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Swiss Centre for Life Cycle Inventories

Wir schaffen Wissen – heute für morgen

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Basic LCI data for life cycle thinking in energy strategies: Electricity datasets in ecoinvent version 3

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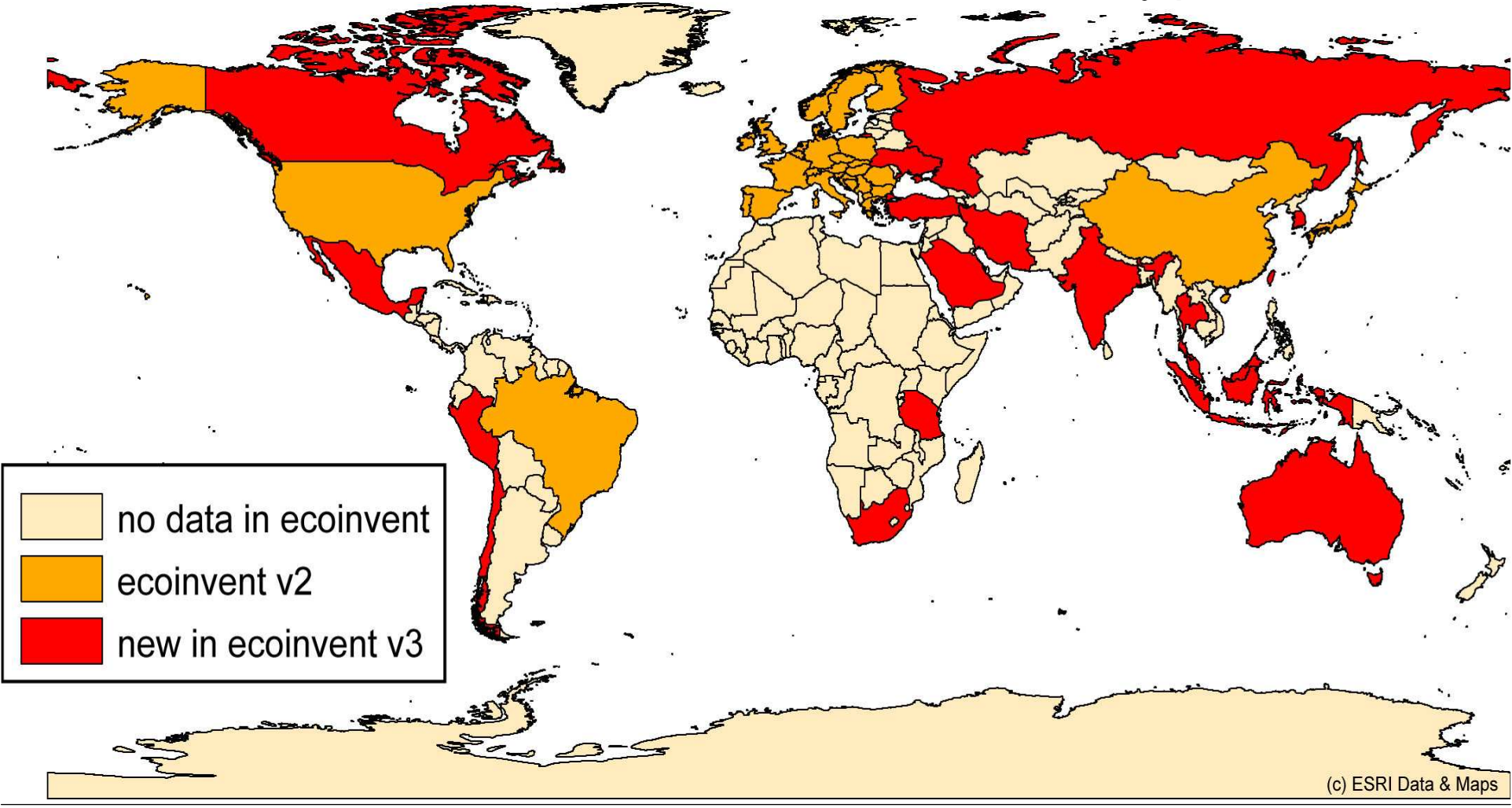
Electricity in ecoinvent v3 – countries

