International Energy Agency

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The importance of energy and activity data for technology policy modeling

2016 InterEnerStat Workshop:

Energy efficiency and end-use data and Meeting of Organisations

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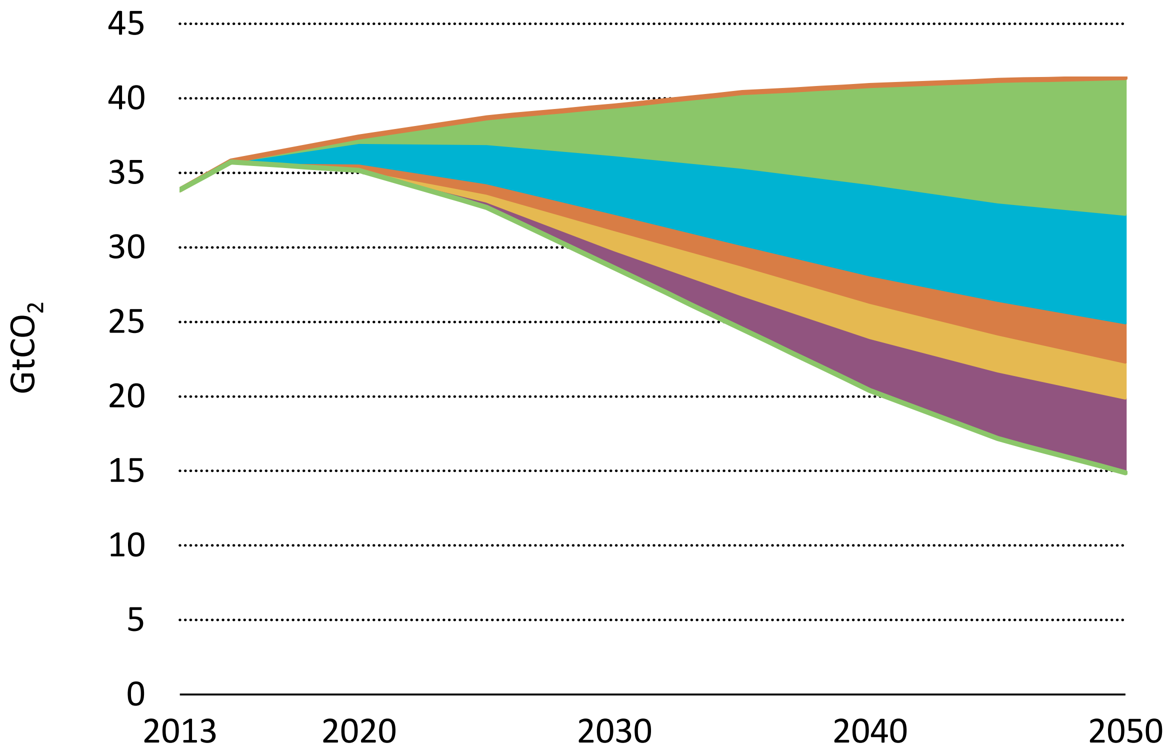
www.iea.org

Sizing the scale of the challenge … and its technology and policy solutions

ETP 2016

Contribution of technology area to global cumulative CO_2 reductions

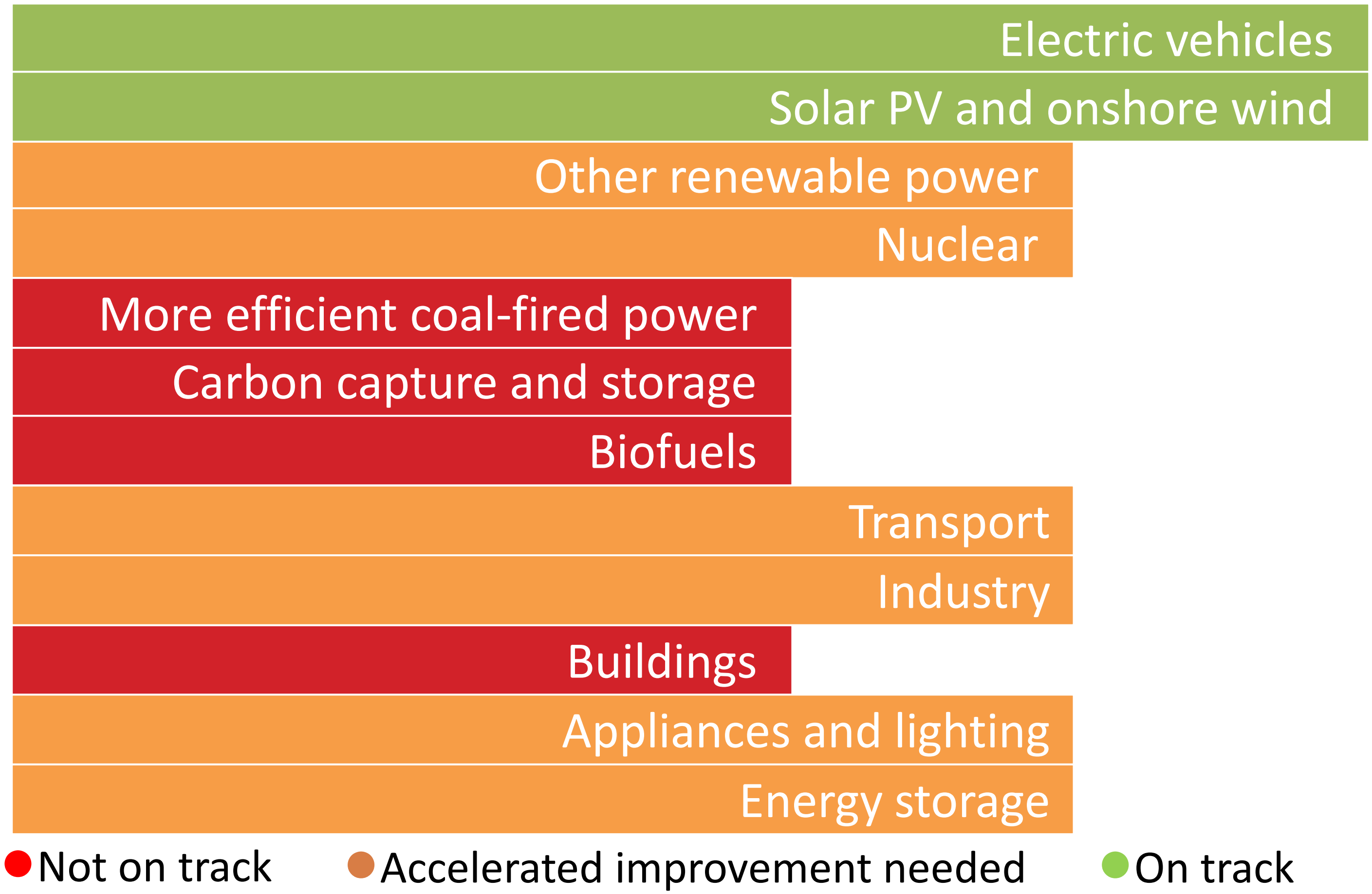


The carbon intensity of the global economy can be cut by two-thirds through a diversified energy technology mix

