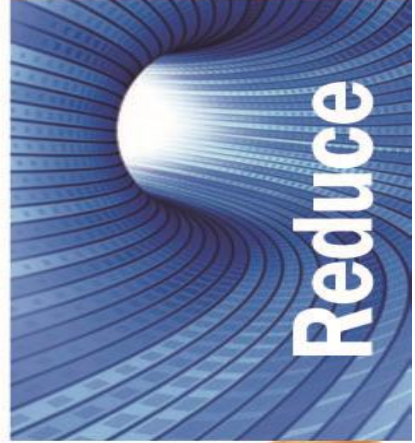
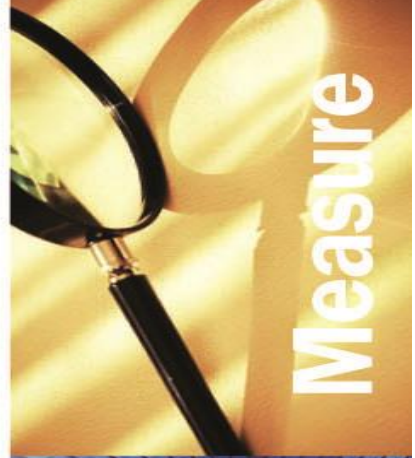


Manufacturing Gas Efficiency

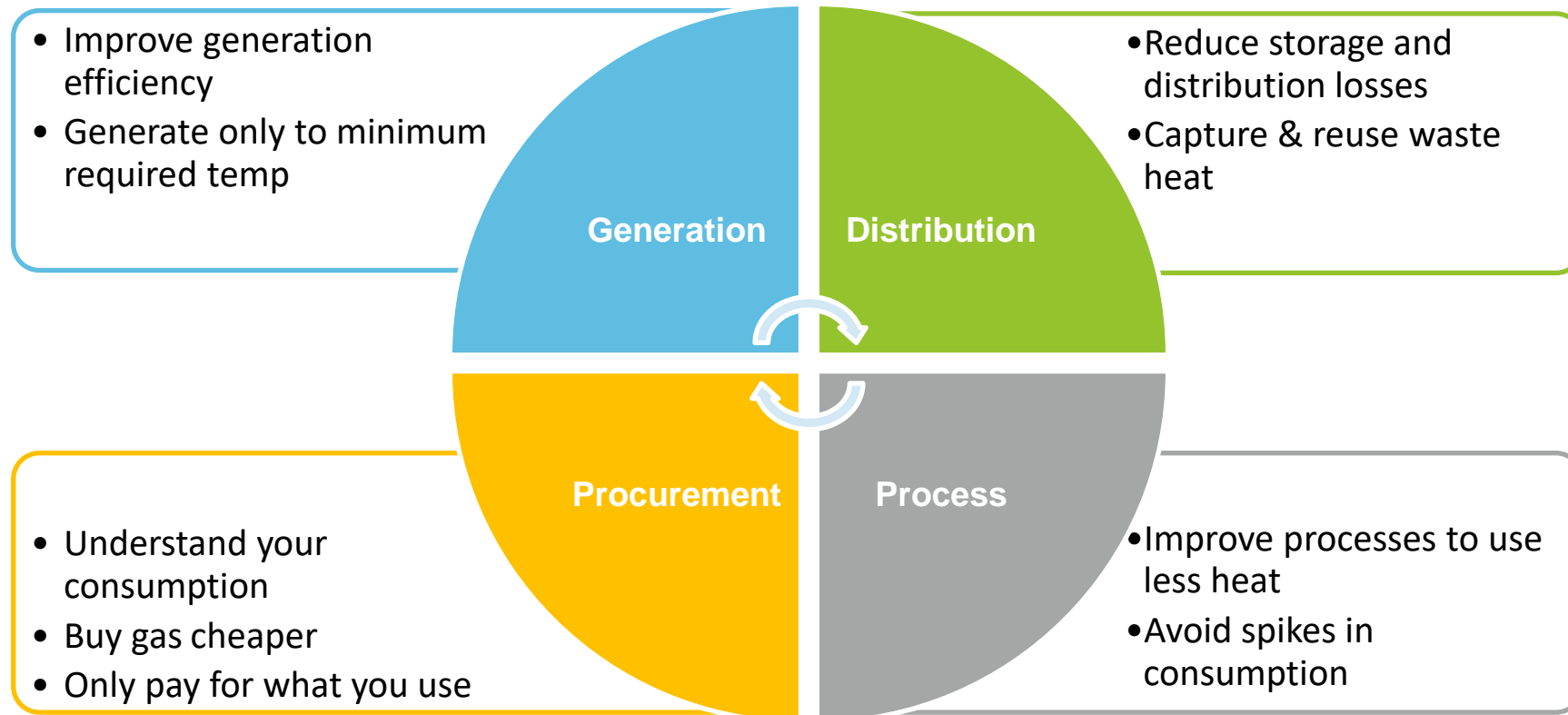


Michael Wiener
General Manager
Out Performers

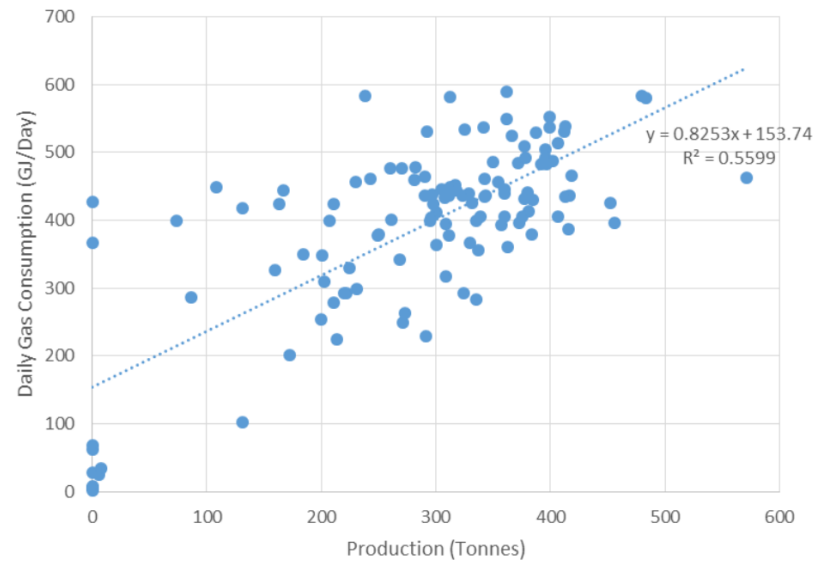




Options to Reduce Gas Costs



Data is Critical: Whole-of-Site Gas Analysis



