

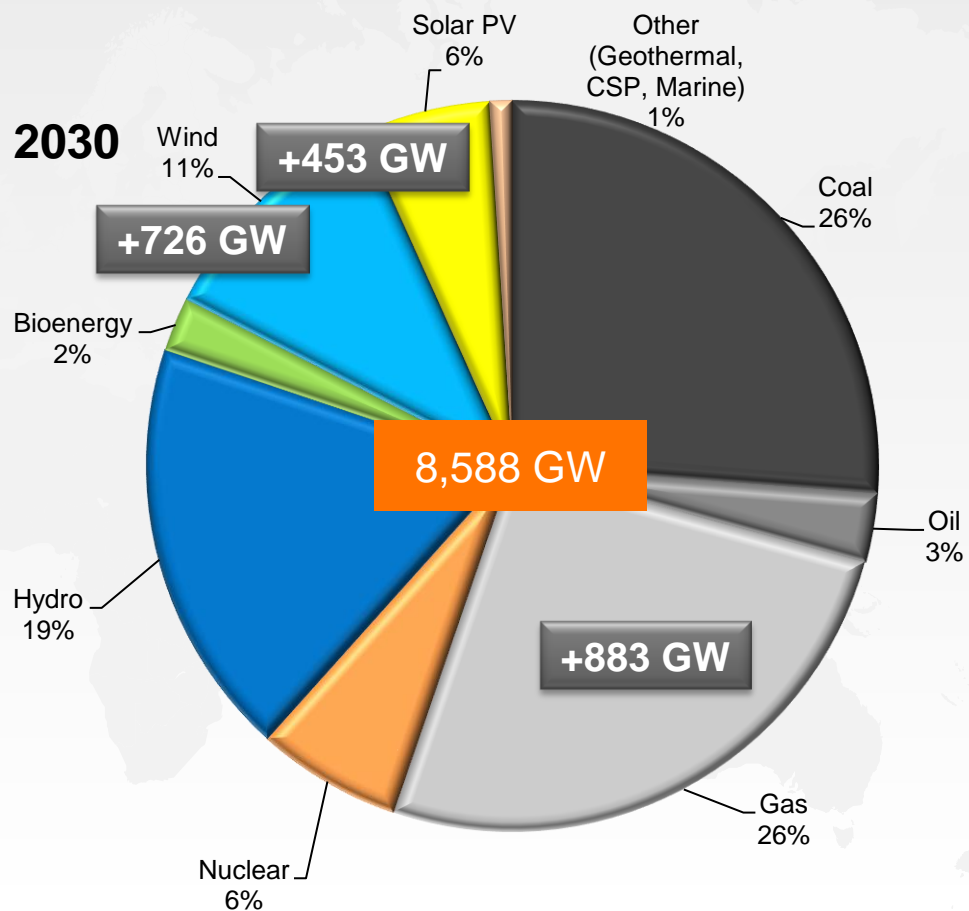
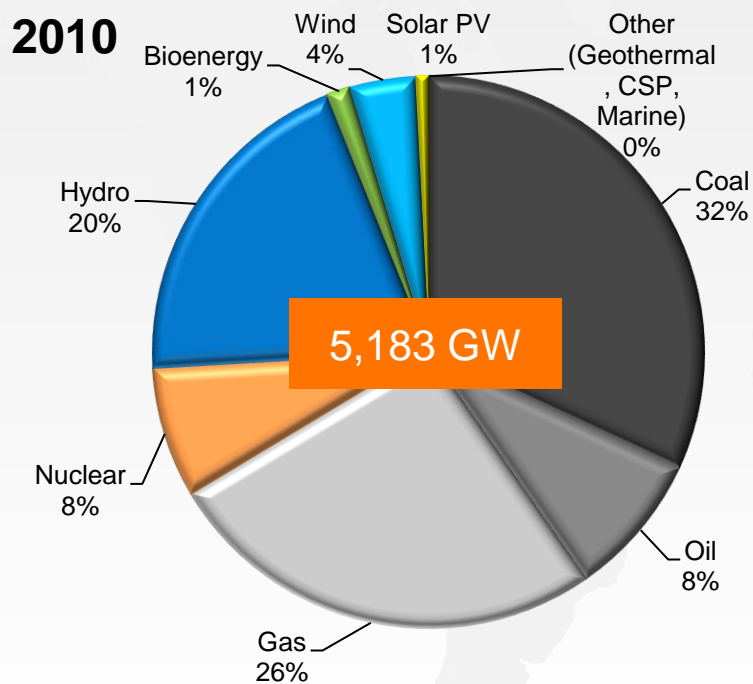


