PV and batteries in ecodesign

IEA PVPS 11 June 2019

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Energimyndigheten

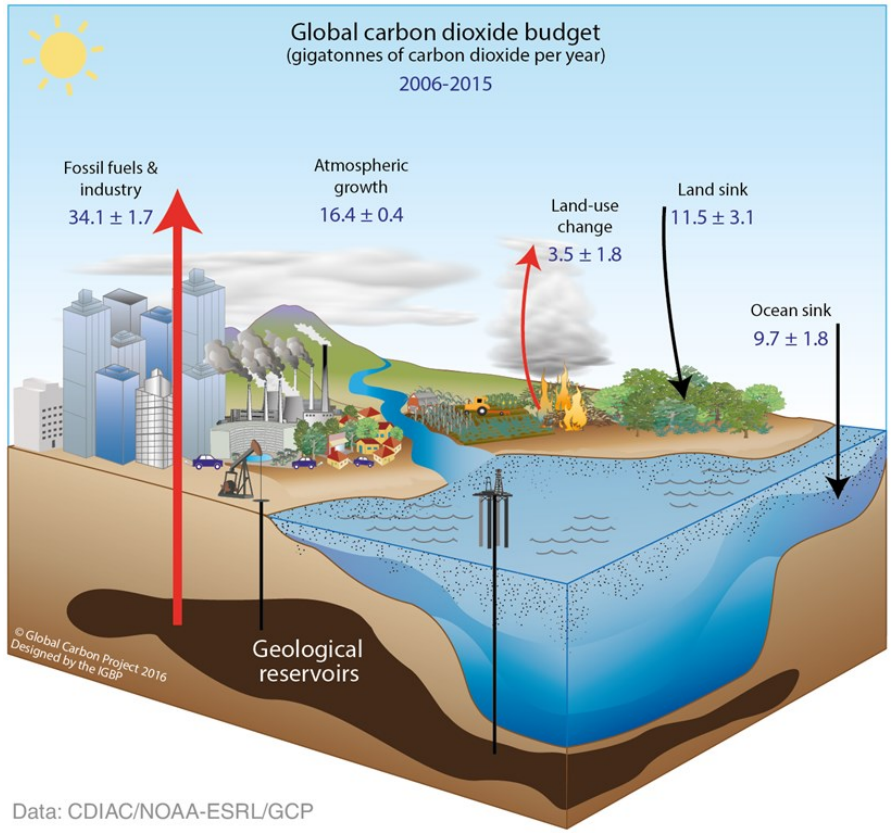
Total Energy Supply

2014:

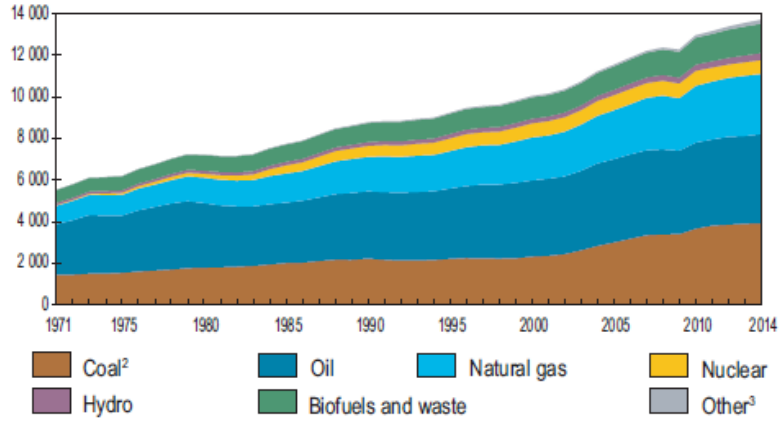
13 700 Mtoe = 159 000 TWh (1 Mtoe = 11.63 TWh)

