

Electricity Investment in South Africa

David Newbery, EPRG

EPRG Spring Seminar

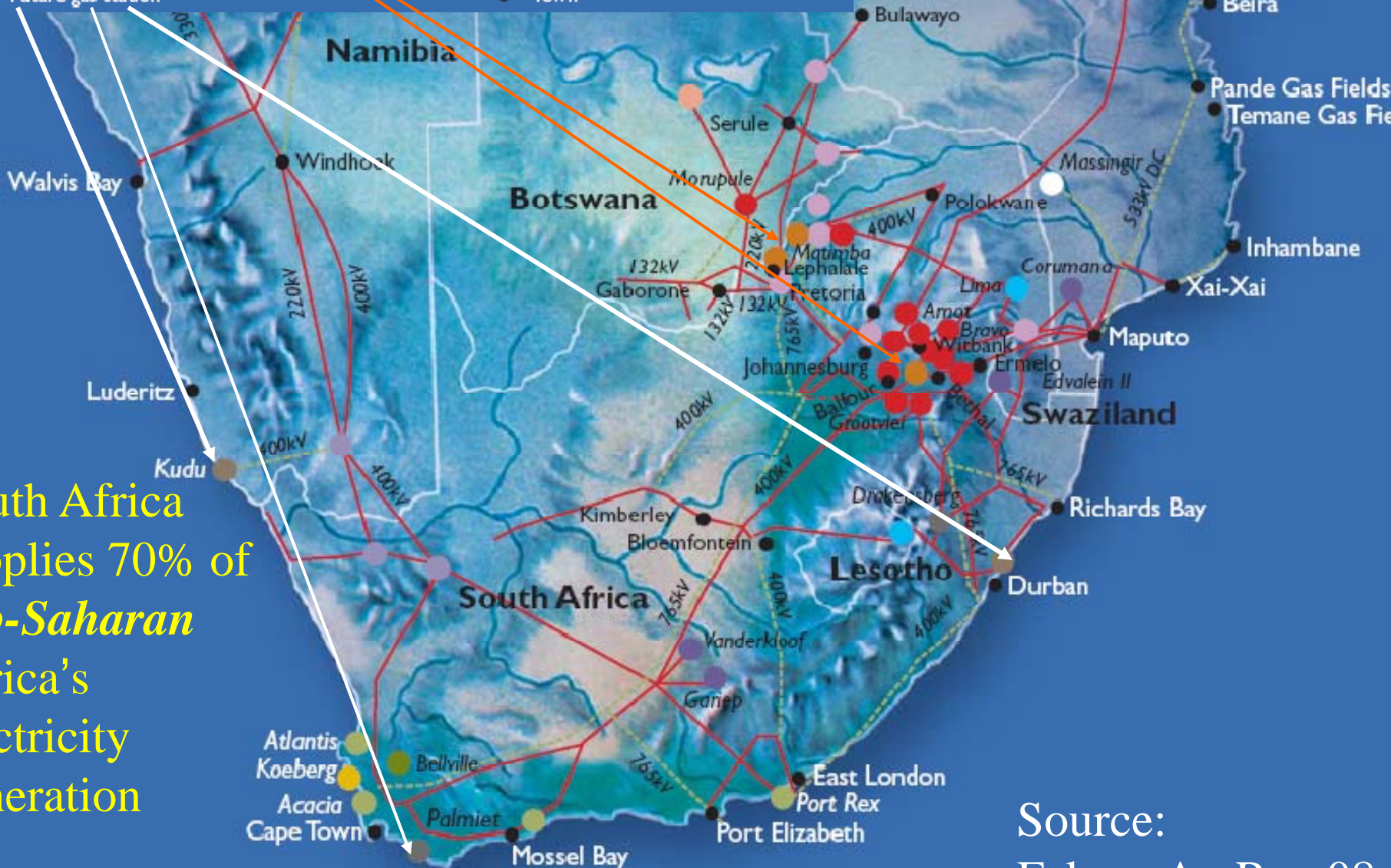
Cambridge: 15th May 2009

<http://www.eprg.group.cam.ac.uk/>

Why is Eskom interesting?

- In top 10 companies by MW capacity
 - generates roughly 45% of Africa's electricity
- Faces massive investment needs
 - R343 b to 2013 approved = \$42 billion
 - 16,304 MW by 2017, almost all coal
- State-owned, regulated, vertically integrated
 - IPP's delayed, single buyer model discussed
- Costs rising, profits low and falling

- Key**
- Existing grid system
 - Possible future grid system
 - Future hydroelectric power station
 - Future coal-fired power station
 - Hydroelectric power station
 - Interconnection substation
 - Future gas station
 - Future pumped storage station
 - Coal-fired power station
 - Future interconnection substation
 - Nuclear power station
 - Pumped storage station
 - Gas power station
 - Renewable energy
 - Town



