



International Manganese Institute

34th Conference, India

What a difference one year makes...

- Will not talk about current prices for Manganese alloy production

- Or about price of power for new projects
 - China: US\$60-80/MWh
 - South Africa: N/A
 - Brazil: >US\$100/MWh

- Lets talk about RELIABILITY

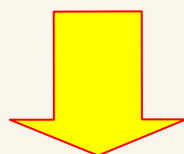
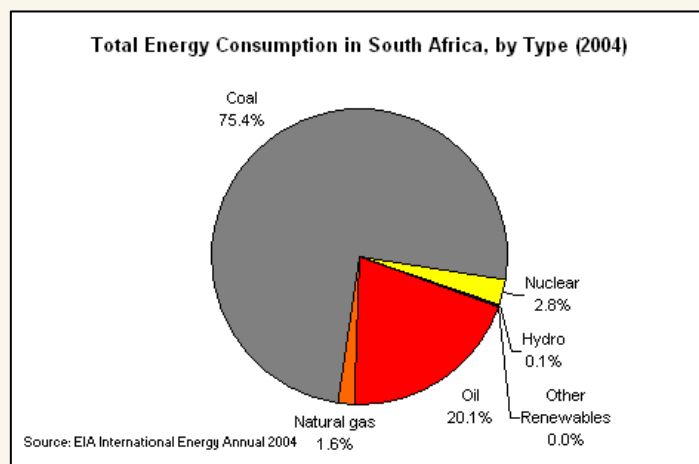
Brazil, China & South Africa: 3 countries with different supply risk profile...

Cross Comparisons	Brazil	China	South Africa
Insufficient reserve margins	Yes	Yes	Yes
Industrials have to cut production	No	Yes	Yes
Weak efficiency in generation	No	Yes	No
Weak efficiency in transmission	No	Yes	Yes
Weak efficiency of industrial consumers	No	Yes	No
Economic Growth	High	Very High	High
Prices	High	High	Low
Energy Matrix	Hydro	Coal	Coal
Power Market Organisation	Hybrid	Hybrid	Single Buyer

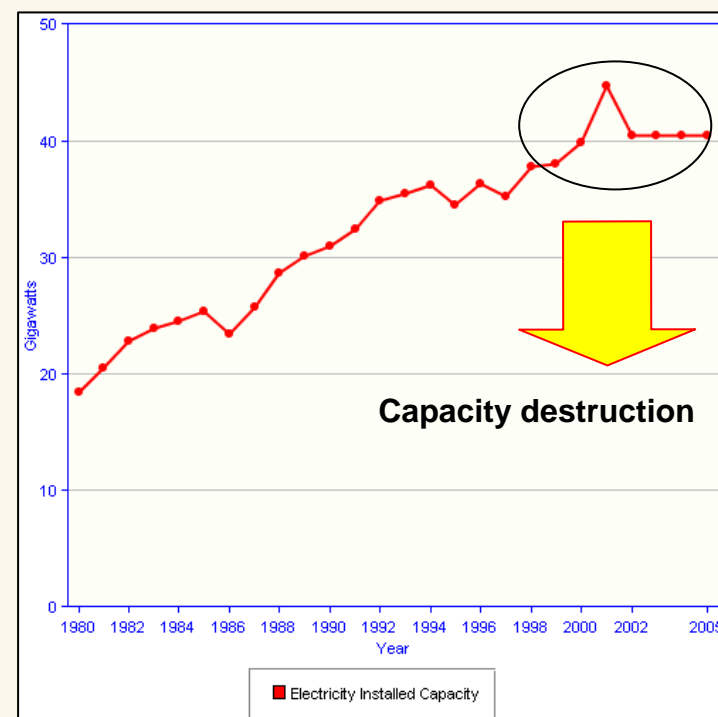
...and different characteristics.

South-Africa – Market Profile

- Eskom generates about 95% of South Africa's energy
- Robust demand growth >4%
- Single buyer market



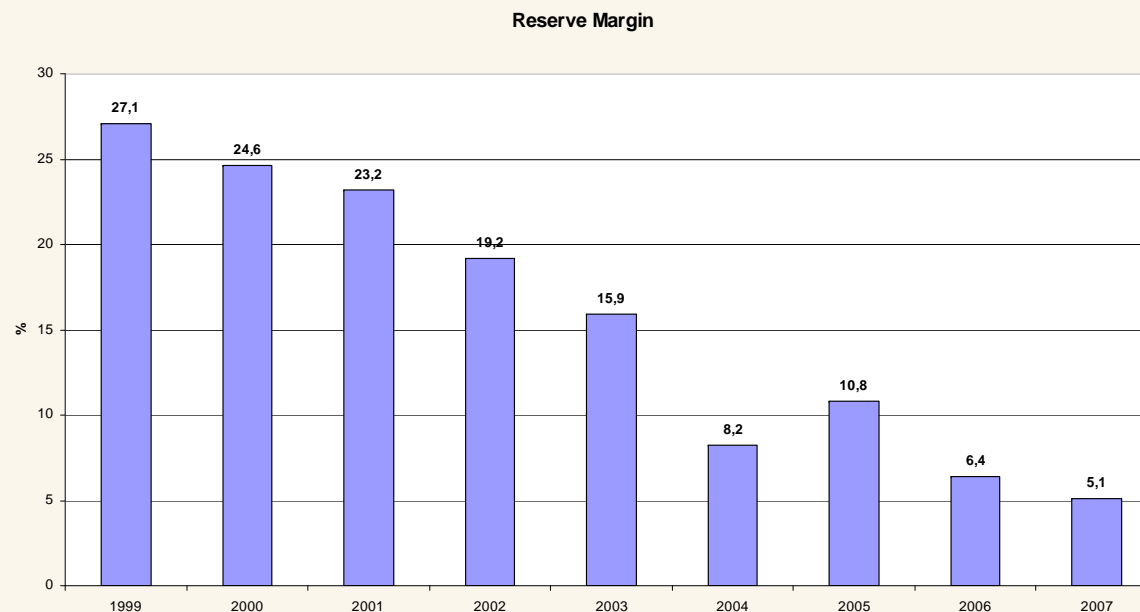
Power mainly generated with domestic coal



Source: DOE

South-Africa current situation is due to: decreasing reserve margins,

- Current reserve margin stands between 4-6%
- **System stability is at great risk**
- Growth will continue with little new capacity additions in the near future



medium planning ineffectiveness and late start of capacity building.

