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IEEE President & CEO 2023

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Technologists’ Role in Addressing Climate Sustainability
IEEE 2023
Board of Directors
Retreat Focus
INNOVATE
COORDINATE
COMMUNICATE
COOPERATE
What is Carbonization?
For millennia, atmospheric carbon dioxide had never been above this line.
Source: State of the Planet
https://news.climate.columbia.edu/2021/02/25/carbon-dioxide-cause-global-warming/
Impacts of Carbonization
Temperature rise target is below 1.5. More than 2.0°C Point of No Return
The July global surface temperature was 1.12°C (2.02°F) above the 20th-century average of 15.8°C (60.4°F), making it the warmest July on record. This marked the first time a July temperature exceeded 1.0°C (1.8°F) above the long-term average.

July 2023 was 0.20°C (0.36°F) warmer than the previous July record from 2021. July 2023 marked the 47th-consecutive July and the 533rd-consecutive month with temperatures at least nominally above the 20th-century average.

Monthly temperature anomalies from 1880 to August 2023 measured with respect to the baseline period 1951-1980.

This graph includes the seasonal cycle showing that June 2023, July 2023, and August 2023 were each consecutively the warmest month on record.

Source: https://svs.gsfc.nasa.gov/14407
Climate-change Impacts
Beijing

Flooded street after heavy rains in Zhuozhou, in northern China's Hebei province August 2, 2023. (AFP)


Residents are evacuated by rubber boats through flood waters in Zhuozhou in northern China's Hebei province, south of Beijing, Wednesday, Aug. 2, 2023. China’s capital has recorded its heaviest rainfall in at least 140 years over the past few days. Among the hardest hit areas is Zhuozhou, a small city that borders Beijing's southwest. (Andy Wong/AP)

Source: https://www.stripes.com/theaters/asia_pacific/2023-08-02/beijing-china-rainfall-deaths-10925575.html/
Flooding in Pakistan – August 2022

Source: https://www.npr.org/sections/pictureshow/2022/08/30/1119979965/pakistan-floods-monsoon-climate

Brazil

Aerial view of the area affected by an extratropical cyclone in Rio Grande do Sul State, Brazil Sept 2023
(AGENCIA RBS/AFP via Getty Images)
Flooding in Libya

Thousands of Lives Lost
Greece

A vehicle crosses a flooded road in the city of Volos, central Greece (AFP via Getty Images) Sept 2023

Cars in a flooded road in the city of Volos, central Greece (AFP via Getty Images) Sept 2023
Droughts in 2022

Dry riverbed in Italy (Po River) due to worst drought in 70 years, June 2022

The Jialing Riverbed at the confluence with the Yangtze River is exposed due to drought on August 18, 2022 in Chongqing, China.
Wildfires in the US

July 2021 - The Dixie fire burned close to a million acres in California’s Lassen county over three months and became the first fire to cross the Sierra Nevada. Photograph: Noah Berger/AP

Peaks glowing with thousands of spot fires on 13 June 2022, in Flagstaff, Arizona. Schumacher/The Republic
Wildfires in Europe - Summer of 2022

Southwestern France, July 17, 2022

Central Portugal, July 13, 2022

Brandenburg, Germany, August 2022

Greece, July 2022

Northern Spain, June 2022

Central Italy, July 2022

“The number of wildfires in 2022 in the EU have nearly quadrupled the 15-year average”

Source: CNN according to Copernicus, EU Earth observation program
Algeria/Tunisia

• Death toll at least 34 fatalities, including 10 firefighters in Algeria
• At least 26 others have been injured.
• Over 1,500 people evacuated in Bejaia, Bouira, and Jijel, Algeria
• Over 2500 evacuated from Maloula and Tabarka in Tunisia

Source: Crisi24
https://crisis24.garda.com/
Wednesday 26/07/2023

Burnt vehicles are pictured in the aftermath of a wildfire in Bejaia, Algeria July 25. REUTERS/Ramzi Boudina


Siberia: Wildfires in June 2020 and June 2021
Greece

Before/After image of Fire Damage in Kiotari Rhodes, Greece
Source: Maxar Technologies via BBC. July 2023
What Can you Do to Serve Humanity?

