GE Oil and Gas

Unlocking the “Age of Gas”

IEA-IEF-OPEC SYMPOSIUM ON GAS AND COAL MARKET OUTLOOKS
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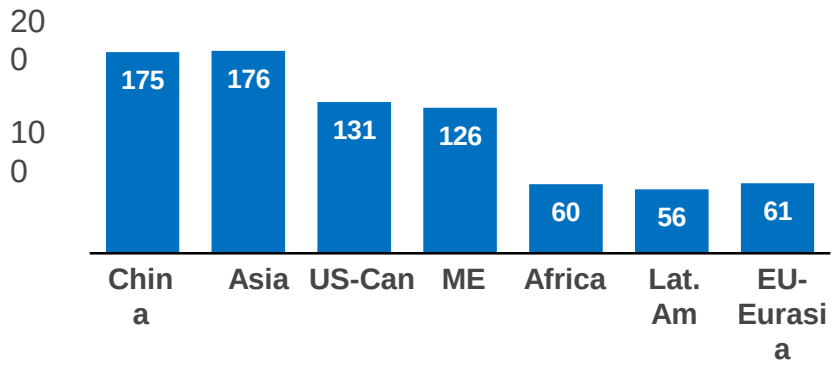
imagination at work

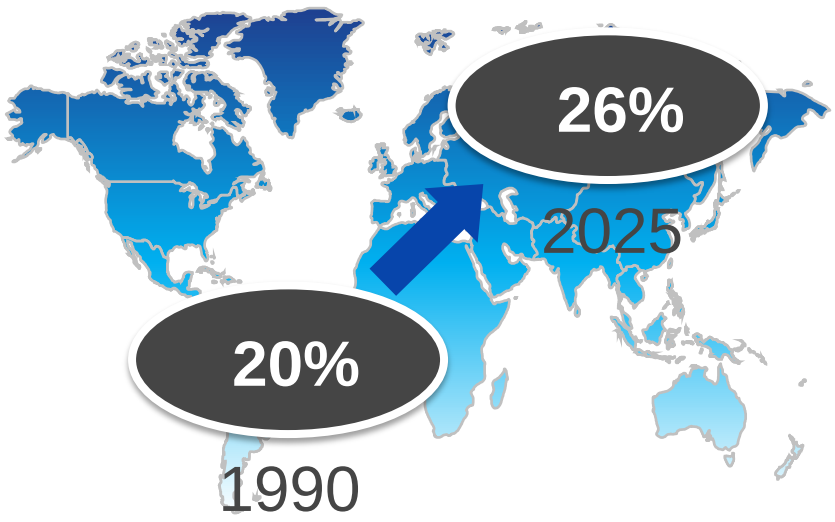
What is the “Age of Gas”?

Global gas consumption growth ‘13-’20
Bcm per year



Source: GE Age of Gas Outlook update June ‘14

Primary Global Energy Production %



Key Benefits

COMPETITIVENESS ▶ **SECURITY - RESILIENCE** ▶ **SUSTAINABILITY**

Natural gas has increasing role in global energy mix

www.ge.com/AgeofGas

“Age of gas” scorecard October 2014

Have signposts toward the “Age of Gas” strengthen or weakened?

Mega project progress
Cost control & execution

Australia & Deep-water inflation

International connections
Coordination between states on big LNG and pipelines

Russia – Ukraine Crisis

UCR unleashed
Shale development with technology & sustainable practice

North America & China progress

Distributed pathway
Small scale gas solutions

Africa & South east Asia, Upstream North America

Pricing and contracts
Subsidy management & flexible contracts; new models

US gas cost remain low, Expanding discussion on new pricing models for Pacific Basin LNG

Network focus
Connectivity & investment

Steady, but no major changes in Gov’t policy or focus that would accelerate NG (eg. EU, US, gas master plans etc.)

