



Residential indicators and related data

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المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة



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Basic residential indicators: consumption per capita or household

- Total energy consumption per capita (toe/capita)
- Total electricity consumption per capita (kWh/capita)
- **Total energy consumption per household or dwelling** (toe/household)
- Total electricity consumption per household (kWh/household)
- Total electricity consumption per electrified household (kWh/household)

Consumption per household is preferable as consumption in the residential sector is more related to the number of dwellings or households than to the population

Core residential indicators: interpretation

Indicators	Interpretation
Energy consumption per household	Very aggregated; includes changes in household equipment
Electricity consumption per household	Very aggregated; includes changes in household equipment and electrification rates
Electricity consumption per electrified household	Very aggregated; includes changes in equipment rates
Energy or electricity consumption per private consumption unit of households	Highly aggregated; measures the relative change between household energy consumption and household income

« Economic » residential indicators: intensity

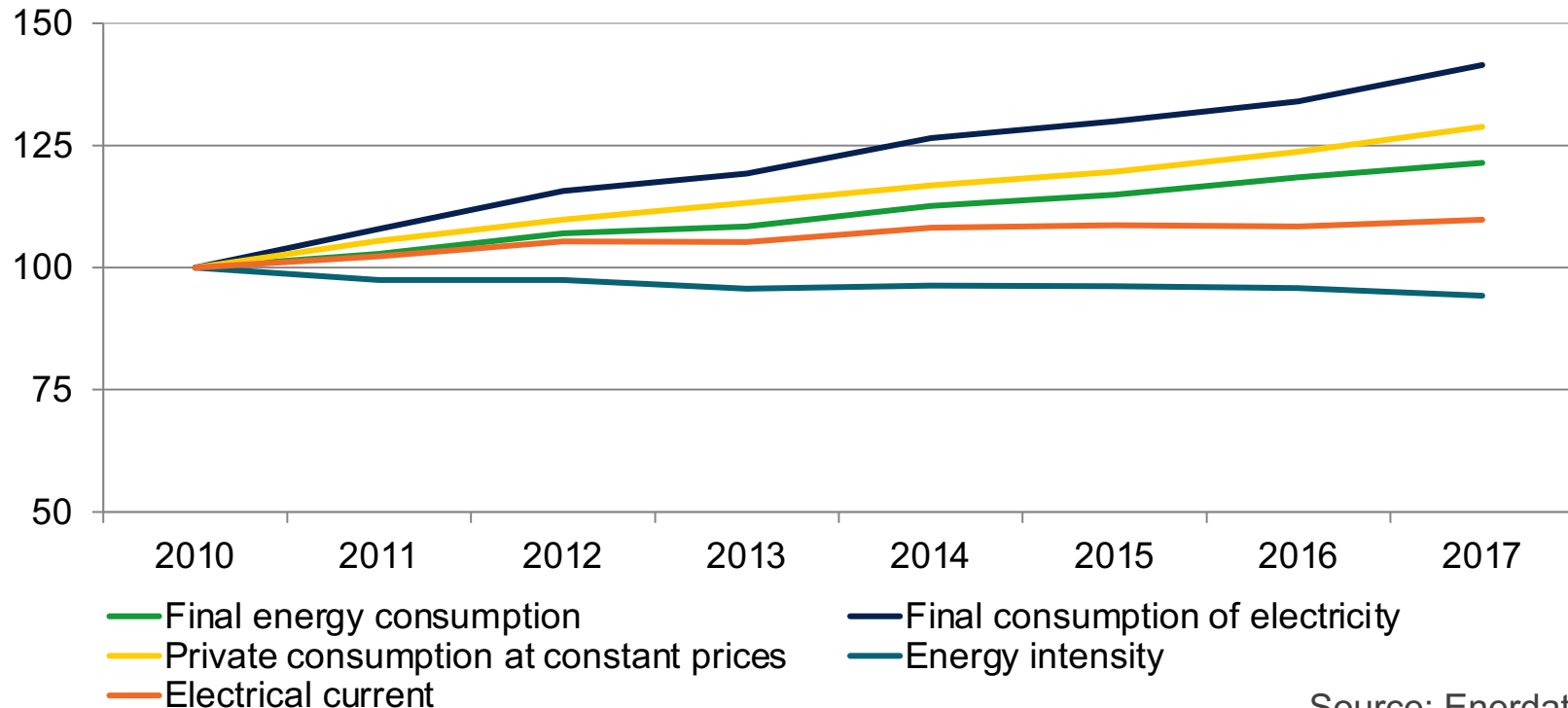
- Energy consumption per unit of income (toe/lcXX)
- Electricity consumption per unit of income (kWh/\$XX)
 - With: lcXX: national currency at constant price
 - €XX: € at constant price and constant exchange rate
 - €XXppa: € at constant price and constant purchasing power parity rate
- Economic indicators of the intensity type
- Income approximated by private consumption of households, i.e. total household expenditure on goods and services (=major component of GDP, i.e. ~60% of GDP)

Household energy and electricity intensities



- Energy consumption grows more slowly than private household consumption **Energy intensity decreases**
- Faster increase in electricity consumption, linked to the increase in the number of electrical appliances **Increase in electrical intensity**

