

Activities in Asia

-Latest research activity of Vietnam and AIM team
for cooperation on future mitigation scenario development-

Tomoki Hirayama^{*1}, Yuki Ochi^{*2},
Tomoki Ehara^{*2} and Yuko motoki^{*1}

^{*1} Mizuho Research & Technologies, Ltd.

^{*2} E-konzal

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Latest research activity of Vietnam and AIM team for cooperation on future mitigation scenario development (OCT. 2020～)

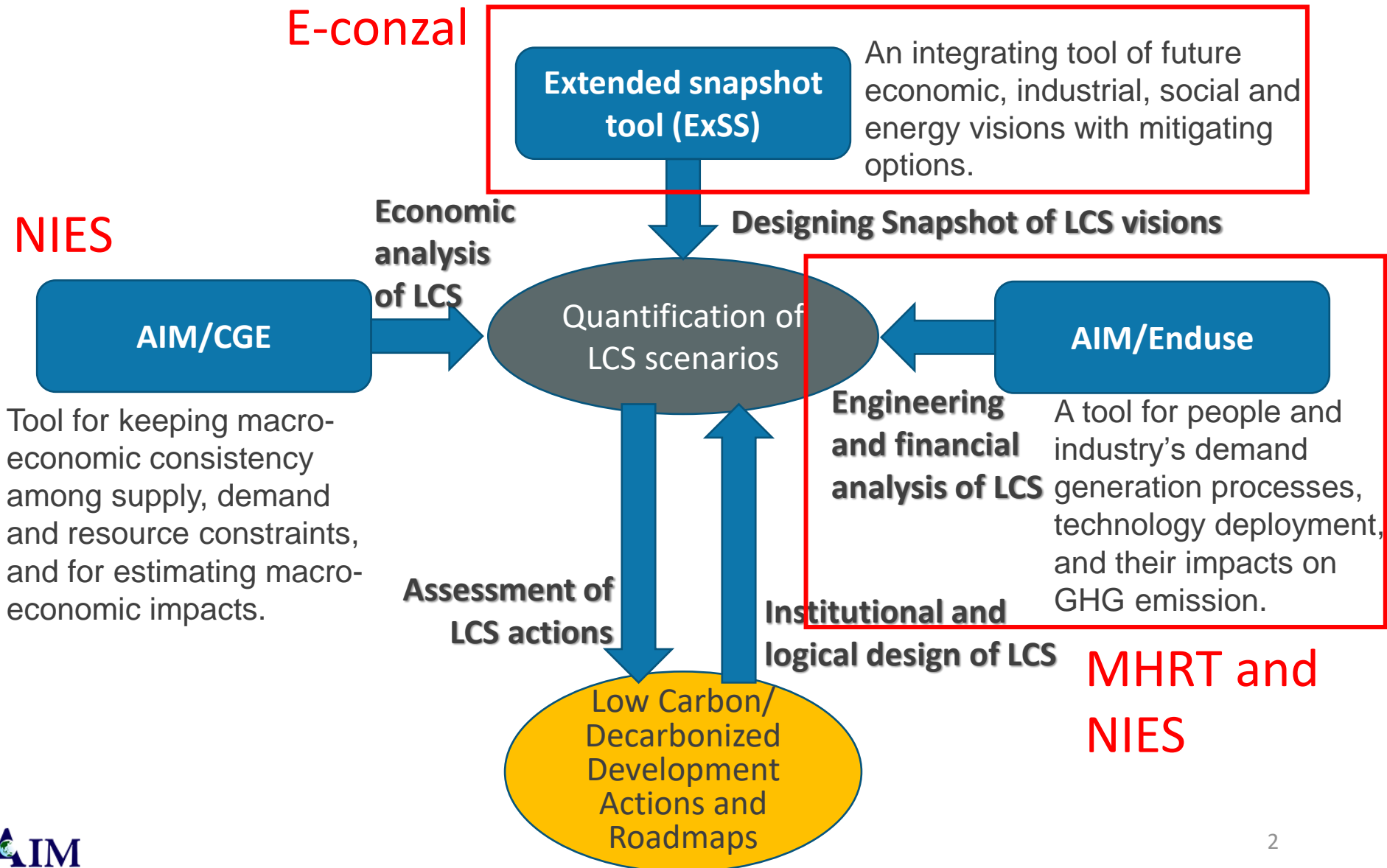
1. Final Goal

- Identification of GHG emissions peak-out in Vietnam
(When will the GHG emissions in Vietnam peak out?)
- Identification of policy measures for accelerating the GHG emissions peak-out and the expected impacts