# POWER PLANTS' FOCUS ON GAS

**VESA RIIHIMÄKI**

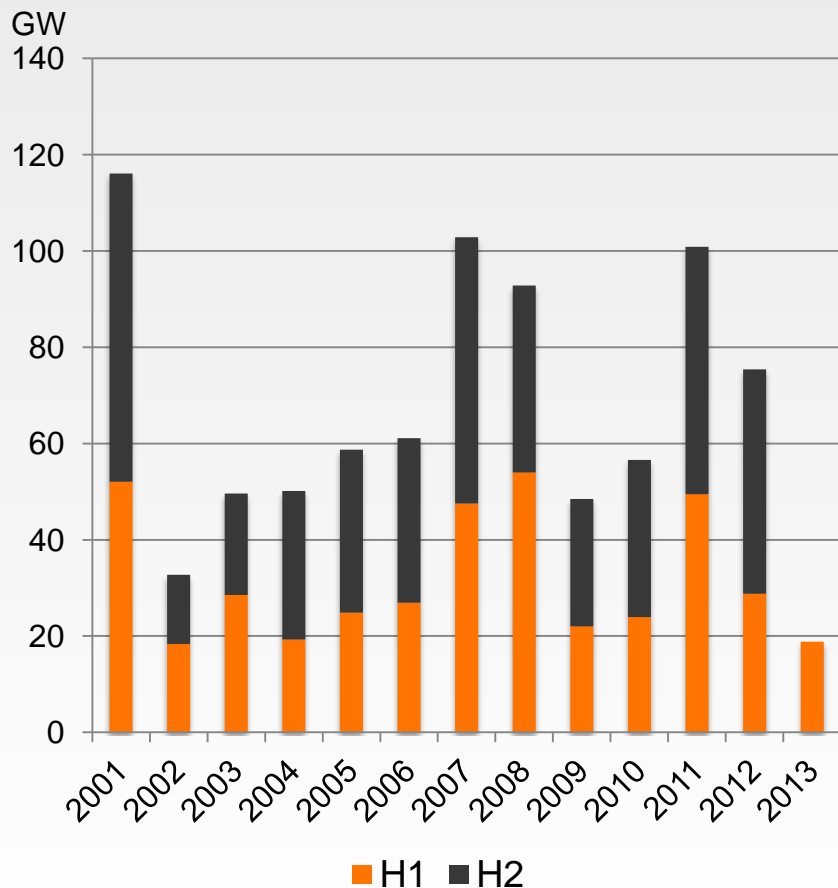
President, Power Plants & Executive Vice President

# Wind, solar and gas expected to grow strongly



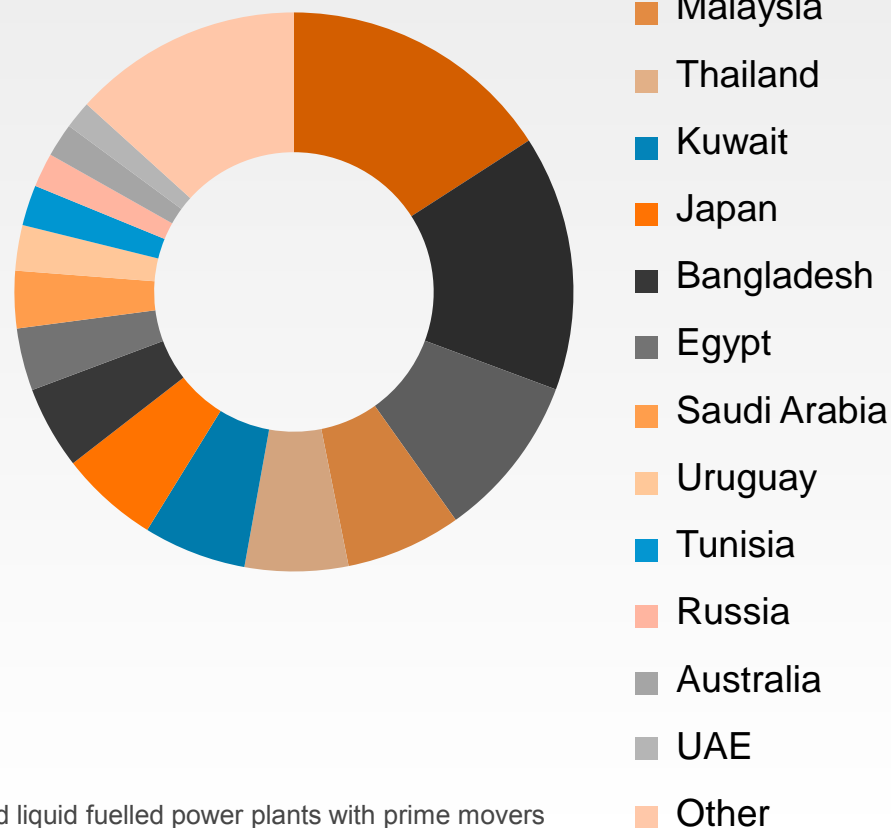
Source: World Energy Outlook 2012 IEA, New Policies Scenario

