Kick-off Meeting under "the Carbon Footprint of Renewable Energy for ASEAN Countries Project

Renewable Energy in the Philippines

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De La Salle University
Manila, Philippines

"A leading learner-centered and research University bridging faith and scholarship, attuned to a sustainable Earth, and in the service of Church and society, especially the poor and marginalized."

- A private, comprehensive, non-stock/non-profit Catholic university founded in 1911
- Ranked **1st among PH HEIs** in number of Scopus-indexed publications in 2019-present
- **600+%** research output growth in 2010-2019
- Times Higher Education (THE) World Ranking **1201+**
- THE Emerging Economies Ranking **501+**
- THE Asia Ranking **401+**
- THE Impact Ranking **401+**
- THE Impact Ranking (Eng.) **801+**
- THE Subject Ranking (Phys. Sci.) **801+**
- THE Subject Ranking (Soc. Sci.) **601+**
- THE Subject Ranking (Comp. Sci.) **601+**
- THE Subject Ranking (Bus. & Eco.) **601+**
- THE Subject Ranking (Educ.) **201+**

Angelo Earvin Sy Choi, Ph.D.

- Associate Professor, Department of Chemical Engineering
- B.S. and M.S. Ch.E., Ph.D. Ch.E. (DLSU)
- Senior Researcher in University of Ulsan (Sept. 2016 to May 2018)
- Research Professor in University Core Research Center for Disaster-free and Safety Ocean City Construction (June 2018 to June 2020)
- **31** publications, *h*-index = **12** (Scopus)
- Recipient of awards from 2nd place in the NAST Talent Search for Young Scientists by NAST, Outstanding Paper by CIEE, Outstanding Research of the Philippines 2015 by IAMURE
- Research Interest: adsorption, oxidation, desulfurization, reaction kinetics, thermodynamics, optimization (RSM and fuzzy), crystallization, solidification/stabilization, biofuels and biotechnology.

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Affiliation history

2014 - 2022 De La Salle University, Manila, Philippines

2018 - 2020 National Research Center for Disaster-Free and Safe Ocean City, Busan, South Korea

2017 - 2018 University of Ulsan, Ulsan, South Korea

Subject Areas

Environmental Science • Chemical Engineering • Energy • Engineering • Chemistry • Business, Management and Accounting • Social Sciences • Medicine • Economics, Econometrics and Finance • Agricultural and Biological Sciences • Materials Science

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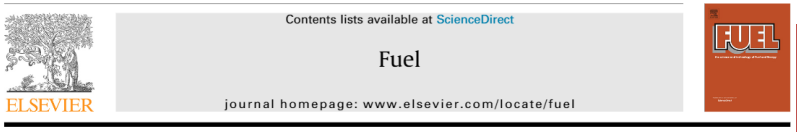
Contents lists available at ScienceDirect

Fuel

journal homepage: www.elsevier.com/locate/fuel

Full Length Article

Adsorption of benzothiophene sulfone over clay mineral adsorbents in the frame of oxidative desulfurization

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Chemical Engineering Journal

journal homepage: www.elsevier.com/locate/cej

Calcium carbonate granulation in a fluidized-bed reactor: Kinetic, parametric and granule characterization analyses

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Contents lists available at ScienceDirect

Nuclear Engineering and Technology

journal homepage: www.elsevier.com/locate/net

Original Article

Fuzzy optimization for the removal of uranium from mine water using batch electrocoagulation: A case study

Angelo Earvin Sy Choi [a, 1], Cybelle Concepcion Morales Futalan [a, 1], Jurng-Jae Yee [b, *]

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Metrics overview

31
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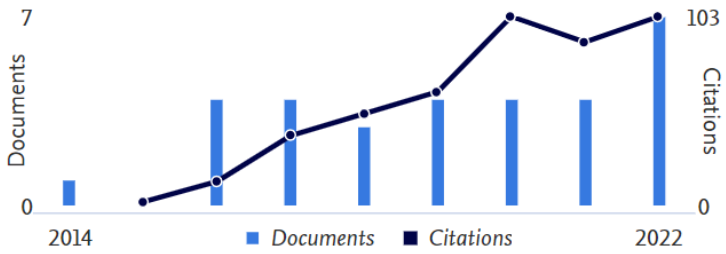

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Most contributed Topics 2017–2021