Progress in clean energy needs to accelerate

ETP 2016

Technology Status today against 2DS targets by 2025

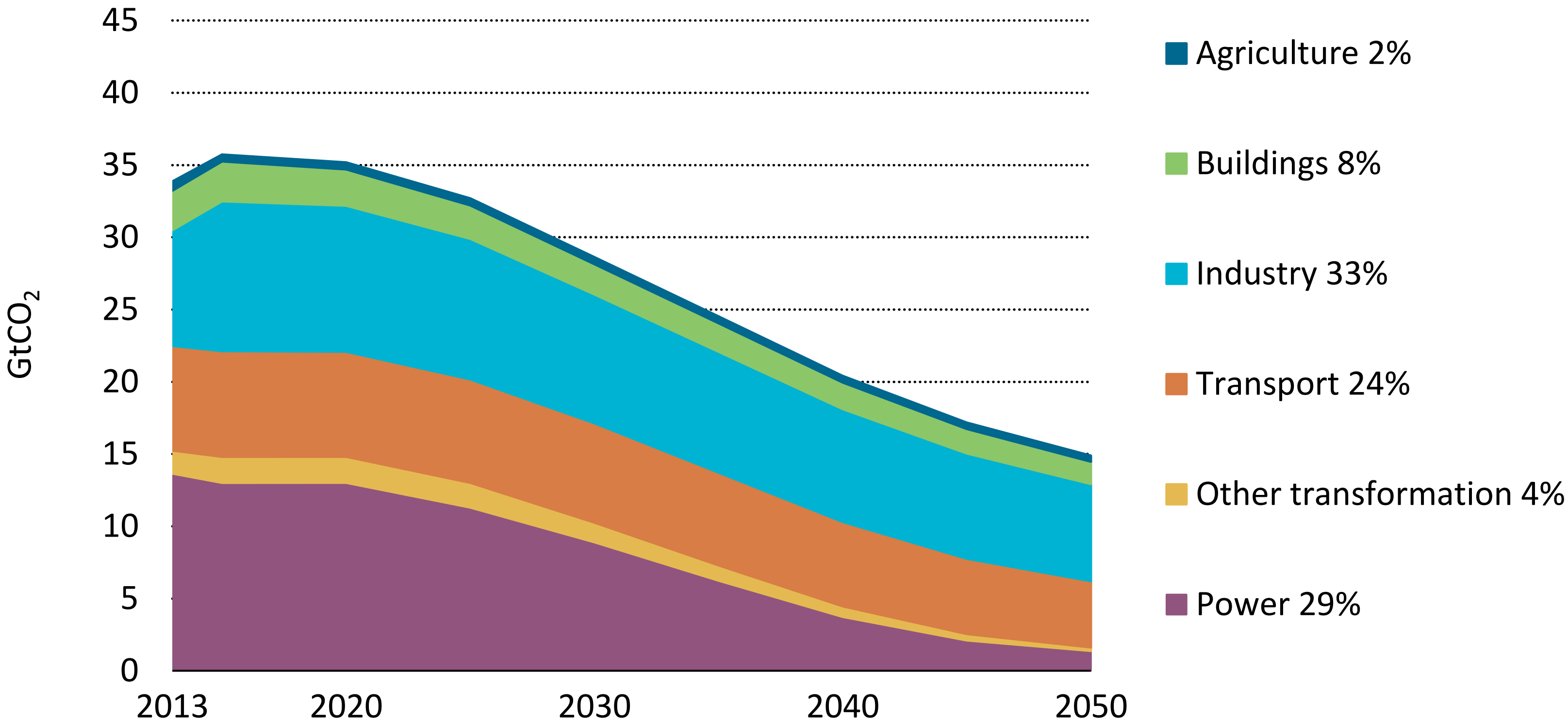


Clean energy deployment is still overall behind what is required to meet the 2°C goal, but recent progress on electric vehicles, solar PV and wind is promising

The challenge increases to get from 2 degrees to "well below" 2 degrees …

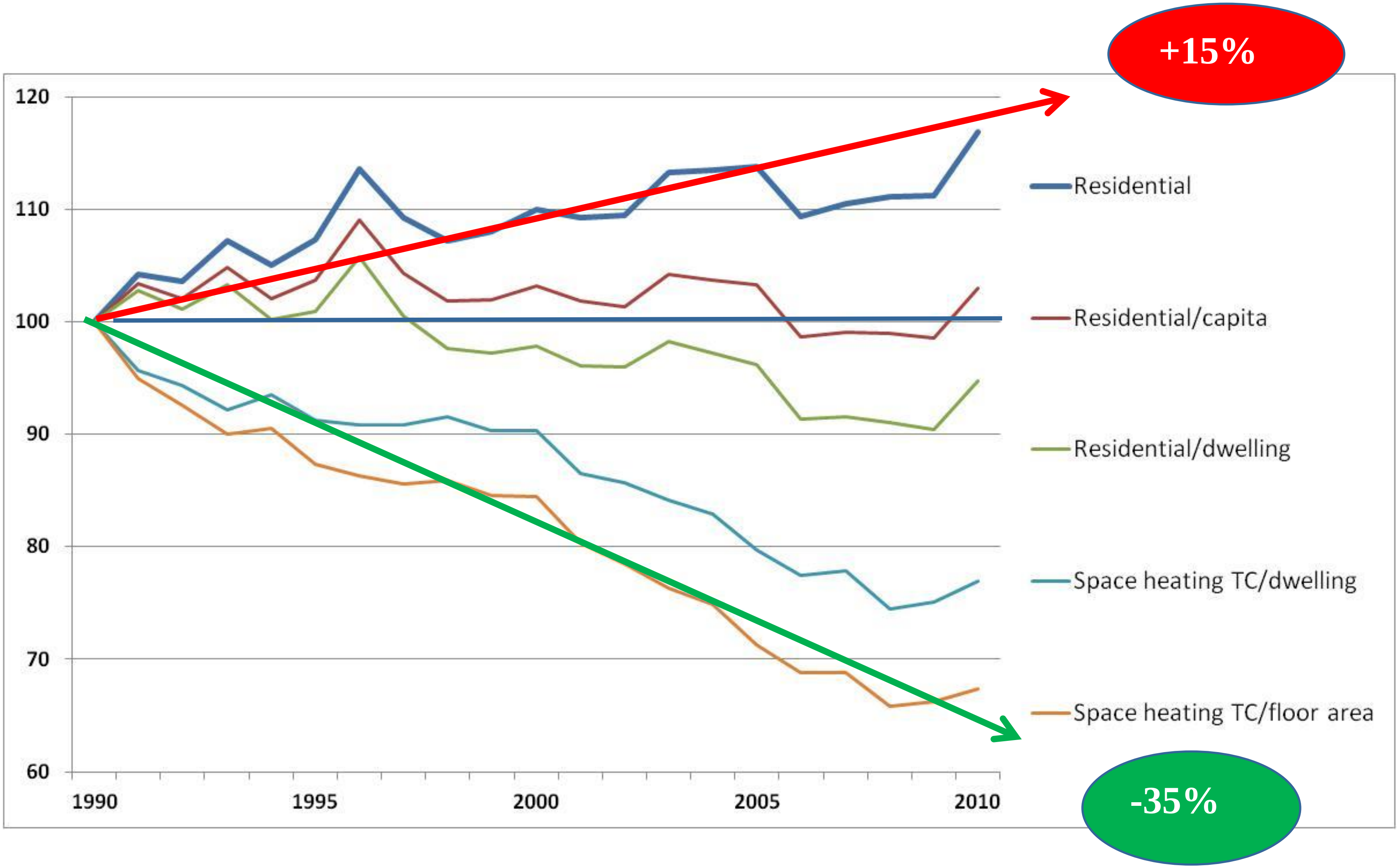
ETP 2016

Energy- and process-related CO_2 emissions by sector in the 2DS



Industry and transport account for 75% of the remaining emissions in the 2DS in 2050.

Data disaggregation → sound analysis



Index: 1990=1. Data for IEA18 (Australia, Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland, UK, USA). Source: IEA energy efficiency indicators database.
TC: Temperature Corrected.

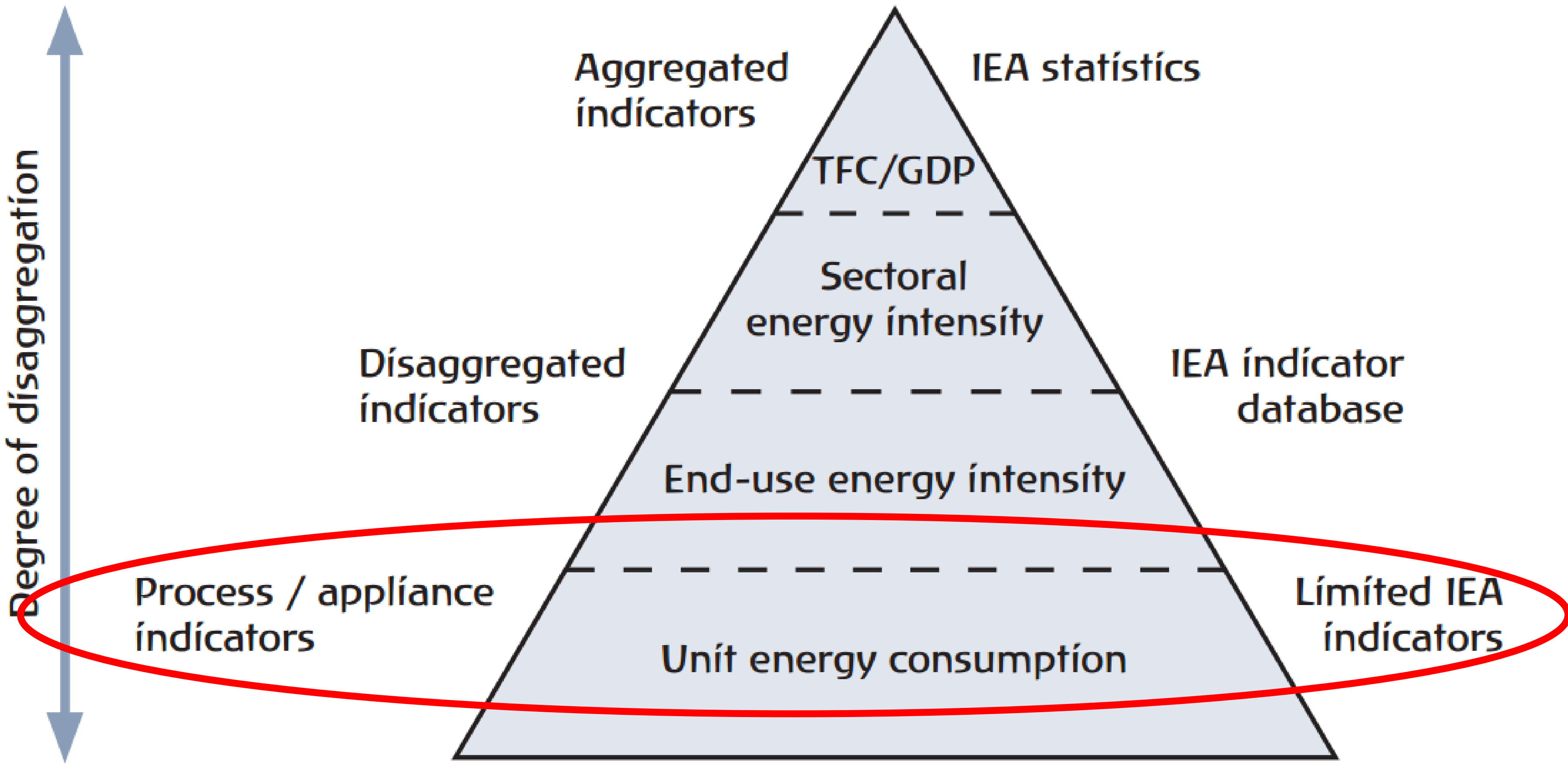
Selected IEA recommended indicators, by sector

