IRP 2010 – Public Hearings

Alstom Power – Comments and Responses

Mark Boneham

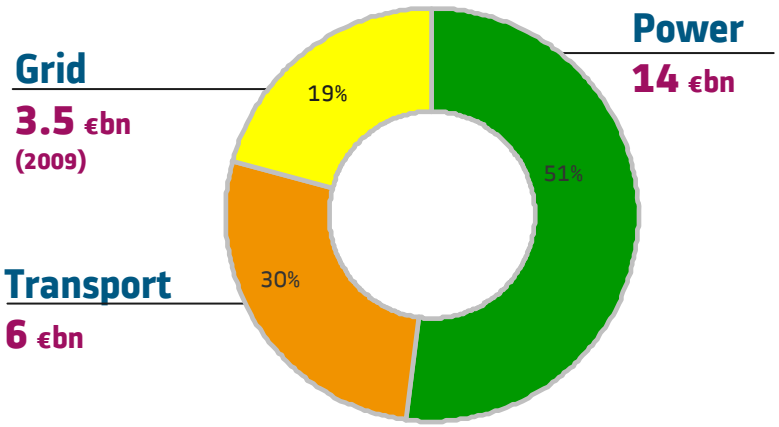
Midrand, 2 December 2010

POWER | ALSTOM

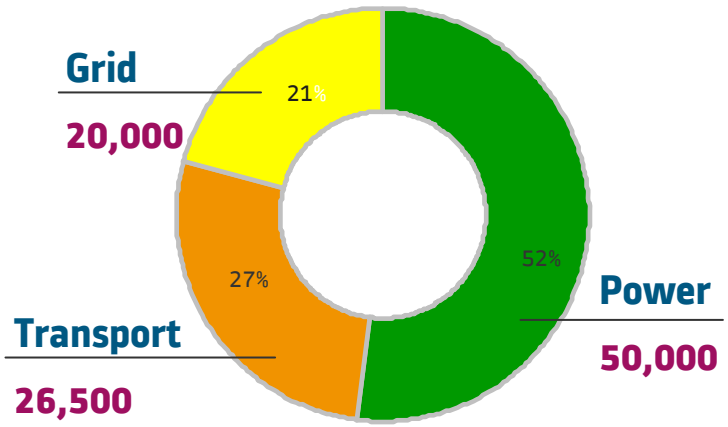
Agenda

- Our Group: A major industry player
- IRP 2010: Energy Mix

Alstom Group: Three sectors



Sales by Sector (proforma figures)