Of which 80 % from fossil fuels, corresponding to

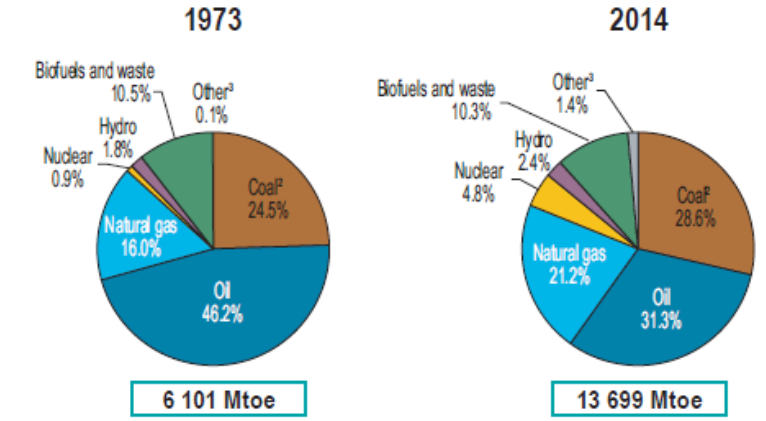
CO_2-emissions of 33 Gt CO_2…



World[1] total primary energy supply (TPES) from 1971 to 2014 by fuel (Mtoe)