## Overall market size



## H1 2013 Top 15 countries

Total 18.8 GW



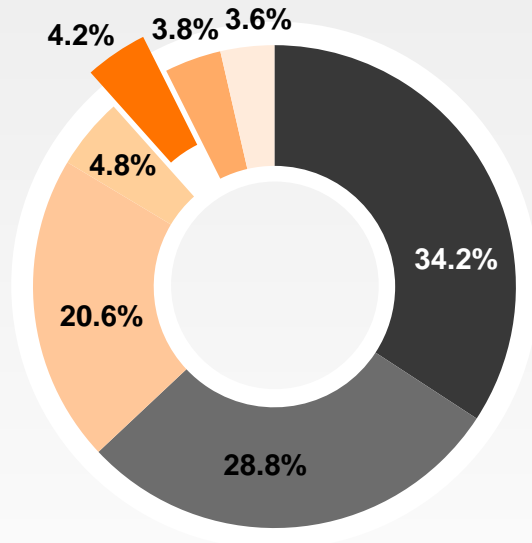
Includes all Wärtsilä power plants and gas turbine manufacturers' gas and liquid fuelled power plants with prime movers above 5 MW, as well as estimated output of steam turbines for combined cycles.

The gas turbine data is gathered from the McCoy Power Report.

Other combustion engines not included. In engine technology Wärtsilä has a leading position.