(In order to accelerate the peak out of GHG emissions, which measures will be needed?
And what kind of positive and negative impacts will be generated?)

2. Expected outputs using AIM

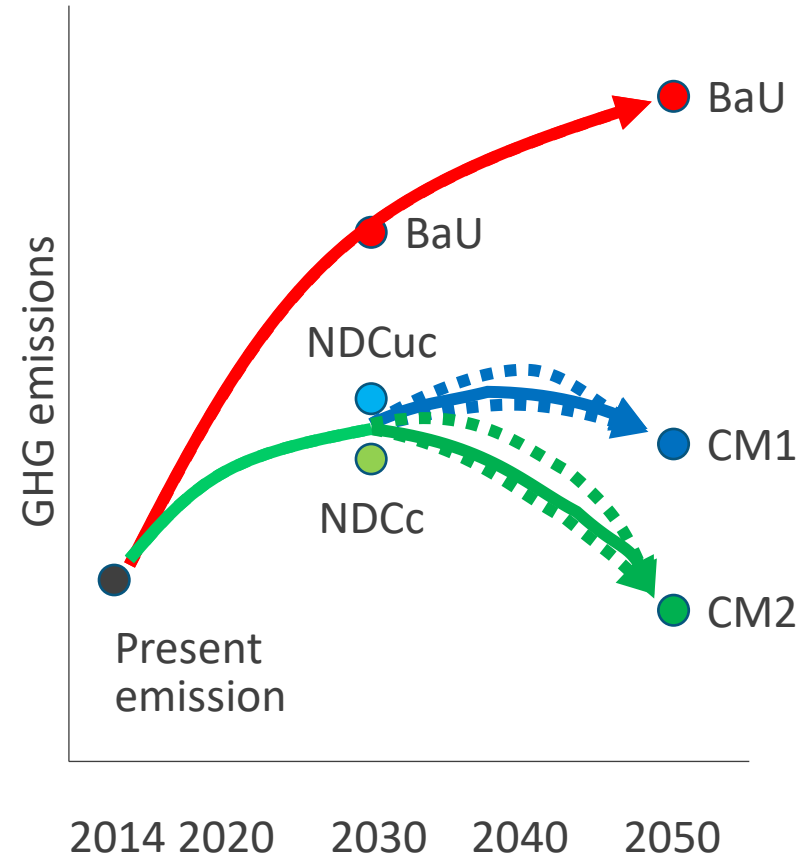
1. Trajectory of energy demand (by energy type and by sector; primary energy and final energy) [Enduse]
2. Trajectory of GHG emission (by gas type and by sector) [Enduse]
3. Trajectory of GHG mitigation costs (by sector) [Enduse]
4. Trajectory of macroeconomic impacts (GDP, final consumption, investment, ...) [CGE]

How to combine the tools in order to keep consistency and unity among Socio-Economic policies and LCS actions