Employees by Sector

Source: Alstom 2008/09

Rail transport infrastructure

Supplier of 1 metro/tram in each 4

Power generation infrastructure

Major supplier in 25% of worldwide installed base

Power transmission infrastructure

Leadership in key markets and fast-growing technologies

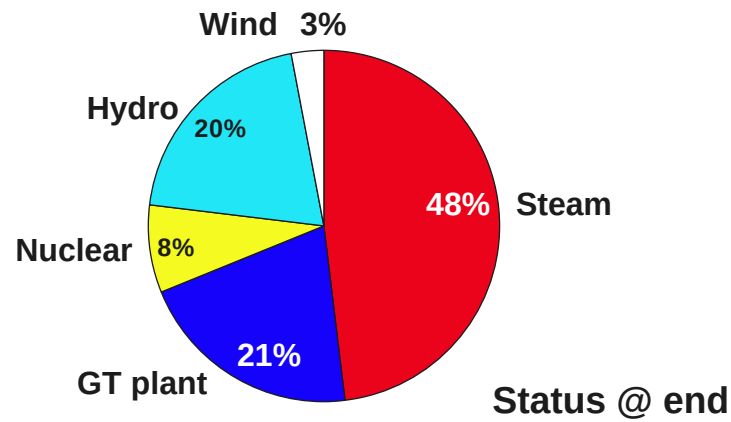
Agenda

Our Group: A major industry player

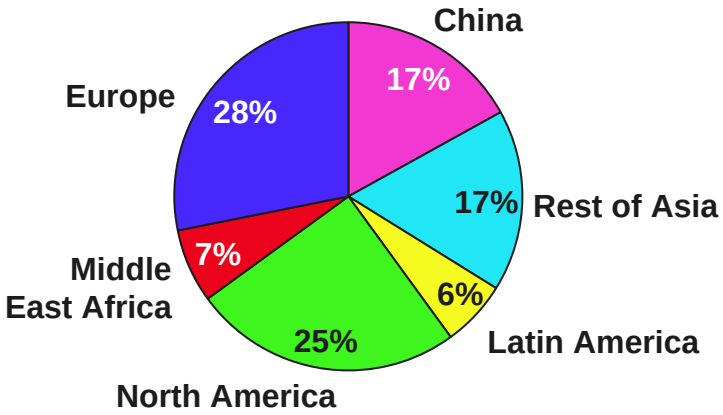
IRP 2010: Energy Mix

Installed base per technology

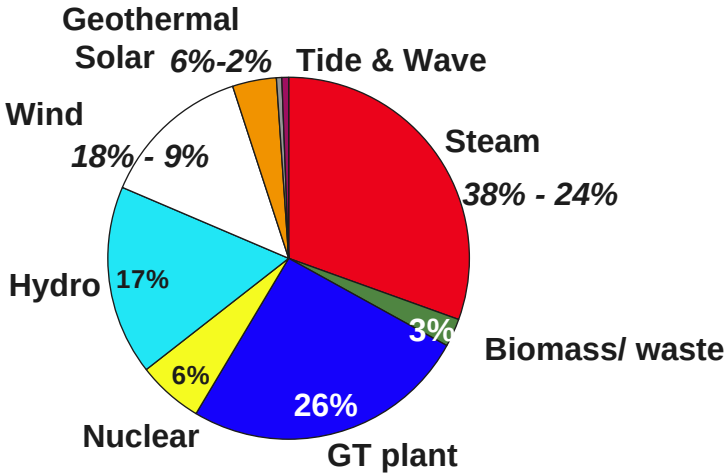
Installed Base 2008