## 2012

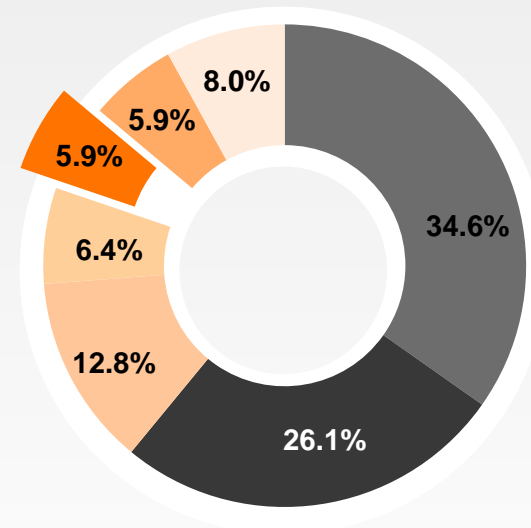
Total market 75.4 GW



- GE
- Siemens
- MHI
- Alstom
- Wärtsilä
- Ansaldo
- Other GTs

## H1 2013

Total market 18.8 GW

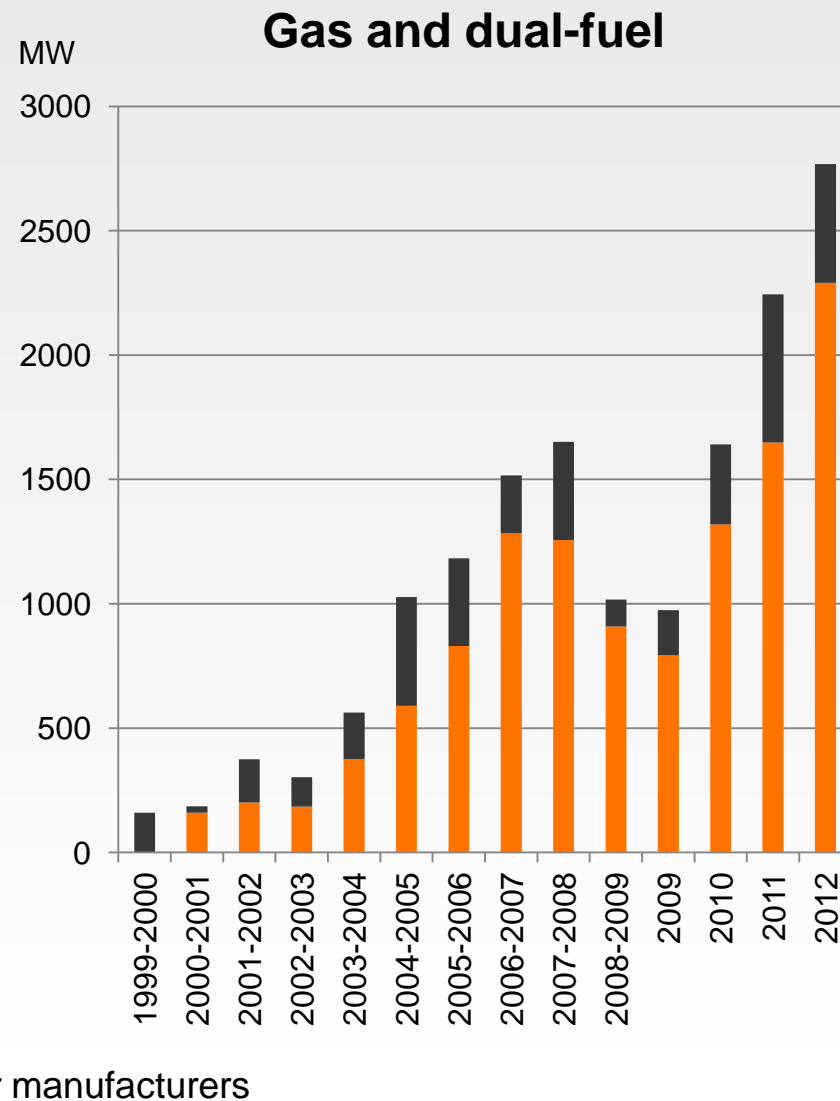
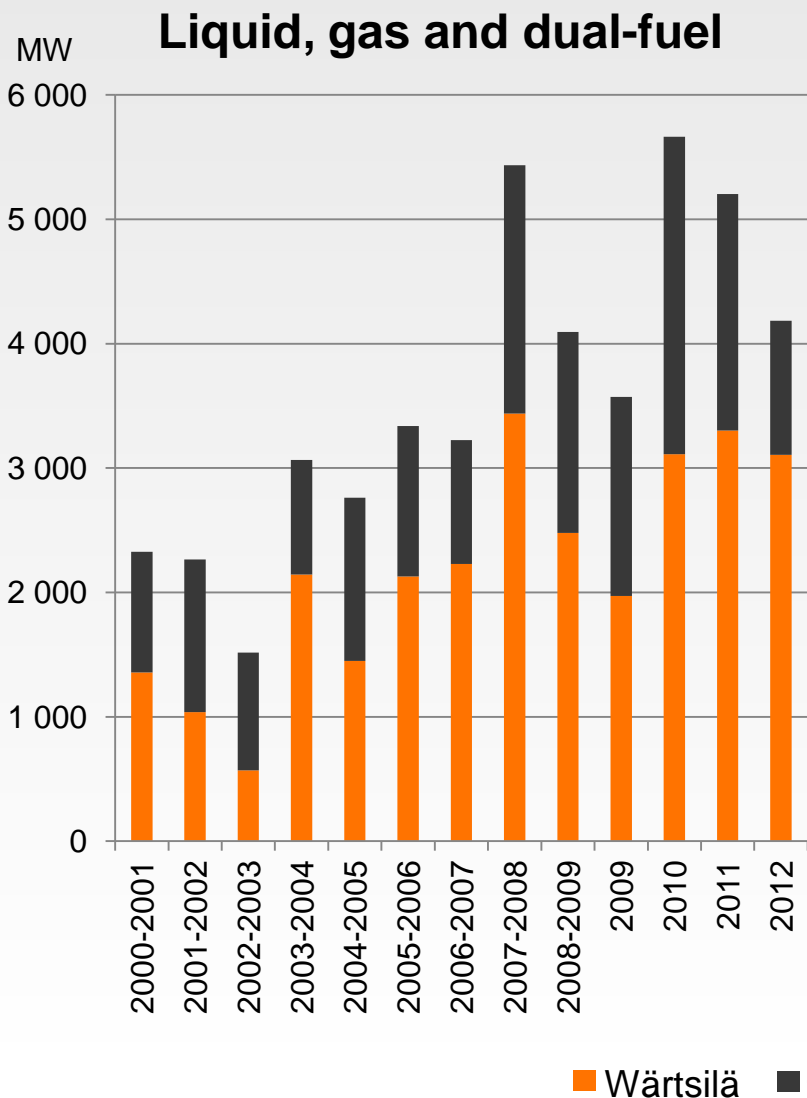


- Siemens
- GE
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Source: DGTWW Power Generation Survey & Wärtsilä

- Maintain our leading position in HFO & dual-fuel power plants by enhancing our value proposition
- Grow strongly in large utility gas power plants by capturing market share from combustion turbines
- Grow in biofuel power plants by enabling a wide fuel range
- Grow in special applications - nuclear emergency power, CHP, oil & gas and LNG infrastructure - by introducing our value proposition to the selected customer segments

Strong growth focus on large gas plants in broad utility markets



## Utilities

Entities supplying electricity to residential, commercial & industrial end users



South Texas Electric Cooperative, USA

## IPPs\*

Financial investors investing in power plants and selling power to utilities



GERA, Brazil

## Industrial Customers

Industries such as mining, cement and oil & gas investing in captive power plants.