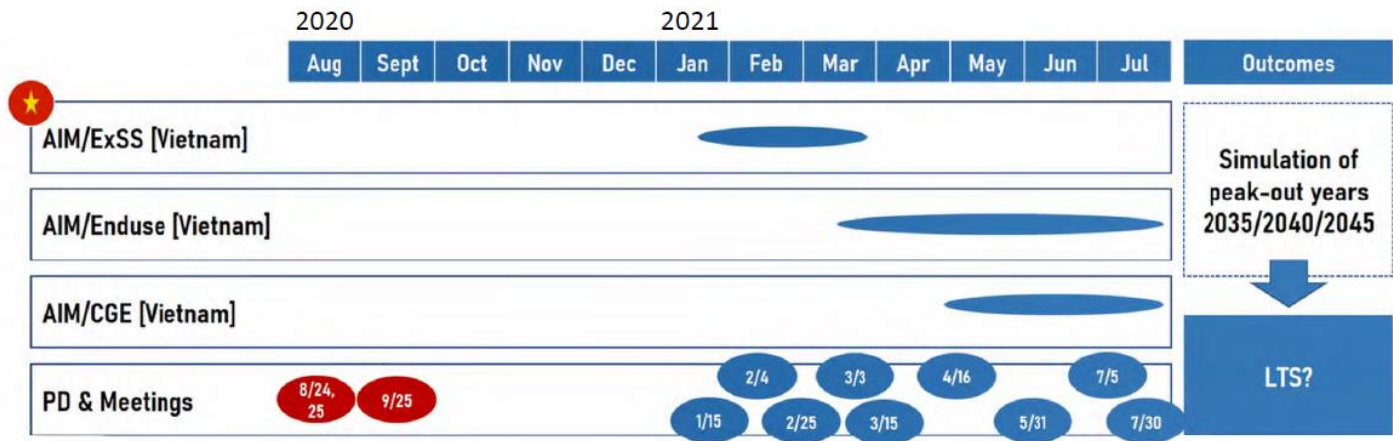
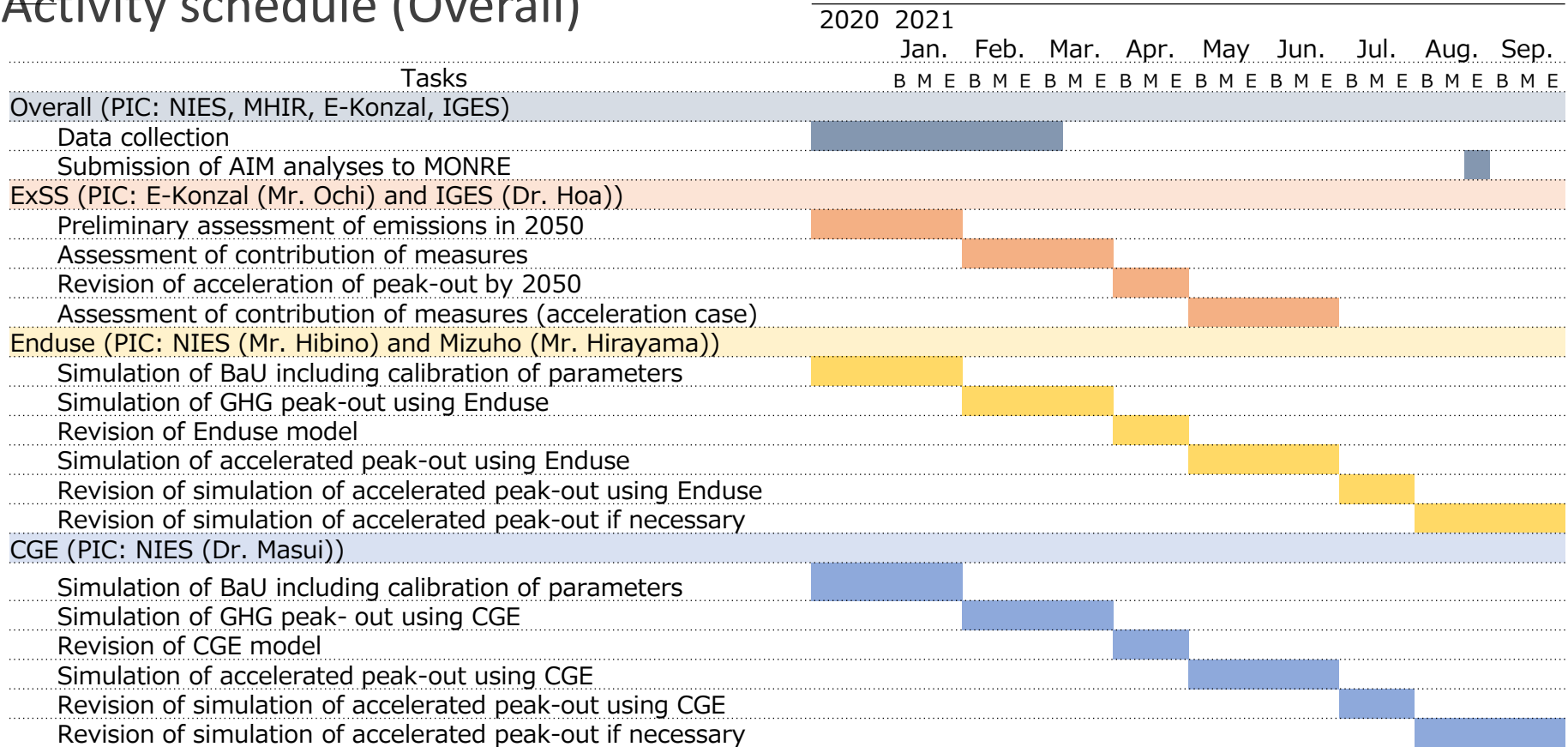


