IRENA
International Renewable Energy Agency

# Measurement and estimation of off-grid solar, hydro and biogas energy

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# Overview

- The challenge of measuring off-grid energy

- Off-grid energy data collection

- Trends in off-grid renewable energy

- Further development and analysis

# Off-grid energy challenges

- Off-grid renewables and the SDGs:
  - % of people with access to electricity
  - % of renewables in TFEC

- Many autoproducers, including households and public services

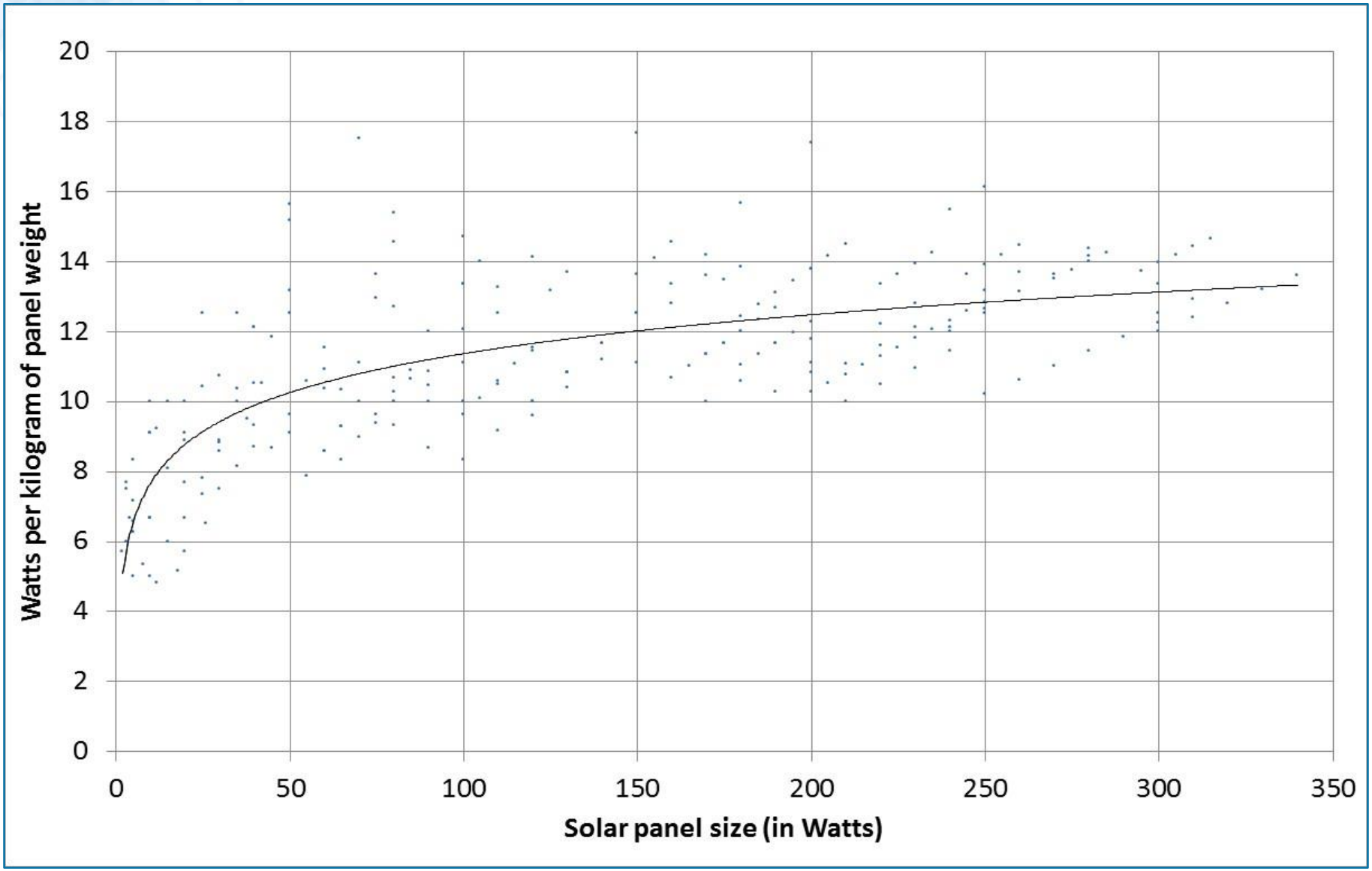
- Large numbers of small plants



# Current data and estimates

- National access data:
  - Utility data (grid connections, plus off-grid estimates)
  - Household surveys
  - National electrification data (grid availability)
- National off-grid power data:
  - National utility “isolated systems”
  - Very little data for non-utilities
  - Off-grid databases in some countries
- IRENA’s off-grid figures:
  - National data and estimates, where available
  - Estimates from solar panel imports (e.g. 10W/kg)

# Solar panel weight and Watts



# IRENA data collection exercise

**Scope:**

- Off-grid PV, hydro, biogas in developing countries

**Purpose:**

- Expand/refine our data for “known” off-grid plants
  - Clearly separate on and off-grid plants in our DB
  - Check the validity of off-grid estimates
  - Standardise measurement and estimation methods
  - Identify end-uses as far as possible
  - Measure/estimate numbers of beneficiaries
  - Examine linkages to other SDGs

# “Bottom-up” data collection

- Multiple data sources:
  - National databases, questionnaires
  - Trade and sales data
  - Project databases, supplier websites
- Technologies:
  - Mini-grids
  - Home systems (including lights)
  - Various others (non-residential uses)
- Variables (standardised):
  - Number/capacity/generation
  - End-uses, timing
  - Number of beneficiaries

# “Bottom-up” data collection

- Number of plants in the database (to 2016/17):
  - Biogas generators 500
  - Hydropower 38,600
  - Solar mini-grids 8,100
  - Solar water pumps 107,300
  - Communication towers 89,700
  - Other solar plants 78,600
  - Solar lights, SHS (records) 650
    (51 million units)

