

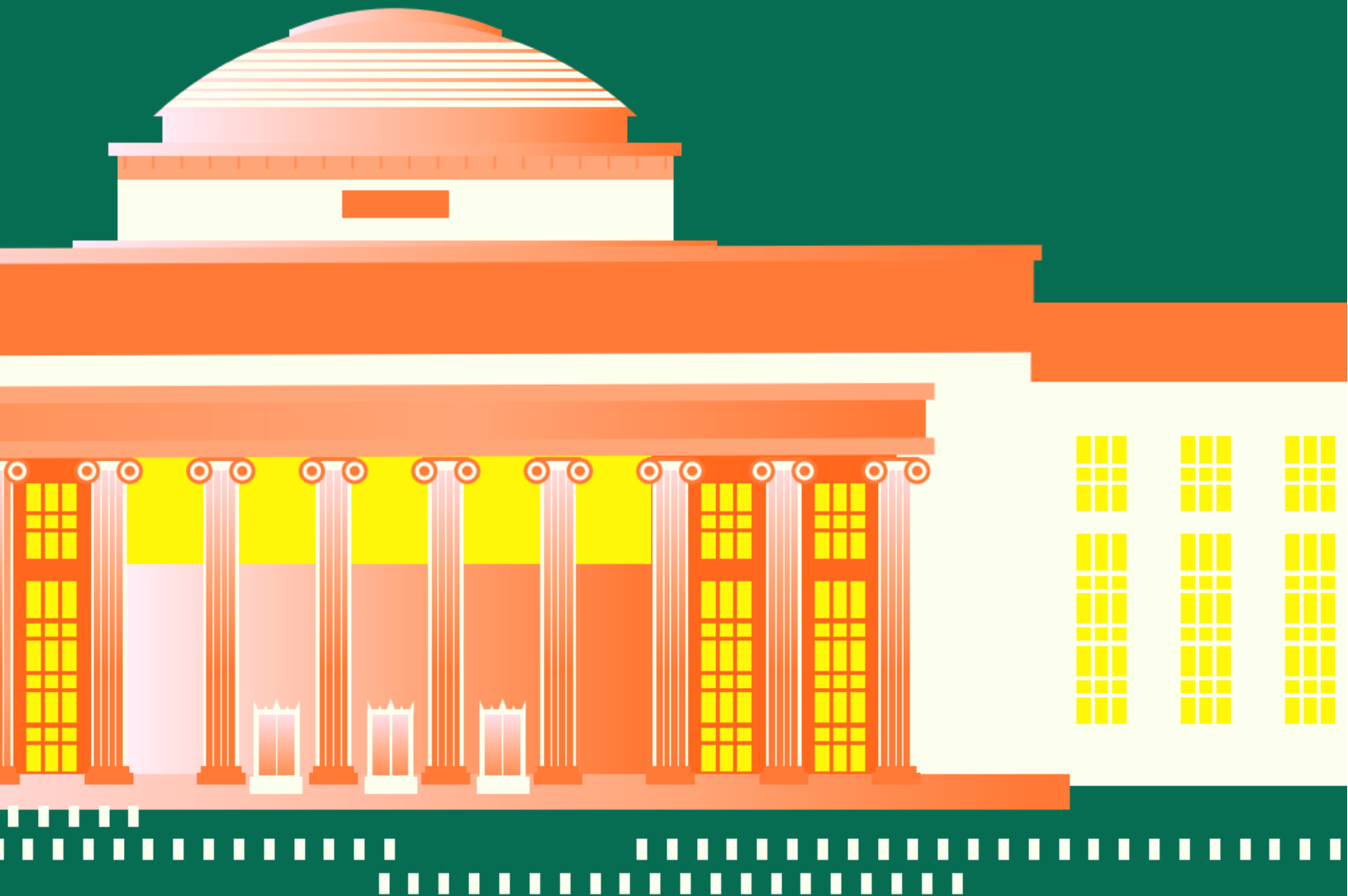
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International Conference on Applied Energy

Applied Energy Symposium

MIT A+B

Co-organized with Harvard
AUG 11-13, 2021 · MIT, Boston, USA



Welcome



Welcome to the Applied Energy Symposium: MIT A+B.

