APEC Outlook 8th Edition – preliminary projections

APERC Annual Conference 2020
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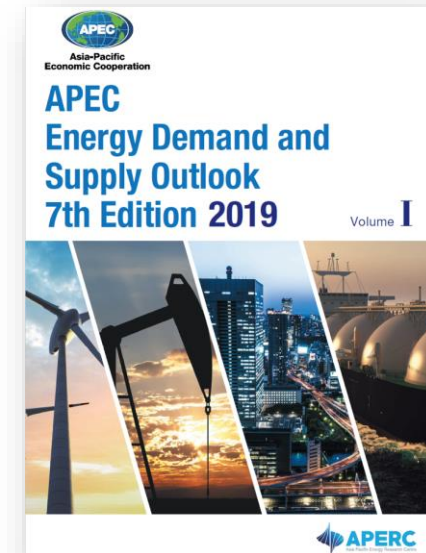Mr. David WOGAN, Assistant Vice President, Senior Researcher, APERC

Outline

- Outlook description
- Analysis tools
- Preliminary results (snapshot)
- Ongoing and future activities

APEC Energy Demand & Supply Outlook

- Provides coverage on projected energy demand and supply trends
  - 21 APEC member economies
  - 2019-2050
- Published every three years
  - 7th edition published June 2019
  - 8th edition scheduled for Q2 2022
- Two volumes
  - APEC-wide trends
  - Economy-specific trends (21 chapters)
- Data tables
- For the 8th edition…
  - **Redesigned analysis workflow**
  - EGEDA data

8th edition scenarios

Current Policies	Announced Policies	Climate Change
This scenario shows a continuation of **current trends and policies in effect** without any additional policy interventions. It serves as a **reference** for the two alternative scenarios. **Currently modeling**	This scenario includes current and **announced** policies that have not been implemented, and **targets and goals**.	This scenario presents a decarbonization pathway consistent with a **2DC** future under the Paris Agreement. It identifies the **additional level of ambition and policy packages** to transition to a low-carbon energy system.

Notes: all scenarios will use a base year of 2019. Projections are annual through 2050. Macro-economic assumptions are constant across scenarios.

Current policies are those that are active in law, regulation, and/or implementation. Current policies do not include targets, goals, or other policy proposals that may have been announced but not implemented.
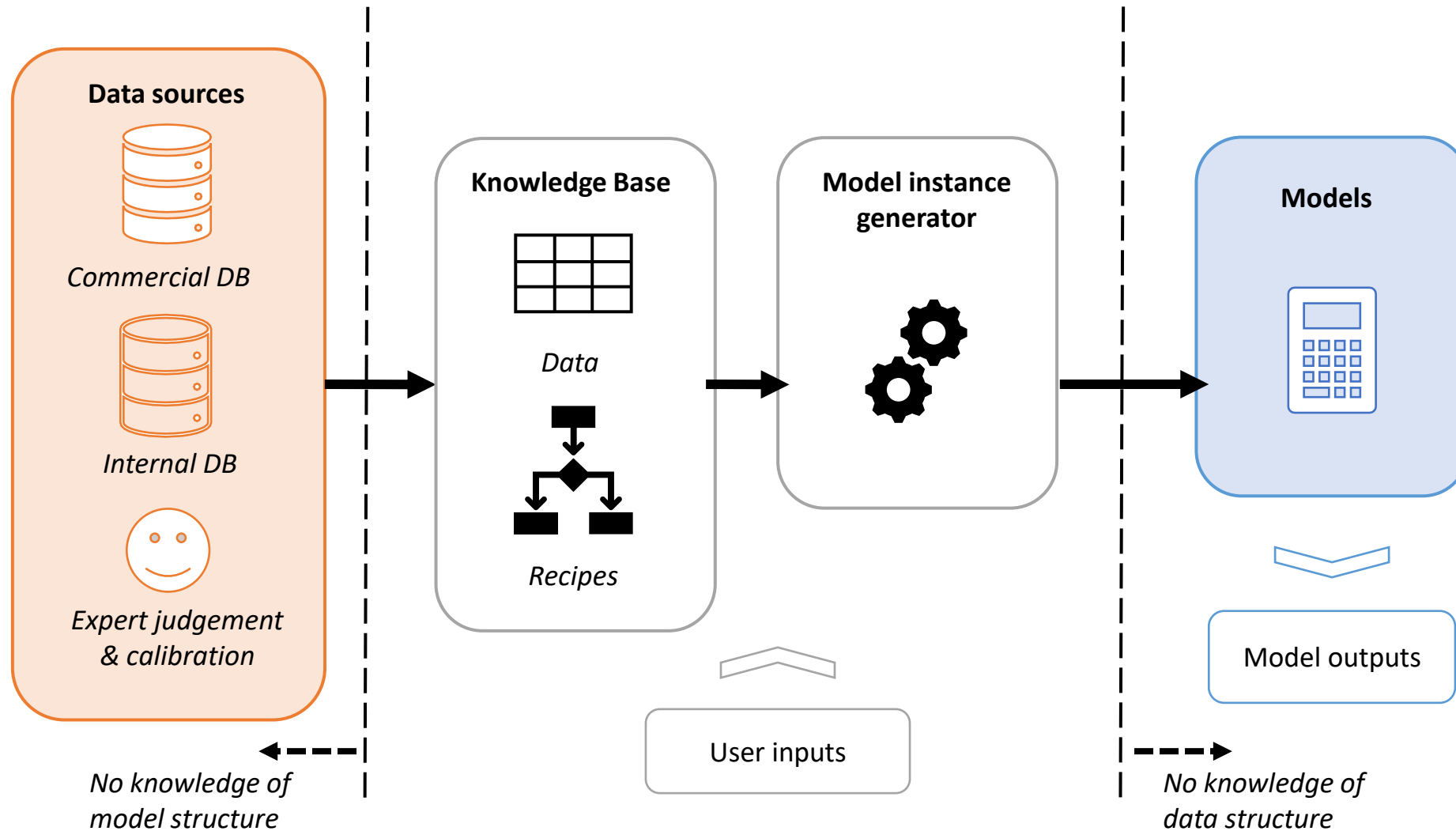
Announced policies include targets and goals, and policies that are not yet under implementation. NDCs are included.

