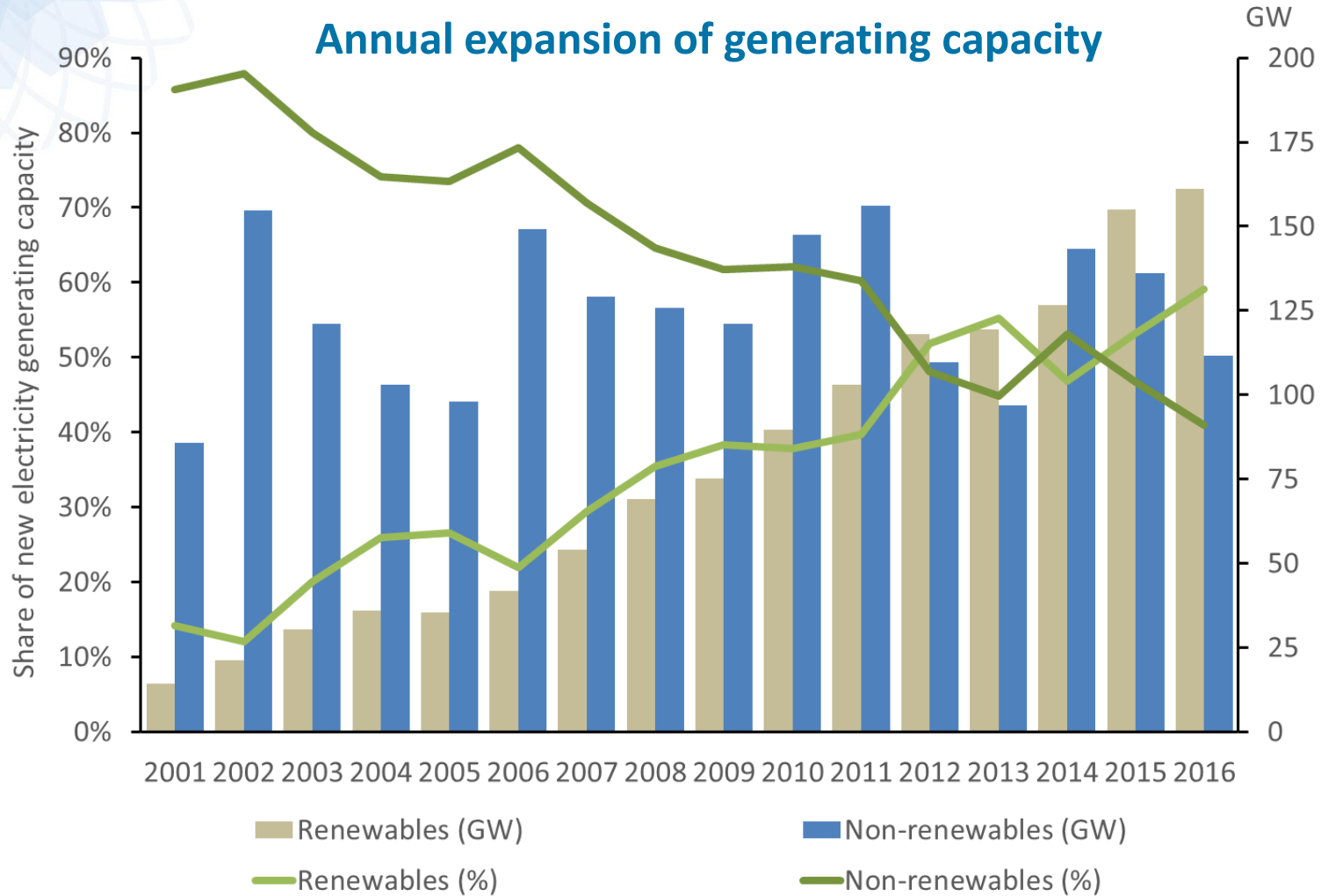


Renewable energy and the Sustainable Development Goals

Adrian Whiteman
IRENA Statistics

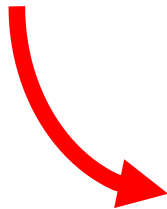
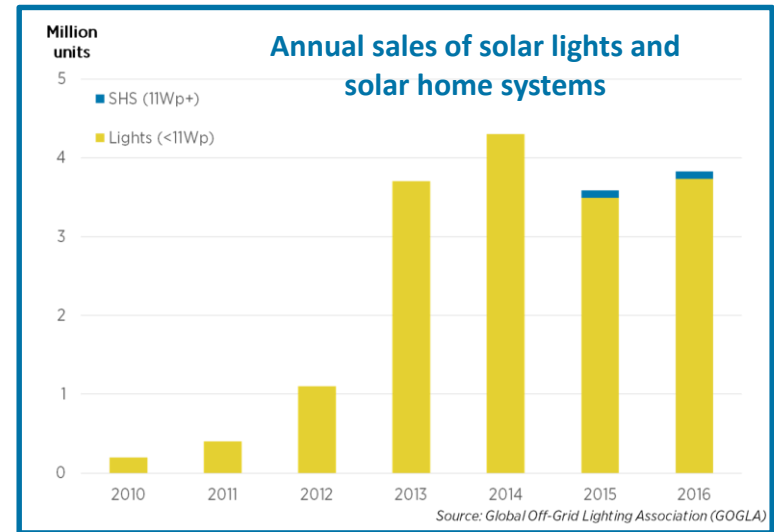