Evolution of energy and electricity intensities in Morocco

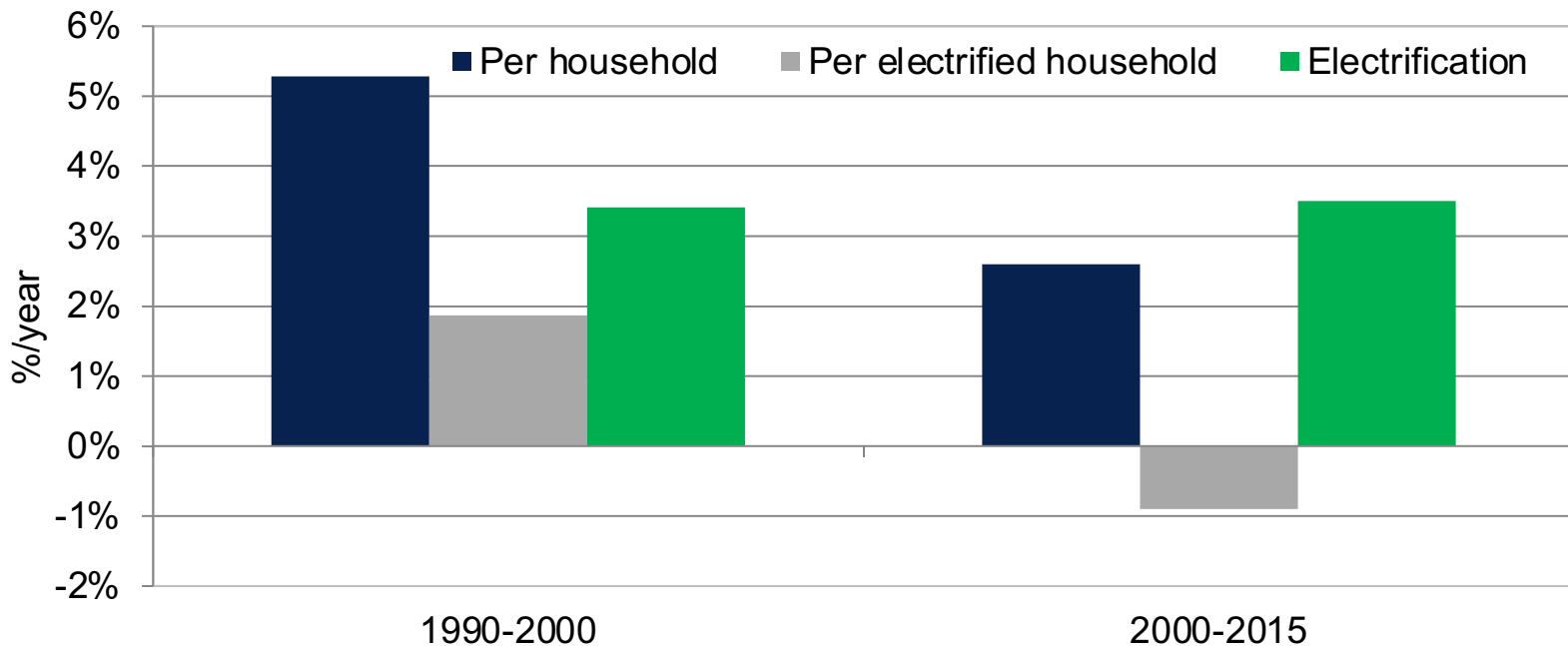


Source: Enerdata

Specific electricity consumption per household: effect of electrification

- Specific electricity consumption per electrified household is increasing less rapidly than specific electricity consumption per household, due to electrification.
- The correct indicator for assessing energy efficiency is the specific electricity consumption per electrified household.

Specific electricity consumption per household: example of the effect of electrification



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Specific consumption indicators by end-use

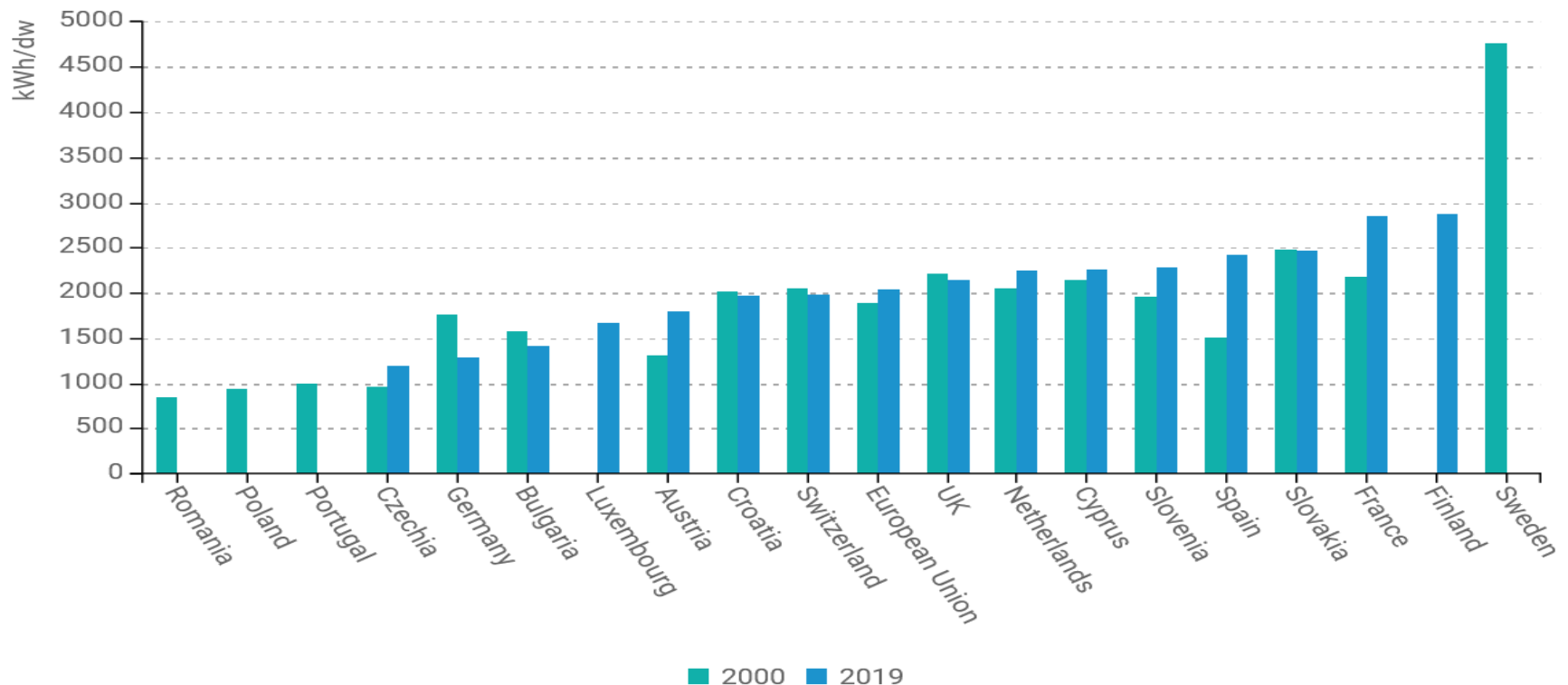
- Allow for a more detailed assessment of the impact of measures as they are more targeted
- Often based on estimates or modelling