Barrick Gold Corporation, Canada



Azerenerji, Azerbaijan



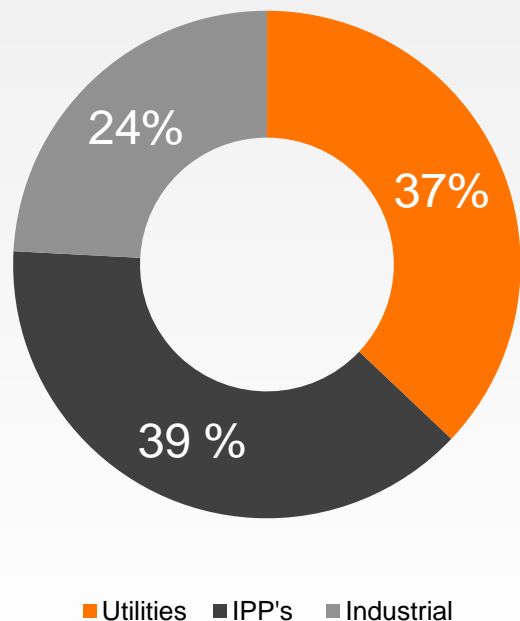
Çakmaktepe Energy, Turkey



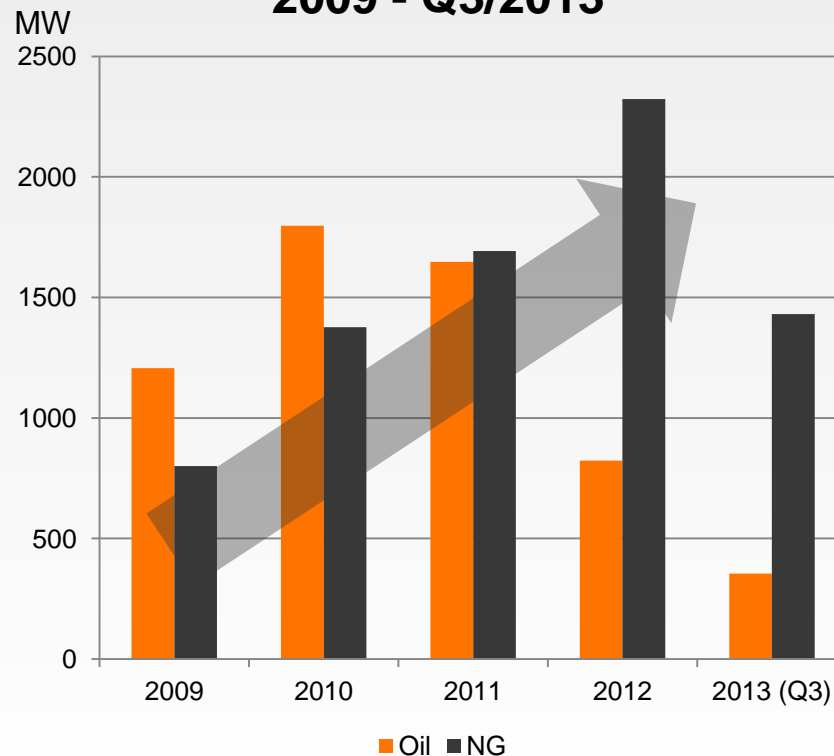
Sasol New Energy Holdings, South Africa

\*) Independent Power Producers

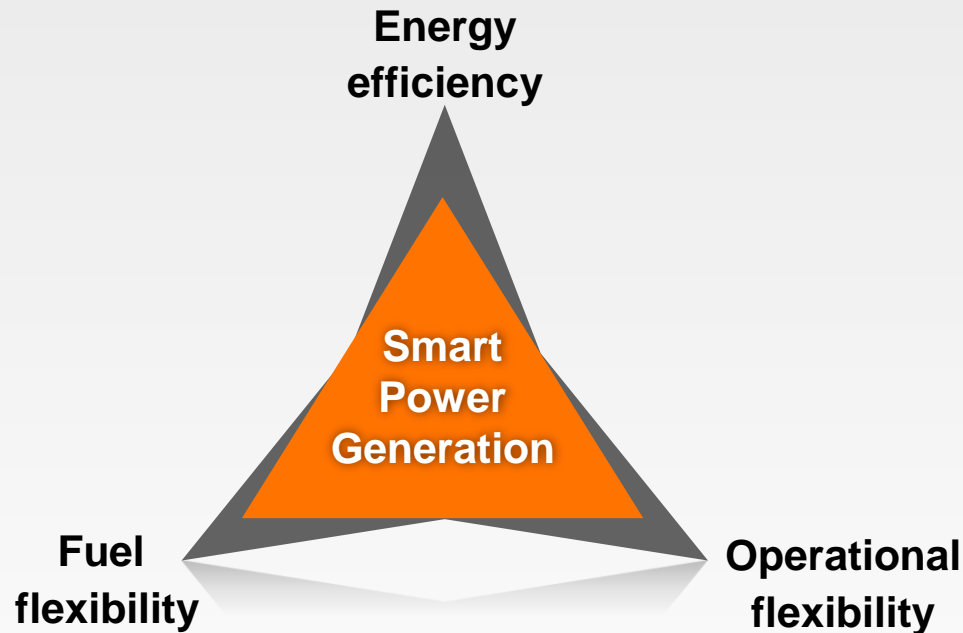
**OI by customer segment  
2009 - Q3/2013**  
Total EUR 6,462 million



**NG and fuel oil share of OI  
2009 - Q3/2013**







Smart Power Generation is a new **concept** which enables an existing power system to operate at its **maximum efficiency** by most effectively absorbing current and future system **load variations**, hence providing dramatic **savings**.

Liquid fuel  
infrastructure  
only

Transition to  
NG (LNG  
infrastructure)

NG as  
mainstream  
energy

NG as  
balancer for  
renewable  
energy

## Dual-fuel power plant



- Initial operation using HFO 15-16\$/MMBtu
- Provides base gas consumption for NG, enabling investment for the LNG terminal
- NG cost using LNG 11-17 \$/MMBtu
- Plant feasibility typically improves with NG, which is a strong driver for investment