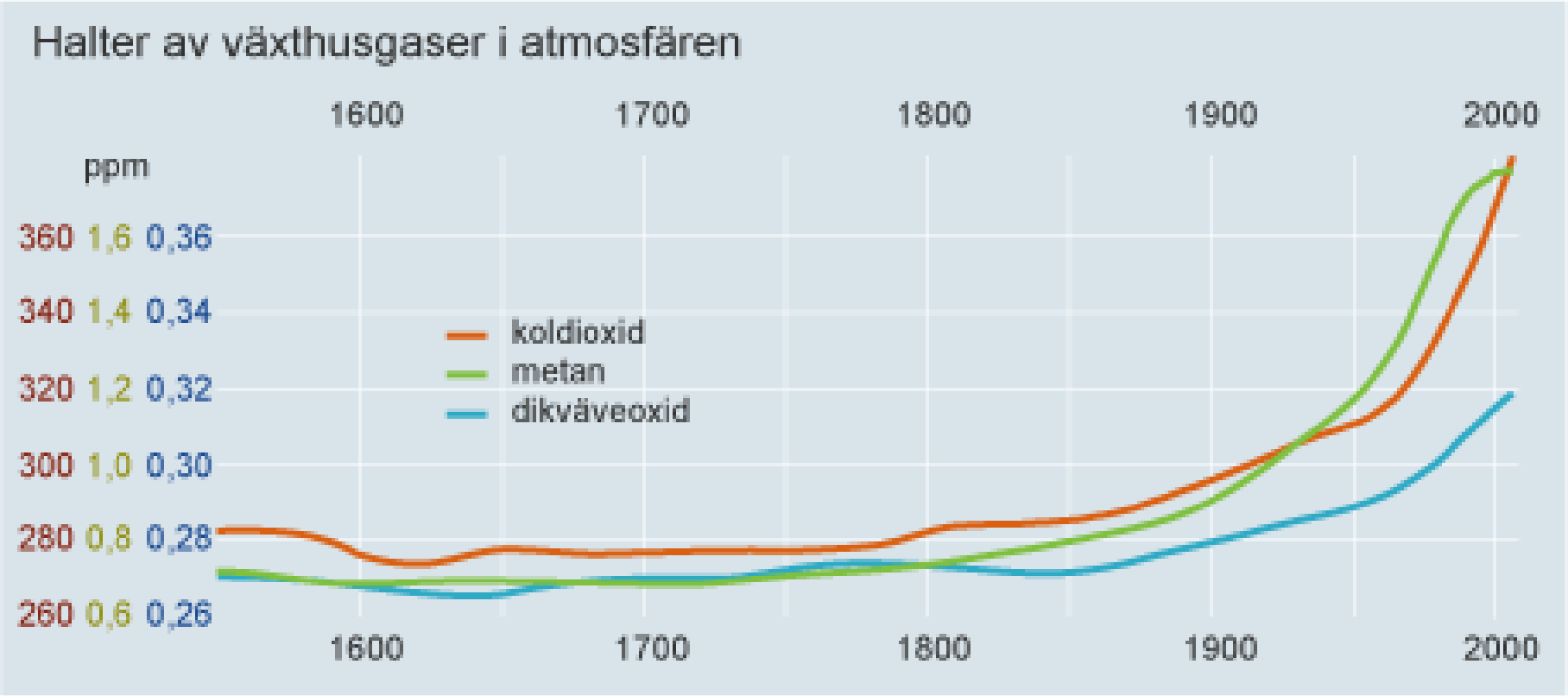


1973 and 2014 fuel shares of TPES



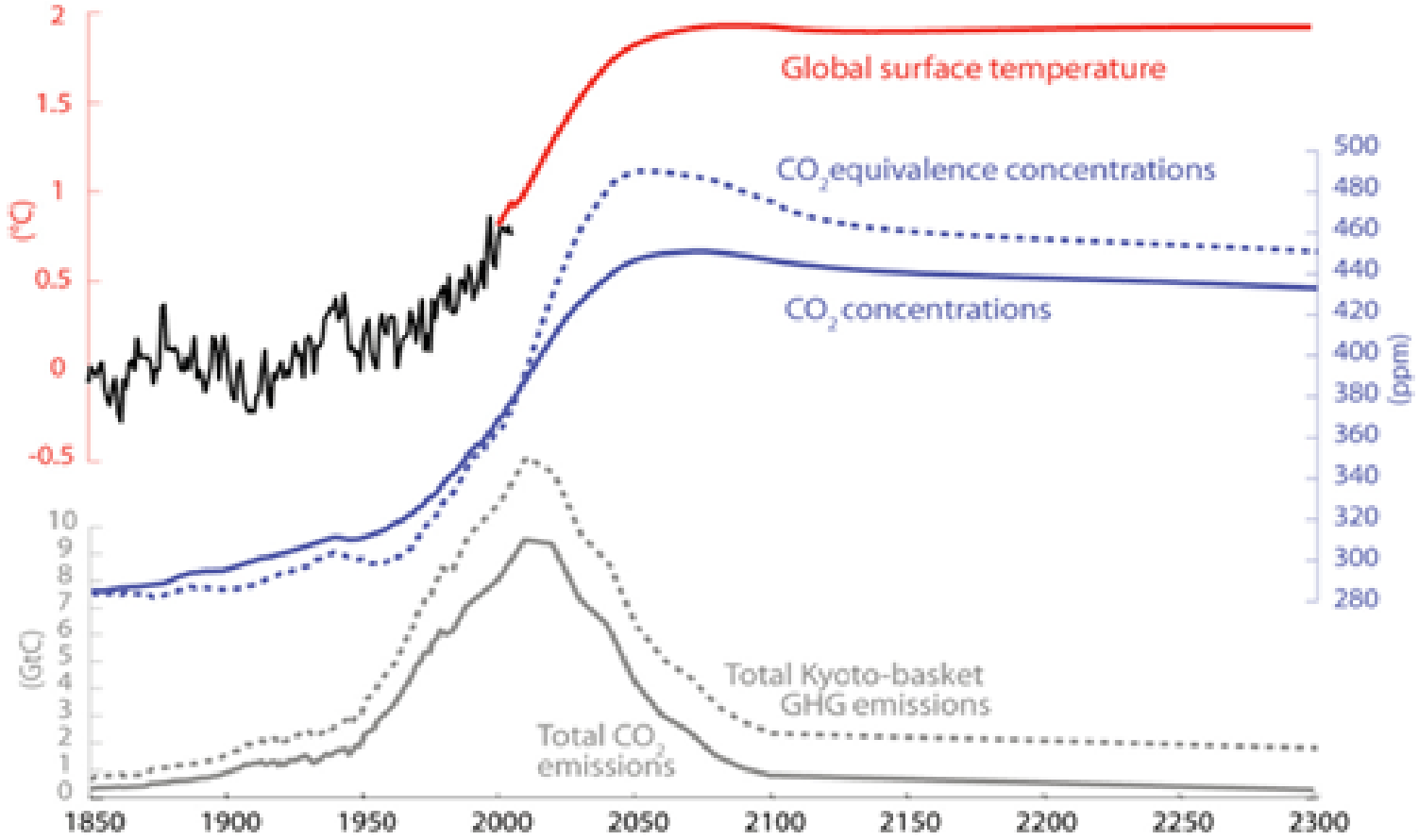
1. World includes international aviation and international marine bunkers.
2. In these graphs, peat and oil shale are aggregated with coal.
3. Includes geothermal, solar, wind, heat, etc.