The IPCC report “Global Warming of 1.5°C” (Oct. 2018) issued a dire warning that unless CO₂ emissions are halved by 2030, devastating changes, which will be sooner than expected and irreversible, will occur in ocean and on land. Time is running out for transitioning to new energy systems globally. Logic and numbers show that the world must take a two-step approach: (A) deploy existing, industrially proven technologies, namely solar, wind and nuclear base load at an unprecedented scale and pace, from now to 2050 -- when a house catches fire, firemen must run to the closest hydrants and stop disputing which water stream would be purer; and (B) develop new concepts and technologies that may replace the dirtier parts of (A) post-2050, at terawatt scale.

The Applied Energy Symposium: MIT “A+B” (MITAB) is dedicated to the accelerated deployment of (A), and new concepts and emerging technologies for (B). For (A), reducing capital and operating costs, managing social dynamics, and minimizing environmental impact while maintaining extreme productivity are key; automation, artificial intelligence, social mobilization, governmental actions and international coordination will provide essential boosts. For (B), we seek new concepts and emerging technologies (e.g. fusion power engineering, superconducting transmission, etc.) that stand a chance to scale to terawatts after 30 years, i.e. “baby technologies” can grow to adulthood in 20-30 years. The AEAB2019 and MIT A+B 2020 were organized by Massachusetts Institute of Technology, Harvard University, and Applied Energy Innovation Institute (AEii) jointly.

We look forward to meeting you online.

Chairs of MITAB2021

Prof. Ju Li
Massachusetts Institute of Technology

Prof. Michael J. Aziz
Harvard University

Prof. Jerry Yan
Editor-in-chief of Applied Energy

- **Welcome to MIT A+B 2021**
- **Committees**
- **Acknowledgments**
- **Program at a Glance**
- **Opening Remarks and Plenary Keynotes**
- **Topic Session**
- **Oral Presentations**
- **Poster Presentations**

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International Conference on Applied Energy

Program at a Glance

Day 1: Thursday, August 12, 2021 (Boston Time)	
8:00 -8:20	Chair Welcome
8:20-9:10	Electrochemically modulated mitigation of acid gas emissions
9:10-10:00	“Green” energy realpolitik: Challenges in materials sourcing
10:00-10:20	Coffee/Tea Break
10:20-11:10	New directions for fuels from sunlight
11:10-12:00	Pathways to a carbon neutral energy system in California by 2045
12:05-13:10	Lunch Break
13:10-15:10	Energy Fuel
15:10-15:35	Coffee/Tea Break
15:35-17:35	Sustainability
Day 2: Friday, August 13, 2021 (Boston Time)	
8:00-10:00	Innovation
10:00-10:25	Coffee/Tea Break
10:25-12:25	Energy Materials
12:25-13:10	Lunch Break
13:10-15:10	Decarbonization
15:10-15:35	Coffee/Tea Break
15:35-17:35	Carbon capture, utilization and storage
Pre-recorded 5 Oral Sessions and E-Poster Track	
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Plenary Keynotes



T. Alan Hatton
Ralph Landau
Professor, Director,
Massachusetts Institute
of Technology

Electrochemically modulated mitigation of acid gas emissions

8:20-9:10, Thursday, August 12

The undisputed warming of the planet and increasing ocean acidification, with their strong implications for global climate and eco system changes, can be attributed to the increasing accumulation of anthropogenic CO₂ in both the atmosphere and in ocean waters. Strategies to mitigate these effects cannot rely simply on accelerated use of renewable energy resources to replace fossil fuels, but must include the capture of CO₂ both at concentration from point sources, and at low concentrations from the ambient, with subsequent subsurface sequestration or utilization. Traditional means for CO₂ capture and release generally rely on either chemical or physical interactions with sorbents with subsequent temperature or pressure changes to release the captured CO₂ and regenerate the sorbent. Isothermal operations that obviate or significantly reduce the heat integration requirements in these processes could potentially have significant advantages over the traditional methods in terms of complexity, energetics and cost of the overall capture operation.

