Up-grading Framework of 3E Model in Tsinghua University

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Outline of Presentation

i. Introduction of present 3E Model

ii. Aim of Up-grading

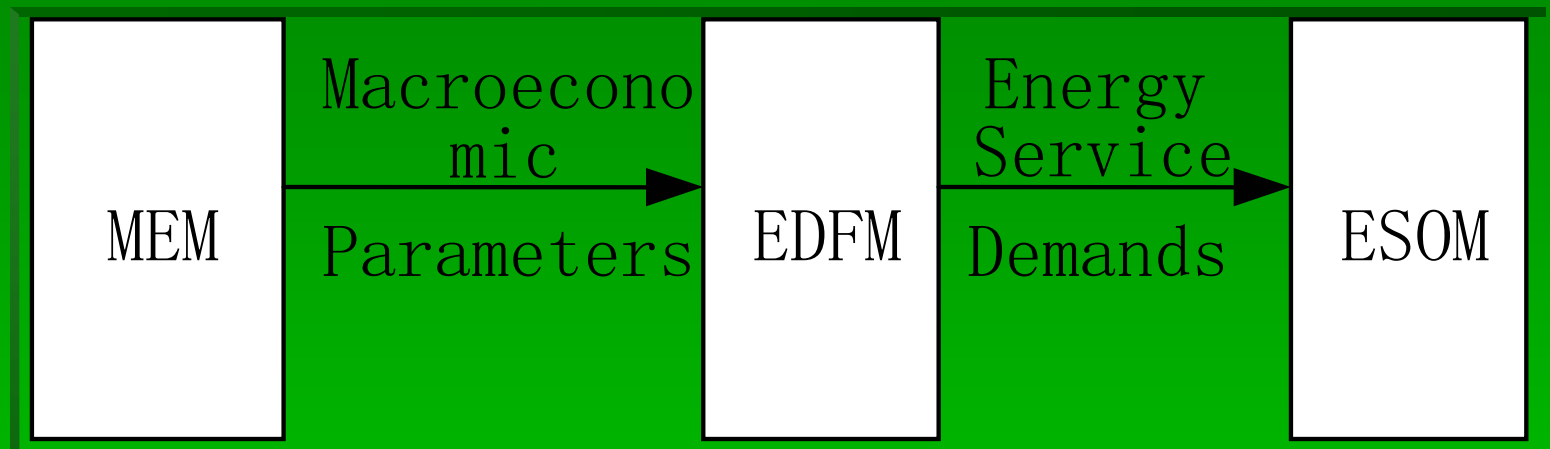
iii. Structure of ESOM

iv. Some CGE Settings

v. Interconnection between CGE and ESOM

vi. Discussion

Introduction of present 3E Model-1



MEM: macro-econometric model

EDFM: forecast all energy services

ESOM: inter-temporal linear optimizing model

Introduction of present 3E Model-2

two key shortcomings:

1. the structure of prior 3E model constraints the feedback of energy system to macro-economic system;

2. unable to calculate the direct effects in macro-economic system caused by CO2 mitigation