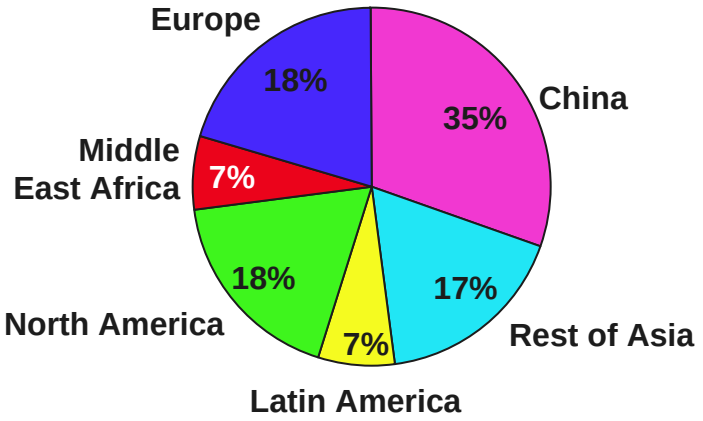


Status @ end 2008
4775 GW



Future Installed base 2030

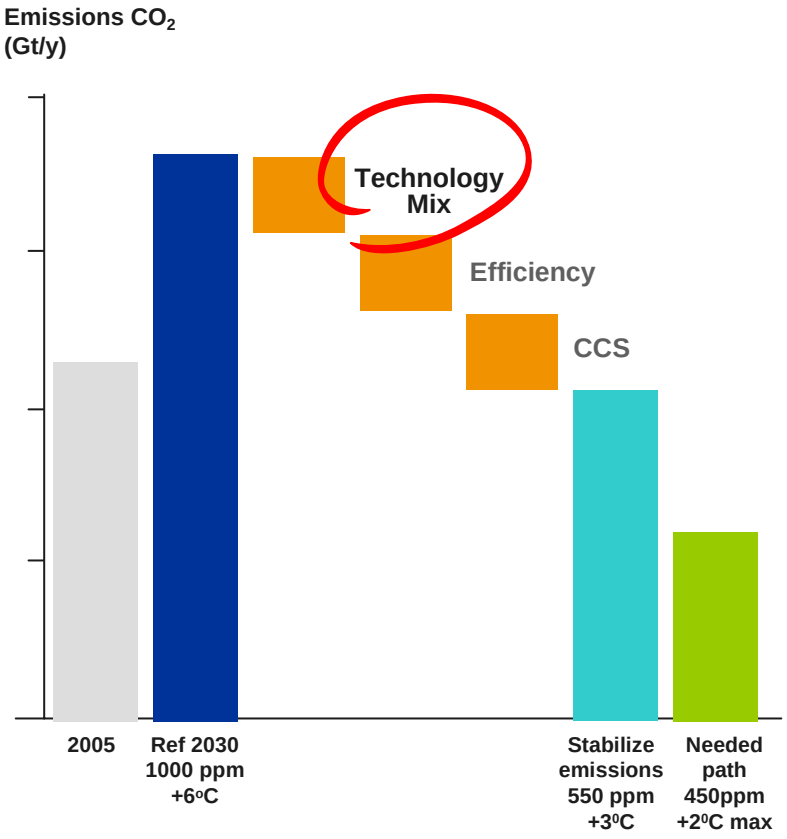


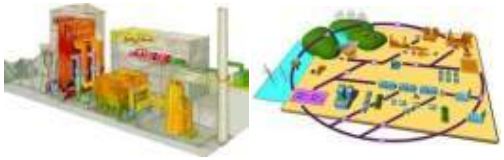


Non CO_2 technologies could account for 50% of global installed base

Alstom Clean Power strategy

Alstom is the world leader in clean integrated solutions





Efficiency: Plant optimisation & retrofit

First CO2 capture demo plant in the world

Alstom Power:
Technologies adapted to all energy sources

Coal

Nuclear
(Conv. Island)