- Power stations` maintenance is compromised
- Mid life power stations requires major planned maintenance and refurbishment
- Some key transmission corridors are constrained

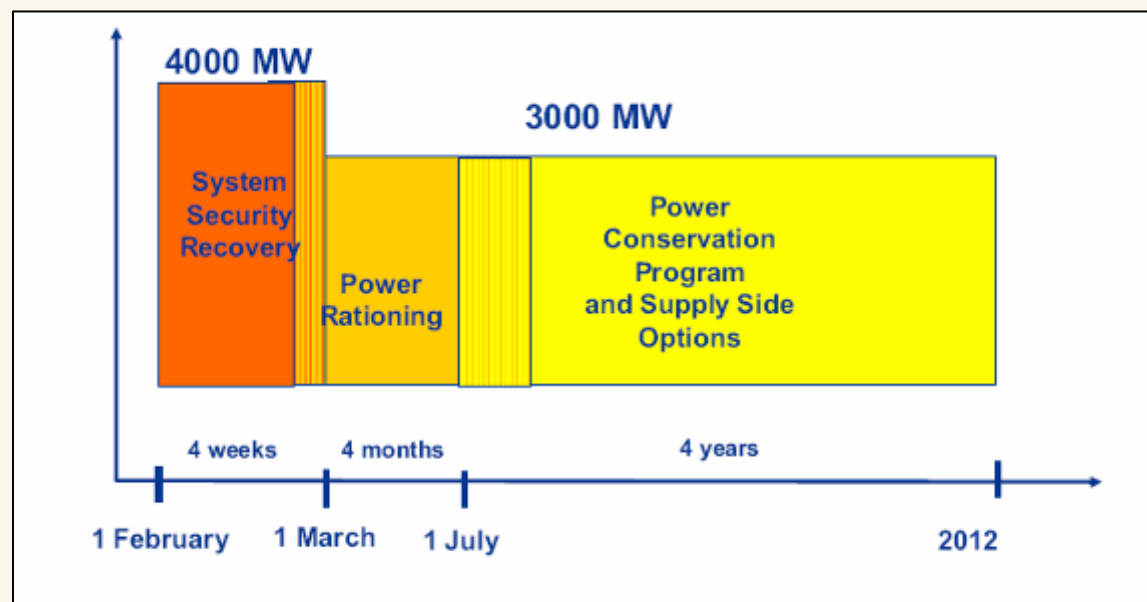
Source: ESKOM

South Africa: Solutions to be implemented...

National Response Plan launched in January 2008

- **Demand Side options**
- Power Conservation Program (PCP)
- Demand side behavioral change programs
- Fast tracking initiatives

...will imply customers cooperation first...



Source: ESKOM

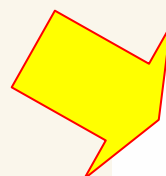
- **Supply Side options**
- Eskom Build Program
- Cogeneration and MW OCGT IPP

...before capacity building.

South Africa: Cooperation from power intensive energy is key...

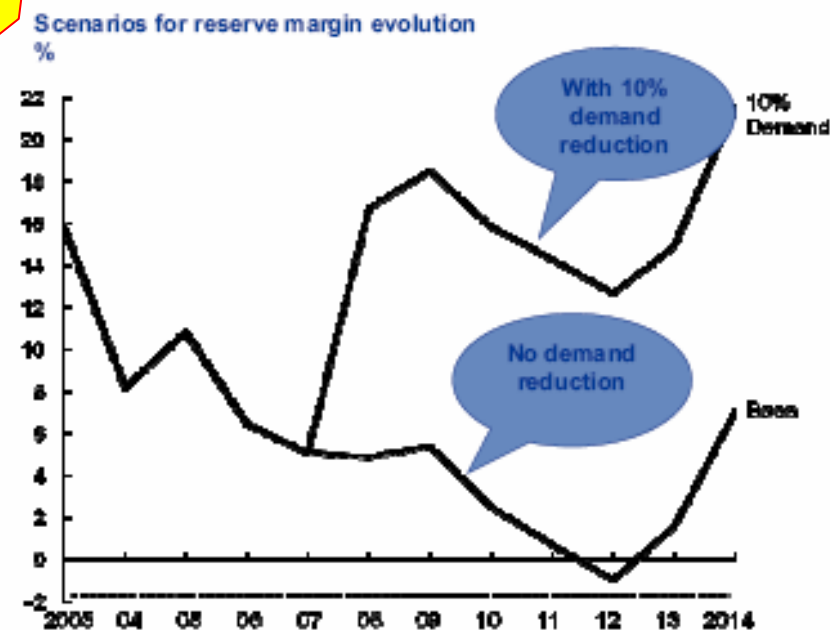
Demand Side Management Targets		2007	2008	2009	2010	2011	2012
Annual Demand Reduction	(MW)	400	800	700	600	400	100
Cumulated Demand Reduction	(MW)		1200	1900	2500	2900	3000
Annual Energy Reduction	(GWh)	350	556	930	1262	944	521
Cumulated Energy Reduction	(GWh)		906	1836	3098	4042	4563

- **Power Conservation Phase** is a key element to managing the current energy crisis and comprises new electrical connections management and existing ones.



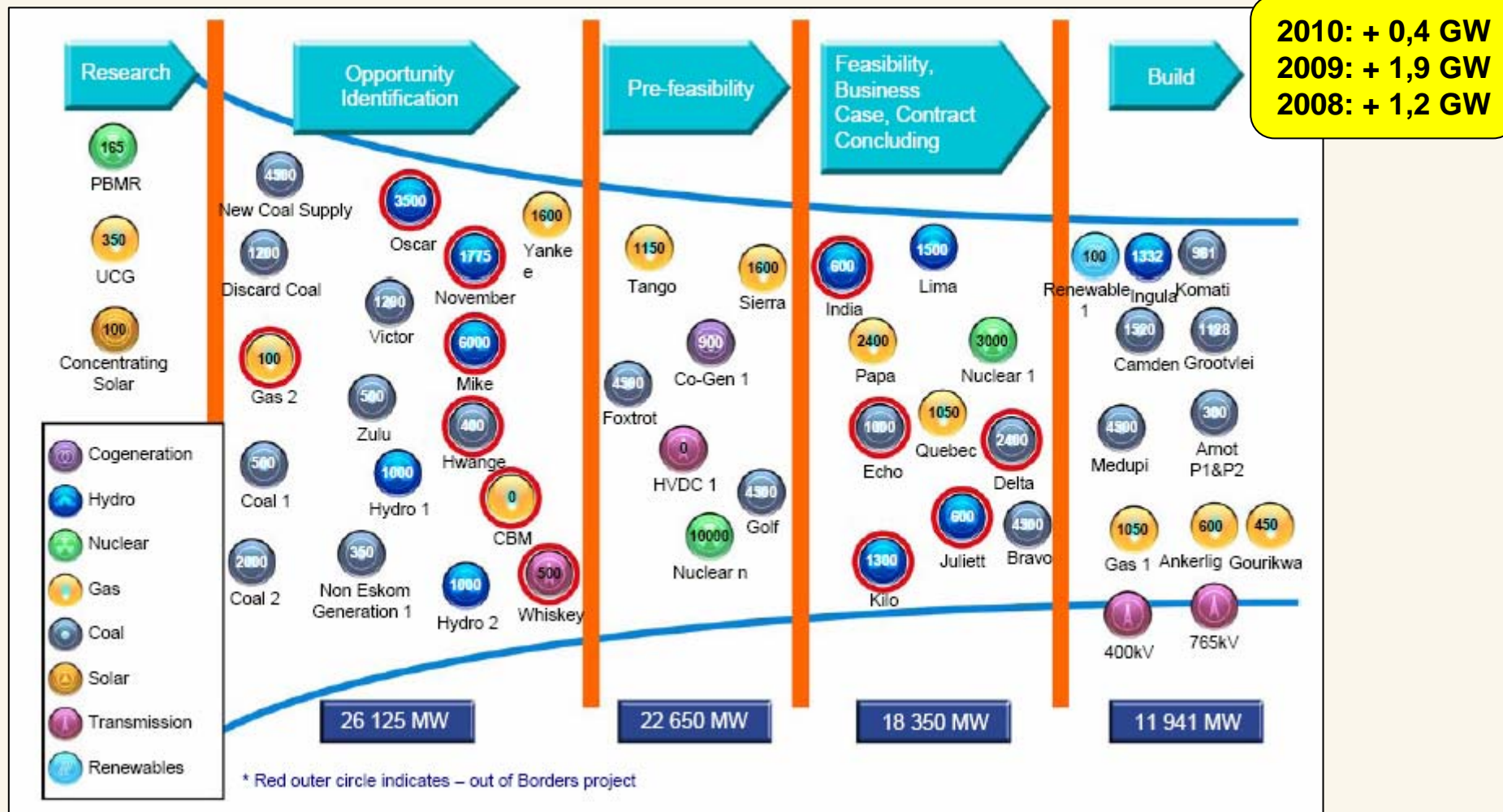
...but still faces critical issues.