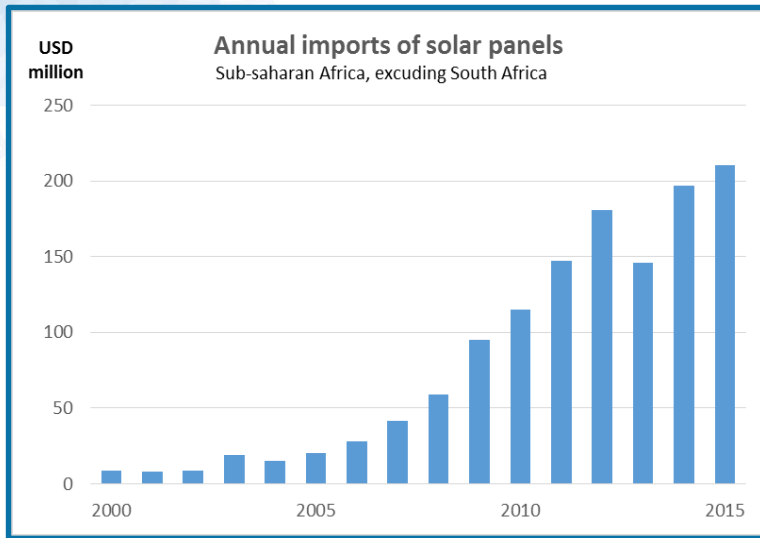
Symposium on SDG 7 (Energy)
18 - 20 Oct 2017, Oslo, Norway

SDG 7.2 Renewables Target

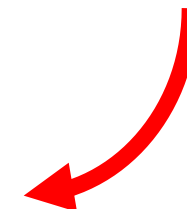
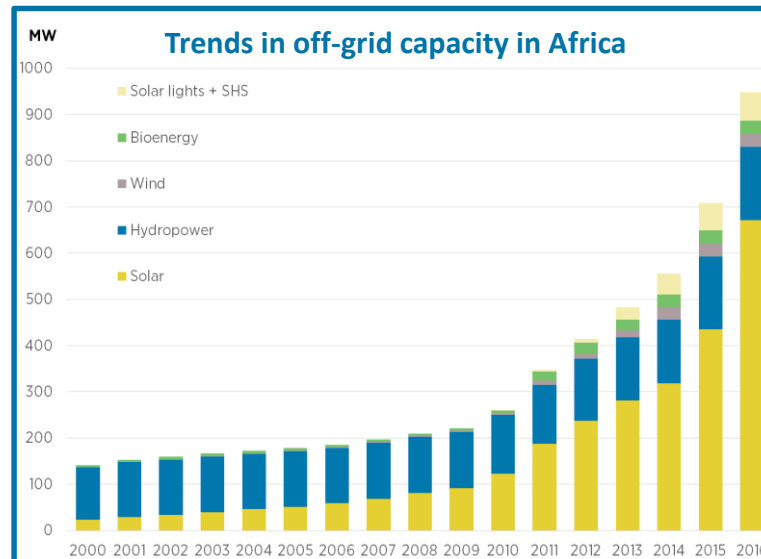


