

Bridging the Gap between Pilots and Commercial Deployment

IEF/GCCSI Symposium on CCS

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POWER

ALSTOM

The Alstom Group

A worldwide leader in its activities



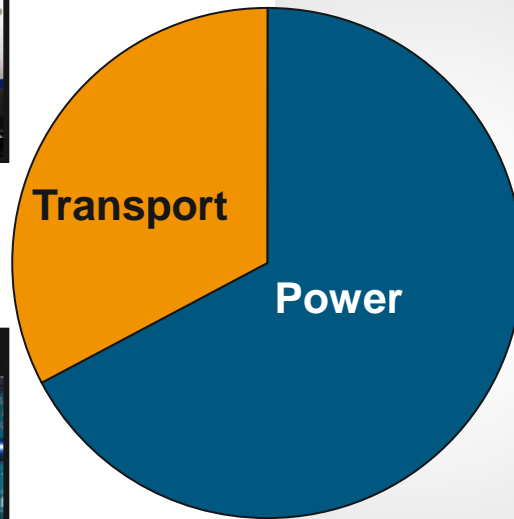
Total orders 2008/09:
€ 24.6 bn



N°1 in high speed and very high speed trains



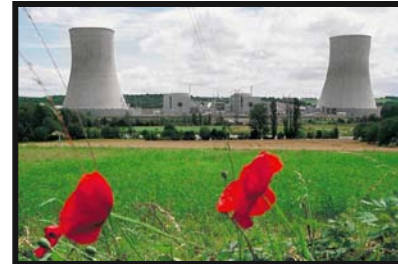
N°1 in urban transport (metros and trams)



N°1 in hydro power



N°1 in integrated power plants



N°1 in conventional nuclear power island



Recent acquisition of wind power



N°1 in air quality control systems



N°1 in services for electric utilities

Alstom activity on 11 major demonstrations



Operating



Vattenfall Schwarze Pumpe
Germany - 30 MWth
Oxy - Lignite



AEP Mountaineer
USA - 58 MWth
Chilled Ammonia - Coal



EoN Karlshamn
Sweden - 5 MWth
Chilled Ammonia - Fuel



Total Lacq
France - 30 MWth
Oxy - Gas



Dow Chemical Co.
USA, West Virginia
Advanced Amines - Coal



Alstom BSF Windsor
US - 15 MWth
Oxy - Coals

Coming



PGE Belchatow
Poland - 260 MWe
Adv. Amines - Lignite



Vattenfall Jämschwalde
Germany - 250 MWe
Oxy - Lignite



Statoil Mongstad
Norway - 40 MWth
Chilled Ammonia - Gas



Transalta
Canada - >200 MWe
Chilled Ammonia - Coal



AEP Mountaineer
USA - 235 MWe
Chilled Ammonia - Coal

Main Partnerships & Projects Portfolio



Advanced Amines	Joint development programme West Virginia Pilot (USA) - Coal			ALSTOM
	Belchatow (Poland) – Lignite	>250 MWe		ALSTOM
Chilled Ammonia	Pleasant Prairie (US) – Coal	5 MWt		ALSTOM
	Karlshamm (Sweden) – Oil/Gas	5 MWt		ALSTOM
	Montainer (US) – Coal	58 MWt		ALSTOM
	Mongstad (Norway) – Gas	40 MWt		ALSTOM
	Mountaineer (US) – Coal	235 MWe		ALSTOM
	TransAlta (Canada) – Coal	200 MWe		ALSTOM
Oxy-combustion	Schwarze Pumpe (Germany) – Lignite	30 MWt		ALSTOM
	Lacq (France) – Gas	30 MWt		ALSTOM
	Alstom Boiler Simulation Facility Windsor (US) – Coals	15 MWt		ALSTOM
	Jänschwalde (Germany) – Lignite	250 Mwe (Feasibility study)		ALSTOM

6 Pilots in commissioning/operation

Tests completed

- Post-combustion and oxy-combustion work effectively: 90% capture and 99% purity rates
- Operator's commitment to coal in generation portfolio
- Importance of public acceptance: Schwarze Pumpe
- Public funding crucial: Transalta, Mountaineer, Belchatow
- Need for early clarity on transport and storage solutions
- Need for legal framework for storage

- Bridging the cost gap: public funding
- Incentivising investments
- Legal framework, including for CCS-ready
- Transport and storage infrastructure
- Public acceptance

- Costs will come down with:
 - learning rate: capex down 12% when capacity doubles
 - reduced energy loss
 - economies of scale
 - common transport and storage infrastructure
- €35-50 / mt CO2 by 2020 is realistic
- AQS precedent: capex/opex fell 30% in first 5 years

- EU Zero Emissions Platform
- EU Funding Mechanisms
- UK Competitions and CCS Levy
- European Industrial Initiative
- CIUDEN / Compostilla in Spain: pilot + demo combined

- Public funding = obligation to share knowledge
 - ✓ Cost data
 - ✓ Performance and process data
 - ✗ Data which would allow reverse engineering
 - ✗ Background IP
- Commercialisation plan (in EU)

Clean Power Today !

Today we provide the cleanest air solutions

- for new plants
- for the installed base