Electrochemically based technologies relying primarily on renewable energy resources for the capture and release of CO₂ under isothermal conditions may prove to be a reliable approach for addressing the environmental crises facing the world. These approaches are suitable for both point-of-use gas emissions mitigation, and for removal of CO₂ from the atmosphere and ocean waters, where it been accumulating for decades. Examples include an indirect approach, in which an electrochemically released species (e.g., copper ions, protons) displaces the CO₂ bound to a chemical sorbent via competitive complexation; the CO₂ and the sorbents are regenerated when the species is re-captured in the cathode chamber of an electrochemical cell, leaving the sorbent free to be cycled back to the absorber. An alternative approach exploits the complexation of an electroactive moiety directly with the CO₂ upon activation by electrochemical reduction, with subsequent release of the CO₂ when the agent is re-oxidized on reversal of the applied cell voltage. In general, these electrochemically based technologies hold promise for tackling the climate change challenges that we, and future generations, must face.



Michelle Michot Foss
Fellow,
Energy, minerals and materials
Baker Institute for Public Policy
Rice University

"Green" energy realpolitik: Challenges in materials sourcing

9:10-10:00, Thursday, August 12

Realizations are growing that large scale shifts in energy technologies could dramatically elevate minerals intensity with attendant risks and uncertainties across a range of concerns, from cost and macroeconomic effects to geopolitical and trade insecurities. A prevailing question is whether recycling can offset demand for primary precursors, but recycling – and other life cycle management options – face their own technical and logistical hurdles and constraints.

Plenary Keynotes



Harry Atwater
Howard Hughes
Professor
Caltech

[New directions for fuels from sunlight](#)

10:20-11:10, Thursday, August 12

Direct synthesis of energy-dense chemical fuels from sunlight, including hydrogen and products from carbon dioxide reduction, is opening new directions for design of solar fuels systems comprised of materials for light harvesting, charge transport and catalytic selectivity. I will discuss the current state of the art for solar fuels and key challenges and opportunities for the future.



Sally Benson
Professor, Senior
Fellow, Director
Stanford University

[Pathways to a carbon neutral energy system in California by 2045](#)

11:10-12:00, Thursday, August 12

In September of 2018 the governor issued an Executive Order committing the State of California to carbon neutrality by 2045. Optimization and technoeconomic models have been used to assess the lowest cost pathways for achieving this goal. Decarbonization of the electricity system is the key to not only reducing current emissions from that sector, but also for reducing emissions from light duty vehicles, replacing natural gas heating, and other activities that can be electrified. This paper describes macro-energy systems modeling the elements of an economy wide strategy for carbon neutrality relying on a combination of renewable generation, carbon capture and storage, hydrogen, biofuels, and carbon dioxide removal.

Plenary Keynotes

Moderators



Prof. Ju Li

Massachusetts Institute of Technology



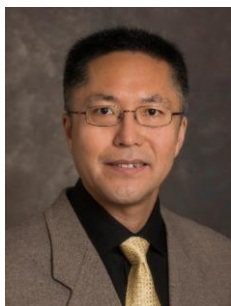
Prof. Michael J. Aziz

Harvard University

Topic Session

Energy Fuel

13:10-15:10, Thursday, August 12



[Prof. Bingqing Wei](#)

University of Delaware

Photocatalytic hydrogen production from water via photothermally induced biphasic systems



[Prof. Curtis Berlinguette](#)

The University of British Columbia

Converting captured CO2 directly into fuels



[Prof. Hans Auer](#)

Technische Universität Wien

Low carbon European energy system scenarios - the open modeling platform developed in openENTRANCE



Session Chair

Dr. Chukwunwike Iloeje

Argonne National Laboratory

Sustainability

15:35-17:35, Thursday, August 12



[Dr. Holger Schlör](#)