Additional measures for the *Climate Change scenario* are bottom-up in nature. Planning for this scenario will commence later this year, followed by modeling in early 2021.

APERC
Asia Pacific Energy Research Centre
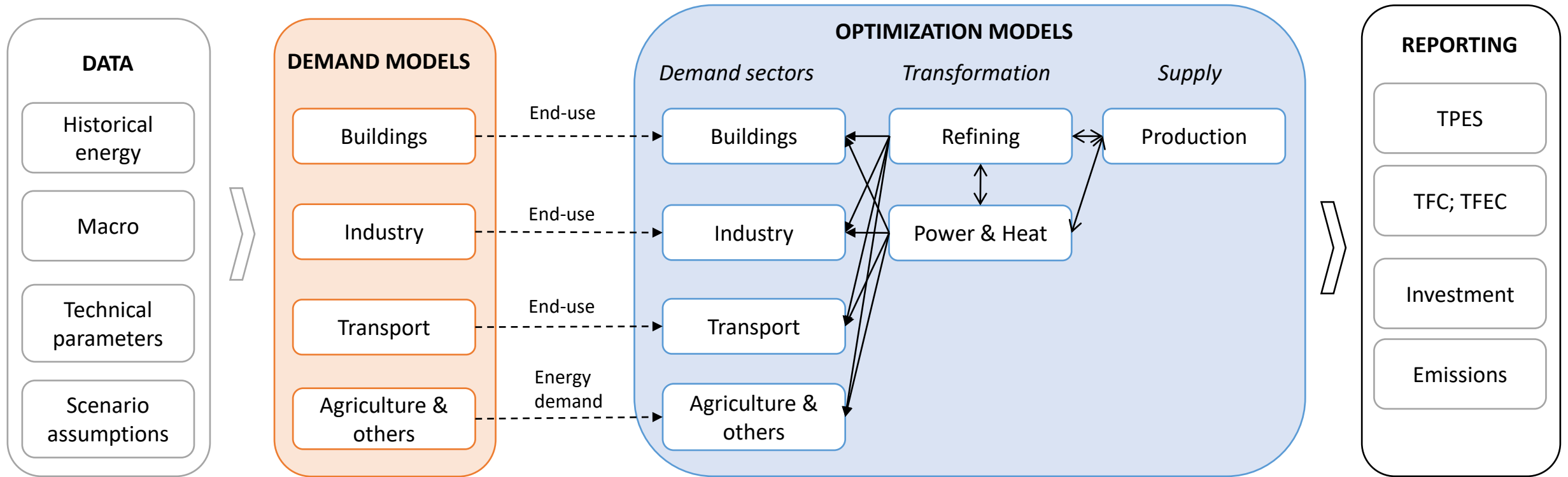
Analysis guiding principles