Data is Critical: Sub-System Analysis



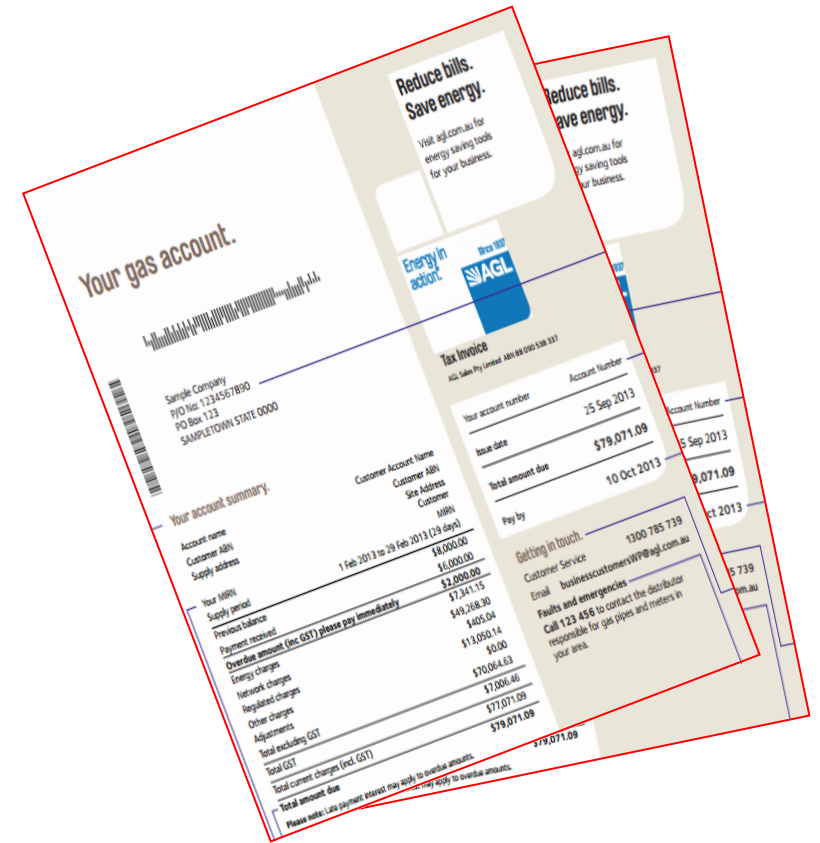
Good Gas Data Plus Effective Analysis



Gas Procurement – Size Matters

- **Small users (Volume Customers < 10TJ/yr)**
 - *Fixed tariffs, no commitments, no penalties*
 - *Shop-around for best price, then improve efficiency*