Sector	Indicator (Level*)	Coverage	Energy data	Activity data
Residential	L2: Space heating energy consumption per floor area (heated)	All heating systems	Total space heating energy consumption	Total floor area
	L2: Cooking energy consumption per dwelling	All cooking devices	Total cooking energy consumption	Total number of dwellings
	L3: Energy consumption per appliance unit	By appliance type	Energy consumption for all appliances of type A	Number of appliances of type A
Services	L2: Space cooling energy consumption per floor area cooled	All cooling systems	Total space cooling energy consumption	Total floor area cooled
	L3: Lighting energy consumption per unit of activity	By service category	Lighting energy consumption for service category A	Unit activity of service category A
	L3: Other equipment energy consumption per unit of activity	By service category	Other equipment energy consumption for service category A	Unit activity of service category A
Industry	L2: Energy consumption per unit of physical output	Sub-sector	Total sub-sectoral energy consumption	Sub-sectoral physical output
Transport	L3: Passenger transport energy consumption per passenger-kilometre	By mode / passenger vehicle type	Energy consumption of passenger transport by mode / vehicle type A	Number of pkm of passenger mode / vehicle type A
	L3: Freight transport energy consumption per tonne-kilometre	By freight mode / vehicle type	Energy consumption of freight transport by freight mode / vehicle type B	Number of tkm of freight mode / vehicle type B

* Levels in the IEA energy indicators pyramid : L2 (Level 2), L3 (Level 3)

Source : IEA (EEI) 2014

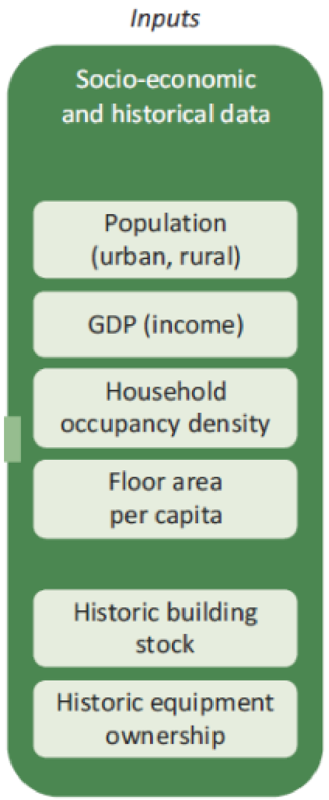
The IEA energy indicators pyramid



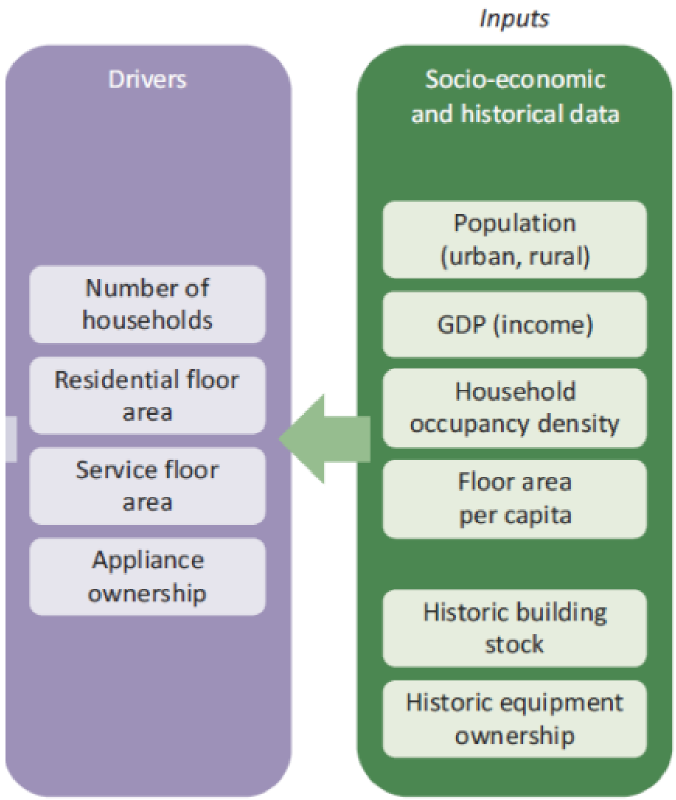
Robust energy technology modeling requires a high degree of disaggregation

Source: IEA (2014). Energy Efficiency Indicators: Essentials for Policy Making. http://www.iea.org/publications/freepublications/publication/energy-efficiency-indicators-essentials-for-policy-making.html