1. Consistency in methodology

2. Increased focus on economics

3. Improved accessibility and usability

4. Open source whenever possible

5. Transparency

Knowledge Based Modeling
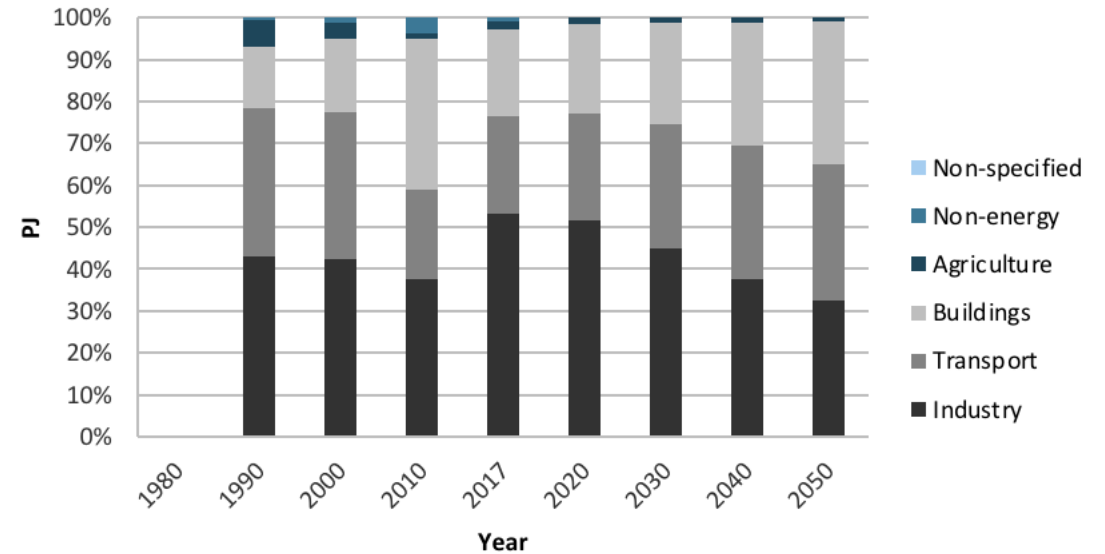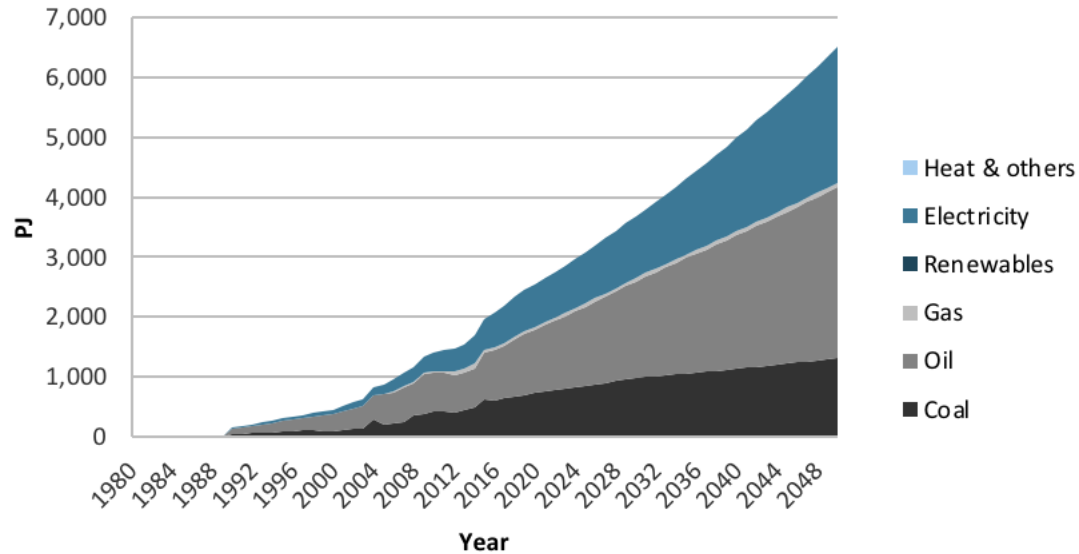
Model structure

