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## Supported by



## Friday, November 10

Friday, November 10, 9:00 AM - 10:30 AM  
**Registration and Networking**

*Room: Sovereign 2*

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Friday, November 10, 10:45 AM - 11:30 AM  
**Master Speaker 1**

*Room: Sovereign 2*

**Karan Grover**, *Karan Grover and Associates, Gujarat, India*

Karan completed a Bachelor of Architecture in 1974 from Maharaja Sayajirao University of Baroda and a Graduate Diploma in 1975 from Architectural Association, London. He is the Founding Director of Karan Grover and Associates, established in 1985. Karan Grover has passionately advocated the need to look at ones culture and heritage for clues as to the direction for a contemporary architecture and sustainable development relevant to the Indian context today. He has won numerous awards in India and internationally, including becoming the first architect in the world to win the USGBC “Platinum” Award for the greenest building in the world, The “CII–Sohrabji Godrej Green Business Centre”.

**Exceeding Excellence (Redefining Landscapes in Developing Countries)**

Excellence is an Art, there is no singularity needed to achieve it; you have to figure out what works best for yourselves, for your cultures, for your surroundings, and for your environments. I define excellence in this manner because it removes cliché synonyms such as dominance and supremacy from the equation, and brings us back to one of life’s great truths... We are what we repeatedly do. For a long time, what we repeatedly did was not good for ourselves, for each other, or for our environments. Thankfully, likeminded individuals such as yourselves have joined in the effort to redefine our landscapes for the better. As such our habits are changing, and are now focused in the right direction. Towards a future designed to better our quality of life, and better serve the needs of our environment. While many still look at such advancements as noise we have proven that it’s a global necessity. Not just for established nations, but perhaps even more so for developing countries. In many ways developing nations stand at the forefront of this movement. However, if we are going to be able to change we must succeed above all expectations, and overcome a number of confrontations, both economical and social. We must adapt trends, develop opportunities, and overcome challenges in a manner never seen before. My Keynote address will examine a future of possibilities for developing countries. It will explore their abilities to create successful habits that redefine landscapes, and exceed excellence.

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Friday, November 10, 11:30 AM - 12:00  
PM  
**Tea Break**

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Friday, November 10, 12:00 PM - 1:30 PM

## Seminar 1

### Smart Cities (1)

Room: Sovereign 2

Chair: C Subramaniam, ISHRAE, New Delhi, India

#### 1. Energy Resiliency and Sustainability for Smart-Cities in Developing Economies

**Thomas Mark Lawrence, Ph.D., P.E., Fellow ASHRAE<sup>1</sup>, Marie-Claude Boudreau, Ph.D.<sup>1</sup>, Brian Northern<sup>2</sup>, Zachary Commanday<sup>1</sup> and Richard Watson, Ph.D.<sup>1</sup>, (1)University of Georgia, Athens, GA, (2)PricewaterhouseCoopers, Atlanta, GA**

This study focuses on the challenges faced by some of the cities participating in the Rockefeller 100 Resilient Cities initiative. It focuses on the subset of cities that have released a formal City Resilience Strategy and are located in developing economies. Of particular concern is the city's electricity supply, as this is the 'raw material' of city life and will become more critical as the complexity of city management is transferred increasingly to automated cyber-physical systems. This presentation describes the energy-related challenges these cities are facing, and how developing a smart-city concept can help address both resiliency and sustainability.

#### 2. Hydrogen Economy in an Exergetically Rational SMART City

**Biröl Kilkis, Ph.D., Fellow ASHRAE<sup>1</sup> and Siir Kilkis, DSc, Member<sup>2</sup>, (1)Baskent University, Ankara, Turkey, (2)The Scientific and Technological Research Council of Turkey, Ankara, Turkey**

A good exergy match in a 4th-generation district energy system establishes the rationality in energy utilization beyond smartness and assures that CO<sub>2</sub> emissions are minimized. A new algorithm for optimizing the exergy bundling is introduced. New definitions like Net-Zero Exergy Metropolis, Net-Zero Carbon Metropolis were also made. A conceptual Rational Metropolis case is presented, which is based on hydrogen economy that is implemented in a closed, circular exergy flow involving solar, wind, biogas from wastes along with hydrogen generation and distribution to nZEXB units, which utilize on-site renewables and hydrogen in fuel cells.

