

INDUSTRY PERSPECTIVE

Small Scale LNG

Opportunities and Challenges
in a Fast Developing Worldwide Industry



David Gordon – Salof President



Safety Moment



How to Stress Less

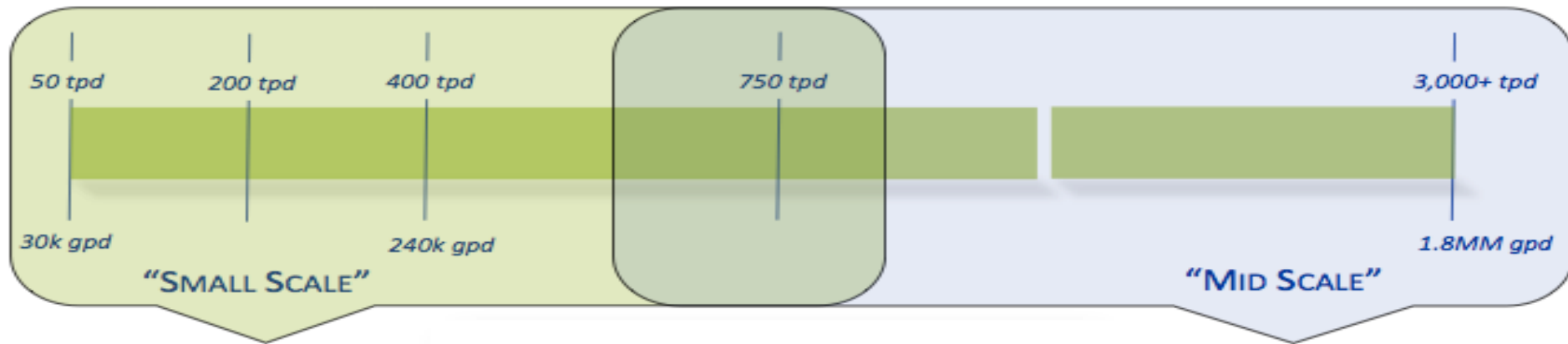


Salof

- Headquartered in New Braunfels, Texas
- Installed facility base of over 130 plants worldwide
- Practical One Stop Solutions
 - LNG & CO₂ Liquefaction Plants
 - Off/onshore Gas Processing and Conditioning
 - International Engineering Capabilities
 - Commissioning, Start Up, and Operation Services
 - Plant Automation
- Small scale LNG industry forefront since 1989



Modular LNG – Plant Size Definitions



SMALL AND MID SCALE LNG

- LNG Can be Traditionally Categorized into Export and Domestic Use
- Domestic Use LNG Created Demand for Small Scale LNG Plants
- "Mini" LNG Plant (< 50 tpd) for "Market Seeding"

- 50 – 600 TPD Typical Market Demand
- New Idea – Can Small Scale Plants Support the Export Market?

What is my perspective?

Where have we been;

Where are we going...

Perspective of the Industry

Where we've come from:

My first presentation in 2002 in Russia



I was either flat wrong or a psychic (few years off)...



Perspective of the Industry

History behind the perspective....

2004 Weizhou Island China	6 MMscfd
2005 Karratha, WA	10 MMscfd
2006 Peru	28 MMscfd



2009 Inner Mongolia, PRC	10 MMscfd
2010 Tianfu, PRC	3 MMscfd
2010 PRC	(2) 2.2 MMscfd
2010 PRC	(2) 4.4 MMscfd
2010 Karamay, PRC	19 MMscfd
2011 PRC	(2) 4.4 MMscfd
2011 Calgary, Canada	38 MMscfd
2012 USA	(6) 40 MMscfd



Perspective of the Industry

EVERYONE says they want to get into “Small Scale” LNG!

Where/what is the “demand”?

Energy Shift - Oil to Gas

Fundamental changes to energy consumption profiles are taking place, from heavy reliance on high cost oil to the use other fuels, particularly natural gas (NG)

Removal of Fuel Subsidies

The reduction / removal of many countries oil fuel subsidies enhances the price competitiveness of Natural Gas, especially LNG usage compared to other fuel alternatives

Strong Energy Growth

Strong energy growth in non-OECD countries is accelerating energy demand for lower cost cleaner gas solutions

Increase Energy Demand

Raising demand for a competitive, reliable supply of clean low carbon energy is a key issue for all energy markets today, and into the future

Specific Demand (Users):

- **Power Generation**
- **Long Haul Trucking**
- **Buses**
- **Drilling Rigs**

Future Market:

- **Marine**
- **Rail**
- **Mining Truck**

To economically displace Diesel or other oil based fuels for power, transport, industrial and/or domestic usage





