

# **Distributed Energy:**

## **An energy company perspective**

**W Blair Healy, Manager Cogent Energy**

# Agenda

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- **Who is Cogent Energy?**
- **What is DE (Distributed Energy) & Cogeneration**
- **EU verses Australia for market take-up**
- **What makes DE viable?**
- **DE solution & operation**
- **DE management and control**
- **DE technical considerations**
- **Summary**

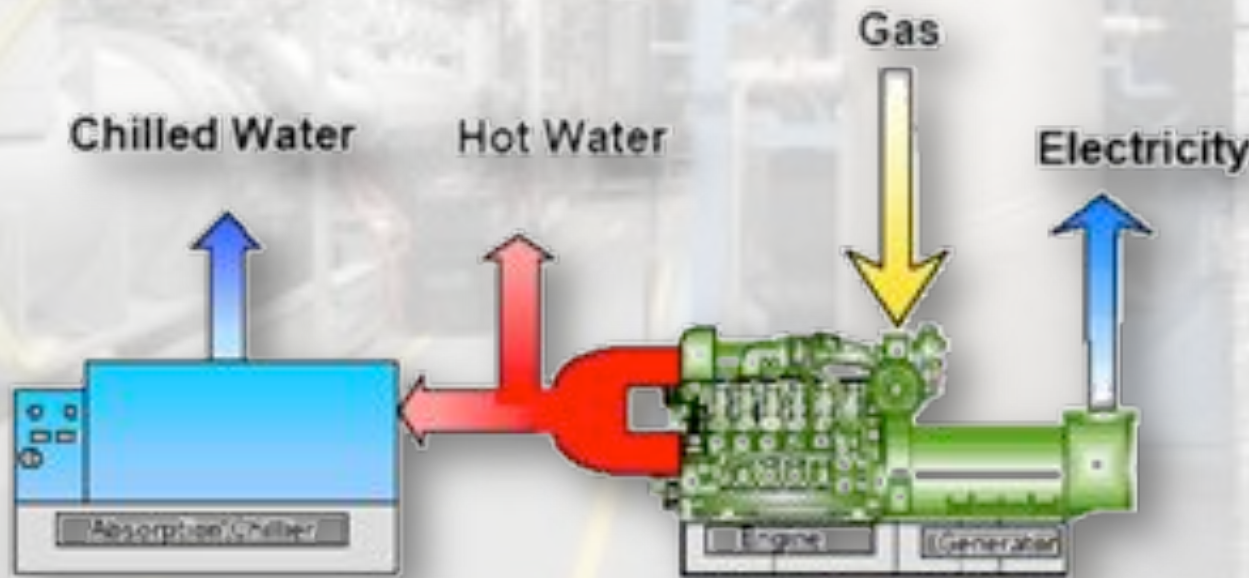
# Who is Cogent Energy?

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- Cogent is a distributed energy company - we build, own & operate cogeneration plants for large sites – commercial buildings, hospitals, shopping centres, government complexes and industry.
- Cogent provides cogeneration plants that integrate into site distribution systems – control, electrical, hot water, chilled water, steam and condenser water.
- Cogent rolling out about 200 MW over next 4-5 years - 1,000,000 tonnes carbon abatement.
- 5 plants in service. Contracts/LOIs for another 4.
- Cogent 100% owned subsidiary of Origin Energy, Australia's largest gas integrated generator retailer.