South Africa
supplies 70% of
sub-Saharan
Africa's
electricity
generation

Source:
Eskom An Rep 08

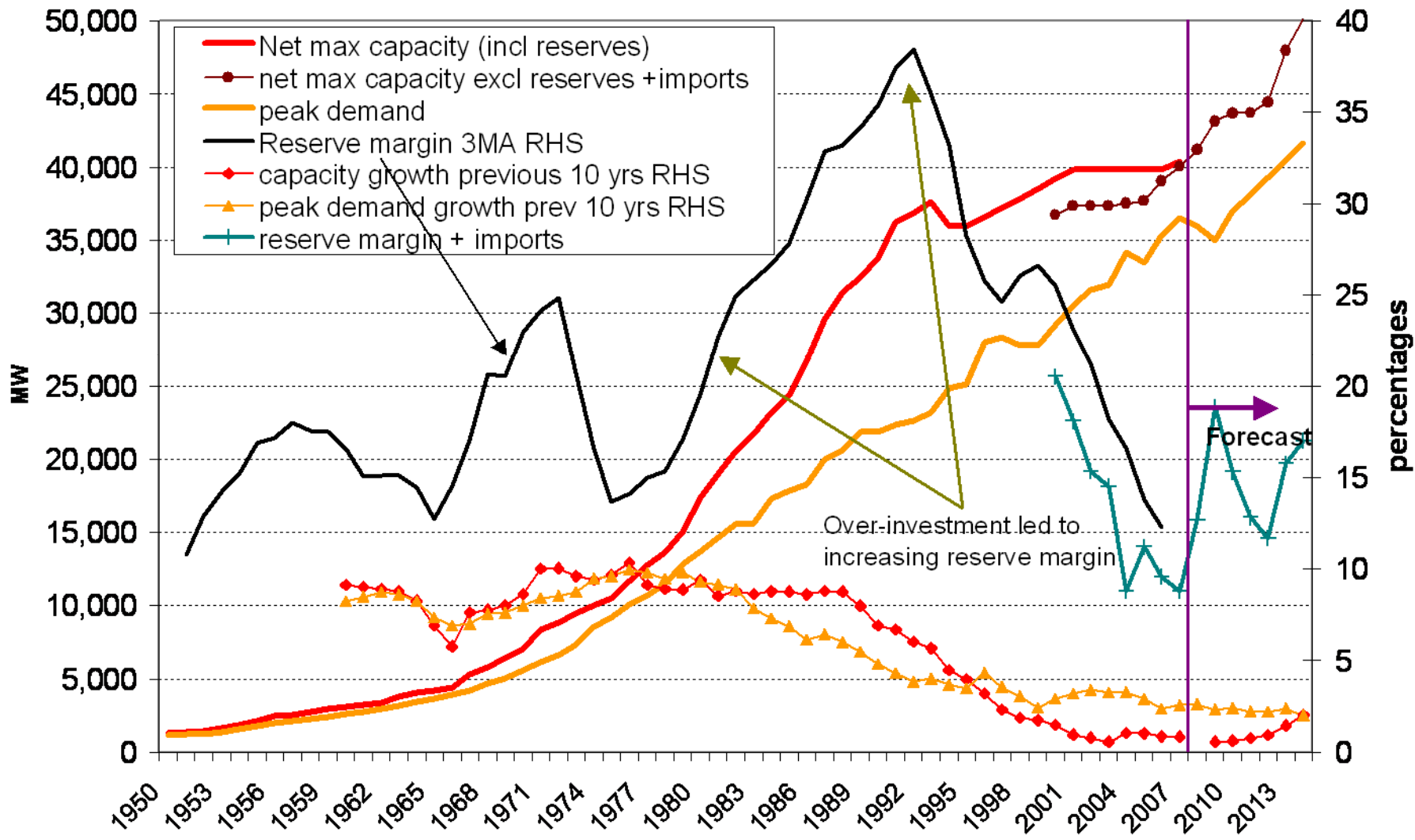
Challenges

- How should NERSA regulate electricity?
 - for a state-owned enterprise (i.e. most ESIs)
- How should electricity prices be set?
 - Marginal or average cost pricing?
 - Historic or replacement asset value?
- How should Eskom be reformed?
 - Is it broke? Should it be fixed? How fast?
- What is effect of Kyoto and financial crisis?

Eskom – a VI monopoly SOE

- Until 1994 unregulated
 - Could borrow at low rates of interest
 - In 1970s embarked on large investment in G
 - 4,000 MW UK stations, unsuited to local coal
 - Low availability => increase investment
 - Borrow, raise prices, then improve performance
- ⇒ Surplus capacity, inflation erodes real debt
- ⇒ Prices can fall in real terms, debt paid off