Fluidized Beds; Water Hardness; Crystal Growth
5 documents

Desulfurization of Fuel; Dibenzothiophene; Catalyst
4 documents

Mechanical Properties; Sulfur; Dicyclopentadiene
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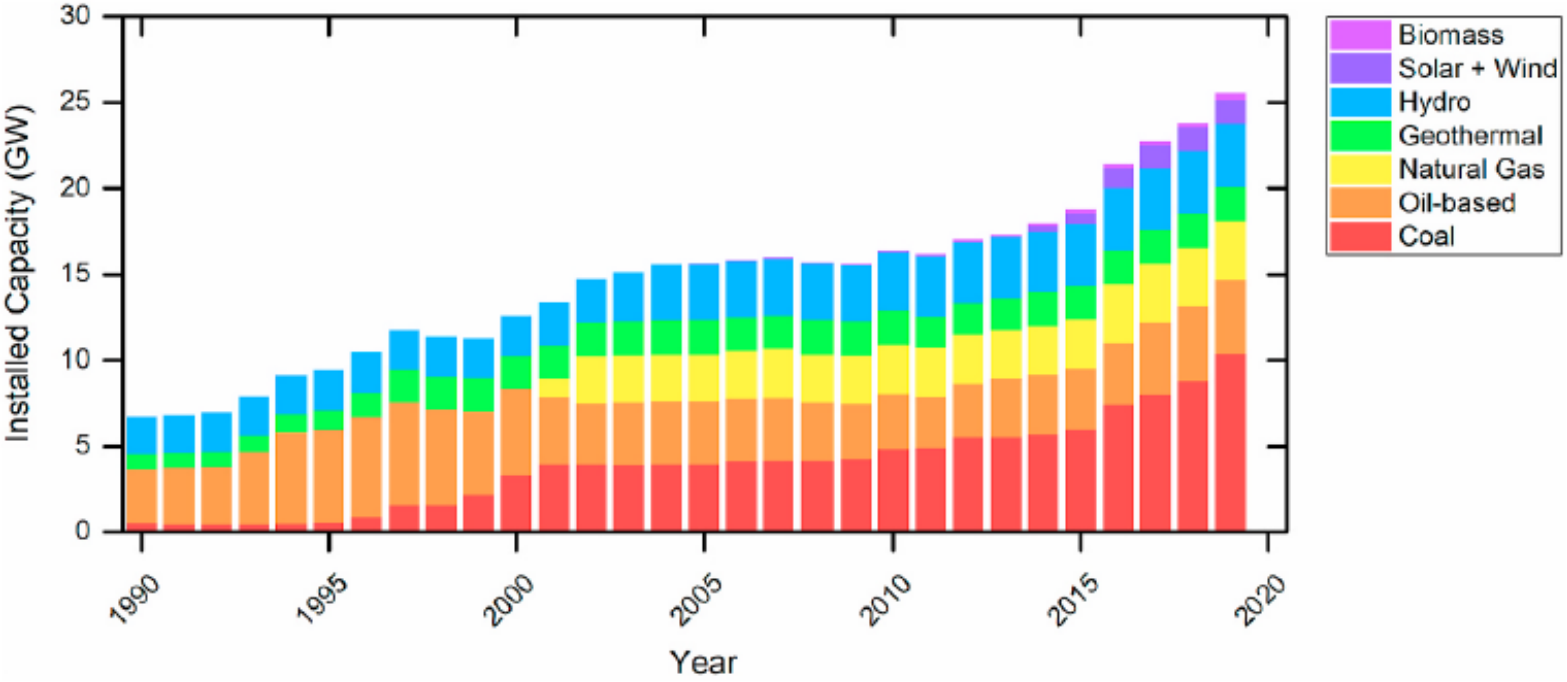
Renewable Energy (RE) in the Philippines

Like other Southeast Asia countries, the Philippines faces the challenge of a rapidly growing population and growing energy demand.

Yet, where it differs and stands out is in its response. Compared to its neighbors, the Philippines is considered a global leader in RE.

Over 47% of its total energy use comes from green sources.

Renewable Energy (RE) in the Philippines



2019: 41.7% coal, 15.1% oil, 13.8% natural gas, 14.9% hydropower, 7.7% geothermal, 3.7% solar PV, 1.7% wind, 1.4% biomass

A. Gulagi, M. Alcanzare, D. Bogdanov, E. Esparcia, J. Ocon, C. Breyer, Transition pathway towards 100% renewable energy across the sectors of power, heat, transport, and desalination for the Philippines, Renew. Sustain. Energy Rev. 144 (2021) 110934. https://doi.org/10.1016/j.rser.2021.110934.