Clean-Tech Solutions for Climate Sustainability
Opportunities of Decarbonization in the Electric Power Supply Industry

Reduce Carbon Emissions

1. Use less electricity, energy efficiency
2. Use low carbon fossil fuel power plants
3. Use H₂ & other storage technologies
4. Promote more renewables
5. Accept some nuclear
6. Promote cross-border power transfer

Source: IEEE Spectrum, Jan 2023
Customers Controlling Buildings Optimized for Savings

**Measured energy savings across deployments**

- **20%** HVAC Energy Savings
- **25%** Lighting Energy Savings

**Occupant satisfaction:** spaces controlled by a building automation systems are more comfortable due to more consistent temperature profiles and healthier air quality through consistent monitoring of environmental factors (CO₂ levels, PM 2.5).
Eemshaven ultra-supercritical steam power plant, The Netherlands

Power Plant: Two units rated 800MW each
Efficiency: 46.2%
Temp: 609 deg C
Steam Turbine: Siemens SST5-6000
Built: 2014
Carbon Capture & Storage Systems (CCS)

• Can help ensure that emissions created during the energy generation phase will not be emitted into the atmosphere
• These technologies have the potential to significantly reduce carbon emissions in energy systems across the board
Hydrogen and Storage Solutions

Optimize renewable energy solutions being integrated into energy grids

- Low-carbon hydrogen will help emerging economies to meet climate goals in and of itself
  - Provide for diverse energy portfolios
  - Improving resilience
  - Lowering costs
- Storage solutions serve as optimizers for other renewable energy solutions
  - Ensure that electricity generated during off-peak hours does not go to waste
Renewable Energy Integration

Whitelee Windfarm, Glasgow, Scotland
Kenya School of Monetary Studies, Nairobi
Advanced Nuclear Technologies

Diverse solutions to address climate change

- Advanced nuclear technologies, such as small modular reactors (SMRs), can play a role
  - Smaller and can be built more quickly than more traditional nuclear reactors
- Ramping up the development of SMRs can help to produce energy when and where needed
- This energy could be integrated into existing power grids
  - helping to provide improved resiliency while simultaneously reducing emissions
Small Modular Reactors (SMR)

20m tall, 2.7m dia. 590 tons LWR
4.95% enrichment. 50 – 60 MWe
Cross-Border Energy Transfer

No Transition without Transmission

- As we are in this fight together, our solutions should be collaborative to secure better outcomes for all countries, regardless of location
- The International Energy Agency (IEA) has identified three main modes of cross-border energy integration:
  - Bilateral
  - Multilateral
  - Unified
Some Case-specific Examples
Gulf Coordination Council Interconnection

Major Benefit: Reduction of Reserve Requirements
Also Helpful in Dealing with Intermittent Sources (PV)
Nepal needs to attract investment by developing a market outside

In Nepal electricity demand is less in summer than in winter
It is opposite in India and Bangladesh due to high air conditioning load
Vietnam has opted to boost hydroelectricity imports from Laos

The limited electricity transmission capacity from the South to the North poses a major challenge.

It is easier and more cost-effective to import hydro-electricity from Laos to shore up power supply for the North, given the shorter transmission distance.
IEEE’s Climate Change Program

IEEE: Enabling Innovation and Technology Solutions
IEEE’s Presence in the UN Conference on Climate Change (COP27) Egypt, November 2022
IEEE at UN Climate Change Conference
Partnership with International Renewable Energy Agency (IRENA)

Founding Partners: Energy Transition Education Network
COP27 Event by IRENA

Energy Transition Education Network
Energy Day at COP27
15 November 2022
IEEE at UN COP28
Dubai, December 2023
IEEE Climate Change Engagement Opportunities
Sections, Regions, Globally
The Climate Change Pavilion in the Sections Congress in Canada
IEEE Climate Change Program

https://climate-change.ieee.org

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As the world’s largest organization of technical professionals, IEEE has both the opportunity and the responsibility to assist in organizing the response of engineers, scientists, and technical professionals across the world to address the causes, mitigate the impact, and adapt to climate change.

IEEE’s scholarly publications, events, conference proceedings, technical standards, and other materials help foster the exchange of technical knowledge and information for the critical climate issues that our planet faces today.

New IEEE Magazine on Climate Change in 2024
IEEE MEETINGS, CONFERENCES & EVENTS—DRIVING INNOVATION IN CLIMATE CHANGE

Register for events from IEEE related to climate change and sustainable resources. IEEE sponsors over 2,000 annual conferences and events worldwide, curating cutting-edge content for all of the technical fields of interest within IEEE.

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https://climate-change.ieee.org
Ecosystem for IEEE’s Climate Sustainability Work

IEEE Spectrum: Climate Change News Feed; Podcasts; Features; Archives; Journal Watch Posts (Xplore); The Institute (Engineers of Climate Change; Coverage of Conferences and Standards)

IEEE Technology Center for Climate

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https://climate-change.ieee.org
2023 IEEE President and CEO Social Media Channels

There are four social media channels for the IEEE President:

https://www.facebook.com/ieeepresident

https://www.instagram.com/ieeepresident/

https://www.linkedin.com/showcase/ieeepresident

https://twitter.com/ieeepresident
Thank you

web: www.srahman.org