

# **A Sectoral Approach in Evaluating the Energy Saving Potential of China**

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# I. Background and Reference Paper

## ◆ Background of the Study: [Energy Saving Potential in China]

- Energy Supply/Demand Becoming Tightened in China in 2003
- Energy Price Beginning to Increase
- Local Environmental Pollutions Becoming Severe, as well as Global.

## ◆ Reference Paper

- [Japanese Paper] Shen Zhongyuan (沈中元) [2003]、 「中国の省エネルギー潜在力」 『エネルギー経済』 秋季号、 第29巻第4号、 pp. 1-14
- [Chinese Paper] Shen Zhongyuan (沈中元)[2004]、 「中国的节能潜力」 『国际石油经济』 2004年12巻第1期、 pp. 1-14
- [English Paper] Shen Zhongyuan ( 2004 ) “The Energy Saving Potential in China”, IPCC Expert Meeting on Industrial Technology Development, Transfer and Diffusion, Tokyo, Japan, September 2004.  
([www.mnp.nl/ipcc/pages\\_media/itdt.html](http://www.mnp.nl/ipcc/pages_media/itdt.html))

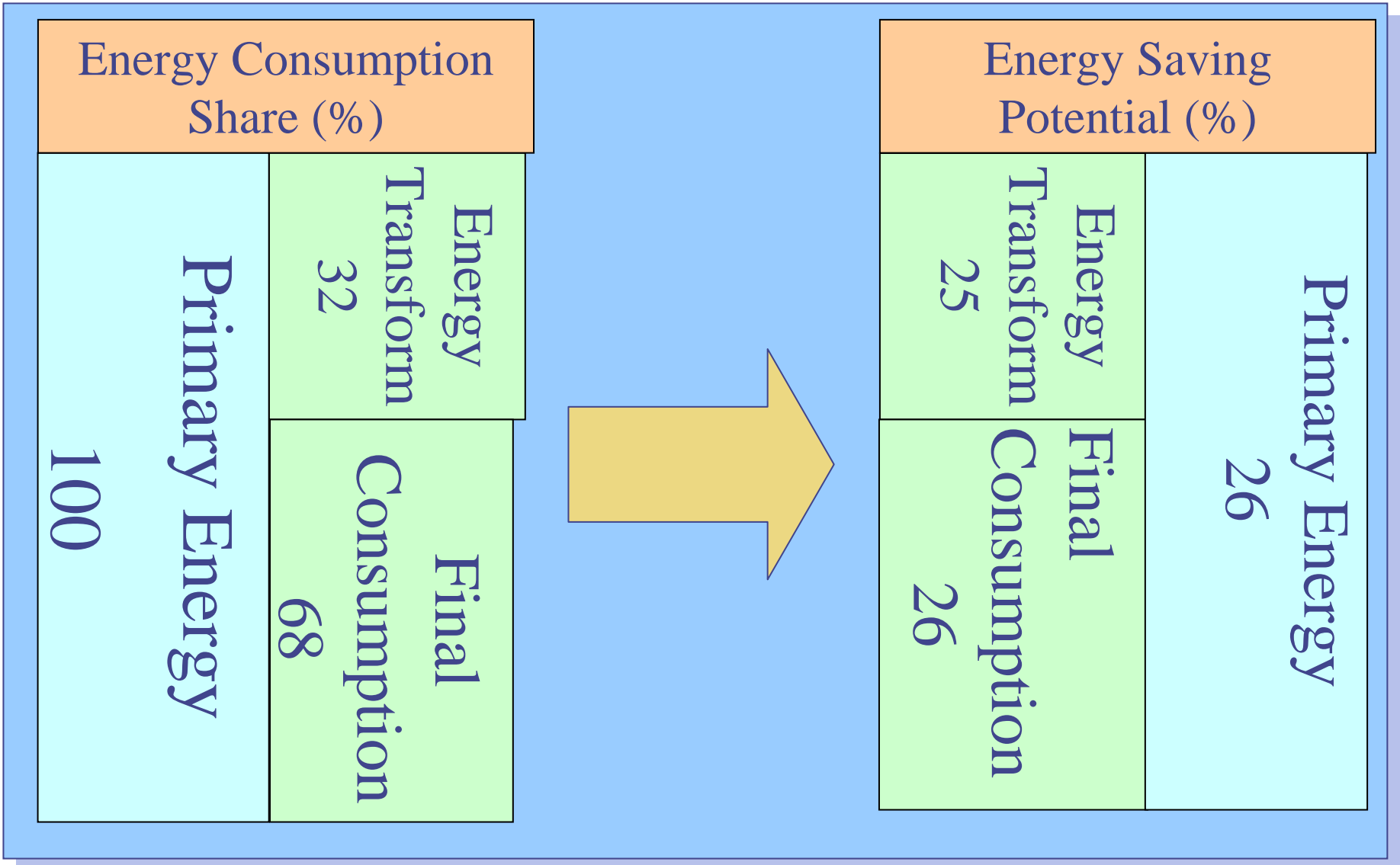
( 2000 )