- **Large users (Demand Customers > 10TJ/yr)**
 - *Lengthy, complex contracts*
 - *Must commit to binding annual, daily and hourly gas volumes (ACQ, MAQ, MDQ, MHQ etc)*
 - *Take-or-Pay and Overrun charges*
 - *Different for each retailer and each network operator*
 - *Contract negotiation requires good data and analysis*
 - *Gas bills are confusing and vary between retailers*
 - *Requires Active Contract Management*



Active Contract Management

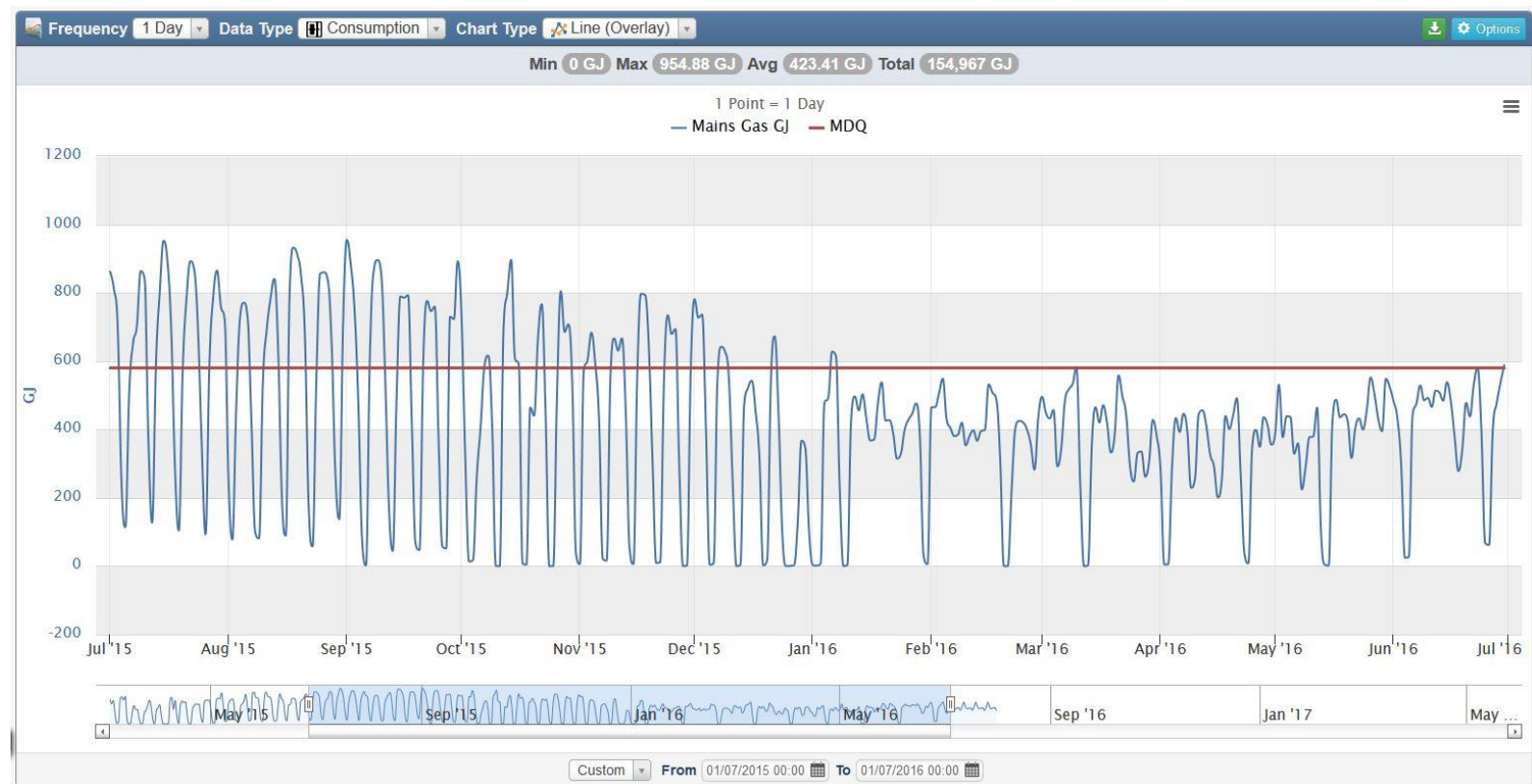
- Not just a job for Procurement / Finance / Legal

