

12th AIM International Workshop
19-21 February, 2007
Tsukuba, Japan

Development of Energy Supply Model

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What is “Energy Supply Model”?

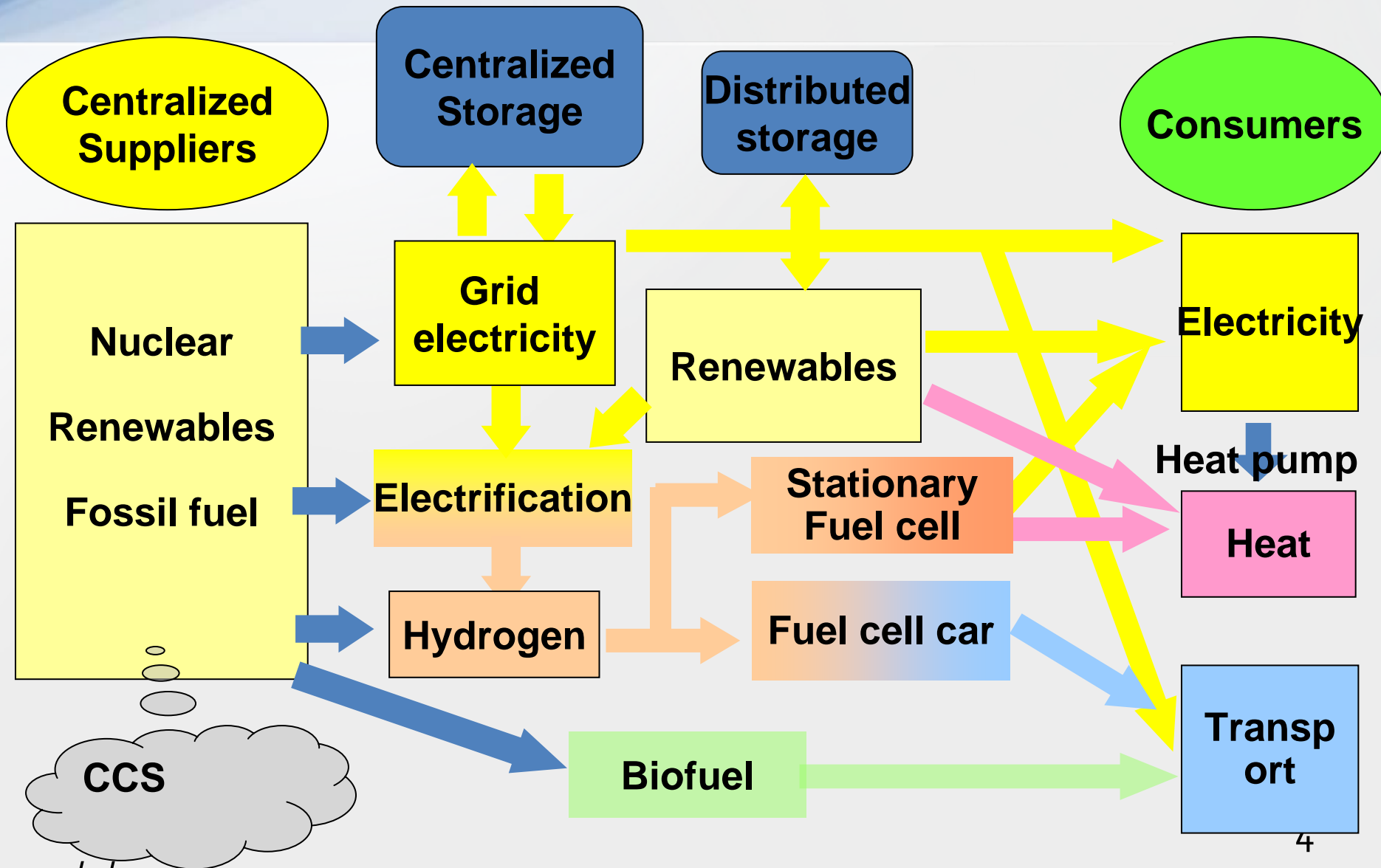
- Basic concepts are close to that of AIM/Enduse
 - **Bottom-up type** model
 - **Linear optimization** framework
 - **Minimizing total costs** through analytical periods
 - Energy **demands** (service demands) **are given**
 - Most data sets for EndUse are also available
- Differences are **time span** and **size of regions**
 - Time span: **1 hr** or below (ESM) vs 1 yr (Enduse)
 - Region size: **prefecture, district, colony** (ESM) vs Country(, prefecture) (Enduse)

Why do we need Energy Supply Model?