## Medium scale LNG terminal



- Economic feasibility depends on scale
  - larger terminals can receive larger tankers which lowers LNG price
  - ship size is a key factor
- 50-1,000MW<sub>th</sub> flow is typically considered Medium size
- 10,000-160,000 m<sup>3</sup> tank sizes
- Tank size to match ship size

- Wärtsilä Power Plants has developed capabilities to become an EPC supplier for medium scale LNG storage and regasification terminals
- Wärtsilä can support and enable transition to gas infrastructure by providing a one stop shop for the investments related to power generation and LNG infrastructure
- Wärtsilä's offering is based on strong EPC capability for power plants combined with regasification solution from Wärtsilä Flow & Gas

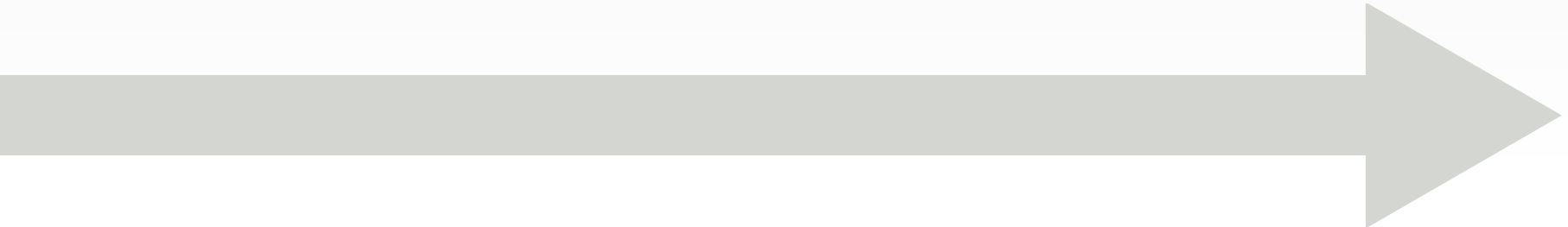


## Traditional world

- Fossil fuels provide **baseload energy**
- **Business model** is based on producing energy (MWh) and getting a small margin sale
- Solution parameters:
  - Electrical efficiency
  - Investment cost
  - Long-term power purchase agreement
- Static world

