

National Guidelines for Emissions from Boilers

Manfred Klein
Electricity and Industrial Combustion Branch
Environment Canada

819-953-6630

Outline

- CCME Boiler Emission Guideline
- Possible future initiatives resulting from:
 - Canada-Wide Standards for PM & Ozone
 - Canada-U.S. Ozone Annex
- Background on opportunities for Combined Heat and Power (CHP)

Air Emissions

(Smog, Acid Rain, Climate Change, Toxics)

GHGs

- Carbon Dioxide CO₂
- Methane CH₄
- Nitrous Oxide N₂O
- SF₆ et al

Ozone Depletion

- CFCs

Air Pollution

- Sulphur Dioxide SO₂
- Nitrogen Oxides NO₂
- Volatile Organics VOC
- Fine Particulate PM
- Mercury & Heavy Metals
- Ammonia

CCME National Guidelines

Canadian Council of Ministers of the Environment

CCME - Federal/Provincial committees and
Environment Ministers

- *NOx/VOC Management Plan -1990*
- *Environmental Harmonization Accord*
- *Canada Wide Standards for PM & Ozone*
- *Canada-US Air Quality Agreement*
- ***Multi-Pollutant Emission Reduction Strategy***
- *Climate Change Action Plans*

Boiler Emission Guideline

- CCME National Emission Guideline for Commercial/Industrial Boilers & Heaters
- Provinces adopting CCME Guideline
 - eg. Ontario announcement March 20, 2001
- WGBE - Environment Canada to draft CEPA Guideline based on CCME Guideline

CCME National Emission Guideline for Boilers

- Published March 1998
- Effective March 2000
- New and Modified Boilers > 10.5 GJ/hr
- Applicable only to primary fuel

Emission Reduction Methods

- Back End Controls
- New Combustion Processes
- Cleaner Fuels & Efficiency
- Energy Conservation

*Pollution Prevention is a
combination of last 3 items*

CCME National Emission Guideline for Boilers

Capacity (GJ/hr)	Reference NOx Emission Limit (g/GJ)			
	Gaseous Fuel	Distillate Oil	Residual Oil <0.35% Nitrogen	Residual Oil >0.35% Nitrogen
10.5 - 105	26	40	90	110
> 105	40	50	90	125

CCME National Emission Guideline for Boilers

ENERGY EFFICIENCY CREDITS

$$\frac{\text{Applied NOx Efficiency}}{\text{Emission Limit}} = \frac{\text{Reference NOx}}{\text{Emission Limit}} \times \text{Energy Credit}$$

Where:

$$\text{Energy Efficiency Credit} = \frac{\text{Actual Thermal Efficiency}}{\text{Reference Thermal Efficiency}^*}$$

* = 83% for HFO firing

Emissions Monitoring

<u>Capacity (GJ/hr)</u>	<u>Verification Requirement</u>
10.5 - 105	Initial test at commission
105 - 264	Initial test + annual test
> 264	Continuous verification

Reporting: Test data subject to random audit

CWS for PM & Ozone

- Ambient air quality standards endorsed by CCME Ministers June 2000
- CWS PM_{2.5} = 30 ug/m³, 24 hr average
- CWS Ozone = 65 ppb, 8 hr average
- All jurisdictions (federal and provincial) committed to meeting CWS by 2010

CWS for PM & Ozone - Joint Initial Actions

Develop national multi-pollutant emission reduction strategies (MERS) initially for:

- Pulp & Paper
- Lumber and Allied Wood Products
- Electric Power
- Iron & Steel
- Base Metals Smelting
- Concrete Batch Mix & Asphalt Mix Plants