RE consumption in 2014: 26.3% electricity, 22.3% heat, 2.8% transport, 18.3% overall

Off-grid electricity in Africa



Estimates added to official statistics



Small capacity, but huge number

SDG 7.1 Energy access

Preliminary estimates of number of households/people using solar devices or connected to a mini-grid in Africa

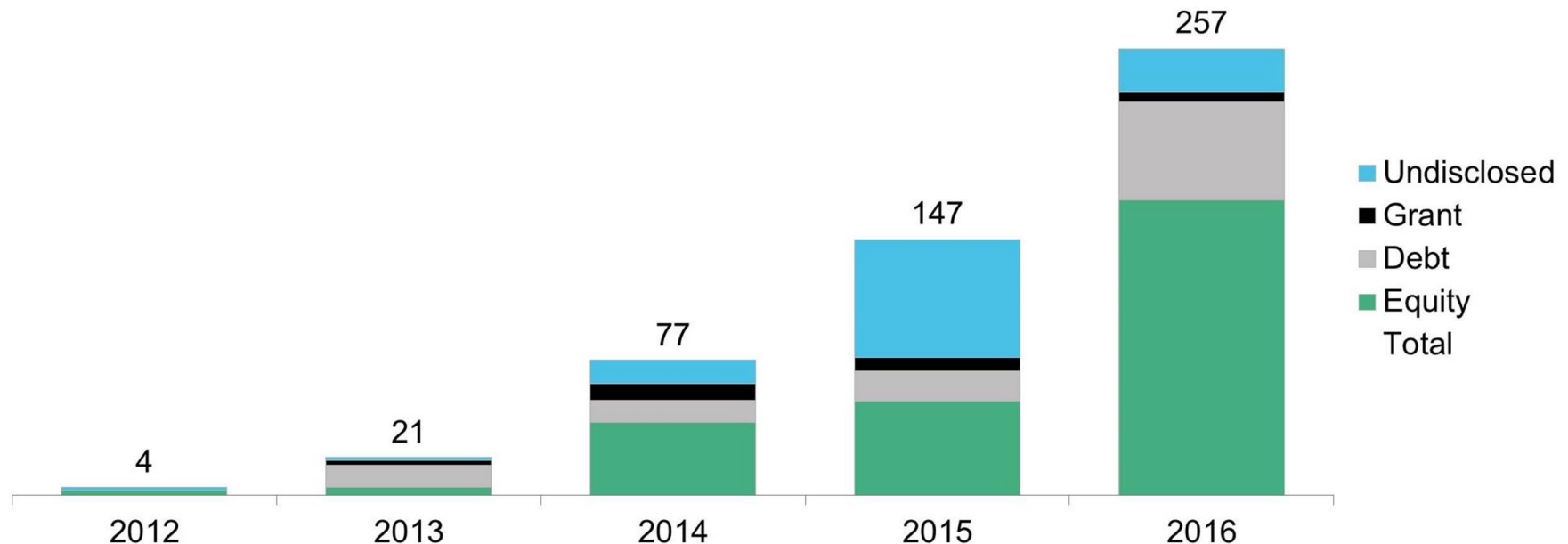
Level of energy access	Households (million)	People (million)
Minimal		
- Solar lights	11.5	58
Basic		
- SHS	0.2	1
Medium or more		
- Solar (standalone + mini-grid)	6.7	34
- Hydropower	1.6	8
- Wind	0.1	1
- Bioenergy	0.1	1

100 million people = 17% of the estimated off-grid population in Africa
(Globally, the number could be at least 300 million or 25% of the off-grid population)

PAYGO Solar – utilities of the future?

Investment of about USD 500 million in recent years, much of this in Africa. These disruptive business models make the “Business-as-usual” scenario unlikely.