Eskom capacity and peak demand



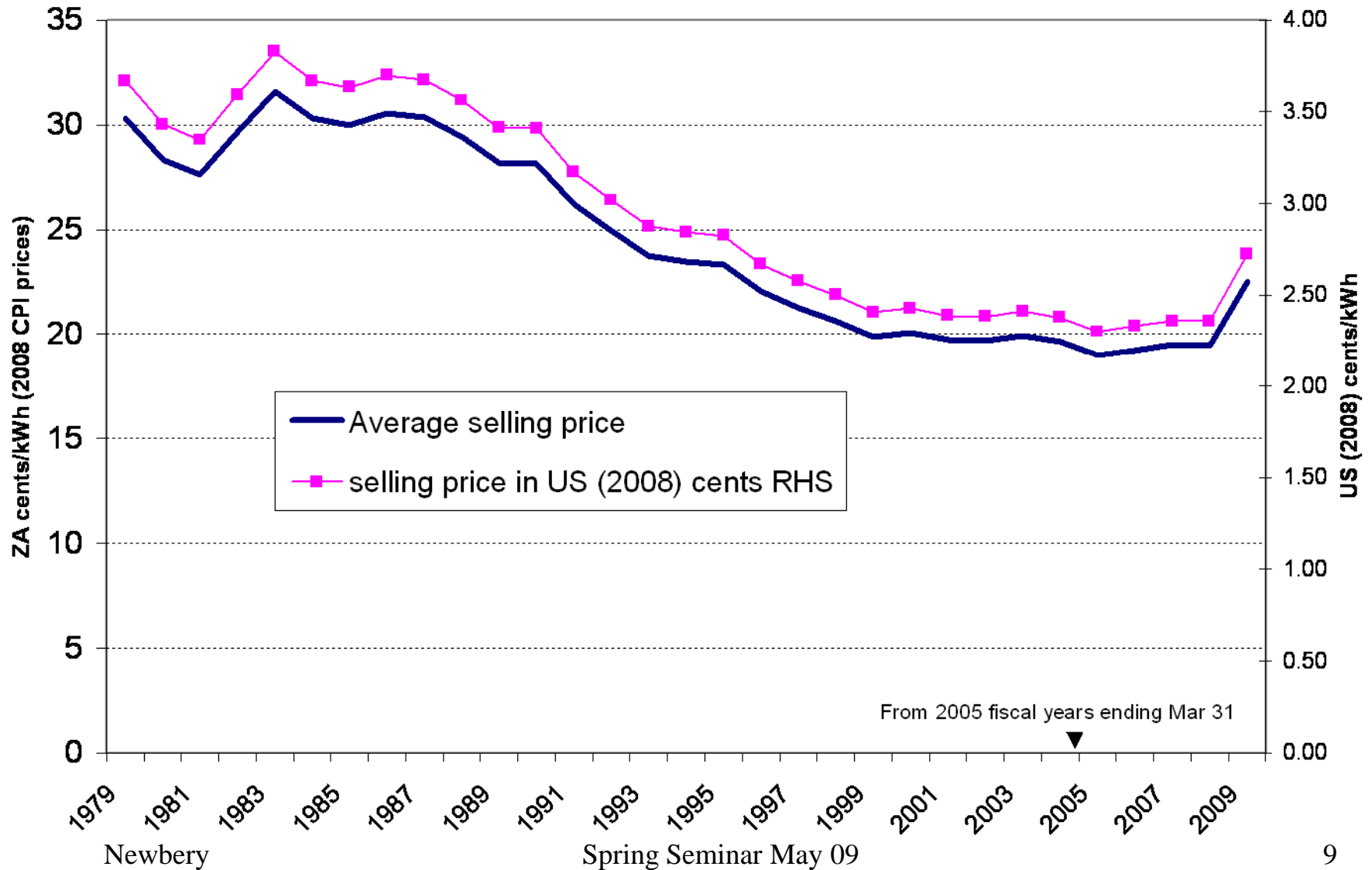
Eskom's successes

- Commission of inquiry replaces management
- Eskom recruits/trains excellent black managers
- Surplus cash poured into electrification
 - Complete change of priorities despite apartheid
- 1994: Eskom darling of rainbow nation
 - Despite continued low prices to the old heavy export-oriented industry

Reform pressures post 1994

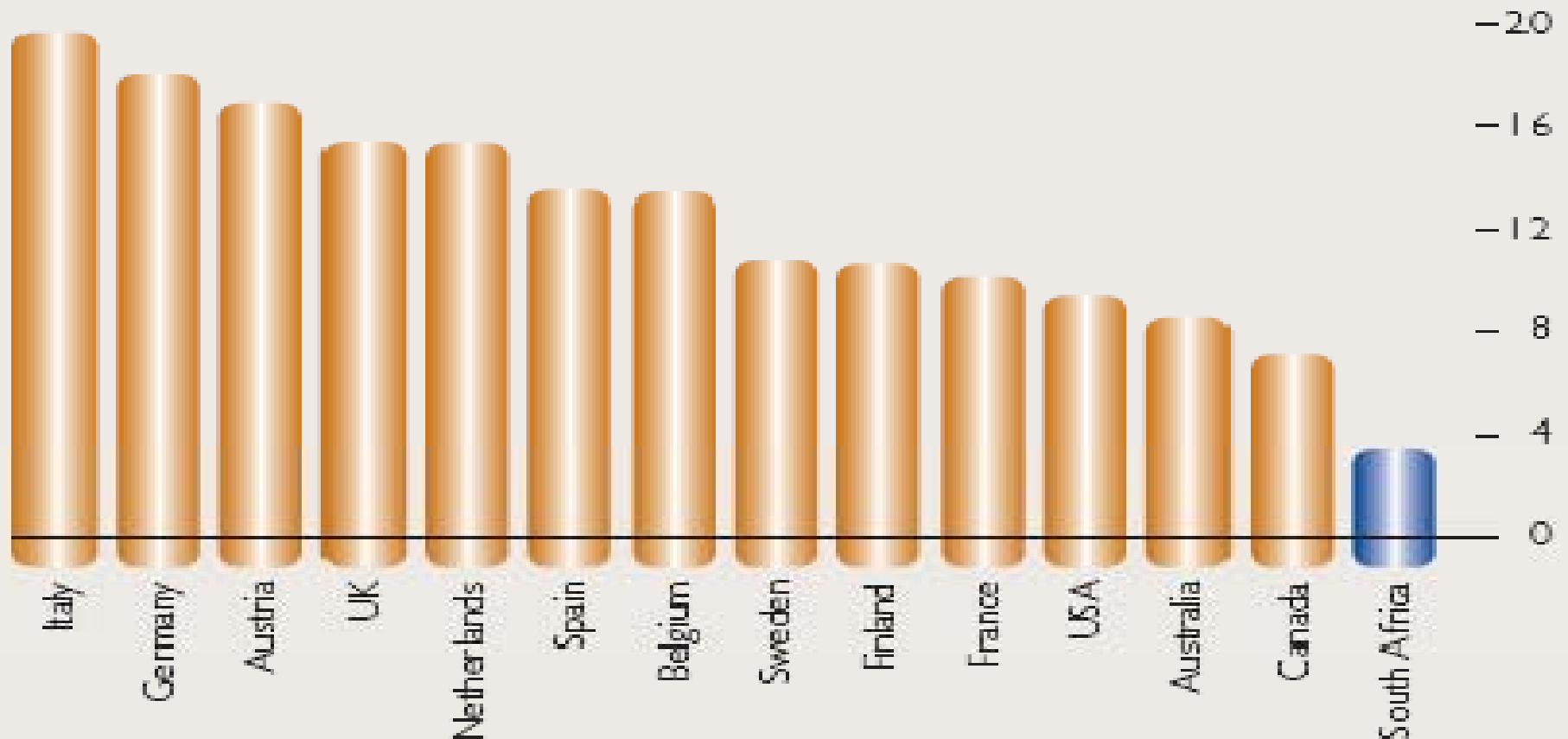
- SOEs increasingly criticised for inefficiency
 - Particularly for investment
- Anticipate need for new capacity 2006+
- Municipal discos inefficient, need reform
- Consensus model – liberalise, unbundle, encourage new IPPs, privatise, regulate ...
- Debate on reform starts – conferences, reports, models,.....