- Regulation required
- Stakeholder support limited
- Gaps in Eskom preparation for implementations
- Readiness of municipalities and metros
- **Actual results are far from the 10% required**



Source: ESKOM

South Africa: Capacity expansion progress: looks could kill



Source: ESKOM

South Africa: Capacity expansion progress: 1.200MW needed every year

Current →

Calendar Year	Installed Capacity MW	Capacity additions MW	Arnot MW	Camden MW	Grootvlei MW	Komatl MW	OCCT MW	Gas 1 MW	Medupi MW	Bravo MW	Pump storage MW	Wind MW
2004	36208	0										
2005	36403	195		195								
2006	36780	377		377								
2007	38464	1684	55	590			1039					
2008	39629	1165	60	400	585	120		1036				
2009	41550	1921	60		585	240						
2010	41990	440	30			310						100
2011	42275	285				285						
2012	43073	798							798			
2013	46024	3751							1596	803	1352	
2014	49228	2404							798	1605		
2015	52377	3149							1596	803	750	
2016	54733	2356								1605	750	
2017	55733	1000										
2018	55733	0										
		19525	205	1562	1170	955	1039	1036	4788	4818	2852	100

New Capacity Commissioned	2656 MW
MW in 2008	985 MW

South Africa: others elements to be considered.

Prices will increase

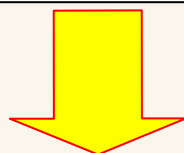
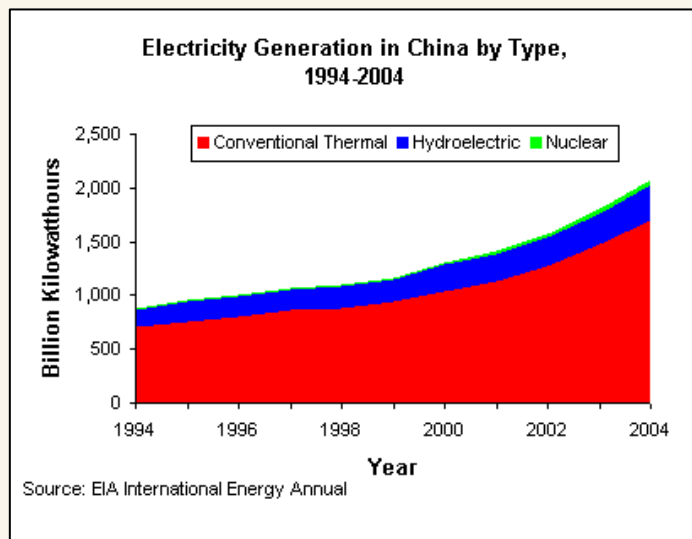
- Necessity to improve Eskom financial structure
- ESKOM was granted a 14,2% price increase in December 2007 and another one in June 2008; 27,5 % total for the 2008/2009 fiscal year
- NERSA (Regulation Agency) indicated that tariff increases of between 20-25% over the next three years in envisaged

Power generation matrix must be diversified

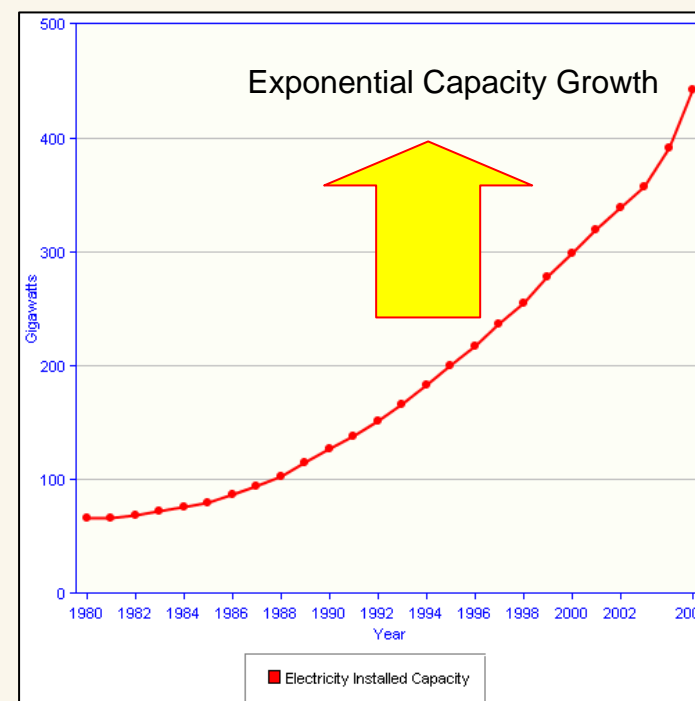
Energy imports are likely to increase

China: Market Profile

- In the 2030 horizon, China needs to add 1.312 GW to its generating capacity, more than the current total installed capacity in the United States.
- Most of it is and will be coal based.
- Heavy Generation & transport losses.
- Hybrid market in Generation & Distribution



Power mainly generated with domestic coal;
Importing coal share is growing



China: A tight power system...