Life Cycle

Management

Oil

Wind

Geothermal

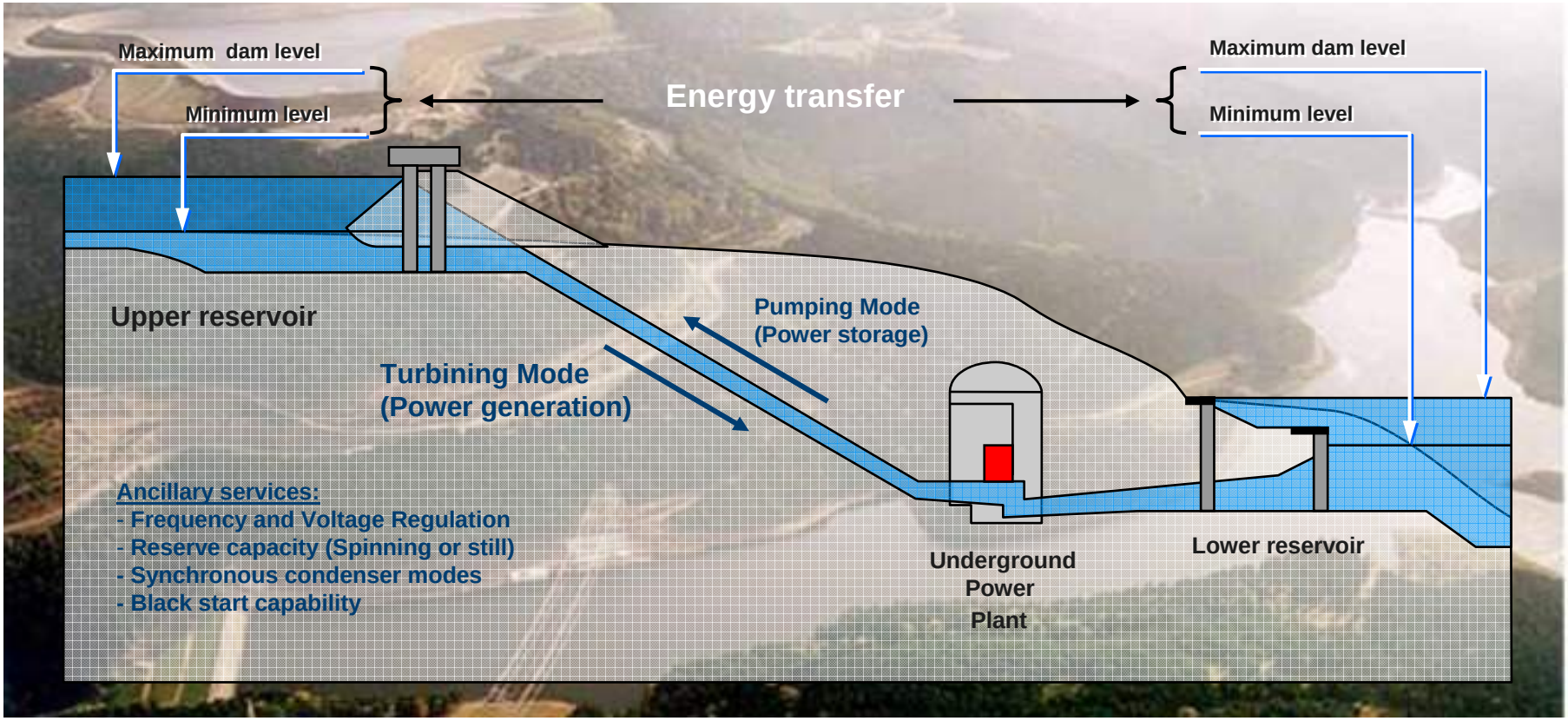
Biomass

Solar

Pump storage: an efficient way of storing large quantity of energy

ALSTOM

Global cycle efficiency ~80 %



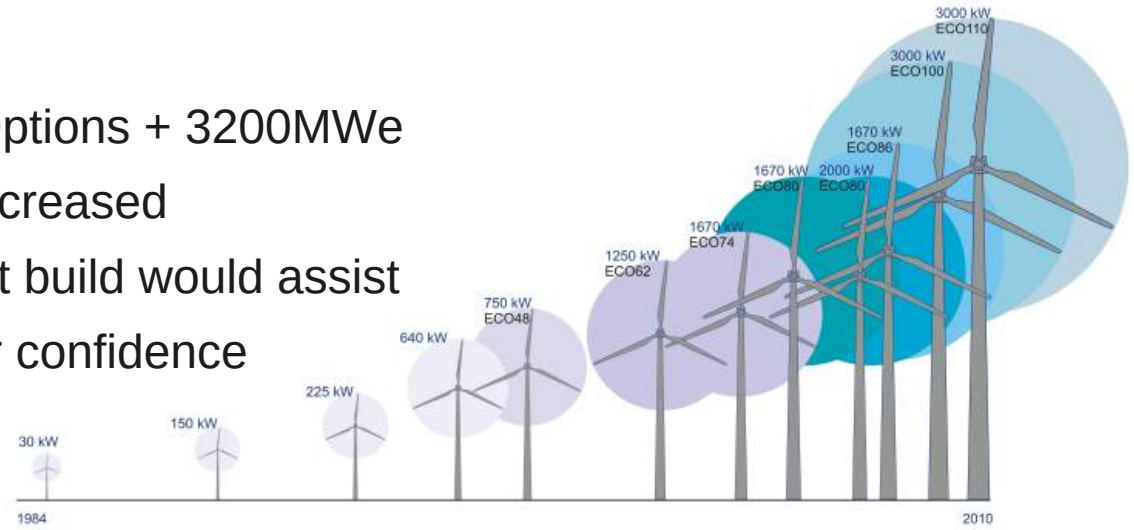
Tubatse Pumped Storage 1.5 GWe capacity =

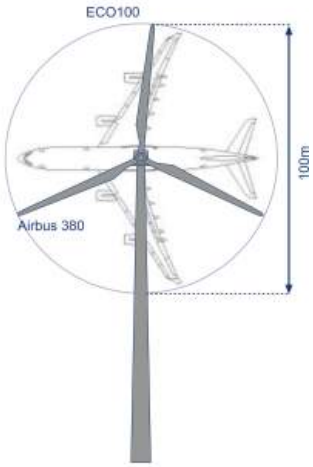
7.8m tons per year CO_2 avoided

Tubatse Pumped Storage is not part of the hydro plan

Wind onshore: energy potential from wind

- Committed build capacity is 800MWe by 2014
- Transmission Network permitting the initial phase should be increased to 1200MWe
- New Build Options + 3200MWe by 2019 – increased committment build would assist with investor confidence