Eskom's average selling price deflated by CPI



2008 Electricity cost comparison

US cents per kWh



The survey is based on prices as of 1 April 2008 for the supply of 1 000kW for a site with a monthly usage of 450 000kWh. All prices are in US cents per kilowatt hour and exclude VAT. Where there is more than a single supplier, an unweighted average of available prices was used. Where available in each country and widely used by the consuming public, deregulated or liberalised contract pricing was used in this survey.

Source: Extract from ©2007 – 2008 NUS Consulting Group International Electricity Survey and Cost Comparison, April 2008

Where are we now?

- Little progress, privatisation abandoned but IPPs still to have at least 30% of (new?) capacity
- Regulator created, but prices still based on historic AC
- Demand has (predictably) outstripped capacity
 - reliability falling, new build delayed, costs rising
- Challenges:
 - Security of supply needs to be restored in G, T & D
 - Prices are below LRMC and need to be raised
 - Reconsider restructuring options?
- How should prices be set?

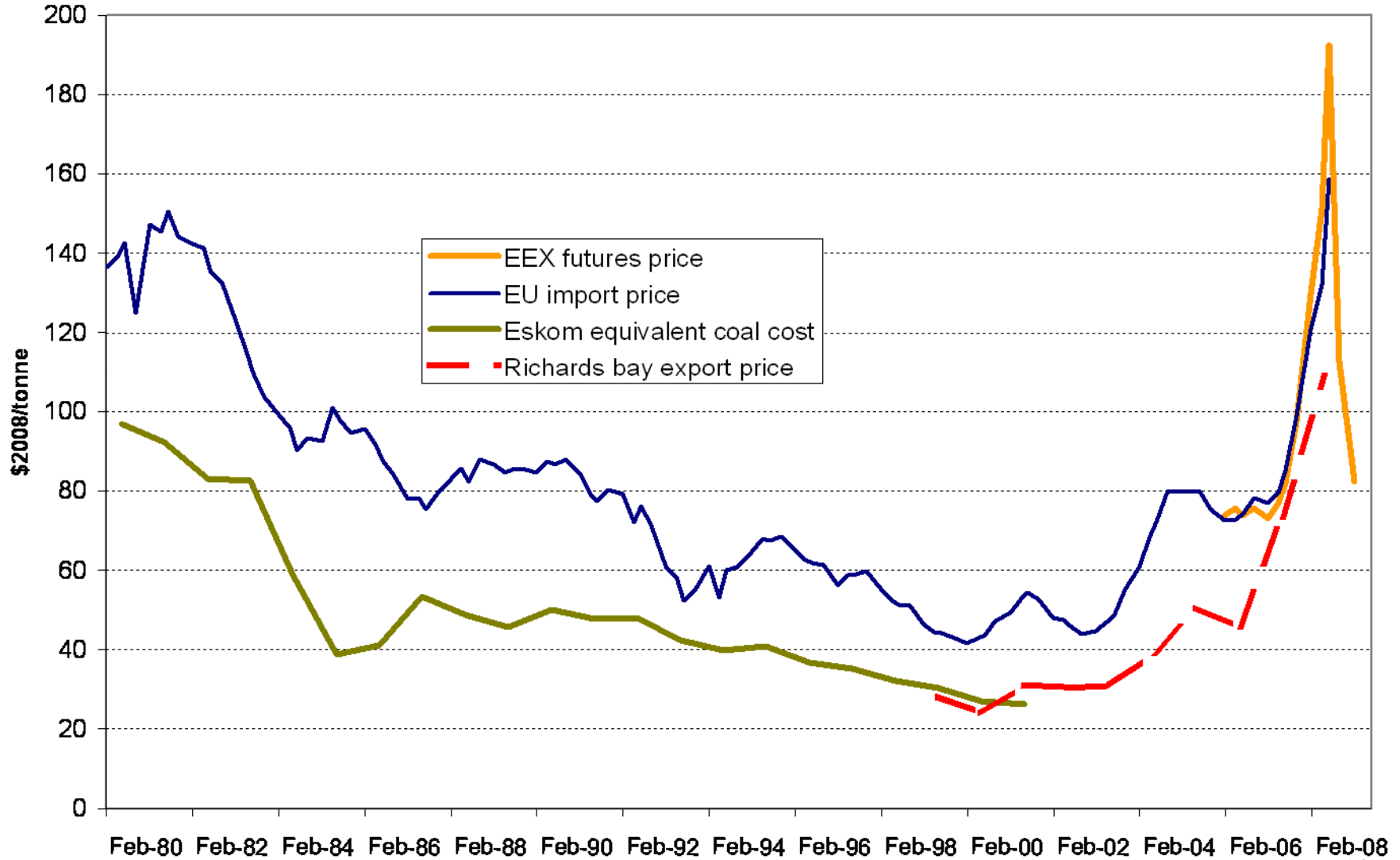
Eskom's prices and costs

- Eskom's sales price is low and falling
- Coal costs are low by international standards
 - but are beginning to rise rapidly
 - and peaking comes from OCGT on distillate!
- Capital costs of new coal are high
- Efficient pricing when investment needed:
 - annual cost = LRMC > current price