CO_2-emissions



CO_2: 1800: ca 280 ppm. 2013: 400 ppm. *2019: 415 ppm…*

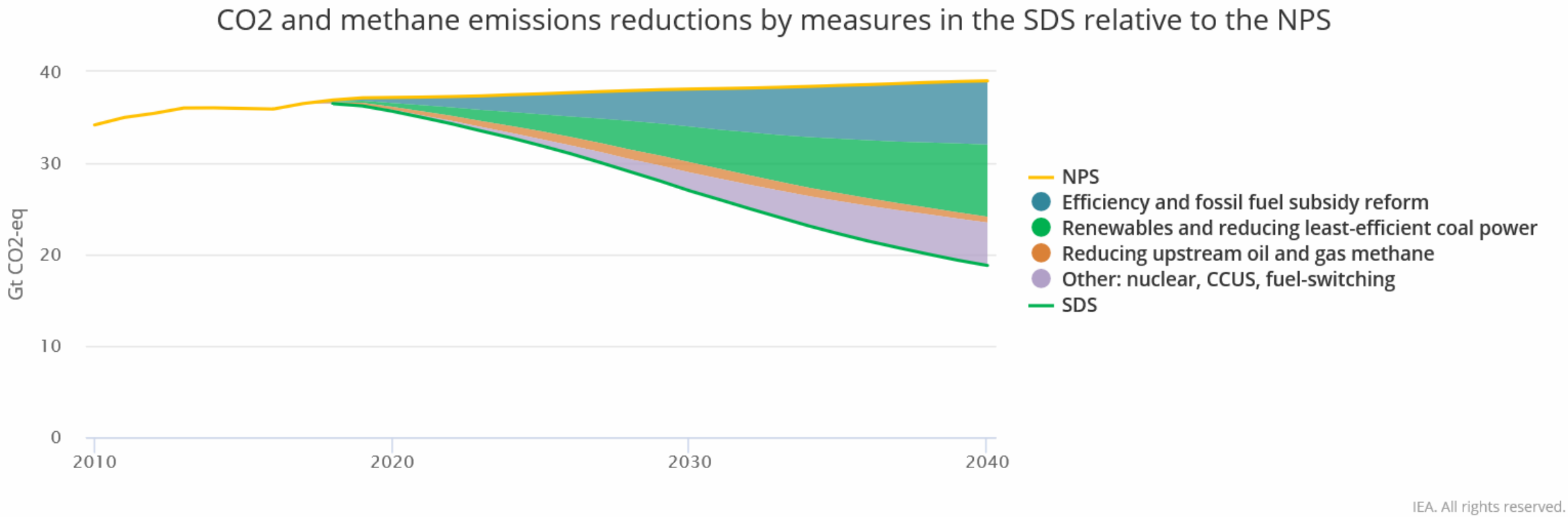
2-degree limit (or 1.5)



Remaining CO_2-budget for a 1.5 degree target: *420-570 Gt*

https://www.ipcc.ch/ and http://www.climatechangenews.com/2018/10/08/37-things-need-know-1-5c-global-warming/

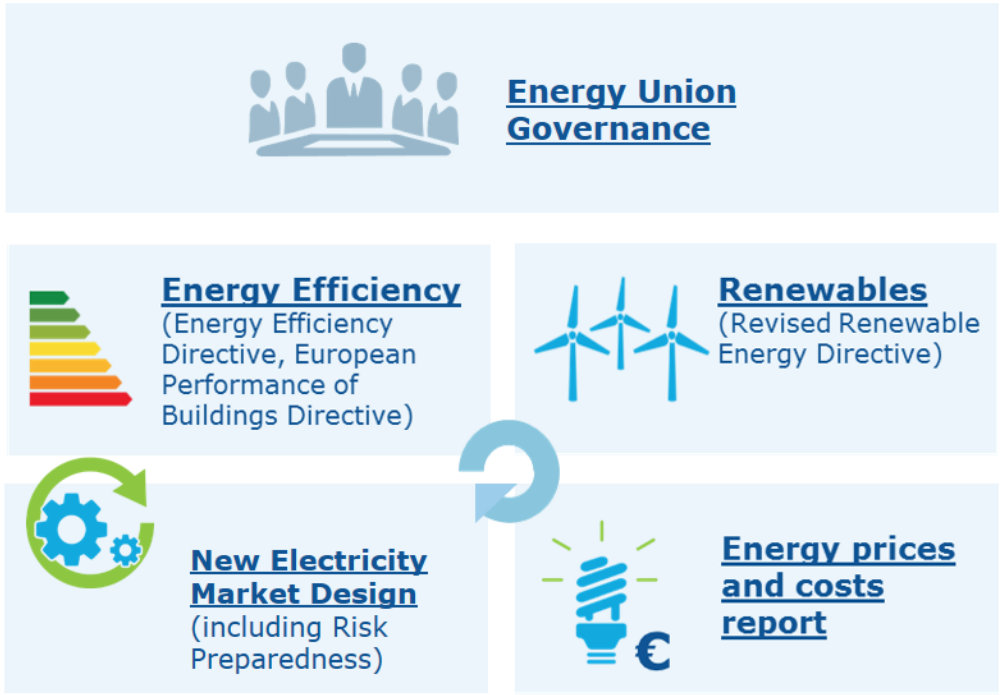
EE (+ DSM) and RES (+ storage) – the *twins* walking together



Check https://www.iea.org/weo2018/ and https://www.iea.org/tcep/ for updates and interactive graphics!

