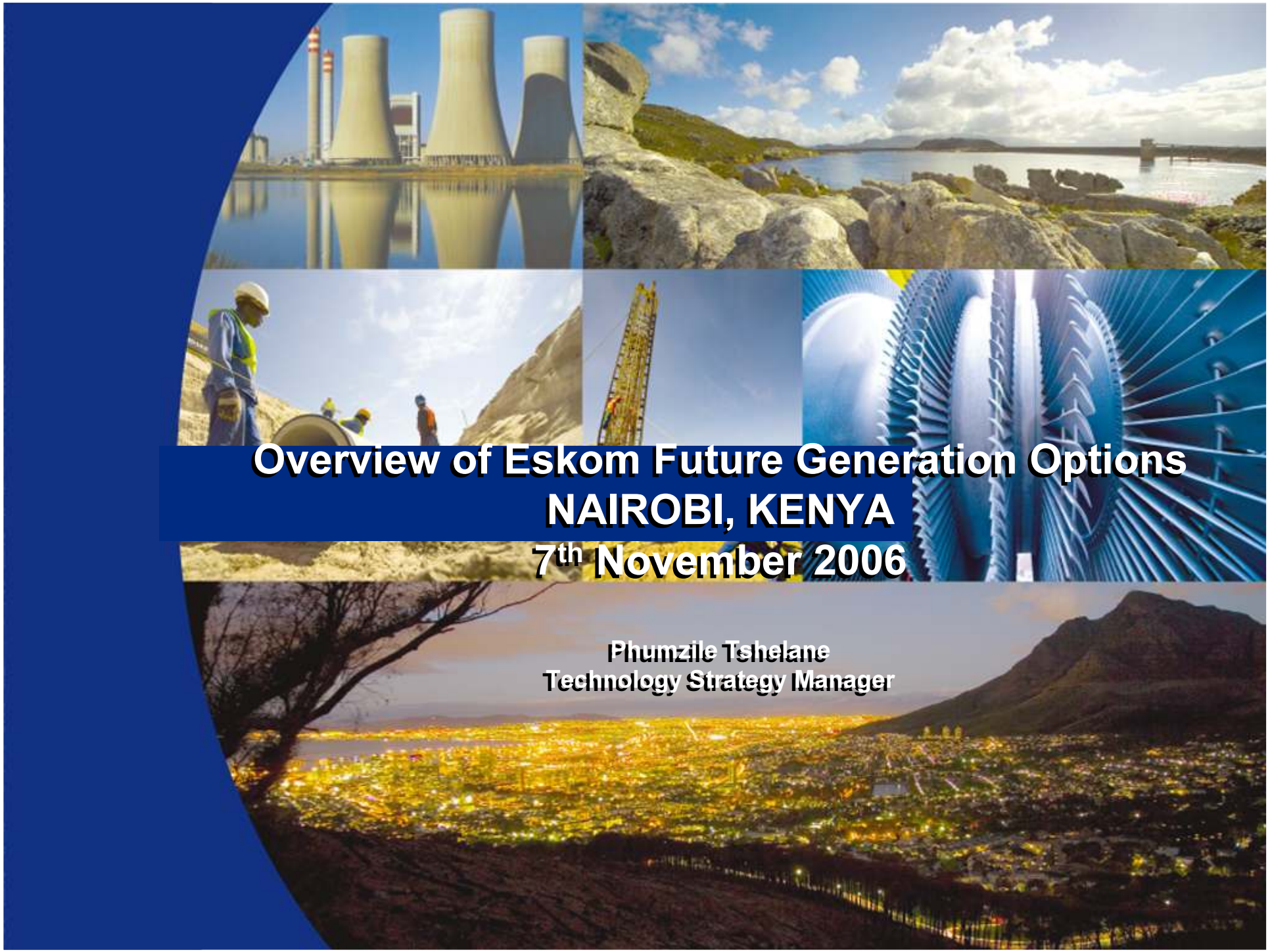

Overview of Eskom Future Generation Options
NAIROBI, KENYA
7th November 2006

Phumzile Tshelane
Technology Strategy Manager

Core business

- **Core business: electricity**
  - Generation
  - Transmission
  - Distribution
- **Main markets:**
  - South Africa
  - Southern African Development Community (SADC) countries