Unit consumption	Unit	Interpretation
Refrigerators, lighting and other large appliances	kWh/household per year	
Heating	toe/household or m2	
Heating for new homes	toe/household or m2	Measures the impact of standards (unit consumption deducted from standards)
Air conditioning	kWh/house or m2	
Domestic hot water	toe/capita	Excluding solar if solar considered as energy saving
Cooking	toe/household	

Specific consumption indicators by end-use: example of electrical appliances

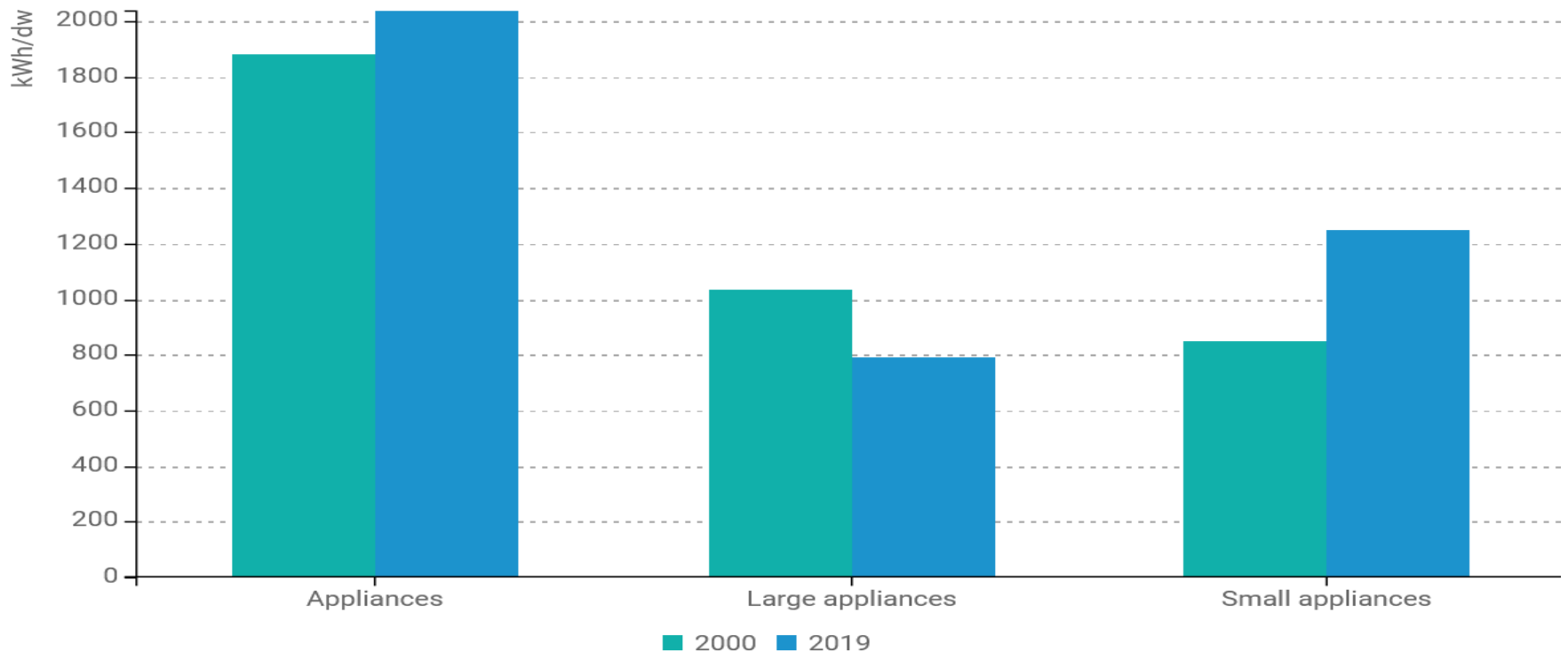
Among the European countries, there are large differences in electricity consumption per dwelling for electrical appliances: from about 1000 kWh (Portugal, Czech Republic and Romania) to 2500 kWh (France, Finland and UK) and even 4500 kWh in Sweden.