Response, like in EU: *Targets and policies*

Year	Increase of Renewable energy	Increase of Energy efficiency	Reduction of CO_2-emissions
2020	20 %	20 %	20 %
2030	40 %	32.5 %	32 %



Goals in Sweden

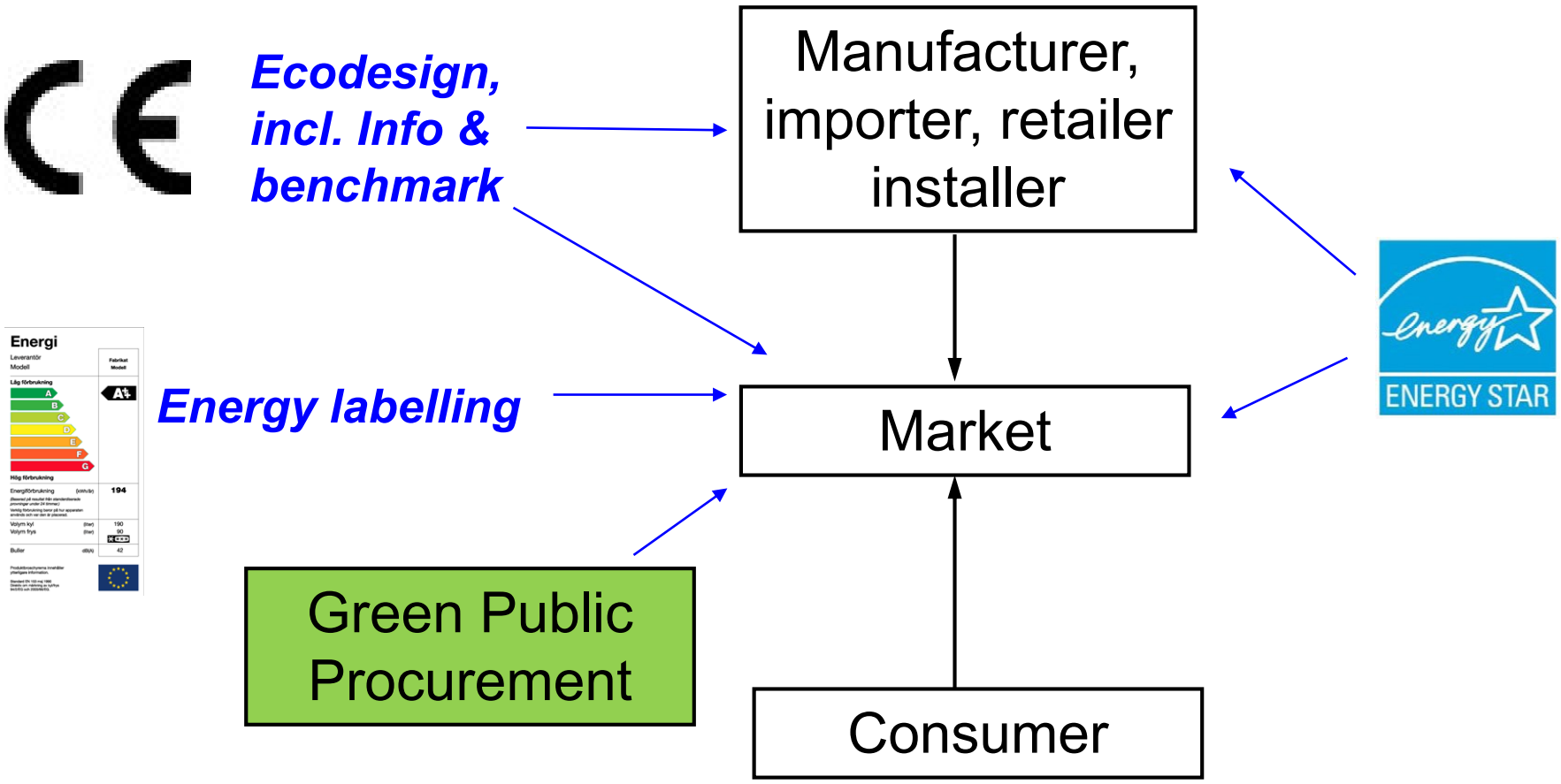
100 % renewable electricity production by 2040