Current underpricing is inefficient, and short-changes owners = the people

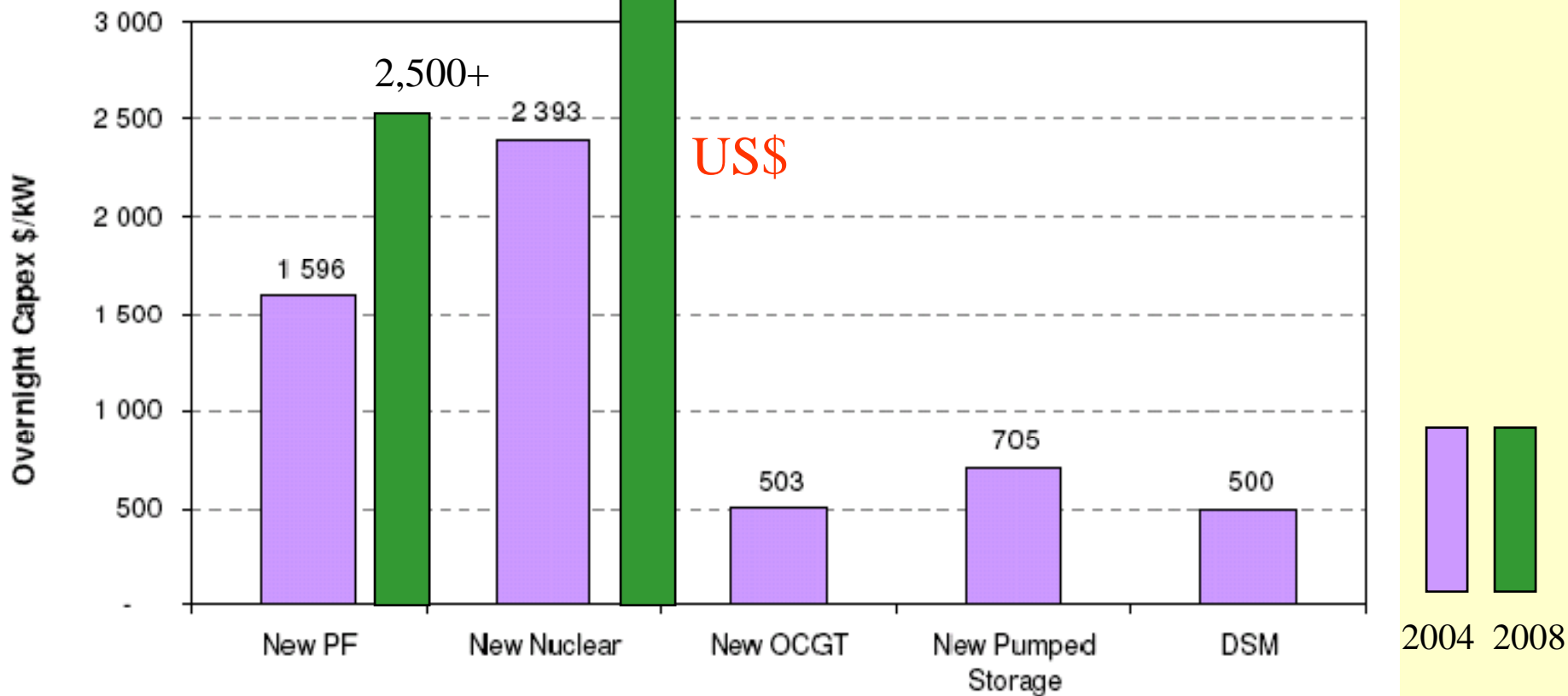
Coal costs to Eskom and in EU

Coal prices US\$(2008)



Note: for Eskom at same MWh/tonne as for EU

Energy and capital costs



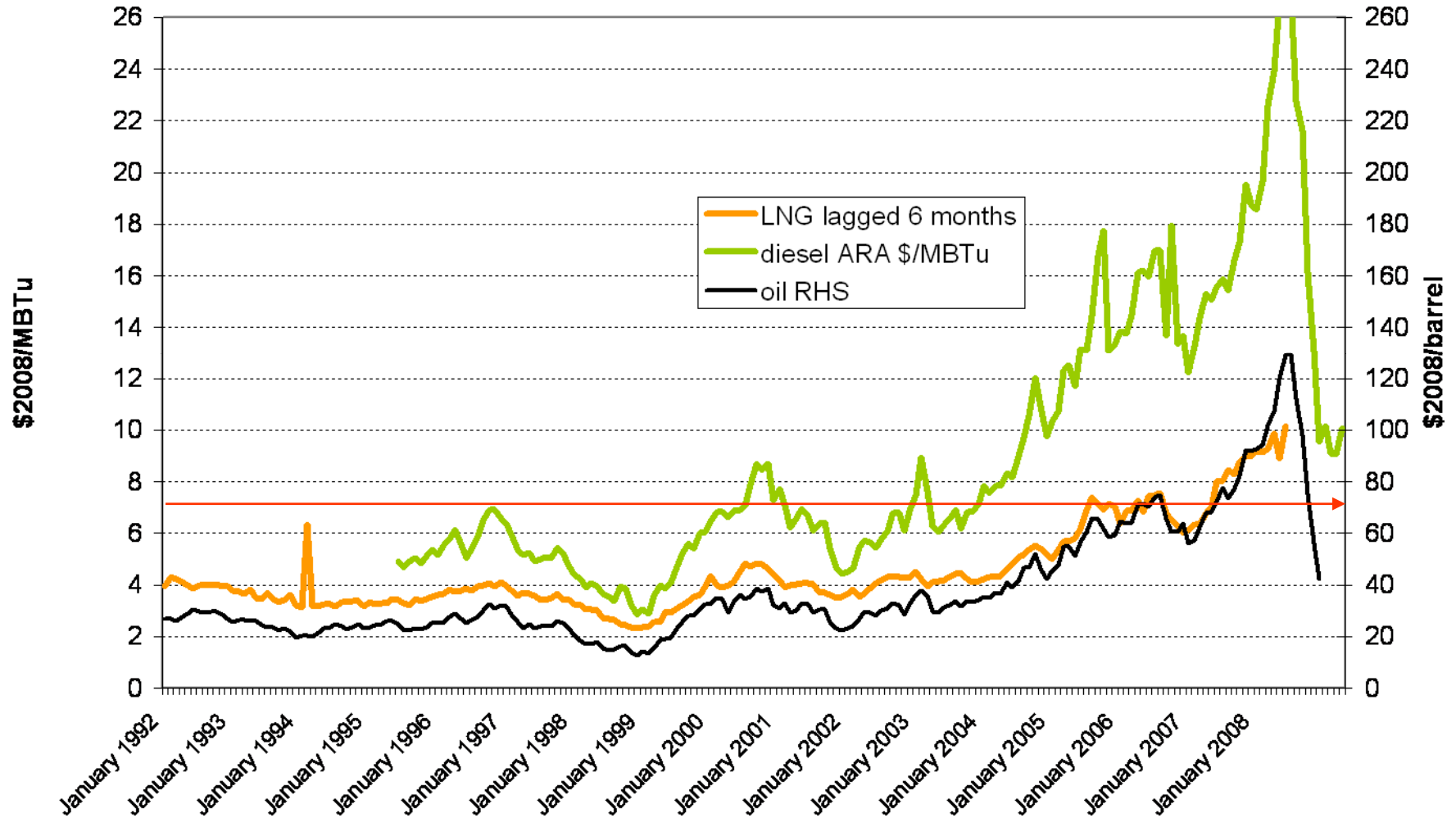
Variable costs: Coal US\$3/MWhe (2001) **\$9 2008 ??**