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Southern African Grid map

353 097 km of power lines

Existing grid system

Possible future grid system

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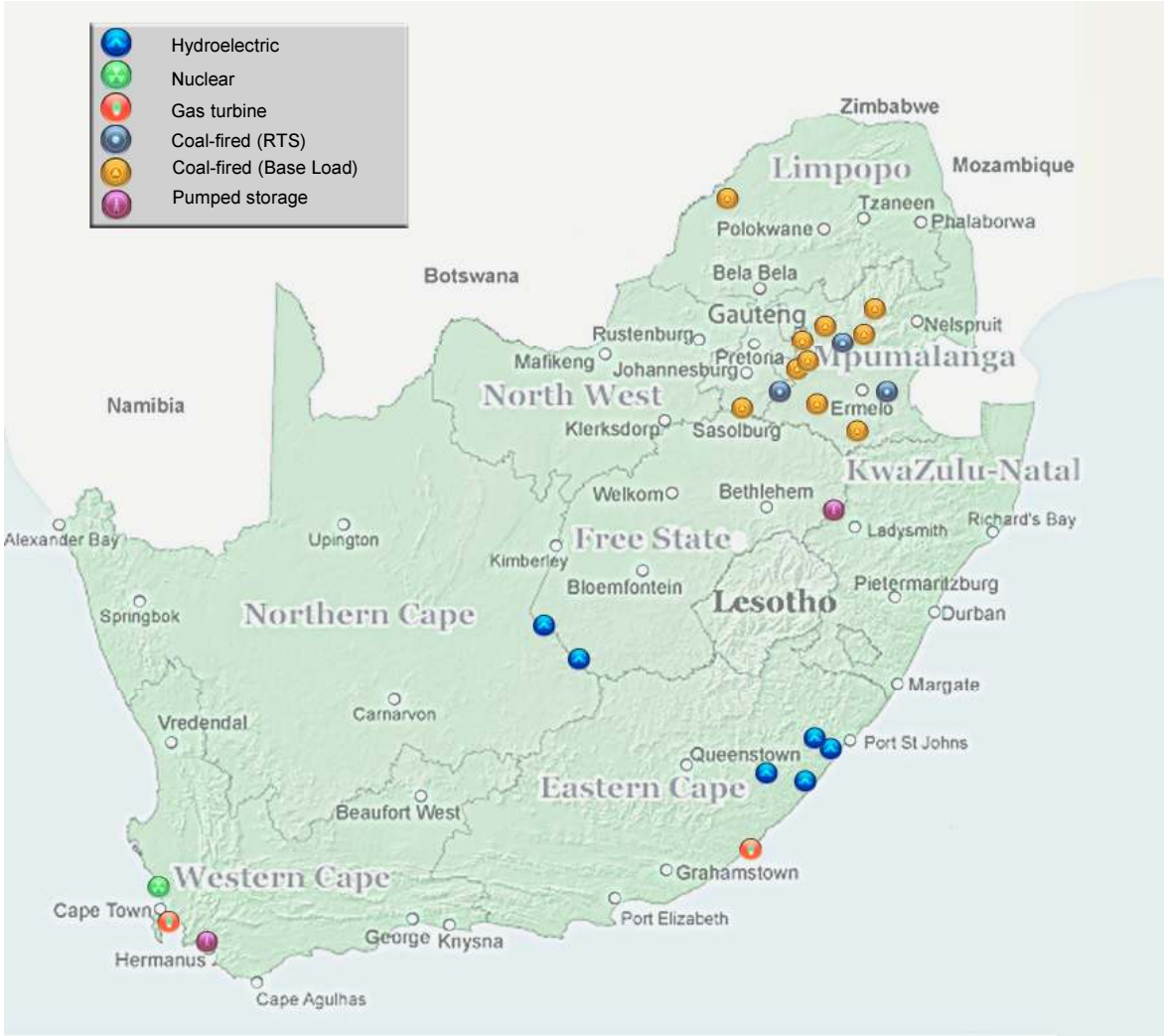
Eskom power stations



SAPP partnerships

Imported hydroelectric power [potential]

- Mepanda Uncua [Mozambique] 2 500 MW
- Cahora Bassa North [Mozambique] 1 400 MW
- Inga 3 [DRC] 3 500 MW
- Grand Inga [DRC] 40 000 MW
- Batoka Gorge [Zimbabwe] 600 MW
- Kafue Lower [Zambia] 450 MW
- Kariba North [Zambia] 350 MW

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SAPP partnerships: gas options

- Kudu (Namibia)
- Potential for about 2 000 MW along South African West Coast
- Pande (Mozambique)
- Potential for about 1 000 MW along