- Power supply remained tight during Q1 2008
- Year 2008 Total Power Demand should be around 3600 to 3670 TWh
- Power shortage of up to 18 GW during summer
 - 10 GW in East China; Central China & Northern Grid China
 - 8 GW in Southern Grid
- Guangdong Province alone is expected to have a 5,5 GW gap in summer peak season; although gas-fired power generation may ease the shortage with spot imports of LNG arrive
- Government is pushing for nuclear power generation growth

... Challenged twice by mother nature.

(1) Snow Incidents: blackout in China

- 30 GW has been brought down; since then restored
- Generation losses around 26 TWh; around 3% of the total power demand in Q1 2008
- Nuclear power plants have been producing more
- USD 22 Bi loss in infrastructure
- Power grid of Hunai; Jiangxi & Guizhou heavily affected; since then restored

... Challenged twice by mother nature.

(2) Sichuan Earthquake: pressure on capacity expansion.

Short Term effects

- Increased the risk of coal shortage :(2350 mines were shut down; 600 damaged) an overall capacity of 100 millions tons
- Power shortages due to infrastructure destruction
- Loss of 28 GW of steam turbine production capacity due to Dongfang (Top 2 turbine manufacturer), factory destruction
 - Delay for power equipment supply through 2009
 - No spare capacity until 2010

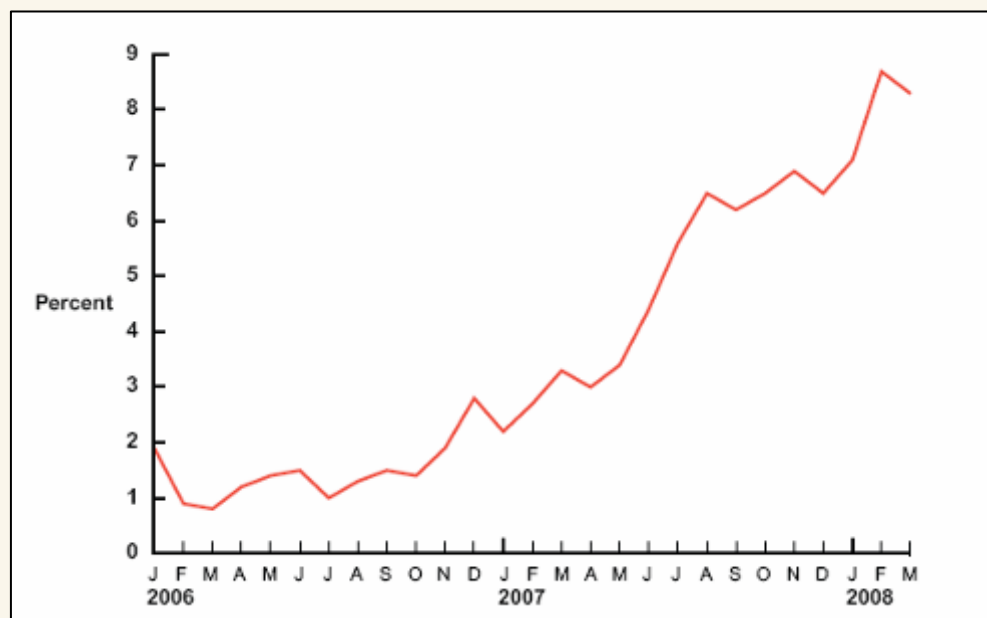
→ Will delay small coal mines & old power plants closure ?

Long Term effects

- Sichuan (120 GW) & Yunnan (98 GW) = 50 % of national water resources available
- 2 most active seismic provinces
- Initial plan to increase from actual 145 GW to 300 GW by 2020 using $\frac{3}{4}$ of available resources
- Siting hydropower & nuclear projects in these zones will be reconsidered

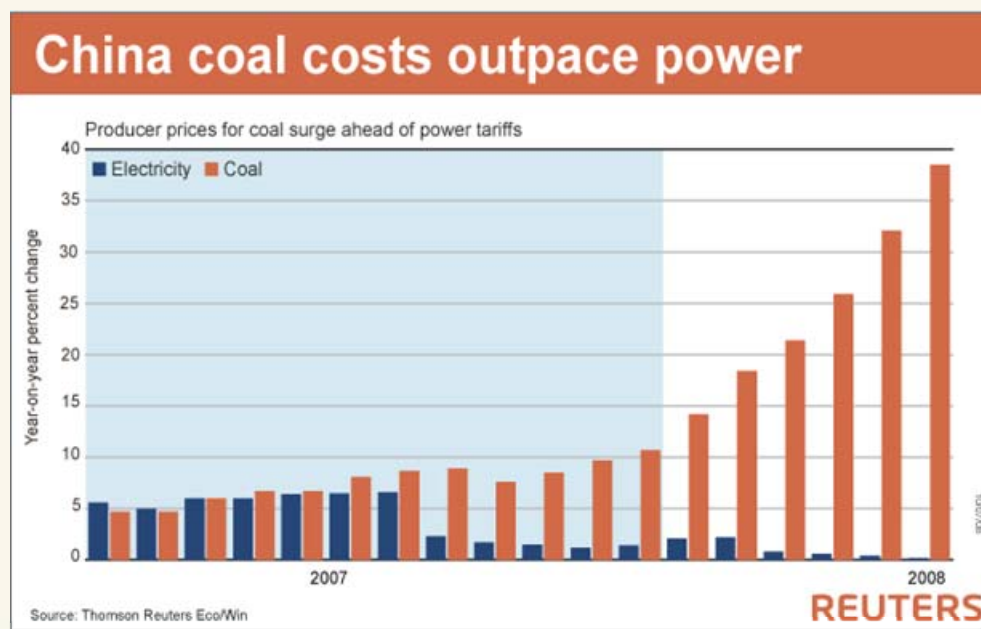
China:

- GDP Q1 2008 = 10,6 % (on a year to year basis)
- GDP Q1 2007 = 16,6 % (on a year to year basis)
- Central government's efforts to direct the economy toward moderation appear to have had some effects
- CPI (Consumer Price Index) reached new high early 2008 and is **Top priority for government**



Strong concerns about inflation will maintain price distortions.

- Central government will maintain cap on power prices (4,7 % increase in the last two years vs >10% inflation rate)
- No cost pass through = Generators companies in the red
- Generator reluctant to increase coal inventories
- And will also cap coal prices (which was floating until last June)



Pressure on Coal prices due to...

Closing of small mines policy

- 300 millions tons capacity shut down
- 3 years plan to shut down small, inefficient and often-dangerous coal mines
- From 1995 to early 2008, coal mines have fallen around 80% to about 16.000
- Government's goal is to reduce the number to under 10 000 by 2010; eliminate by 2015

Possible solutions for the Chinese situation.