Source: GE Oil and Gas Strategic Marketing

Gas to Power … understanding scale

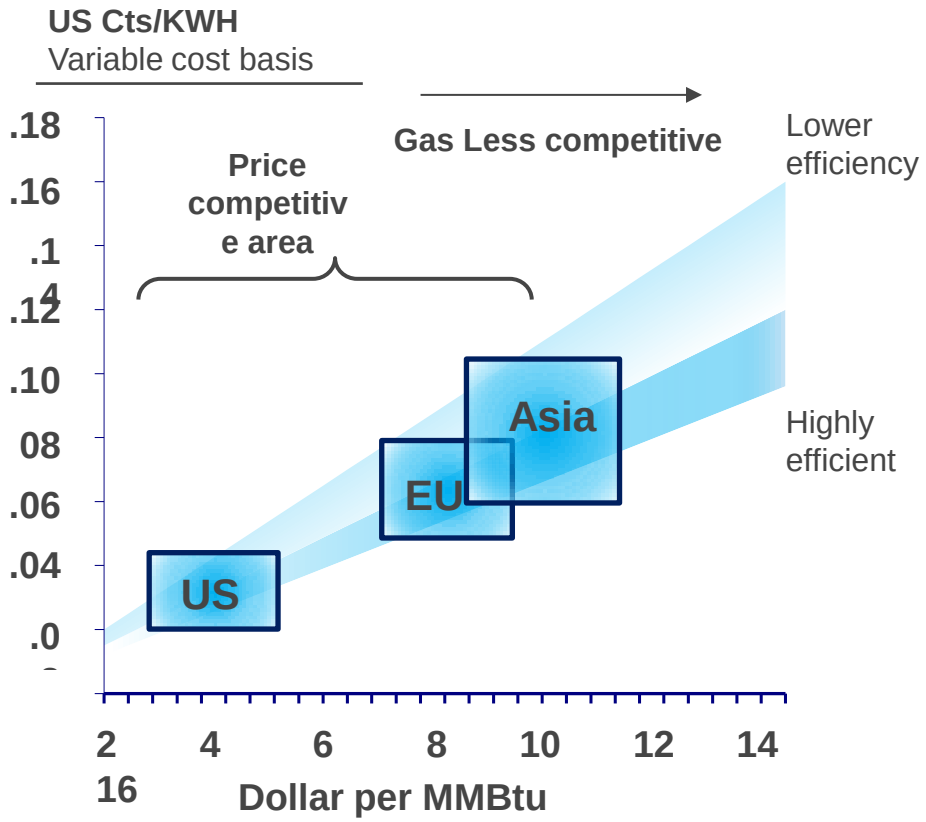
Large scale feeds thermal…small scale feeds DP and virtual pipeline

Gas to Power options			BCFD (Bcm / MMTPA)	~GWe (CCGT)	Typical project $B CAPEX	Typical Aspects
Large "Anchor Systems"		Int'l Mega Pipeline	3.5 (35 / 25) →	20	$10-30B	Sovereign ownership state to state deals.
		LNG Mega	2.2 (22 / 16)	12		Long-term commitments on gas and infrastructure
Mid		Regional Pipeline	1.2 (12 / 8.5) →	6.5	$1-5B	Mix of state owned & private players
		Floating LNG Regas	0.45 (4.5 / 3.3)	2.5		Gas and infrastructure can be separate (tolling)
"Satellite Systems" Small		Small-scale LNG	MMcfd (DP) 8- 40 →	~MWe 40- 200	$50 - 300MM	Single entity or small JV partnerships
		CNG in a Box	0.5- 5	2.5- 20		Modular, pre-configured designs

Source: GE Oil & Gas, GE Distributed Power; Bcfd/MMcfd: Billion/Million cubic feet per day; GWe/MWe: Giga-Megawatt equivalent

Strike zone for natural gas

Competitive landscape versus coal …



Key Issues

- Competitive landscape different by region
- Recognize peaking and load following benefits of gas
- Recognize environmental benefits
- Pricing outside the strike zone will limit market growth … particularly in Asia

Recent spot price have been in the "strike zone"