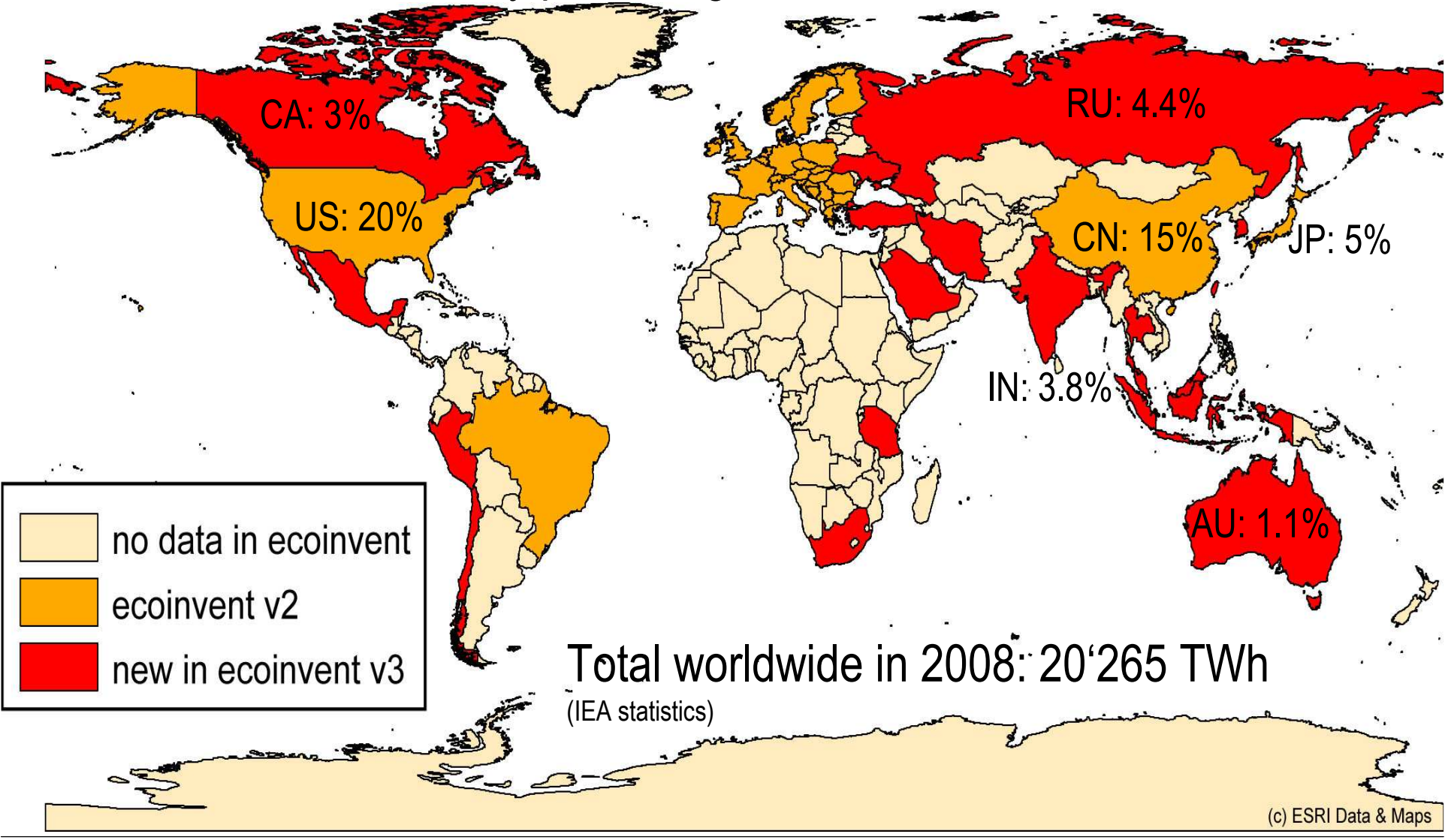
v2: 32 countries – ca. 65% of 2004 worldwide electricity production