Solutions

Allow market to set power tariffs

Delay closing & reopen small coal mines

Boost capacity ramp up

Energy Management Programs

Delay closing of small, local generating facilities

Observations

Faint chance as inflation's at record high

Conflicting signal with local government

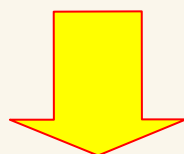
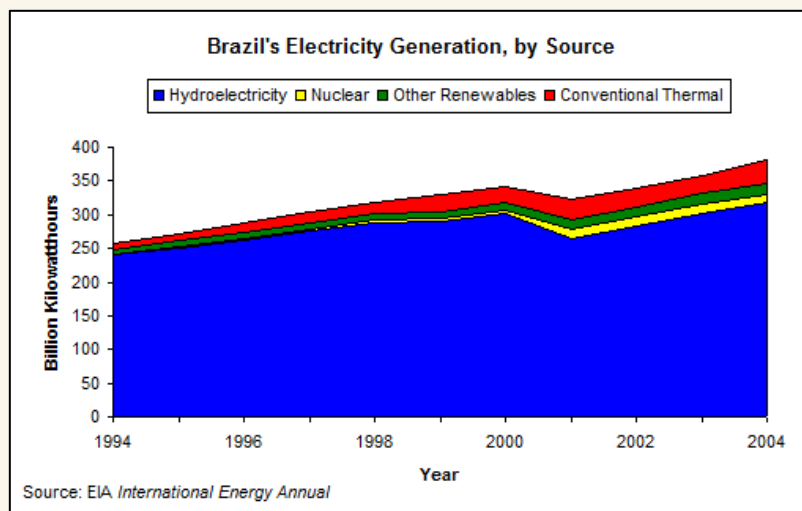
VAT exemptions; Preferred loans; Subsidies;
Equipment bottleneck;

Energy efficiency programs

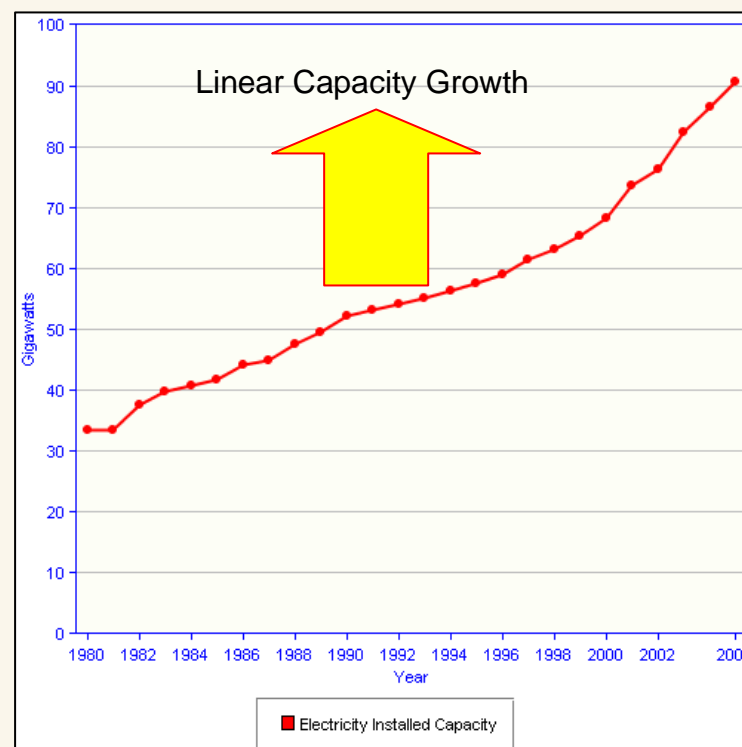
Closing inefficient plants: Generation or Industrial
consumer

Brazil – Market Profile

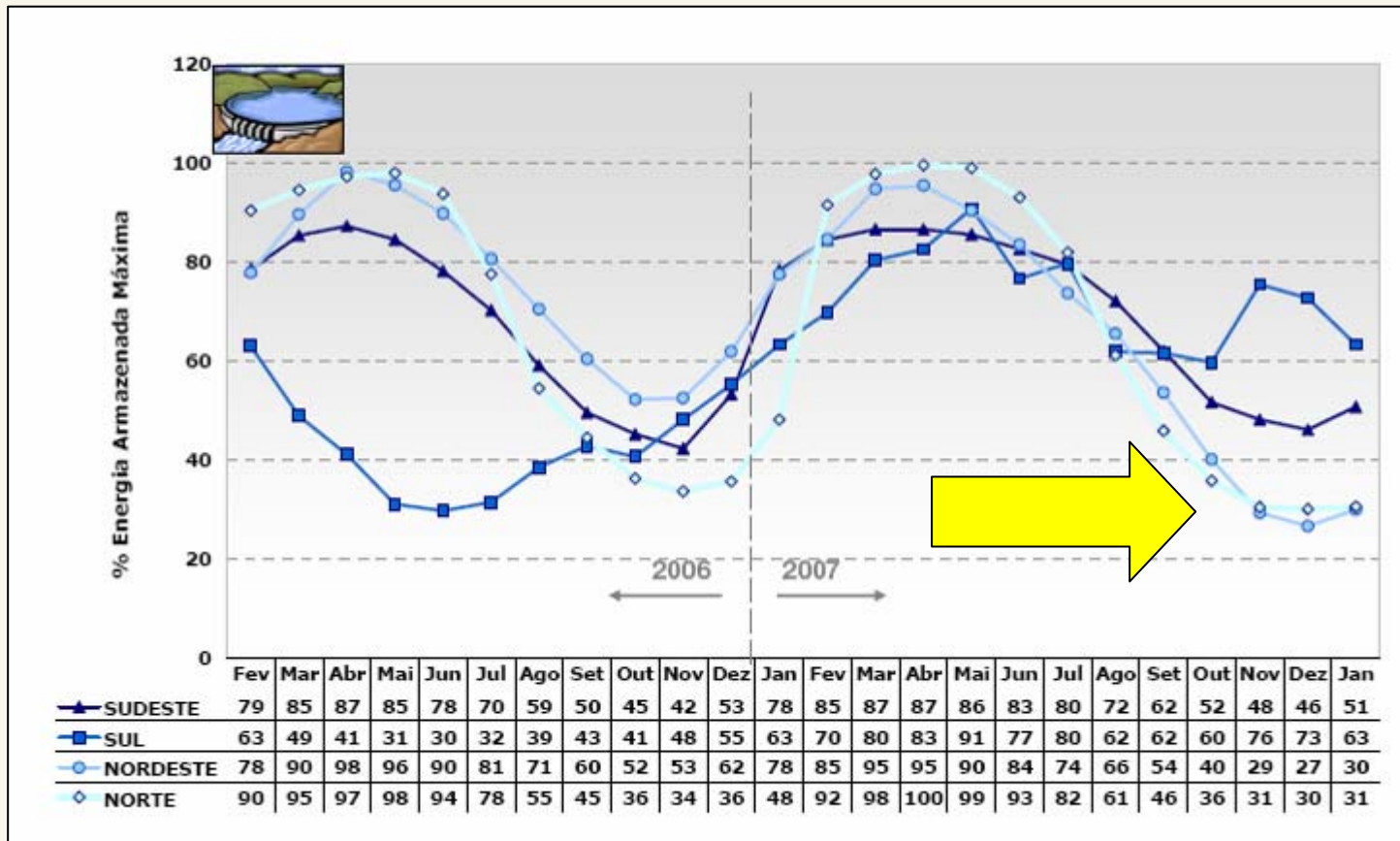
Open Market
 Generation Companies can sell directly to market (in theory)
 They have to reserve a part of energy to distribution company
 Dispatch is centralized