Electricity consumption per dwelling for electrical appliances (EU 2000-2019)



Specific consumption indicators by use: example of electrical appliances

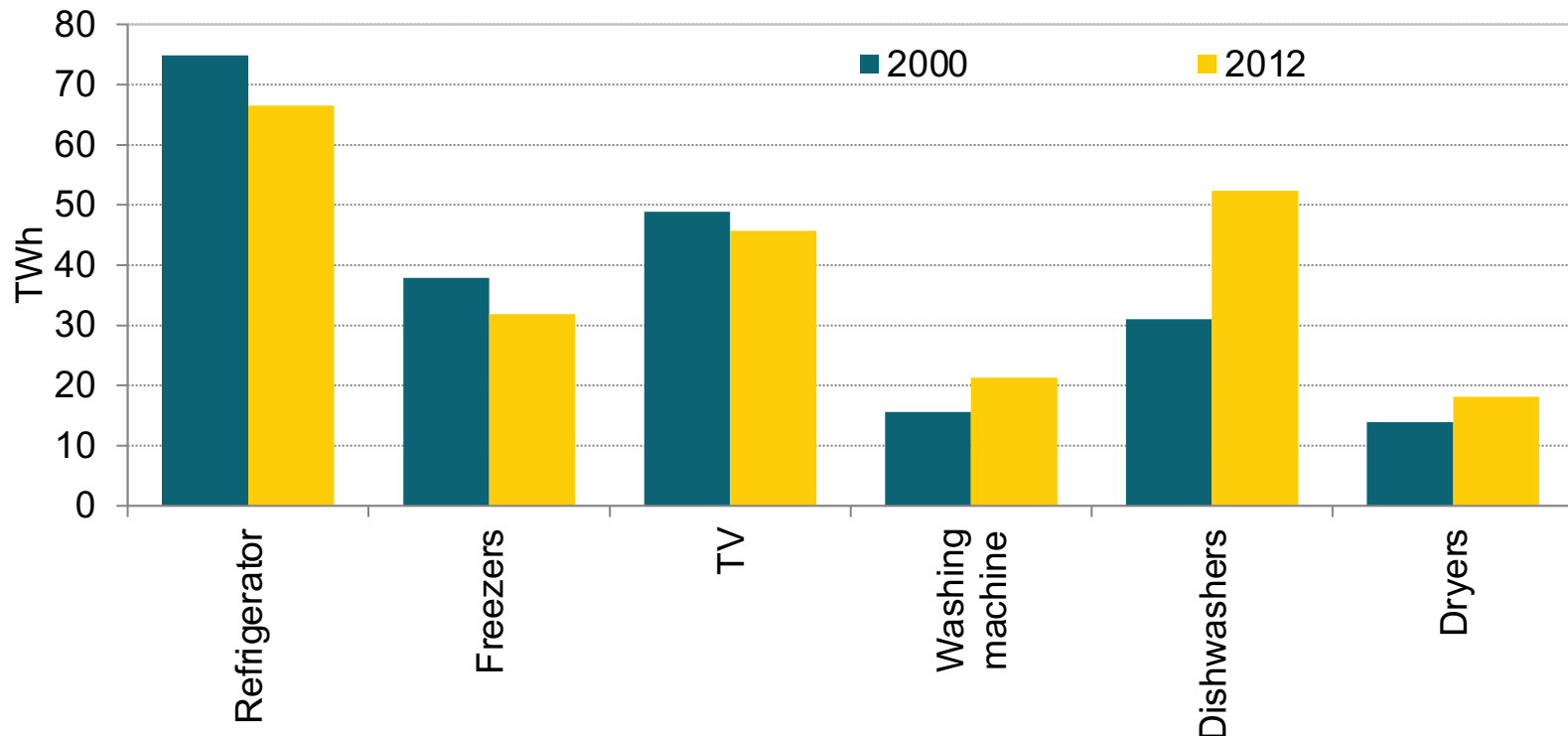
Electricity consumption per dwelling by type of electrical appliance (EU)



Specific consumption indicators by use: example of electrical appliances

- Electricity consumption of tumble dryers and dishwashers increased over the period 2000-2012 due to rising equipment rates
- The electricity consumption of refrigerators has decreased with the diffusion of new energy efficient appliances.

Electricity consumption of large electrical appliances by type (EU)



