



# Project Rainbow

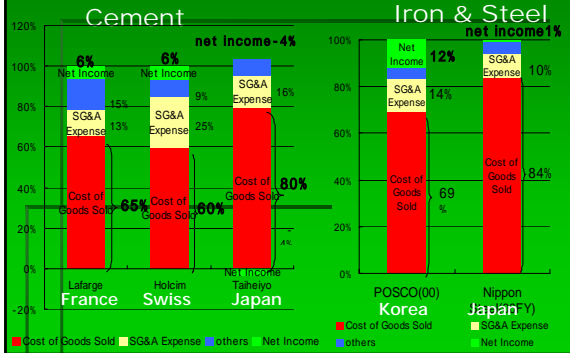
The Way to Achieve  
Sound Environment and  
Good Economic Future of Japan

SERF (Shonan Environmental Research Forum)

Yasuhiro Murota

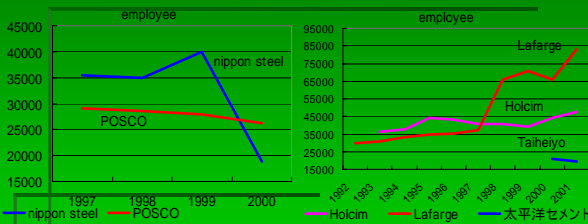
Kae Takase

## Are Japanese Energy Intensive (EI) Industries efficient economically?



## Japanese EI industries cut their employees. But !

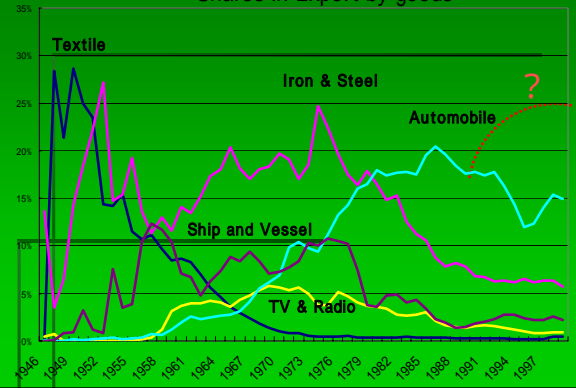
Cement Iron & Steel



• Japanese companies had done large-scale layoffs in recent years.

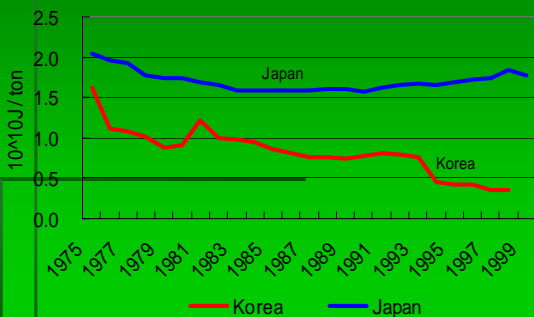
• On the other side, companies of other nationalities increase their employees, or keep the number of their employees.

## We Need New Leading Industries. Shares in Export by goods



## CO2/Production (iron&steel sector)

Unit energy consumption in Iron&Steel production



## Our Current Problems

- We still keep many inefficient EI industries domestically.
- They are inefficient not only in economic performance but in energy efficiency.
- Ex. Iron&Steel and cement industry can hardly keep their employment, because of lower profit due to domestic production with higher cost. And their EI are not so good.
- Japanese leading exporting goods had been shifting to higher value added ones. After 1990, however, no next leading exporting good emerges.
- To recover the Japanese economy, we need next leading industries.
- They should have higher economic performance and lower environmental load.

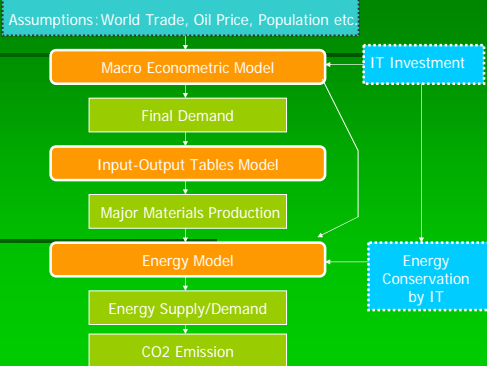
# Global Warming: Our obligations.