v3: 50 countries – ca. 83% of 2008 worldwide electricity production



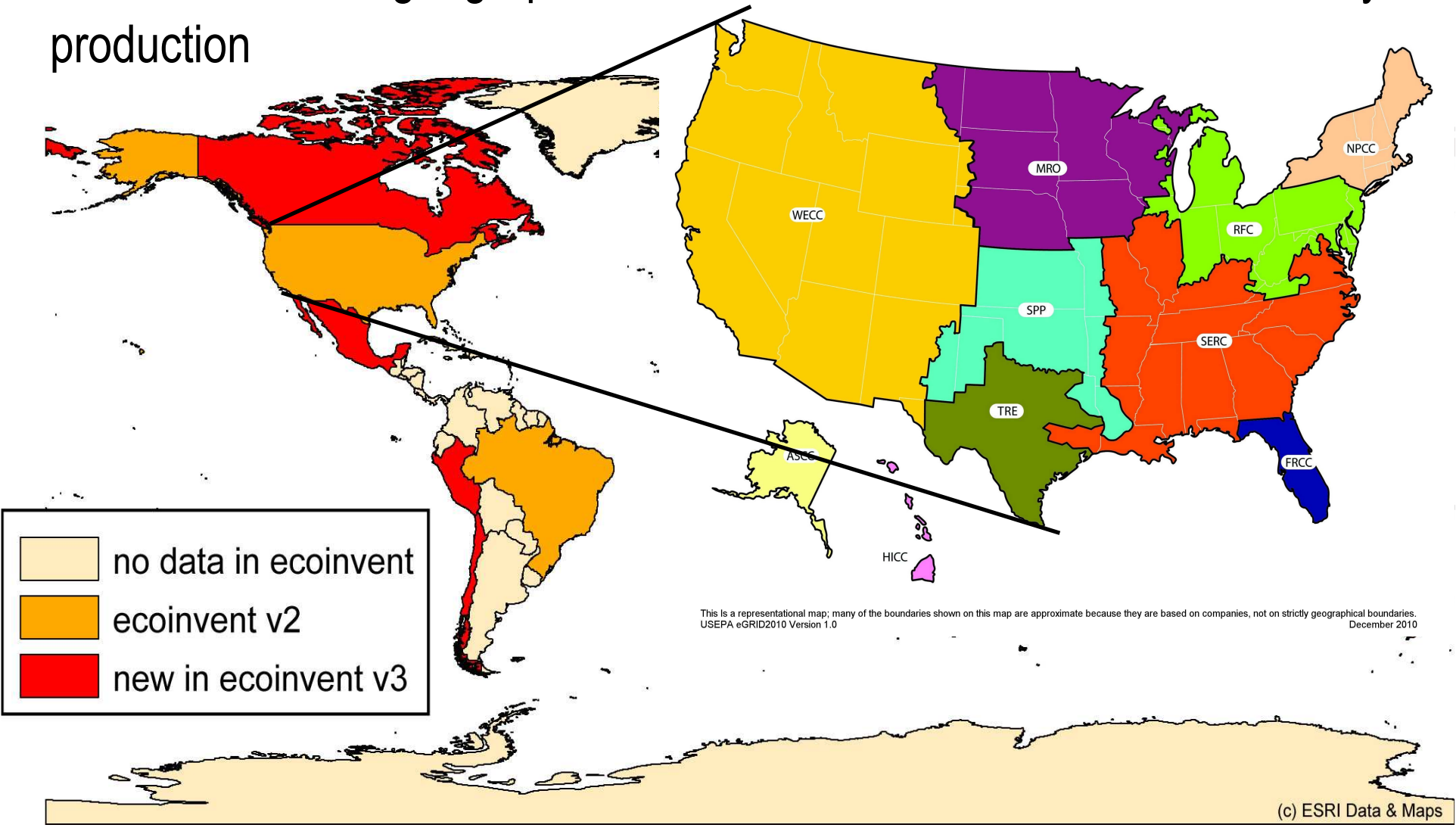
Electricity in ecoinvent v3 – countries

50 countries – no country producing >1% omitted



Electricity in ecoinvent v3 – countries

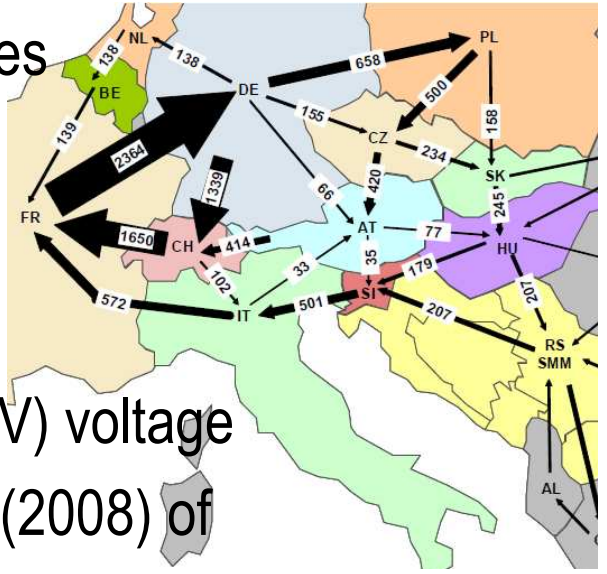
50 countries – 71 geographies – ca. 83% of 2008 worldwide electricity production



Electricity in ecoinvent v3 – **markets**

Electricity market =

Domestic production mix + imports from markets from neighbour countries – transformation and transmission losses



Source: swissgrid

- Markets for high (HV), medium (MV) and low (LV) voltage
- Specified using the annual production volumes (2008) of generation technologies provided by IEA statistics
- Main data sources: Itten et al. (2012) „Life Cycle Inventories of Electricity Mixes & Grid“ and IEA statistics