Investments in pay-as-you-go solar companies (\$m)



Source: Bloomberg New Energy Finance

Renewables and other SDGs (Africa)

- **Solar pumps (at least 10 MW):**

Namibia (2005): 1,220
The Gambia (2014): 266
Ethiopia (2016): 165
Uganda (2016): 240
Tanzania (2016): 200
Malawi (2016): 150
Kenya (2016): 140

- **Solar refrigerators, 2010-15 (10 MW):**

15,000 procured by UNICEF, mostly for Africa

- **Solar in schools, 2016 (0.5 MW):**

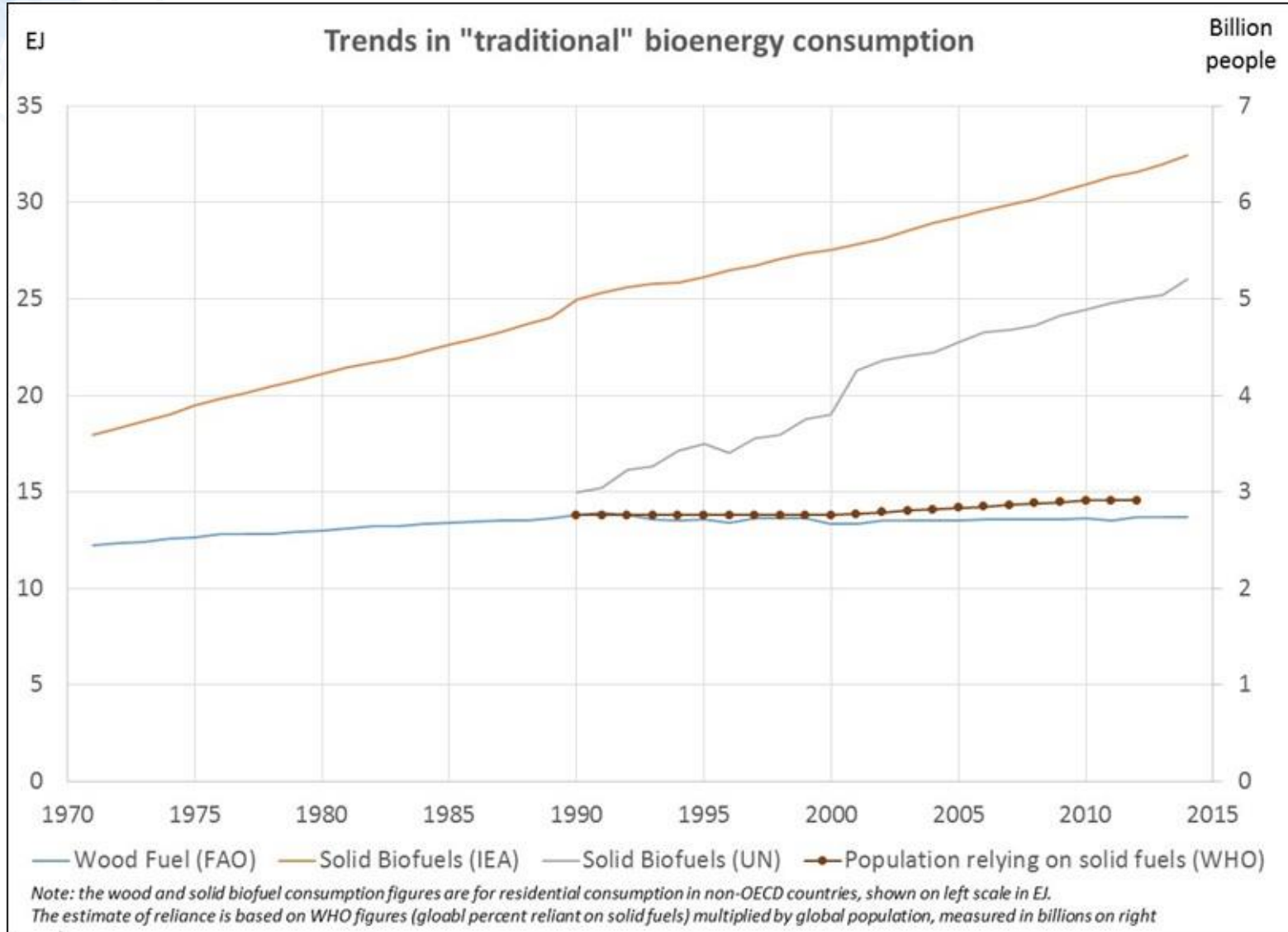
Kenya (4,171), Lagos (180), Zambia (28 planned)

- **Solar cell towers, 2014 (10-15 MW):**

Africa - about 3,400, often diesel-solar hybrid



What about other renewables?