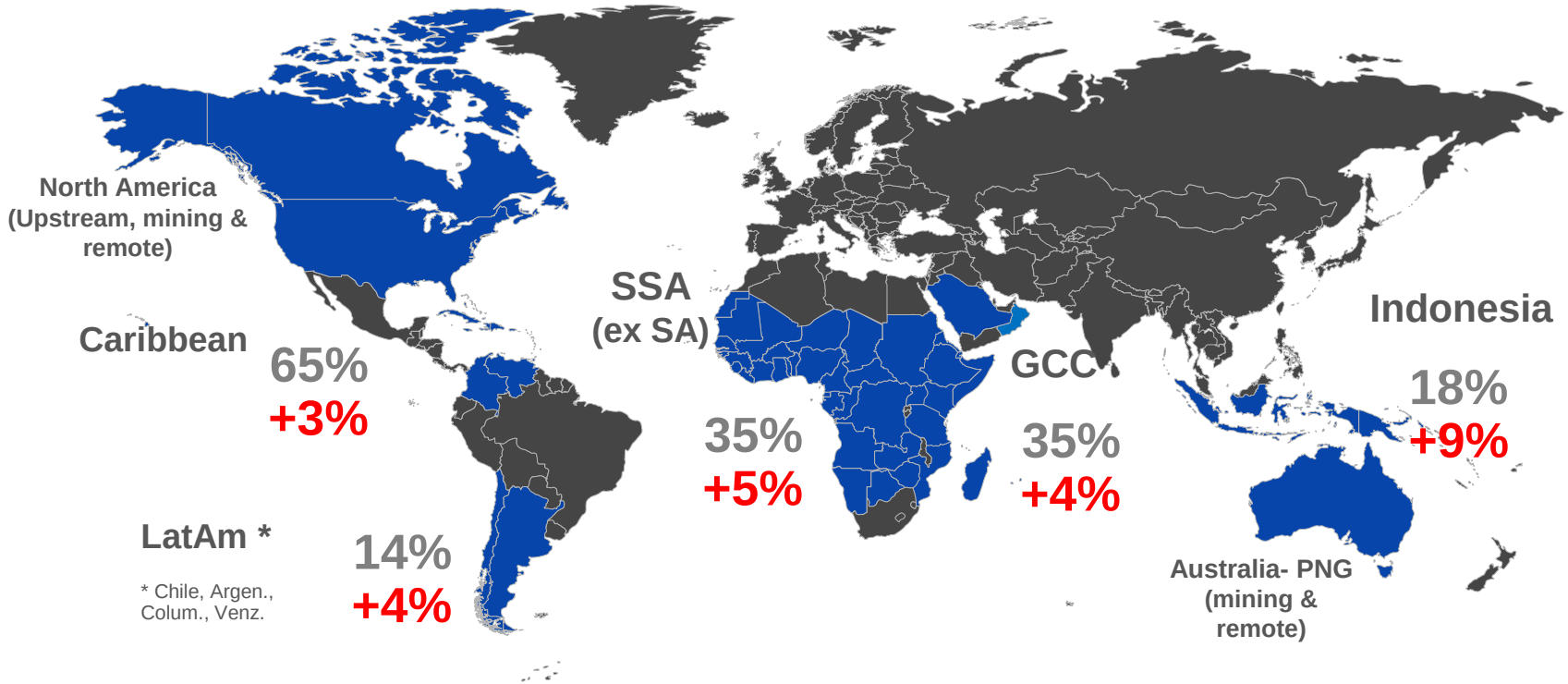
Note: Estimates of high efficiency natural gas are based on 10,000 heat rate, while lower efficiency estimates are based on a 6000 heat rate.

Distributed pathway … small gas-to-power

Oil substitution and energy access are drivers…

Key regions for small gas-to-power

Key metrics: % oil generation ‘13 est.
CAGR elec. dem. ‘14-’20



Large growth opportunity with right structures …

Sources: GE Oil and Gas , GE PW Feb ‘14 Outlook , IEA

Distributed gas … rail and small shipping solutions

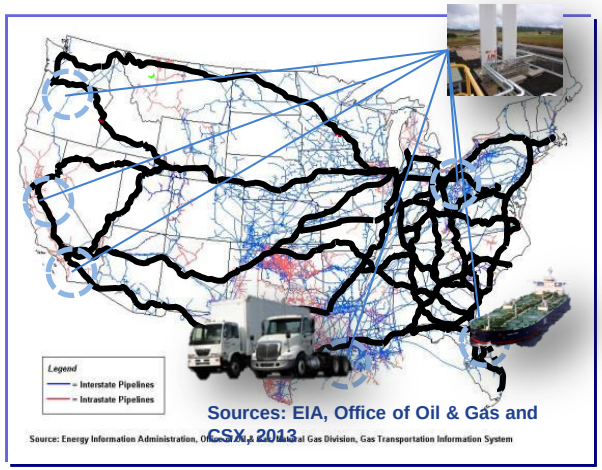
Cost of small LNG continue to fall … industrial fleets and power opportunities