LNG: \$56/MWhe, distillate in OCGT = \$130/MWhe (at **\$7/mmBTU for gas**)

Peak price (Megaflex) = ZAR630/MWh=**\$76/MWh 08/9**

Oil and gas prices

Real European gas and oil import prices US\$(2008)



Coal vs other fuels

- gas was costly in 2003 at \$3.50/mmBTU
- since then price has more than doubled
 - as has oil and distillate, lower in 2009
- coal capex is rising fast
 - world coal prices trebled, then fell back
- nuclear - too expensive, now off agenda
- but 100 MW wind planned for 2010

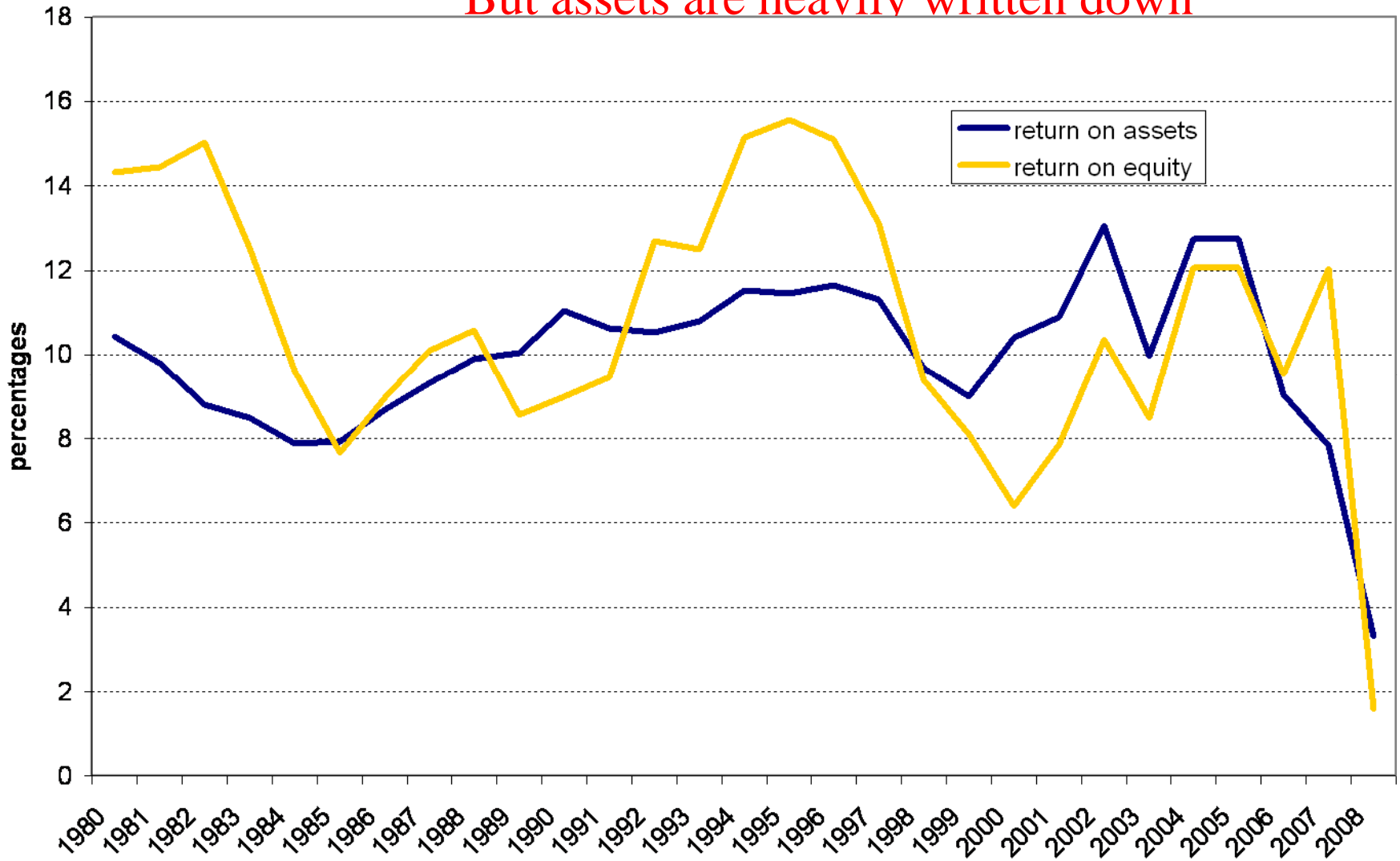
Eskom's pricing

- Based on average historic cost
- Forward price projections based on need to finance new investment
 - share of new capex large relative to RAB
 - Eskom wants large increases **over next 3 years**
- Scarcity pricing ($SRMC > LRMC$) generates huge price rise **now**, resisted by NERSA