  KwaZulu-Natal coast

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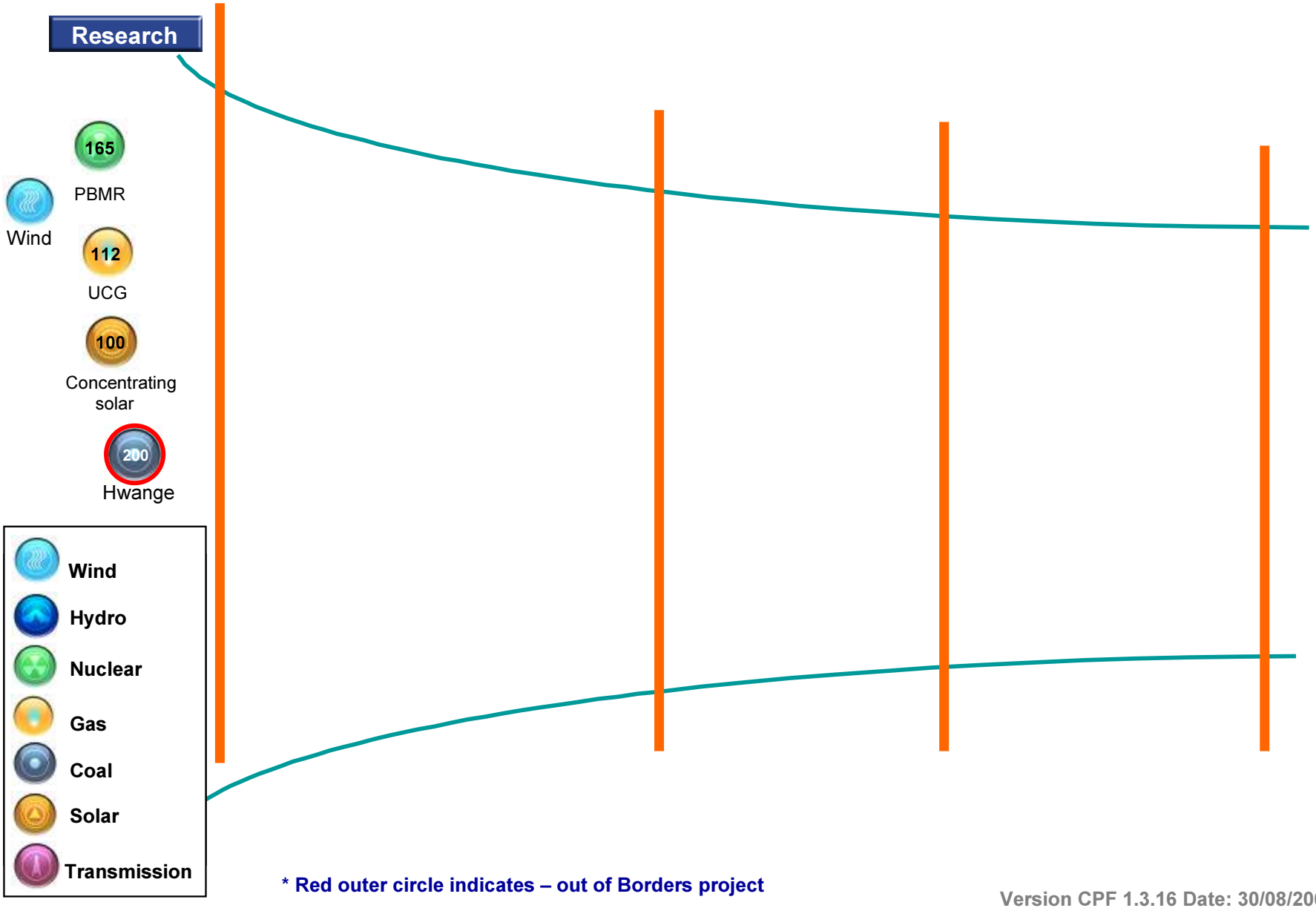
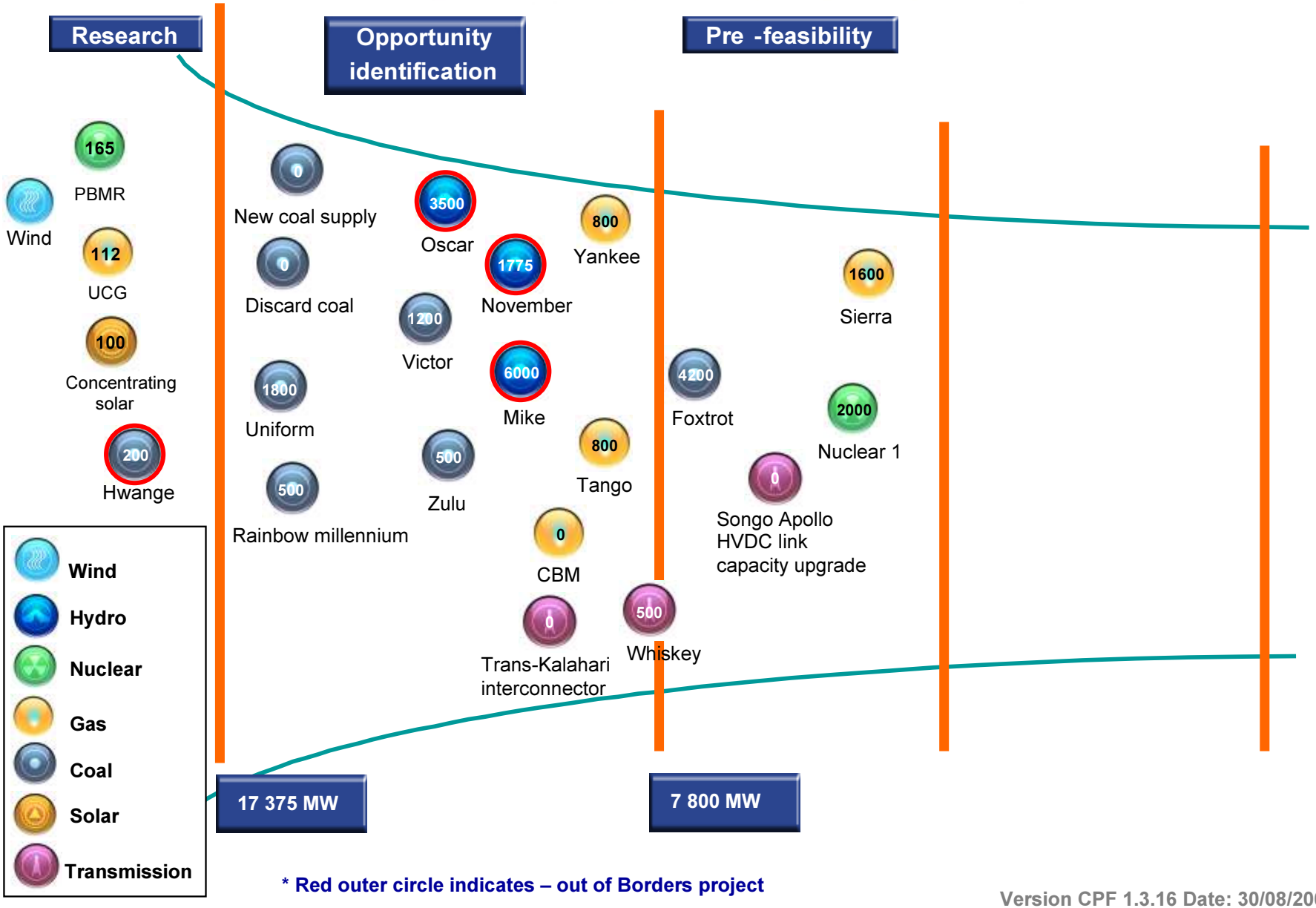
Making it happen