- Kyoto Protocol: -6% of GHG emission of 1990 (2008~2012)
  - 2000: 16.4% increase of 1990 level
    - Industry: 9.3%, Household: 24.4%, Commercial: 28.7%, Transport: 22.0%
  - Gov. Outlook: 1990 level in 2010 without flexibility measures(ex.JI)
    - Industry: -7%, HH&Com.: -2%, Transport: +17%
  - 6% reduction with flexibility measures

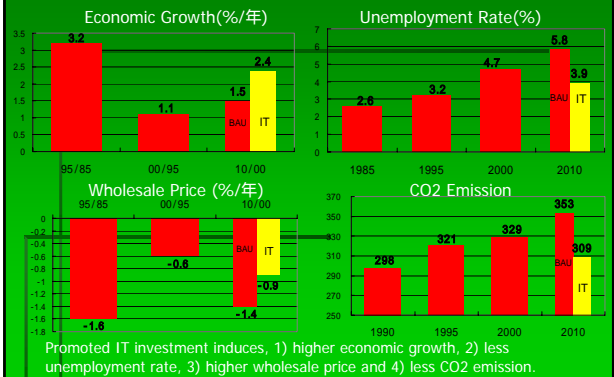
# Outline of Our Analysis

- Suppose IT business is our next leading industry, what would be our economic & environmental situation in 2010.
- We calculate two scenarios.
  - **BAU**
    - **IT promotion**: Increase of IT related investment.
    - The impacts of IT investment
      - *Economic Impacts*
        - GDP growth, inflation and unemployment
        - Change in the industrial structure
        - Change in the external trade structure
      - *Energy Impacts*: by assumption
        - Decrease of Commercial floorspace,
        - Increase of car efficiencies.
        - Increase of renewable energy usage.

# Simulation System

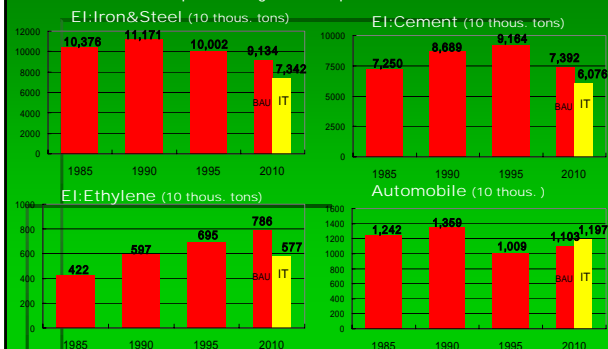


# Result: Macro & CO2



# Production of Major Products

Crude Steel Production: 73 million tons, Cement: 60 mil. tons, Ethylene: 5.7 mil. tons  
 On the other hand, car production grows in IT promotion case.

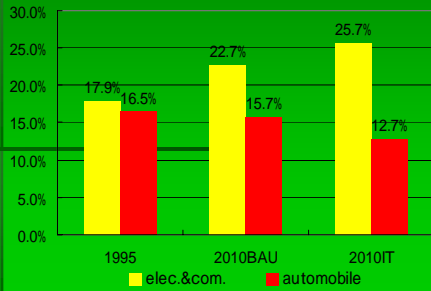


# Change in Employment by sector (IT - BAU, 2010)

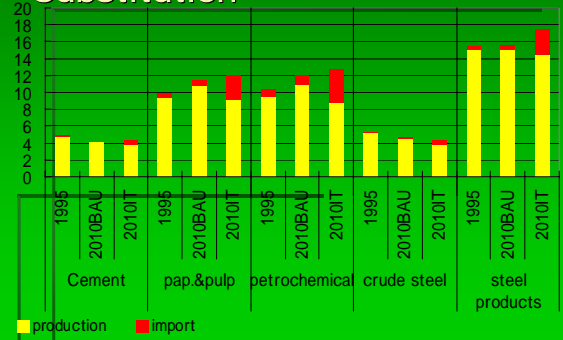
	persons	%
Electronics & Communication	+470 thou.	33%
Business services	+1,010 thou.	19%
Machinery	+280 thou.	17%
EI: Iron & Steel	-40 thou.	-12%
EI: Cement	-20 thou.	-16%
EI: Paper & Pulp	-60 thou.	-22%
EI: Petrochemical	-20 thou.	-25%
<b>Total</b>	<b>+1,040 thou.</b>	<b>2%</b>