Power mainly generated by hydro capacity
 = Huge dependence of rainfalls seasons

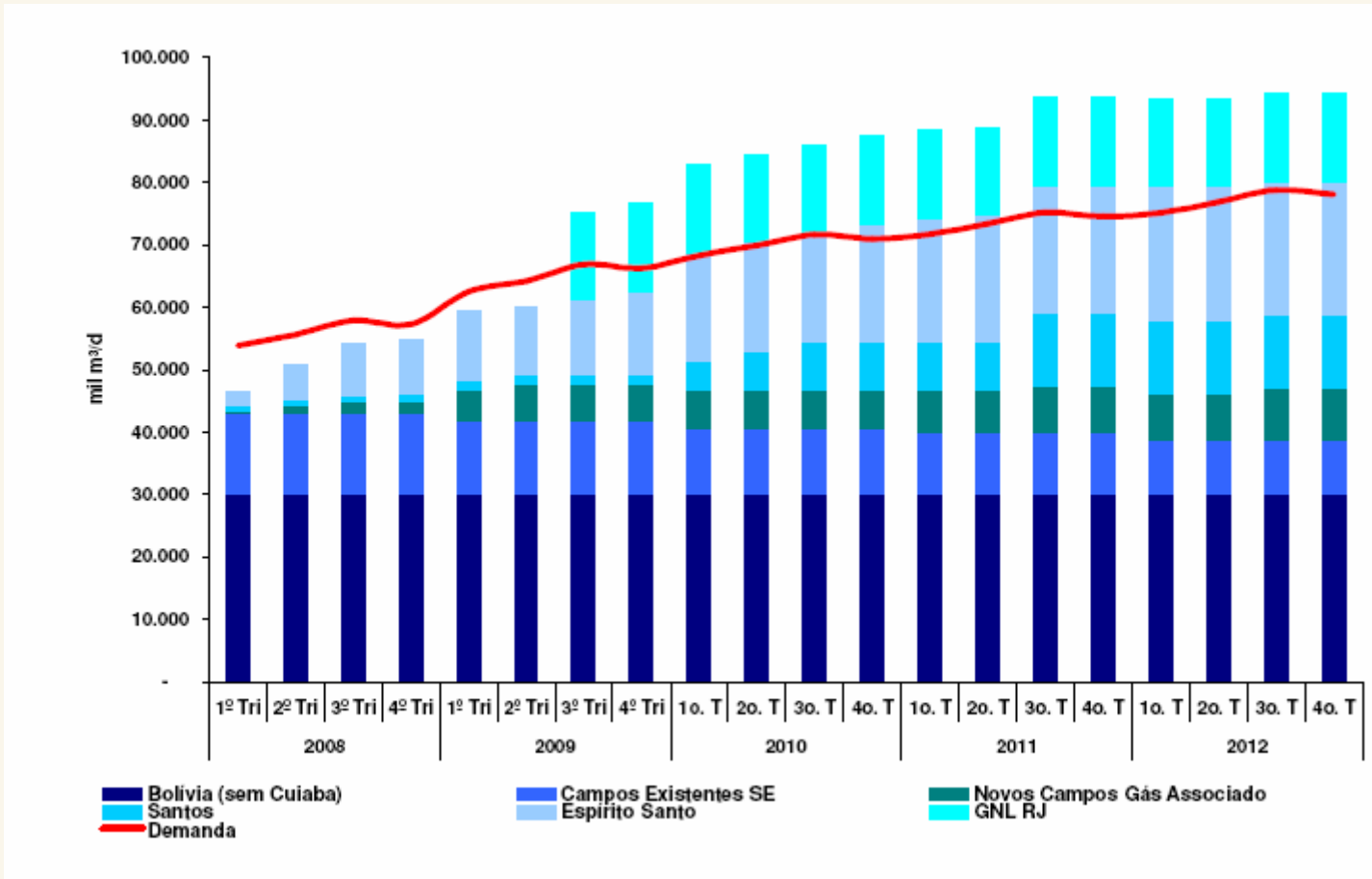


Brazil: Due to lower rainfall...



Source: PSR

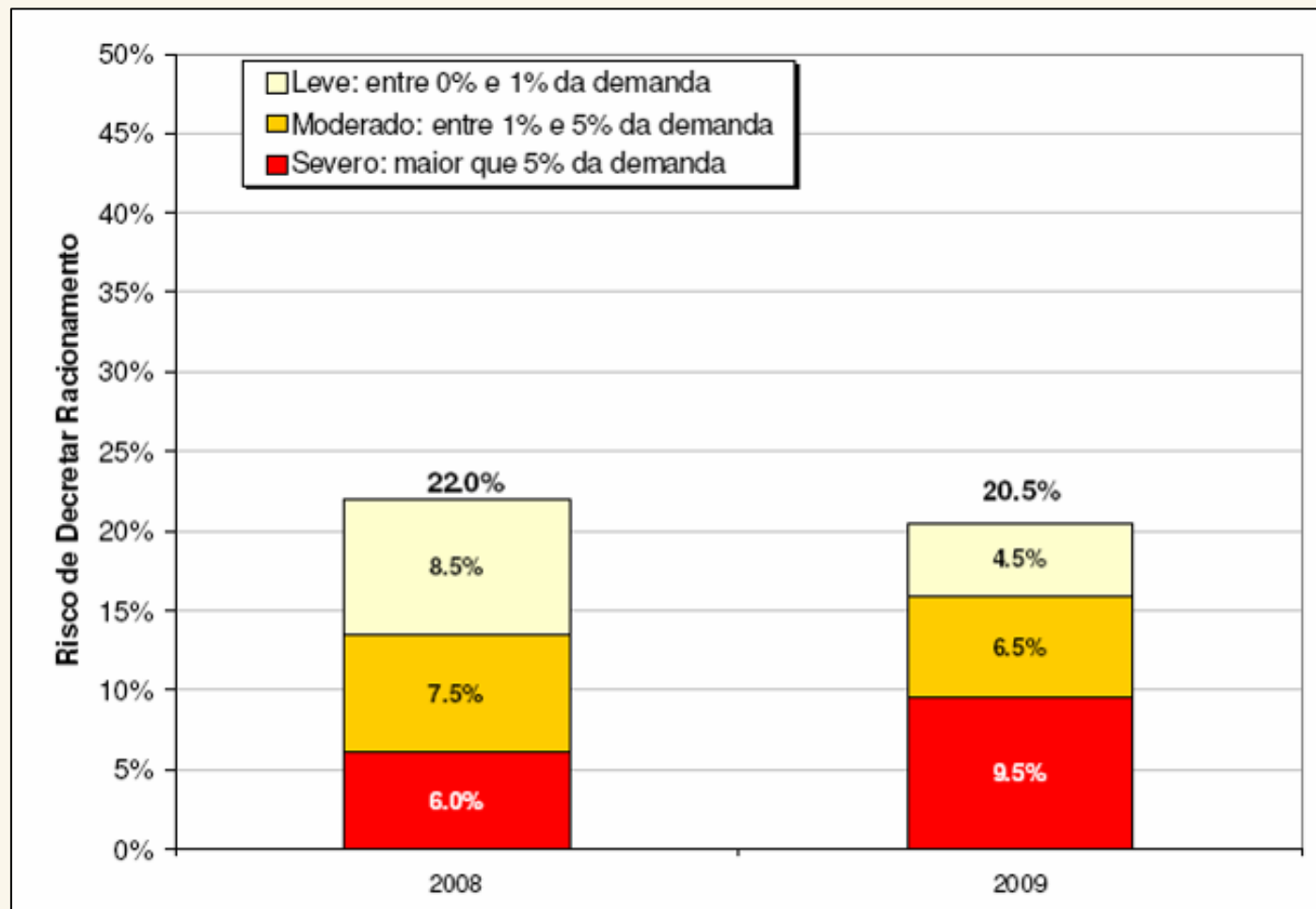
... and natural gas shortfalls...