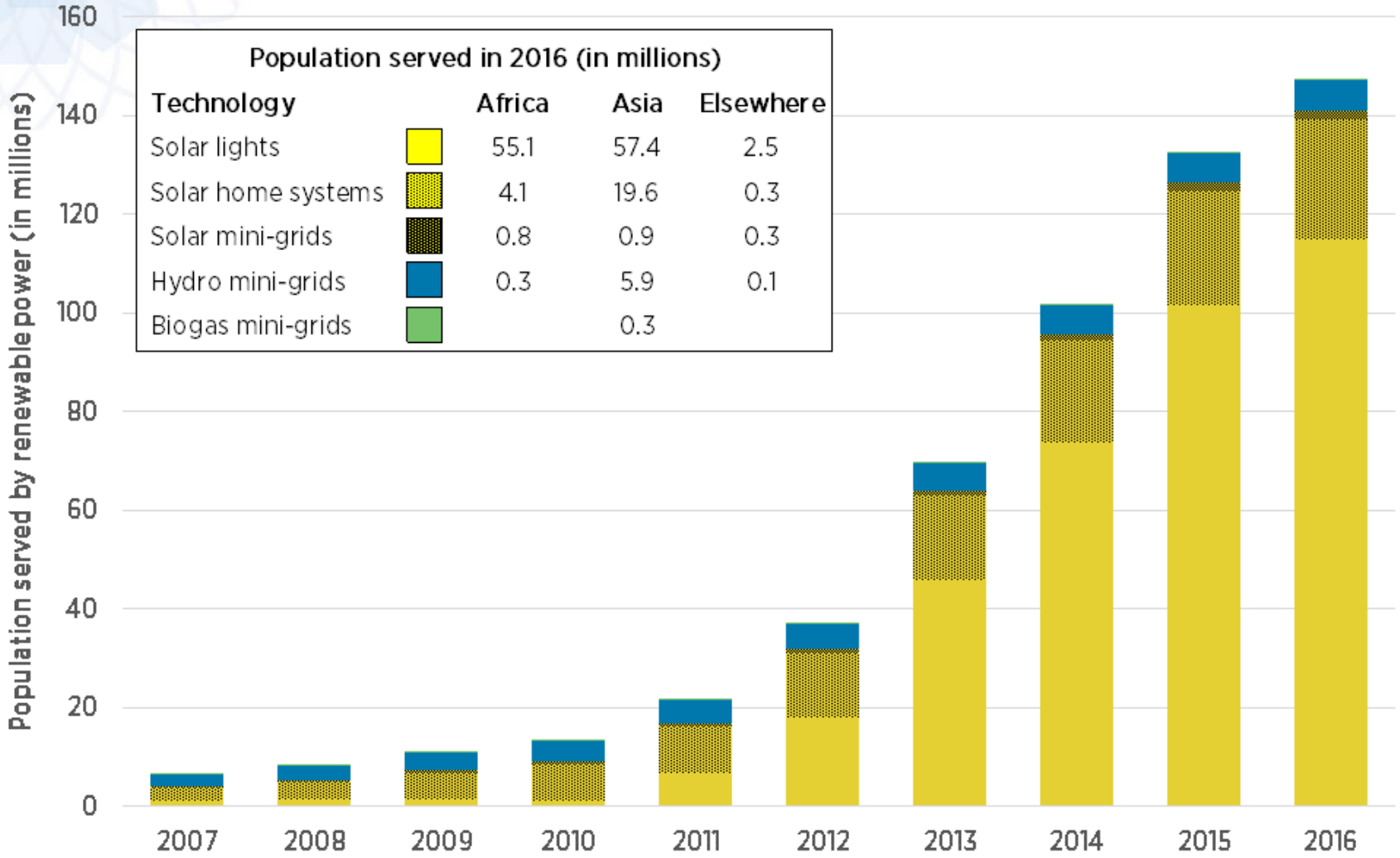
- Data challenges:
  - Converting from number of plants to capacity/beneficiaries
  - Decommissioning/retirement (product lifespan)
  - Number of connections (mini-grids, multiple device use)