Capacity project funnel



* Red outer circle indicates – out of Borders project

Capacity project funnel



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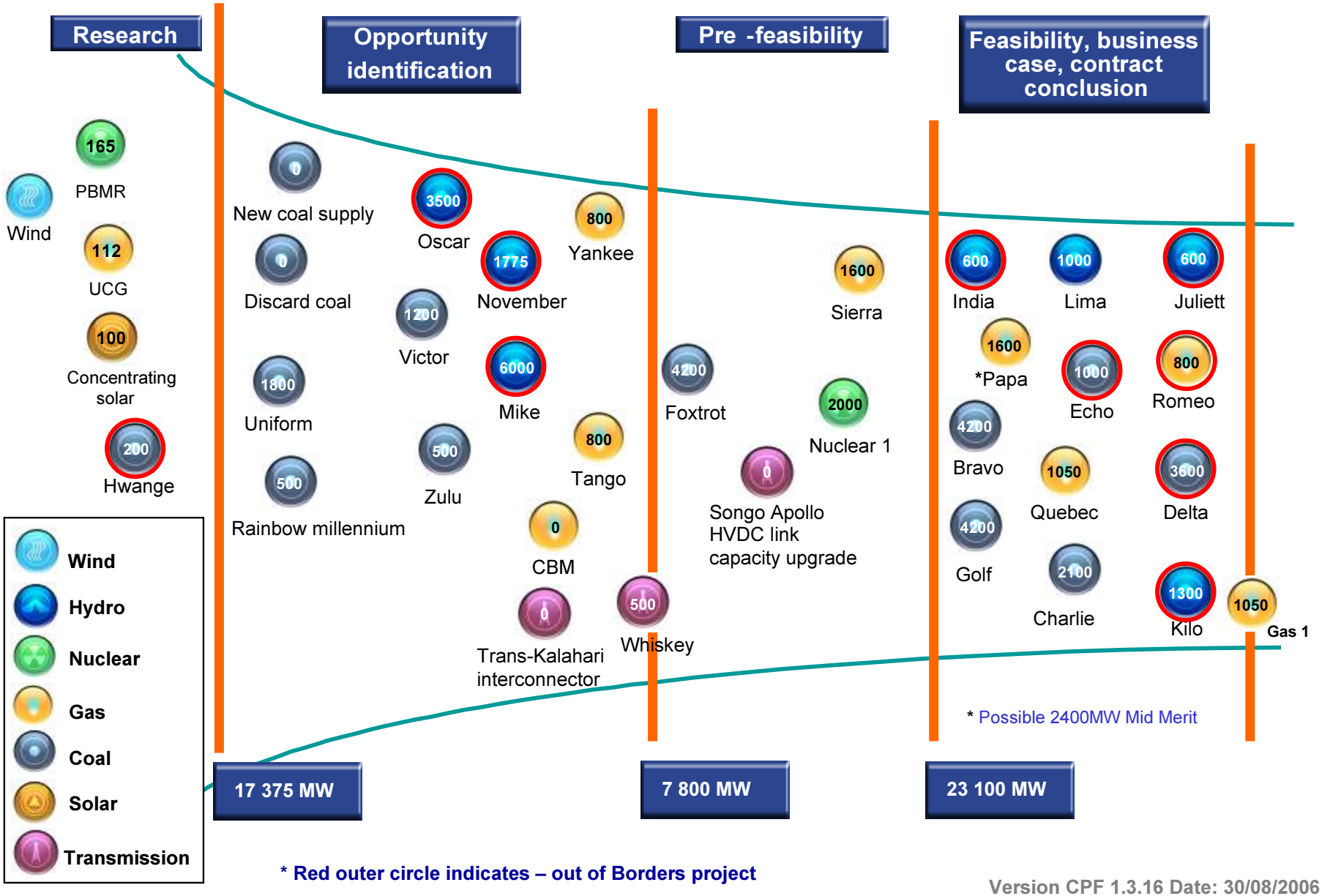