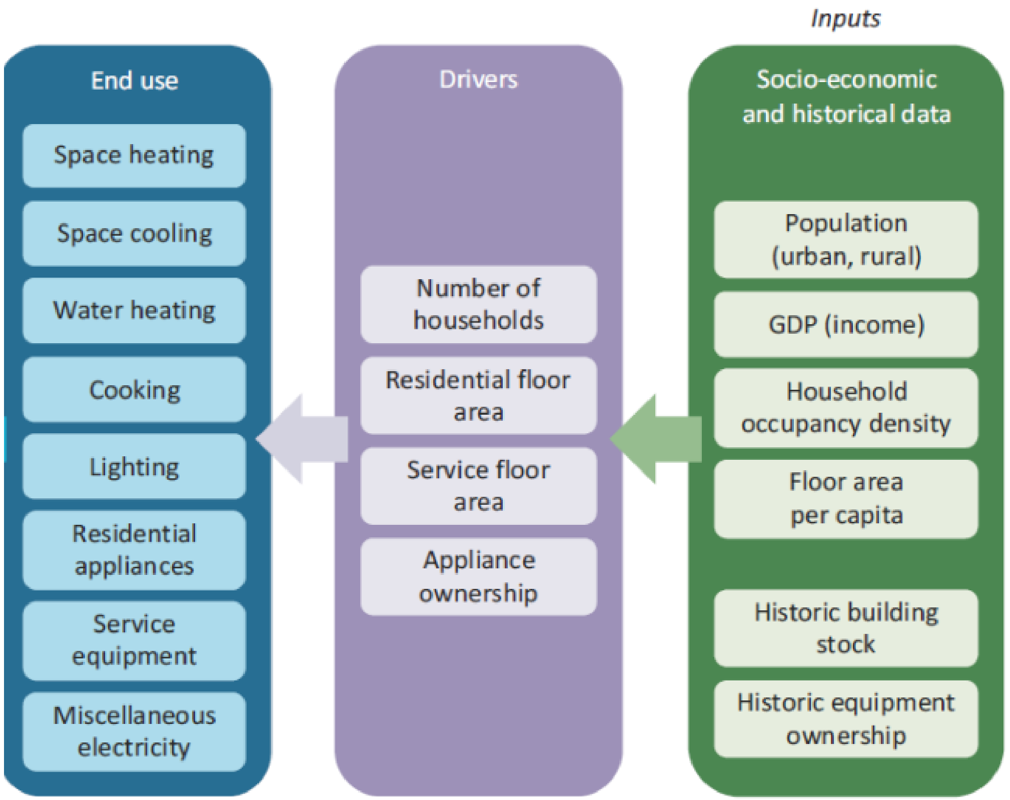
ETP buildings model structure



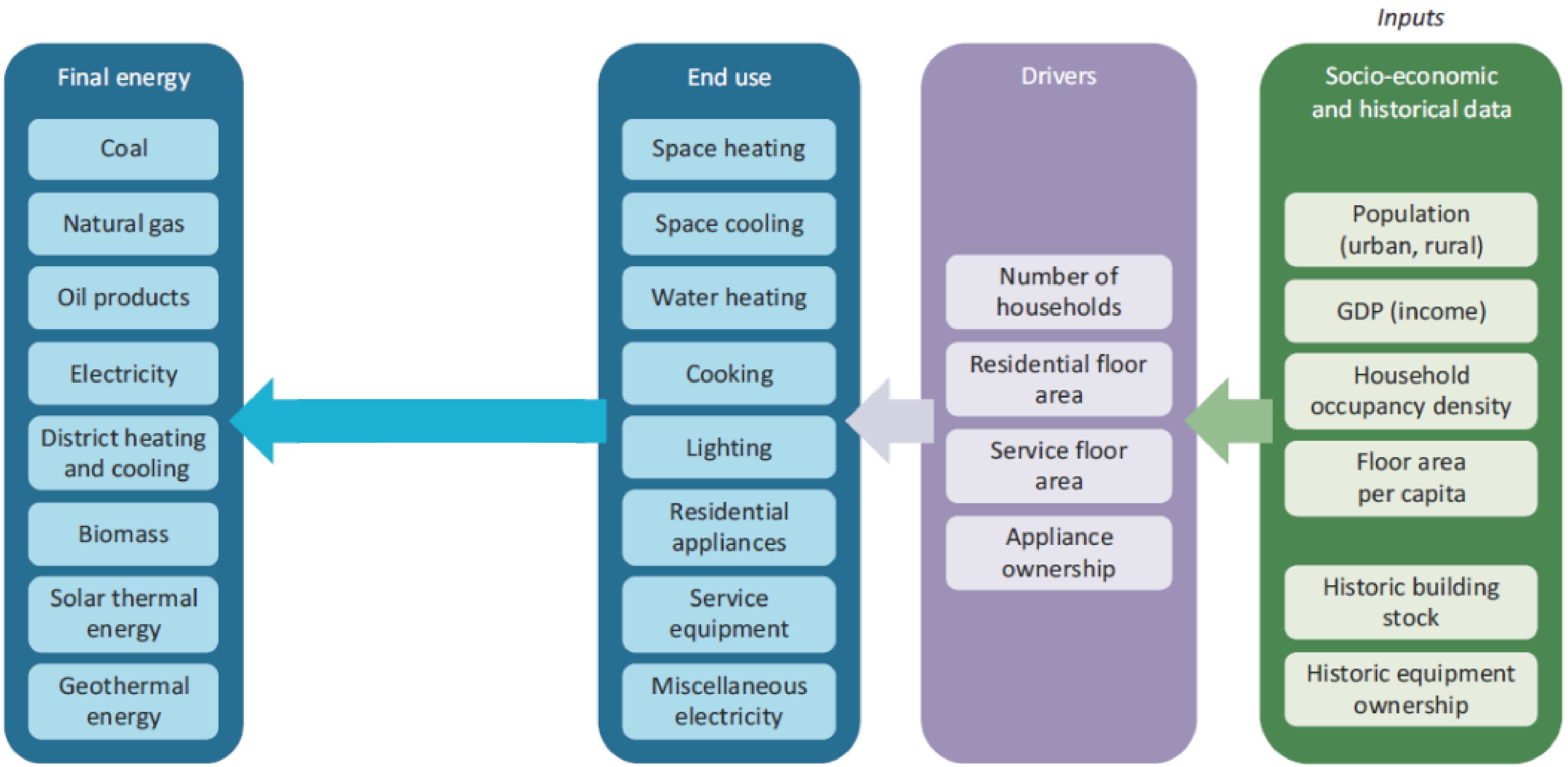
ETP buildings model structure



ETP buildings model structure

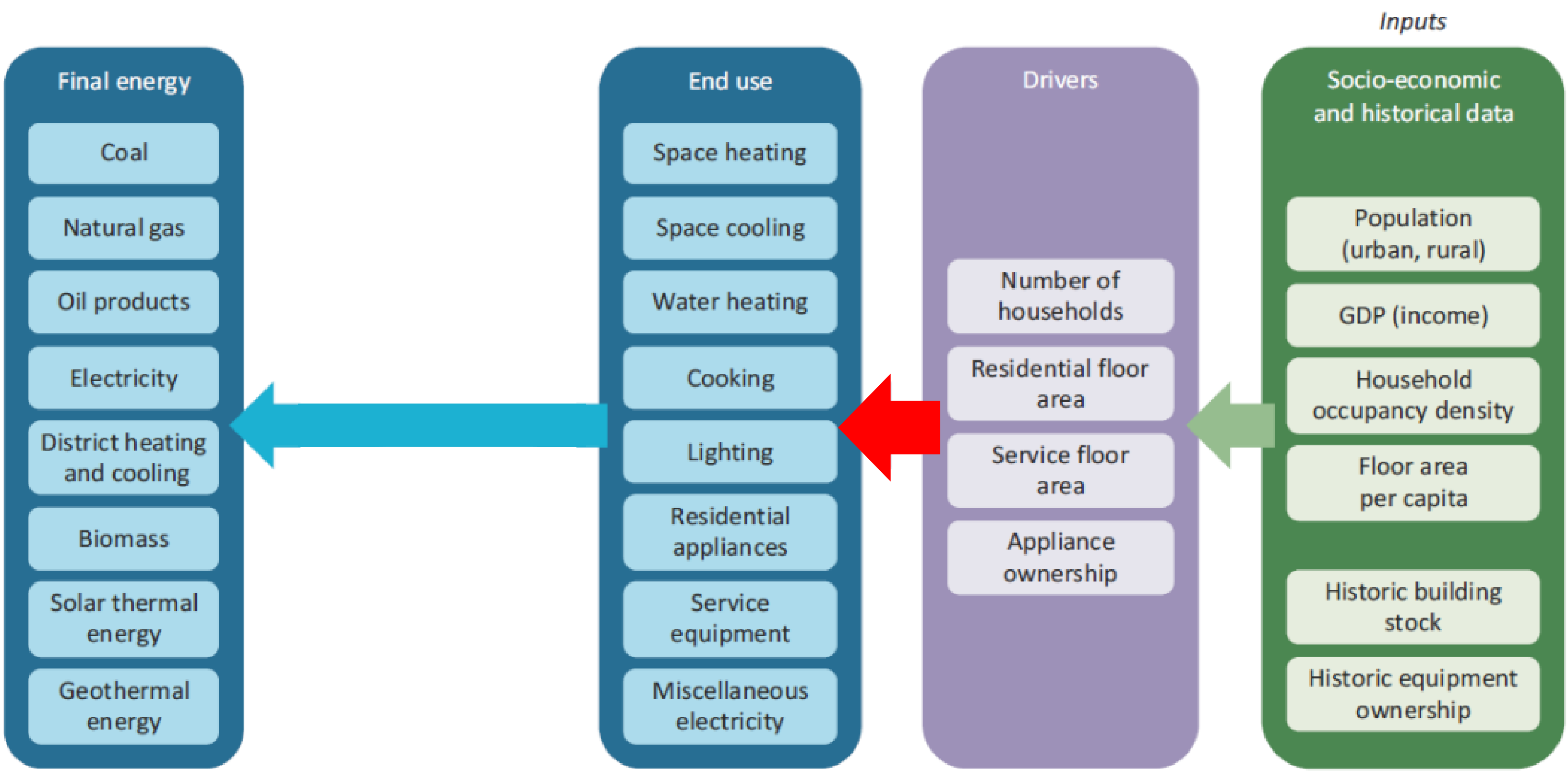


ETP buildings model structure

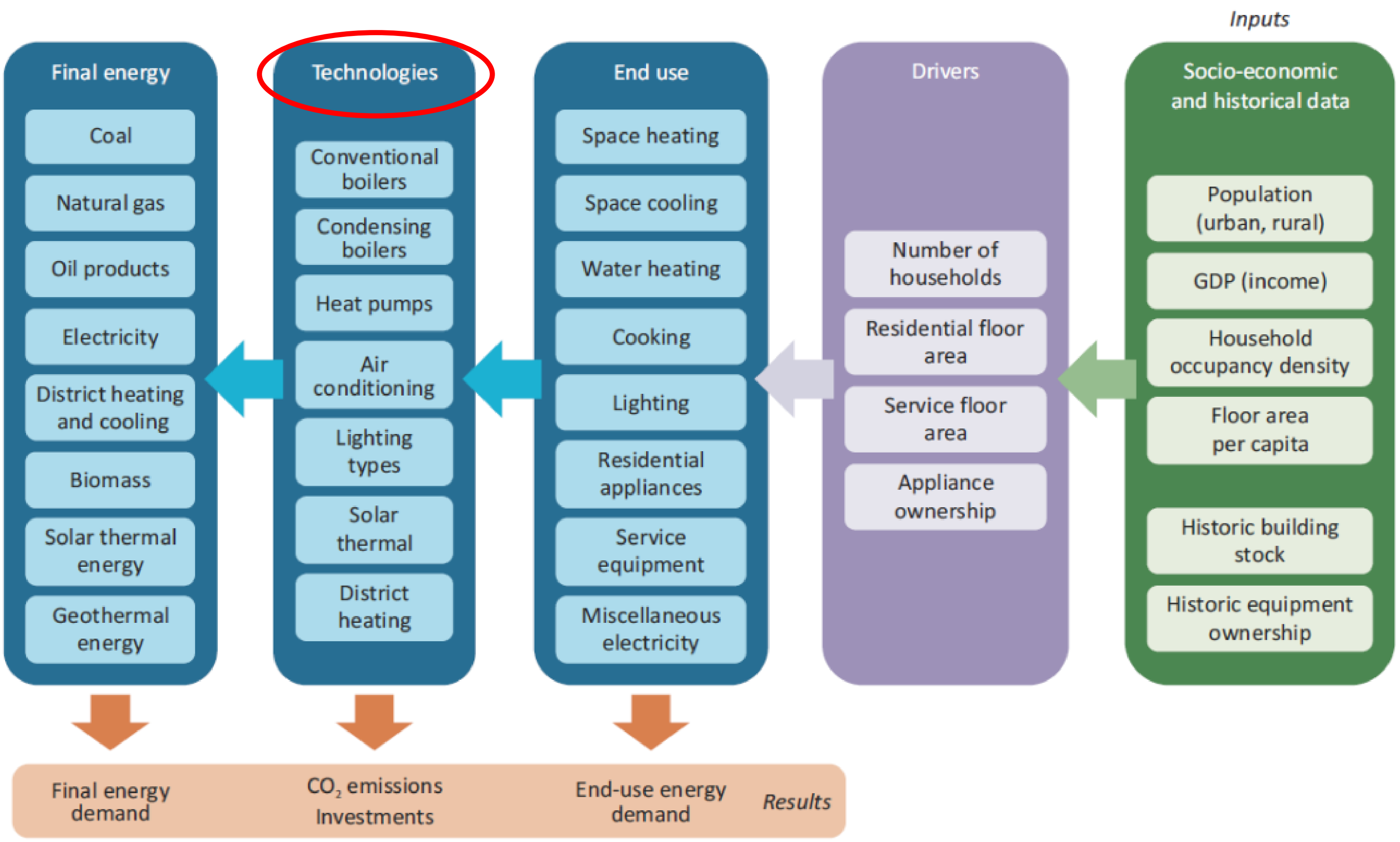


ETP buildings model structure

Level 2 indicators enable analytical linkages between drivers and end uses, which is critical for model calibration