12:00 PM - 1:30 PM

## Seminar 2

### International Experiences in HVAC Systems

Room: Inspire

Chair: Ashok Virmani

#### 1. The Use of a Hybrid Super-Efficient Cooling System for FIFA 2022 Showcase Stadium

**Esam Elsarrag, Ph.D., Member, Gulf Organisation for Research & Development, Doha, Qatar**

The design and construction of buildings in hot-humid climates requires high energy consumption typically for air conditioning due to higher thermal loads. Regionally, there is a rising concern on the current rate of energy consumption due to air conditioning. Considering the wider impacts of carbon emissions on our climate and the need to reduce these emissions, effective energy efficiency solutions are necessary in order to achieve the overall goal of reducing carbon emissions. This presentation presents the simulated and measured efficiencies of the superefficient fully integrated HVAC systems driven by-product of rejected brine, waste heat and solar absorption chiller. The tested system has shown more than 60% reduction in energy consumption compared to conventional systems.

#### 2. How Standards and Certification Transform Markets

**Bridge Xue, AHRI, Arlington, Virginia**

Long before there were any regulatory requirements or financial incentives to establish performance standards and testing/certification programs, industry groups such as the Air Conditioning, Heating, and Refrigeration Institute (AHRI) established voluntary industry performance rating standards and certification programs to ensure a level playing field for competition and integrity in the industry's ratings. Past experiences have demonstrated that the establishment of standards and certification programs have a profound positive impact on the performance ratings of a whole industry. Common wasteful practices such as equipment oversizing and redundancy can often be eliminated if there is general acceptance that the industry's ratings are accurate. This presentation provides an inside view of how voluntary performance certification programs work and proof how they can transform a market.

#### 3. New Energy Ideas from the National Labs

**Walt Vernon IV, P.E., Member<sup>1</sup> and Reshma Singh<sup>2</sup>, (1)Mazzetti, Inc., San Francisco, CA, (2)LBNL, Berkeley, CA**

For five years, a coalition of the US National Labs, led by the Lawrence Berkeley National Labs, has collaborated with industry partners and a similar cohort of researchers from the country of India in a quest to find building energy strategies that will help reduce building energy consumption in both countries. This bundle of projects is coming to an end. The various projects are in different states of TRL (Technology Readiness Levels). Many of them are directly relevant to the healthcare community. This session provides an overview of some of the technologies that are more relevant to healthcare, many of which are available now, for piloting by innovative healthcare facility engineers.

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Friday, November 10, 1:30 PM - 3:00 PM  
**Networking Lunch: Presentation by Hitachi**

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Friday, November 10, 3:00 PM - 4:45 PM  
**Seminar 3**

**Smart Cities (2)**

*Room: Sovereign 2*

*Chair: Richie Mittal, Overdrive Engineering Pvt Ltd, New Delhi, India*

**1. District Cooling Experts**

*Alaa Olama, Dr.Eng, Cairo, Egypt*

Developing economies are increasingly relying on District Cooling technologies to meet large air conditioning loads demand, especially in new urban developments. Traditionally mechanical vapor compression stations, powered by conventional electric chillers were the favored technology used. This technology is increasingly challenged by modern cooling techniques utilizing Not-In-Kind technologies instead of large capacity centrifugal chillers. Natural gas direct-fired absorption chillers are one example. Indirect fired absorption chillers operated by steam and hot water obtained by reject heat recovery boilers are another example. In Northern Europe, advanced District Cooling techniques, utilizing deep sea cooling, are used. This presentation describes those new technologies and compares them with conventional District Cooling technology from a technical, economic and environmental point of view.

