

## Themes & Topics

| Session Title   | Session Description  |
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| #1<br><b>Power Systems and Smart Grids</b>                  | Power Systems and Smart Grids, is a multidisciplinary session where research findings are discussed regarding all aspects related to current and future power networks. Original research works about power network structure, hardware components, control/management schemes and performance are covered in this session with emphasis on transforming existing power systems into a robust, reliable, flexible, and efficient system that supports the use of a cleaner energy. The aspects covered in this session include integration of renewable/distributed energy source, energy storage applications, demand response implementation, adoption of AC/DC microgrids, power network monitoring, advance Metering Infrastructure, smart grid protection schemes, and cybersecurity in smart grid.   |
| #2<br><b>Sustainable Energy Solutions</b>                   | Sustainable Energy Solutions aims to bring together the science, technology, policy, and economic issues needed to limit the global greenhouse gas (GHG) emissions towards Net Zero carbon emissions. Original contributions on recent and future changes in the energy sector are encouraged, pointing to those technologies that can transform our fossil fuel based energy system into a sustainable one. In particular, we aim for contributions picturing the different scenarios for transitioning the energy sector; sustainable transportation; nuclear energy role into the future energy mix; myths about wind, solar and energy efficiency; sustainable energy finance; clean energy access for all, and future breakthrough technologies in sustainable energy.  |
| #3<br><b>Wastewater Management</b>                          | Wastewater generation is massive around the world because of ever-growing population, industrialization, and urbanization. Wastewater contains several pollutants and contaminants, including nutrients, pathogenic microorganisms, heavy metals, and micro-pollutants. All of these can cause health and environmental problems when untreated, or poorly treated wastewater is released into the environment, and can have economic/financial impacts (e.g. increased treatment costs to make water usable for certain purposes). The use of properly treated wastewater across many industries, especially in arid regions where water is scarce, can significantly contribute to water sustainability by supplementing the use of limited freshwater available. Wastewater management is challenging because infrastructure and environmental regulation has not kept pace with rapid development. The importance of wastewater management applies to all aspects of life and increased water sustainability and availability. We encourage contributions from the following areas:<br><ul style="list-style-type: none"> <li>▶ Wastewater reclamation and reuse</li> <li>▶ Distribution and management of treated wastewater</li> <li>▶ Biosolids disposal and applications.</li> <li>▶ Industrial wastewater treatment and reuse</li> <li>▶ Advanced treatment processes</li> <li>▶ Removal of PPCPs and EDCs and other contaminants of emerging concern.</li> </ul> |
| #4<br><b>Novel materials for Environmental Applications</b> | This session is focused on recent trends and advantages in molecular design, synthesis, characterization, and performance of novel materials for environmental applications such as materials for renewable and sustainable energy, water treatment and desalination, air pollution control, and corrosion inhibition applications. These include novel efficient materials for solar panels, adsorbents, membranes and biocides for water treatment, anti-corrosive agents, catalysts for petrochemical industry applied to control water and air quality. This section will also cover the employing of novel polymeric/inorganic composites, metal-organic frameworks, including carbon-based nanomaterials, nanofibers, graphene, Ag wire/particles, Cu mesh, transition metal dichalcogenides, clays, zeolites, and other materials with focus on market driven research.   |