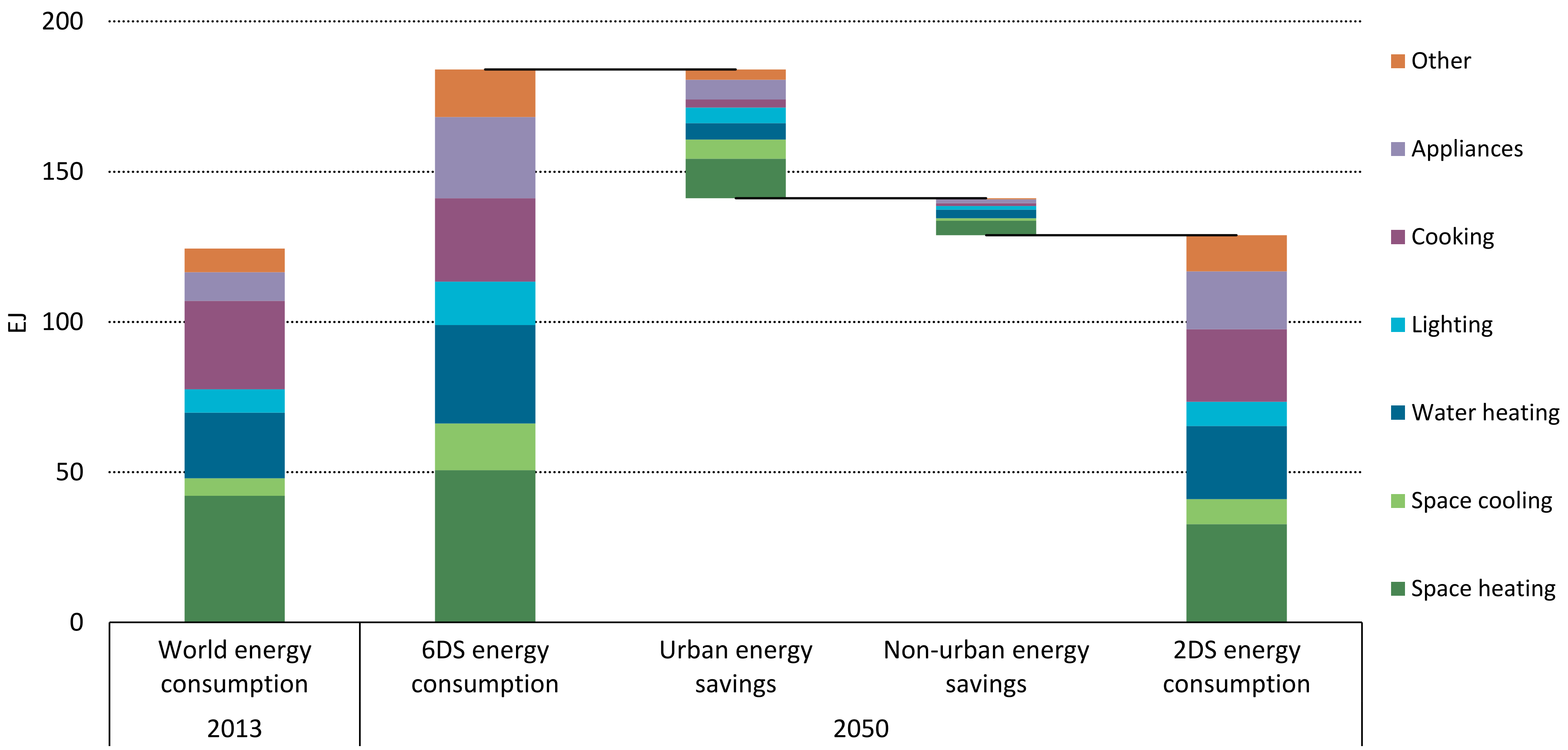


ETP buildings model structure



Technology-rich policy guidance

Global buildings sector final energy savings by end use

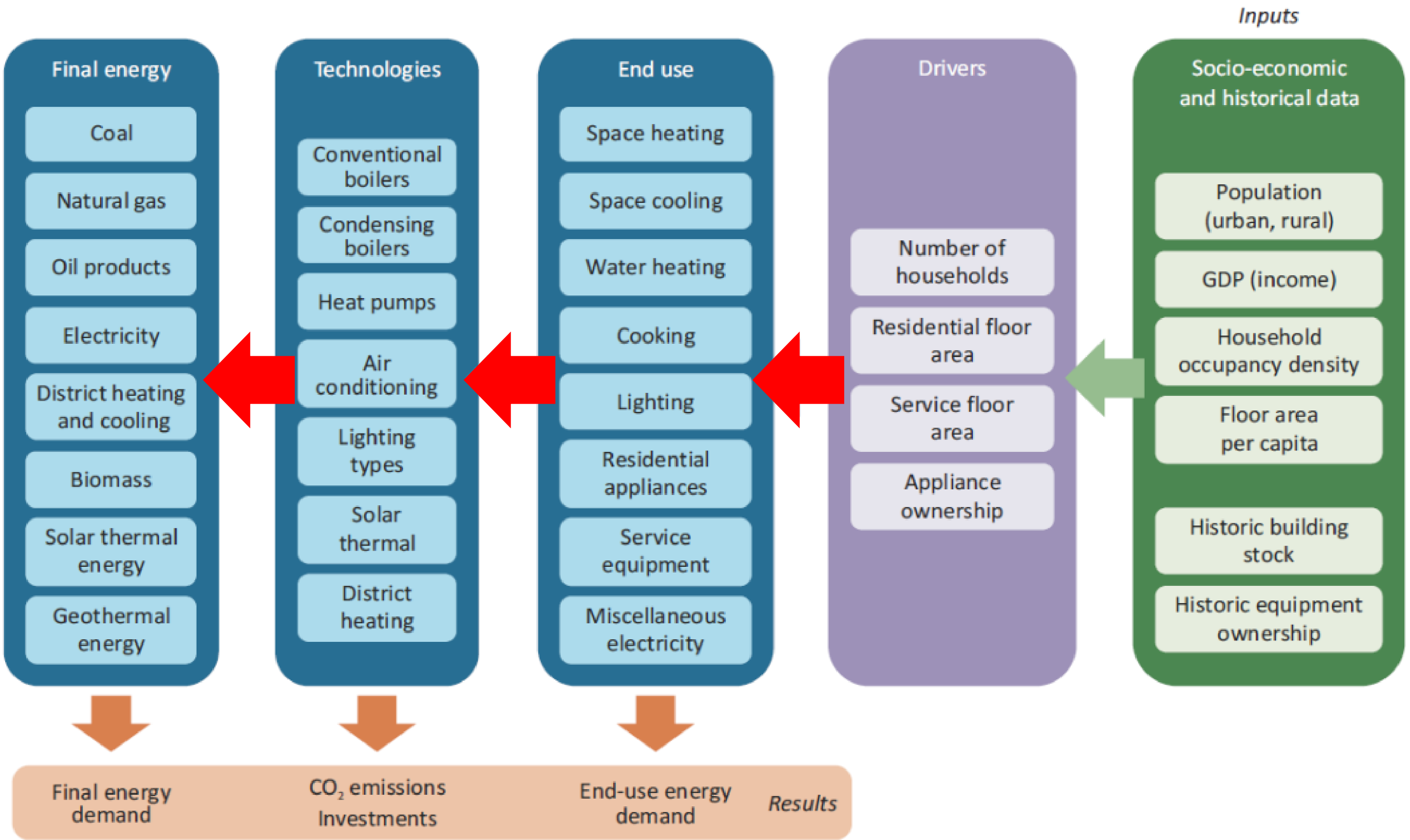


Urban buildings account for more than 75% of global building final energy savings in 2050, led by space heating and cooling demand reductions

