An example of power demand

... + associated gas availability

- total power
- from alternative
- from associated gas

power requirement

year of operation

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
And even more varies .......

- The gas heating value: 42 MJ/m³ - 25 MJ/m³
- The gas Wobbe index: 45 MJ/m³ – 30 MJ/m³
- The knock resistance (Methane number) 70 – 40
- The daily gas flow

**Required, a technology that:**
Is insensitive to gas quantity and quality
Can use a back up fuel
Has a high utilisation efficiency
A reciprocating engine + generator: the solution
The technology: a gas-diesel engine

Associated gas

350 bar

43.5 * 0.954 = 41.5 %

Gas spray

Diesel spray

Gas spray
Operation in ‘full’ gas mode

-6-

Load %

Fuel Share %

Constant liquid fuel amount 3 - 5 % of energy input at 100 % load
No power problem if the gas flow varies complement with crude, HFO, MDO, LFO

- Fuel Sharing
- Gas and oil share adjustable
- diesel pilot
- Fuel oil operation
- Transfer window
The efficiency

- Ideal for:
  - islanding
  - spinning reserve

Close to flat line
A modular approach

Repeatability, flexibility, adaptability, reliability
Multi unit gas engine power plant

The multi unit gas engine power plant has very high part load efficiency. Example with 5X20V34SG ~45 MW plant

Source: Alstom product brochure 01; Wärtsilä perf
Fuel-sharing reference in Ecuador
Even more energy available

2 MW heat

chiller

6.5 MW chill
For gas treatment or selling

23 MW fuel

engine

2 MW heat

generator

10MW Electr.
Not only electric power......
References: Storage

Gas engines as compressor drivers

**REN - Armazenagem, S.A, Portugal**
Gas storage in salt caverns
- 100 000 Nm³/h; 37 -> 187 bar
- 2 x 16V25SG + reciprocating compressor
- in operation since 2005

**Lentransgaz, Russia**
Gas Storage aquifer
- 440 000 Nm³/h; 45 -> 150 bar
- 4 x 18V28SG + reciprocating compressor
- in operation since 2005
To remember

Flaring can be reduced and the gas can be used with high:

1. Fuel flexibility
2. Power flexibility
3. Fuel-to-power efficiency

pekka.laine@wartsila.com
ronald.westerdijk@wartsila.com
jacob.klimstra@wartsila.com
www.wartsila.com