Alternative indicators for equipment

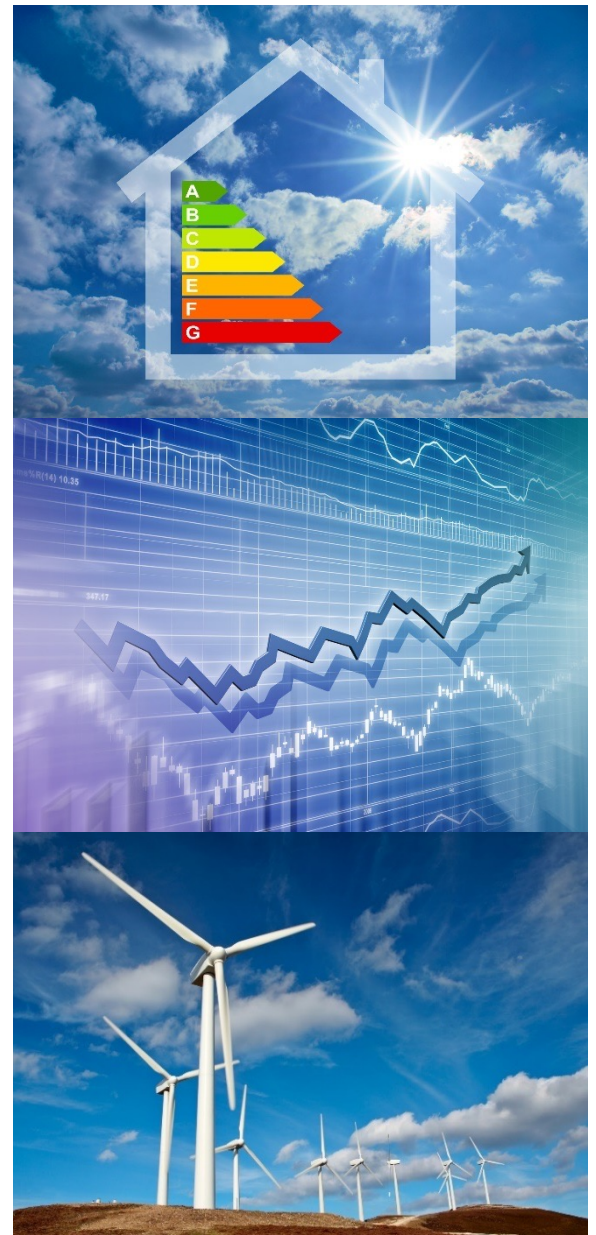
	kWh/household equipped	kWh/equipment	kWh/litre (refrigerator) or per cycle (washing machine)
Assets	<ul style="list-style-type: none"> •Takes into account the equipment rate 		<ul style="list-style-type: none"> •Closer to technical efficiency as corrected for size (refrigerator) or use (washing machine)
Boundaries		<ul style="list-style-type: none"> •Reduces the amount of energy savings as equipment size increases 	<ul style="list-style-type: none"> •Need more data on equipment size

Alternative indicators for heating and cooling

	kWh/household	kWh/household equipped	kWh/m2
Assets		<ul style="list-style-type: none"> •Takes into account the equipment rate 	<ul style="list-style-type: none"> •Corrects for the size of the dwellings
Boundaries	<ul style="list-style-type: none"> •Reduces the amount of energy savings as dwelling size increases 		

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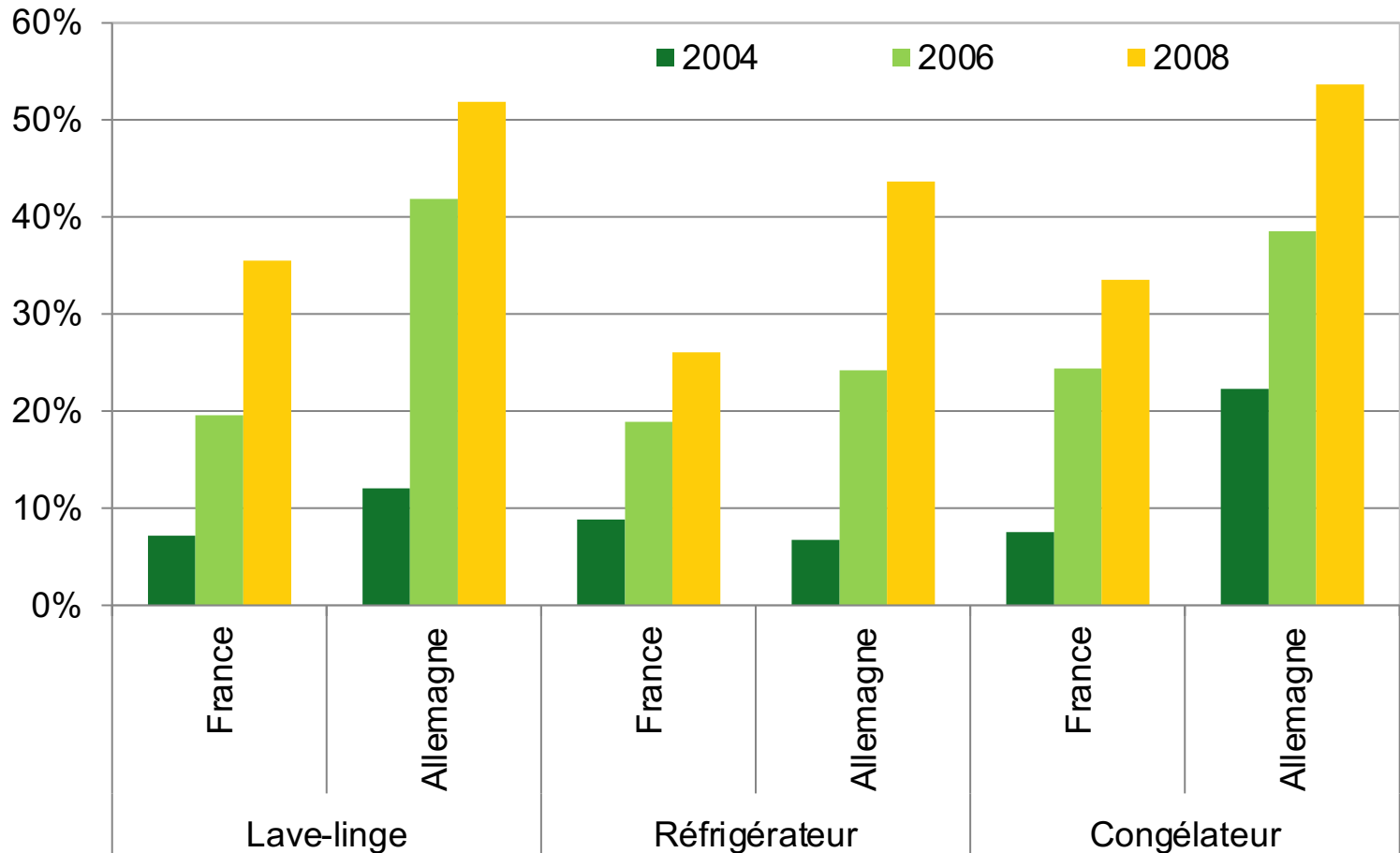
Dissemination indicators

