Role of Renewables in Climate Change

Invited Talk: IEEE Education Society YP Seminar

Professor Saifur Rahman, IEEE Life Fellow
2023 IEEE President
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What is Carbonization?
For millennia, atmospheric carbon dioxide had never been above this line. Current level is significantly higher than the 1950 level.
Source: State of the Planet
https://news.climate.columbia.edu/2021/02/25/carbon-dioxide-cause-global-warming/
Impacts of Carbonization
**Temperature rise since 1850**

Global mean temperature change from pre-industrial levels, °C

Source: Met Office


Temperature rise target is below 1.5. More than 2.0°C  Point of No Return
Opportunities of Decarbonization in the Electric Power Supply Industry

Source: IEEE Spectrum, Jan 2023

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
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).
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

Source: NUScale Power
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
What Can you Do to Serve Humanity?

Clean-Tech Solutions for Climate Sustainability
IEEE’s Climate Change Program

IEEE: Enabling Innovation and Technology Solutions
Examples of Global Engagements
Energy Transition

Rotary Pavilion - 1st Floor, Zone B7
Building 89, near COP28 Health Pavilion

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Thank you

web: www.srahman.org