NGV … Railroad opportunities

Global diesel use in Rail ~ 620K bbl/d

US Class 1 diesel use in Rail ~ 240K bbl/d
~ 7% US diesel Demand

Example Integration:
USA Multi model hubs for LNG/CNG

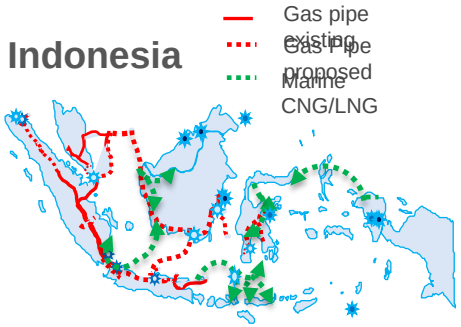


Sources: EIA, Office of Oil & Gas and CSX, 2013

BNSF RAILWAY

Generation … Island power examples

Indonesia



Caribbean & Cent. America

Gas to Power potential

LNG potential by ’20 *

2.5 GW

3.5 MTPA

2.7 GW

3.7 MTPA

* Assumes replacement of 30% installed oil capacity & gas captures 50% recip growth . 3-5 Year potential

Integrating value chain to create comprehensive solution is key

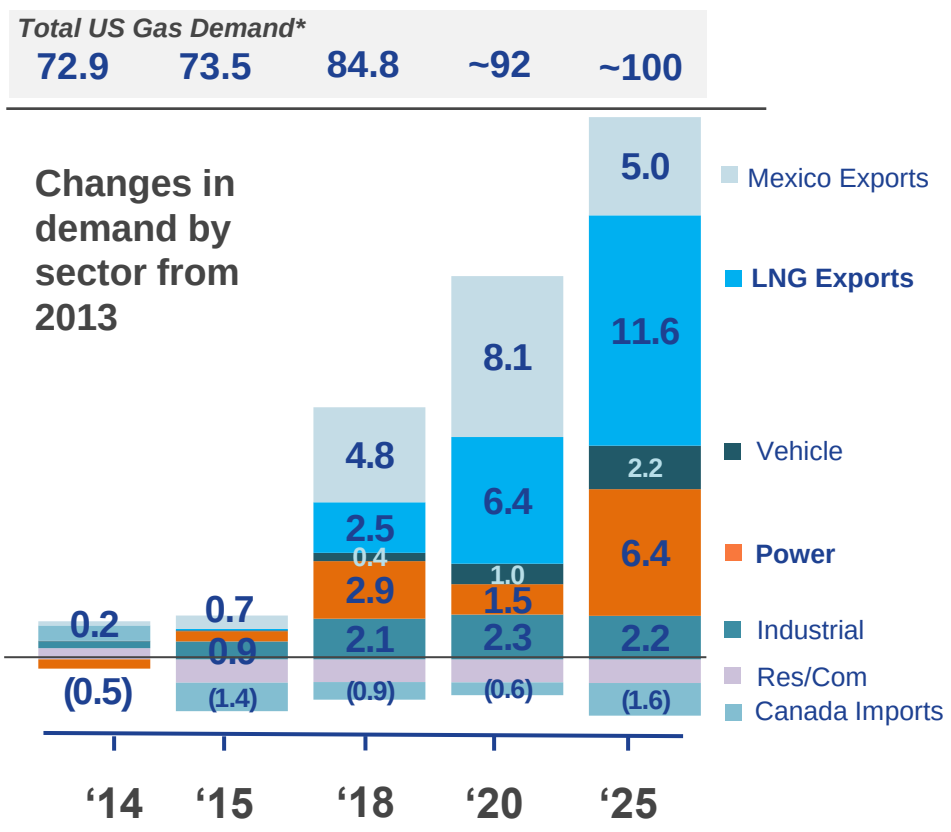
Sources:GE Oil and Gas , GE Distributed Power , IEA 2012, EIA