- Gas bills are influenced by:

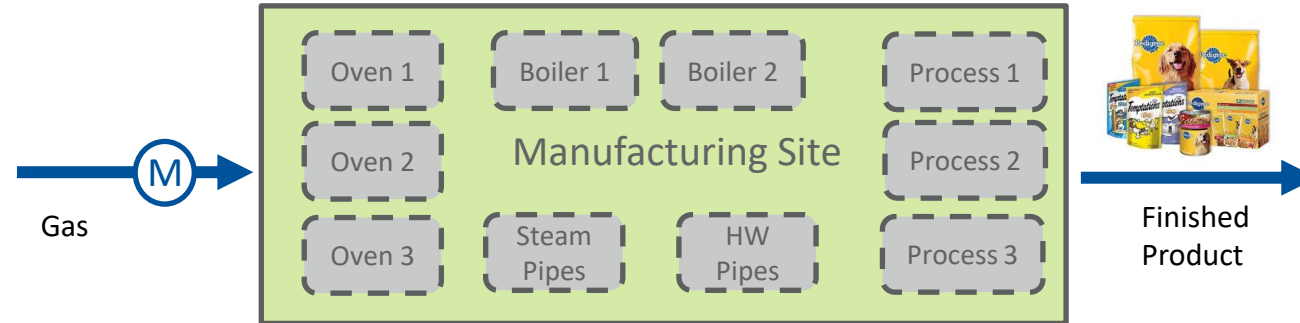
- Procurement, Finance, Legal
- Engineering
- Maintenance
- Operations
- External support

- Team of stakeholders need:

- Training and engagement
- Data
- Data
- Data
- Systems and/or external support to help analyse and optimise



Typical Manufacturing Opportunities



Steam Generation

- Boiler tuning
- O2 Trim
- TDS control
- Blowdown Heat Recovery
- Tank lagging
- Boiler controls
- Boiler sequencing