Version CPF 1.3.16 Date: 30/08/2006

Capacity project funnel



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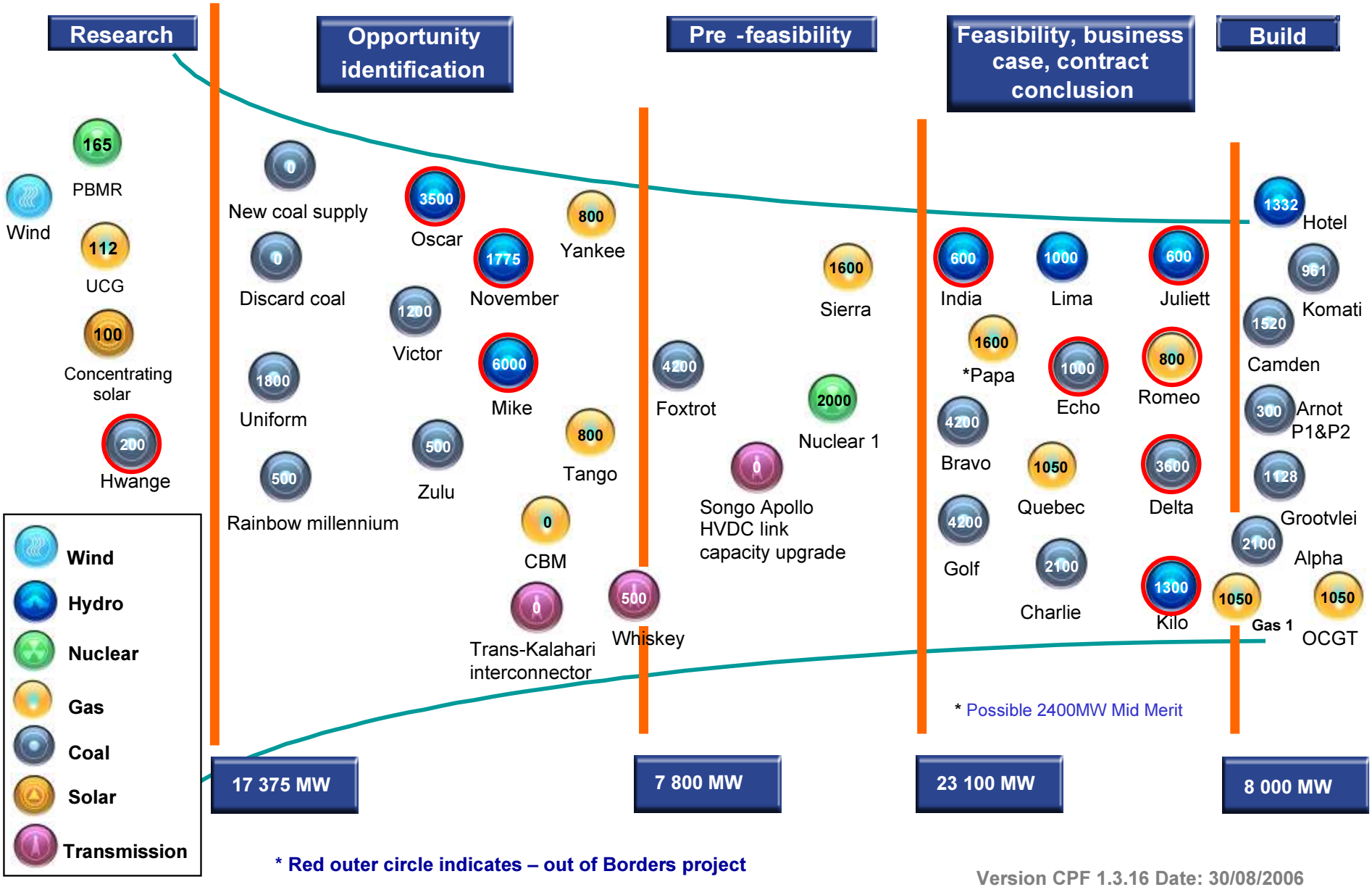
Capacity project funnel