**2. The Future of Energy Reduction**

*Rohan Rawte, IES, Shanghai, China*

IES has been at the cutting edge of 3D performance modelling and analytics for over 20 years and pioneered the commercial use of simulation software. This presentation describes a vision of delivering a city which operates in an integrated fashion, through taking a smart approach to a community's development. One which uses digital technologies to enhance performance and wellbeing, to reduce costs and resource consumption, and also to engage more effectively and actively with its citizens. Case studies demonstrate the power of technology and its integral role in making buildings and cities as sustainable as possible.

**3. Smart Cities: Smart Solutions for a Better Tomorrow**

*Shubhranshu Pani, JLL, Ahmedabad, India*

Smart Cities are not merely about planning for better cities, it is also about creating cities with key ingredients of competitiveness, sustainability and quality of life. Aspects such as ease of doing business, employment opportunities, safety and security, investment attractiveness, inclusiveness, quality healthcare and education, good governance and efficient use of resources through technology etc. become key ingredients. Creating such a mix would involve participation from all stakeholders, the government, the community and the citizens.

3:00 PM - 4:45 PM  
**Seminar 4**

**Eco Labelling (ASHRAE-UN Environment Cooperation)**

*Room: Inspire*

*Chair: Atul Bagai, UN Environment, Bangkok, Thailand*

**1. Eco-Labeling: Criteria from an Environmental Perspective**

*Liazzat Rabbiosi, UN Environment, Regional Office for Asia and the Pacific*

**2. Ecodesign: Minimum Efficiency Performance Standards: The EC Directive European Partnership for Energy and the Environment**

*Andrea Voight, European Partnership for Energy and the Environment*

**3. Complying with EC Directive: An OEM Perspective**

*Hiroshi Aihara<sup>1</sup>, J. Bhambure<sup>2</sup> and R.K. Mehta<sup>3</sup>, (1)Daikin Japan, Tokyo, Japan, (2)Bluestar Ltd., Mumbai, India, (3)RAMA, New Delhi, India*

Friday, November 10, 4:15 PM - 4:45 PM

**Panel 1**

**UN Environment Panel Discussion**

*Room: Inspire*

*Chair: Atul Bagai, UN Environment, Bangkok, Thailand and Liu Chang, GREE ELECTRIC APPLIANCES INC. OF ZHUHAI, ZHUHAI GUANGDONG, China*

The European Partnership for Energy and the Environment (EPEE) represents the heating, cooling, refrigeration, air-conditioning and heat pump industry in Europe. Founded in the year 2000, EPEE's membership is composed of 47 member companies, national and international associations from Europe, the USA and Asia. EPEE member companies realise a turnover of over 30 billion euros, employ more than 200,000 people in Europe and also create indirect employment through a vast network of small and medium-sized enterprises such as contractors who install, service and maintain equipment. EPEE member companies have manufacturing sites and research and development facilities across the EU, which innovate for the global market. As an expert association, EPEE is supporting safe, environmentally and economically viable technologies with the objective of promoting a better understanding of the sector in the EU and contributing to the development of effective European policies.

**UN Environment**

In the EU alone, heating and cooling represents 50% of the annual energy consumption. Over 80% of the emissions of heating and cooling equipment are related to the energy consumption. Ecodesign and Energy Labelling is Europe's regulatory framework to address the energy efficiency of products. While Ecodesign product measures "push" manufacturers to develop products which fulfill minimum energy efficiency performance requirements (MEPS), Energy Labelling "pulls" consumers to buy the most energy efficient equipment. The major challenge with existing and potential future measures is finding the right balance between energy efficiency, the transition towards lower GWP refrigerants, safety and cost.