## World of renewable energy

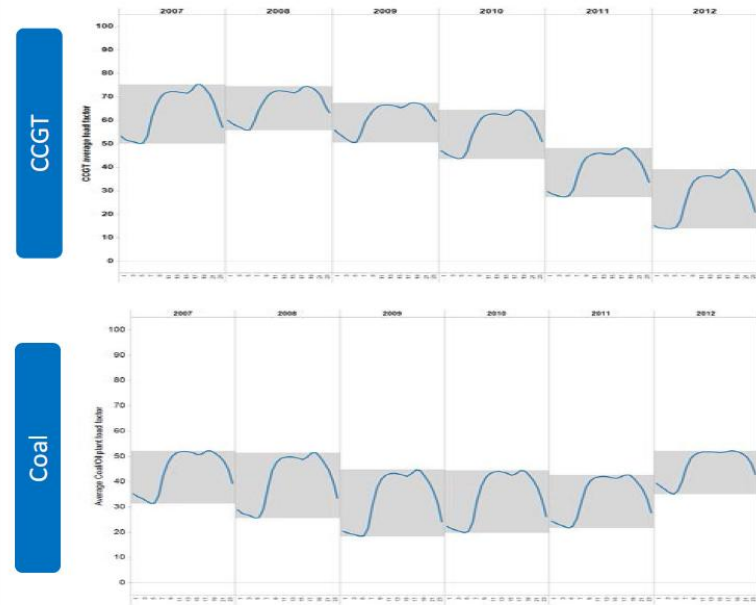
- Wind and solar provide increasing share of energy
- **Business model** for fossil fuels is to **generate power when renewable energy is not available**
- Solution parameters:
  - Operational flexibility
  - Energy efficiency
  - Remuneration based on balancing services
- Dynamic world



- Large scale deployment of solar and wind truncates thermal plants to a narrow operating window
- CCGT load factors are consistently going down, but the day vs. night gap is increasing, causing technology to operate at its most suboptimal conditions, low load and cyclic operation
- System needs SPG – **OFF** at night, **ON** at peaks
- Energy only market does not support investment for balancing power
- EU is striving towards harmonic capacity/flexibility markets to support investment for balancing power

## Plant load factor

CCGT and coal plant hourly average load factor 2007-2012, %



**Energy Infrastructure Package:**  
**Implementation progress and expected outcome**  
Catharina Sikow-Magny  
European Commission, Director General for Energy  
23-24 May, 2013

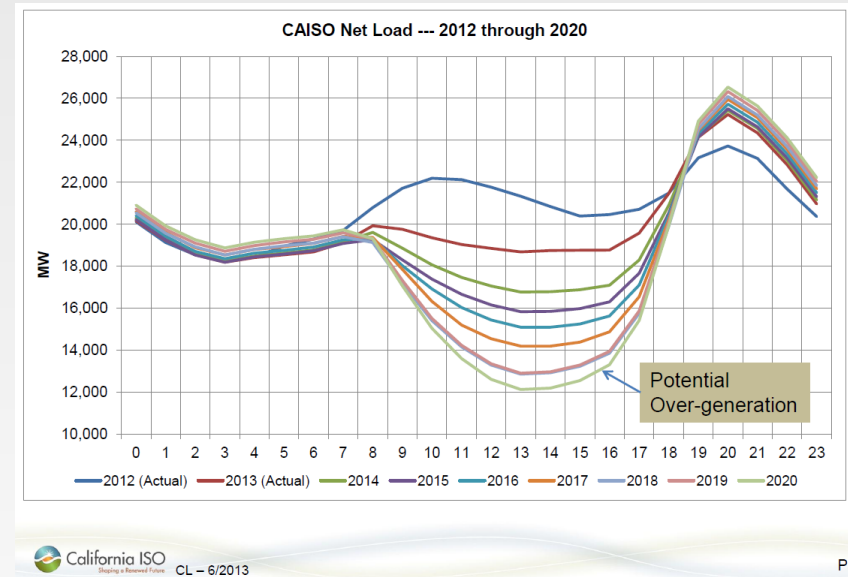
**California:** Solar generation is effectively turning the daily peak to a daily low

Massive up/down ramps expected, up to 14GW in 4 hours in 2020

- Fossil generation more than doubled in 4 hours
- 14GW is the approximate peak load of Finland

Market opportunity is emerging as ISO's are recognizing the value of flexibility

- STEC & Portland projects



**California: Net load patterns changing rapidly due to wind & solar – 2020 expectation is 14GW in 4 hours during non summer months**