Conflict between politics and economics

Accounting rates of return

But assets are heavily written down



Eskom's 2006 asset values

= 57 ZAR bn historic cost in (\$8.4b)

Optimal deprival value = 335 ZAR bn (\$50b)

but capital costs have risen increasing ODV

Economic return = 2.3% on ODV in 2006

has since fallen sharply

Suggests serious underpricing

Pricing

- Prices: 2006 = \$25; 2009=\$30/MWh *average*
 - megaflex *peak* = \$76/MWh 2009
- ODV 2006 value + WACC of 8%: prices should to **\$40/MWh average**
- LRMC 2008 = **\$53/MWh av.** (our est.)
- LRMC 2008 **\$103/MWh av.** (recent SA est.)
 - *now falling with declining fuel prices*

What are the right prices to set?

Pricing in liberalised markets

- for private investment wholesale price must satisfy investors
 - they must expect prices at or above LRMC
 - future risks (cheaper alternatives) => higher discount rate
- test: does the market price reward PPAs?
- Would energy consumers sign PPAs?

Pricing

- Efficient prices important for marginal demand
 - => LRMC for new energy-intensive users
(Aluminium planned at Cape)
 - benchmark against IPP PPAs
 - => Target price increases on larger customers
 - => raise peak prices, energy prices relative to fixed charges

Eskom should be a cash cow, not a hungry dog

Pricing for SOEs

- Long-term contracts linked to LRMC
 - fixed volumes, cover capacity + energy costs
 - benchmark against IPPs
- Marginal demand (+ve and -ve) at SRMC
- slows adjustments for domestic consumers
 - in SA only 20% of demand
- Consistent with single buyer model

Climate change and financial crisis

- Eskom selects plant with shadow price for CO₂ and participates in CDM
 - *but CO₂ price not reflected in tariffs*
- Approved capex of R343 b to 2013 (\$42b)
- Eskom placed on credit watch Feb 2008
- Govt makes R 60bn (\$7.3b) subordinated loan
- Feb 09 guarantees R176b for 5 yrs (\$21.3b)

Conclusions

- Eskom has been adept during the transition
 - in electrification, securing political support, improving performance, setting standards for Discos
- Challenge: financing and delivering efficient investment and performance in all segments
 - starting from a low price but with valuable assets
- Regulation & governance:
 - clarify responsibilities for investment, pricing, IPPs
 - decide on suitable pricing model => to reassure creditors!

