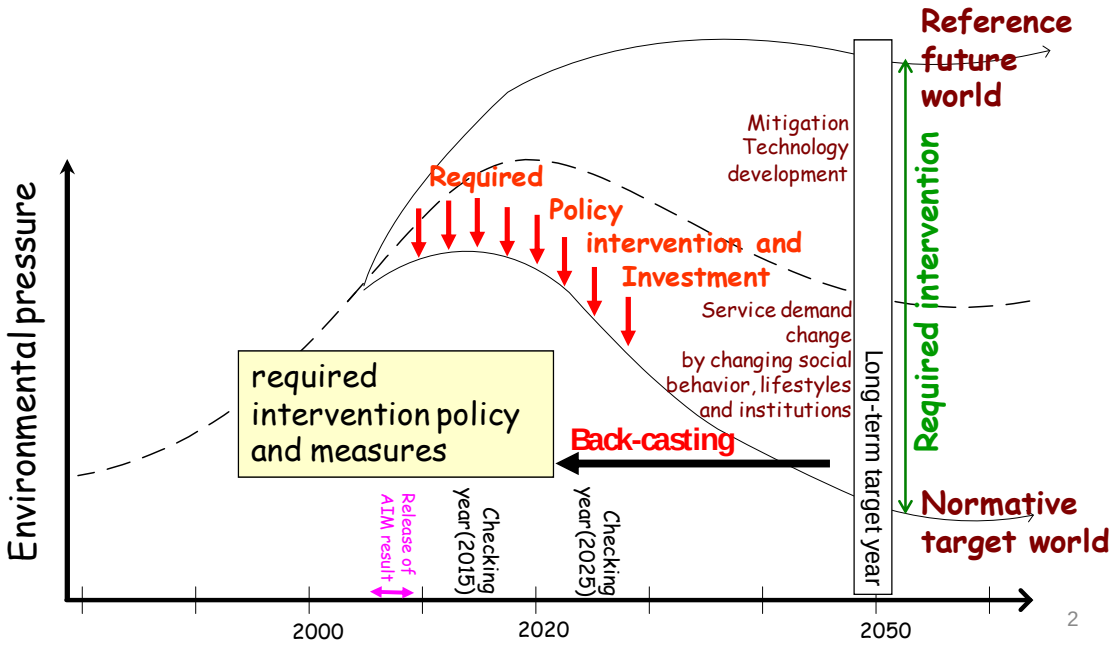
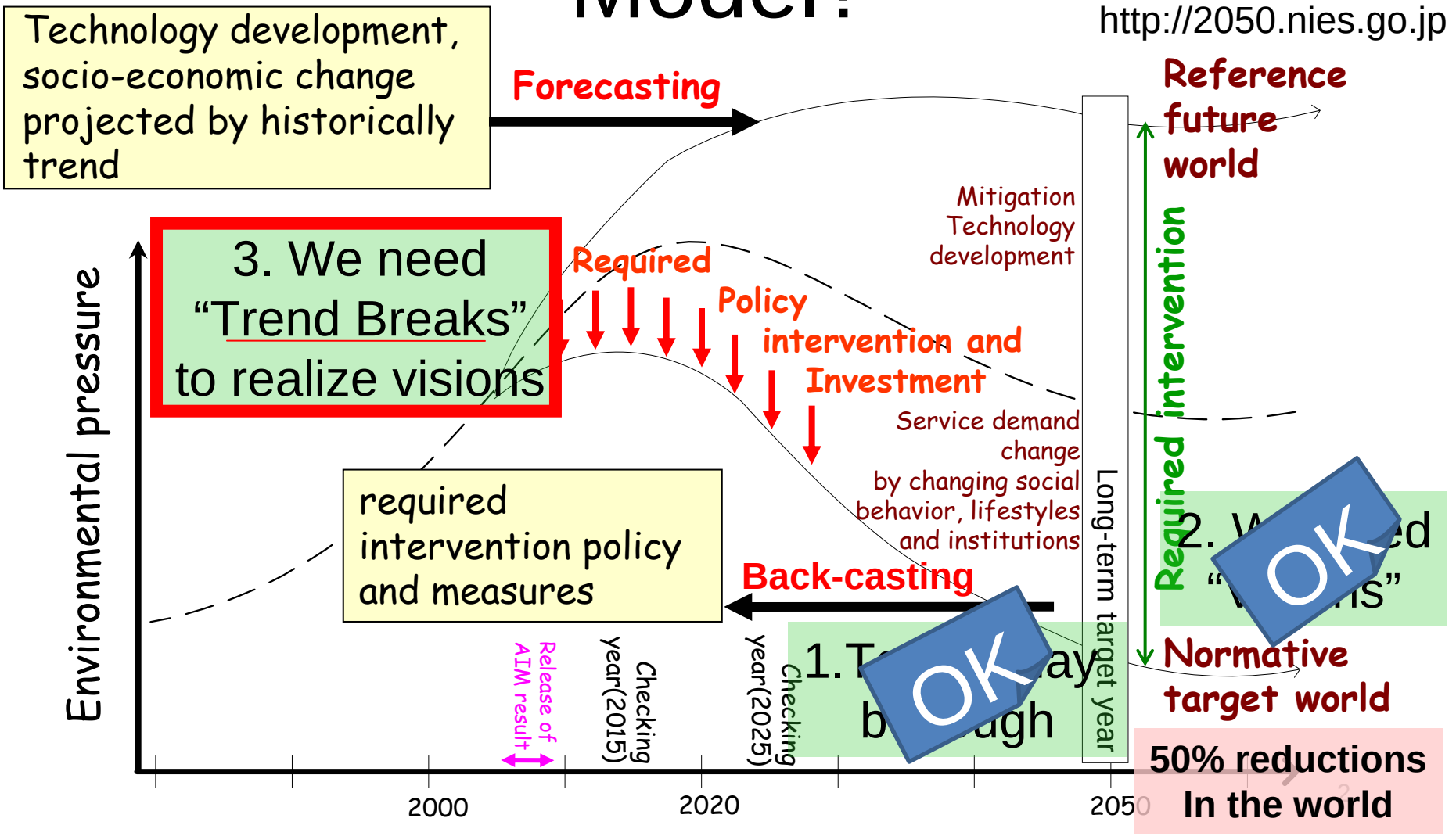
Advanced LCS Model
- Backcast Modeling -