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Version CPF 1.3.16 Date: 30/08/2006

5 year Capacity expansion programme

- Five years capacity expansion at a projected cost of R97 billion
- Return to service of three mothballed power stations, i.e. Camden, Grootvlei and Komati
- Major capacity expansion
  - New coal-fired base-load station – Project Alpha
  - New pumped storage – Project Hotel
  - Transmission lines
  - Open-cycle gas turbines – Mossel Bay and Atlantis

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Nuclear in Eskom

History of Koeberg

- Late 60's - idea of nuclear power emerged
- Early 70's - decision to build a nuclear power station
- 1976 – construction began
- 1984 – unit 1 commissioned
- 1985 – unit 2 commissioned

- 2004 – celebrated 20 years of safe operation
  - –Jan H Smith award
  - –EdF award
- 2005 – 3rd in EdF radiation protection competition

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Role of Koeberg

Geographically

- 1 500 km from main generators
- Anchors grid
- Mitigates line losses – these losses are as high as 400MW without Koeberg running
- Mitigates consequences of absence

Resources

- Cost of coal transport
- Water
- Environmental
- 6% of generation

Uranium fuel is cheaper than coal which is about R 1.5m/day extra

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Technical information on Koeberg

- Koeberg's units were started in 1984/5
  - –40 years = 2024/5
  - –50 years = 2034/5 (Most likely)
  - –60 years = 2064/5
  - –Koeberg has successfully operated for 20/21 yrs
- The 2 Koeberg Units generate a total of 1800 MW
- 50% of the power to the Western Cape is transferred via overhead transmission lines - this increases to 75% when one unit is off line.
- There is one unit off line for refueling and maintenance approximately every 16 – 18 months

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Koeberg's economic impact

- Spends approximately R300m on suppliers and contractors each year.
- Employs 1100 staff and 350 contractors on a full-time basis
- During refuelling outages, an additional 700 contractors are employed
- More than 2000 families are wholly or partly dependent on Koeberg operations.

Koeberg's direct cash injection into the Western Cape economy exceeds R300m per year

Koeberg decommissioning plans

- The Koeberg units will be shut down in 2034/35.
- The two units will then be decommissioned according to an approved plan.
- The level of decommissioning will take into consideration the fact that the site will be retained for future nuclear.
- Eskom is making provision for the cost of decommissioning during the normal operation of Koeberg. The provision is regularly benchmarked against international norms.
- The rate and method of decommissioning depends on:
  - how long the spent fuel needs to be stored on site ie. Is there a national repository available?
  - when the site will be re-used?
  - radioactive decay to manageable levels to reduce costs.
- Decommissioning is costly because of the radiation. It is, however, fairly simple because it is a pure dismantling operation.