Energy Consumption Share (%)				Efficiency (Japan) [Saving]	Saving Potential (%)
Final Energy Consumption 68	Industry 41	Iron & Steel 24	Crude Steel 92	781kgce/ton (658kgce)[16]	Industry 25
			Synth. Amm 38	970kgoe/ton (Intl:664)[24]	
		Chemicals 26	Ethylene3.2	784kgoe/ton (500)[36]	
			Cement 77	171kgce/ton (12.1)[29]	
	Resid. 38	Urban 19	Kitchen W 50	Oxide970kgoe(I454)[53] Elec14.3MWh(I13.0)[9]	Residential 28
			Heating 38	K..6%; W..42% Average 45% (60%)[25]	
		Rural 81	Kitchen W 68	K..16%; W..35% Average 25% (T35%)[29]	
			Heating 27	Stock Based 10.8km/L (13.5km/L)[20]	
	Trans 10	Road 62	Gasoline 67		Trans 20
	Final Energy consumption 26				

# I. Energy Transformation Sector ( 2000 )

Energy Consumption Share (%)		Efficiency (Japan) [Saving]	Saving Potential (%)	
Energy Transform 32	Power Gen. 53	Coal Fired 92	33.2% (40.1%)[17]	Power Gen. 17
			Cons. Ratio 23% (17%) [26]	
	Own Use 23	Power Gen. 31	14.3kgoe/flowed-oil (8.9kgoe)[38]	Own Use 44
		Refinery 22	13.6toe per ktoe (U:1.24 A:3.59) [82]	
		Coal Prod 19		
	Coal Transf. 11	Blast Furnace 76	Recov. Rate 29% (52%)[23]	Coal Transf. 22
Coke 24		196kgce per ton (161kgce)[18]		

# I. Technological Energy Saving Potential ( 2000 )



## II. Advantages: Easy to Understand and Accept

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- ❑ Comparison Methods (I > II > III)

- I. Energy Intensity of GDP

- II. Energy Intensity of GDP on PPP Base

- III. Energy Intensity of Production on Physical Unit Base

- ❑ I is probably too big to accept for all stakeholders

- ❑ Active introduction by NDRC, Ambassador, Journal, Newspapers

- ❑ Start of an era of energy saving in China from 2004

# III. Discussions: Definition of the potential

- Three different ways (I < II < III)