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| #5<br><b>Metallurgic Waste Management</b>                   | CO <sub>2</sub> mineralization is a promising method for the chemical sequestration of CO <sub>2</sub> via reaction with oxides of alkaline or alkaline-earth metals to form carbonates. It has documented advantages over similar technological solutions to climate change. The huge amount of industrial solid and liquid waste can provide additional alkalinity sources for CO <sub>2</sub> mineralization. In this session, we present the latest advances in the emerging technologies of CO <sub>2</sub> -mineralization via industrial solid and liquid waste (including but not limited to coal fly ash, steel slag, phosphogypsum, and brine), with an emphasis on the discussion of the involved process-intensification methods and valuable chemicals produced.  |
| #6<br><b>Pollution Control from Detection to Mitigation</b> | Pollution has been scientifically linked to countless drastic impacts on the environment and human health. It was also reported that long term exposure to pollutants can sometimes result in irreversible damage to humans and the environment. The pollution control theme focuses on the recent trends and advances in the Pollution Control, from Detection to Mitigation, to investigate the issues of mutual concern, in addition to spreading knowledge, sharing ideas and generating solutions. The objective of this theme is to tackle the pollution control subject throughout all the stages from detection to mitigation. This will enable us to lead the work on controlling and regulating all types of pollution in the environment (such as air, water, soil, etc.). Moreover, the advancement in the pollution mitigation, minimization and prevention measures will also be addressed in this theme. The conference aims to gather the world's experts in the field of pollution detection (characterization) and control, to excel in reducing and treating different types of pollutions in the environment. The conference will enable scientists and students, with extensive experience with pollution, environmental impacts on humans, risk assessment of pollution, and advanced control technologies and methods, to showcase their findings and share them with the scientific community. |
| #7<br><b>Sustainable Petrochemical Industry - Workshop</b>  | This workshop is designed to discuss Drivers, Challenges and Opportunities in the implementation of "Circular (Make, Use, Return) Economy" as an alternative to "Linear (Take-Make-Dispose) Economy". In a Circular Economy, the utilization of all available resources is extended to extract the maximum value before it is transformed to recover and regenerate products and materials in an eco-friendly manner. Advances in Chemical Catalysis is thus essential and fundamental to the concept of circularity, i.e., "Keeping the Molecules in Play". QEERI in collaboration with industrial partners is expanding efforts using the Concepts of Circularity for transformation of waste CO <sub>2</sub> , chemical recycling of plastics, and bio-based resources to result in a sustainable industrial growth.  |
| #8<br><b>Smart Building Technologies</b>                    | This topic will draw from and expand on the community engaged with Smart Buildings Technologies. Our approach to this session is to bring together the audience to explore the latest smart buildings technologies trends, showcase market initiatives, opportunities, and challenges for Qatar and abroad. Smart Building Technologies session's topics include contemporary smart building technologies ranging from smart homes, smart sensors, renewable energy, demand response, load forecasting to communications and computational intelligence.   |

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| <b>#9</b><br><b>Public Health Impacts of Environmental Pollution</b> | <p>Environmental pollutants cause harmful health effects and have been a global concern for decades. It has been estimated that a quarter of human diseases such as perinatal disorders, infant mortality, respiratory disorders, allergy, malignancies, cardiovascular disorders, endothelial dysfunction, mental disorders, and various other harmful effects are due to chronic exposure to pollution, and that proper management of pollutants is necessary to protect against detrimental human health impacts. Human poisoning occurs through inhalation of smoke or ingestion of contaminated soils, water, and/or vegetation. Several emerging pollutants are stable, non-biodegradable, and persistent and, can accumulate in food chains, lasting for many years in different environmental segments. Currently, a key problem in understanding the environmental health problems is the lack of appropriate technologies and theoretical approaches. Innovative methods and models are required to reveal the toxicological pathways and interaction mechanisms of diverse pollutants in air, water, and soil. This section focuses on, but is not limited to, exposure of environmental pollution and its health impacts including sampling techniques, methods for analyses of pollutants in environmental or biological samples, human exposures, source apportionment, and toxicity mechanisms.</p> |
| <b>#10</b><br><b>Desalination</b>                                    | <p>Seawater desalination and water purification is a sustainable solution for arid areas, where the lack of natural potable water is limiting economic growth. The seawater quality in the Gulf Region motivates the compromise among desalination technology-based sustainability, reliability, and cost-effective strategies. This session will focus on the latest achievements in science and technology of desalination, and exchange of ideas aiming to exert innovation, pace creativity, and achieve advancements in this rapidly growing field with new trends aiming at breaking the cost and energy barriers of desalination.</p> <ul style="list-style-type: none"> <li>► Advances in membrane science and technology</li> <li>► Advances in thermal desalination technology</li> <li>► Latest developments in high recovery desalination</li> <li>► Renewable energy driven desalination systems</li> <li>► Novelties in seawater pretreatment and post-treatment</li> <li>► Brine concentrate management and MLD/ZLD Innovations</li> <li>► Mineral recovery from brine</li> <li>► Emerging desalination technologies</li> <li>► Innovative technologies for breaking the cost and energy barriers of desalination</li> <li>► Road-mapping of the future of desalination technology</li> </ul>   |
| <b>#11</b><br><b>Transportation Electrification</b>                  | <p>This track is focused on components, systems, design, standards, and grid interface technologies related to efficient power conversion for all types of electrified transportation, including electric vehicles, hybrid electric vehicles, and plug-in hybrid electric vehicles (EVs, HEVs, and PHEVs) as well as heavy-duty, rail, off-road vehicles, airplanes, water transportation, electric bikes and scooters, and other tools for riding instead of walking.</p>   |