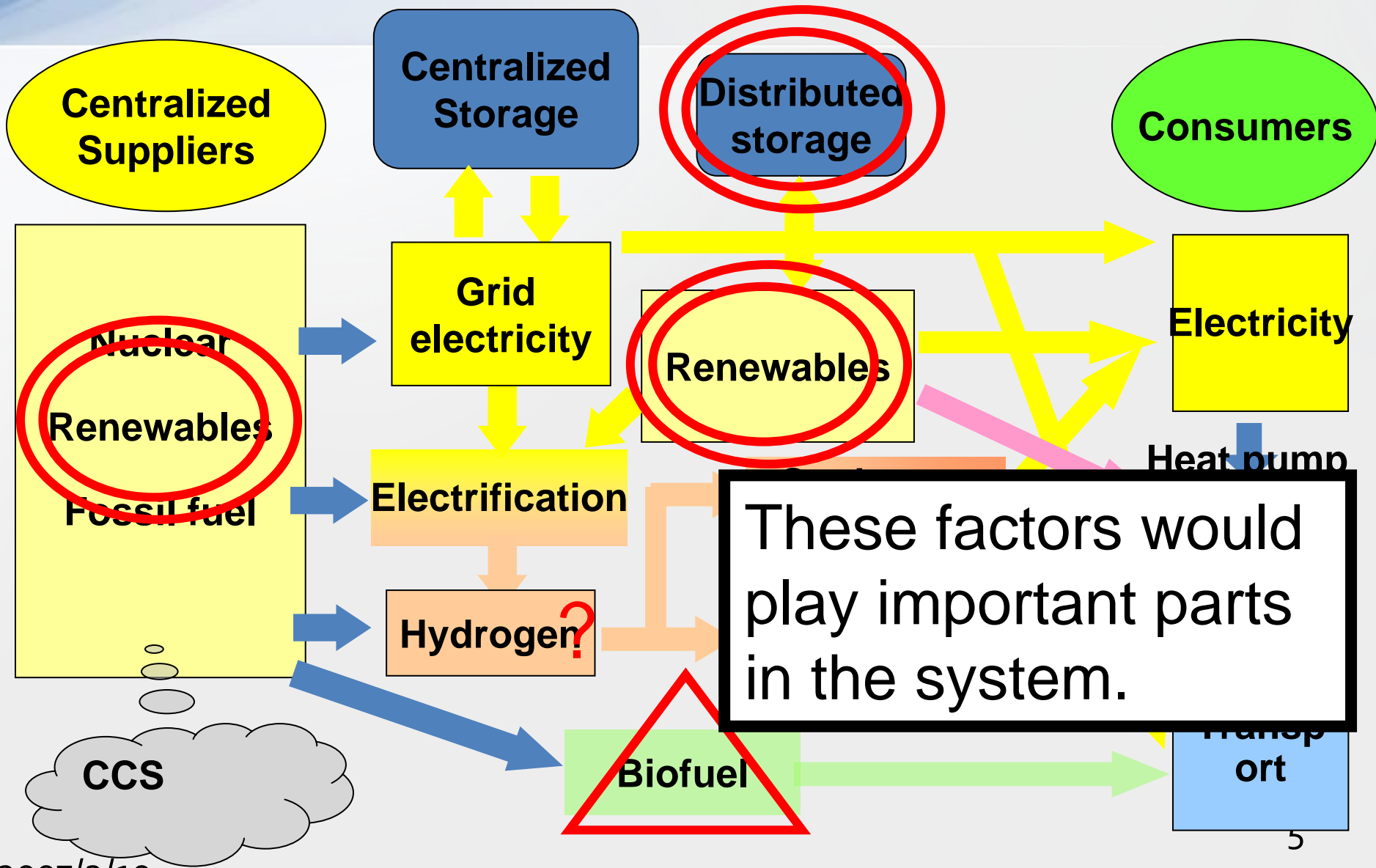
Answer:

To explore future energy system configurations **with renewables, micro-grids, and CHPs.**

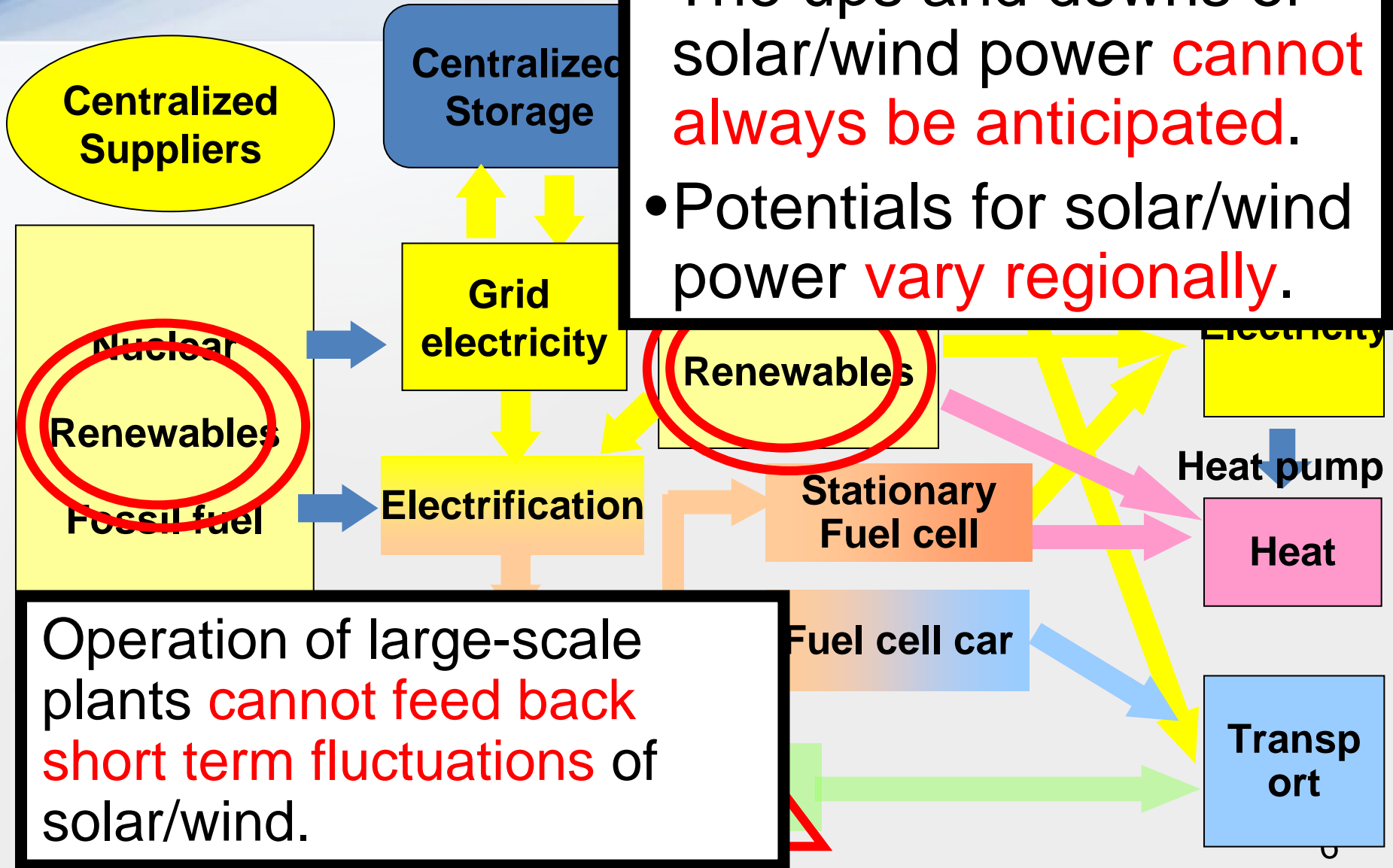
Key factors for future energy system



Key factors for future energy system



Key factors for future energy system



Key factors for future energy system

Centralized

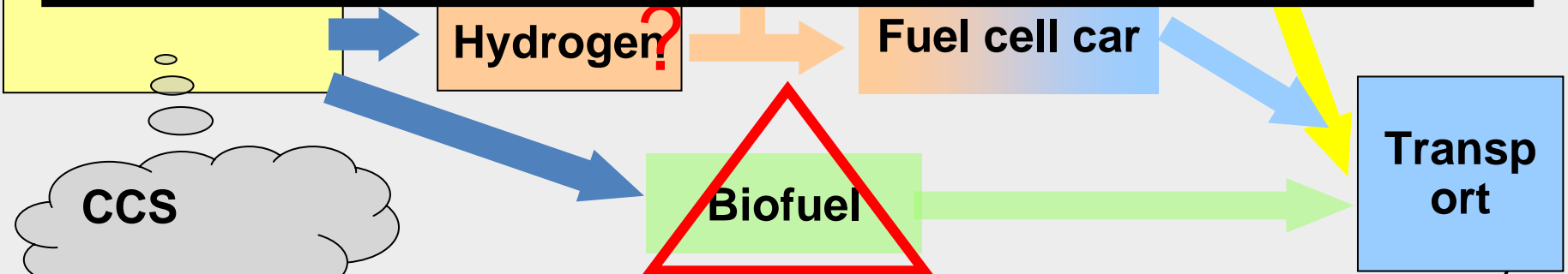
Centralized Storage

Distributed

Consumers

For drawing future energy systems, a simulation model requires to have 1 hour or below of time span, and to cover regions and/or local communities.

= Energy Supply Model