Electricity generation: country specific technologies

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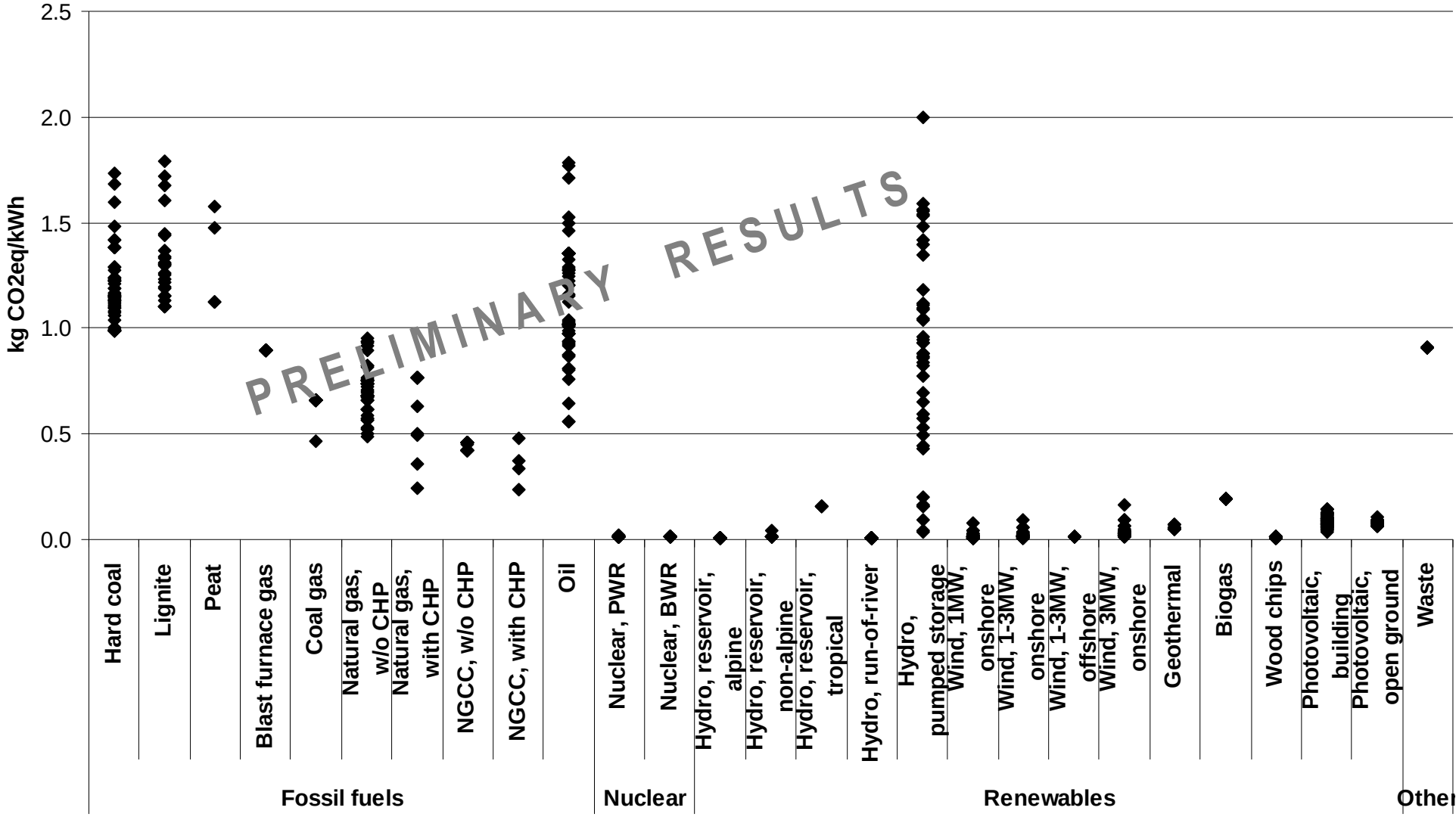
Electricity in ecoinvent v3 – technologies