Notes
- *APEC member economy data is provided by EGEDA.*
- *Demand models project future end-use demand (e.g., lighting). The Agriculture sector projects energy consumption directly due to data limitations.*
- *While each sector is formulated as an LP, some sector models are more constrained than others to account for non-cost minimization decisions.*
- *Additional metrics are reported than the ones listed.*

Tools

- [Python](#): to automate workflows

- [Pandas](#): to manipulate datasets

- [scikit-learn](#): machine learning-based demand projections

- [Pyomo](#): to generate linear programs

- [OSeMOSYS](#): to generate linear program model instances
  - provides a consistent framework to organize the model elements
    - Input and output data
    - Supply-demand balances
    - Cost structure
    - Emissions accounting

- Microsoft Excel: data management and charts
  - Charts are created using Pandas [XlsxWriter](#)

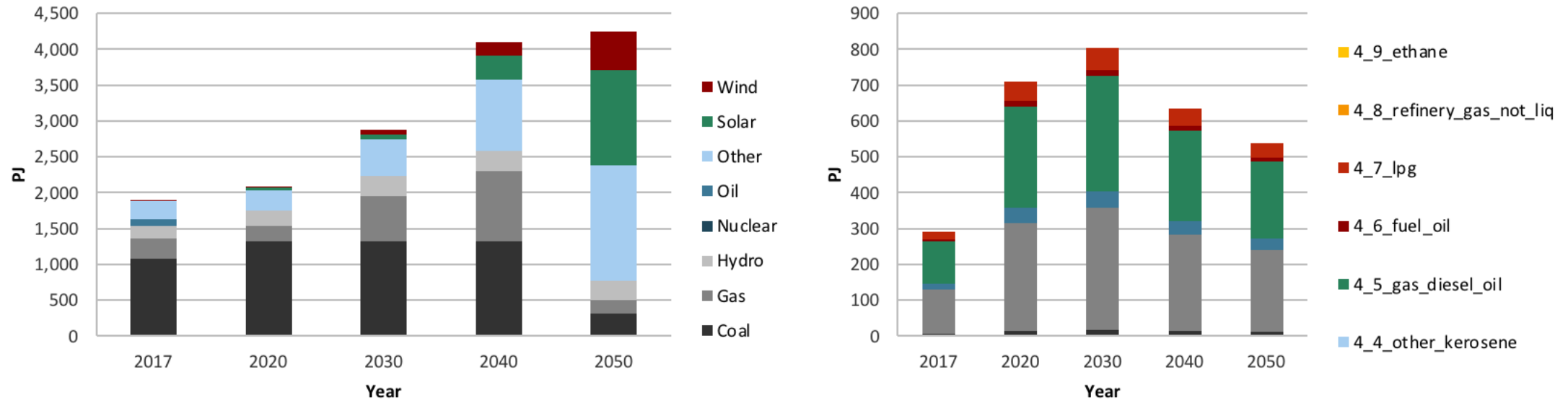# Preliminary results – Total Final Consumption (TFC)

Figures: *TFC by fuel (left) and sector (right) for Viet Nam, 2017-2050.*
Note: TFC = end-use energy consumption in demand sectors and non-energy use.

- Strong aggregate TFC growth a result of preliminary demand model calibrations

- Service demand calculated by regressions (sci-kit learn)