Source: PSR

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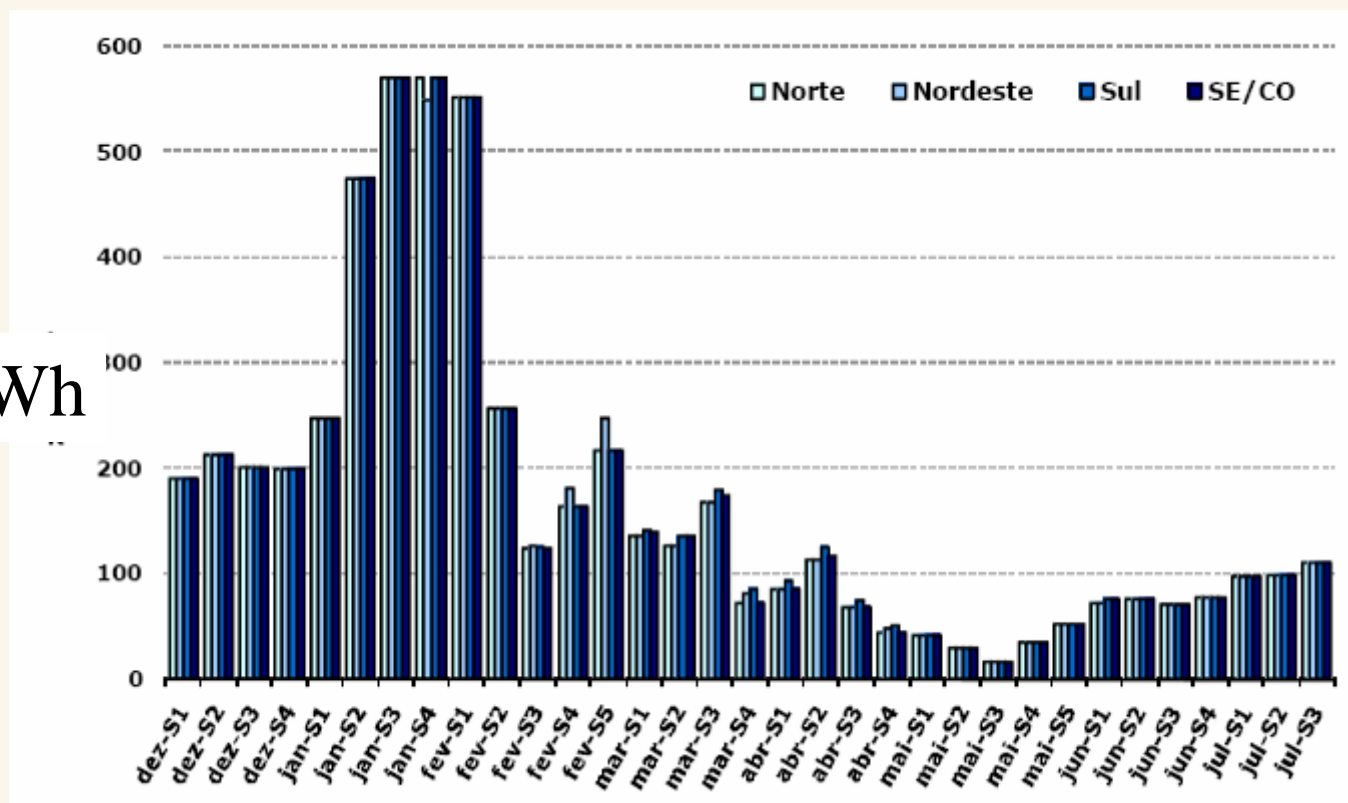
Is exposed to rationing risk...



Source: PSR

Pushing prices on the spot market.