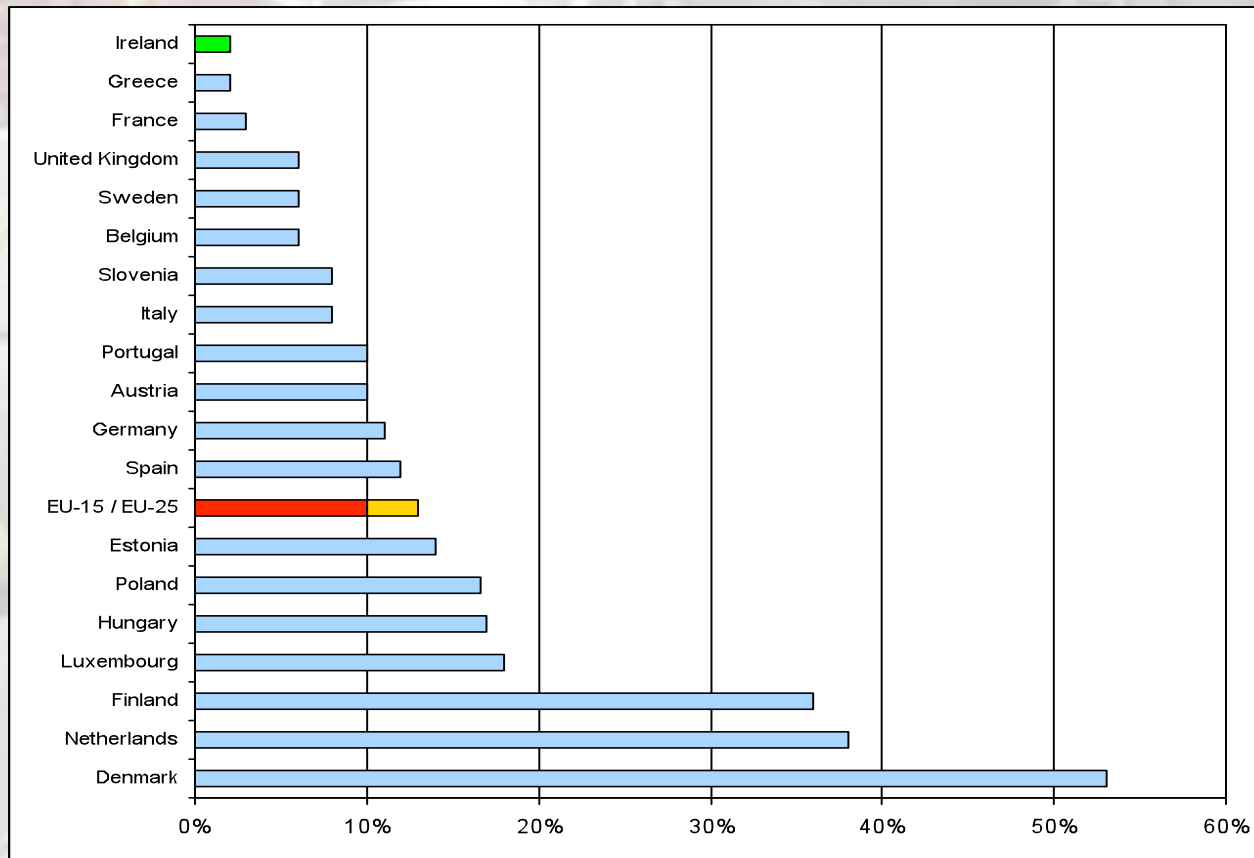
# What is DE and Cogeneration?

- DE (Distributed Energy) also called on-site generation, embedded generation, or decentralized energy, generates electricity from many small energy sources.
- Cogeneration (CHP) is associated with DE and is simultaneous production and use of electricity and heat energy to provide high energy efficiencies ( $> 80\%$ ).
- Trigeneration (CCHP) involves an absorption chiller (electricity, heating & cooling from a single plant).



# DE/Cogeneration in the EU

- **2006 penetration of DE/cogeneration in EU at about 14%**
  - 6% commercial – includes “district heating”
  - 8% industrial
- **DE/cogeneration target for 2010 set at 20%**



# DE/Cogeneration in Australia

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- **2006 penetration of DE/cogeneration in Australia - 4%.**
  - **4.0 % - Industrial**
  - **0.1% - Commercial**
- **Industrial DE/cogeneration in Australia has primarily been developed in the sugar industry – 80%.**
- **Commercial DE/cogeneration restricted to a few commercial buildings and hospitals in Melbourne and Sydney – but this is starting to change!**

## What makes DE viable?

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**DE viability relies on cost containment and achieving economy of scale to ensure:**

- Low plant cost - buying volume of common “plant modules”.
- Low gas cost - buying gas in volume that ensures the lowest cost.
- Low maint & ops cost – central maint & ops for multiple sites.