Canada - U.S. Ozone Annex

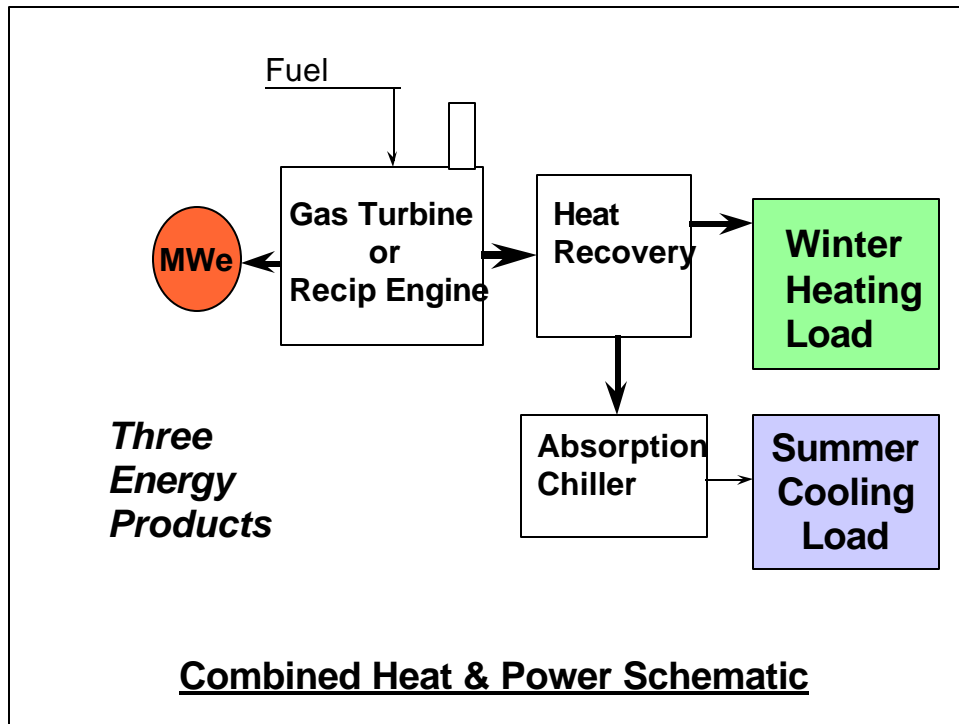
- Commitment to implement CWS Joint Initial Actions MERS measures:

“These measures shall address, inter alia, NOx emissions from new, modified and existing industrial and commercial boilers”

Potential Federal Actions for Industrial Combustion

Assist jurisdictions on industrial combustion measures for MERS (and other) sectors:

- implementation of new source guidelines
- P2 plans, emission guidelines, economic instruments etc. for existing sources
- project feasibility studies for CHP
- national guideline for emission monitoring
- courses/seminars on emission reduction opportunities



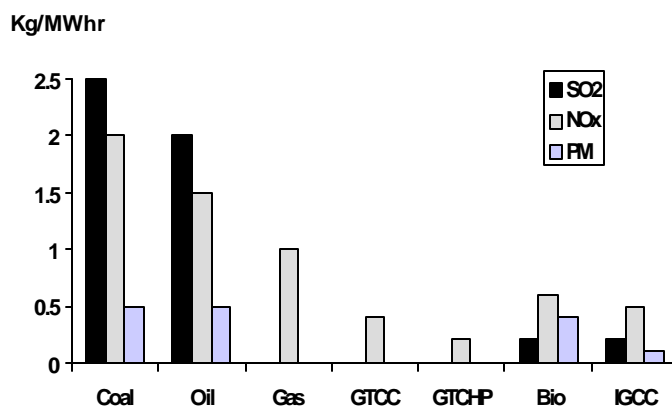
Quality of Energy

- Electricity & Shaft Power
 - Industrial Process Heat
 - Cooling
 - High Pressure Steam
 - Hot Water
 - Space Heating
- High
 ↓
 Low
- **All of these can be made with same fuel**
 - **Need to Use Energy at Best Level**
 - **Env. Standards could Encourage this**

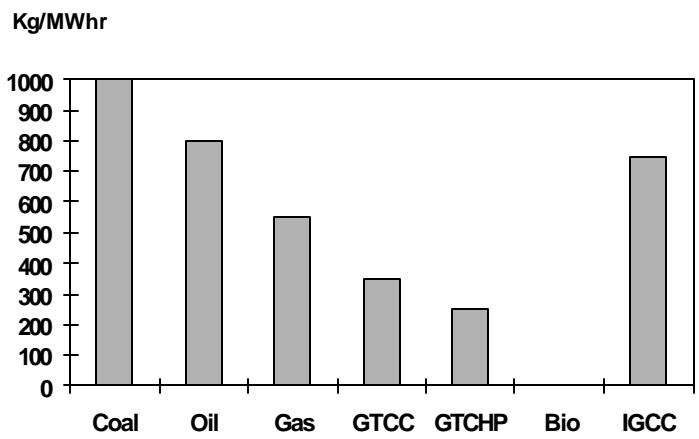
Benefits of CHP Systems

- Energy Conservation and Security
- Maintaining Energy \$\$ in Communities
- Energy Diversity and Reliability
- Reduces Transmission Losses
- More Building Space Available
- Lower GHGs, Air Pollution, CFCs

