project
Philippines	Trident (UP, NTU, DHI, DoST); Environment Impact Assessment Procedure (UP MSI; DoST); Wave and Tidal Demonstration Sites (UP, DoST, NTU), Ocean Pixel Project (with Singapore)
Singapore	Joint Industry Program (NTU); Resource Mapping (TMSI, NUS; DHI; NTU); Ocean Pixel Project
Thailand	Marine Research Lab (CU), Wave Energy Modelling (KMUTT); Ocean Energy Resource and Systems Modelling (JGSEE, KMUTT), Participation in the SEE Forum
Vietnam	Manpower, R&D Sites, Facility Sharing; Resource Assessment; Modeling on Wave and Tidal Energy

Table 2 - Summary of the initial meetings with each Southeast Asian country and their promised contribution/s to the SEAcORE Network.

B. SEACORE WORKSHOPS

- a. *“Southeast Asian Collaboration for Ocean Renewable Energy: What Do Experts Say?”* on February 25-26, 2013. This has been a preliminary meeting among the Research & Development and Technology experts on Ocean Renewable Energy – scientists, R&D people, technology providers or engineers in Southeast Asia and UK. The results of this FGD were collated and analysed in order to have a technical “framework” on how to put forward the use of ORE in the SEA region (advantages, disadvantages, opportunities and costs of ORE). (Please see SEAcORE Bulletin no. 1)





Achievements: 1) The SEACORE was “established” with the signing of Commitment to SEAcORE among Southeast Asian countries; 2) initiation of discussion of MoUs among SEA universities; 3) initiation of some potential projects in Southeast Asia (e.g. Tow Tank use in exchange for HPC) 4) SEACORE next steps were also defined.

- b. *SEAcORE in SIEW 2013*. In line with the vision of the SEAcORE and as part of strengthening the established network from the first workshop, we held series of events within the Singapore International Energy Week (SIEW) in October 2013:
 - i. SEAcORE Meeting October 2013
 - ii. Joint Technical Session with Offshore Renewable Energy Conference (OREC 2013)
 - iii. Round Table Discussion (RTD) with Policy Makers: The Role of Government in Ocean Renewable Energy (Please see SEAcORE Bulletin no.2)

Achievements: 1) Different MoUs formally were signed among the different SEA institutes and NTU. 2) The current status of ocean renewable energy in SEA region (specifically providing the gaps for ocean renewable energy development in the region) was identified by the team.

Country	Research and Development	Resource Assessment					Technology Development	Policy Existence	Existence of Roadmap
		Tidal Current	Tidal Barrage	Wave	OTEC	Salinity Gradient			
South East Asia									

Level of Activity/Dev't:

Existence of Works	
Developing	
Early Efforts	
Yet to be Developed	

Resource Assessment works need to be improved.
 Suitable Technology **Co-Development** Needed
 Project **Feasibility Studies** needed for different stages
 Progressive Development, e.g. **Demonstration** Projects

Figure 1 – Current Status of Ocean Renewable Energy (ORE) in Southeast Asian Region and its Gap

3) Specific areas of collaboration for ocean renewables have been discussed.

COUNTRY	Institution	Potential Projects
Brunei	Universiti of Brunei Darussalam	Wind Map for Borneo
Indonesia	Indonesian Ocean Energy Association (INOCEAN) / Indonesian Counterpart for Energy and Environmental Solutions (ICEES)	Enhancing the ORE capacity in SEA; Pilot projects on OTEC, wave and tidal energy
Malaysia	Universiti Teknologi Malaysia National Oceanography Directorate	Projects on OTEC and technology development in ORE
	Universiti Tunku Abdul Rahman	Energy Management Systems
Myanmar	Myanmar Maritime University Union of Myanmar of Federation of Chambers of Commerce and Industries, Energy and Environment Cluster Group	Resource Assessment of ORE
Philippines	University of the Philippines - Energy Engineering Programme University of the Philippines - Marine Science Institute	Resource Assessment of ORE (Ocean Pixel)
Thailand	King Mongkut of Technology Thonburi	Resource Assessment in Thailand Gulf
Vietnam	Vietnam Academy of Science and Technology, Institute of Energy Science Hanoi University of Science and Technology	Resource Assessment; Small-scale tidal turbine