## DE/Cogeneration Advantages

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- **Competitively priced energy** – can be competitive to grid.
- **Energy efficiency** – up to 80% energy efficient.
- **Carbon abatement** – up to 60% reduction in carbon emissions - improves Green Star & NABERs energy ratings by up to 2 stars
- **Emergency back-up** – can be configured to displace back-up diesels.
- **Energy security** – many distributed sites provide security of energy supply.

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- The diagram illustrates the energy flows and control systems within a Cogeneration Plant Room. Key components and connections include:
- Cogeneration Plant Room:** The central area containing the **Gas engine & generator**, **Absorption Chiller**, **Switch Gear**, and **Control Equipment**.
  - Water Flows:**
    - Chilled Water:** Represented by a blue arrow flowing from the Absorption Chiller to the **Site Chilled Water** storage tank.
    - Hot Water:** Represented by a red arrow flowing from the Gas engine & generator to the **Site Hot Water** storage tank.
  - Electrical System:**
    - Electricity:** Flows from the **Gas engine & generator** through the **Switch Gear** to the **Main Switch Boards** and then to the **Site Electrical Distribution System**.
    - Grid Sub Station:** Provides external electricity to the plant via a thick black line.
  - Control and Monitoring:**
    - Control Equipment:** Manages the plant's operations, receiving input from the **Grid** (represented by power lines and towers).
    - Remote Control & Billing Centre:** Shown as a person at a computer, connected to the plant via a yellow lightning bolt (communication link).
  - Metering Equipment:** Three circular meters (labeled 'M') are positioned along the main vertical lines for water and electricity to monitor usage.

# Access & Spatial Requirements

- Ideally located in plant room near HVAC plant and main switch boards.
  - Containerised rooftop / external solution also available.
- Plant room will require ventilation, noise attenuation & exhaust extraction
- Ceiling height of 4.5m usually required