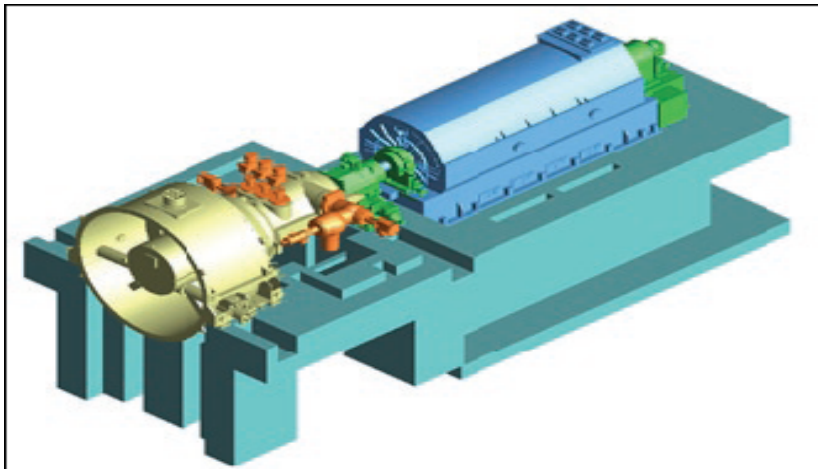


Planned wind capacity approx 800 MWe = **5.2m tons CO2 avoided**

Potential of wind capacity far greater

Solar: an untapped Energy Source

- IRP indicates CSP committed build of 200 MWe by 2015
- Total of 400 MWe New Build Options by 2019
- Huge shortfall relative to solar potential in South Africa
- Recommended Target should be in excess of 2000 MWe – facilitated through REFIT by 2019
- Solar target will not motivate localisation of technology

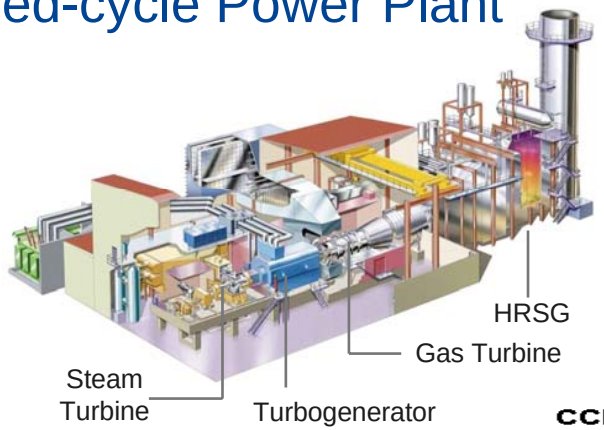


Planned solar capacity approx 200 MWe = **1.0m tons CO2 avoided**

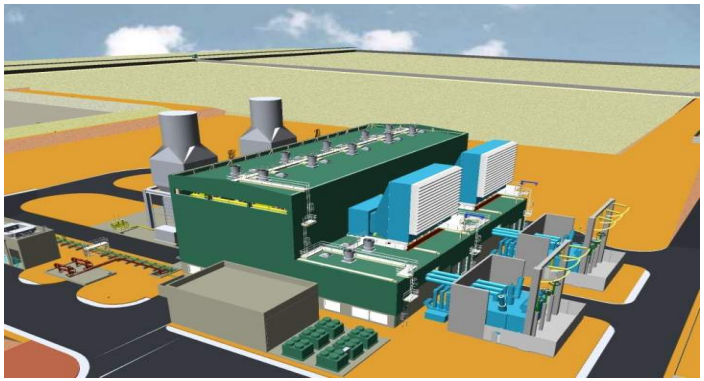
Potential of solar capacity is significantly under stated