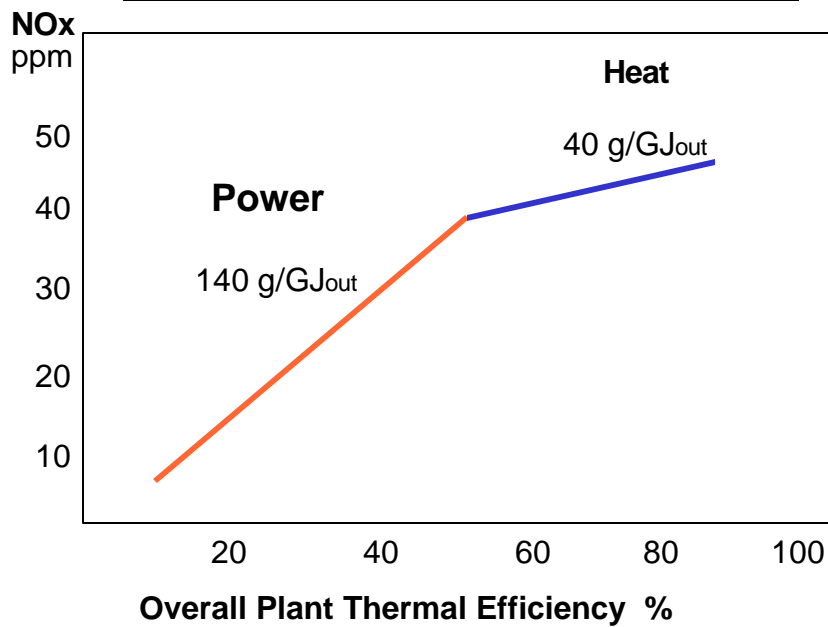
Comparison of Air Pollution Emissions from Various New Energy Generating Plants



Comparison of CO₂ Emissions from Various Power Generation Plants



CCME 1992 Gas Turbine Emission Guideline



Descriptions of Institutional Gas Turbine Cogeneration Plants

- TransAlta Ottawa 68 MWe 1992
- University of Windsor 4 MWe 1993
- University of Toronto 6 MWe 1994
- Trigen London 3 MWe 1997
- York U. Toronto 5 MWe 1997
- NRCC Ottawa 4 Mwe 1994
- SAIT Calgary 3 MWe 1999

Institutional Recip Engine CHP Plants

- | | <u>MWe</u> | |
|----------------------------|------------|------|
| • University of Ottawa | 0.5 | 1988 |
| • Olympium, Etobicoke | 0.25 | 1991 |
| • Brock University | 6.3 | 1994 |
| • Cornwall District Energy | 5 | 1995 |
| • EC WWTC, Burlington | 0.8 | 1995 |
| • Ft MacPherson | 2 | 1997 |
| • Ottawa Water Treatment | 2.4 | 1999 |
| • St. Catherines Hospital | 2.5 | 1999 |
| • City of Sudbury | 5 | 2000 |
| • Markham | 3.3 | 2002 |

CHP in Federal Gov't Facilities

Recip Engines

Env Can. CCIW

- Burlington 0.8 MWe

Correctional Services

- Warkworth 0.6 MWe

Gas Turbines

Nat'l Research Council

- Ottawa, 4 MWe

National Defence

- Valcartier 3 MWe
- Petawawa 3 MWe

Health Canada

- Toronto
microturbine

Conclusion

- CCME emission guideline is being adopted by some provinces and federal facilities for new & modified boilers
- *CWS, Ozone Annex and Climate Change Plan* require action on existing industrial/commercial combustion sources
- There will be opportunities for emission reduction projects relating to commercial boiler facilities, including potential for CHP