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Summary of Nuclear Technology Options short listed by Eskom

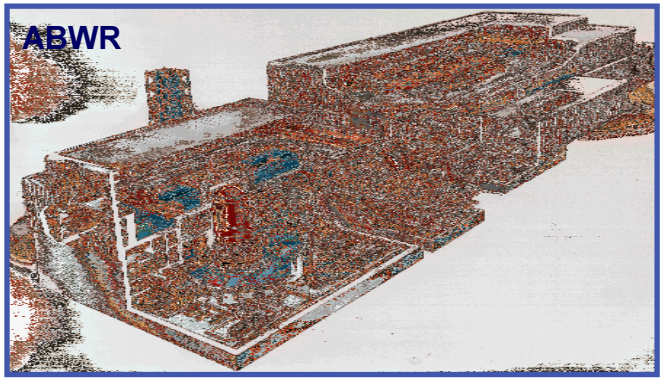
- Various conventional nuclear power generating technologies exist for potential deployment in Eskom's present power generating fleet.
- The following table summarizes the results of the study conducted thus far.

Reactor Type	Technology	Plant Options	Vendor	Maturity	Core Damage` Frequency (CDF)	Last Plants Constructed
Light Water Reactor	**Pressurized Water Reactor**	RSA 1000	Areva NP (French)	Proven	$1x10^{-5}$	Ling Ao 1 & 2, China (2002/3). Operating
		Koeberg	*Areva NP (French)*	*Proven*	$2.5x10^{-5}$	More than 10 operating all over the world
		EPR	Areva NP (French)	Unproven	$1x10^{-7}$	TVO, Finland Under construction
		AP1000	Westinghouse (USA)	Unproven	$5x10^{-7}$	None operating or under construction
	Boiling Water Reactor	ABWR	General Electric (USA)	Proven	$2x10^{-7}$	TEPCO I & 2, Japan. Operating
Heavy Water Reactor	**CANDU**	Candu-6	AECL (Canadian)	Proven	$1x10^{-6}$	Quinshan 1 & 2, China (2002/03). Operating

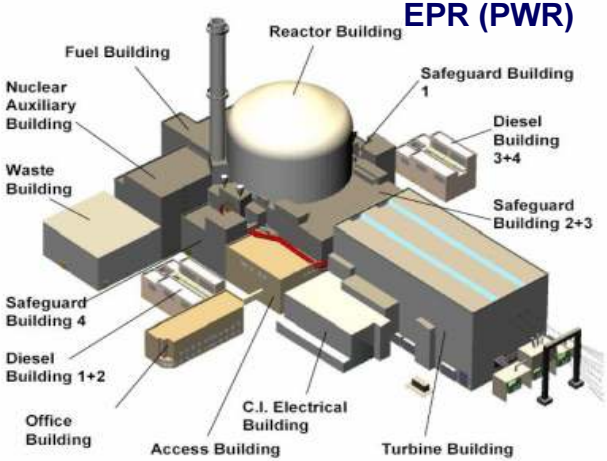
Note: Core Damage Frequency (CDF) measures the level of safety (the lower the better)

New Convetional Nuclear in Eskom

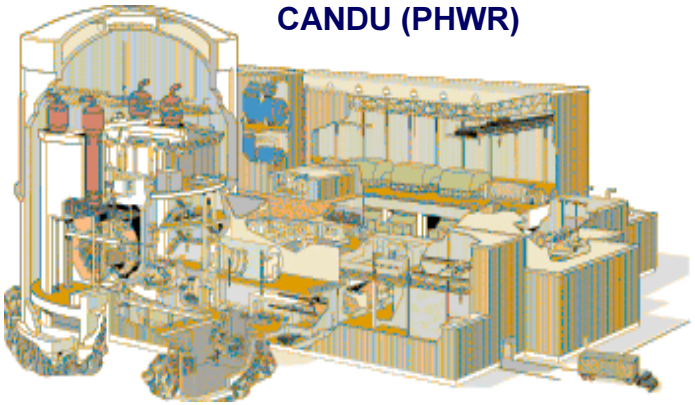
ABWR



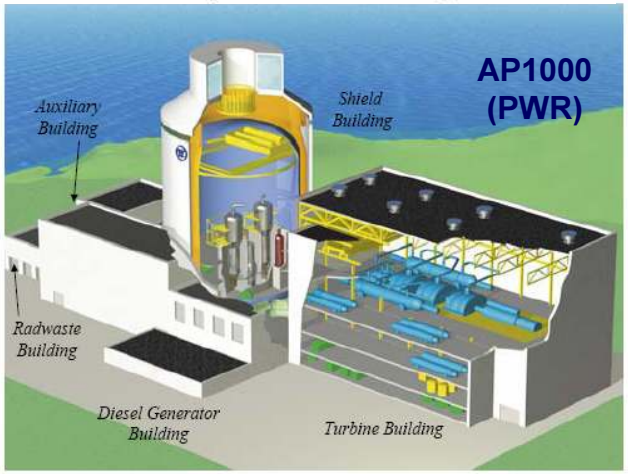
EPR (PWR)