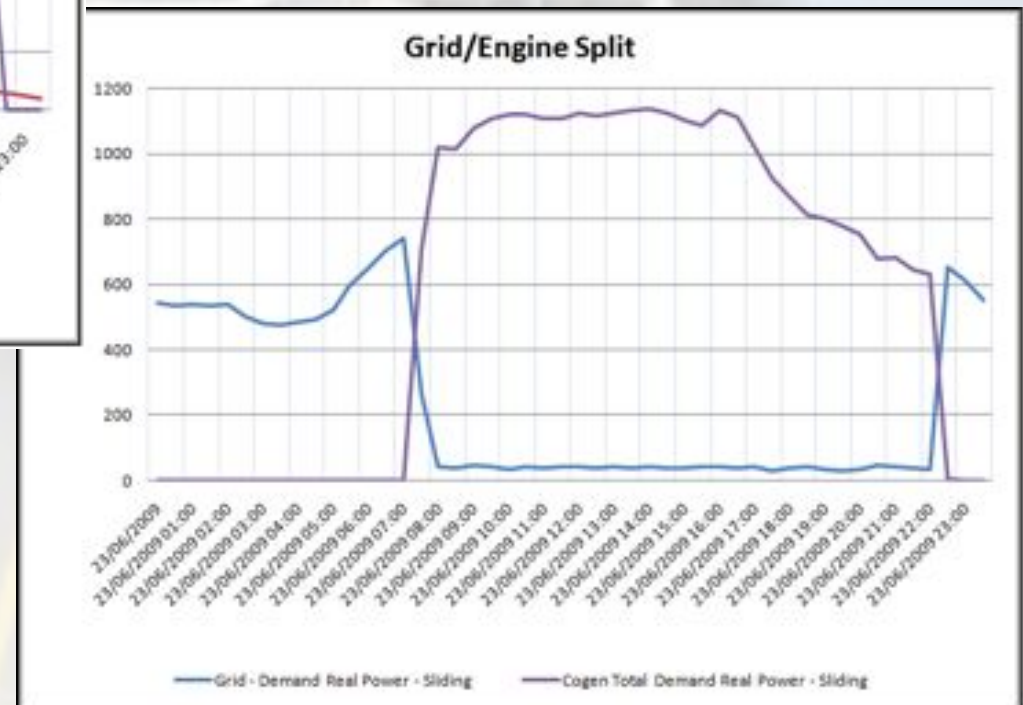
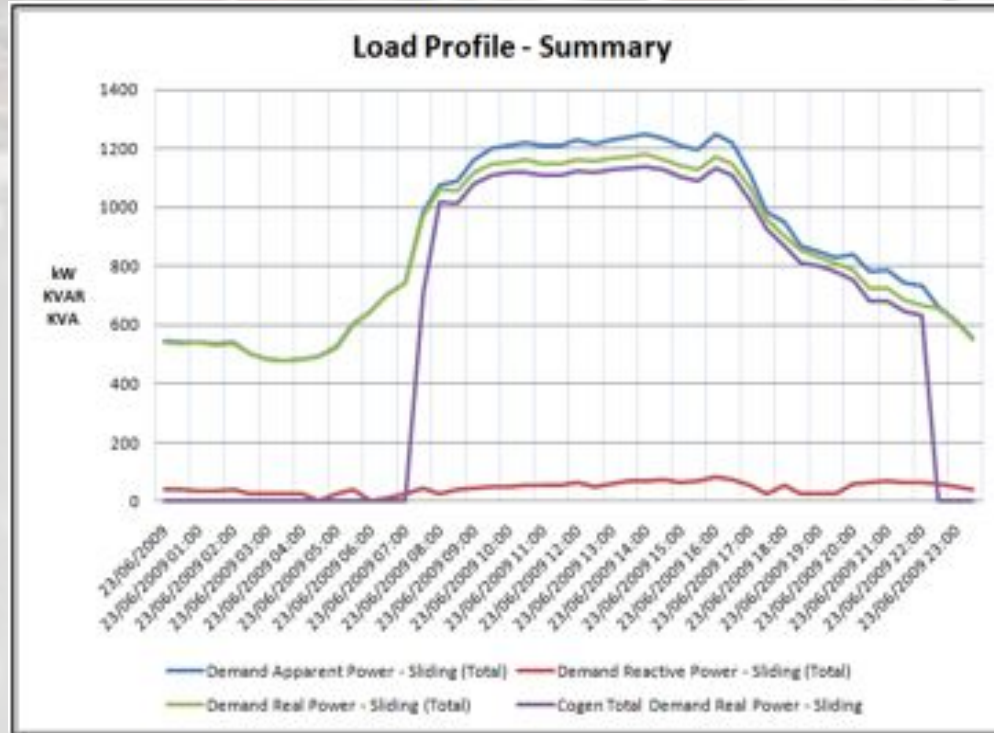


