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Use of Hybrid Generation to Reduce Requirement of Grid-Scale Battery Storage While Emitting Zero Carbon Dioxide

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Abstract

Steady penetration of solar and wind energy into US electric generation has brought significant changes to the industry. This went on at a time when gas remains abundant and cheap. In fact, gas turbines running on gas are very often touted as renewable-enabler as their fast start-up characteristics make them ideal for meeting grid demands when generation from solar and wind energies fall off. the mix of enhanced electric grid and back-up power generation would work nicely, except that CO2 would still be emitted while using the back-up power generation. Of course, which will change when affordable, grid-scale battery storage is accessible? This presentation covers two different power production scenarios, where direct solar electricity generation will be complemented by alternative modes of power generation specified no greenhouse emission gets released to the atmosphere even when fossil fuel is employed to enhance the renewable generation. the primary scenario covers solar thermal power generation hybridized with Super-Critical greenhouse gas (sCO2) power cycle with oxy-combustion of gas. Here, greenhouse gas are going to be naturally captured even when fossil fuel is employed because the heat source, and additionally, water are going to be produced within the oxy-combustion process which will be available for consumption. The second scenario involves solar PV array to be complemented by a Salinity-Gradient-Solar-Pond (SGSP) that acts as a thermal storage to store the alternative energy when available. When sun isn't shining, stored thermal energy is converted to electricity

Approximately 40% of world CO2 emissions are emitted from electricity generation through the combustion of fossil fuels to get heat needed to power steam turbines. Burning these fuels leads to the assembly of greenhouse gas (CO2)—the primary heat-trapping, “greenhouse gas” accountable for warming. Applying smart electric grid technologies can potentially reduce CO2 emissions. Electric grid comprises three major sectors: generation, transmission and distribution grid, and consumption. Smart generation includes the utilization of renewable energy sources (wind, solar, or hydropower). Smart transmission and distribution relies on optimizing the present assets of overhead transmission lines, underground cables, transformers, and substations such minimum generating capacities are required within the future. Smart consumption will depend upon the employment of more efficient equipment like energy-saving lighting lamps, enabling smart homes and hybrid plug-in electric vehicles technologies. A interest group is given to the Egyptian case study. Main opportunities for Egypt include generating electricity from wind and solar power sources and its geographical location that produces it an ideal centre for interconnecting electrical systems from the Nile basin, geographic region, Gulf, and Europe. Challenges include shortage of investments, absence of political will, aging of transmission and distribution infrastructure, and lack of consumer awareness for power utilization.

Global emissions in 2010 approached 30 gigatons (Gt). Approximately 12 Gt (40%) are emitted from electricity generation sector through the combustion of fossil fuels like coal,

oil, and gas to come up with the warmth needed to power steam-driven turbines. Burning these fuels leads to the assembly of dioxide ()—the primary heat-trapping, "greenhouse gas" liable for heating, additionally to other nitrogen and sulphur oxides to blame for various environmental impacts

Over the past two centuries, mankind has increased the concentration of within the atmosphere from 280 to over 380 parts per million by volume, and it's growing faster on a daily basis. Because the concentration of has risen, so has the typical temperature of the world. Over the past century, the typical surface temperature of Earth has increased by about 0.74°C. If we still emit carbon without control, temperatures are expected to rise by an extra 3.4°C by the tip of this century. Temperature change of that magnitude would likely have serious consequences for keeps on Earth. Water level rise, droughts, floods, intense storms, forest fires, water scarcity, and cardiorespiratory diseases would be some results. Agricultural systems would be stressed—possibly declined in some parts of the planet. there's also the danger that continued warming will push the earth past critical thresholds or "tipping points" —like the large-scale melting of polar ice, the collapse of the Amazon rainforest, or the warming and acidification of the oceans—that will make irreversible temperature change. Despite mounting evidence of the risks posed by global climate change, efforts to limit carbon emissions remain insufficient, ineffective, and, in most countries, non-existent. Given current trends and therefore the best available scientific evidence, mankind probably must reduce total emissions by a minimum of 80% by 2050. Yet day by day emissions still grow

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Electricity sector is that the major source of the whole global emissions chargeable for approximately 40% worldwide, followed by transportation, industry, and other sectors as shown in Figure. As a result, we are going to focus during this paper on the way to decrease the quantities of emitted from electricity sector using what's called the Smart Electric Grid.

Biography

Jayanta S Kapat is currently the Pegasus Professor of Mechanical and Aerospace Engineering at the University of Central Florida (UCF). He received his doctoral degree in Mechanical Engineering from the Massachusetts Institute of Technology, and has been at UCF since 1997. Since 2012, he has been the founding Director of the Center for Advanced Turbomachinery and Energy Research (CATER) at UCF. He has supervised and graduated 20 doctoral students, most of who are currently at various OEM's such as Siemens Energy and Mitsubishi. He has over 200 journal and peer-reviewed conference publications.