I. By National Average Efficiency Level

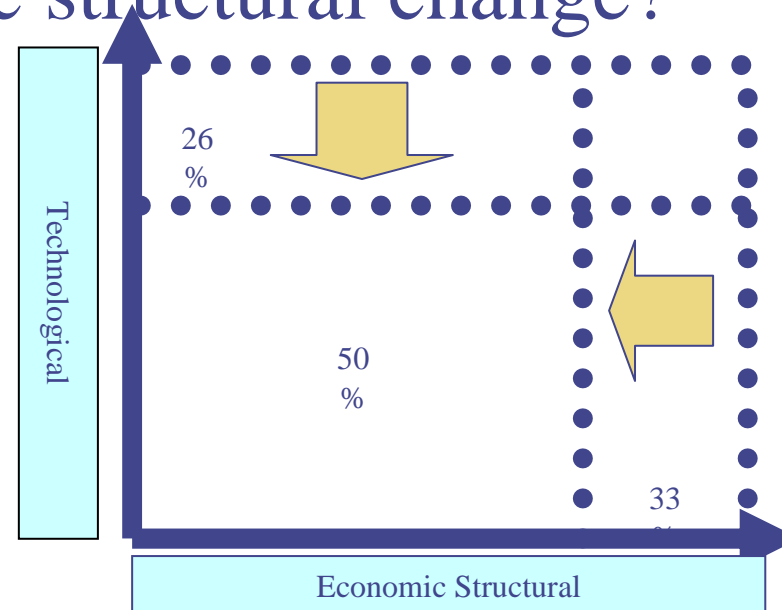
II. By Best Available Technology

III. By Projected Potential New Technology

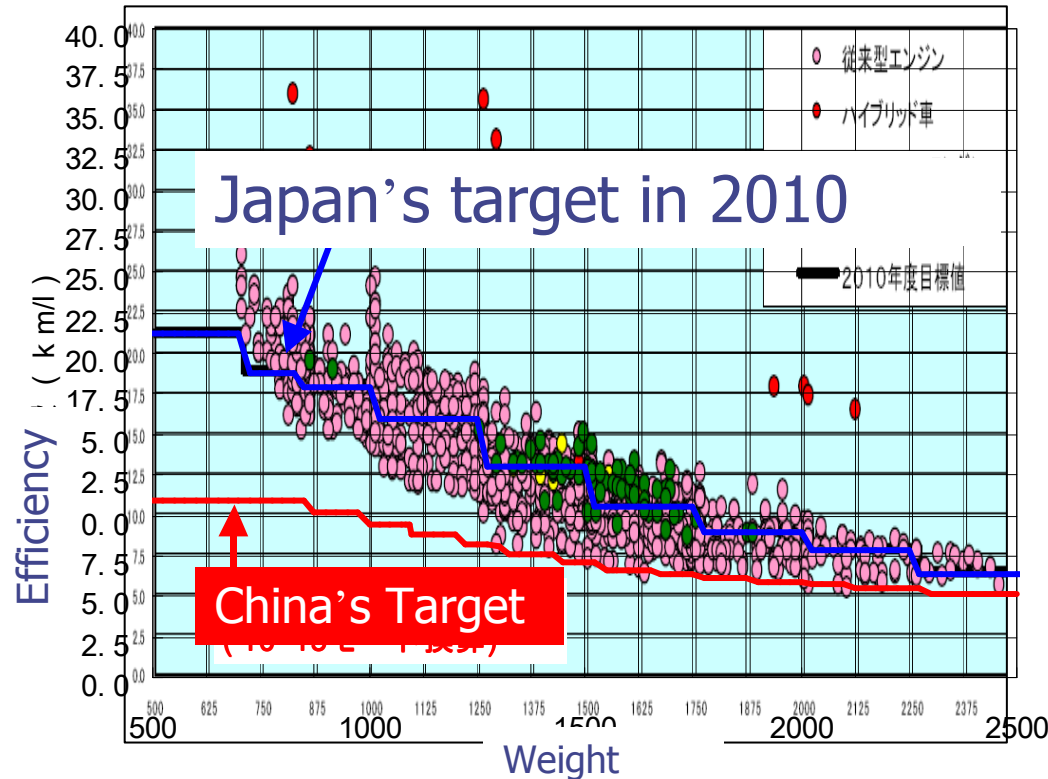
- Include economic structural change?