# Results: capacity and end-uses

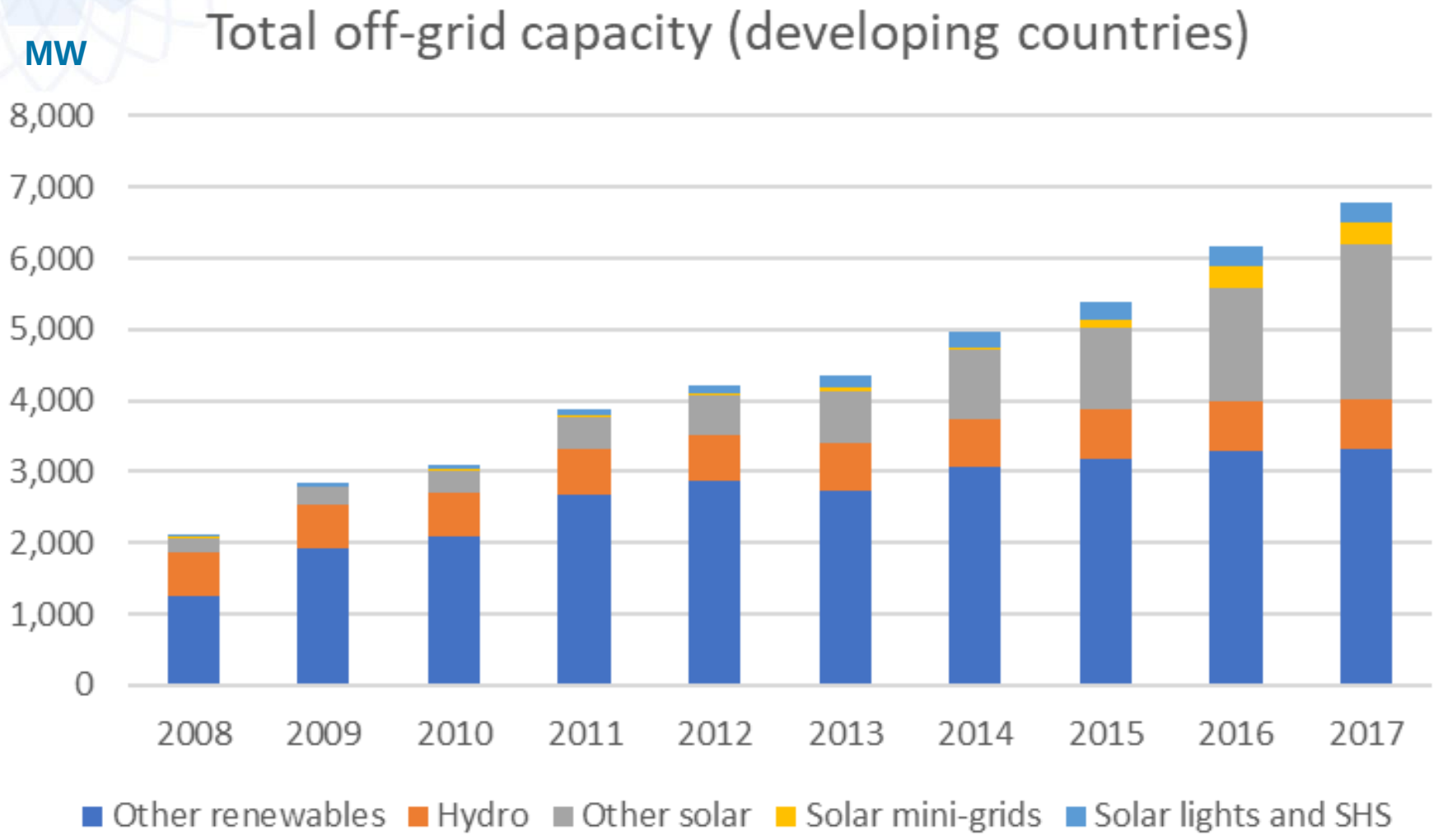
## Off-grid capacity and end uses in 2016 (in MW)

| | Hydro | PV | Wind | Bio | Geo | Total |
|---|---|---|---|---|---|---|
| **New data** | | | | | | |
| Industry | 3 | | | 4 | | 7 |
| Commercial/public | 6 | 414 | | 4 | | 424 |
| Residential | 61 | 289 | | 4 | | 354 |
| Other | 10 | 212 | | 16 | | 238 |
| Mixed use | 245 | 294 | | | | 539 |
| **Total** | **325** | **1,209** | | **28** | | **1,562** |
| Current data | 504 | 2,162 | 441 | 2,796 | 53 | 5,956 |
| **New total** | **700** | **2,162** | **441** | **2,824** | **53** | **6,180** |
| Identified end-uses | 65% | 42% | 100% | 100% | 100% | 70% |