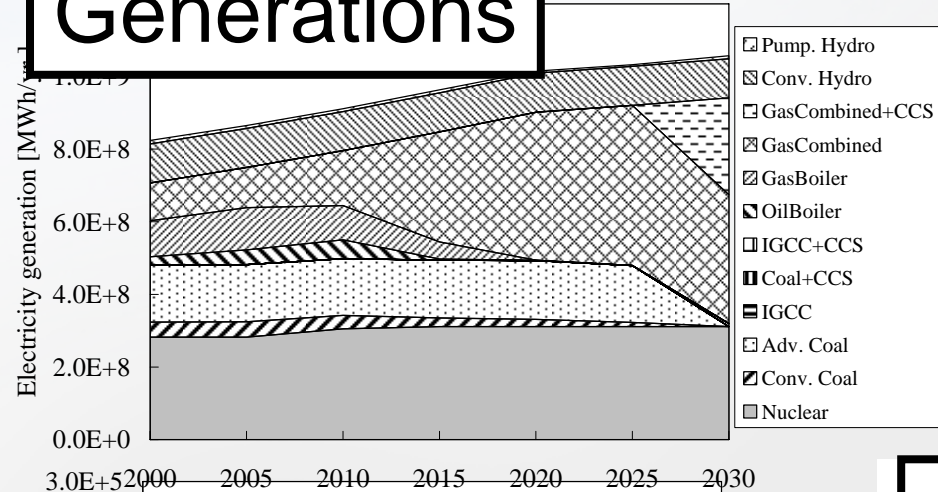


Energy Supply Model could respond to following questions

1. Conventional energy system really has no potentials for CO₂ reductions? If not, how to reduce?
 - What types of energy appliances need to popularize?
 - Does such CO₂ reduction strategies vary regionally?
2. How to increase renewables energy supply in the electricity sector?
 - How much does it cost? Is it affordable?
3. May Micro-grid with renewables supply low carbonized, stable energy sources?
 - What kinds of role centralized energy system will play?