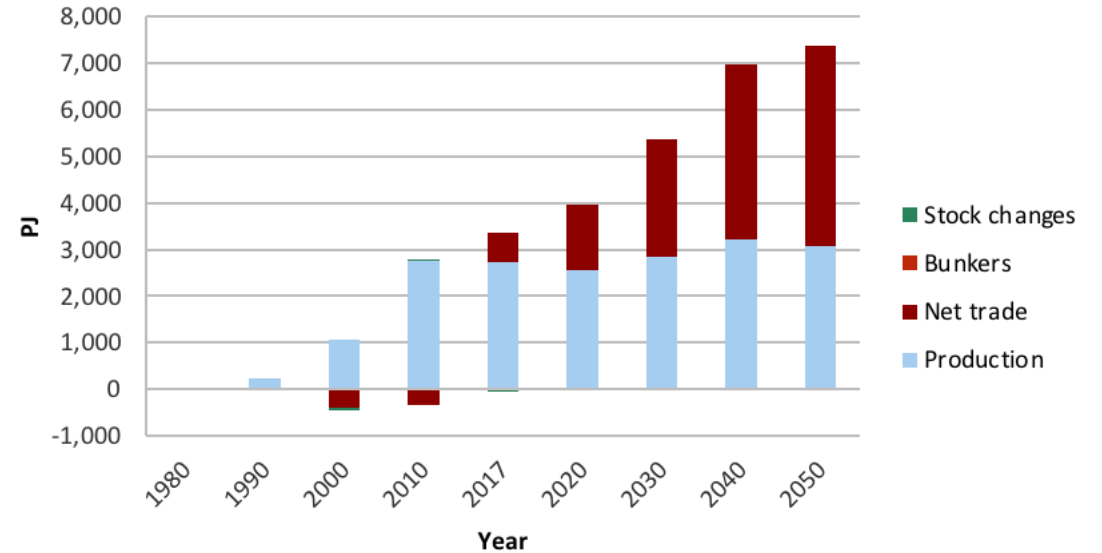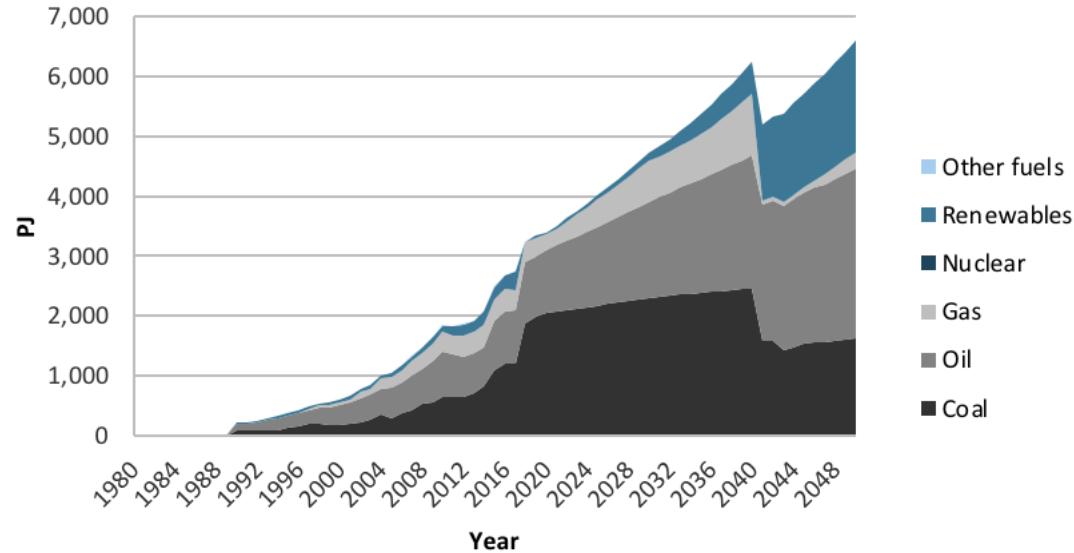- Energy efficiency improvements included in OSeMOSYS parameters

Preliminary results – Transformation activities

Figures: *Fuel consumption by Power sector (left) and Refined Petroleum Product production (right) for Viet Nam, 2017-2050.*

- Power sector represented by cost-minimizing capacity expansion model (OSeMOSYS), which meets exogenous electricity demand (from demand sectors)
- Refinery sector follows same approach

Preliminary results – Total Primary Energy Supply (TPES)

Figures: *TPES by fuel (left) and sector (right) for Viet Nam, 2017-2050.*
TPES = production + net imports

- Structural break starting in 2040s likely due to "end effects" → next runs will be performed over an extended horizon (e.g., 2075)

- Supply model can invest in additional production and import capacity for a range of resource and technology types (e.g., onshore tight oil production, LNG exports, etc)

Ongoing and future activities

- COVID-19 assumptions
  - We are incorporating short- and long-term impacts by adjusting GDP assumptions (applies to all three scenarios) and commodity prices
    - Short-term: GDP disruption and recovery projections from IMF
    - Long-term: return to previous GDP growth rates
  - **Question**: what other long-term structural and/or behavioral shifts should be considered?
- Climate Change Scenario
  - Will begin design late 2020/early 2021
  - **Question**: what new developments or trends should we explore? E.g., Circular Carbon Economy?
- Expert feedback
  - We are seeking reviewers for our results and chapters

Thank you for your kind attention!

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https://github.com/asia-pacific-energy-research-centre