Table 3 – Specific areas / potential projects to be worked on with the different SEA countries as initial steps for ocean renewable energy in the region

C. ASEAN CENTRE FOR ENERGY – TECHNICAL WORKING GROUP

In partnership with the ASEAN Centre for Energy (ACE), SEAcORE has been proposed to be the “technical working group” of ACE in ocean renewable energy-related research work and activities in Southeast Asia. The discussion is on-going with the Director of ACE, Dr. Hardiv Situmeang and the SEAcORE Team.

D. COMMUNICATIONS AND NETWORKING

SEAcORE Website/E-group – A portal where all happenings, events and updates on SEA ORE would be placed (www.sea-core.org). This would also be a venue for communication among the SEAcORE members.

Survey of ORE capabilities for each country – A database of SEA ocean/offshore renewable energy capabilities and facilities (manpower, expertise, facilities and current ORE projects) was created for information sharing and capacity building. This is accessible to the SEAcORE Network.

Contact and networking with other regional and international organizations for networking, possible funding sources and information sharing.

- Ocean Energy Systems (OES)
- International Network on Offshore Renewable Energy (INORE) – resulted in the creation of INORE-Southeast Asia (INORE-SEA); spearheaded by JIP PhD Students
- Asian Wave and Tidal Energy Conference Series (AWTEC) – recommended SEAcORE members to be part of the organizing committee of AWTEC.
- Asian Development Bank (ADB)

With local institutions and governmental bodies:

- Sustainable Energy Association of Singapore (SEAS)
- Southeast Asian Embassies in Singapore
- The Netherlands Embassy
- The British High Commission
- Monaco Foundation

SEAcORE Secretariat and **International Advisory Committee** have been created. The Secretariat Team has the role of organizing and coordinating the events and would serve as the point of contact from each SEA country for SEAcORE activities and projects.

SEAcORE Secretariat Committee

Singapore	– Ms. Mary Ann Joy Quirapas (Lead Secretariat)
Malaysia	– Ms. Farah Ellyza Binti Hashim, UTM
Thailand	– Dr. Chaiwat, JGSEE
Philippines	– Ms. Marianne Catanyag, UP
Vietnam	– Mr. Nguyen Binh Khan, IES
Brunei	– Dr. Sathyajith Mathew, UBD
Indonesia	– Mr. Agung Iswandi, ICEES

International Advisory Committee:

Professor AbuBakr Bahaj – Head of Energy and Climate Division of University of Southampton

Mr. Cameron Johnstone – CEO of Nautricity and Professor in University of Strathclyde

Ms. Eileen Linklater - Client Relationship and Marketing Manager, European Marine Energy Centre

E. SEACORE FUNDING AND SUSTAINABILITY

The following are the sponsorships given to SEAcORE Events by external bodies or organizations during its first year.

- Ocean Energy Systems – 5000 Euros
- British High Commission – sponsored SGD 25,000 for the SEAcORE February Workshop; sponsored two UK Speakers (Professor AbuBakr Bahaj of University of Southampton and Mr. Cameron Johnstone of Nautricity and University of Strathclyde to be speakers for SEAcORE events in SIEW 2013)

MOVING FORWARD

After establishing the network and collaboration for SEAcORE on Year 1, YEAR 2 will focus more on establishing joint research activities through creating research collaborative projects among different ASEAN countries. Below are some of the proposed activities:

Research Collaboration Agreements towards Specific Projects among SEAcORE members As MoUs are in place, the next step is to have specific collaborative projects among the different Southeast Asian countries. Table 3 above shows that different themes that the SEAcORE member countries could work on together as initial regional projects for the ocean/offshore renewable energy.