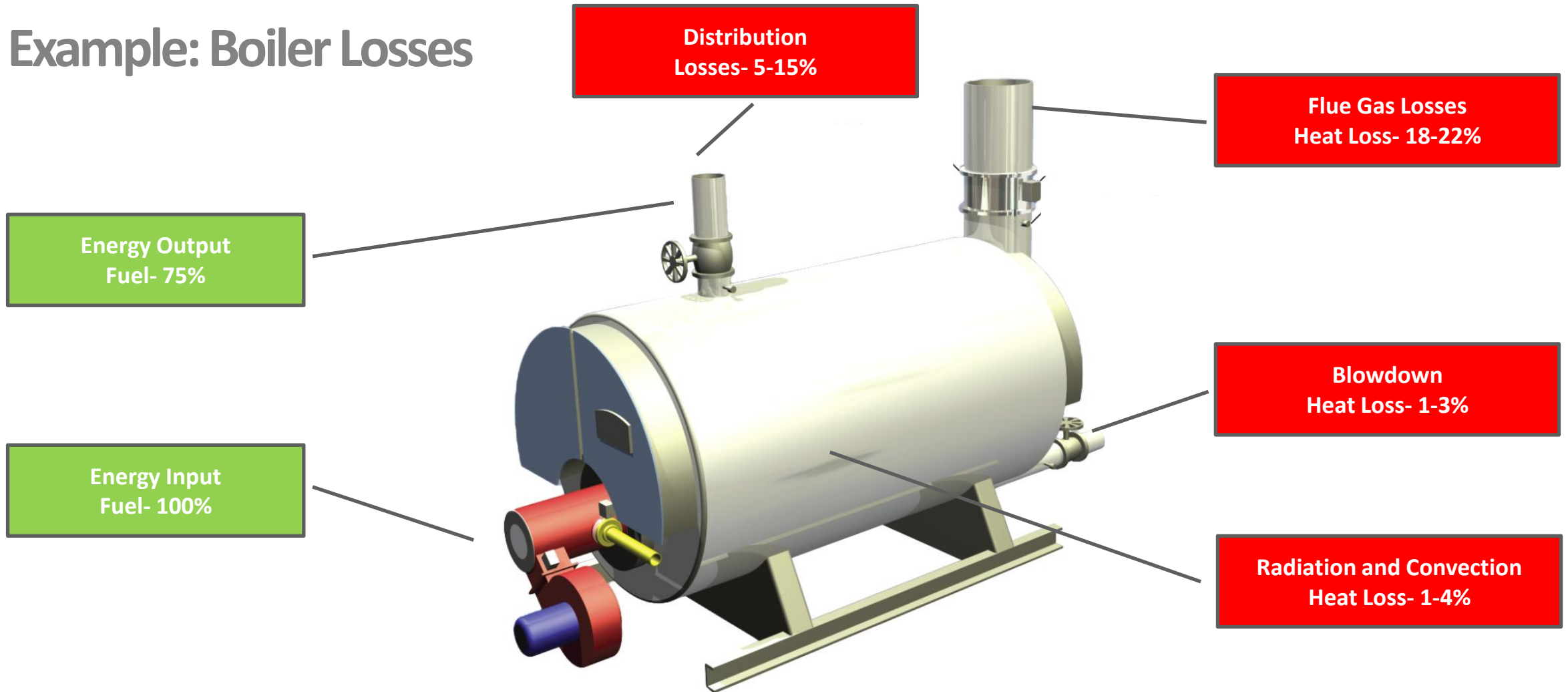
Reticulation + Usage

- Lagging
- Steam traps + leaks
- Condensate Return
- Secondary Heat Recovery
- HW Temperature
- Optimised Cleaning (temp vs chemicals)

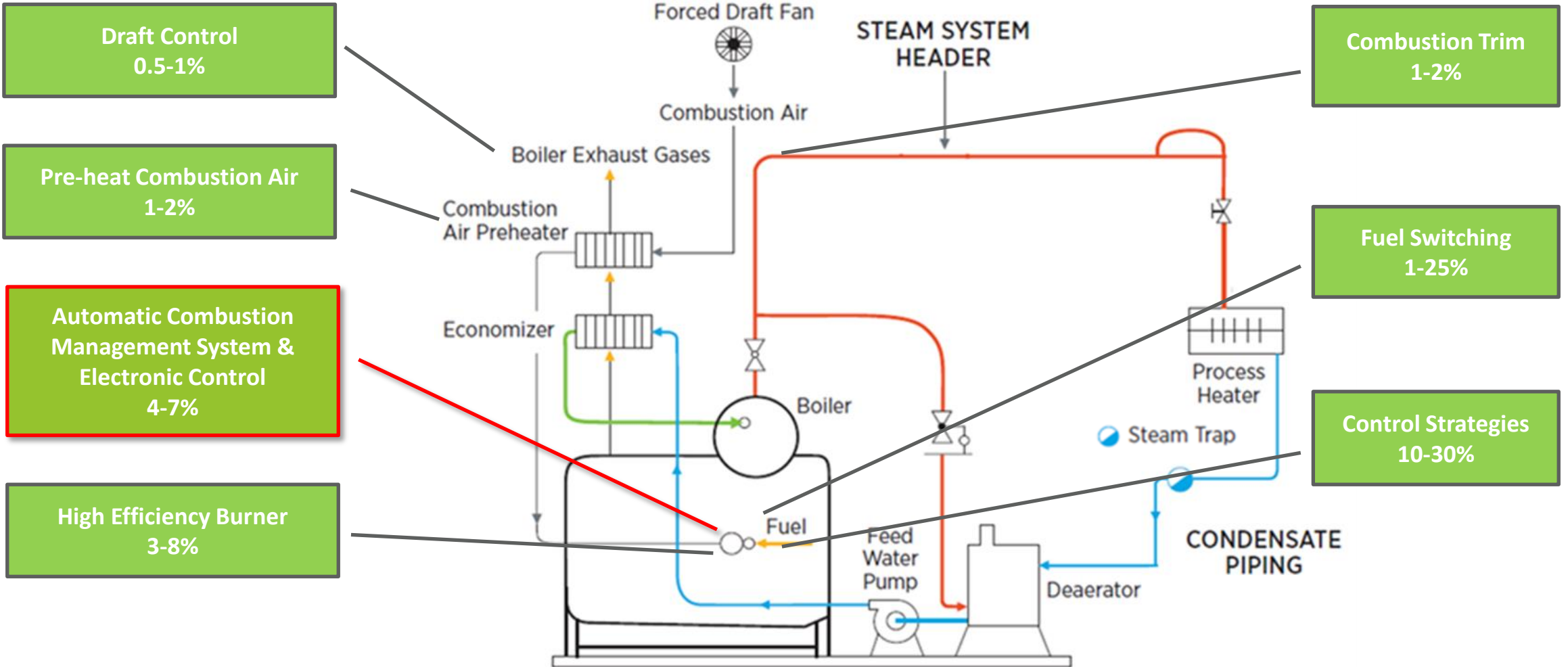
Appliances / Demand

- Usage Efficiency
- Optimise Process
- Heat recovery
- Oven balancing
- Fuel switching
- Local HW generation