CANDU (PHWR)



AP1000 (PWR)



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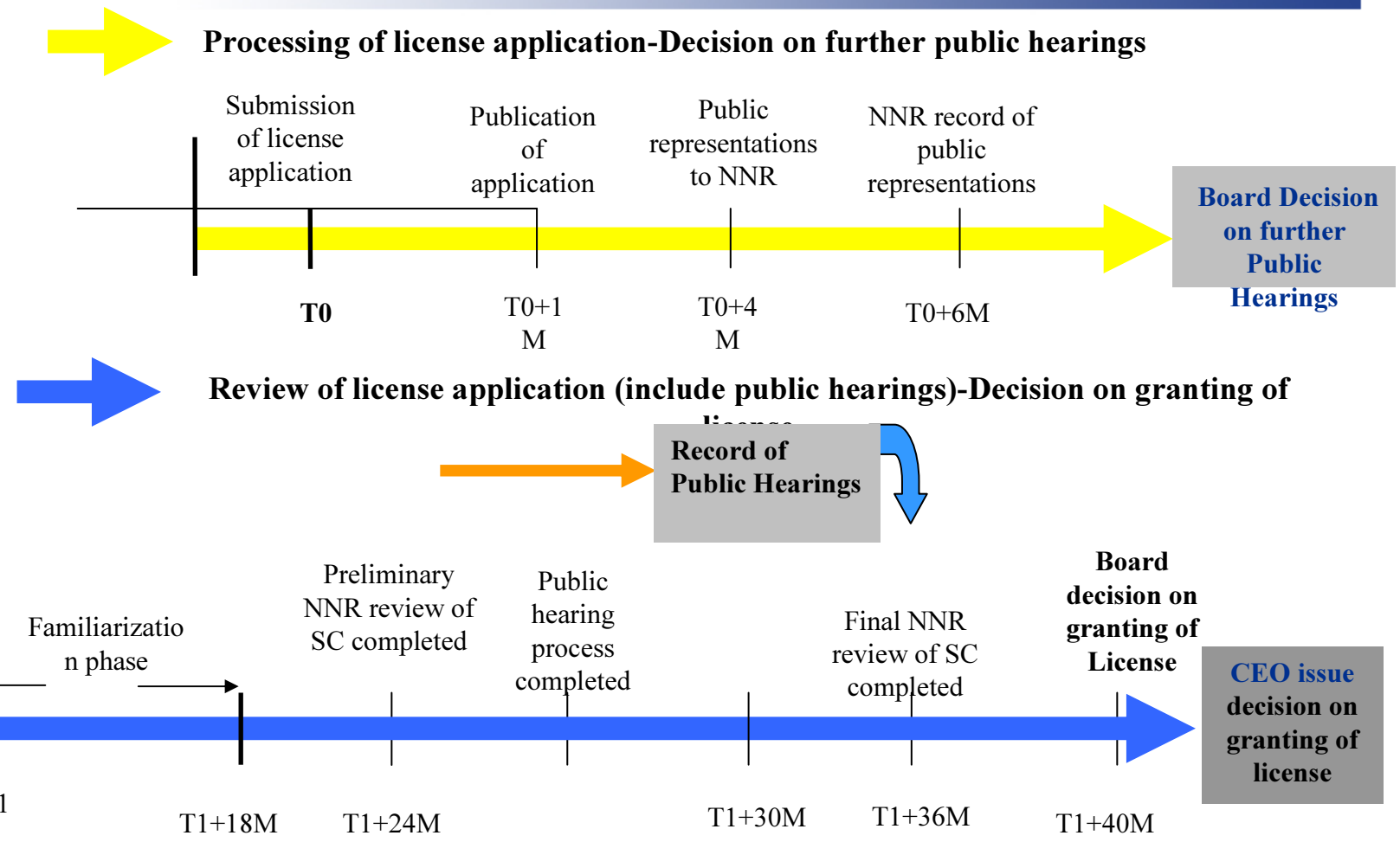
Licensing of new “proven” reactor technology: Estimated timescales. Two parallel process




Thank you
Sapphire Air
407
Eskom