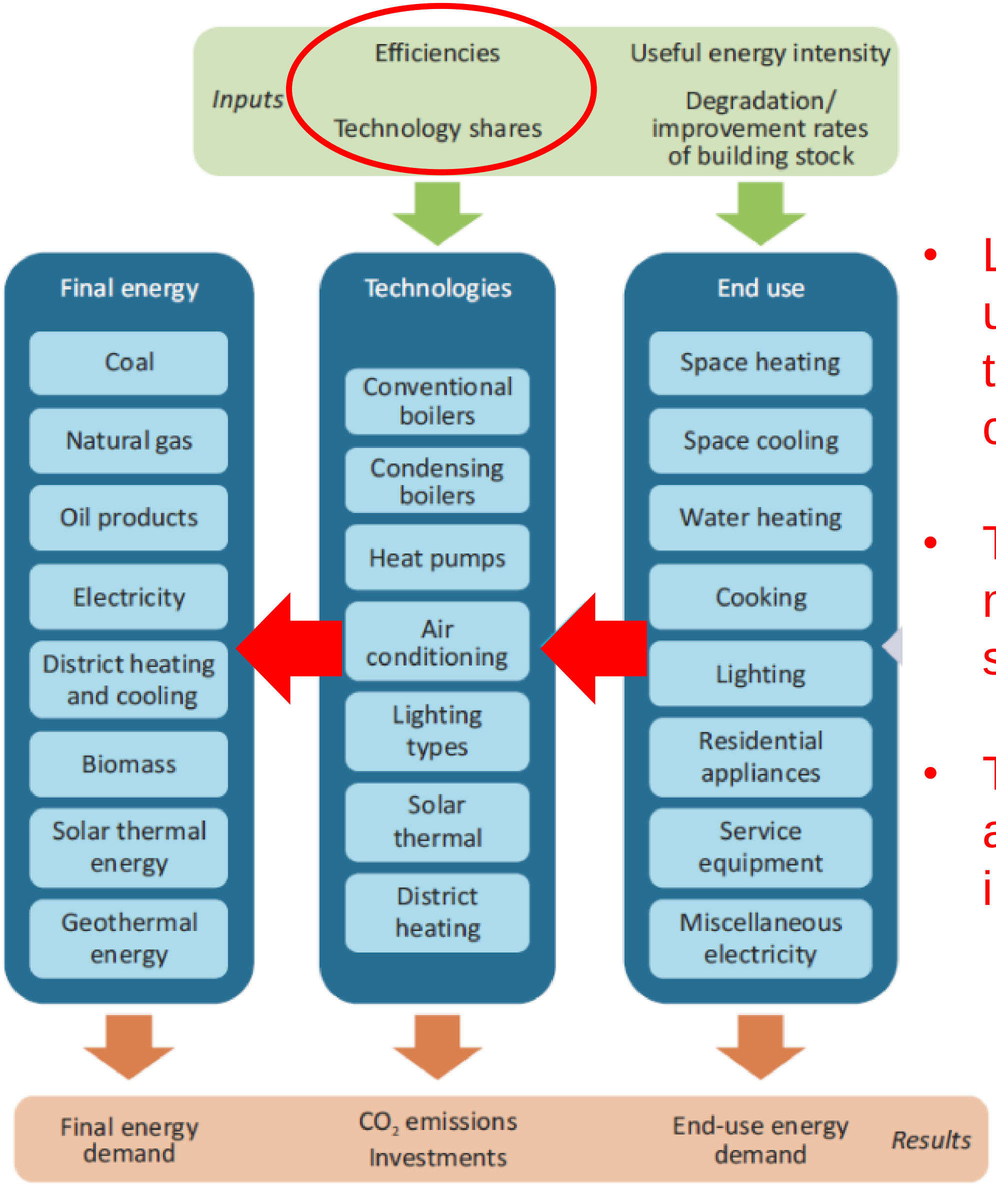
Source: ETP 2016

ETP buildings model structure

Level 3 indicators enable analytical linkages between drivers and end uses, and end uses and technologies, which is critical for technology-rich energy systems modeling