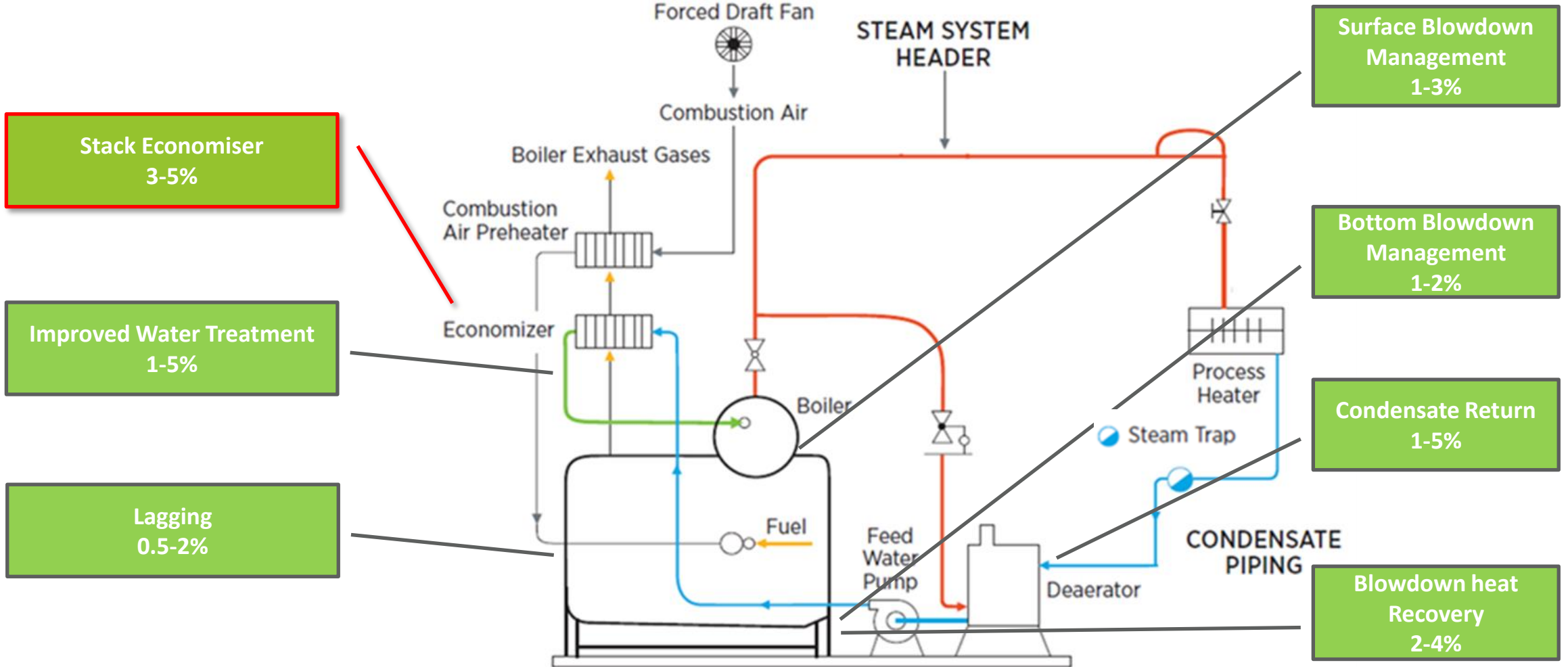
Example: Boiler Losses



Example: Boiler Optimisation Techniques (1)



Example: Boiler Optimisation Techniques (2)