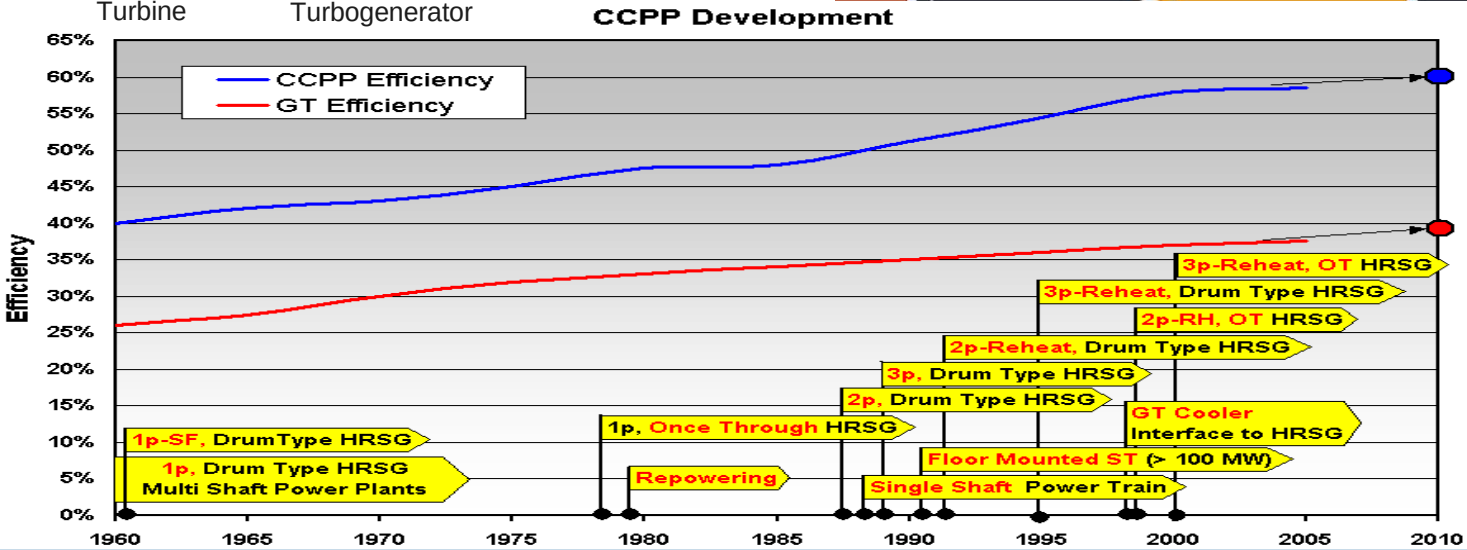
Gas: Open Cycle Gas Power Plants

Combined-cycle Power Plant



Open-cycle Power Plant





Planned Gas Capacity OCGT Capacity = 6.8 GWe (35% efficiency)
CCGT = 1.9 GWe (58% efficiency)

Biomass co-firing: significant potential to reduce CO_2 emissions

- DRAX- UK's largest coal fired plant – **4GW**
- 1.5 million tons/year biomass co-firing at 10% heat input
- **400 MWe of green power**
- **2 million tons/year CO_2 avoided**
- Fully Commissioned early 2010

Potential of biomass

- **Up to 20 % CO_2 avoided**
- **Retrofitable** to existing coal plants
- Flexibility – **low incremental cost**
- Biomass combusted in highly efficient boilers

Nothing included in committed build – potential exists
Clarity required for New build options of Renewables