Electricity Investment in South Africa

David Newbery, EPRG

EPRG Spring Seminar

Cambridge: 15th May 2009

<http://www.eprg.group.cam.ac.uk/>

Acronyms

AC: average cost

DSM: demand side management

G: generation

IPPs: Independent Power Producers

LRMC, SRMC Long-run, short-run marginal cost

NERSA: National Energy Regulator of SA

OCGT: open-cycle gas turbine

ODV: optimal deprival value, like current replacement cost

PPA: power purchase agreement

SOE: State-owned enterprise

T&D: Transmission and distribution

VI: vertically integrated

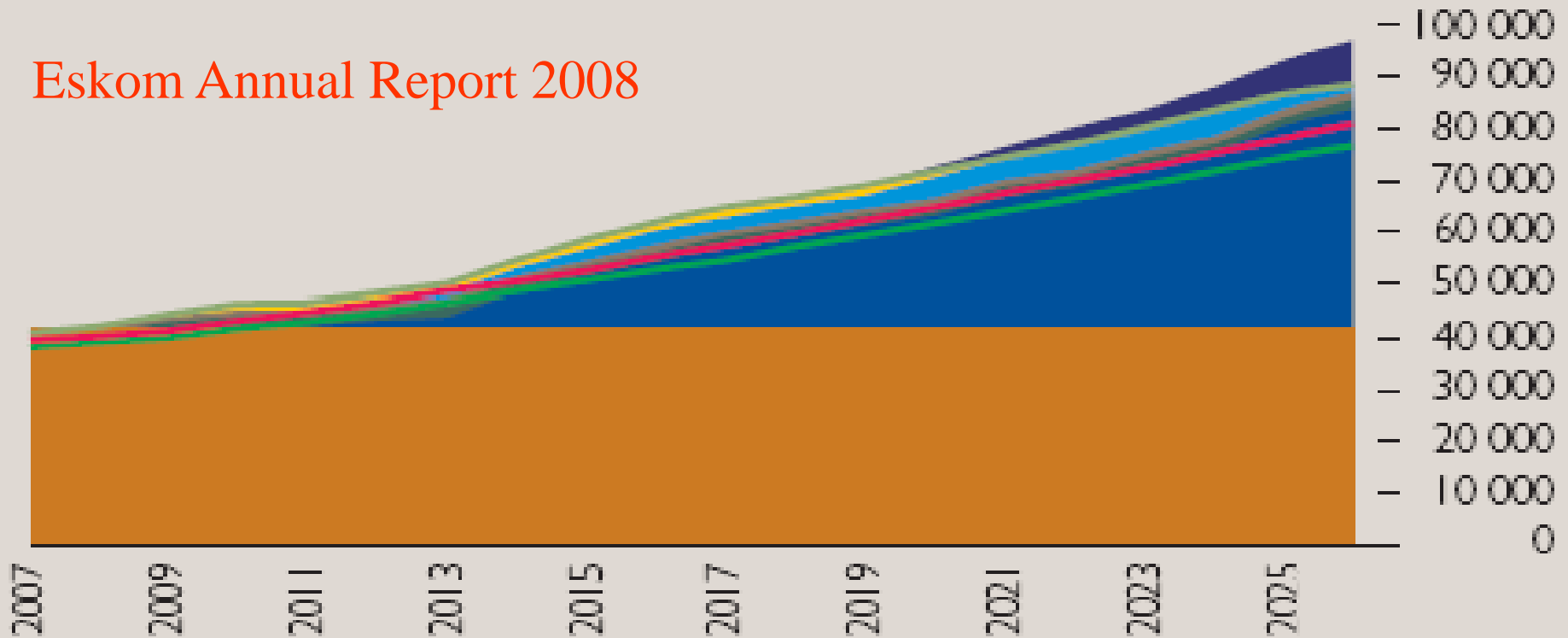
NERSA on pricing electricity

- Tariffs should enhance *economic efficiency*
- Structure and level should be *cost reflective*
 - with possible exceptions:
 - to ease transition, for distributional reasons
- Cross-subsidies should be levied *transparently*
 - licensees should publicise average level of cross subsidy between customer categories

Capacity outlook 2007 to 2026

Load (MW)

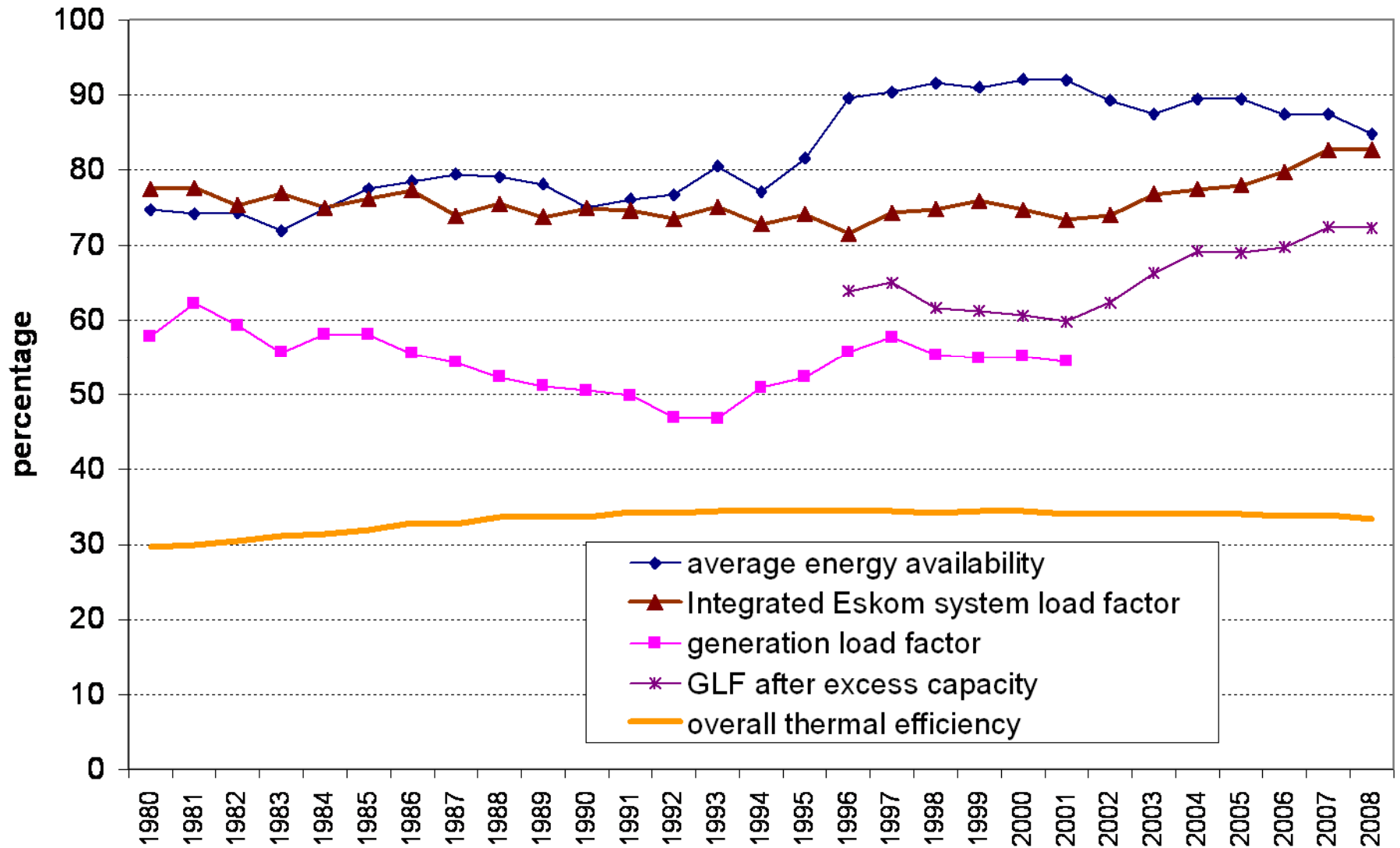
Eskom Annual Report 2008



- Total decommissioned plants
- New peaking power stations (gas and renewables)
- New pumped storage stations
- Cahora Bassa hydro import
- Return to service: Grootvlei and Komati power stations
- New base-load (coal, nuclear and co-generation)
- Total existing power stations (National plus Eskom)
- Total generating capacity (National plus Eskom)
- Peak demand after DSM (MW)
- Peak demand before DSM (MW)

Nuclear cancelled

Eskom Generation Performance



Forward prices in European markets

UK 2010 forward electricity and fuel prices