No netto emissions of CO_2 by 2045

50 % more efficient energy use by 2030 compared with 2005 (normalised by GDP)

The pillars of the Swedish energy policy

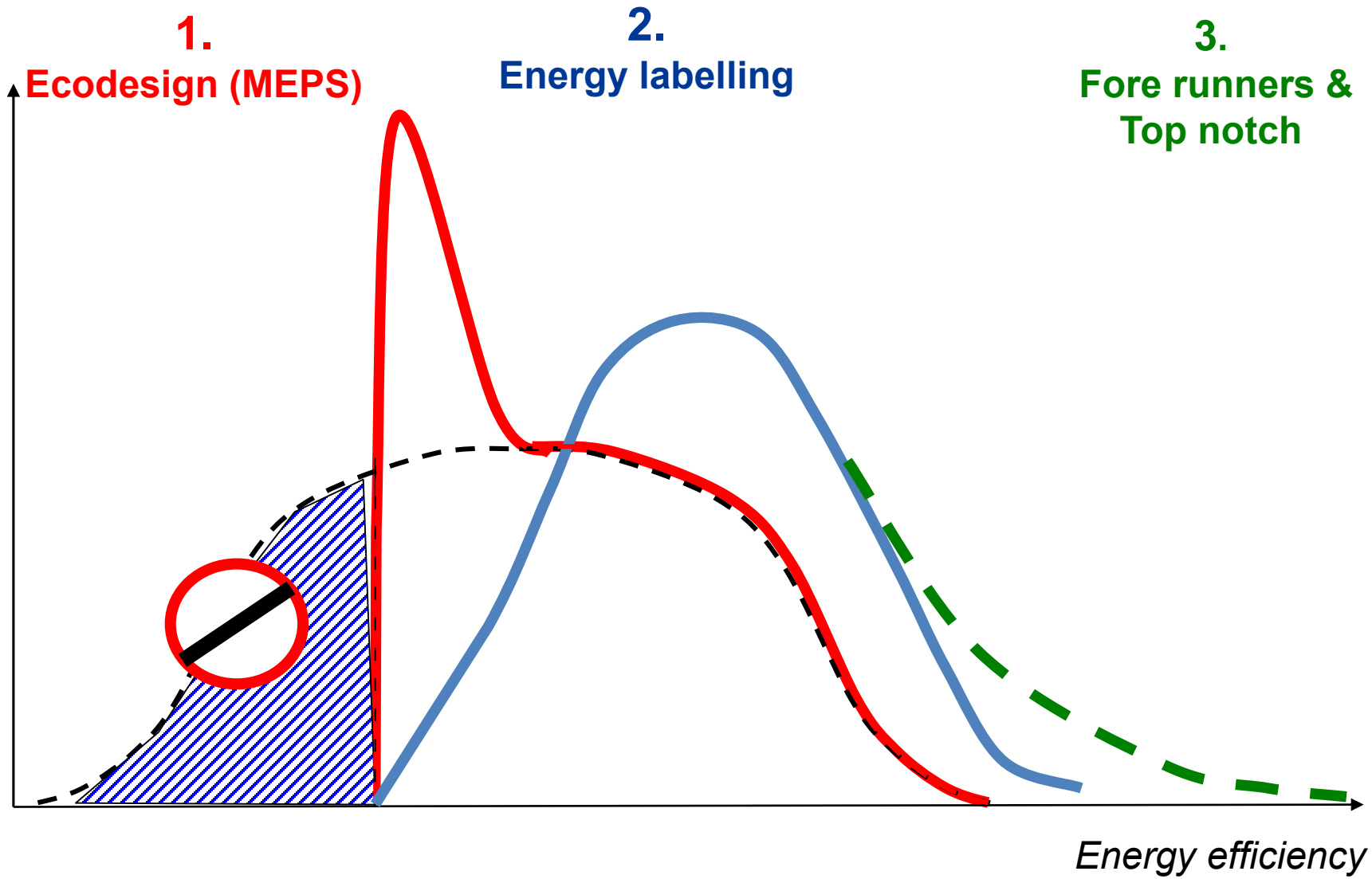
Transforming the market by ecodesign and labelling… *and more*!