1. Conventional energy system really has no potentials for CO₂ reductions? If not, how?

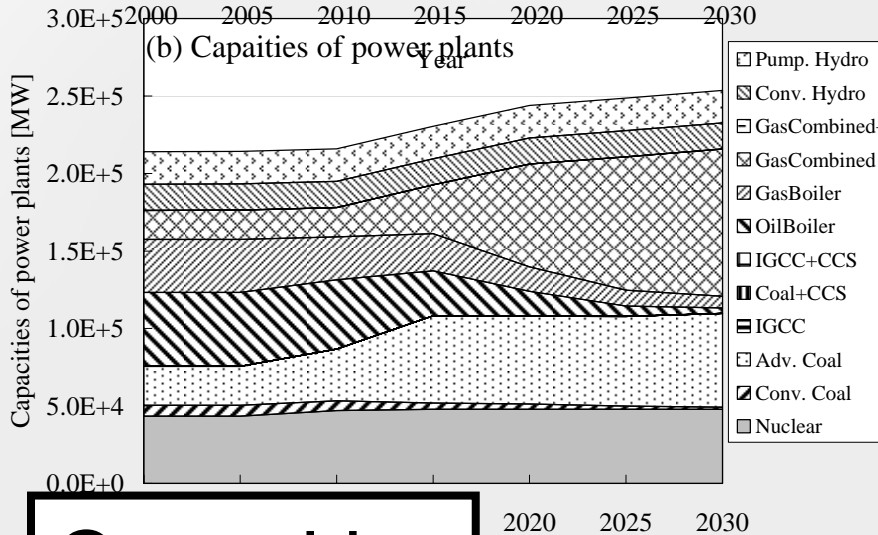
Generations



- Utilities decrease their CO₂ emissions to **70 Mt-C without CCS**, and **22 Mt-C with CCS**.

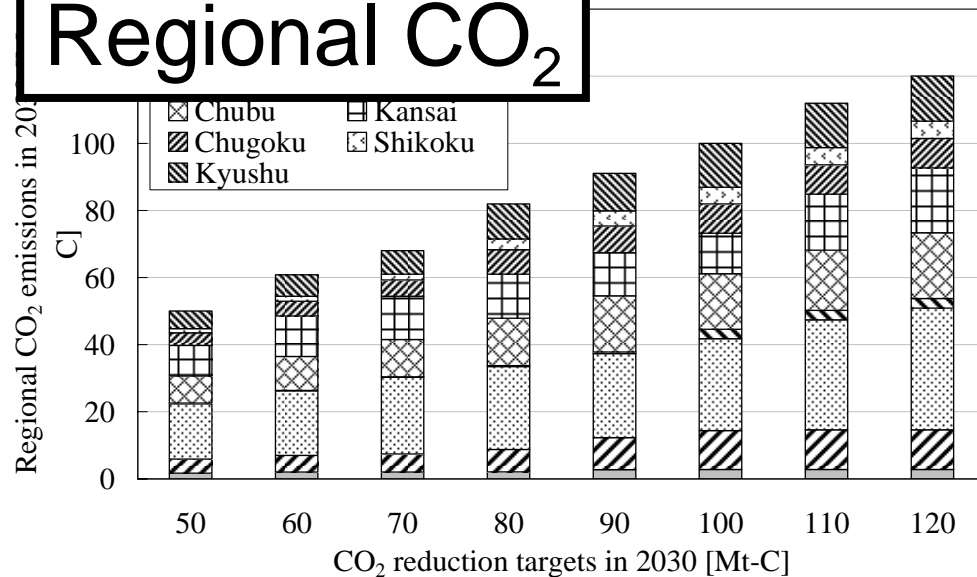
(CO₂ in 1990: 78 Mt-C)