① No 26%

② Yes 50%



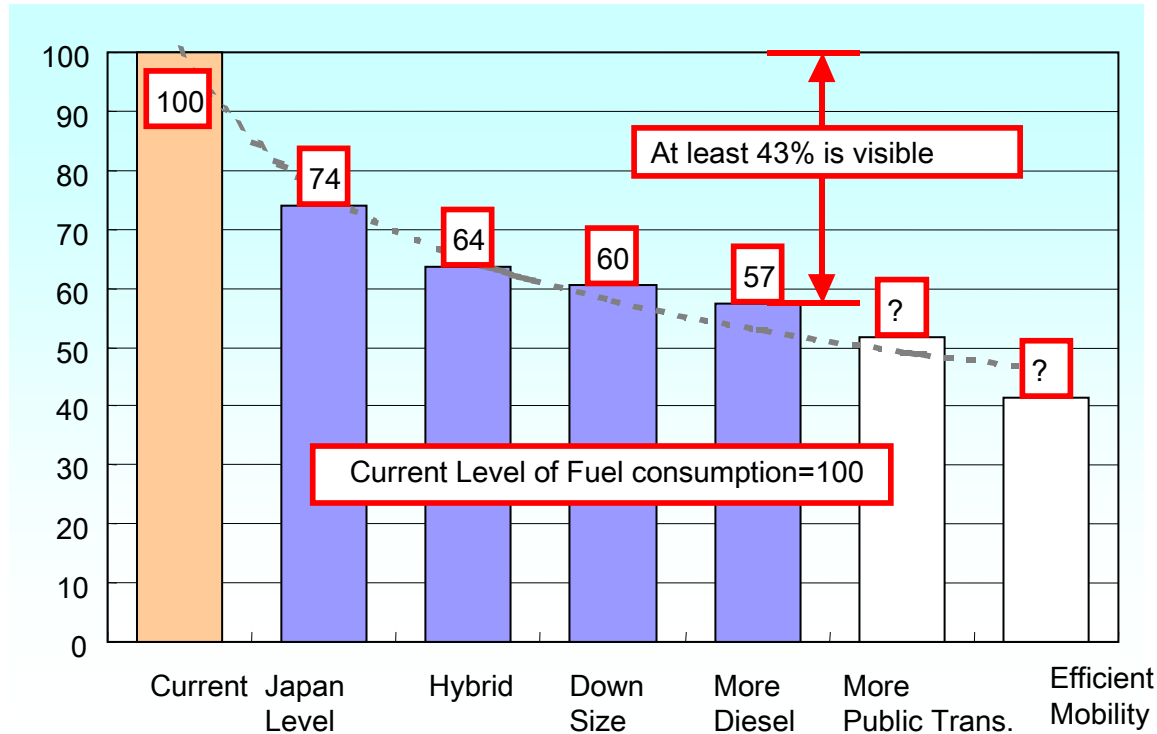
# III. Discussions: Data Update for Gasoline Engine



Source 1 )  
MLIT(2006) ,“Fuel Efficiency of Vehicles”  
Source 2 )  
CATARC ( 2003 ) ,  
“China’s Car Fuel Efficiency and Policy”

- ◆ China: Average engine size=1650CC, Efficiency(NEDC)=9.1L/100km
- ◆ Japan: Average engine size=1616CC, Efficiency(10・ 15M)=15km/L
- ◆ 35% worse/ 26% saving potential for China(Size/mode Converted)

### III. Discussions: More Potential for Vehicle to Save



Source 1 ) [Chinese] Shen Zhongyuan (2006) The Energy Saving Potential in Automobile Sector in China, International Petroleum Economics 2006.10

Source 2 ) [Japanese] Shen Zhongyuan (2006), Same Title as above, Energy Economics (2006.10)

- ◆ By available technology, like in Japan=26%
- ◆ By 50% Hybrid in 2030=14%
- ◆ Down size & More Diesel vehicle=5% each
- ◆ Others (probably big but need to analyze)

### III. Discussions: Data Updating for Power Generation (2005)

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	China	Japan
Thermal Efficiency ( % )	35.8 ( Coal )	40.3 ( Coal )
Own use Ratio ( % )	6.8 ( Coal )	4.4 ( Thermal )
Transmission Loss ( % )	7.1 ( All Average )	5.1 ( All Average )

Source: China Electricity Council(2006),”Annual Report”, METI(2006) “Outline of Electricity Demand”