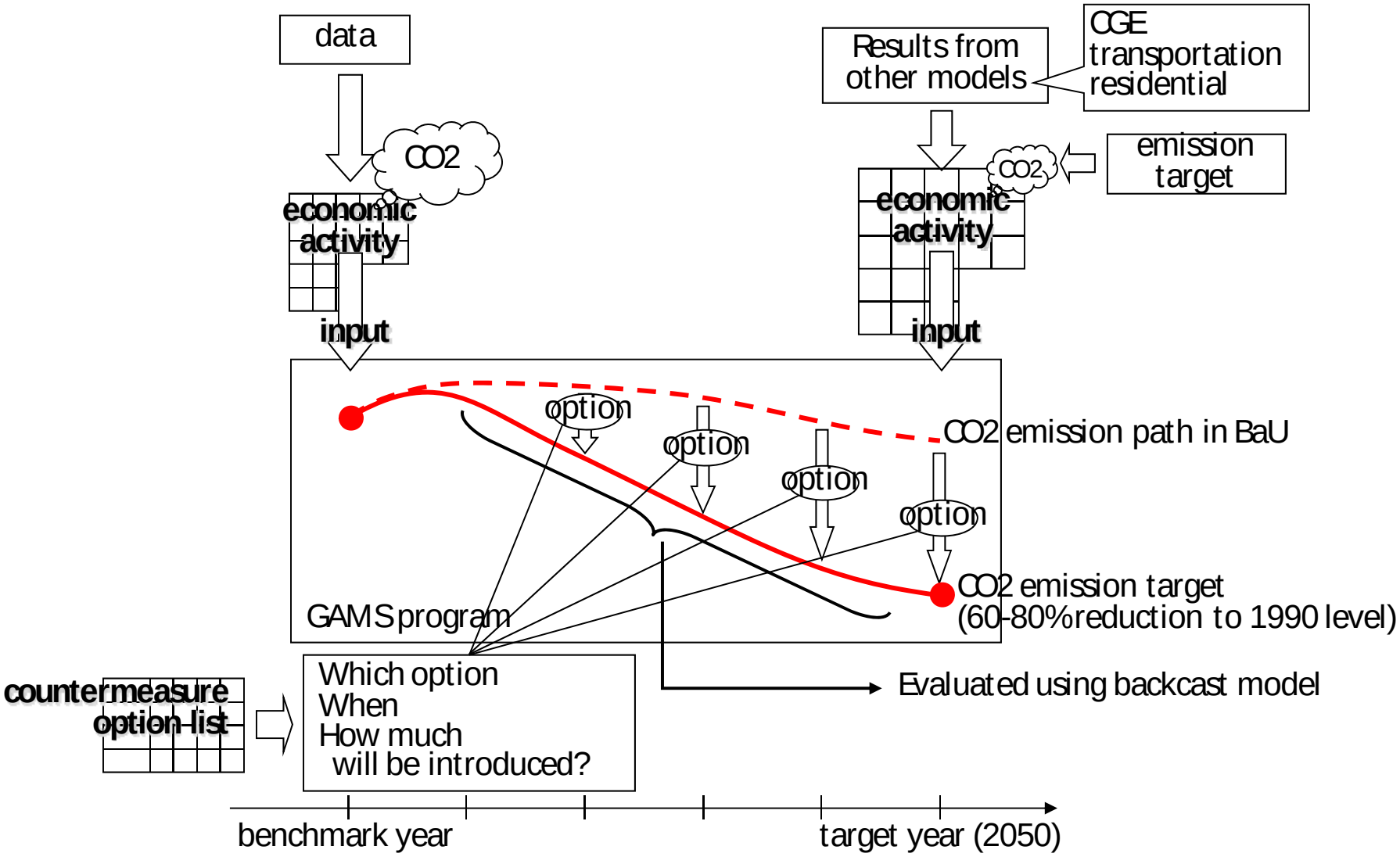
Shuichi Ashina

(National Institute for Environmental Studies)

Why do we need Backcast Model?



Where is “Backcast model” ?



From presentation of Dr. Masui in 12th AIM WS (2007

Outline of the model

- Purpose: Representing **inter-temporal optimal strategy** on introduction of new technologies and economic activity change **in order to achieve the future targets** such as carbon emissions in 2050.

- Core model: Dynamic optimization model with linear/mixed integer programming.

- The countermeasures proposed by the other models can be introduced, and evaluated.

From presentation of Dr. Masui in 12th AIM WS (2007)

What is “Backcast Model” ?

- **Interactive tool for dialogue!**
  - Between business and consumers, government and citizens, government and business, or national and local level government
  - For a while, between Japan LCS Project members

- The model **choose sets of countermeasures with quantitative evaluation**, such as energy reduction.
  - In-depth analysis relegate other AIM models.
  - Run-time requires under few minutes, if possible, within 1 minutes.
    - The model employs LP/MIP framework with GAMS.