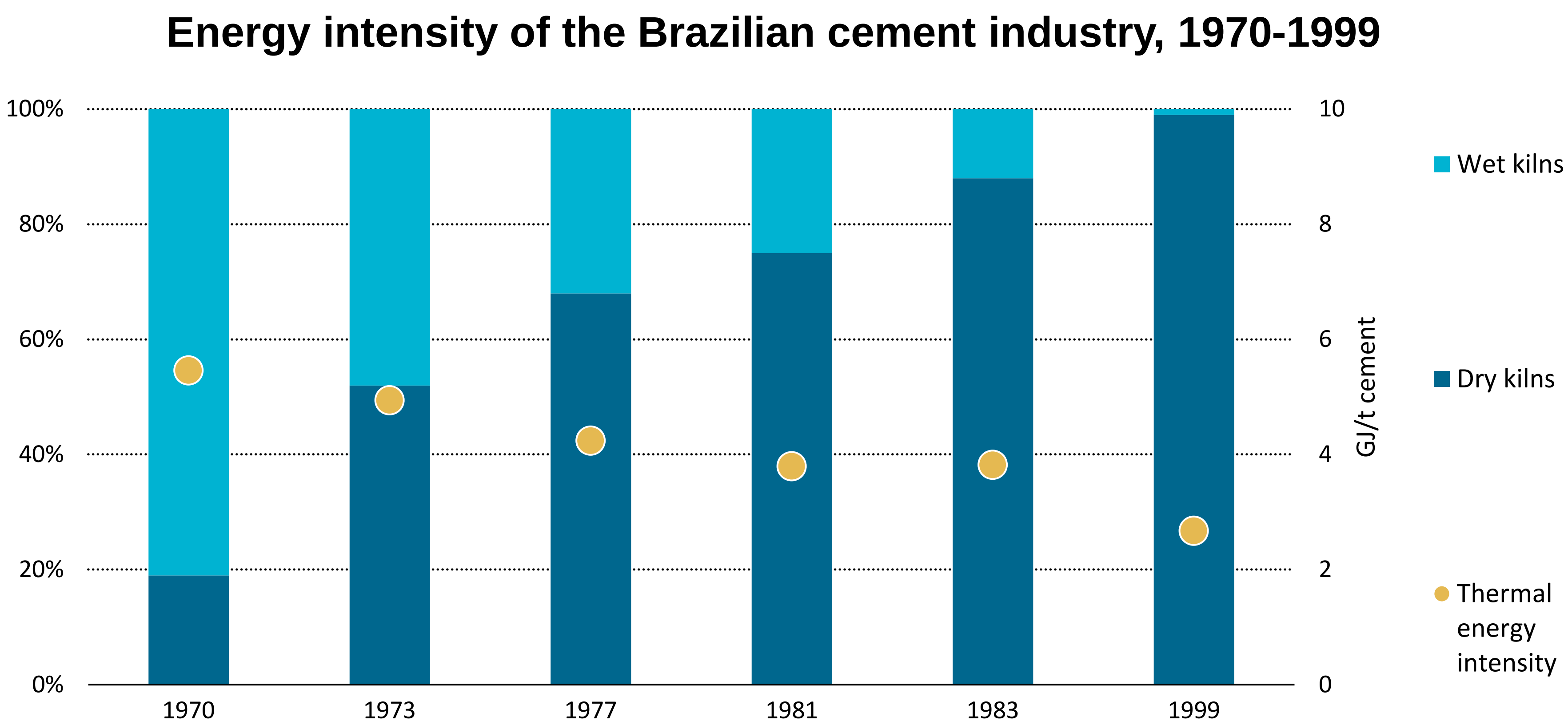


ETP buildings model structure



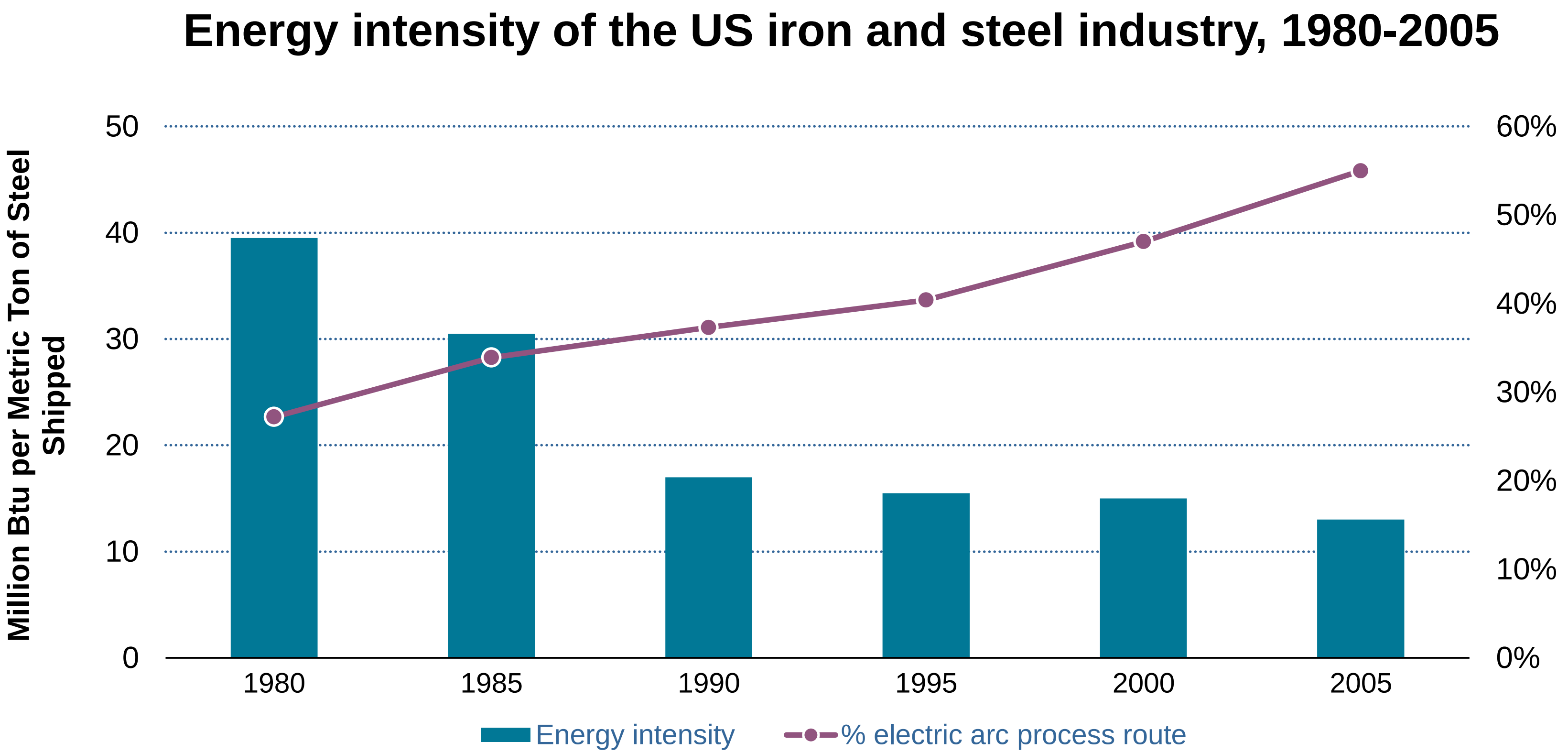
- Level 3 indicators require a deep understanding of technologies and their relevant energy system characteristics
- Typically requires extensive data matching from often disparate sources
- Technology-rich energy surveys are uncommon, and often infrequent

Level 3 technology data for industry



Robust modeling of industrial subsectors often critically depends upon sufficient Level 3 technology data

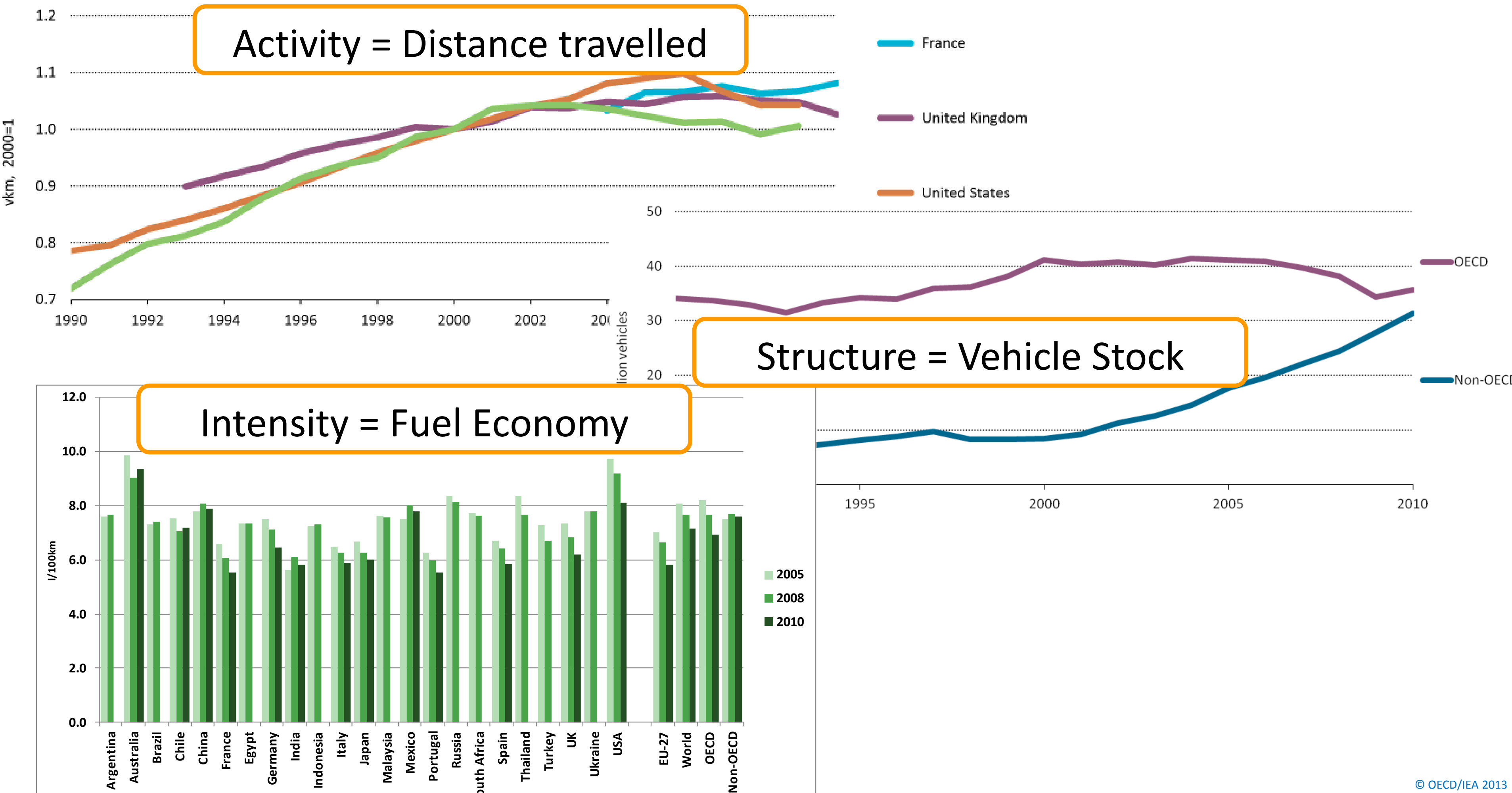
Structural and system boundary considerations



Disaggregation to capture structural effects is typically important, but must also be done with consistent system boundaries in mind

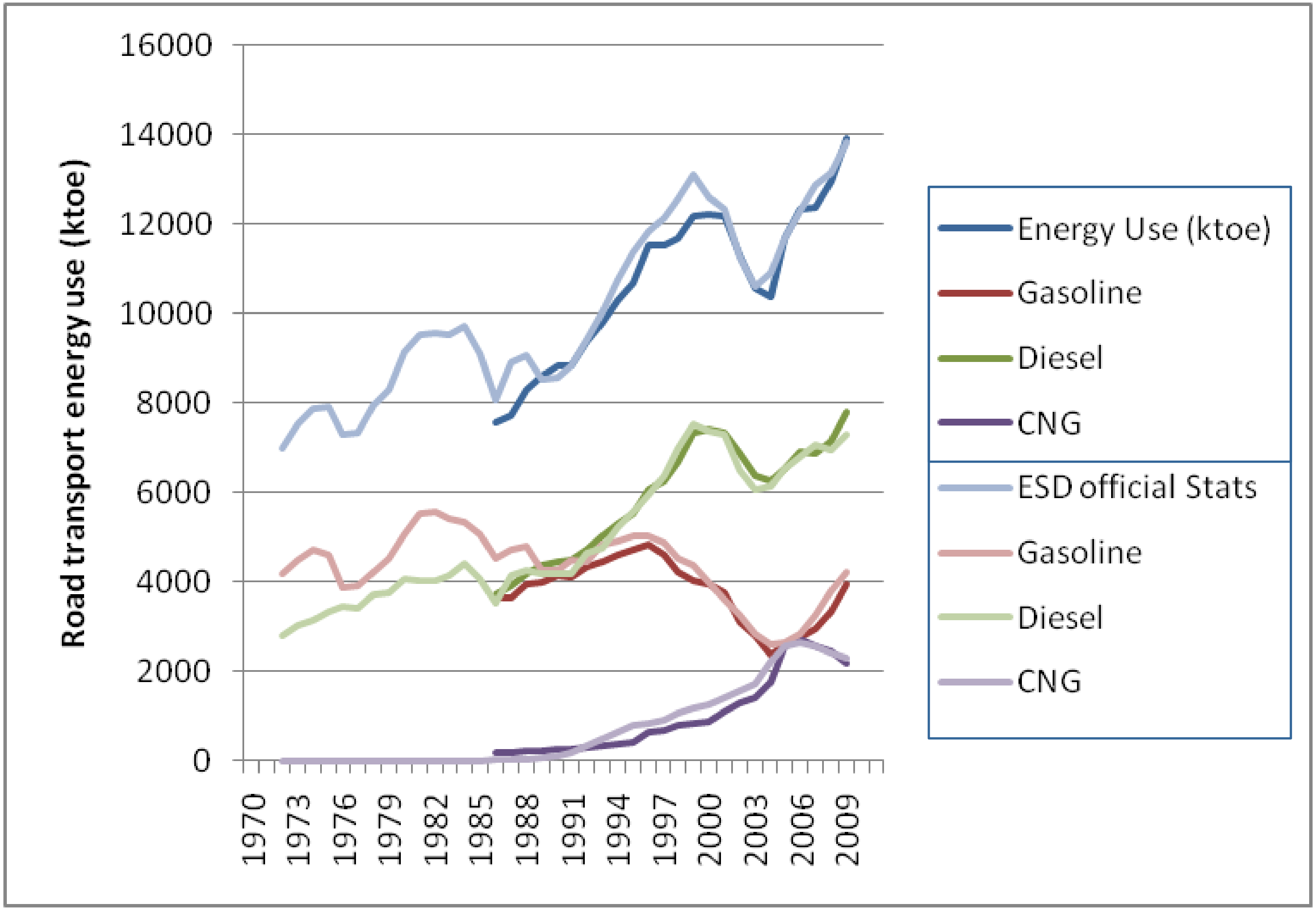
Modeling and energy data systems: synergies