### III. Discussions: Understand the Reasons and Complication

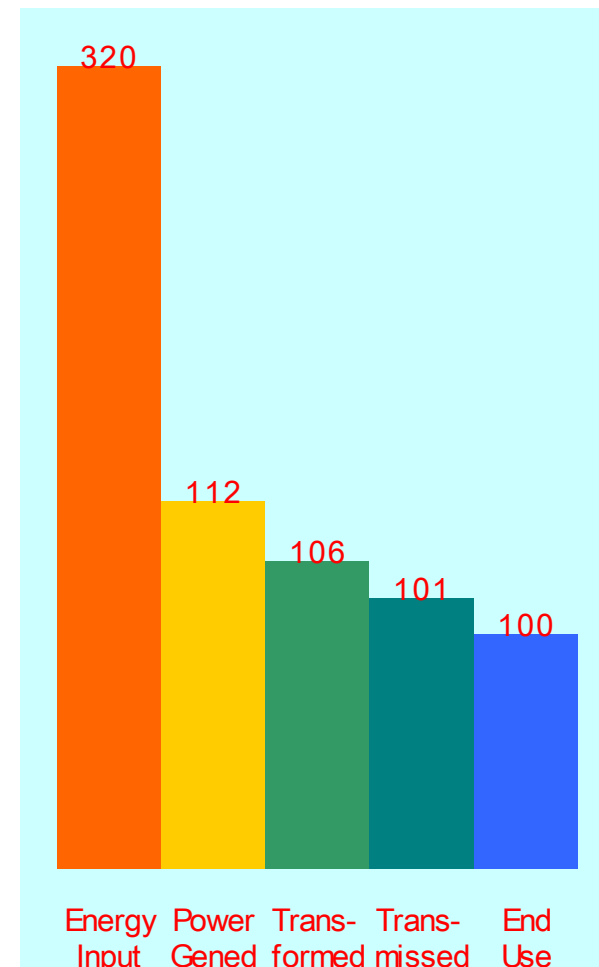
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- ❑ Absolutely high coal fired ratio  
(Base load, Peak adjustment and Frequency adjustment )
- ❑ Very small size of equipment  
(Average size is 62MW, Japan=420MW)
- ❑ Unstable coal quality
- ❑ Unskilled Operation Ability
- ❑ More electrical pumps and Centrifugal Air Blowers  
(Each 20% more energy consumption)
- ❑ Low ratio of high voltage distribution
- ❑ High loss in agricultural grid

### III. Discussions: Think More about the Role of Power Generation

- ❑ In China, 42% of CO<sub>2</sub> emissions are from Power Generation Sector
- ❑ 1% thermal efficiency improvement will reduce CO<sub>2</sub> emission by 74Mt-CO<sub>2</sub> in 2010, 84Mt-CO<sub>2</sub> in 2020, 101Mt-CO<sub>2</sub> in 2030
- ❑ Nuclear, Hydro and New Energy's role are expected. Currently, nuclear composes only of 2% of electricity, and 1% of Primary Energy Supply
- ❑ 1% more in electricity mixture of nuclear will reduce CO<sub>2</sub>emission by 34Mt-CO<sub>2</sub> in 2010, 47Mt-CO<sub>2</sub> in 2020, 57Mt-CO<sub>2</sub> in 2030
- ❑ An extreme, although unrealistic simulation shows that 30% of nuclear ratio in electricity mixture, like in Japan, will reduce CO<sub>2</sub> emissions by 1424Mt-CO<sub>2</sub> or 15.3% in 2030.
- ❑ However, a more energy-saving life style or electricity-saving life style also means a lot.

#### Energy Flow for Electricity Usage



# IV. Conclusions

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- ❑ Sectoral Approach is an easy to understand and accept analysis approach.
- ❑ Behind the simple comparison result is a very complicated story.
- ❑ Potential volume depends on definition
- ❑ Data comparison and updating provide helpful information for policy makers.
- ❑ Energy saving potential approach is an important approach for CO<sub>2</sub> emission reduction.
- ❑ Improving energy efficiency is a most urgent task for the world, especially for developing countries.
- ❑ Shifting towards a more energy-saving life style is indispensable.

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Thank you!



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