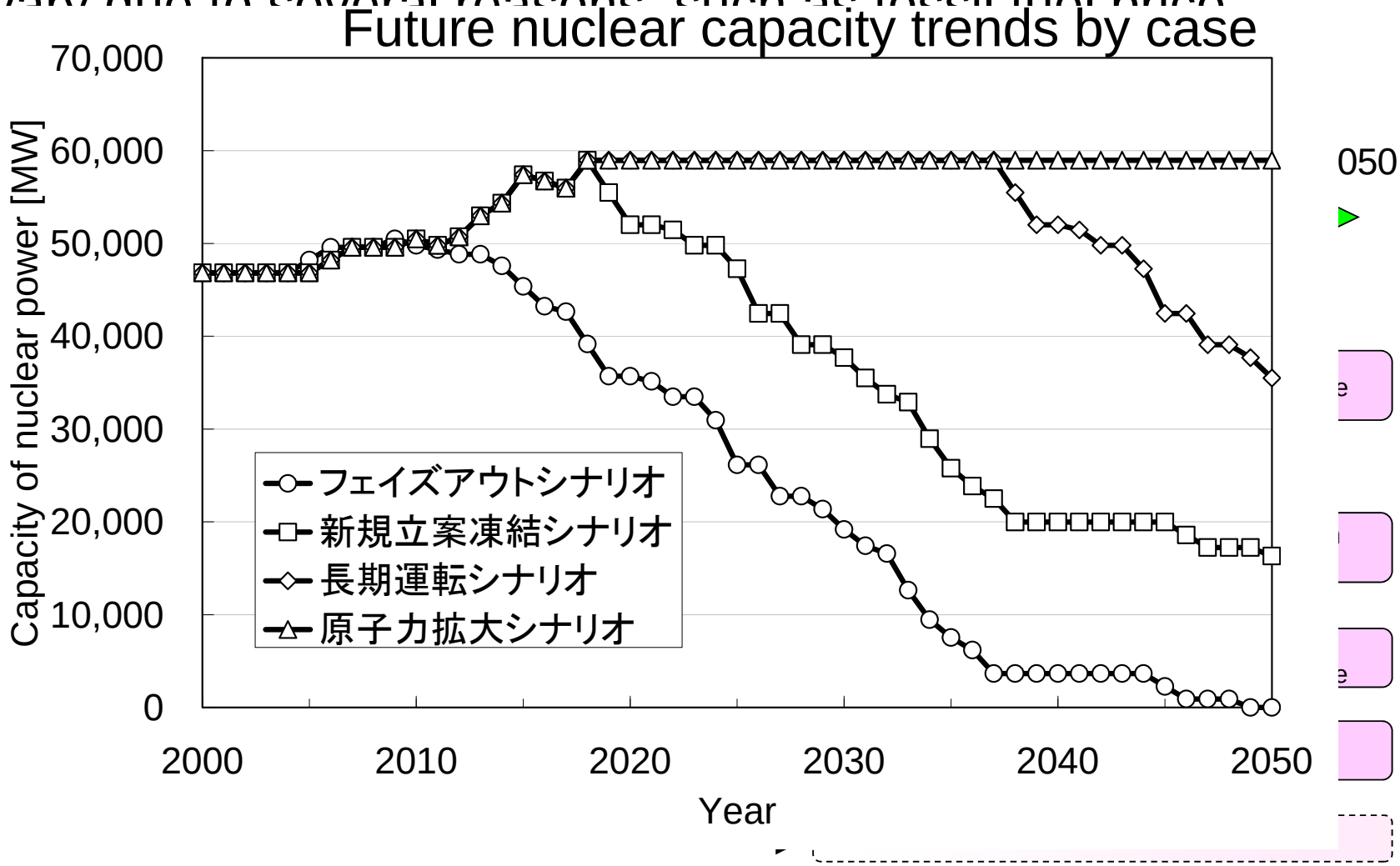
Steps towards designing Roadmap to Low Carbon World

- 1st version
  - simple selection of technologies
- 2nd version (under development)
  - introduction of sub-sectors by energy saving technologies to CGE section (completed…?)