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| <b>#12</b><br><b>Sustainability of Urban and Industrial Infrastructures</b> | <p>Urban and industrial infrastructures in deserts and arid regions are exposed to a harsh environment with extreme heat and humidity, significant amounts of dust in the air, and high salinity, leading to numerous corrosion challenges. As a result, the assets in these regions are subject to deterioration in an overly aggressive climate. Thus, maintenance works are paramount to ensure the reliability of the infrastructure. The costly ongoing activities of inspecting, cleaning, repairing, and replacing facilities are crucial to ensuring the sustained and reliable operation of the civil infrastructure that the citizens and businesses rely upon. In its Corrosion Impact Study, the National Association of Corrosion Engineering (NACE) estimated the cost of corrosion in the Gulf Region to be ~5% of the countries' GDP, equivalent to \$140.1 billion USD annually. This session welcomes abstracts related to the Sustainability of Urban and Industrial Infrastructures through novel corrosion control and management approaches. Topics of interest include, but are not limited to:</p> <ul style="list-style-type: none"> <li>▶ Corrosion management</li> <li>▶ Corrosion of steel infrastructure</li> <li>▶ Corrosion of concrete infrastructure</li> <li>▶ Coating degradation</li> <li>▶ Micro-biologically influenced corrosion</li> </ul>   |
| <b>#13</b><br><b>New Sustainability Paradigms and Frameworks</b>            | <p>Six years have passed since the adoption of the 2030 Agenda in 2015, which conceptualized sustainable development through the 17 Sustainable Development Goals (SDGs). Many of these indicators are quantitative, however several appear too broad to guide precise actions. In addition, the rapid development at the social, economic, and policy levels and climate change inspire to challenge the current 2030 objectives and identify new paradigms for their achievement. This reflection is particularly urgent for GCC countries, where sustainable economic growth through diversification away from fossil fuel exports is imperative. This session welcomes contributions on new visions and approaches for the theorization, implementation, and evaluation of sustainable development goals beyond the 2030 Agenda. These include research papers on new governance mechanisms for SDGs implementation, innovative perspectives on SDGs synergies beyond the nexus approach, integration of global health criteria in sustainable development goals, new tools including AI, ML, and big data for achieving and monitoring sustainability targets. Similarly, bottom-up co-design methodologies, to include youth and civil society as advocates and recipients of sustainable targets, will be of interest. We particularly encourage multidisciplinary contributions encompassing the technology, economic, social and policy dimensions.</p> |

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| #14<br><b>Solar Energy Applications</b>                       | <p>Solar Renewable energy from solar applications is one of the main drivers in the journey towards a carbon neutral world. For example, solar PV has been the top source of new renewable power generating capacity since 2013 and accounted for 2.8% of global electricity production in 2019. The aim of this section is to examine and discuss these developments in the light of their present and future contributions to clean energy production and their integration with electrical power systems and other forms of power generation. Themes covered by this section include but not limited to: AI applied to the management and operation of solar systems; Solar Powered Carbon Dioxide (CO<sub>2</sub>) Conversion; Solar for Hydrogen Production; Integration of PV systems in cities; Buildings and microgrids; Hybridization of PV systems with electrical storage; Integration of thermal systems in cities; The predictions of resources for the estimation of multiscale PV production; Solar water heating; Solar desalination; Solar Energy for industrial process heat; Solar Heating for Building and Solar Greenhouse.</p>   |
| #15<br><b>Material Selection for Sustainable Power Plants</b> | <p>A power plant is sustainable if it uses sustainable energy, and the use of energy is considered sustainable if it meets the demands of the present without compromising the demands of the next generations. Definitions of sustainable energy incorporate environmental aspects such as greenhouse gas emissions and social and economic aspects such as energy poverty. The energy transition to meet the world's needs for electricity, heating, cooling, and transport in a sustainable way is one of the most significant challenges facing humanity in the 21st century and requires the development of sustainable power plants. A sustainable energy system is likely to see a shift towards more electricity use in sectors such as transport, energy conservation, and the use of hydrogen produced by renewables or from fossil fuels with carbon capture and storage. Materials, either structural or energy materials, are playing a crucial role in developing sustainable power plants to produce sustainable energy systems. Examples are battery materials, thermoelectric materials, high strength high-performance alloys for offshore windmills, tidal energy systems, etc. This session welcomes abstracts on the Material Selection and development for Sustainable Power Plants. Topics of interest include, but are not limited to:</p> <ul style="list-style-type: none"> <li>▶ Material for hydrogen storage and transportation high-pressure hydrogen gas and liquid hydrogen</li> <li>▶ Advanced materials for renewable energy</li> <li>▶ High strength high-performance alloys for offshore windmills and for tidal energy systems</li> <li>▶ Thermoelectric and battery materials</li> </ul> |
| #16<br><b>Global Environmental Change</b>                     | <p>Climate change, pollution, loss of biodiversity, changes in hydrological systems and the supplies of fresh water, stratospheric ozone depletion, land use change and rapidly escalating urbanization are among the key large-scale global environmental challenges and hazards facing humans and impacting our climate, health, and access to fundamental resources. Mitigating the negative impacts of the human induced chemical, biological and physical perturbations of our Earth's system necessitate management at multiple levels, from the socio-economic drivers of environmental change to the harm caused by population exposures. This session invites contributions addressing the fundamental and social sciences as well as the human impact and policy dimensions of global environmental change. We also welcome contributions addressing the impacts and future scenarios of environmental change on the Middle East and the Arabian Gulf Region.</p>  |

