

**REDUCING ENERGY POVERTY WITH NATURAL GAS:
CHANGING POLITICAL, BUSINESS, AND TECHNOLOGY PARADIGMS**

SYMPOSIUM AGENDA
MAY 9 and 10, 2017
Last updated 5-3-2017

Location: MacKenzie Room, Jen-Hsun Huang Engineering Center, 475 Via Ortega, Stanford, CA 94305

MAY 9

8:00 Registration, Breakfast, and Networking

8:30 Welcome Remarks

Mark Zoback, Director, Natural Gas Initiative, Stanford University
George P. Shultz, former Secretary of State, Stanford University

8:45-10:15 Welcome Keynotes

What Does Meaningful Reduction of Energy Poverty Entail?

- Samir Saran, Observer Research Foundation, India

A Vision for Natural Gas in Transforming Energy Access

- Maarten Wetselaar, Integrated Gas & New Energies Director, Royal Dutch Shell plc

Moderated Discussion, Tisha Schuller, Stanford University

10:15-10:30 Break

10:30-12:00 Natural Gas and the Multi-Faceted Energy Poverty Challenge

Energy poverty takes many forms: households are not connected to the electric grid, meals are cooked over dung, companies struggle to operate with unreliable electricity, unaffordable fuels perpetuate poverty, and citizens breathe air thick with particulates. Diving into the debate on what it means to successfully address energy poverty, this panel will discuss the many applications for natural gas, such as baseload electricity, cooking, feedstock, and transportation. We will discuss how natural gas compares to alternatives such as coal, liquid fuels, and renewables for health effects, emissions reductions, and economic opportunities. In what applications and in which countries could natural gas have the biggest impact if successful? This panel will include:

- The World Bank's Multi-tier framework to bring clarity to energy access
- Non-electricity direct uses of gas including LPG and transportation
- Energy poverty and gas for chemicals, feedstocks, industrial demand
- Opportunities for natural gas in the power sector: meeting electricity shortages, fuel substitution, mini-grids
- Complimentary role and cost competitiveness with renewables in electricity generation

- The relative challenges and benefits gas faces compared to other fuels
- Technology or business model innovations to enable gas use for pro-poor growth

Moderator: Todd Moss, Center for Global Development

- James Rockall, World LPG Association, Paris
- Catherine Wolfram, Berkeley
- Anatol Feygin, Executive Vice President and Chief Commercial Officer, Cheniere Energy, Inc.

12:00-1:00 Lunch – Addressing the Ambition Gap

For many working in energy access, addressing energy poverty means providing a cell phone charger and a lightbulb. In this arm chair discussion, we will discuss the gap between this vision and building meaningful economic development. What kind of energy building blocks will be required to transform emerging economies?

Moderator: Mark Zoback, Director, Natural Gas Initiative, Stanford University

- Philip Mshelbila, General Manager, Upstream Gas, Shell Petroleum Development Company, Nigeria

1:15-2:45 Sustaining Success: Requirements for Natural Gas to Deliver Its Energy Promise

To be successful over the long-term and deliver meaningful societal benefits, natural gas projects must be thoughtfully developed in their political, social, market, and cultural context. Some of these challenges are typical of all infrastructure projects in the developing world, but others are unique to natural gas. Balancing the economic requirements of investors with the desires of the local population affects every aspect from timing, to pricing, to development constraints. What are the characteristics of countries and projects with the best chance of successfully using natural gas to reduce energy poverty? This panel will include:

- Tensions in gas pricing: subsidies, international markets, domestic obligations
- Best practices for energy governance, revenue management, and community engagement
- Conditions for investment in undeveloped markets
- Balance between use and export
- Lessons learned from the decades in West Africa
- Implementation challenges unique to natural gas

Moderator and Speaker: Mark Thurber, Stanford University

- Patrice de Vivies, Senior Gas Advisor, Energy & Extractives, World Bank
- Robin Dunnigan, Deputy Assistant Secretary for Energy Diplomacy, Bureau of Energy Resources, State Department
- Ken Koyama, Managing Director and Chief Economist, IEEJ
- Mr. George Amoako-Adjei is the Commercial Director of the Ghana National Gas Company