Institute of Energy and Climate Research

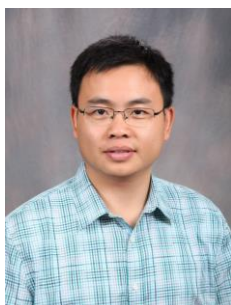
The Food-Energy-Water-Nexus and a Keynes sector in a post growth economy – learnings from a CGE model



[Dr. Destenie Nock](#)

Carnegie Mellon University

Low-carbon energy transitions: a systemic approach to quantifying equality and sustainability trade-offs



[Prof. Le Xie](#)

Texas A&M University

An Open-access Cross-domain Approach to Analyzing the Impact of Extreme Events on the Electricity Sector: What We Learned from COVID-19 and 2021 Texas Winter Outage



Session Chair

Dr. Rachel Meidl

Rice University's Baker Institute

Topic Session

Innovation

8:00-10:00, Friday, August 13



[Dr. Tyler H. Ruggles](#)

Carnegie Institution for Science

How many years of data is enough? Using multiple years of data to increase electricity system performance



[Prof. Jacopo Buongiorno](#)

Massachusetts Institute of Technology

The economic potential of nuclear batteries



[Dr. Chuanbo Yang](#)

National Renewable Energy Laboratory (NREL)

Temperature management to enable fast charging of li-ion batteries



Session Chair

Dr. Audun Botterud

Massachusetts Institute of Technology

Energy Materials

10:25-12:25, Friday, August 13



[Prof. Andrew Blakers](#)

Australian National University

100% renewables is easier and cheaper than most people think



[Prof. Sandra Venghaus](#)

RWTH Aachen University

Beyond coal lies within a circle: structural change in Germany from narratives to numbers



[Prof. Koroush Shirvan](#)

Massachusetts Institute of Technology

Nuclear energy cost and innovations that matter



Session Chair

Prof. Sarah Marie Jordaan

Johns Hopkins University

Topic Session

Decarbonization

13:10-15:10, Friday, August 13



Prof. Nguyen Trung Van

University of Kansas

A solid/liquid high-energy-density storage concept for redox flow batteries and its demonstration in a H₂-V system



Prof. Shu Hu

Yale University

A Coating strategy for stable photocatalysis: Pathways to photochemical conversion at scale



Prof. Christopher Arges

Penn State University

Electrochemical properties of thin film ionomers for high-temperature polymer electrolyte membrane systems



Session Chair

Prof. Adam Clayton Powell

Worcester Polytechnic Institute

Carbon capture, utilization and storage

15:35-17:35, Friday, August 13



Prof. Mihri Ozkan

University of California

Two steps to decarbonization: direct air capture of CO₂ and electrification of mobility



Prof. Nader Mahinpey

University of Calgary

CO₂ capture research technologies for the energy-driven economy in Alberta, Canada



Prof. David Goldberg

Columbia University

Opportunities for offshore wind energy and large-scale sequestration of CO₂ in basalt rocks: the Kerguelen Island case