Sources:GE Oil and Gas , GE Distributed Power

US Gas demand trajectory uncertain

Power sector use and exports will drive US gas demand

Changes in US Gas Demand ‘14 to ‘25
Billion cubic feet per day



Demand side issues

1. LNG exports could be big US Gov’t policy and gas prices will dictate how fast
2. Transportation, Industrial sectors are all lining up for lower cost NG
3. Power sector gas demand has biggest growth potential … will be sensitive to price and policy

Sources: GE Oil and Gas , Baseline case Aug ‘14. EIA, Excludes Alaska

* Includes Net Exports

Lessons from North America

Upstream

Learning by doing …

- ✓ Innovation – exploration
- ✓ Development

Standardization is difficult because each basin/well is different

Competitive industry structure

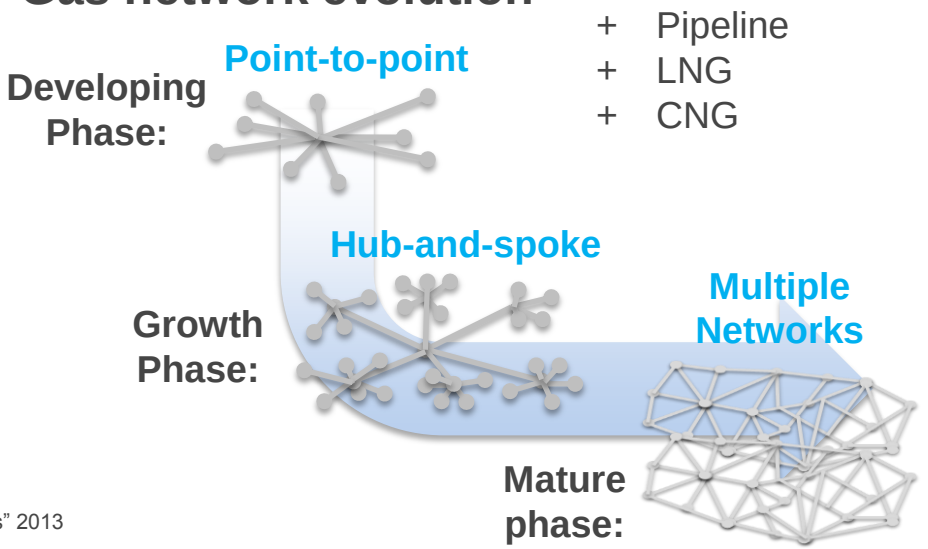
- \+ Fast scale up
- \+ Rapid investment
- \- Coordination issues & constraints

Midstream & downstream

Integrating infrastructures

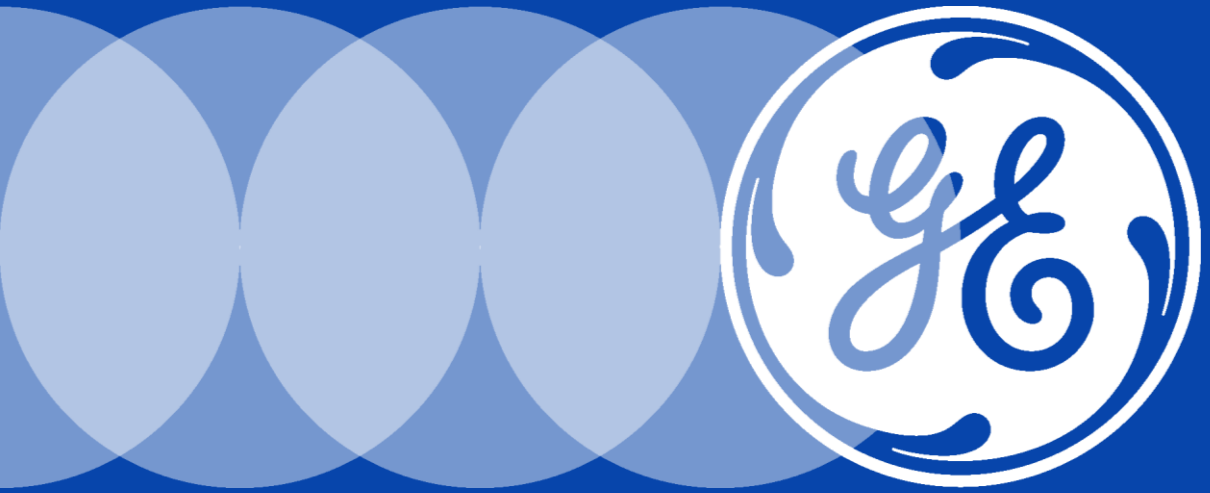
- ✓ Gas with renewable energy
- ✓ Gas for transportation