(b) Capacities of power plants

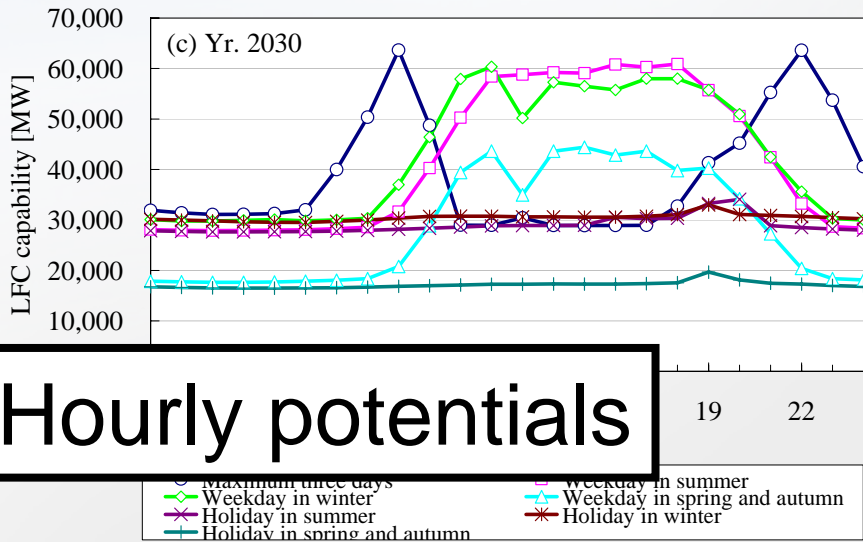


Capacities

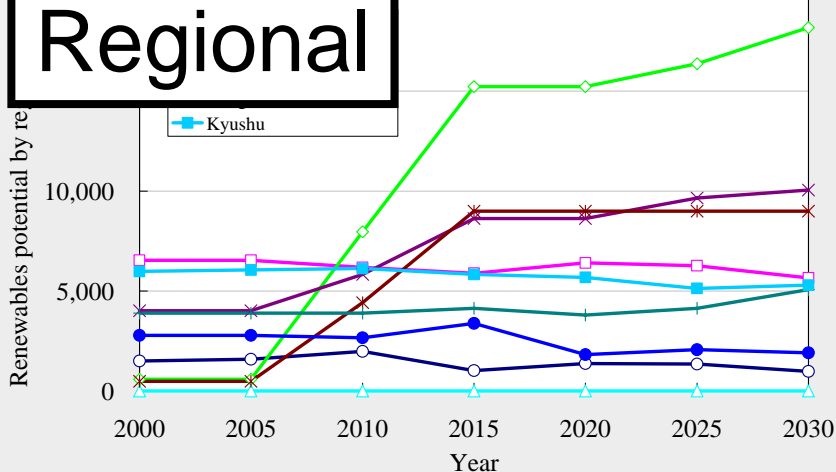
Regional CO₂



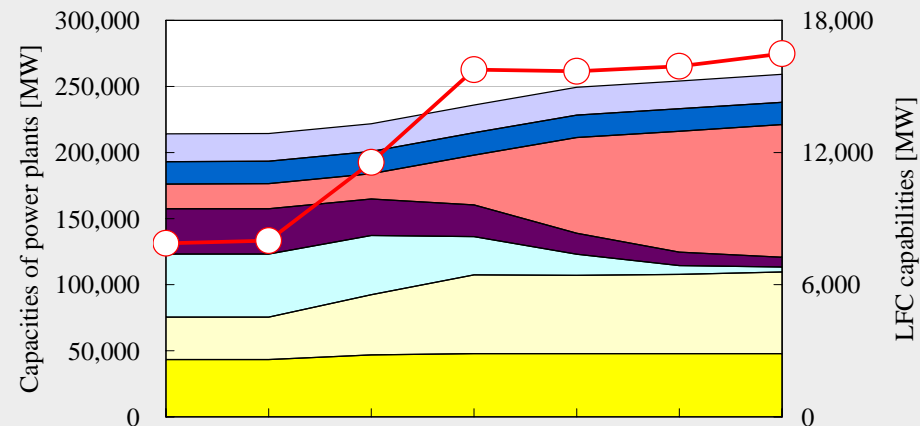
How to increase renewables energy supply in the electricity sector?