2:45 Break

3:00 to 4:00 Concurrent Breakout Sessions

- 1 - Understanding Demand in the Developing World, Working Session; Sally Benson, Stanford University
- 2 - Global LNG Markets and the Developing World; Lauren Culver, Stanford University and Paul Doucette, GE
- 5 - Pricing; Mark Thurber, Stanford University
- 9 - Where Does Gas Fit in a Decarbonized Energy Strategy? Paula Gant, formerly DOE and Todd Sostek, SoCal Gas
- 14 - Natural Gas Infrastructure and African Business Environments: Challenges and Opportunities; Mark Caine, African Union

4:15 to 5:00 Closing Keynote: Meaningful Energy Access in Practice

Once the ambition gap for energy access is understood, the practical challenges of meeting energy demands in a quickly evolving economy rise to the forefront. This arm chair discussion will address the realities of growing energy supply and use, using India as an exciting, relevant, and modern example.

Moderator: Rachel Pritzker, Founder and President, Pritzker Innovation Fund

- Joyashree Roy, Professor of Economics, Jadavpur University in Kolkata

5:00-6:30 Networking Event

MAY 10

8:00 Breakfast and Networking

8:30-9:15 Welcome

The Global Natural Gas Business

- Peter Hughes, Partner, Global Gas Partners GMBH, UK

9:15-10:30 Meeting the Promise of India

India is one of the most significant new markets for natural gas in the world. Energy demand is growing faster than in China, air pollution from coal fired power plants and local biomass combustion rivals that of Beijing, and there are 400 million people without basic access to electricity (compared to a total US population of 300 million people). India has existing LNG import facilities to feed growing fertilizer and petrochemical industries, is aggressively pushing LPG in rural areas as a clean fuel option, and already has meaningful use of natural gas in their transport system. However, natural gas's share of the energy mix is far below that of a modern economy and expansion of natural gas infrastructure has been stalled because of poor policies and regulated pricing in both the natural gas and electricity sectors.

This panel will include:

- Overview of India's possible markets for natural gas
- The need for infrastructure, both LNG and pipelines to access markets
- Possibilities for micro-LNG
- Gas pricing scheme's effects on domestic production, consumption, and fuel switching
- Natural gas and mini-grids for electricity access
- Lessons to be learned from LPG clean cooking efforts
- The potential for transportation fuel networks

Moderator: Jeremy Carl, Stanford

- Sunjoy Joshi, Director, ORF, India
- Ajay Khandelwal, President of E&P, Reliance, India
- BC Tripathi, Chairman and Managing Director, GAIL, India

10:30 Break

10:45 Sally Benson, Energy at Stanford

10:55 Building Blocks of Prosperity: Natural Gas in East Africa

Mozambique and Tanzania are among the least developed countries in the world with an extremely high percentage of the population lacking basic access to electricity. Recent off-shore gas finds are sizeable and hold the potential to be exploited to the benefit of all concerned. However, both countries are struggling to enact policies that balance the needs of the gas producers and the expectations of the people. There is a difficult tension between exporting to international markets at international prices and providing fuel to an energy starved population through domestic obligations or subsidies. Working with the community to find viable solutions and developing governance structures to share the country's resources with citizens across time and geography are paramount. This panel will include:

- Governance and revenue management to counter insecurity and corruption
- Best practices for community engagement
- Conditions for investment in undeveloped markets
- Natural gas and mini-grids for electricity access
- Stimulating a petrochemical and fertilizer industry
- LPG for clean cooking

Moderator: Christine Jojath, Stanford University

- Scott Moore, Anadarko
- Morgan Bazilian, Lead Energy Specialist, The World Bank
- Emma Msaky, President's Office, Oil and Gas Advisory Bureau, United Republic of Tanzania