Hydroelectric plants

Angat Dam, a major hydropower facility in Bulacan, Philippines

Geothermal Power

Geothermal power plant in Valencia, Negros Oriental

Solar Power

The **Calatagan Solar Power Plant** is the largest solar facility in Luzon, Philippines. [63.3 MW].

Wind Power

All wind power sites in the Philippines are on-shore facilities. Some, such as Ilocos Norte, Pililla Wind Farm in Rizal and Bangui Wind Farm are tourist destinations

Biomass Power

Biomass resources are abundant in the Philippines due to its large agricultural industry. Bagasse, rice husks, and coconut husks are used to generate power. The Philippines also uses Biogas from landfill as a biomass energy source.

Current RE Situation in the Philippines 2022

- The **Philippines**, alongside Indonesia, are the countries with the **highest concentration of geothermal power generation** in Asia. It has the world's third-largest installed geothermal power capacity at **1,918 megawatts (MW)** – with Indonesia coming a close second and the United States coming out on top.

- The REN21 report identified **7.1 giga-watts (GW)** of RE capacity in the Philippines. Over half, or **4.3 GW**, came from hydropower, with a further **896 MW** sourced from solar energy. In the coming years, solar demand is expected to shoot up dramatically. This is thanks to a significant pipeline of projects approved or under development. By 2022, solar energy in the Philippines is expected to rise to **3 GW**.

- Solar energy's RE counterpart, wind, only makes up **427 MW**. Despite having an estimated potential of up to **76 GW**, the current administration targets just 2.3 GW by 2030.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

RE Potential in the Philippines

In 2011, the country adopted an ambitious plan aiming for 15.3 GW of renewable power capacity by 2030 and over 20 GW by 2040. To achieve this lofty goal, the National Renewable Energy Program (NREP) laid out a five-step plan to reach all targets by 2027.

- Raise geothermal capacity by 75%
- Expand hydropower capacity by 160%
- Add an additional 277 MW of biomass power capacity
- Extend an additional 2,345 MW of wind power capacity
- Develop an ocean energy facility

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

RE Potential in the Philippines

- However, according to the WWF-Philippines *Building Momentum for Low Carbon Development* study, an even more ambitious scenario of 100% RE is feasible.

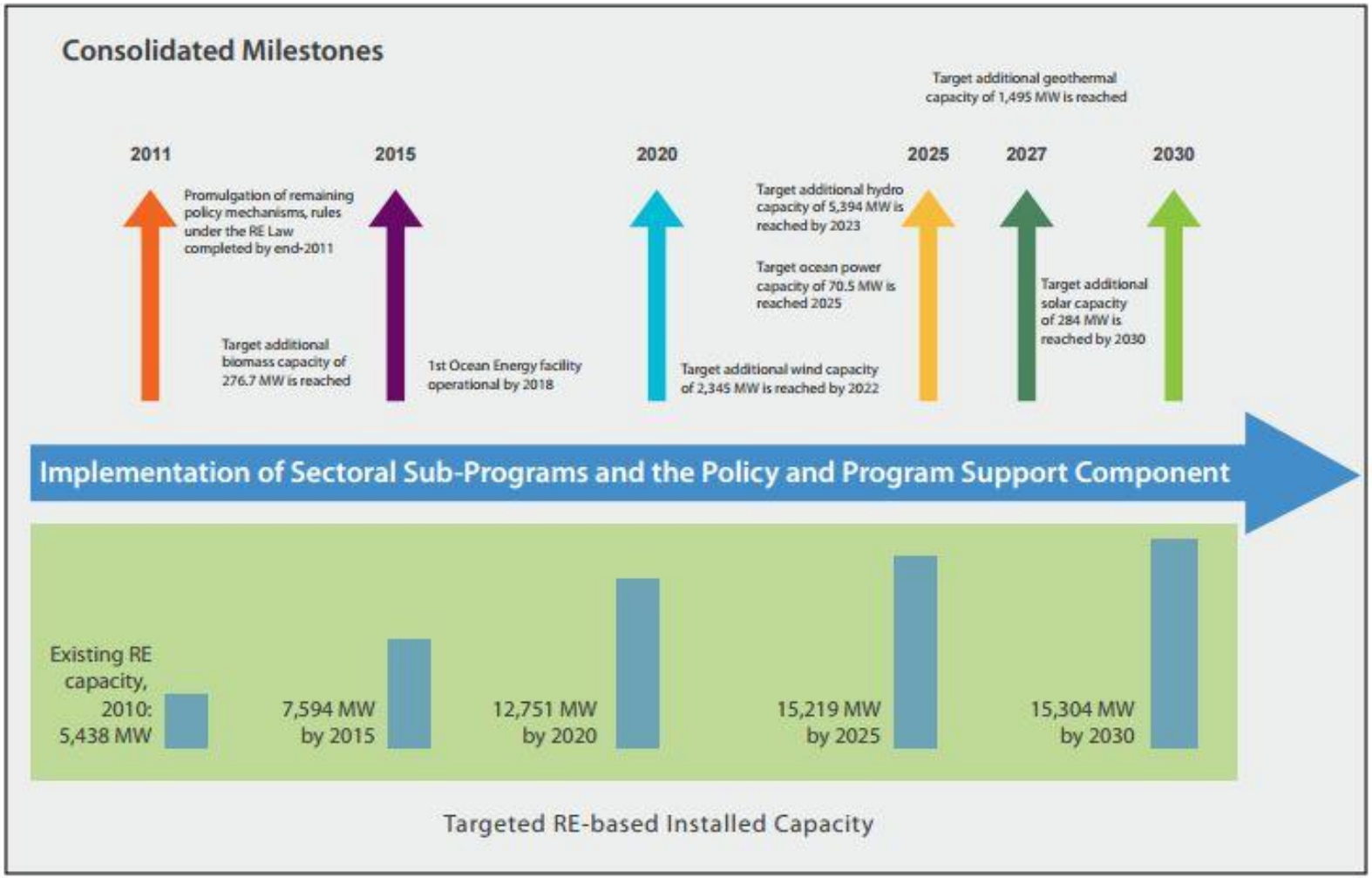
- The reasons for optimism are rooted in the RE potential in the Philippines.