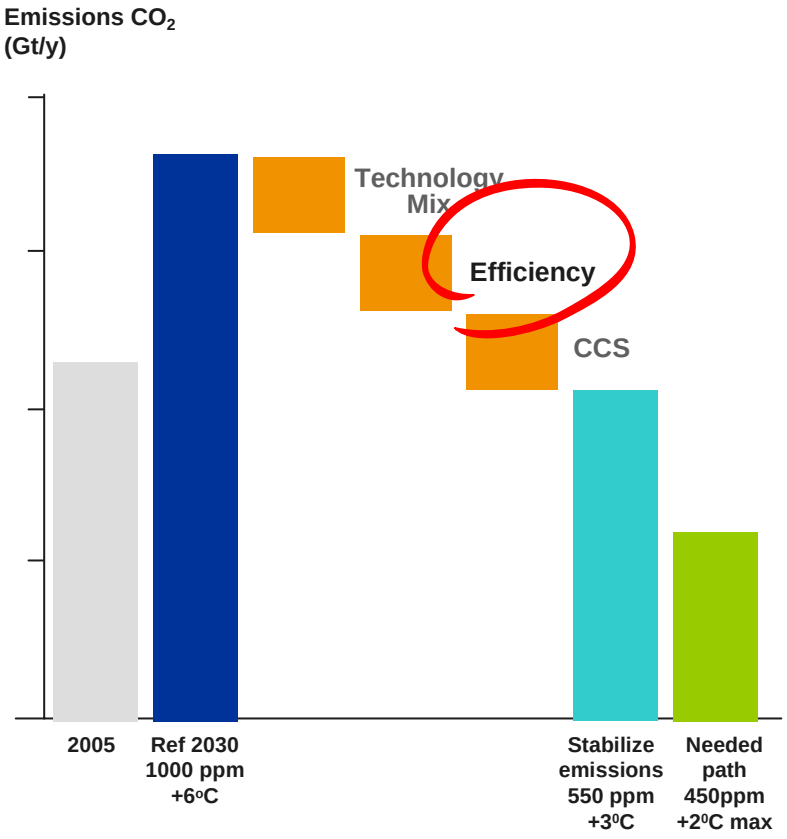
Nuclear conventional island: ARABELLE™

- Encouraged with inclusion of Nuclear in New Build Options
- Earlier commitment encouraged to ensure continued localisation and upskilling after committed build programs

Planned nuclear capacity 9.6 GWe = **50m tons CO2 avoided**

Alstom Clean Power strategy

Alstom is the world leader in clean integrated solutions



N° 1 nuclear* & biomass

* Conventional islands

Wind, solar & geothermal

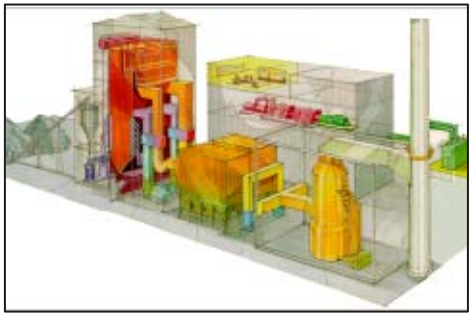
N° 1 hydro

Efficiency: Plant optimisation & retrofit

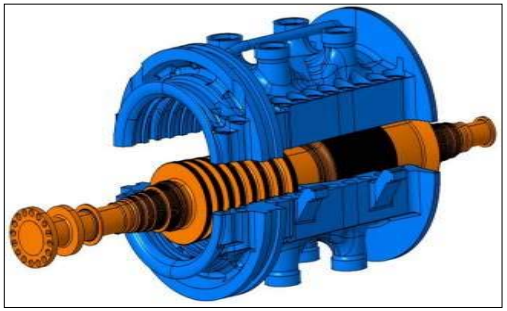
First CO2 capture demo plant in the world

Production Efficiency – Existing Plant

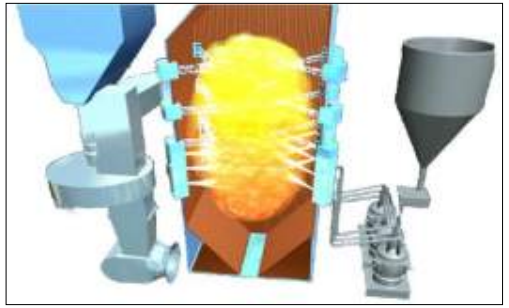
Retrofit



Plant Optimisation: -5% CO_2



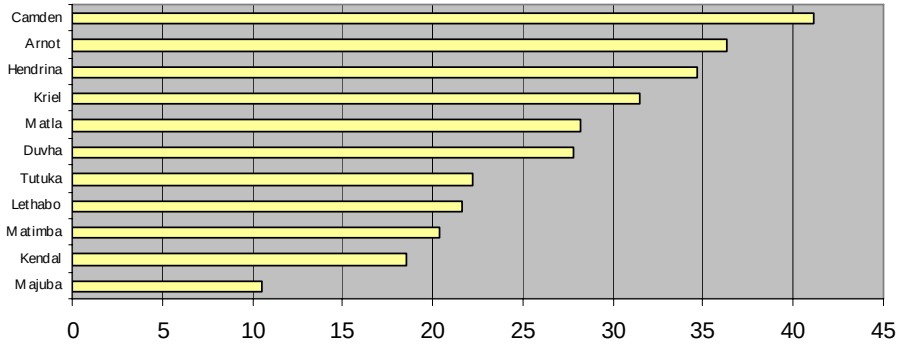
Turbine retrofit: -5% CO_2



Boiler retrofit: -3% CO_2

60% of Carbon emitted in 2030 will come from today's installed base

Average Age in-Service
Eskom Plants



- Increased cycle **efficiency**
- Increased **capacity** avoiding need to build additional capacity
- Extended utilisation of existing assets
- Reduced CO_2, NOx & SOx emissions