12:15-1:00 Networking Lunch – Sponsored by Anadarko Petroleum Corporation

1:15-2:30 Concurrent Breakout Sessions

- 4 - Community and the Social License to Operate; Philip Mshelbila, Shell Nigeria and Landon Derentz, State Department
- 6 - Governance; Christine Jojarth, Stanford University
- 7 - Technology and the Promise of Small Scale Natural Gas; Paul Doucette, GE
- 12 - India: Domestic Regulation & Governance
- 13 - East Africa: Domestic Regulation & Governance; Mark Caine, African Union

2:30-2:45 Transition

2:45-4:00 Concurrent Breakout Sessions

- 3 - Natural Gas Beyond Electricity
- 8 - LPG; Mark Thurber, Stanford University and James Rockall World LPG Association
- 10 - Geopolitical Moves for Securing Energy Flows; Megan Clark Welch and Tom Campbell, Stanford University
- 11 - India: Midstream Infrastructure & Capacity; Sunjoy Joshi, Director, Observer Research Foundation

4:00-4:15 Transition

4:15 Closing Remarks: Taking the Effort Forward, Tisha Schuller

5:00 Adjourn

BREAKOUT DETAILS

1 - Understanding Demand in the Developing World, Working Session; Championed by Sally Benson, Stanford University (May 9, 3-4 pm)

There is still much economists and development experts do not understand about how growth among the poor affects energy demand. Changes in energy demand are not linear. What are the priorities for research?

Sally Benson, Stanford University, Moderator

- Hamis Ussif, Ghana National Petroleum Corporation
- Alex Trembath, The Breakthrough Institute
- Joyashree Roy, Professor of Economics, Jadavpur University in Kolkata

2 - Global LNG Markets and the Developing World; Championed by Lauren Culver, Stanford University and Paul Doucette, GE (May 9, 3-4 pm)

Global LNG markets are undergoing dramatic change. Can the market deliver gas reliably at prices that can benefit the world's poor? What are the risks and benefits of developing countries exposing themselves to this changing market? Are there technologies or business models that can mitigate the risks? How can the risks of gas development and the LNG market be balanced between producers and consumers?

Lauren Culver, Stanford University, Moderator

- Dr. Neil Parsan, former Ambassador to the U.S. from Trinidad and Tobago
- Anatol Feygin, Executive Vice President and Chief Commercial Officer, Cheniere
- Oliver Simpson, Vice President, Commercial for Exceleerate Energy L.P.

3 - Natural Gas Beyond Electricity – David Carrol, President and CEO, GTI (May 10, 2:45-4 pm)

Natural gas is an important feedstock for chemicals, an alternative transportation fuel, and source of energy for industry. Can gas consumers that are not in the power generation business anchor upstream gas development or initiate investment in natural gas distribution or must power generation or gas exports lead the way?

Speakers:

David Carroll, President and CEO, GTI, President, International Gas Union, 2015-2018 (moderator)

- Morgan Bazilian, Lead Energy Specialist, The World Bank
- Philip Mshelbila, General Manager, Upstream Gas, Shell Petroleum Development Company, Nigeria
- Simon Zhang, CEO, NW Innovation Works

4 - Community and the Social License to Operate; Philip Mshelbila, Shell Nigeria and Landon Derentz, State Department (May 10, 1:15-2:30 pm)

With new resource development, there is often a strong expectation among the local community for immediate improvements in employment, services, and infrastructure. What are best practices for managing expectations, finding the right community liaisons, and balancing in-country commitments with market considerations?

Moderator/Speaker: Landon Derentz, State Department

- Philip Mshelbila, Shell Nigeria
- David Carroll, President and CEO, GTI, President, International Gas Union, 2015-2018

5 - Pricing; Mark Thurber, Stanford University (May 9, 3-4 pm)

Price is everything. Price too high and gas is unaffordable for poor communities or strained power companies. Price too low and investment in infrastructure is stifled. Subsidies encourage over consumption. Domestic obligations discourage upstream development. Is there a way to cross-subsidize domestic use to protect the most vulnerable, create sustainable markets, and encourage production and distribution? What does a coherent pricing structure look like? How does it inform the balance between domestic use and export?