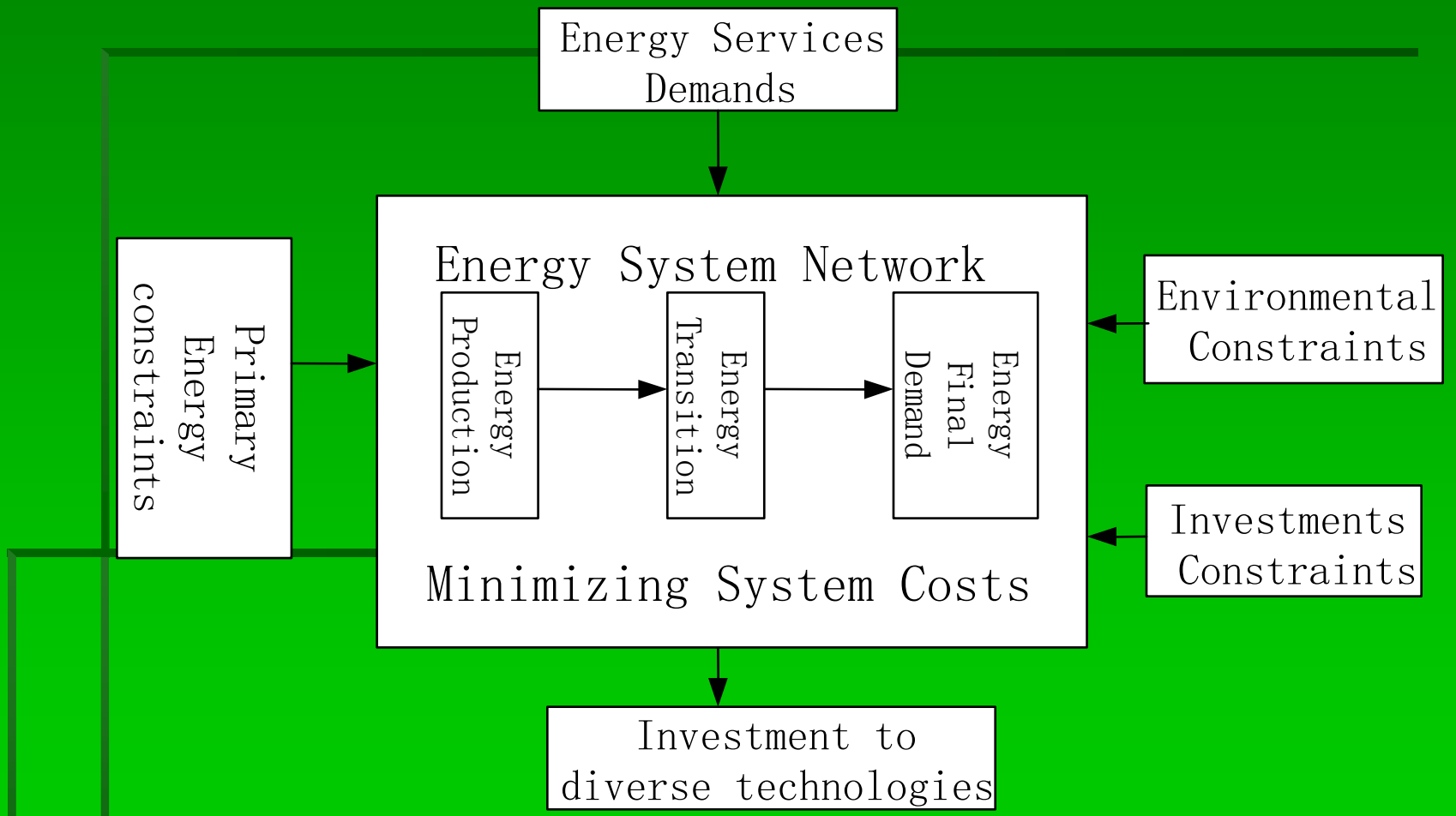
Aim of Up-grading

- More adaptable to simulate the real correlation among macro-economic system and energy system and environment

- specifically:

Establish CGE model to substitute MEM and EDFM and to interconnect with ESOM

Structure of ESOM



CGE settings

1. Sectors Setting

   Agriculture, cement, iron/steel, nonferrous metal, chemical production, paper making, electricity production, other energy sectors, other industries, construction, transport, other services

2. Main factors setting

   capital and labor

3. Other setting

Interconnection between two modules-1

Three approaches in the world:

1. Detailed Bottom-Up and simple Top-down

   e.g. Makal-Macro

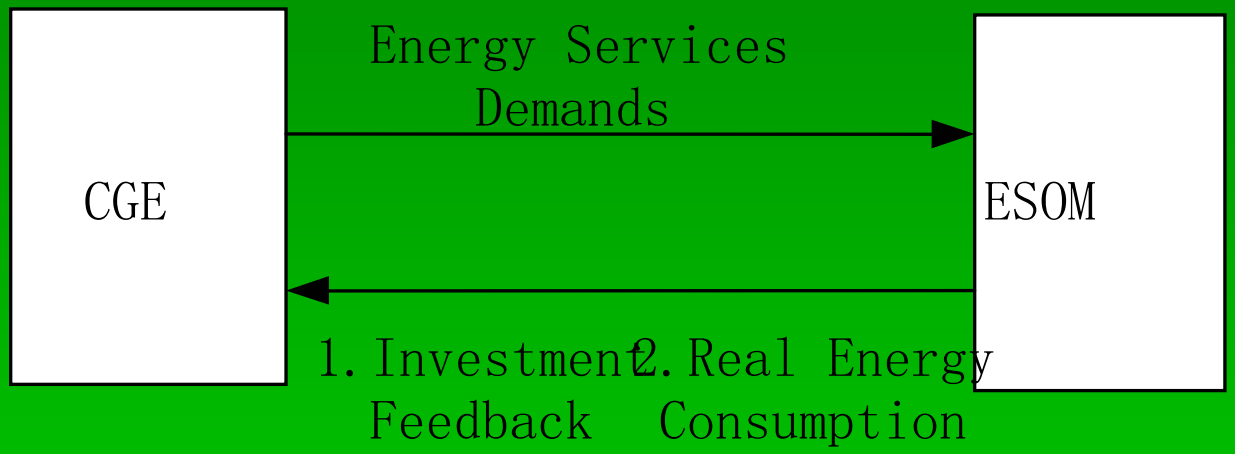
2. Detailed Top-down and simple Bottom-Up

   e.g. CGE interconnect with a power planning model, built by Zhang Zhongxiang, 1997

3. Detailed Top-down and detailed Bottom-Up

   e.g. HERMES-MIDAS（Capros,1990）, COMPASS（KEIO）

Interconnection between two modules-2



Interconnection between two modules-3

- From CGE to ESOM：

Connection variables:

energy services demands in ESOM

some services demands variables are directly taken from CGE, some need further calculation

Interconnection between two modules-4

Energy Services Demands in ESOM

Sectors	Sorts of Energy Services Demands
Industry	i Five energy intensity products: cement, iron/steel, paper, Aluminum; ii other process heat; iii other power consumption; iv other material
Agriculture	i agricultural engine; ii agricultural mechanism; iii primary product produce
Transport	i passenger turnover, by road, railway, aviation, ship and pipeline ii cargo turnover, by road, railway, aviation, ship and pipeline;
Service Industry	i cooling; ii useful energy of light/appliances ; iii useful energy of heating/hot water
Urban Household	useful energy of Cooling, heating, cooking/hot water, light and other appliances
Rural Household	useful energy of electric appliances , heating, cooking/hot water

Interconnection between two modules-5

- From ESOM to CGE:

1. Investment Feedback

Classify investments of all technologies in ESOM by CGE sectors, and then input to the CGE.

Interconnection between two modules-6

series of technologies	detailed technologies series	the sectors Belonging to in CGE
Energy resources exploitation	exploitation 、 renewable energy produce	Energy
	Energy input and output	Final consumption
Energy transformation	Power generation	electricity production
	Heating	Other industries
	Washing coal/coke/oil refinery/gas-making/ coal products /others	Other industries
Energy services	agriculture	agriculture
	cement	cement
	Ferrous production	Ferrous sector
	aluminum	Non-ferrous sector
	Synthetic Ammonia	Chemical sector
	Machine-made Paper and paperboard	Paper making and product
	transport	transport
	Other technologies in service sector	Service sector
	Appliance used in urban household	Other industries
	Appliance used in rural household	Other industries

Interconnection between two modules-7

2. Adjustment of Energy Consumption

primary energy consumption can be output from ESOM, which can be used to adjust the energy consumption variable in CGE.

just adjust the total consumption, the i/o parameters do not change.

DISCUSSION

1. The relation between the energy system in CGE and that described by ESOM

2. Operation mode：

CGE operation: step-up

ESOM: intertemporal optimizing mode

Thanks a lot!