OCEAN PIXEL Project of ERI@N and University of the Philippines through SEAcORE To elucidate SEAcORE's collaboration a case study of tidal resource study called The Ocean Pixel Project can be taken for brief understanding. In conjunction with the University of the Philippines regional marine spatial planning including the development of a web-based GIS platform for ORE Planning featuring Collated Ocean Energy Resource Maps, Environmental Impact Scores, Resource Analysis, Navigation and Shipping Considerations, etc was achieved. The study helped to understand the tidal energy potential between few islands such as Verde, Matnog, Cebu and Davao.

Facilitated by ERI@N, other similar projects could be done with the rest of Southeast Asian (SEA) countries. Examples are resource assessment measurements and small scale turbines to be tested on SEA waters.

Asian Wave and Tidal Energy Conference Series (AWTEC) 2014 – AWTEC is an international technical and scientific conference under European Wave and Tidal Energy Conference (EWTEC) organization, focused on ocean wave and tidal renewable energies and widely respected for its commitment to maintain high standards in the quality of academic and industrial contributions to its proceedings.¹ The second biannual SEAcORE Workshop would happen under AWTEC 2014 as this provides attendees with a perfect forum for knowledge transfer and debate at the cutting edge of marine renewable energy technology and also provide the recent activities in Asian region.²

RE@SIEW Expo and Conference 2014 (Renewable Energy @ Singapore International Energy Week) This is the annual conference organized by ERI@N and the Singapore Energy Market Authority (EMA) which the SEAcORE Annual meeting is also happening in conjunction. A technical session is dedicated to discuss the marine renewable energy where most of the participants are from the SEAcORE Network. (please see RE@SIEW 2014 flyer)

¹ <http://www.awtec.org/>

² *Ibid.*

Study Visits/Technical Trainings (SEA ORE stakeholders to Europe or any installation outside SEA Region) – The purpose of this visit is to see actual ORE installations through organizations like EMEC. Finally, this study visit would be an opportunity for SEA delegates to meet EU companies and universities with ORE R&D in order to establish further collaborative projects.

Establishment of SEAcORE as regional consortium recognized by ASEAN Attendance to ASEAN Centre for Energy (ACE) sponsored events; meetings with ACE, for networking and making the presence of SEAcORE be recognized by ACE.

Year 3 of SEAcORE will focus on Feasibility Studies of ORE in SEA

Collated Ocean Energy Resource Map for SEA As there is concrete information and data gathered for Ocean Pixel, it could be completed and launched on the year. This tool would be helpful in providing information on Energy Density, Project Development Planning, Environmental Scores, Resource Analysis, Navigation and Shipping Considerations, etc.

Inclusion of SEAcORE in Ocean Energy Systems (OES) The OES is an intergovernmental collaboration between countries, which operates under framework established by the International Energy Agency (IEA) in Paris. The importance of SEAcORE being part of OES could be depicted from passage below from OES website:

“The OES brings together countries to advance research, development and demonstration of conversion technologies to harness energy from all forms of ocean renewable resources, such as tides, waves, currents, temperature gradient (ocean thermal energy conversion and submarine geothermal energy) and salinity gradient for electricity generation, as well as for other uses, such as desalination, through international cooperation and information exchange.”

http://www.ocean-energy-systems.org/about_oes

As part of OES, SEAcORE would not only have a regional presence but could also be part of the international arena which focuses on increasing the uptake of ORE in the world.

Study Visit (EU-ORE or any ORE Stakeholders outside SEA to SEA region) – The purpose of this visit to see the possible installation sites or deployments projects that SEA region has on the third year of SEAcORE. Experts from EU or any international organization related to ORE outside the region would also be able to assist in the deployment of demonstration projects in the region.

Year 4 of SEAcORE will focus on Pilot Installations of ORE technology in SEA.

Assist in Deployment of Demonstration Projects SEAcORE Team would be facilitating/assisting the actual deployment of demonstration projects in the sea across different SEA countries.

These deployment projects would not only be for R&D/academic purposes but could be expandable to commercial/industrial projects.