Moderator: Mark Thurber, Stanford University

- Peter Hughes
- Mr. George Amoako-Adjei, Commercial Director of the Ghana National Gas Company

6 - Governance; Christine Jojarth, Stanford University (May 10, 1:15-2:30 pm)

What are the best practices for sustainable development and distribution of wealth? What can be done to help governments develop their resources sustainably? What are the learnings from developed markets, and what are the constraints faced by energy poor countries in emulating these learnings?

Moderator: Christine Jojarth, Stanford University

- Patrice de Vivies, Senior Gas Advisor, Energy & Extractives, World Bank
- Kenyon Weaver, Attorney-Advisor specializing in Energy at the US Department of Commerce's Commercial Law Development Program
- Emma Msaky, President's Office, Oil and Gas Advisory Bureau, United Republic of Tanzania

7 - Technology and the Promise of Small Scale Natural Gas; Paul Doucette, GE (May 10, 1:15-2:30 pm)

Small scale distribution of natural gas could open up many new markets and may be critical to serving low income countries where initial demand may be very modest. What technology, policy, and business models are currently being considered? What innovation is still needed? What is the synergy with the

ongoing revolution in mobile banking? How relevant are new silicon-valley driven efforts to collect data to understand customer behavior and de-risk investment?

Moderator: Paul Doucette, GE

- Ricky Buch, Strategic Marketing, Emerging Markets, GE
- Alicia Trent, Product Leader, Gas Processing GE Oil & Gas
- Hamis Ussif, Ghana National Petroleum Corporation
- Alex Trembath, The Breakthrough Institute

8 - LPG; Mark Thurber, Stanford University and James Rockall World LPG Association (May 10, 2:45-4 pm)

LPG is far superior to traditional biomass when it comes to air qualities. What policies can enhance the availability and affordability of a health- and climate-friendly cooking fuel? Current projects have identified opportunities and barriers to adoption of LPG on a massive scale.

Mark Thurber, Stanford University, Moderator

- James Rockall World LPG Association
- Joyashree Roy, Professor of Economics, Jadavpur University in Kolkata
- Andrew Adu, Commercial Manager, Ghana National Gas Company

9 - Where Does Gas Fit in a Decarbonized Energy Strategy? Paula Gant, formerly DOE and Todd Sostek, SoCal Gas (May 9, 3-4 pm)

The development community increasingly suggests that we don't need to develop gas because renewables will soon be cheaper anyway. This breakout will ask the question... can energy poverty be reduced without natural gas? How does the dropping price of renewables

Plummeting natural gas prices have resulted in natural gas being a viable alternative to coal for developing countries such as India looking to ramp up domestic energy supply. The World Bank has already declared an end to investment in coal power plant projects & climate change commitments will make coal an increasingly unfeasible option towards 2030. Natural gas has roughly half the emissions of coal and is capable of supplying consistent base load power to balance renewable energy in the grid. How can global policies and conversations, particularly those around investments by multilateral development banks and the OECD move towards investments in natural gas infrastructure in developing countries? How can energy poverty and climate goals be addressed simultaneously?

- Speaker/Moderator: Paula Gant, formerly DOE
- George Minter, Regional Vice President, External Affairs and Environmental Strategies, Southern California Gas Co. – 30 minute presentation on “Decarbonizing the Gas Pipeline.

10 - Geopolitical Moves for Securing Energy Flows; Megan Clark Welch and Tom Campbell, Stanford University (May 10, 2:45-4 pm)

Sanctions on energy rich countries might be effective in pressurizing the countries in question to change their domestic policies on energy. However, this also has the knock on effect of driving up energy prices and reducing supply in the market, both of which impact developing countries and their ambitions to extend energy access. Furthermore, in the case of gas, reductions in supply inevitably lead consumers to switch to coal, compromising climate goals and setting us back in the transition away from coal powered plants. How can geopolitical decisions shift away from blocking energy access and stop passing the cost of sanctions to the energy poor in developing nations?