Session Chair

Prof. Christian M. Lastoskie

University of Michigan

Oral Presentations

Electricity Decarbonization, Power System Flexibility, Smart Grids		
I.D.	Authors	Title
8	Haiying Sun and Hongxing Yang	Study on the impact of wind turbine relative position on power output performance
31	Charles Forsberg, Bruce Dale and Eric Ingersoll	Nuclear energy drop-in replacements for gas turbines, natural gas and fossil liquid fuels
56	Brian Tarroja and Greg Rhodes	Exploring the role of flexible geothermal electricity resources in developing cost-effective decarbonized electricity grids
83	Ghazal Kamyabjou, Robyn C. Meeks and Jeremiah X. Johnson	Unsupervised residential load disaggregation based on low-resolution smart meter data and surveys in a developing country context
87	Charles Van-Hein Sackey and Destenie Nock	Incorporating electricity demand for small-scale pumped irrigation as a productive use for electricity in system planning for sub-Saharan Agrican countries.
89	Guillaume Tarel, Audun Botterud and Magnus Korpås	On the profitability of market participants in decarbonized power systems
130	Austin Lassetter and Eduardo Cotilla-Sanchez	Accelerating phasor measurement units (PMUs) data analytics
132	Pallavi Bharadwaj and Marija Ilic	Data-Driven Design & Control Of Low-Carbon Microgrids For Developing Communities
134	Jocelyn Kluger, Maha Haji and Alexander Slocum	Cost optimization of symbiotic wind-wave CAES farm for power matching in an isolated grid
147	Reda Ragab, Hafez El Salmawy, Tariq Al Sawy and Mohamed Hamdi	Optimized hybrid renewable energy system for a baseload plant
166	Destenie Nock, Olivia Pfeiffer and Erin Baker	Wind energy's bycatch: Offshore wind deployment impacts on hydropower operation and migratory fish
187	Farhad Billimoria	Electricity reliability differentiation under deep decarbonization
189	Fabiola Sousa Pereira and Carlos Santos Silva	Combustion of emulsions in isolated electricity systems and reduction of pollutant emissions
190	Lily Hanig, Destenie Nock and Corey Harper	Equity implications of high charger penetration rates in emergency evacuation
194	Pegah Mottaghizadeh and Jack Brouwer	Integrated solid oxide fuel cell and solar system to achieve zero net energy in residential nanogrids in California
195	Dongqi Wu, Xiangtian Zheng, Yixing Xu, Daniel Olsen, Bainan Xia, Chanan Singh and Le Xie	An open-source model for simulation and corrective measure assessment of the 2021 Texas power outage

Oral Presentations

Energy Materials and Thermal Energy		
I.D.	Authors	Title
27	Qiliang Wang, Zhicheng Shen, Yao Yao, Hongxing Yang	Negative thermal-flux phenomenon and regional solar coating optimization for next-generation solar power tower
28	Shiddartha Paul, Daniel Schwen, Micheal Short and Kasra Momeni	Radiation damage study of T91/Fe-Cr-Si multimetallic layered composite for generation IV reactor deployment
33	Liang Jun Zheng, Hyun Wook Kang	Research of improve waste heat recovery efficiency in thermoelectric generator with passive evaporative cooling heat sink
43	Pushpesh Sharma, A. Al Saedi, C.S. Kabir	Understanding thermal-energy extraction prospects in wellbore fluid circulation
49	Jiahui Yu, Bingge Feng, Gang Yang, Peng Jiang, Shuai Liu and Tao Wu	Plasma assisted preparation of MOF derived Ni/Al₂O₃ with promising application in CO₂ methanation
65	Jayendran Iyer, M. Ali Haider and Tuhin Khan	High-throughput approach to predict catalytic activity of heteropoly acids for sustainable solutions
94	Amr Abdalla, Mohammed Mohamedali, Nader Mahinpey	CuO-WO₃ bimetallic oxygen carriers for chemical looping combustion
105	Haseena K V, Md Imteyaz Alam, Tuhin Suvra Khan and M. Ali Haider	Understanding catalytic reactions in complex environments to produce biorenewable energy and chemicals
127	Niranjan Sitapure and Joseph Kwon	Multiscale modeling of spray coating of perovskite quantum dots (QDs) for application in solar cells.
145	Jiseon Kim and Kangwoo Cho	Ni-based mixed metal (oxy)hydroxide electrocatalysts for direct urea oxidation
178	Jaeseo Lee, Kyung Hwan Ryu and Jay Hyung Lee	The design, operation and evaluation of electrochemical CO₂ reduction system with renewable energy