  - Adding option selection procedure to the model.
- 3rd version (not yet developed)
  - complete backcast model

Already introduced by Dr. Masui

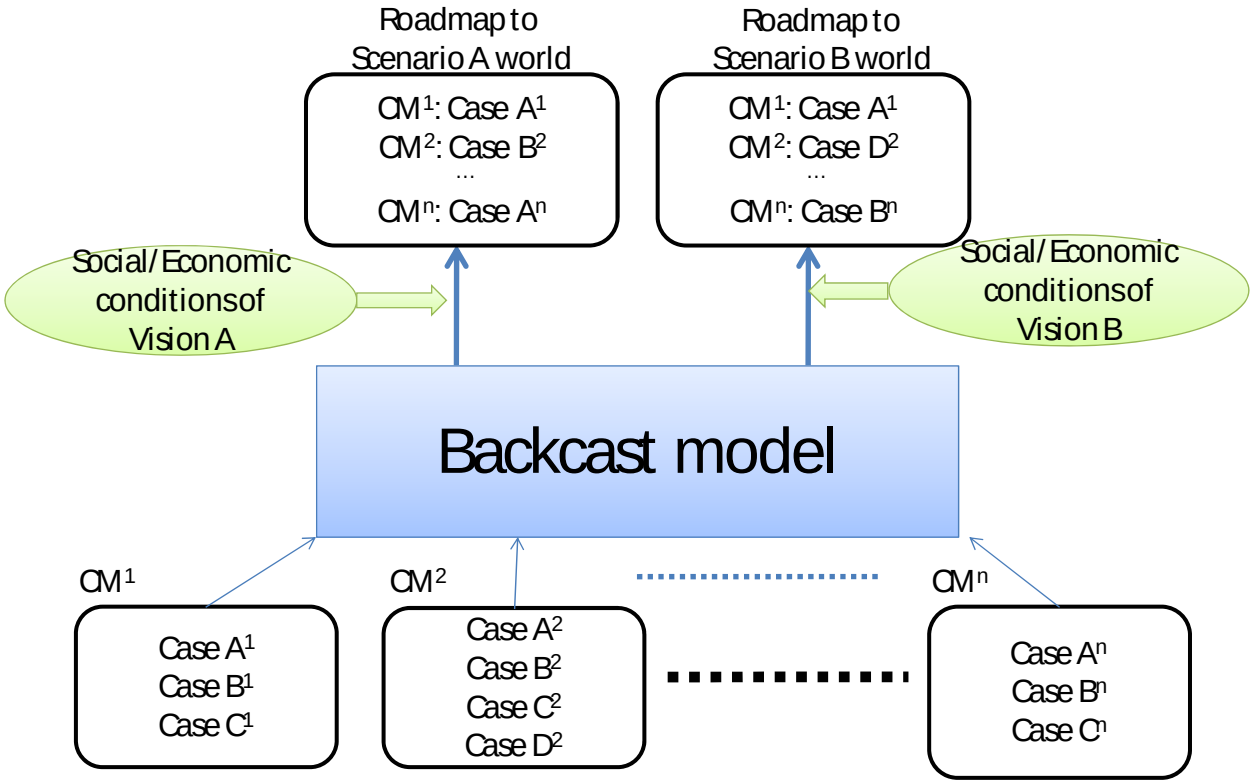
Why“option selection procedure” is needed?