Hourly potentials

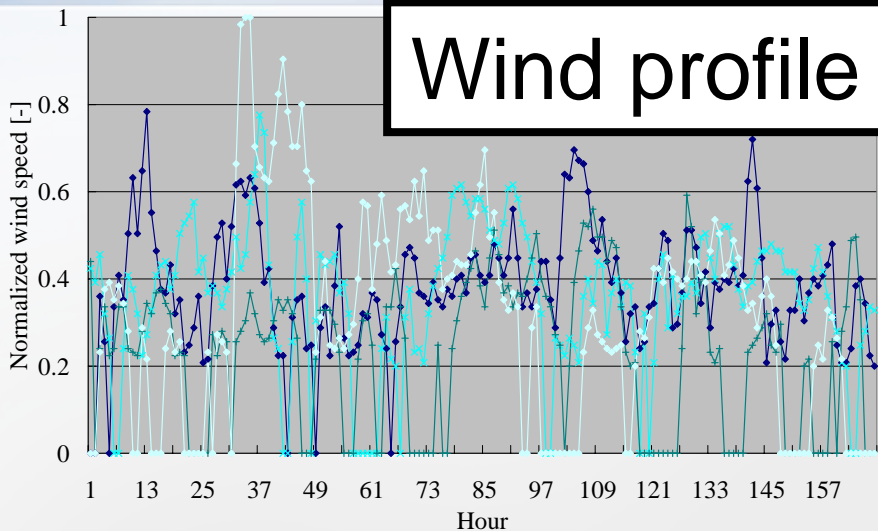


- Max. potentials of renewables reach **20% of total installed capacities**.
- **Coal-fired plants** encourage installation of **wind power**.
- **Gas combined cycle** leads to increase in capacity of **PV**.

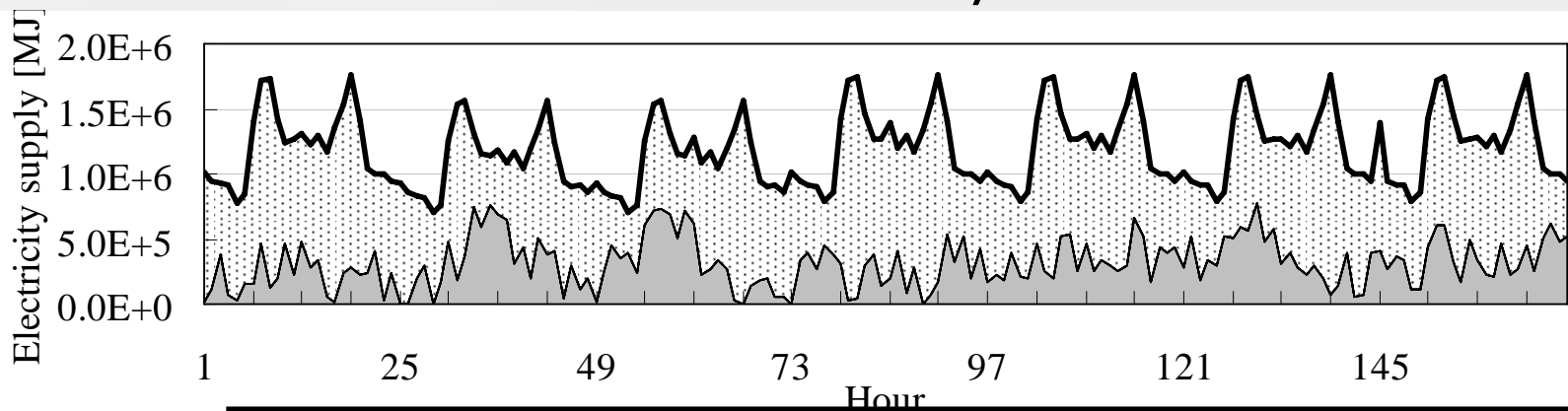


Capacities & Potentials

May Micro-grid with renewables supply low carbonized, stable energy sources?



- Half of energy demands can be supplied by renewables, mainly wind power.
- Energy cost will decrease by use of renewables.



Energy supply (Wind+Solar+Battery)

Thank you!

Your comments and suggestions
are always welcome!

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