# Results: electricity access



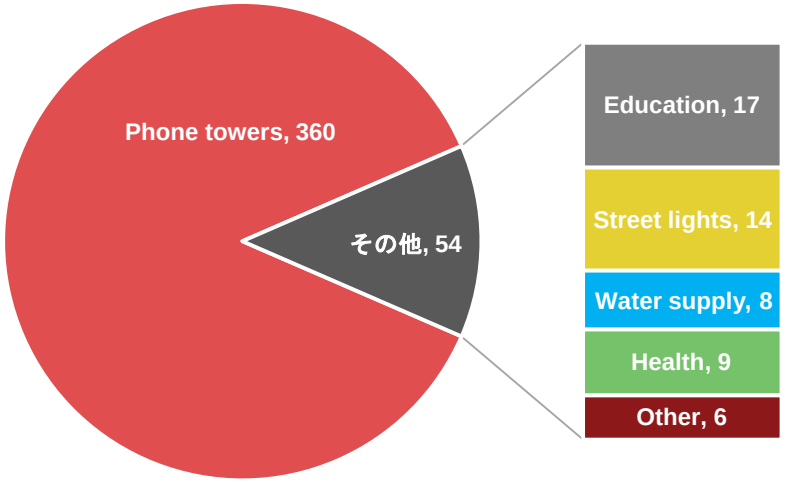
# Results: off-grid capacity



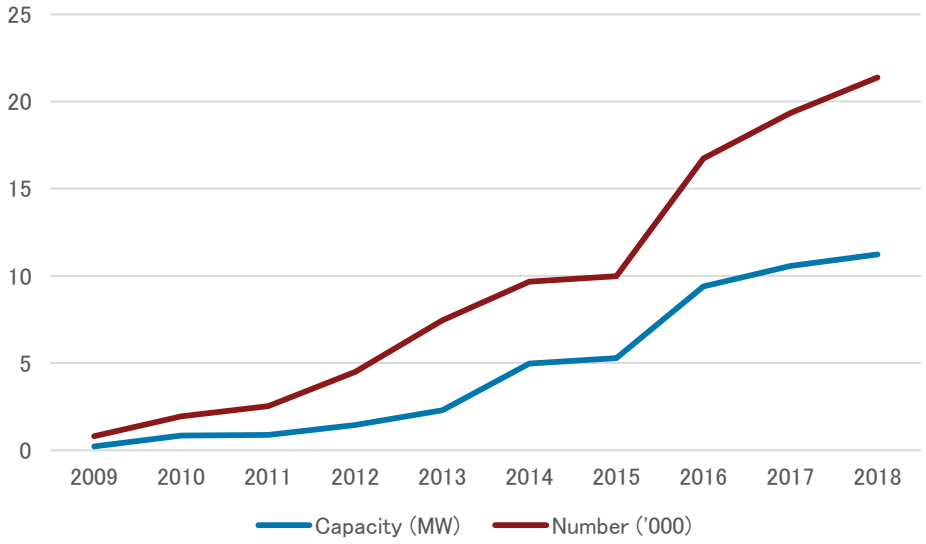
# Further analysis of end-uses

Solar PV is becoming the power source of choice for pumping, phone towers, street lighting, rural clinics (including fridges) and other remote locations

**Commercial and public uses of solar PV (total = 414 MW)**




**Growth in the use of solar PV in health care**




Solar PV improves the delivery of health care for millions of people and varies in scale from small portable devices to major plants powering small hospitals

# Next steps

- Ensure that renewables are included in HH surveys
- Continue to work with countries to increase the recognition of off-grid renewables and possibilities for measurement (training, pilot surveys, manuals)
- Integrate the new data into IRENA's off-grid figures
- Further analysis of linkages to other SDGs (education, water and sanitation, agriculture)

# Improvements to trade data

## 1. Harmonized System:

- 5,000 6-digit codes used for international trade
- Covers 98% of global trade
- HS 2017 just entered force; next is HS 2022
- Commodity description and coding system

## 2. Solar products:

- 841919 Instantaneous or storage water heaters, non-electric (excluding instantaneous gas water heaters and boilers or water heaters for central heating)

- 854140 Photosensitive semiconductor devices, incl. photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes (excluding photovoltaic generators)

  ***Definition of solar cells:*** *silicon photovoltaic cells which convert sunlight directly into electric energy. They are usually used in groups as sources of electric power, e.g., in rockets or satellites employed in space research, for mountain rescue transmitters.*

# Improvements to trade data

## 3. Solar lights and lighting kits:

- All over the place!

**85 = Electrical machinery**
**94 = Furniture**

850131:
DC generators

940540: Electric lights n.e.s.

940550: Non-electric lights

850239:
Generating sets

940510: Electric ceiling and wall lights

850440: Static converters

854370: Electrical machines n.e.s.

854140: Solar panels

851310: Electric torches

850680: Batteries

850760: Lithium-ion accumulators

# Thank you

Renewable energy statistics available at:
http://resourceirena.irena.org/gateway/dashboard/