- Objectives
 - Measuring the diffusion of efficient equipment and RES: LBC, CES, share of most efficient labels for electrical appliances (A, B, etc.)
 - Measuring the impact of support policies
- Two types of indicators
 - Indicators of sales or installed base of such equipment
 - Leading indicators that put this diffusion into perspective in relation to the size of the market (e.g., % of households equipped)

These indicators are more amenable to international comparisons between countries of different sizes because they are in relative terms:

 - Diffusion of SWH (residential): m/capita²; % of dwellings equipped
 - Diffusion of LBCs: number of LBCs per household; % of households equipped

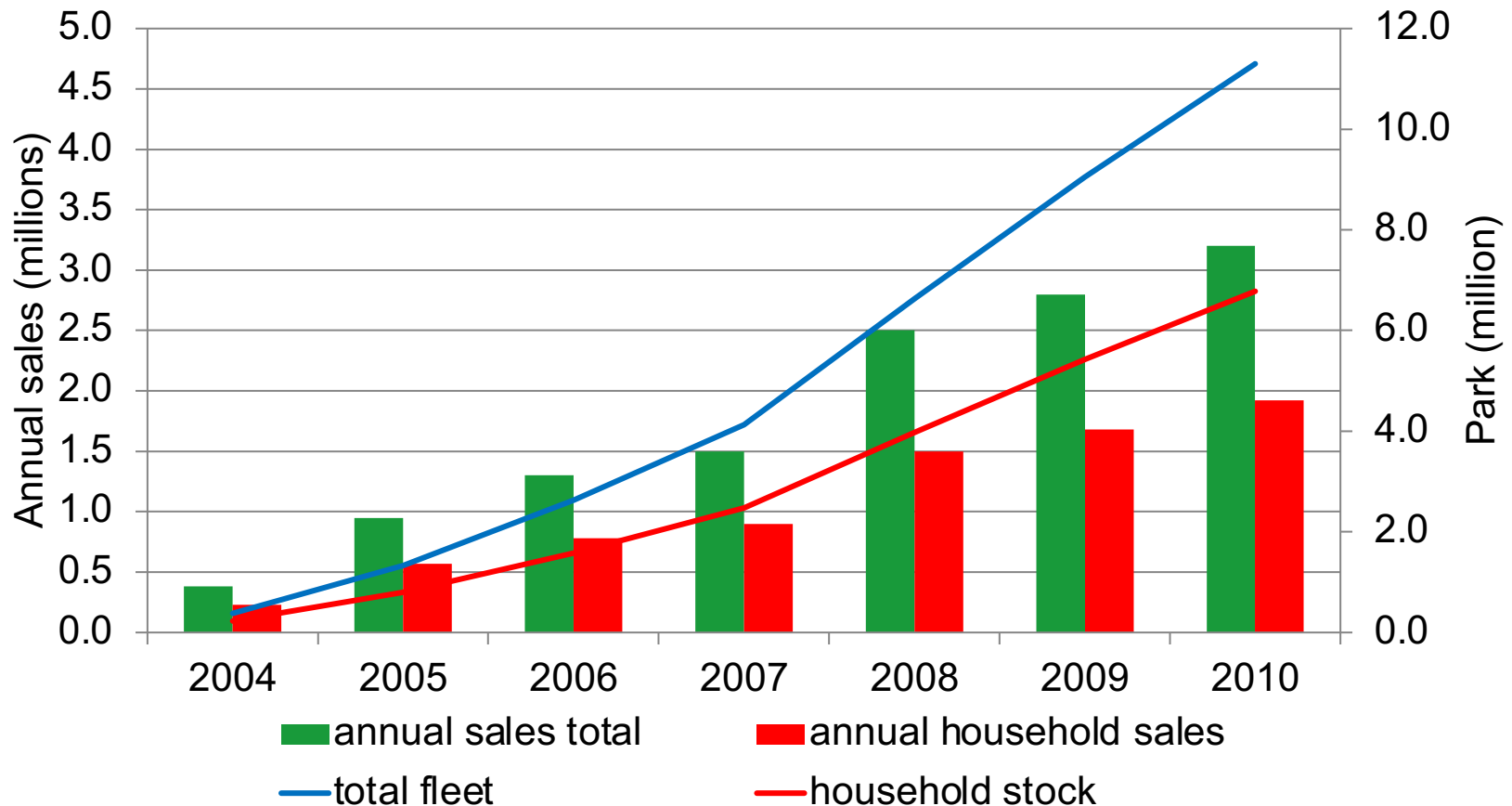
Penetration of the most efficient equipment (A+ and A++) in France and Germany