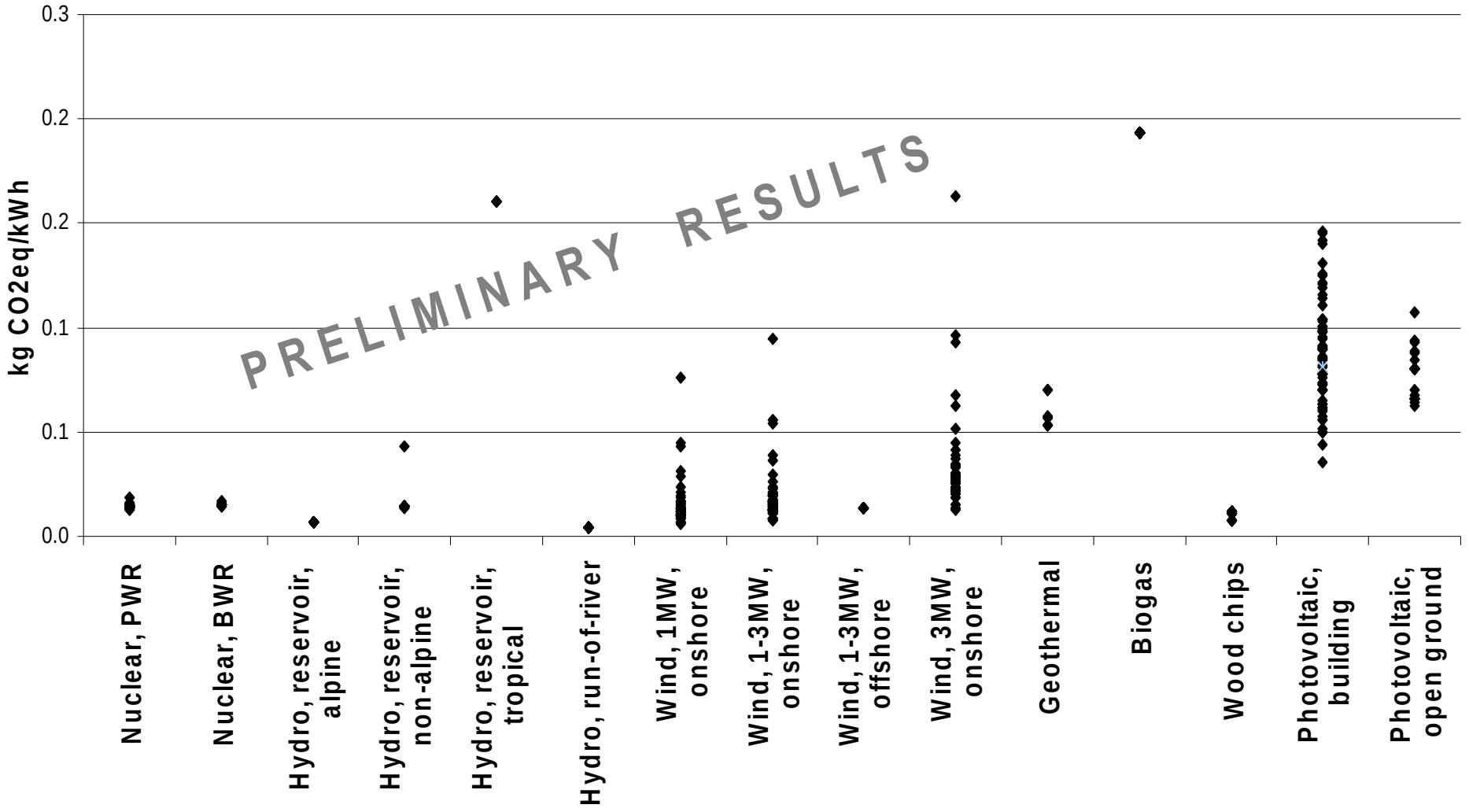
Fossil fuels	Coal	Hard coal	**Renewables**	Hydropower	Reservoir power plants: alpine/non-alpine/tropical region
		Lignite			Run-of-river power plants
		Peat			Pumped storage power plants
	Industrial gases	Blast furnace gases		Geothermal	Hot-Dry-Rock (EGS)
		Coke (coal) gases		Solar	Photovoltaic: Building integrated and open ground
	Oil				*Solar thermal (no data)*
	Natural gas	Conventional gas power plant, with/without CHP		*Wave and tidal energy*	*(no data)*
		Combined cycle gas power plant, with/without CHP		Wind	Onshore, capacity class <1MW / 1-3MW / >3MW
Nuclear		Pressurised water reactor (PWR)			Offshore, capacity class 1-3MW
		Boiling water reactor (BWR)		Wood	Wood chips, with/without extensive emission control
				Biogas	Biogas from biowaste, sewage sludge and landfill gases
			Waste	Waste incineration	Municipal and industrial waste