All efficiency improvement programs in DSM
Lost opportunity to ensure highest efficiency at point of production

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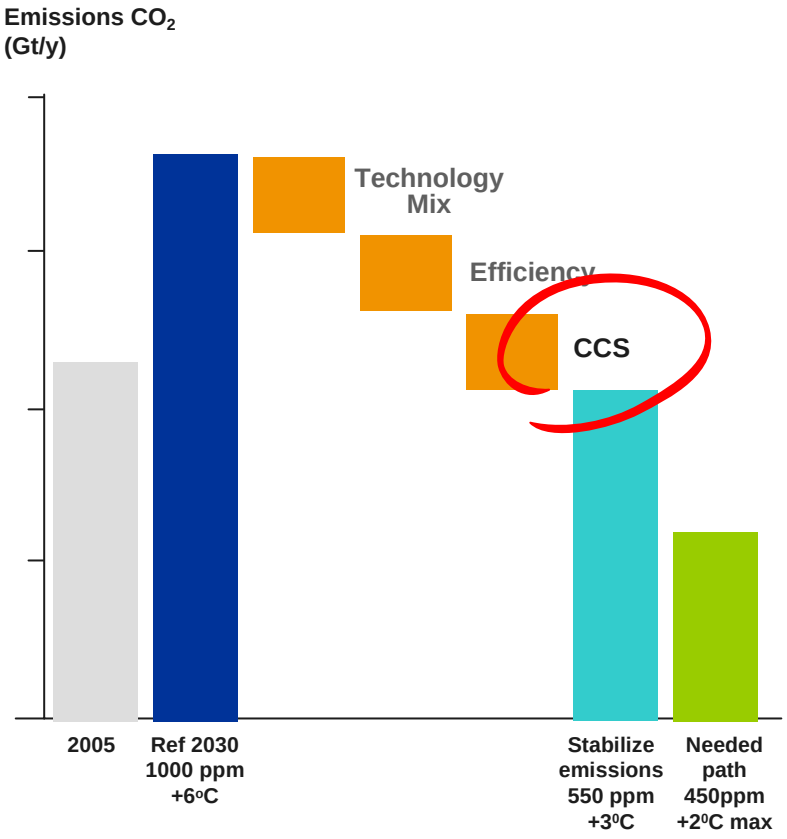

N° 1 nuclear* & biomass

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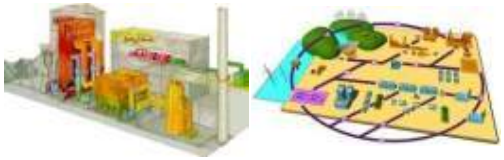
Wind, solar & geothermal

N° 1 hydro



Efficiency: Plant optimisation & retrofit

First CO2 capture demo plant in the world

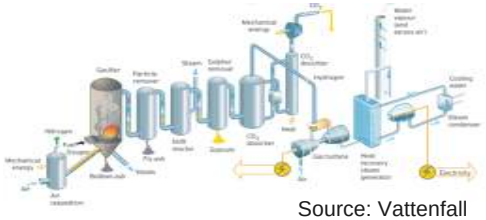
Alstom CO_2 capture technologies

Power Plant with CO_2 capture

Post-combustion
(New + retrofit)

Oxy-combustion
(New + retrofit)

Pre-combustion
(New only)



Source: Vattenfall

Solutions developed by Alstom

- CCS will be commercially available - 2015
- CCS capturable CO_2 in South Africa ~ 240m t/yr
- Cost of electricity production (kw/hr) from **Coal + CCS = similar to Nuclear**

CCS must also be applied to the installed base
Nothing included for New or existing fleets

IRP 2010 – Summary

- IRP 2010 – A good start in **diversifying** energy mix
- **Highest** levels of production efficiency from all technologies – not just DSM -
  - Concider **CCGT** v OCGT
  - Improve efficiency from **installed base**
- Potential from Solar capacity **far greater**
- **Earlier** start for Nuclear program
- Risk of skills gap due to late introduction of **Clean Coal**
- **CCS** must be accommodated in energy mix

South Africa – on a path to diversified energy production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