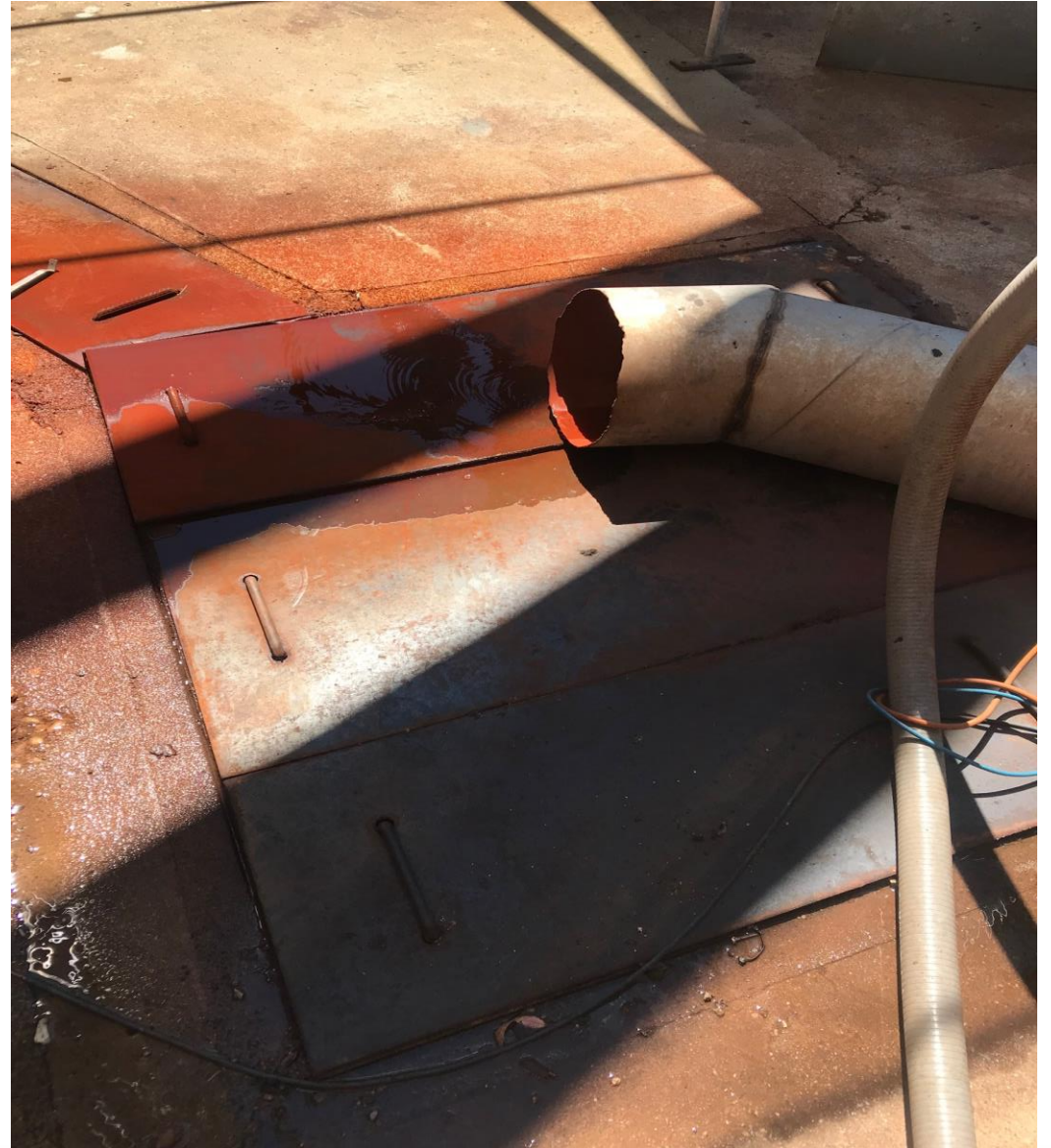
Financial Viability of Gas Efficiency Projects

Typical Payback Class *	Opportunities
Under 12 months “Good Housekeeping”	<ul style="list-style-type: none"> ▪ Boiler tuning and Oven Balancing ▪ Blowdown limits and controls ▪ Steam trap maintenance ▪ Lagging ▪ Monitoring and targeting program (get utility interval data, establish site baseline)
1 to 3 years	<ul style="list-style-type: none"> ▪ Gas and steam sub-metering ▪ Energy data managing system <u>with support</u> ▪ Combustion Management System (“O2 Trim etc”) ▪ Stack Economiser ▪ Blowdown Heat Recovery ▪ Condensate return
3 to 5+ years	<ul style="list-style-type: none"> ▪ Burner and boiler upgrades ▪ Fuel switching ▪ Process optimisation

* Based on typical projects in manufacturing sites, with variable gas tariffs of \$10/GJ,