LCIA results

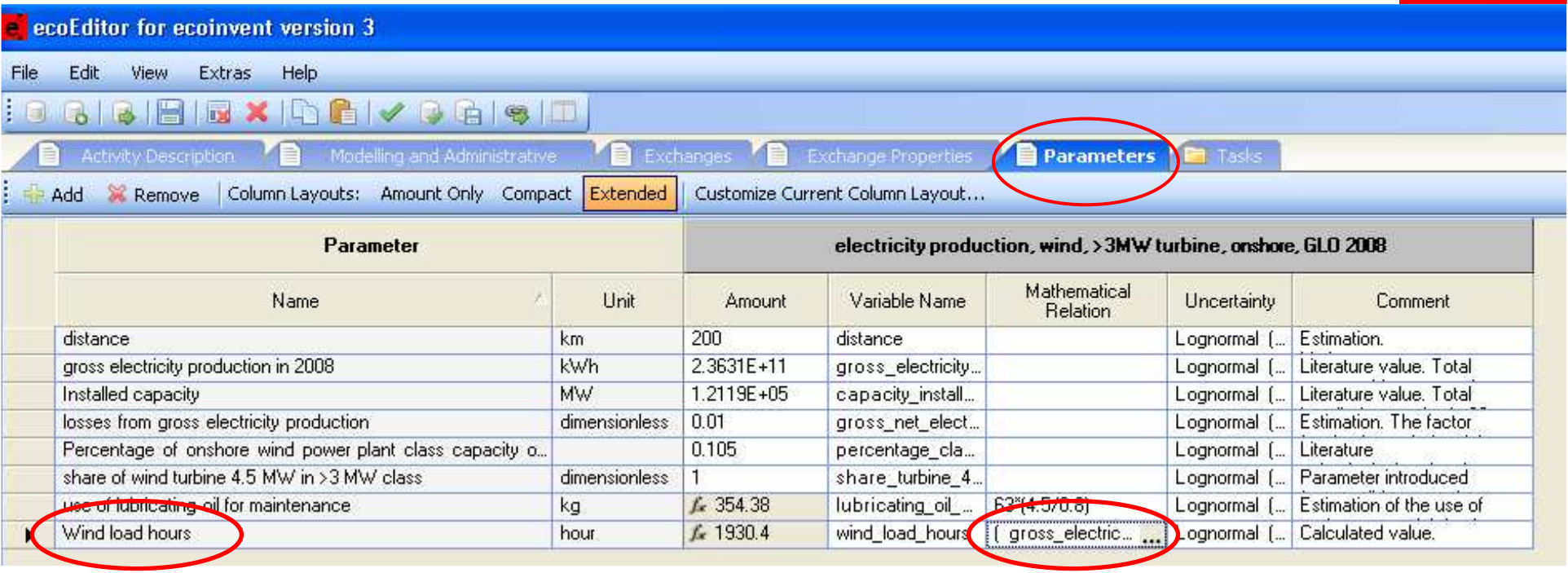
IPCC 2007, GWP 100a for technologies



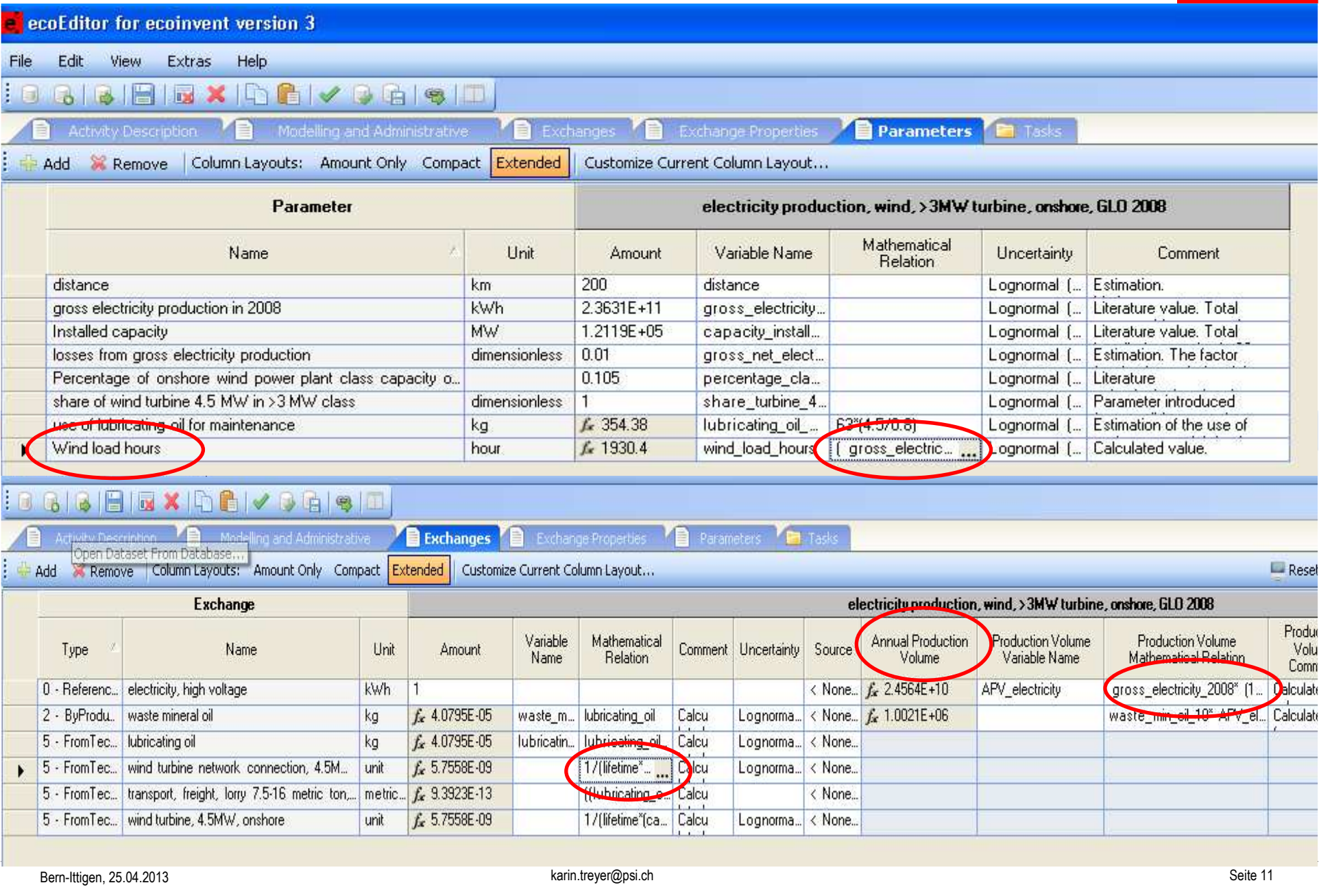
IPCC 2007, GWP 100a for technologies (nuclear and renewables)