Outline: Process of this model activity

1. Analysis of GHG emissions in 2050 using ExSS
2. Discussion of emission pathways between present and future
3. Assessment of emission pathways using AIM/Enduse
4. Assessment of economic impacts using AIM/CGE
5. Discussion of peak-out of GHG emission
6. Revision of emission targets in 2050 and/or pathways if necessary



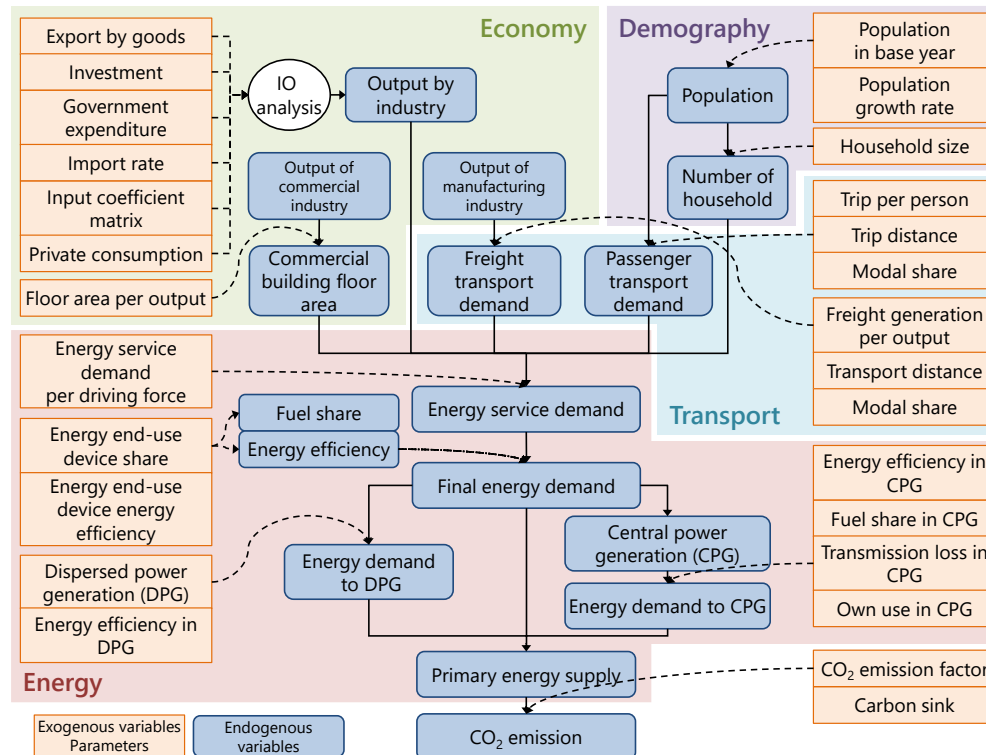
Activity schedule (Overall)