- The report shows that the Philippines could aim higher. This would further add **1,200 MW** of geothermal, **2,308 MW** of hydropower, **235 MW** of biomass, and **7,404 MW** of wind, all before 2030.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

RE Potential in the Philippines

The National Renewable Energy Program (NREP) Consolidated RE Roadmap



Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

Advantages and Challenges for the RE Transition in the Philippines

- The Philippines' ambitious RE transition would guarantee energy security and self-sufficiency, accompanied by reduced reliance on imports.
- It would also boost local economic development and promote a favorable investment climate.
- Naturally, this would result in more jobs and reduce health and welfare costs.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

Advantages and Challenges for the RE Transition in the Philippines

- Currently, the country has some of the most lucrative government incentives for rural electrification – at least on paper.
- These should transform into attractive opportunities for private investment.
- However, private companies are yet to show considerable interest in energy access initiatives.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

Advantages and Challenges for the RE Transition in the Philippines

- Access to financing remains a massive problem. Today, only a few domestic banks support RE projects in the region. Furthermore, in recent years there have been significant decreases in investment. For example, in 2019, they were down 77% by USD $300 million.

- An International Renewable Energy Agency presentation showed that some of the main challenges revolve around **high upfront** and **technology costs**, **inaccessible financing**, and a **lack of competitiveness in the market**.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

The Enablers for the Philippines's RE Transition

- Despite the challenges, there are opportunities to capitalize on RE in the Philippines.

- For instance, the government has developed a framework of fiscal and non-fiscal incentives. Among these are an ***income tax holiday***, a ***duty-free importation of equipment*** and ***VAT-zero rating***, ***tax credits*** on domestic capital equipment, ***tax exemption*** on carbon credits, priority connection to the grid, and the Green Energy Option Program (GEOP).

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

The Enablers for the Philippines's RE Transition

- The Philippines discontinued its feed-in-tariff (FIT) programme and instead switched to reverse auctions.
- The goal of this is to ensure better support for large-scale solar energy projects.
- This strategy resulted in more competitive solar and wind generation costs at a grid level.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

The Enablers for the Philippines's RE Transition

- Currently, the country has the lowest bid within the region – USD $0.044 per 50 MW solar plant.
- Alternative financing models are sorely needed to accelerate renewables adoption.
- These include crowdfunding through platforms like Kiva, which has helped raise over USD $250,000 for RE projects development in the Philippines and India.

Source: https://energytracker.asia/renewable-energy-in-the-philippines-current-state-and-future-roadmap/

The End


Thank you for listening!