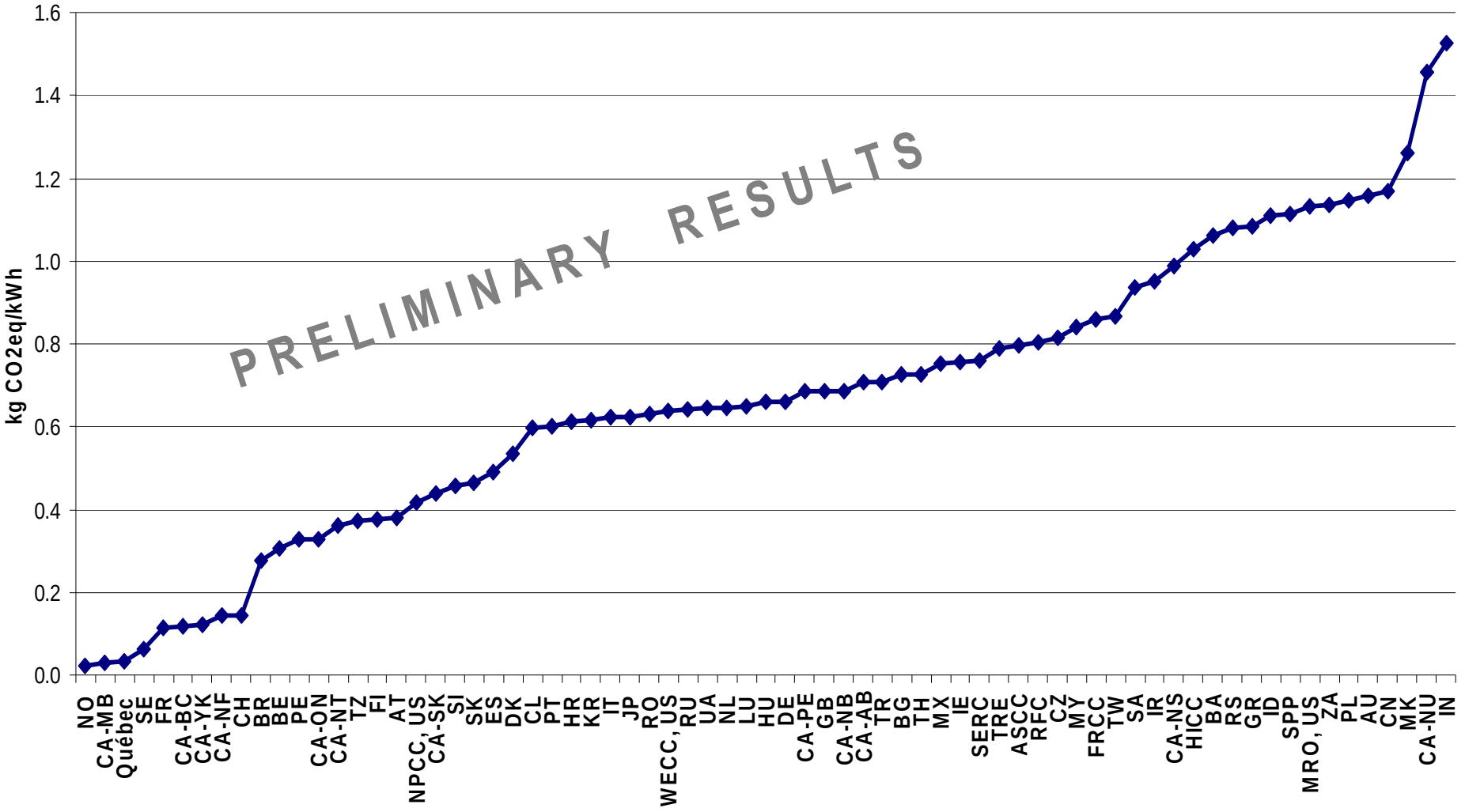
Adaptation of datasets to local or future conditions



