

## **Future Energy Systems: The Role for Natural Gas in a Decarbonizing, High-Renewables World**

October 16 & 17, 2018 Stanford, California

### ***A discussion about the future of energy around the world, grounded in real economic and engineering constraints***

Energy systems around the world are changing, and these changes are expected to continue and accelerate as jurisdictions around the world work to address the challenges of population and economic growth, energy access, air pollution, and climate change. Technological developments, ranging from more efficient generators and engines, to solar energy, and energy storage, are combining with commercial opportunities and policy drivers to deliver new energy mixes for power generation, industry, transportation, and other uses. Over the coming 20, 40, or 60 years, we expect energy systems to continue to evolve, subject to real economic and engineering constraints, and to evolve differently in different parts of the world, depending on factors such as existing infrastructure, resource availability, economic strength, political pressures, and environmental and human health needs.

The Future Energy Systems symposium at Stanford University is designed to facilitate discussions and discovery of what future energy systems may look like over the coming decades in different parts of the world, based on a clear-eyed, realistic assessment of the state of energy technologies and economic realities driving energy decisions. Within this range of uncertainty in future energy systems we seek to investigate what role natural gas will play in enabling these future energy systems and how existing, mainly fossil-fuel, energy sources will persist, be replaced, or change in their uses in the coming decades.

**Desired Audience and Speaker Participants:** Global thought leaders and experts, representing a cross-section of industry, government, inter-governmental organizations, non-governmental organizations, and academia

#### **Opening and Framing Session**

- Welcome discussion: “The Global Energy Challenge”
- Keynote Address
- Framing talks (metrics, recent performance, the future technology landscape, sustainable development and gas)

#### **Topic #1: Gas integration in power systems with very high renewable penetration**

- Competitive markets, carbon pricing and policy, price volatility, energy sources and energy mix to complement renewables

#### **Topic #2: Gas peakers versus storage**

- How will existing technology address intermittency of renewables in the near and mid term?
- How will pricing signals and volatility impact decisions about storage and generation?
- Trade-offs in cost, performance, and environmental impacts of peakers versus CCGT

#### **Topic #3: Long-term energy storage**

- Options for longer term energy storage (days to seasonal); what is likely success and timing of each choice? does existing infrastructure impact choice?

#### **Topic #4: Renewable natural gas**

- Decarbonizing gas through biogas, power to gas, or hydrogen; does existing infrastructure impact choice? Role in carbon capture and utilization for net zero strategies.

#### **Topic #5: Specific market and regional sessions**