About ExSS

- ExSS is a comprehensive estimation tool for socio-economic indicators and GHG emissions designed for a backcasting study.
- Estimation by ExSS doesn't take much time because it requires relatively fewer data compared with AIM/Enduse or AIM/CGE.
- We illustrated quantitative snapshot of Vietnam in 2050, which includes socio-economic conditions, energy demand and CO₂ emissions.

Model Structure of ExSS



Schedule of Research (ExSS)

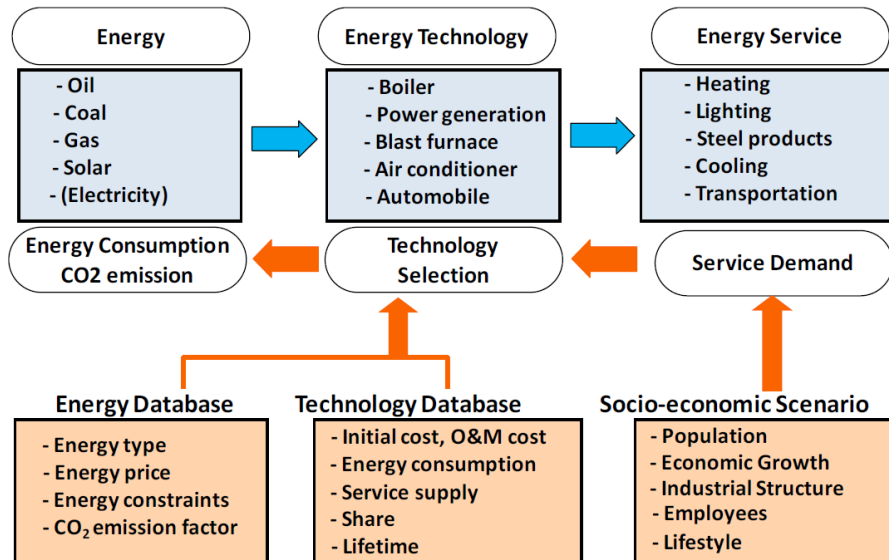
- **We collaborated with ISPONRE (The Institute of Strategy and Policy on Natural Resources and Environment) to collect data and information that is necessary for estimation by ExSS.**
- A low carbon scenario for Vietnam was prepared in about 3 months using ExSS.
- **We showed the result in the consultation meeting on March 2021 prior to other models so that MONRE (Ministry of Natural Resources and Environment) can understand the image of low carbon future and necessary countermeasures to achieve it.**

2020	Oct	- Meeting between Vietnam (MONRE, IMHEN and ISPONRE) and Japan (MOEJ, Viet Nam Embassy of Japan, JICA and NIES) about an inception report on this research
	Nov	- Internal meeting in AIM Japan team about the inception report and schedule - Preparation of the inception report
	Dec	- Data collection with ISPONRE
2021	Jan	- Internal Meeting in AIM team including ISPONRE to check the progress - Preparation of base year data
	Feb	- Internal Meeting in AIM team including ISPONRE to check the progress - Assumption of countermeasures and estimation of CO ₂ emission in 2050 - Internal Meeting in AIM team including ISPONRE to check the preliminary result
	Mar	- Revision of estimation - Consultation Meeting between Vietnam and Japan to show the result and discuss for improvement

About AIM/Enduse

- In order to conduct quantitative analysis of emission pathways in Vietnam, GHG emissions up to 2050 were estimated using a sequential dynamic system technology selection framework, AIM/Enduse.
- A sequential dynamic system is used to estimate the combination of technologies that minimizes total costs (technical introduction, operation and maintenance costs) to meet service demands imposed externally.