# Major Exporting Goods (next leading industry?)

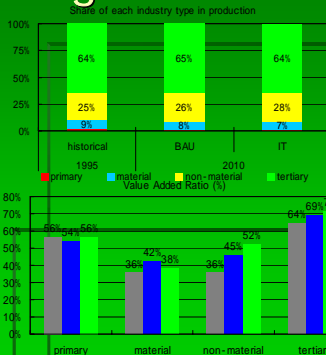
- Automobile
- Electronics & Communication



# EI Materials: domestic production Import Substitution



# Higher Value Added Ratio



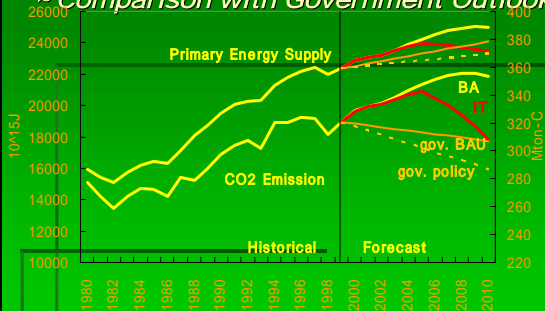
- Share of material production decreases.
- Shift to non-material production with higher value added.
- All surviving industry would have higher value added ratio.

# Summary of Our Calculations

- BAU: economic growth 1.5%/year (2000 ~ 2010), unemployment rate 5.9% (2010), and CO2 Emission 20% higher than the 1990 level.
- IT: economic growth 2.4%/year, unemployment rate 3.9% (2010), and CO2 emission reduced to the 1990 level.
- IT: domestic material production is substituted by the imports. GDP is increased due to the shift to higher value added goods.
- JI possibilities: EI goods would be produced at the more efficient plants in developing countries, which will increase the growth potential of these countries. (See Posco case.)

# Energy and CO2

~ Comparison with Government Outlook ~

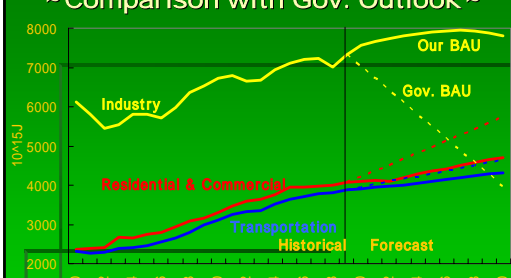


\*Energy and CO2 in gov. BAU is too small required policy will not be sufficient to meet Kyoto target.

\*CO2 emission will be decreased by IT promotion, along with shift to less energy intensive industry (higher value added industry). In this case, economic growth and employment will increase. (Gov. does not have aspects to employment and economy.)

# Energy Demand by Sector

~ Comparison with Gov. Outlook ~

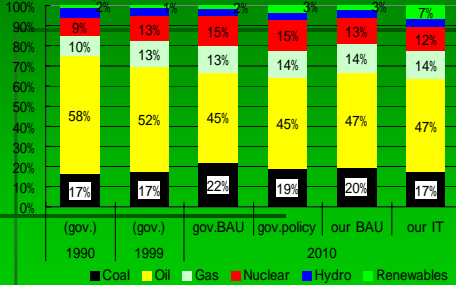


\*Gov. BAU and our BAU: Gov. industry: -49%, residential&commercial: +22%, transportation: +8%.

\*Gov. outlook shows less figures in industry, bigger in res.&com. And transportation.

# Primary Energy

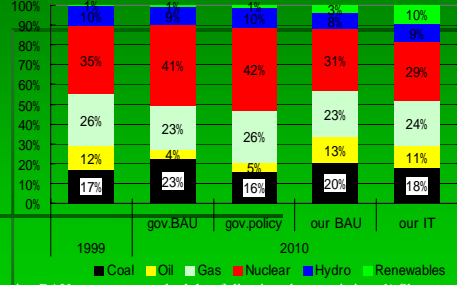
~ Comparison with Government Outlook ~



•Comparing BAU cases, gov. outlook has following characteristics. 1) Shows very low share of oil, 2) higher share of nuclear and coal, 3) lower share of renewables. (indicates government's policy)  
 •In our IT case, coal demand decreases, new energy and oil increases. (change in economic structure)