- **ETP model uses the ASIF (activity–structure–intensity–fuel) methodology**



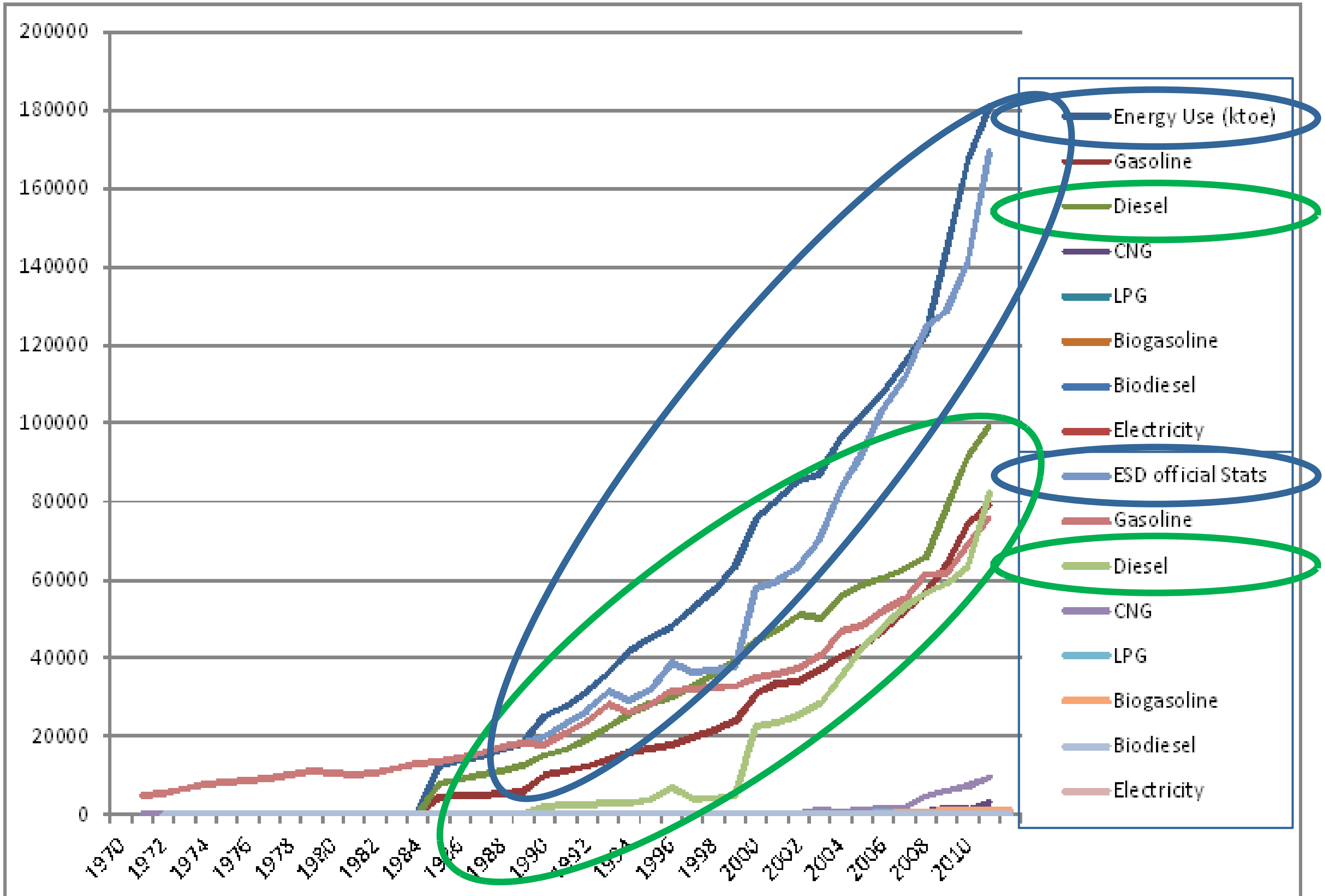
IEA data coverage and transparency – Understanding energy use patterns

- **Fuel use in Argentina**



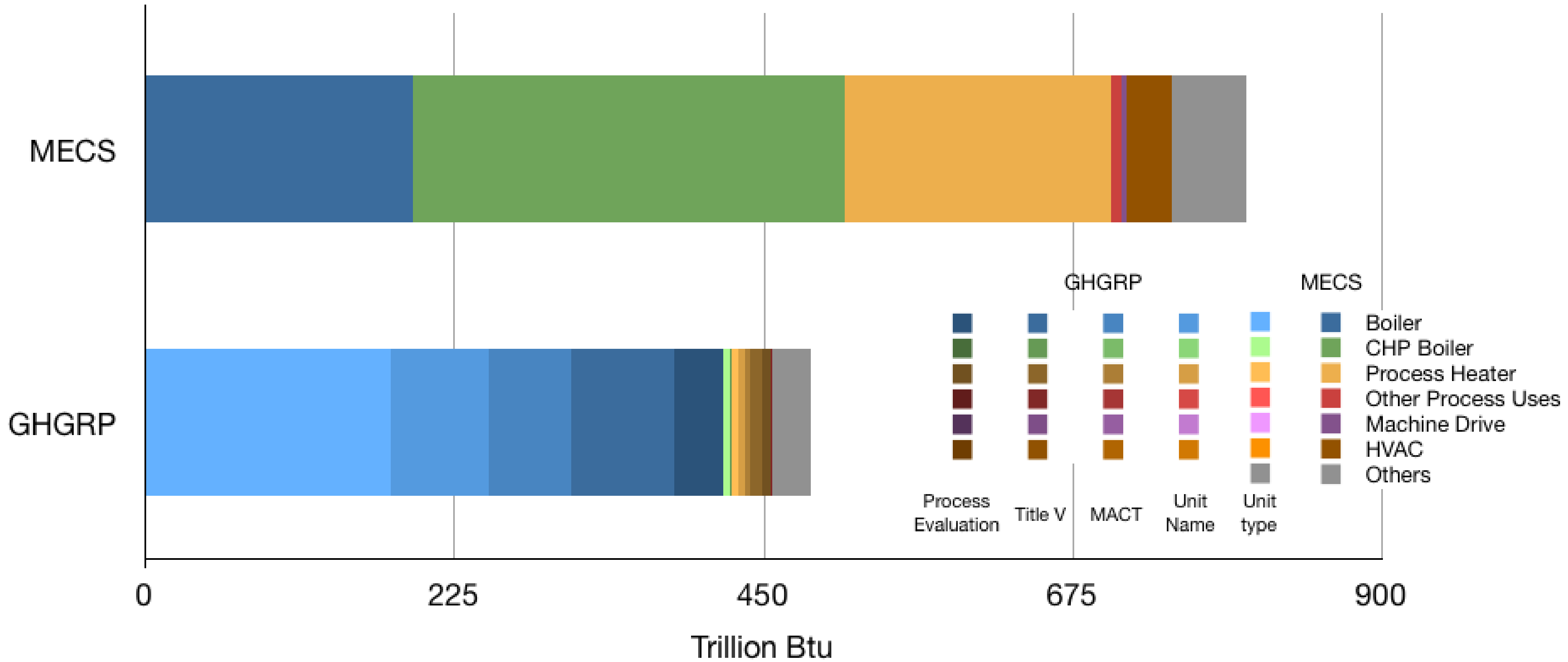
IEA data coverage and transparency – Understanding energy use patterns

- Fuel use in China



Data matching can reveal opportunities for improved coordination

U.S. Manufacturing Energy Consumption Survey (MECS) vs. U.S. GHG Reporting Program (GHGRP)
Food Processing Industry, 2011



Source: Huang et al. 2013

Summary

- Technology-rich energy systems modeling provides critical guidance to the energy policy community
  - But this is not possible without credible and comprehensive data!
- Detailed activity and technology-level data are very important for technology-rich energy systems modeling
  - Requires coordination with subsector and technology expert communities
- Data matching is often required, but more disaggregated data and coordination among data collection institutions can help
- Level 3 data availability should be accelerated to meet the growing needs of the energy modeling, policy, and progress tracking communities
- Coordination and exchange between the modeling and data communities can be highly mutually beneficial