Model structure of AIM/Enduse



Example of technology dataset

Energy Sector	Efficient power generation; coal and gas with CCS; hydropower; wind power; solar PV; geothermal; bioenergy; ocean; PHS; reinforcing electricity interconnection; Hydrogen generation (electrolysis)
Transport Sector	Efficient train, maritime, and aviation; NGV; BEV, PHEV; FCEV; biofuels; eco-driving
Building Sector	Energy-efficient buildings (e.g. insulation); high-efficiency equipment and appliances; electric heat pump water heaters; electrification for heating, cooling, and cooking; energy-management systems
Industry Sector	Energy-efficient industrial processes; CCS for iron making and cement lime; high-efficient boiler, furnace, and motor; industrial heat pump; agricultural machines; bioenergy use

Minimize Total Cost (TC) at year t

$$TC = \text{Initial investment cost (\$)} + \text{Operating and maintenance cost (\$/year)} + \text{Energy cost (\$/year)} + \text{Payment for energy tax (\$/year)} + \text{Payment for emission tax (\$/year)}$$

• Service demand

$$D(j) \leq \sum_l A(j,l) \cdot X(l)$$

$D(j)$: Service demand quantity of service type j
 $A(j,l)$: Output of service j per unit operation of device l
 $X(l)$: Operating quantity of device l

• Stock dynamics

$$S(l) = \bar{S}(l) \cdot \left(1 - \frac{1}{T(l)}\right) + r(l) - w(l)$$

$S(l)$: Stock of device l
 $\bar{S}(l)$: Stock of device l in the previous year
 $T(l)$: Life time of device l
 $r(l)$: Recruited quantity of device l
 $w(l)$: Retired quantity of device l

Schedule of Research (Enduse)

- Emission scenario calculations and assessment of peak-out GHG Emissions in Vietnam were conducted using AIM/Enduse in about 7 months.
- **By holding consultation meetings many times, we could have opportunity to have a discussion about our calculated result.**
- **Thanks to the shared basic data with Vietnam team (Dr. Bao and Dr. Tan, MONRE), estimation could be refined in line with the actual situation in Vietnam.**

2021	Jan-Feb	<ul style="list-style-type: none">- Setting of socio-economic indicators which conform to ExSS assumptions- Setting of scenario for power supply which conform to Vietnam's official plan (PDP8)
	Mar	<ul style="list-style-type: none">- Preliminary calculation of BAU(Technology-fixed) and countermeasure scenarios- Consultation On line Meeting between Vietnam and Japan to show the result and discuss for improvement
	May	<ul style="list-style-type: none">- Revised calculation of BAU(Technology-fixed) and countermeasure scenarios- Consultation Meeting between Vietnam and Japan to show the result and discuss for improvement
	Jun-Jul	<ul style="list-style-type: none">- Revised calculation of 2 BAU(Technology-fixed) and 5 countermeasure scenarios- Consultation Meeting between Vietnam and Japan to show the result and discuss for improvement
	Aug	<ul style="list-style-type: none">- Data sharing with Vietnam team (Device costs and future assumptions of socio-economic indicators)- Revised calculation of 2 BAU(Technology-fixed) and 5 countermeasure scenarios

Suggestions for the next step

- From the view point of international research collaboration, after the pandemic of Covid-19 we have **more opportunities to have online discussions**. For example, holding **monthly online meeting** is effective for project members to understand the progress of each part of the research.
- It is difficult to access **the latest information of national strategy/plan** from overseas. The latest information is rarely translated in English. It is important to collaborate with local researchers to get the latest information.
- **Assumptions of socio-economic activities (=service demand)** critically influence on the calculation for energy supply and demand as the driving forces. Well in advance these data should be shared among all the project members, including Vietnam side and AIM side.
- **Physical and economical potentials for available renewable energy** also give an impact on the estimated emission pathways. Taking more time to discuss this agenda enables us to describe more various decarbonized scenarios.
- **Data sharing concerning technology information (cost, efficiency,...)** is also needed for more accurate estimation for necessary additional investment.