Moderators Megan Clark Welch and Tom Campbell, Stanford University

- Samir Saran, Observer Research Foundation
- Landon Derentz, US Department of State (invited)
- Paula Gant, formerly Department of Energy (invited)

11 - India: Midstream Infrastructure & Capacity; Sunjoy Joshi, Director, Observer Research Foundation (May 10, 2:45 to 4 pm)

India faces a capacity deficit in midstream infrastructure for handling natural gas, particularly in receiving LNG, regasification terminals, and pipelines within the country for transporting natural gas and last mile delivery to customers. Creating a midstream regasification and distribution network is critical to supporting downstream and upstream policy changes for scaling up natural gas capacity in India. India needs to develop its domestic infrastructure for ramping up handling of imported natural gas in the country considering its prospective agreements with Iran, Oman and Turkmenistan. Floating Storage and Regasification Units (FSRU) and micro LNG may help in the short to medium term. Considering developing this infrastructure will be expensive, how does India leverage foreign and domestic capital for such investments and allow for cost recovery?

Moderator: Sunjoy Joshi, Director, ORF, India

- BC Tripathi, Chairman and Managing Director, GAIL, India
- Ajay Khandelwal, President of E&P, Reliance, India

12 - India: Domestic Regulation & Governance; Championed by Rathin Roy, Director, National Institute of Public Finance and Policy, India and Pallassana Venkataraman, ExxonMobil (May 10, 1-2:15 pm)

India currently does not have an open gas market. Gas prices are set by the government which discourages foreign investments. Low gas prices have failed to spur a domestic gas market. The political will to allow for the development of an integrated gas market is needed. The difficult decision to remove direct and quasi control over pricing and end-use will create conditions where benefits and costs are accrued through market operations and will help attract interest from investors, producers and distributors. What pricing structures can enable domestic use without crippling domestic development? How can price structures that incentivize both supply and demand be created?

Moderator: Pallassana Venkataraman (Venkat), Global Business Development Lead, ExxonMobil

- Sunjoy Joshi, Director, ORF, India
- Ajay Khandelwal, President of E&P, Reliance, India

13 - Harnessing the African Gas-fired Power Opportunity: What is Needed from African Governments?
Mark Caine, African Union (May 10, 1:15-2:30 pm)

Africa's gas-fired power opportunity is substantial, but so too are the barriers to its realization. Many of these emerge directly from the policies and practices (or lack thereof) of African governments, which often control not only mineral rights and land but also some or all of their domestic electricity markets.

This working session will draw on participants' research and experience to produce a set of actionable recommendations for African governments seeking to increase the role of natural gas in their electricity supply. These recommendations will cover the following areas, identifying both high-impact immediate interventions and transformative medium- and longer-term actions:

- Policy and political dynamics, eg administrative processes, regulatory structures, tax codes, and political risks
- Financial dynamics, eg creditworthiness of generators and off-takers, currency risks, banking infrastructure, and barriers to FDI
- Market dynamics, eg small market sizes, artificially low power prices, interconnection and network access rules, and project and contract structures
- Business environment dynamics, eg labour availability, gas and equipment supply chains, local content requirements, and

Round Table Participants:

- Moderator: Mark Caine, African Union
- Mark Thurber, Stanford University
- Todd Moss, CGD
- Philip Mshelbila, Shell
- Mr. George Amoako-Adjei is the Commercial Director of the Ghana National Gas Company

14 - Natural Gas Infrastructure and African Business Environments: Challenges and Opportunities; Mark Caine, African Union (May 9, 3-4 pm)

The business environment in Sub-Saharan Africa (SSA) has long been a constraint on the growth of African gas. This session will explore SSA's business environment obstacles, characterizing their relative impact and country-level distribution and identifying strategies for navigating them. How can investors and project developers navigate the political and administrative barriers, regulatory and taxation challenges, local content requirements, logistics and supply chain constraints, labor availability issues, and social and cultural complexities facing Africa's most promising gas markets? Longer-term, what reforms should policy makers in these markets prioritize to de-risk investment and accelerate projects?

- Speaker: Mark Caine, African Union