Oral Presentations

Innovations Now		
I.D.	Authors	Title
24	Sebastian Zwickl-Bernhard, Hans Auer	Green hydrogen from hydropower: A non-cooperative open-source modeling approach assessing the profitability gap and future business cases
25	Alvaro Moreno Soto, Jack Lake and Kripa Varanasi	Transient effects caused by gas depletion during carbon dioxide electroreduction
35	Matthew Blubaugh, Ali Razban and Jie Chen	Demand-controlled ventilation energy savings for air handling units
38	Juner Zhu and Martin Bazant	Mechanical safety of Li-ion batteries: physics-based models, data-driven approaches, and their intelligent combinations
52	David Keisar and David Greenblatt	Direct wind-energy based water desalination with reinforcement learning control for off-grid applications
63	Changyu Qiu and Hongxing Yang	Numerical evaluation and sensitivity analysis on dynamic heat transfer of a novel CdTe-base vacuum PV glazing
68	Jinbo Kim, Cheolhyon Cho, Hwandong Jang and Eunkyong Kim	Photo rechargeable energy saving smart windows for high light transmission control
77	Arvind Srinivasan, Raphael Wu and Giovanni Sansavini	Flexibility and reliability optimization of multi-energy systems
96	Paolo Giani, Marc Genton and Paola Crippa	Addressing key challenges of high-resolution numerical weather prediction models for wind energy
97	Mehdi Jafari, Apurba Sakti and Audun Botterud	Understanding technology tradeoffs — An optimization algorithm for flow battery capacity restoration
162	Marui Li, Chaoyu Dong, Qian Xiao, Xiaodan Yu, Zhe Wang and Hongjie Jia	Reinforced temperature prognosis of energy storage system based on two-node electrothermal model and integrated long and short-term memory network
173	Marco Molinari, Jonas Anund Vogel and Davide Rolando	Using living labs to tackle innovation bottlenecks: the kth live-in lab case study
181	Huaiyu Wang, Changwei Ji, Yunshan Ge, Cheng Shi, Shuofeng Wang, Jinxin Yang and Hao Meng	Machine learning model-based investigation and prediction of combustion parameters of the pure hydrogen Wankel rotary engines
202	Sayanthan Ramakrishnan, Shravan Muthukrishnan and Jay Sanjayan	An innovative method of integrating phase change materials in buildings for thermal energy storage via additive manufacturing

Oral Presentations

Geoenergy Development and Emission Mitigation

I.D.	Authors	Title
34	Robert Kleinberg	EPA methane emission controls: What needs to be fixed
78	Caleb Geissler and Christos Maravelias	Optimization and analysis of ethanol production with carbon capture and sequestration
85	Erin B. Wetherley, Ryan Calvert, Steve Deiker, Brian B. Jones and Elena S.F. Berman	Multi-basin field surveys provide real-world methane super-emitter distributions
117	Paolo Gabrielli, Jordi Campos Schweitzer, Viola Becattini, Marco Mazzotti and Giovanni Sansavini	Optimization and assessment of resilient CO2 value chains via carbon capture and storage
131	Kaiyu Cao, Sang Hwan Son and Joseph Kwon	Integrated scheduling and offset-free model predictive control of hydraulic fracturing operations with closed-loop implementation
153	Neelam Choudhary and Jyoti Phirani	Effect of layers on the gas recovery from an oceanic class-2 unconfined gas hydrate reservoir
154	Ameerah Bokhari, Naif Alabdulatif, Ronald Loughland and Amr Abdel-Fattah	Advanced materials for enhanced CO2 capture & conversion in algal cultivation
157	Raffie Hosein, Deborah Ramnath, Trishana Nandoo and Jarod Rampersad	Z Factors for carbon dioxide with hydrocarbon gas impurity
174	Boyun Guo, Ning Liu and Jim Lee	Electricity generation from flowing gas hydrates
192	Seetharaman Vaidyanathan	Microalgae carbon capture for a circular bio-based economy
197	Sen Zhang, Biao Shu and Jingqiang Tan	The critical concerns of carbon dioxide in the reservoir of enhance geothermal systems