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| #17<br><b>Environmental Sensing &amp; Monitoring Technologies</b>           | There is a pressing need for interdisciplinary research that connects environmental technologies to public and environmental health, resource recovery, social economics, and sustainability. Particularly, monitoring of environmental pollution and air & water quality is becoming more important to reduce individual exposure to pollution by identifying modifiable local factors and enabling personal behavioral changes. Low-cost sensors, mobile monitoring, and remote sensing are pushing the forefront of our knowledge, but they also have unique challenges that need to be addressed both at the data collection and data interpretation levels. This session welcomes presentations on innovations in sensors and monitoring technologies, novel applications, and case studies that show both potential and successful use of these new technologies to improve human health. Topics include, but are not limited to, exposure assessment and epidemiology of indoor and outdoor air quality, water quality, green space, temperature, and other environmental factors, and the impacts of climate change on urban health. Technologies for analyzing emerging contaminants via chemical and microbiological methods and toxicological studies are also welcome. |
| #18<br><b>Food Security and the Energy-Water-Environment Nexus</b>          | Energy, water, and the environment underpin many SDGs and are crucial to achieving food security. The present imperative is to produce more with less. The Energy-Water-Environment (EWE) Nexus approach aims at safeguarding the supply of these resources by improving the synergies and reducing trade-offs among these sectors while ensuring food production. This session will serve as a forum for multidisciplinary dialogue on solutions for food security and EWE nexus. We welcome submissions on advancements in EWE decision support tools, monitoring, and evaluation of EWE nexus performance. Likewise, research on new technologies for water and energy conservation and recycling, innovative agricultural practices, water and energy demand reduction, management, and environmental conservation efforts for food safety are highly encouraged. Finally, integrated solutions to prevent food crisis, water, and energy supply disruption, and environmental-induced migration are accepted. We encourage contributions from different fields ranging from engineering to economics and social sciences.   |
| #19<br><b>Climate Change Policy in the GCC</b>                              | This session will focus on the challenges and opportunities that climate change and the energy transition present for GCC states and the role the region might play in a net-zero world. As global ambition on climate change intensifies and as a growing number of countries and companies worldwide accelerate their transition from fossil fuel use toward low carbon energy, the Gulf States will need to drastically reduce their domestic emissions while establishing a new role in the global energy system that ensures continued economic prosperity for their citizens. The session will serve as a forum for GCC climate policy specialists to come together and explore solutions and pathways to a low-carbon future in the GCC. We welcome research papers on the following topics: domestic energy transition and economic diversification pathways in the GCC, drivers of climate change action in the GCC, the impact of decarbonization on the region's political economy, and policies and scenarios for key technologies such as hydrogen, renewables and carbon capture utilization and storage.  |
| #20<br><b>Innovation and sustainable development responding to COVID-19</b> | The COVID-19 pandemic is a great global challenge in all aspects of life with direct impact on public health and mortality or indirect impacts on social, economic, and political systems. Scientific efforts around the globe have attempted to counter the crisis with a variety of rapid and innovative responses. This session focuses on innovative development and efforts in response to the COVID-19 pandemic to address pressing health, environmental, social, and economic challenges, as well as to secure societies' long-term resilience. This includes but is not limited to rapidly developing and deploying tests, personal protective equipment (PPE), developing effective surveillance techniques and technologies for monitoring the viral spread in the environment, disinfection technologies and waste management during the pandemic, developing appropriate policies and interventions for dealing with social and economic effects, as well as ensuring a secure and sustainable longer-term recovery.  |