Gas network evolution



Source: GE Global Strategy & Analytics "Age of Gas" 2013

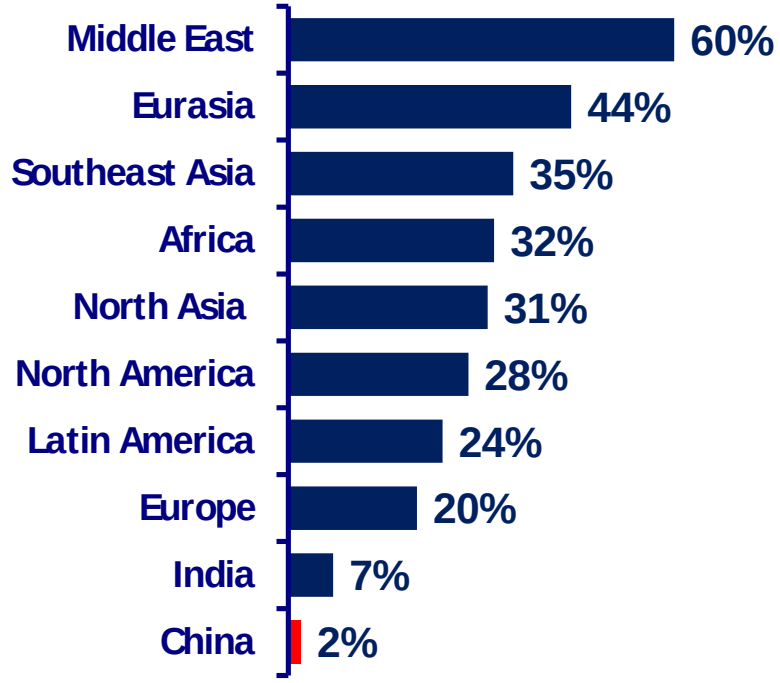
Unleash the innovators … build the networks … to unlock the Age of Gas



Natural gas-fired power share varies by region…

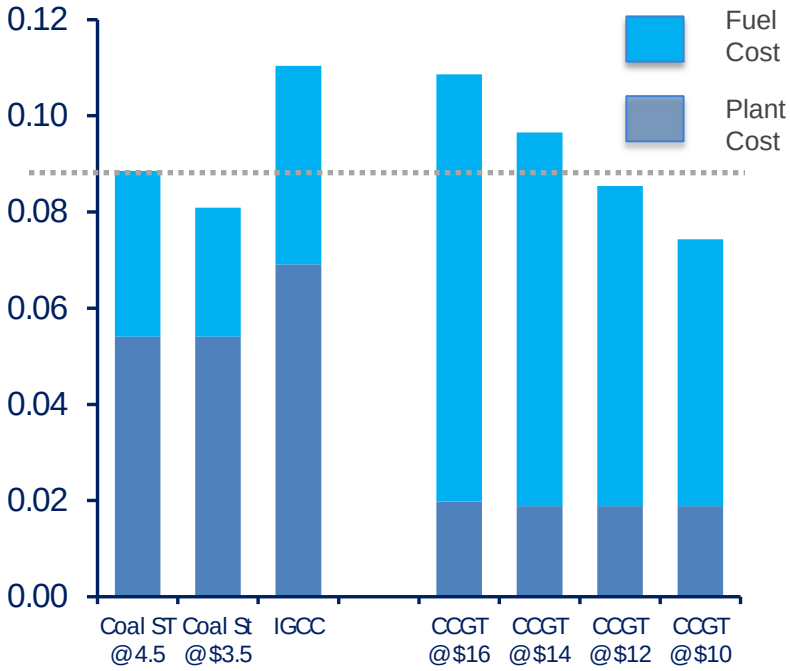
Competition versus coal … CAPEX vs Fuel contract