- Future status of technologies/policy/social trends/etc will vary due to several reasons, such as fossil fuel price



How to address set of countermeasures?

- The model **chooses strictly one of cases** in each countermeasures **based on given** social and economical **conditions for maximizing welfare** determined in CGE part.



CM: countermeasure

What is needed ?

- **The model requires** two types of data sets: **Technological data** sets and **Relational data** sets

- Technological data
  - Data sets like AIM/Enduse.
  - Costs, energy consumption, life time, etc.
- Relational data
  - Important to describing roadmaps.
  - Relationships between countermeasures, times for implementation, etc.

Technological data sets

sector	Technology		Unit	Energy consumption (kgoe/Unit)				Capital cost (JPY/Unit)		Life time (year)
	LC tech (energy saving)	Conventional tech		LC tech		Conv. tech		LC tech	Conv. tech	
industry steel	High efficiency coke oven	Conventional coke oven	Crude steel 1t (converter)	COL	291.56	COL	298	9,247	8,026	30
	High efficiency sintering furnace	Conventional sintering furnace	Crude steel 1t (converter)	COL	39.45	COL	44	14,868	13,063	30
	High efficiency blast furnace	conventional blast furnace	Crude steel 1t (converter)	COL	8.64	COL	8.72	20,650	18,200	30
				ELE	5.27	ELE	5.50			
	High efficiency electric furnace	High efficiency electric furnace	Crude steel 1t (electric furnace)	ELE	30.41	ELE	38.80	25,181	19,581	30
	:	:	:							

From presentation of Dr. Masui in 12th AIM WS (2007)

Relational data sets

- Data are answers following questions:
  - When the CM* will become in practical use?
  - How many years will be required to become widespread use?
  - What types of technology/policy is necessary before implementation of CM?

Example of Design Structure Matrix: Biomass utilization

		A	B	C	D	E	F	G	H	I	J	K	L
A	バイオ車体の改良					①							
B	バイオエネルギー備蓄技術の開発					②							
C	ステーション数の確保		③		④								
D	GSへの補助金導入												
E	規格の統一												
F	バイオ資源量の確保							⑤	⑥	⑦			
G	セルロース分解技術の開発												
H	バイオエネルギーへの先行投資												
I	石油連盟の雇用対策												
J	健康影響評価												
K	バイオ燃料優先レーン												
L	バイオマス自動車への補助金・税優遇												
PP	バイオ自動車の導入	⑧		⑨			⑩				⑪	⑫	⑬

*CM: Countermeasures

Current status of the model

- Model is still under development, and will be completed by the end of this month.
- Data sets will be assembled in next month.

- Sorry for none of results…
- I (or Masui-san) will bring in results of the Backcast model at next AIM (T)WS!

What should we do next?