Challenge: Increasing and Proving Demand "Game Changers"

Heavy Off Road



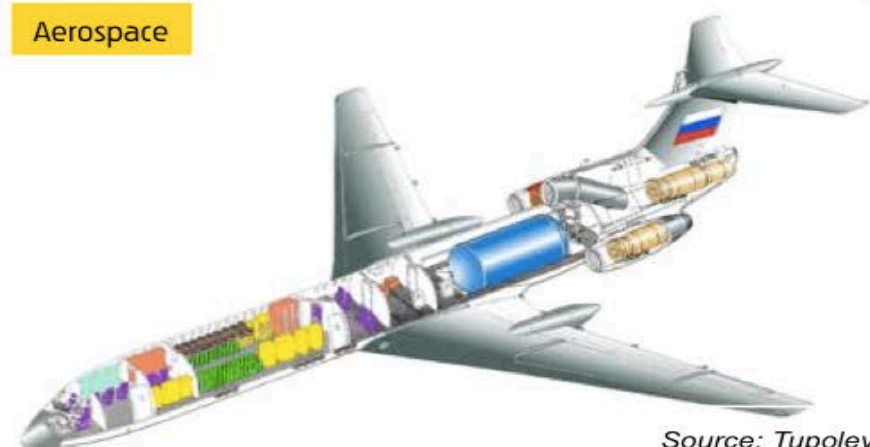
Marine



Locomotive



Aerospace



Source: Tupolev

Perspective of the Industry

Challenge: Don't Believe the "Hype"

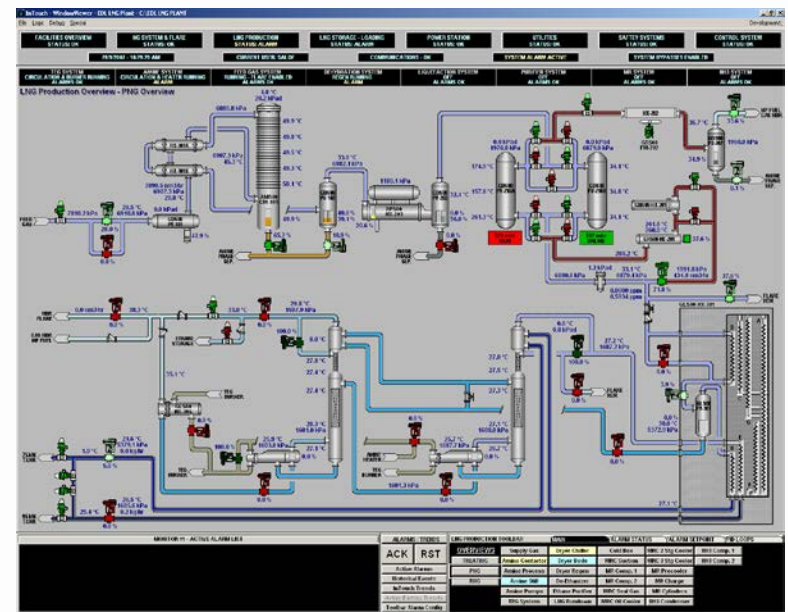


Those that dream up
new market
schemes and try to
“impress” the
market...and those
that build plants...

Perspective of the Industry

Challenge: Meeting the Demand

MODULAR LNG PLANTS



Factors that go into the design/selection of a LNG plant:

- Inlet gas quality (as well as temp/press),
- LNG quality (as well as temp/press),
- Throughput (tons/day),
- Ambient conditions,
- Water cooling or air cooling,
- Type of driver (motor, engine, turbine),
- Type of refrigerant process (exp, n^2 , SCMR, PCMR,...),
- Code requirements (country requirements),
- Air permitting/discharge requirements,
- Stick built, modular, plug-n-play,
- Additional customer requirements (type of PLC, instrumentation, ...),
- Utility requirements,
- Others...



Plant Offerings: Differentiation

Refrigeration Processes

- Nitrogen compression/expansion;
- BOG compression/expansion;
- Pre Cooled Mixed Refrigerant;
- Mixed Refrigerant;

Plant Supply

- Stick Built
- Modular
- Full Modular Plug-n-Play



Market Key: Standardization

- The ability to provide a “standard” plant will be a key to future success. For the US market a plant that is sized around a market requirement (mine truck, rail, feed to local truck market,...) will help to meet market demand.
- The ability to “design one and build many” will help to lower costs and continue to drive the market.



Please Come Visit US

380,000 ft² Offices and Manufacturing Facility



1150 Schwab Road, New Braunfels, TX



**We don't just dream
about LNG solutions...
We build them.**



Example of Complete Plant Plug-n-Play



Single Point Field Connection



Installed On Site