Source: ADEME/Enerdata 2012 based on GfK data

AML sales and stock: the case of Tunisia

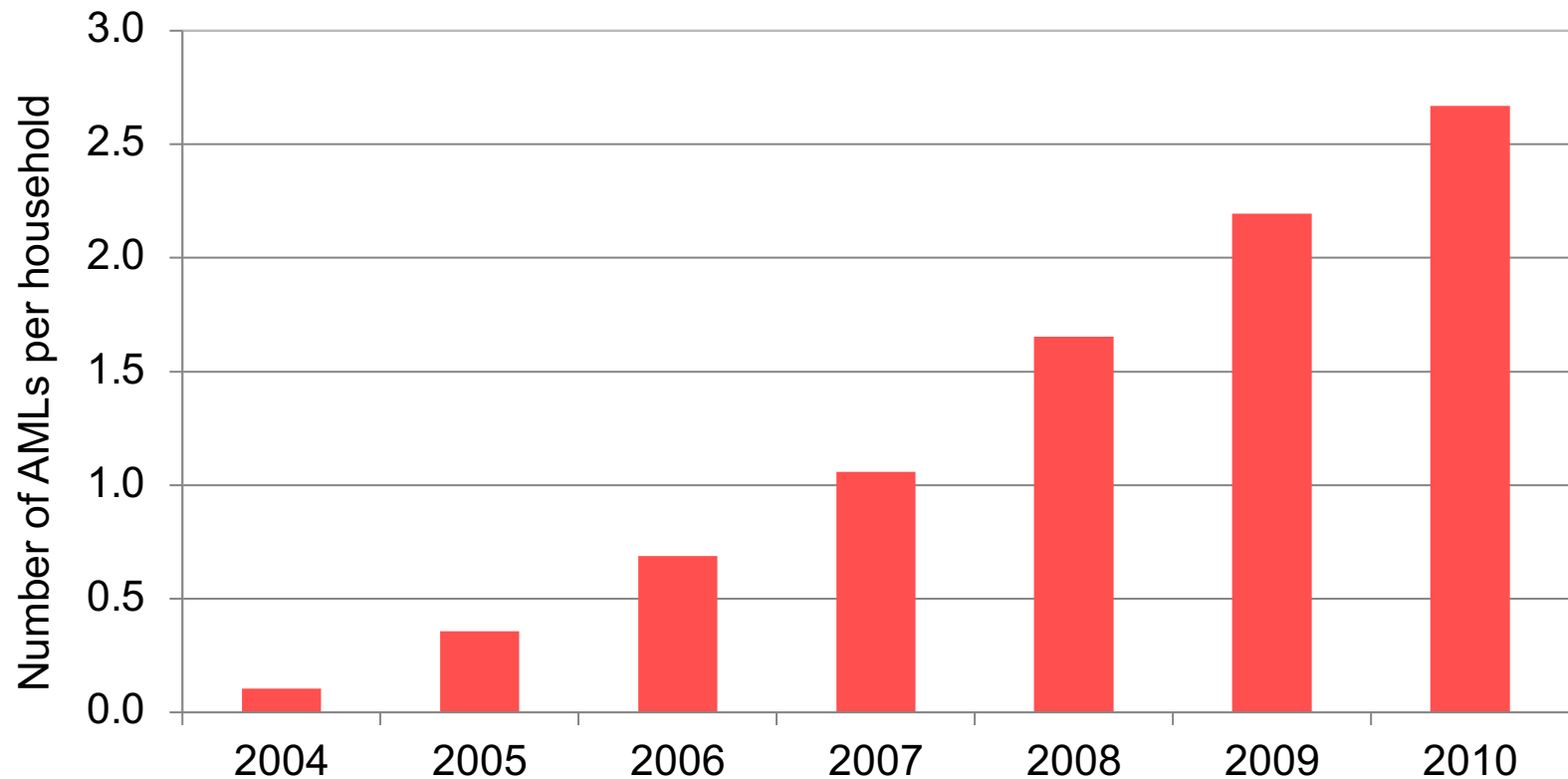
LBC sales growth of 23%/year on average from 2005 to 2010 and 13%/year since 2008



Source: ANME; stock estimated on the basis of an average life of 5 years

Household penetration of AMLs: the case of Tunisia

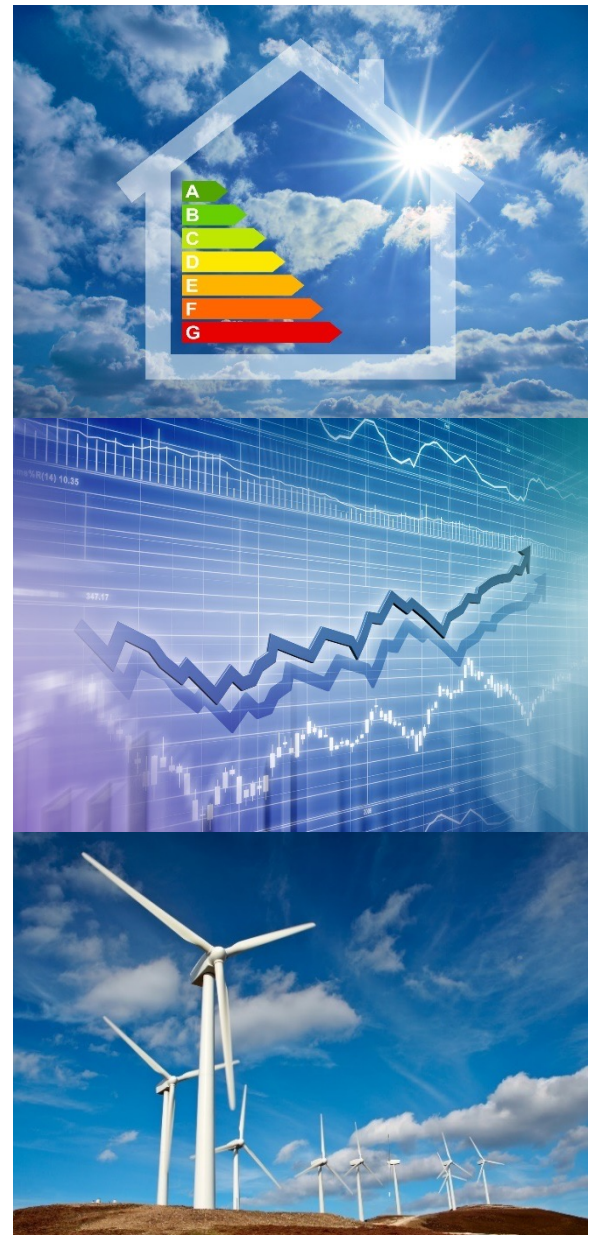
Very strong increase in the average number of AMLs per household: from 1 in 2007 to 2.7 in 2010