Plant Room Solution

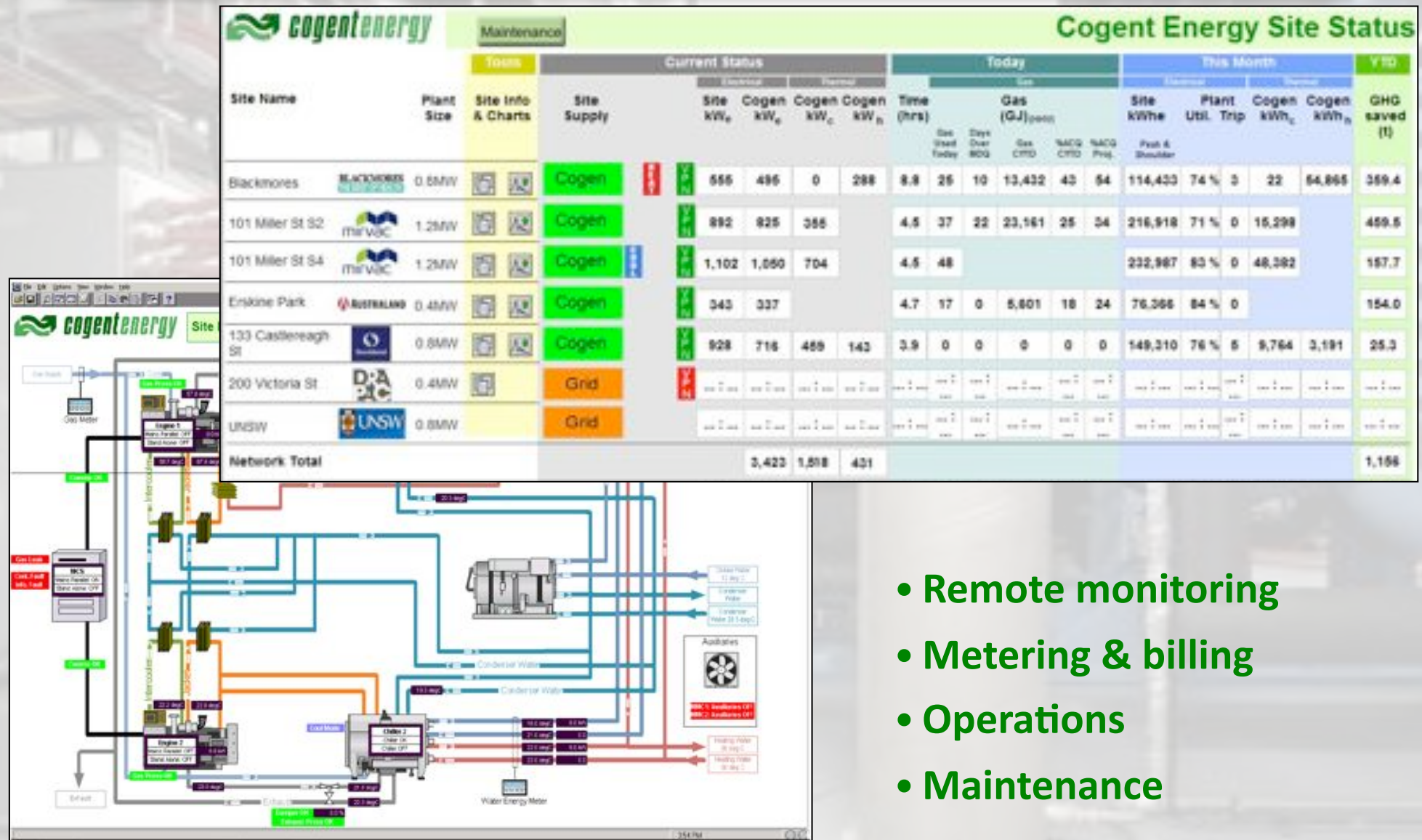


External / Rooftop Solution

# Peak/Shoulder Operation Profile



# Remote Management



- Remote monitoring
- Metering & billing
- Operations
- Maintenance

# Technical Considerations

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- **Control Considerations**

- Integrated control
- Parallel import/export operation
- Load shedding/build-up for island mode operation
- Plant room auxiliaries

- **Grid Considerations**

- grid protection
- grid synchronization
- grid fault current – biggest issue today!

- **Emergency Back-up Considerations**

- Gas engines don't have same load capability as diesel engines
- Main switch boards & BMS will need to be set-up for load build-up & shedding

## Summary

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- Cogent is DE company that provides electricity, hot & chilled water to a BOO (Build, Own & Operate) scheme.
- Australia has very low penetration of DE compared to EU even though conditions seem promising.
- Advantages of DE include energy efficiency, cost of energy and up to 60% reduction in carbon emissions
- Successful DE relies on economy of scale in terms of plant purchase, gas purchase and cost of operations & maintenance.
- Opportunity for DE changing in Australia due to CPRS/ETS and concerns about climate change.