Share of gas fired generation
2013 estimated



Source: GE Strategy and Analytics 2014.
Note: North Asia includes Japan, Chinese Taipei Korea
Southeast Asia excludes India

Levelized cost of electricity LCOE
US Cents/Kwh - North Asia example



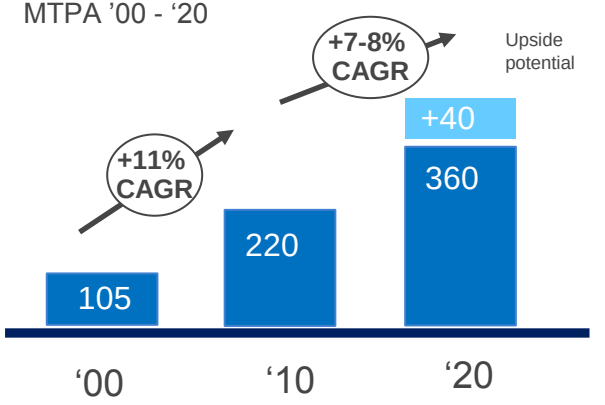
~800 MW – 36% efficient
90% CF
$1,900 KW
30 year asset life
15% return
60/40 Debt Equity
No Carbon price

~770 MW – 61% efficient
90% CF
$790 KW
30 year asset life
15% return
60/40 Debt Equity
No carbon price

LNG industry evolution continues

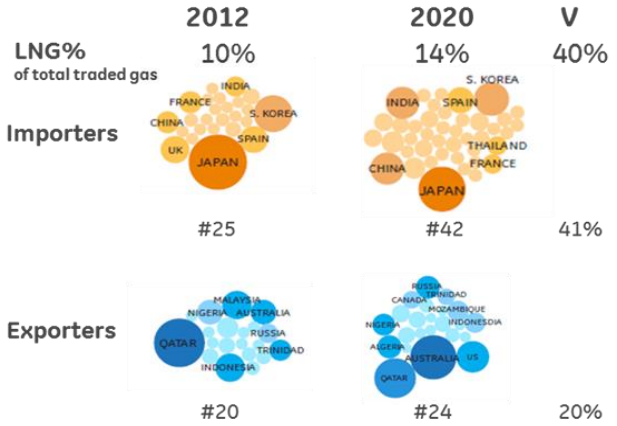
Global LNG demand

MTPA '00 - '20



Source: GE, CERA

LNG network expanding

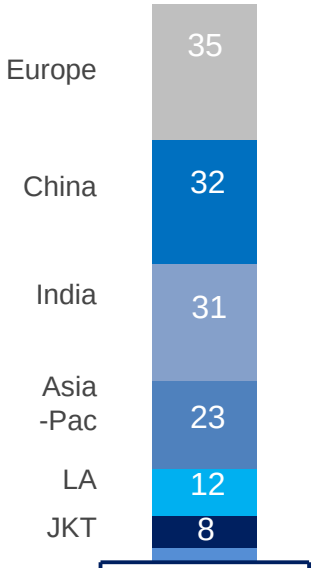


LNG demand growth

MTPA '14-'20

+145

85% in contract or tolling



GE Age of Gas

LNG designs evolve

LNG 1st gen

LNG Mega-trains

Brownfield Regas plant Conversions

- Next gen onshore LNG
- Small-scale LNG
- Floating LNG

Feedstock slate growing

- ✓ Stranded gas (big fields)
- ✓ Offshore
- ✓ Sour
- ✓ Associated
- ✓ Arctic
- ✓ Stranded gas (small fields)
- ✓ CBM
- ✓ Shale & tight gas

'00 '10 '20

Industry poised to grow 60% over next 5-7 years … but will look very different