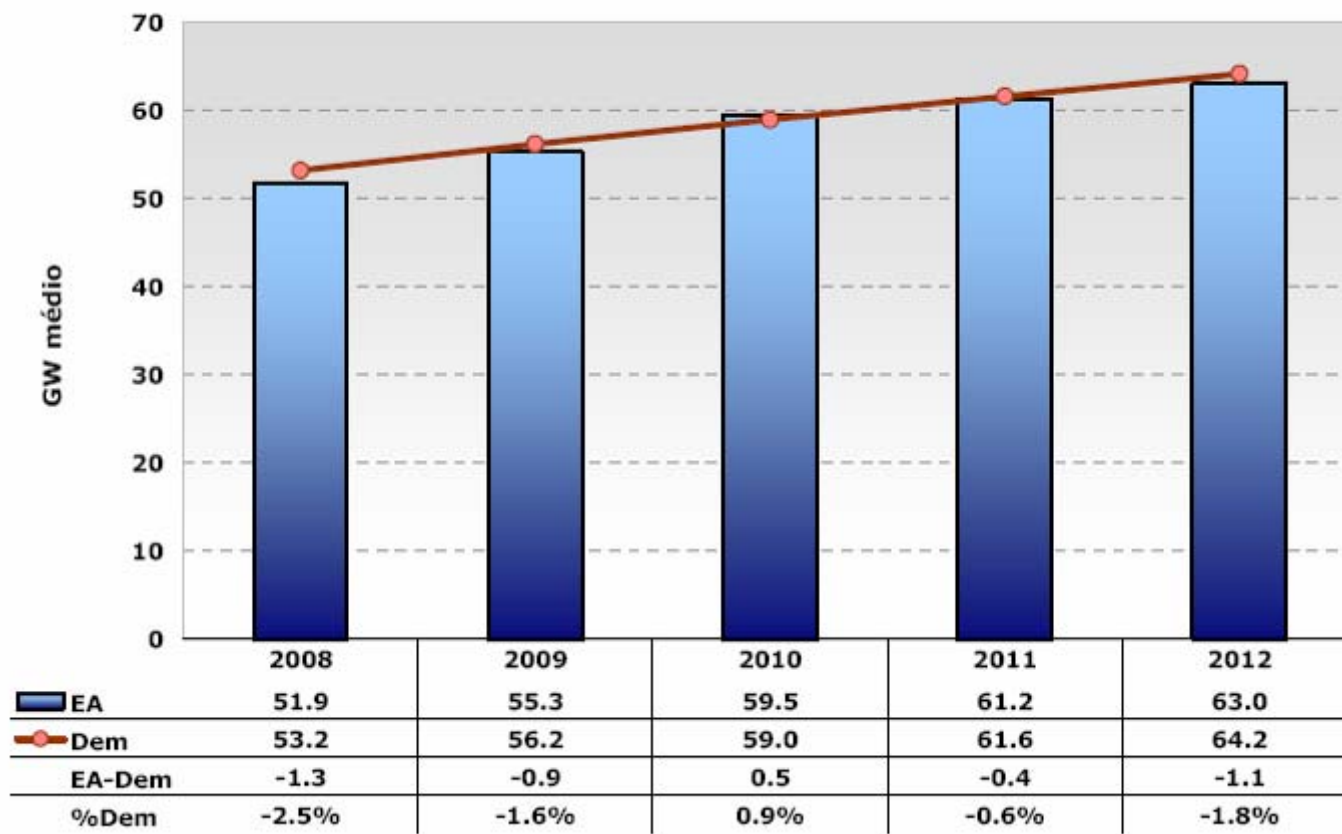
R\$/MWh



1 USD = 1,7 BRL

Source: PSR

Brazil: No reserve margin until 2012



Source: PSR

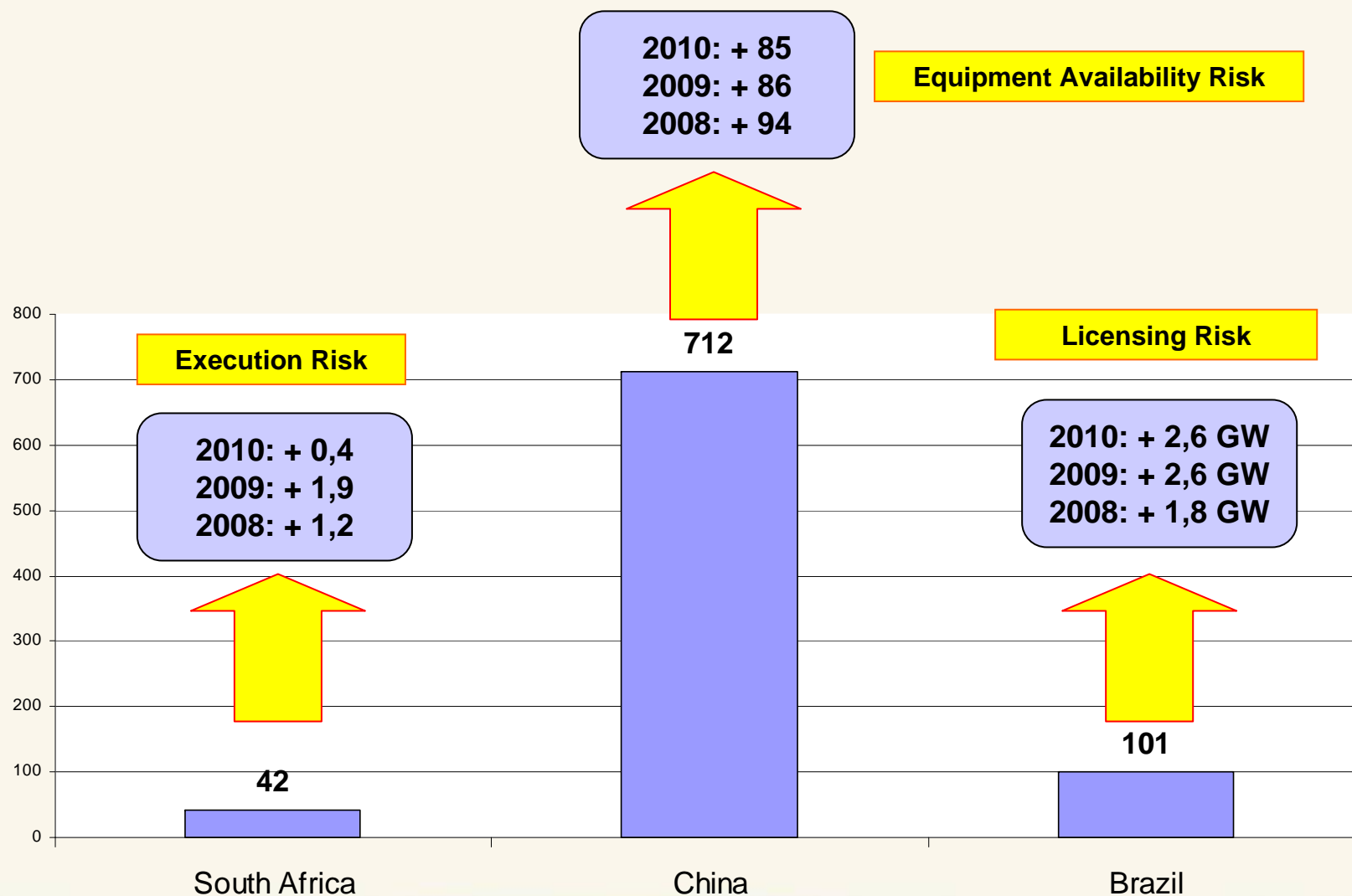
What should be done in Brasil

Possible solutions for Brazil

- Government is active in preserving hydro power (not concerned about cost)
- Diversification of energy matrix increasing Nat Gas and Coal participation
- Biomass and Small Hydro play important role
- Expedite permit process for new generation

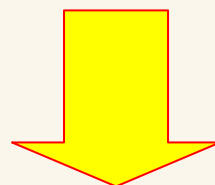
Brazil, China & South Africa: Conclusions

Growth of Installed Capacity (GW): different challenges ahead.



Brazil, China & South Africa: industrials should take care of their power needs

In the short term supply demand balance will remain vulnerable with strong probability for load shedding or at least growth limitations



Industrials will have to implement their own energy supply strategies or be exposed to government management decisions.

Energy Efficiency

Even though focus today is on reliability, don't lose focus on cost