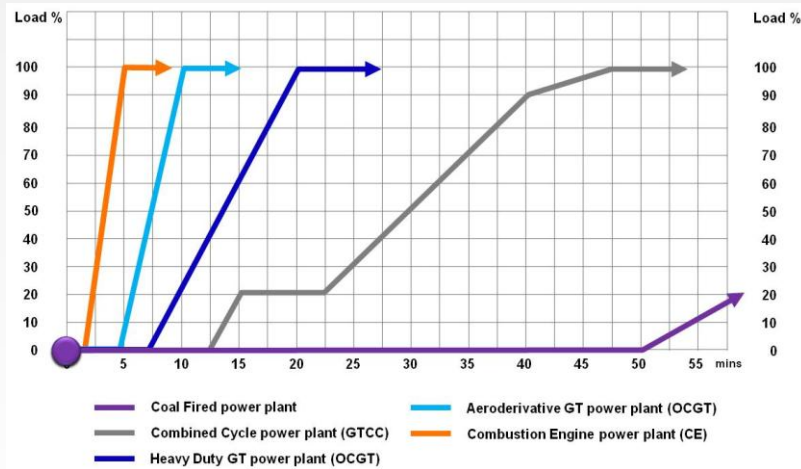
***NET LOAD = LOAD – wind & solar generation***

Source: California ISO, Karl Meeusen

TECHNOLOGY

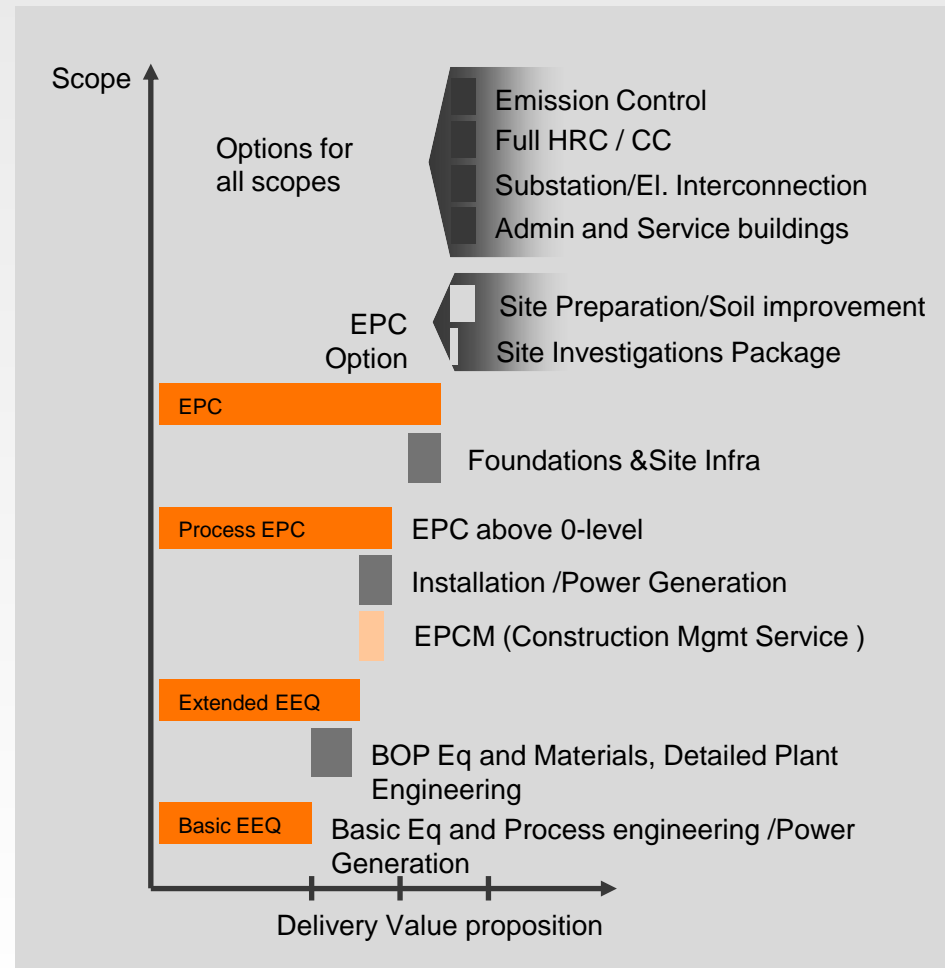
SOLUTIONS

REFERENCES





- Wärtsilä Power Plants has extensive experience in turnkey power solutions since early 90's
- Approximately 25% of the projects are executed on an EPC basis
- The turnkey supplier role provides visibility on the overall economics of investments and the potential challenges that our customers have – key knowledge for solution development



# Quisqueya I&II 430MW, dual-fuel flexicycle



November 2011



February 2012



May 2012



August 2012



November 2012



March 2013

Quisqueya I&II, Dominican Republic 430MW / dual-fuel flexicycle  
Power supply to a gold mine and peaking power to the utility  
Wärtsilä EPC delivery

# Quisqueya I&II 430MW, dual-fuel flexicycle



September 2013



**WÄRTSILÄ**