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Friday, November 10, 4:45 PM - 5:15 PM

**Tea Break**

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Friday, November 10, 5:15 PM - 6:15 PM

**Panel 2**

**Can Developing Economies Leapfrog from Urban Mismanagement to Smart Cities?**

*Room: Sovereign 2*

*Chair: Ashish Rakheja, P.E., Member, AEON Integrated Building Design Consultants LLP, Noida, India*  
Can Developing Economies Leapfrog from Urban Mismanagement to Smart Cities

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Friday, November 10, 6:30 PM - 10:00 PM

**Networking Dinner: Presentation by  
Kirloskar**

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# Saturday, November 11

Saturday, November 11, 10:00 AM - 10:45 AM

## Master Speaker 2

Room: Sovereign 2

**Guaranga Das**, Govardhan Ecovillage (GEV), Mumbai, India

Gauranga Das is the Director of Govardhan Ecovillage (GEV), a 90-acre model community for sustainable rural development at Wada. He and his team have led environment friendly initiatives that have become a hub for eco-tourism and rural development. GEV's award-winning initiatives include water conservation, waste management, renewable energy, green infrastructure, organic farming, rural empowerment and global outreach. GEV's work has been recognized internationally and received several awards including the United Nations 2017 Award for Excellence and Innovation in Sustainable Tourism from the UNWTO. It is the first time India has ever won this recognition in the NGO sector. Gauranga Das is also an inspirational speaker and gives spiritual guidance to corporate leaders, students in premier institutes and doctors both in India and abroad.

Saturday, November 11, 11:15 AM - 1:00 PM

## Seminar 5

### Energy Water Nexus

Room: Sovereign 2

Chair: **Om Taneja**, USDSA, NA, Bahrain

#### 1. Water Energy Nexus: A Strategy and Roadmap

**Essam E. Khalil, Ph.D., P.E.**, Fellow ASHRAE, Cairo University, Cairo, Egypt

All Arab countries have realized the strategic importance of regional Energy-Water Roadmap and strategy. The purpose of the roadmap is to assess the effectiveness of existing water and energy development programs within the individual countries and among them in addressing energy and water related issues and to assist in defining the direction of research, development of national and regional efforts to insure the achievement of energy-related issues associated with providing adequate water supplies, optimal management and efficient use of water, as well as issues associated with providing adequate supplies, optimal management and efficient use of energy are adequately and efficiently addressed.

#### 2. Water Conservation and HVAC Design

**Daniel Nall, P.E.**, HBDP, CPMP and BEMP, Fellow ASHRAE, Syska Hennessy, New York, NY

This presentation discusses options for water conservation and wastewater harvesting techniques. Technology for water conservation is discussed. Utilization of on-site non-potable water resources is also discussed as well as methods of capturing and treating these resources. The requirements of water consumption end-uses that can benefit from non-potable resources is presented, along with technical issues that limit the exploitation of these resources. A case study showing a 2/3 reduction in potable water consumption through the utilization of both conservation measures and non-potable water harvesting is also presented.

#### 3. Absorption Chillers – Green Cooling Using Hot Water (Waste Energy)

**Dinesh Gupta**, USDSA, NA, Bahrain

Capturing and using waste heat could be one of the largest conservation and greenhouse gas reduction opportunities. Heat recovery is an opportunity to recycle energy that is typically wasted. Adsorption Chillers can save up to 70% in electrical power consumption compared to conventional systems and thereby, help reduce operating costs significantly. No matter which type of waste heat is used to drive chillers, the chillers always operate with utmost efficiency and ease of use.

11:15 AM - 1:00 PM

## Seminar 6

### Internet of Things

Room: Inspire

Chair: **Gurmeet Singh**, JCI Hitachi, New Delhi, India

#### 1. Model Predictive Control and VRF Systems: Using Optimization to Achieve the Lowest Operating Cost for Installed VRF Systems

**Hank Marcy**, Johnson Controls, Tokyo, Japan

Model predictive control (MPC) has recently been applied to provide the lowest operating cost for large central heating and cooling plants. In these applications, the primary tenets of MPC; optimization, prediction and estimation, are managed in a closed-loop fashion to continuously optimize central plant operating costs. The research presented here is focused on extending the MPC to VRF systems. The objective is to provide the lowest operating cost in any VRF system installation.