Oral Presentations

Low Carbon Energy Economics and Resource Management

I.D.	Authors	Title
4	Jakub Holovský, Rupendra Kumar Sharma, Anna Pražanová, Lenka Šterberová, Gabriel Cardoso Bertolucci, Guillermo García Torres, Taha Naved Mujtaba, Brianna Conrad and Mathieu Boccard	When high PV conversion efficiency is profitable and why low irradiance performance matters
6	Robert Hayes	Nuclear energy as a sustainable, safe and even renewable resource
20	Bassem Haidar, Pascal Da Costa, Jan Lepoutre and Fabrice Vidal	Assessing the trade-offs between battery capacity and charging power of battery electric vehicles: A French case study
30	Juan-Manuel Restrepo-Florez and Christos Maravelias	A systems-level approach to the design of biorefineries for the production of advanced biofuels from ethanol
61	Eduardo Mello, Matthew Peine and Peter Bauer	Optimized autonomous driving: An energy component analysis
91	Ethan Everly, Antoine Durocher, Keena Trowell, Nicholas Pinkerton and Jeffrey Berghorson	A techno-economic analysis of hydrogen-based energy carriers
103	Shan Tian, Kate Forrest, Scott Samuelsen, Joseph Suratt and Brian Tarroja	Characterizing and comparing vehicle-to-grid induced battery degradation in different electrified vehicle classes
104	Wonjae Choi and Sanggyu Kang	Greenhouse gas reductions and economic benefits of using green hydrogen in steel industry
106	Ettore Bompard, Tao Huang, Filippo Spertino, Alessandro Ciocia, Mehdi Jafari and Audun Botterud	Sustainability assessment framework and its application to the energy transition
114	Cian Moran, Eoghan Moylan, Jack Reardon, Tubugas Aryandi Gunawan and Rory F.D. Monaghan	Can regional hubs make green hydrogen viable? – A case study for Ireland
133	Pallavi Bharadwaj, Rupamathi Jaddivada, Dan Wu, Min Zhang and Marija Ilic	Unified energy-space modelling of multi-energy- carrier systems applied to industrial HVAC
135	Bartocci Pietro, Lorenzo Riva, Henrik Kofoed Nielsen, Qing Yang, Haiping Yang, Øyvind Skreiberg, Liang Wang, Eid Gul, Marco Barbanera and Francesco Fantozzi	Two alternative fuels for the reduction of GHG emissions in the steel industry: biocarbon and hydrogen
136	Shuchen Cong, Destenie Nock, Yueming Qiu and Bo Xing	The energy equity gap: Unveiling hidden energy poverty
139	Fangliang Zhong, John Calautit and Yupeng Wu	Analysis of HVAC system operational fault impacts on energy demand under current and future climate scenarios
143	Hyun Kyu Choi, Chang Geun Yoo and Joseph Kwon	Strategies to overcome lignocellulose recalcitrance during acid fractionation via multiscale modeling and economic model predictive control
148	John Schramski	Energy, design theory and the structure of scientific revolutions
151	Isa Ferrall, Annelise Gill-Wiehl, Serena Patel, Samuel Miles, Hilary Yu, Jodie Wu and Daniel M. Kammen	Community energy infrastructure: Point-of-service clean energy to serve the food/water/health nexus
152	Adam Powell	A magnesium clean energy ecosystem vision
156	Rachel Meidl	Progressing plastics sustainability through advanced recycling: Policy recommendations
165	Mohammad Sameti and Eoin Syron	Optimization of a green hydrogen storage based on end-user consumption profile
184	Jeffrey Reed	Optimal role of renewable and zero-carbon gaseous fuels in the future energy economy
186	Peng Zhang, Wentian Wei, Dandan Zhao, Zhentao Zhang, Jiahui Lin, Junling Yang, Xiaoqiong Li and Hanyong Li	Quality and economic analysis of transcritical CO2 heat pump in blanching of penaeus chinensis
196	Kaihui Song; Giovanni Baiocchi	A window of opportunities of sustainable recovery pathways in post-COVID in the U.S.
198	Parichehr Salimifard, Marissa Vanry, Jonathan Buonocore and Joseph Allen	Health co-benefits projection of energy conservation pathways: Bringing health into climate action policy planning
199	Jonathan Buonocore, Parichehr Salimifard and Joseph Allen	Quantifying patterns in seasonal energy use in the U.S. and implications for future decarbonized and healthy energy infrastructure
201	Sifat Chowdhury, Kai Zhu, Yu Zhang	Mitigating greenhouse gas emissions through generative adversarial networks based wildfire prediction

