Organised by
Environmental Engineering Technical Division

The Institution of Engineers, Malaysia

Training Mode: Physical

Approved Duration: Applying

HRD Corp Serial No: Applying

Physical Half Day Seminar on "Next-Generation BECCS: Modular Carbon Capture Technology in Biomass-to-Energy Systems"

BEM APPROVED CPD: Applying REF NO:Applying

Date : 04 OCT 2025 (SATURDAY)
Time : 8.30 am - 1.30 pm
Venue : Auditorium Malakoff, Wisma IEM
Speakers : Dr. Steven Lim

REGISTRATION FEE'S (subject to 8% SST)		
	ONLINE FEE (RM) - NON HRD Claimable (via IEM portal)	NORMAL FEE (RM) - HRD Claimable (via email / invoice / quotation
IEM Student Members	100.00	150.00
IEM Graduate Members	180.00	230.00
IEM Corporate Members	300.00	350.00
Non-IEM Members	500.00	550.00

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SYPNOSIS

Bioenergy with Carbon Capture and Storage (BECCS) presents a promising pathway to achieve negative carbon emissions by combining biomass energy production with carbon capture technologies. The integration of advanced carbon capture solutions within biomass gasification systems enables not only renewable energy generation but also the removal of CO_2 from the atmosphere, contributing significantly to climate mitigation goals. Green Environmental Engineering Sdn. Bhd. (GEE) has developed and demonstrated innovative technologies pivotal for future BECCS applications. We have designed a hundred-tonne biomass gasification system, coupled with a steam turbine generator, to exemplify a state-ofthe-art biomass conversion facility. This system efficiently converts widely available sustainable biomass feedstock into syngas through a fluidized bed gasifier operating at moderate temperature. The produced syngas, characterized by high concentrations of combustible gases (CO, H_2 and CH_4), fuels a boiler system that generates saturated steam to drive electricity production, thereby combining renewable power generation with process heat recovery.

For this next-generation BECCS system, GEE seamlessly integrates a highperformance carbon capture unit known as the Matrix Flux Purification (MFP) system, which utilizes calcium looping technology with CaO/Al_2O_3 sorbents to capture CO_2 with over 90% efficiency. Unlike conventional capture methods, the MFP system offers simultaneous removal of multiple pollutants including but not limited to CO_2, SO_2, HCl and particulate matter in a single, energy-efficient modular unit. More importantly, the technology leverages industrial by-products (such as blast furnace slag from steel industry) for mineralizing CO_2, effectively locking it into stable carbonate forms that can be repurposed as sustainable construction materials. This closed-loop approach demonstrates circular economy principles by converting captured carbon and waste into valuable products, enhancing both environmental and economic viability.

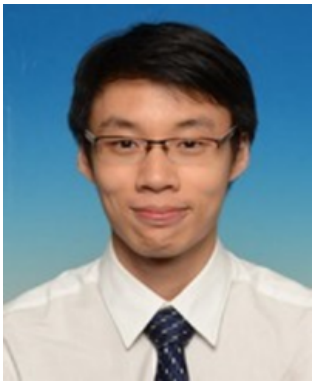
The integration of carbon capture within the biomass gasification process capitalizes on waste heat and low-cost energy inputs, substantially reducing operational energy consumption and costs. The modular design of the MFP system supports scalability from pilot to large-scale implementations, with demonstrated energy efficiencies suitable for industrial integration. The designed gasification project has the potential to show promising performance, producing clean syngas with low emissions, minimal tar formation and reliable operational stability, while the carbon capture unit ensures significant CO_2 removal potential. BECCS deployment through this combined biomass gasification and carbon capture system not only addresses renewable energy demands but also enables negative emissions by sequestering atmospheric CO_2. The technology's scalability, cost competitiveness and environmental benefits make it a viable solution to decarbonize energy-intensive sectors and contribute to achieving net-zero targets. Furthermore, the ability to generate renewable electricity alongside carbon sequestration enhances the system's attractiveness for sustainable industrial transformation.

In conclusion, the coupling of advanced biomass gasification with innovative calcium looping-based carbon capture technologies, as designed by GEE engineering team, provides a robust technical and commercial foundation for BECCS applications. This integrated approach offers a clear pathway to sustainable energy production combined with meaningful carbon dioxide removal, supporting global climate goals and advancing the circular economy

PROGRAMME

TIME	PROGRAMME
8:30 am – 9:00 am	Registration & Breakfast
9.00 am - 9.15 am	Welcome Speech By IEM
9.15 am - 10.00 am	**Session 1:** • Overview of Bioenergy and the Role of BECCS in Net-Zero Goals ◦ Introduction to BECCS and its climate mitigation potential
10.00 am - 10.45 am	**Session 2:** • GEE's Biomass Gasification System: Engineering a Carbon-Negative Power Plant ◦ Design, feedstock, gasifier technology, syngas utilization
10.45 am - 11.00 am	Morning Tea Break
11.00 am - 11.45 am	**Session 3** • Matrix Flux Purification (MFP) System: Advanced Carbon Capture Using Calcium Looping ◦ CO_2 removal, pollutant control, energy efficiency
11.45 am - 12.30 pm	**Session 4** • Circular Economy in BECCS: Mineralization, Waste Valorization & Sustainable Materials ◦ Use of slag, stable carbonates, construction products
12.30 pm - 1.00 pm	Q&A Session & Closing remark by IEM Representative
1.00pm	Lunch

SPEAKER PROFILE



Steven Lim is a project and research director at Green Environmental Engineering Sdn Bhd. He is also an associate professor at the Department of Chemical Engineering, Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, Malaysia. He obtained his PhD in Chemical Engineering from Universiti Sains Malaysia (USM) in 2014. His research interests revolve around devising sustainable and cost-effective methods to synthesis renewable energy (biodiesel, bioethanol and syngas) and other value-added products (bioplastic, cellulose nanofiber and triacetin) from renewable sources such as biomass.

REGISTRATION FORM

Physical Half Day Seminar on “Next-Generation BECCS: Modular Carbon Capture Technology in Biomass-to-Energy Systems”
Date: 04 October 2025
Venue: Auditorium Malakoff, Wisma IEM
Email : syafiq@iem.org.my

REGISTRATION FEE'S (subject to 8% SST)		
	ONLINE FEE (RM) - NON HRD Claimable (via IEM portal)	NORMAL FEE (RM) - HRD Claimable (via email invoice / quotation)
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NAME	MEMBERSHIP NO. / GRADE	FEES (RM)
	Sub Total:	
	SST Added 8% :	
	Total Amount Payable :	

PAYMENT DETAILS :

☐ Cash RM_____

☐ Cheque no._____for the amount of RM_____(non-refundable) .

FULL PAYMENT must be settled before commencement of the course, otherwise participants will not be allowed to enter the hall. If a place is reserved and the intended participant fails to attend the course, the fee is to be settled in full. If the participant failed to attend the course, the fee paid is non refundable. The Registration Fee includes lecture notes, refreshment and lunch.

For **ONLINE REGISTRATIONS,** please note that payment **MUST** be made **BEFORE the closing date.** If payment is not received within the stipulated time, the registration fee will be reverted to the normal registration fee.

Contact Person: _____Designation:_____

Name of Organization: _____

Address : _____

_____

Telephone No. : _____(O) _____(Fax No.)

_____(H) _____(HP)

Email :_____

_____
Signature & Stamp

_____
Date