# Electricity Supply

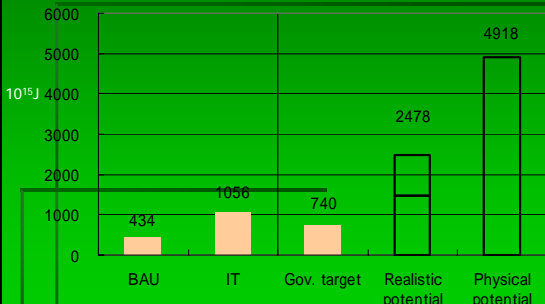
~ Comparison with Government Outlook ~



•Comparing BAU cases, gov. outlook has following characteristics. 1) Shows very low share of oil, 2) higher share of nuclear and coal, 3) lower share of renewables. (indicates government's policy)  
 •Government policy case achieve CO2 mitigation by, promoting natural gas instead of coal.

# Renewables

Our renewable installation amount in BAU case is lower than government's policy case, but higher in IT promotion case. This is because energy demand structure is more distributed, and lowered price of DC converters because of diffusion.



\* Renewable energy includes, photovoltaics, wind power, waste power & heat, solar heat, black liquids & waste woods, unutilized energy, and biomass.

# Comparison with the Government Outlook

- In government BAU, more energy conservation is assumed than our BAU forecast. Difference is prominent in industry sector.
- Government CO2 mitigation target is expected to fail because of recent difficult situation around nuclear power. Additional policy is likely to be announced on very short notice.
- We assume rapid industrial structural change by the usage of IT, while government's outlook does not assume such changes.

# Impact of IT investment (Energy mode)

Substitution effect (Green arrow)  
 Income effect (Red arrow)

	2010			
	BAU	IT	IT-BAU	%
Final Demand (PJ)	17,137	16,046	-1,091	-6.4
Industry	7,816	7,485	-331	-4.2
Residential	2,530	2,636	106	4.2
Commercial	2,169	1,825	-344	-15.9
Transportation	4,307	3,762	-545	-12.7
Primary energy supply	25,001	23,444	-1,557	-6.2
CO2 Emission (Mton-C)	353.2	308.5	-45	-12.7

# Summary of IT impact

## Economy

Economic growth	Unemployment	WPI
↑	↓	↓

## Energy & Environment

Substitution effect  
 - Industrial structure shift from "massive and heavy" to the IT industries (electronics & communication etc.)

Income effect  
 Household purchase more electrical appliances etc.

	Final Energy
Industry	↓
Residential	↑
Commercial	Decreased floorspace
Transportation	Car effie ency increase

Laitner (2000.3)  
 "2 ~ 3% decrease of CO2 emission":  
 Income effect was excluded.

## Assumption of IT case in detail

- Macro Model
  - IT related investment
    - BAU: 4%/year(00 ~ 10) IT: 10%/year(00 ~ 05), 12%/year(06 ~ 10)
  - Exchange Rate
    - BAU: 160 yen/\$, IT: 120 yen/\$ (2010)
- IO Model
  - Import Ratio: Domestic production Import substitution, in EI industries
- Energy Model
  - Car efficiency: Efficiency increases since 2004, 25% less energy use in 2010 by the use of IT devices.
  - Floorspace : Increase the office usage efficiency by IT (cf. ATT or IBM experiments).
  - Renewable energy : increase of decentralized system which is compatible with IT society.
    - Electricity: BAU (362.58 PJ), IT (938.1 PJ), in 2010
    - Heat, etc: BAU (263.39 PJ), IT (678.86 PJ), in 2010

## Conclusions

- In future, persisting with current major industries (ex. EI industries) is no more meaningful economically and environmentally.
- If we use the fruit of IT to change our industrial structure, CO2 is mitigated to 1990 emission level. And we have higher economic growth and lower unemployment.
- Project rainbow: 1) CO2 target, 2) higher employment, and 3) higher economic growth of DCs (=contribution to global peace in a broad sense) can be achieved jointly. (*Rainbow colored future*)



**For more information on the material  
referenced in this presentation, contact:**

Yasuhiro Murota  
Shonan Econometrics  
email: [murota@serfinc.net](mailto:murota@serfinc.net)

or

Kae Takase  
Shonan Environmental Research Forum Inc. (S.E.R.F.)  
email: [kae@serfinc.net](mailto:kae@serfinc.net)

or

See our website: [www.serfinc.net](http://www.serfinc.net)

*Shonan Beach, 2002*