## **2. Internet of a Thing (IOT) in HVAC Built Environment**

*Adewale a. Adelaja, CEng, Associate Member, A+O Associates, Lagos, Nigeria*

By reference the internet of a thing can be said to be a vast network of objects or things that are connected together in which each is assigned an Internet Protocol. Most modern day structures now employ the use of internet for connectivity, remote monitoring and control, data analysis for better performance and so on. There are challenges such as lack of technical know-how by the practitioners. This presentation explains the benefit that is derived from Internet of a thing and how best the developing economies can exploit the trend for infrastructural development.

## **3. Converged IOT Environment in Building**

*Vijay Kumar, Associate Member, ASHRAE Emirates Falcon Chapter, Dubai, United Arab Emirates*

This presentation discusses the effects of Internet of Things. Three statements are addressed: Internet of Things (IoT) is driving the integration of the physical and digital worlds, Internet of Things (IoT) in Smart Buildings could go beyond mere integration of systems and services and Internet of Things (IoT) in Smart Cities could deliver a larger goal of citizen satisfaction and happiness. A case study also explains how Internet of Things is achieved in Smart Cities.

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Saturday, November 11, 1:00 PM - 2:30 PM  
**Networking Lunch: Presentation by Blue Star**

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Saturday, November 11, 2:30 PM - 4:00 PM  
**Seminar 8**

## **Tall Buildings**

*Room: Inspire*

*Chair: G. C. Modgil*

### **1. Smoke Management Control and Active Fire Strategies for Tall Buildings**

*TL Chen, P.E., Fellow ASHRAE, ASHRAE Malaysia Chapter, Kuala Lumpur, Malaysia*

This presentation explores tall building fire designs in conjunction with the intricacies of smoke control and pressurization systems. It will discuss various smoke management techniques suitable for tall buildings, taking into consideration the phenomenon of plug-holing, stack and reverse-stack effect. Application of engineered smoke control systems and how to avoid pitfalls in the industry are highlighted together with the important topic of integrated fire testing and commissioning which is deemed absolutely essential for tall buildings. The presentation concludes with a provocative thought on the need to review existing fire codes to meet future challenges as we “reach the sky”.

### **2. Climate Effects on Tall Buildings**

*Peter Simmonds, Ph.D., Fellow ASHRAE, Buildings and Systems Analytics, Marina Del Rey, CA*

The design of tall buildings has historically relied on ground measurements for climate data. In some cases, the climate information at grade has been extrapolated upwards. However, as buildings have become taller the need for elevation specific meteorological data is becoming more important. The climate conditions at 100 m above grade is not the same as 600m. Over the height of the building, the pressure between the buildings and environment will become huge enough to cause a large impact on the functionality of these buildings, even on the building façade directly. Therefore, architects and engineers should pay sufficient attention to this phenomenon and ensure the function and operation of the building. This novel presentation explores the nuances of the ambient climate on tall buildings and the effects on the buildings performance.

### **3. Design of Mechanical, Electrical, Plumbing and Fire Systems to Survive Earthquakes**

*Robert Simmons, P.E., Member, PETRA SEISMIC DESIGN, Houston, TX*

Designing building systems for earthquakes is essential to maintain life safety, building operation, post disaster response and to prevent major economic loss. Non-structural components such as HVAC equipment, pipe, duct, electrical systems, fire protection, etc., must operate as needed during and after an earthquake. This is especially true for tall buildings. If equipment fails, the cost in public safety and economic loss can be beyond the value of the building. To reduce risk of failure and liability, design professionals should insist on code compliant seismic design for equipment. This session presents some practical guide to ensure seismic loads are met.

Saturday, November 11, 2:30 PM - 5:30 PM  
**Seminar 7**

**IAQ**

*Room: Sovereign 2*

*Chair: Nirmal Ram, P.Eng., Fellow ASHRAE, Cerebration Consultants, Bangalore, India*

**1. Required Ventilation for an Acceptable Indoor Air Quality**

*Bjarne W. Olesen, Ph.D., Fellow ASHRAE, Technical University of Denmark, Lyngby, Denmark*

Today an acceptable indoor air quality is often defined by specifying the required level of ventilation in air changes per hour or outside air supply rate. This would be equivalent to defining the requirements for thermal comfort by specifying the level of heating or cooling in Watts. In developing economies more than 5.000 people, according to WHO, die every day due to bad indoor air quality and lack of ventilation. Many studies in developed countries also show a lack of ventilation to create acceptable indoor air quality. This presentation provides an overview and discusses the criteria used for specifying required indoor air quality and ventilation rates.