Source ANME (ratio of installed base of households to number of households)

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Household data

- Activity data :
 - Number of households and housing stock
 - Equipment stock and/or equipment rate, annual sales
 - Equipment stock and/or equipment rate by energy (heating, hot water, cooking)
 - Equipment stock, penetration rate, sales of efficient equipment (e.g. LBC, CES)
 - Number of heating and cooling degree days
- Energy consumption by use and type of equipment :
 - Heating
 - Domestic hot water
 - Cooking
 - Refrigerators
 - TV
 - Washing machines
 - Air conditioning
 - Lighting

3. Presentation of the sectoral tabs: Residential

Residential

- Number of households
- Dwelling characteristics: by type and use; floor space; annual construction
- Electrical equipment: stocks, sales, equipment rate; specific consumption
- Efficient equipment (CFLs, LEDs, solar water heaters, efficient stoves or cookers): numbers, sales
- Consumption by use

Data

- Energy intensity;
- Unit consumption by use (some climate adjusted)
- SWH: installed area, % of dwellings equipped; heat production

Indicators

Housing stock

- **Different definitions** for the housing stock may result in inconsistent data across sources:
 - total number of dwellings
 - number of occupied dwellings or primary residences

Difference between the two data: secondary residences, vacant dwellings (important concept for energy consumption studies: main residences assimilated to the number of households)

- Need for urban/rural separation.

Housing stock: data source

- Census (about every 10 years), housing surveys
- Number of persons per household: an important concept for moving from population to number of dwellings and estimating the number of dwellings per year
- Principle of estimation:
 - Extrapolate the number of persons per dwelling (linear extrapolation as it evolves very slowly)
 - Attention to the definition of the housing stock and to the consistency of the date used for the population and the dwellings (beginning, middle, end of year)

Demographics: sources

- **Annual construction:** generally known by the statistical institutes
- **Electrification:** known from household and administrative surveys
- **Size of dwellings:** less known in non-OECD countries; can be estimated from household surveys based on the number of rooms per dwelling

Data sources for equipment (1/2)

- Data generally available from Statistical Institutes for the years of housing surveys (10 years)
- Data available:
 - On an annual basis:
 - from **specific surveys**: e.g. in France with a survey on durable goods owned by households)
 - or from **household expenditure surveys** (e.g. India)
 - Every 2/3 years: from **consumption surveys** (as in Germany) or through **specific questions** from household budget surveys (as in Norway)

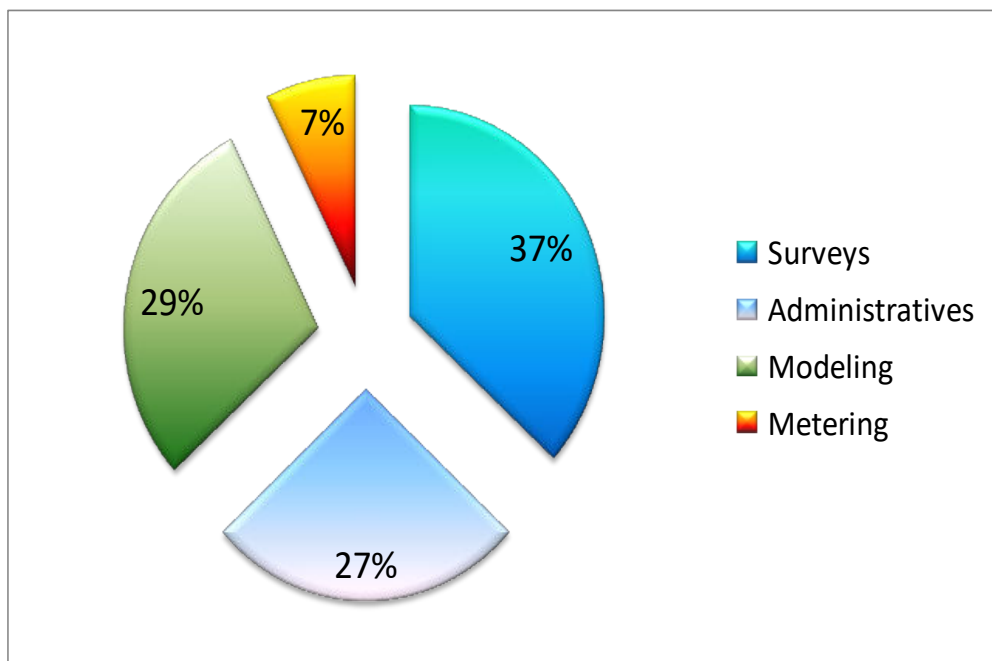
Data sources for equipment (2/2)

- Other sources:
 - Annual surveys organised by equipment manufacturers' associations (e.g. GIFAM in France with TNS Sofres) or by the Energy Agencies (e.g. ADEME in France with TNS Sofres)
 - Surveys of electricity companies (e.g. Tunisia) (every 4 years)

If the data is not known on an annual basis, it can be interpolated/extrapolated in a linear way as it evolves slowly.

Data source for energy consumption by use

Relative weight of methods used according to the IEA



In reality, household consumption by use is estimated by specialised organisations based on a **combination of all approaches**, in particular surveys and modelling

Source: IEA survey 2011 (March 2012), based on 68 data sources