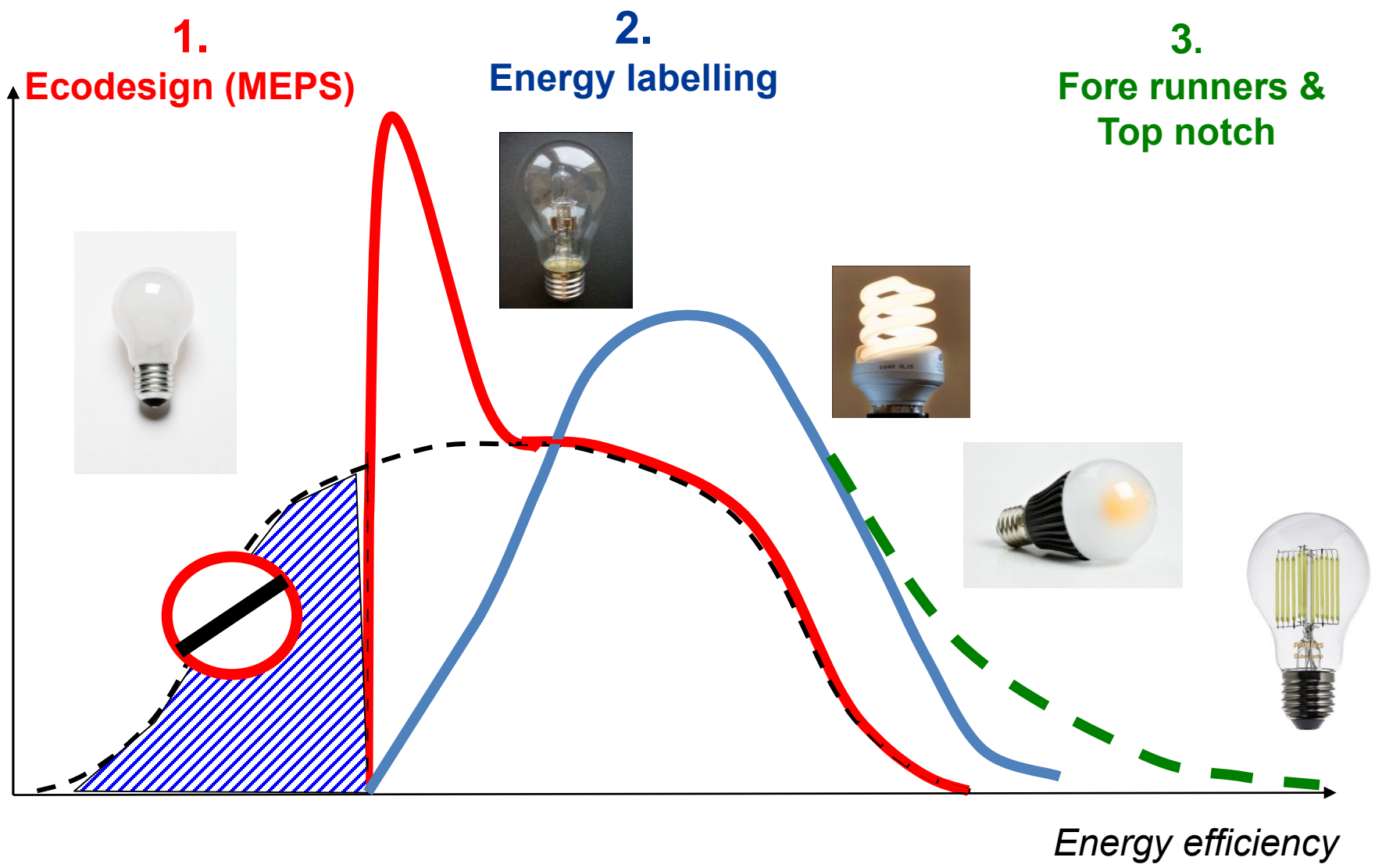
Features of ecodesign and energy labeling

- Base: performance per power or energy unit, such as:
  - Light sources: maximum light output per W, or lumen per W, or lm/W
  - Dish washer: minimum kWh per dish
- Other aspects:
  - Quality parameters such as colour rendering, dish cleaning performance etc
  - Minimum noise, water use etc
- Ecodesign: *minimum* performance
- Energy labeling: *grading* of performance (higher than the minimum performance
- Resource efficiency:
  - Minimum impact during production
  - Repairability, upgradability, recyclability
  - Long lifetime