Adaptation of datasets to local or future conditions



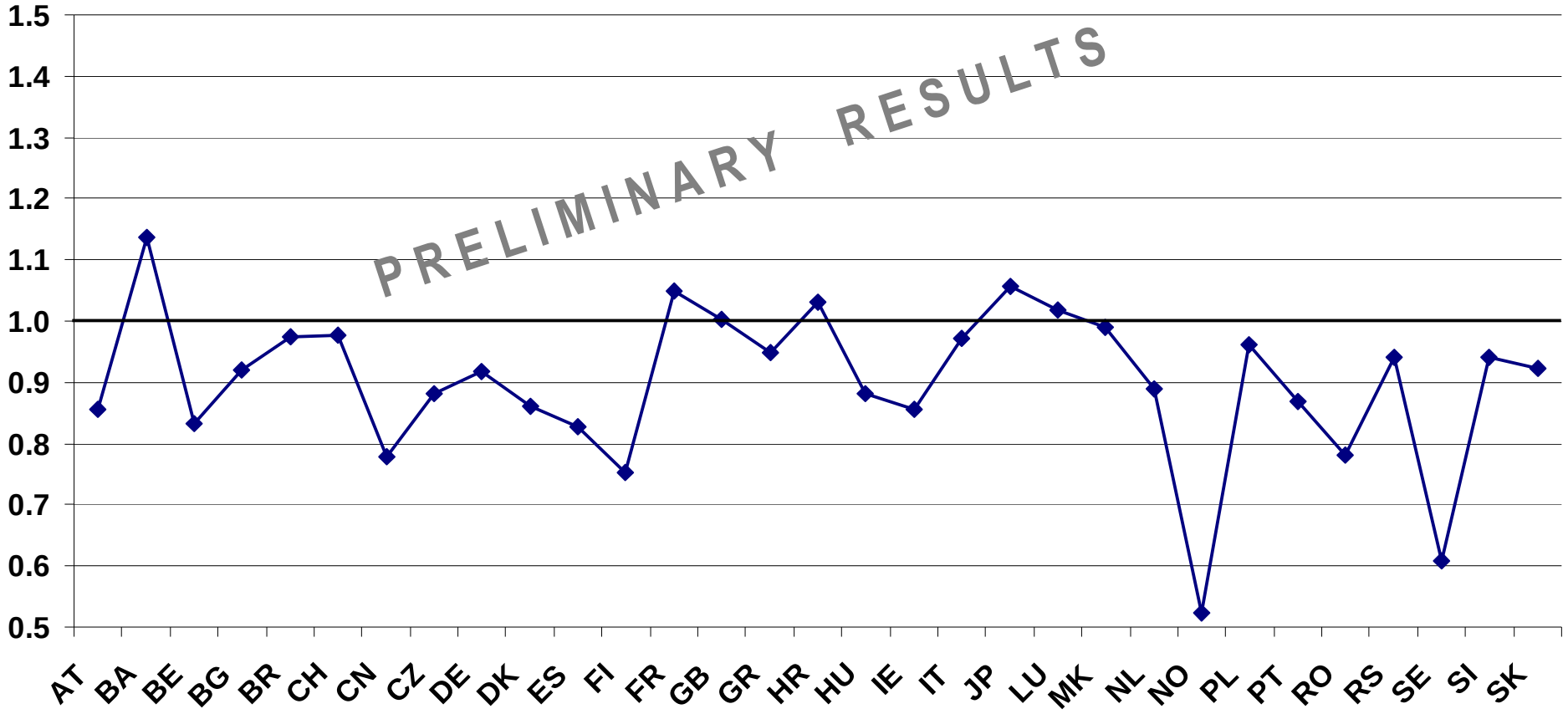
IPCC 2007, GWP 100a for low voltage markets



LCIA results – comparison v3 to v2

IPCC 2007 GWP 100a results in relation v3/v2 for electricity at low voltage:

v2 dataset name: „electricity, low voltage/XX U“
v3 dataset name: „market for electricity, low voltage, XX“ **XX = Geography**



Conclusions & Outlook

- Higher geographical coverage of global electricity production in v3
- Geography– specific LCI data are important
- The differences between LCIA results of electricity mixes version 2 and version 3 are explainable
- LCI data:
  - basis for determining the status quo of environmental impacts of electricity production
  - and basis for long-term energy strategies
- Easy to adapt datasets support modelling of future electricity scenarios.

Conclusions & Outlook

Potential for further improvement

- Data on fuel supply chains should be made even more country-specific
- Extension of the database in terms of
    - generation technologies, e.g. wave power, solar thermal
    - specific power plant types used in a certain geography
    - electricity mixes of more geographies
- Regular update of annual production volumes

Thanks to Christian Bauer, ecoinvent staff, treeze/ESU-services

-- Thanks for your attention!