Poster Presentations

E-Poster Track		
I.D.	Authors	Title
22	Zhiming Chen, Xiaoliang Zhao and Kamy Sepehrnoori	Apprising carbon dioxides (CO₂) geological storage potential in abandoned coal mines by a well-testing method
41	Andy Zalay	Opportunity for MIT and Harvard to Conduct Feasibility Study to Assess Options to Meet 2050 Climate Change Challenge of 50 Tonnes CO₂e/GWh
47	Zhenlong Wu, Yangquan Chen, Donghai Li and Yanhong Liu	Load frequency regulation for multi-area power systems with renewable sources via active disturbance rejection control
48	Oi Lun Li, Lusha Qin and Sungho Lee	In situ Mg activator-based water donating hydrogenation of glucose to sorbitol
69	Renyi Cao, Junjie Shi, Linsong Cheng, Yang Wang and Chenxu Yang	A simulation method of enhanced geothermal systems (EGS) based on modified 3D-EDFM coupling factors on thermal and geomechanical stresses
100	Feng Wang, Lin Zhang and Shaohua Jiang	High-mass-loading MnO₂ composite electrode enabling high energy density devices
107	Youwei He, Zhiyue He, Yong Tang, Jiazheng Qin and Yong Wang	An integrated AI-based evaluation system for shale gas productivity prediction
118	Yuhang Zhang, Xiangtian Deng, Yi Zhang and Yi Zhang	An attention-based Seq2Seq model for short term energy consumption prediction
121	Kuanrong Qiu and Evgueniy Entchev	Biomass-fired organic rankine cycle-based cogeneration under cold climate conditions
122	Kuanrong Qiu, Hajo Ribberink and Evgueniy Entchev	Technical and economic feasibility of electric highways for heavy-duty electric trucks
124	Wenchao Shi, Yunran Min, Hongxing Yang and Yi Chen	Numerical study of indirect evaporative cooler using porous media with dynamic performance prediction
137	Reda Ragab and Hafez El Salmawy	Techno-economic assessment of wind farm repowering: A case study of Zafarana station, Gulf of Suez, Egypt
138	Silabrata Pahari, Mustafa Akbulut and Joseph Sang-li Kwon	Modeling linear rheology of nanoparticle-enhanced viscoelastic fracturing fluids
159	Chengliang Zhang, Tong Xu, Gengchen Wu, Boguang Wang	Reduction in fugitive volatile organic compounds emission from petroleum refinery by leak detection and repair survey
167	Ming Lei and Sinisa Coh	Hydrogen plasma favored modification of anatase TiO₂ (001) surface with desirable water splitting performance
169	Wei Yu and Brent Young	Process digital twins for sustainable geothermal development and management
170	Wei Yu, Panos Patros, Tim Walmsley and Brent Young	Engineering of smart digital twins for decarbonising process heat
176	Hao Chen, Chao Zhang, Xiliang Liu, Yu Wang, Ian Duncan and Xuan Li	Problems and solutions in the application of machine learning algorithms in the energy field
185	Hao Chen, Yu Wang, Mingyang Yang, Chao Zhang and Mingsheng Zuo	A new prediction model of supercritical CO₂ diffusion coefficient in crude oil under reservoir conditions based on BP neural network
193	Qiyu Chen, Sien Wang and Qing Hao	Atomic force microscopy-based local anodic oxidation as an effective approach to guide heat flows within thin films
200	Bowen Yao, Lei Wang, Haojun Xie, Timothy Kneafsey, Xiaolong Yin and Yu-Shu Wu	Experimental investigation of carbon dioxide injection-induced fracturing during carbon sequestration and enhanced oil recovery processes
203	Ji Zhang, Yan Yang and Chuang Wen	A novel concept of CO₂ removal using nonequilibrium phase change contributing to carbon capture and storage
204	Yan Yang, Haoping Peng, Hongbing Ding and Chuang Wen	Nanoparticles and wavy fins for melting performance enhancement of phase change materials in tubular thermal energy storage units
210	Qingzi Zhu and Asegun Henry	Porous medium method validation for compact heat exchangers
212	Qingzi Zhu and Asegun Henry	Flow maldistribution in compact heat exchangers



International Conference on Applied Energy

Note