Gas Efficiency Project Example- Abattoir and Rendering Plant

Description	<ul style="list-style-type: none"> Flash steam recovery Improved condensate return Boiler set point optimisation Blowdown heat recovery Automated temperature controls Lagging on steam and condensate return Decommissioning of 1 of 3 boilers Further work to come
Gas Savings	<ul style="list-style-type: none"> 26,082 GJ per year (23.2% reduction) \$448,610 per year (\$17.20/GJ) Other savings through reduced water consumption and chemical dosing
Total Project Cost	\$443,000 (incl \$45,000 for metering)
Simple Payback	<ul style="list-style-type: none"> <1year Project also received support through the NSW OEH Gas Efficiency Program

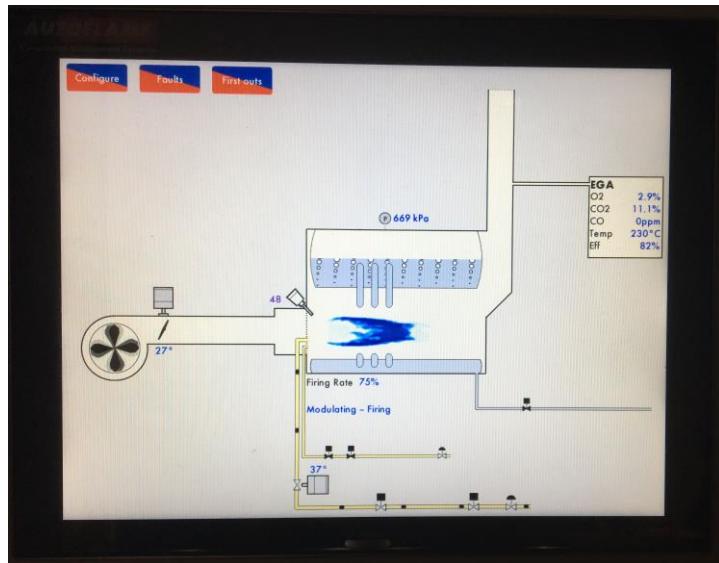


Gas Efficiency Project Example- Building Products Manufacturer

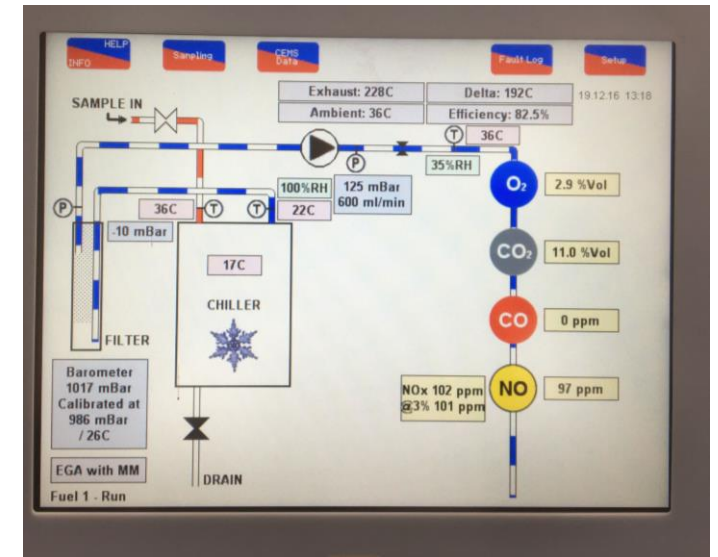
Description	Upgrade 8MW steam boiler to include full sub-metering (gas, water, steam); Autoflame fuel/air ratio controller, multi parameter combustion trim and Danfoss variable speed drive
Gas Savings	6,984 GJ per year (8.45% reduction) \$99,452 per year (\$14.24/GJ)
Total Project Cost	\$108,000 (incl \$24,000 for metering)
Simple Payback	1.1 years



- **Fuel/Air Ratio Controller-** with integrated burner management system, steam pressure PID control and direct drive servomotors
- Complete removal of mechanical linkages, cams and jackshafts



- **Combustion Trim-** O₂, CO₂, CO, ambient temperature and pressure; including CO₂ trending, emissions reporting and CEMS (continuous emissions monitoring software)



Why Energy Efficiency Projects Fail

Study of 117 large industrial site energy efficiency projects...

79% of projects didn't meet objectives – some didn't save any energy at all, for many projects savings are not known.

- Energy baseline not established
- Projects identified by poor quality audits
- Accurate business case not developed
- No independent assessment - OEM/Supplier driven
- Purchasing decision did not consider life cycle costing.
- No verification of outcomes conducted
- Sub contractor used “similar” agency product instead of that specified
- No consideration of operational risks
- Equipment not commissioned correctly
- Smarts not purchased
- No ongoing monitoring – savings disappeared