**2. IAQ: For the Many and Not Just the Few**

*Tim Dwyer, CEng, Fellow ASHRAE, UCL Institute for Environmental Design and Engineering (IEDE), London, United Kingdom*

Maintaining appropriate indoor air quality (IAQ) is not just a challenge for HVAC engineering practitioners but also excites increasing interest in government, the general public and the media. In the developing economies growth in wealth inevitably augurs worsening ambient air quality with, for example, over 130 Indian cities failing to meet targets for atmospheric particulate matter (PM10) by over 500%. IAQ pervades many areas of building design guidance and this presentation draws out key messages to benefit every practitioner and, importantly, building user, in delivering high IAQ standards in buildings for the many and not just the few.

**3. Legionella Control in the Hospitality Sector in Developing Economies-An Overview**

*Mahesh Prabhu, Member, CEO - The Essem Group, Goa, India*

The Hospitality sector in emerging markets in the last decade has shown tremendous growth and continues to outpace growth in developed countries. IATA data indicates air travel growth is 2% in the United States, 7% in Asia-Pacific and greater than 10% in the Middle East. Recognizing this trend, Global Hospitality Majors have initiated massive expansion in the developing nations. To remain competitive, hotels have to provide superior amenities as a value proposition to their guests, which typically include water features such as spas and Jacuzzis, lobby fountains and splash pools in rooms, etc. Water sources and supply lines running into and within the building provide locations for growth of Legionella bacteria and pathways for potential exposure to Legionella and contraction of Legionnaires Disease.

**4. Indoor Air Quality and Health Hazard Evaluation: Something in the Air?**

*Mitesh Kumar, Member, Orison QEHS LLP, Singapore, Singapore*

Built environments are a predominant part of our daily lives. When humans merge with the built environment, we share microorganisms with each other and our surrounding space. Microbes are shed or removed with skin cells and dirt; passed through handshakes and saliva as particulates and circulated into air-conditioning systems, plumbing systems and on various hard and porous surfaces. This presentation discusses the existing relationships between outdoor and indoor microbes and the behavior of microbes found in the indoor air, on indoor surfaces, in air-conditioning and ventilation systems and its effect on health hazard evaluation. The presentation also discusses sampling techniques to identify potential impacts of microbes on people and structures within the built environment.

**5. Indoor Air Quality to Prevent Nosocomial Infections Propagation**

*Prabir Kumar Sen<sup>1</sup> and Parijat Sen, M.D.<sup>2</sup>, (1)Consulting Engineer, Kolakta, India, (2)Henry Ford Health System, USA, Detroit*

In developing countries the frequency of hospital acquired infection is higher than in developed countries. Device-associated infections are also higher. Air takes a vital role in transmitting these infections. Apparently, non-airborne infection microorganisms travel in the air at some stage of their transmission path. IAQ management can improve. Old healthcare systems still rely on their old HVAC system/ equipment. These systems need upgrades per current standards. Emergency rooms/ outpatient rooms also have undiagnosed infectious patients. Air management in these areas need attention. HVAC system audits and regular air quality monitoring can reduce nosocomial infection and related mortality and financial burden.

Saturday, November 11, 3:50 PM - 4:50 PM  
**Panel 3**

**Is Up the Only Way to go for Developing Economies**

*Room: Inspire*

*Chair: Pankaj Dharkar, Pankaj Dharkar & Assoc, Gujarat, India*

A continued discussion on the Tall Building Session

Saturday, November 11, 5:00 PM - 5:30 PM  
**Closing Ceremony**