Accelerating the transformation of the product *market*



Ca 40 products on the list – eg *lighting*



Huge impact of ecodesign and energy labelling

- Delivers *half* of the EU 20 % goal to 2020 for Energy efficiency
- Delivers a *quarter* of the EU 20 % goal of reduced GHG reductions
- Reduces *other* environmental impacts such as emissions of Nox, Hg, particles etc
- Increases the *resource* efficiency – material use, water use (indirectly)
- Increases the *security of supply* – less import of energy in EU
- *Saves money* for companies and households – e.g. ca 500 Euro/hh, yr
- *Defends the market* from poor products
- Stimulates *product innovation*

PV and batteries on the ecodesign list

- Treated separately but with connections – e.g. solar systems with batteries
- Not typical ecodesign products:
  - Introduces a ”Functional unit” as the base for the LCA and policy options
  - Production phase:
    - Material use, in particular Critical Raw Material (such as rare earth metals)
    - Carbon footprint: local or EU electricity mix? Very important difference!
  - User phase:
    - Carbon footprint: EU electricity mix?
  - Recycle phase
    - Easy to recover the material
- Lot to learn from off-grid experiences in regions outside EU

PV-panels and inverters

- Link to EU prep study: http://susproc.jrc.ec.europa.eu/solar_photovoltaics/documents.html
- Scope:
  - The module:
    - Multi crystalline Si, Back surface field (BSF) design
  - The inverters:
    - Residential: One string, 2.5 kW, 1-phase
    - Commercial: One string, 20 kW, 3-phase
    - Utility: Central inverter, 3 strings of 500 kW, in total 1500 kW
- Timetable:
  - Prep study 2019
  - Decision ?

PV: Functional unit for the LCA

- For PV modules: 1 kWh of DC power output under predefined climatic and installation conditions as defined for a typical year and for a service life of 30 years
- For inverters: 1 kWh of AC power output from a reference photovoltaic system (excluding the efficiency of the inverter) under predefined climatic and installation conditions as defined for a typical year and assuming a service life of 10 years
- For systems: 1 kWh of AC power output supplied under fixed climatic conditions as defined for a typical year (with reference to IEC 61853 part 4) and assuming a service life of 30 years.

This extended service life allows to take into account operation and maintenance activities, failure probability and degradation rates along the life time of the system and its components.

PV: Policy proposal

- Production phase:
  - Material use, in particular Critical Raw Material (such as rare earth metals)
  - Carbon footprint: local or EU electricity mix? Very important difference!
- User phase:
  - Unclear
- Recycle phase
  - Easy to recover the material
- Four options explored so far:
  - Ecodesign
  - Energy labelling
  - Ecolabel (voluntary label with multi parameter requirement)
  - Green Public Procurement (minimum requirements and BAT)

Batteries

- Link to the EU prep study: https://ecodesignbatteries.eu/welcome
- Scope:
  - High energy rechargeable batteries of high specific energy with **lithium** chemistries for e-mobility and stationary energy storage (if any) with a high specific density (>100 Wh/kg) and high capacity (2 to 1000 kWh.
  - 7 base cases:
    - 5 on batteries in vehicles (cars, trucks…)
    - 1 on home solar systems
    - 1 on large batteries used in the grid
- Timeline:
  - Prep study phase 2019
  - Decisions during 2021?
  - Coming into force not earlier than 1 year after decision

Batteries: Functional unit for the LCA

- Based on the stored energy: *Max number of kWh a battery can deliver during its lifetime*
- Special feature:
  - A *second* life is considered, for another application -> longer lifetime, better outcome in the LCA
  - But debated whether good or bad: better to recycle directly after first application? Cf comments by Northvolt this morning!

Batteries: Policy proposal

- Production phase:
  - Material use, in particular Critical Raw Material (such as rare earth metals)
  - Carbon footprint: local or EU electricity mix? Very important difference!
- User phase:
  - Carbon footprint: EU electricity mix?
- Recycle phase
  - Easy to recover the material

Batteries: Policy proposal

- Must consider boundary conditions for the legislation:
  - The battery directive
  - Transport not really part of ecodesign
- Different options considered:
  - Ecodesign
  - Energy labelling
  - Stand-alone regulation?

Extra: From Test Methods to Enforcement (using the EU as an example)