Sugarcane mass/energy flows

Harvesting

1.30 t
cane plant



Crushing

1.00 t
cane



Boiling

0.70 t
juice



Crystallisation

0.15 t
sugar



0.25-0.30 t
residues



1,900 MJ (50%mc)
3,040 MJ (30%mc)

0.30 t
wet bagasse



2,300 MJ (50%mc)

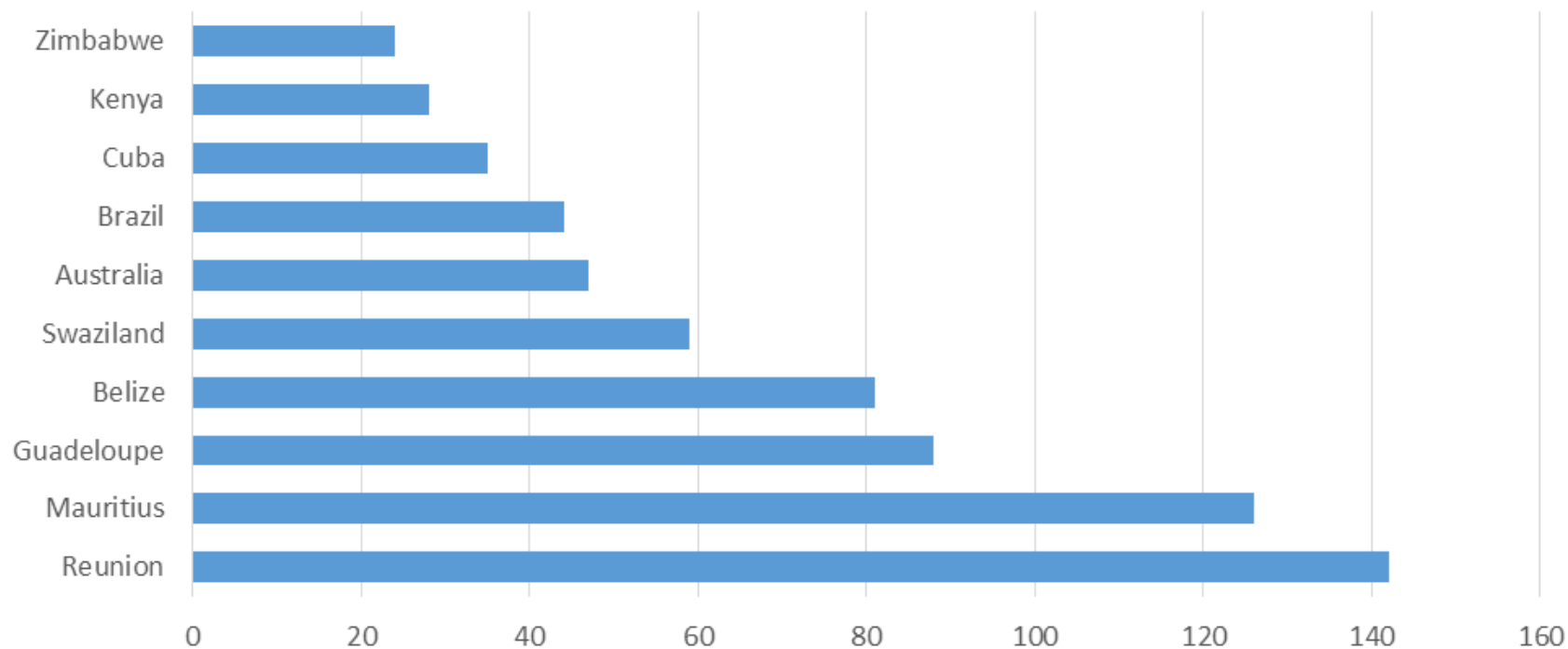
Energy use in low-technology mill (MJ/t cane)

Process	Energy	Efficiency
Crusher (steam-driven)	150	6.5%
Boiling + crystallisation	700	30.4%
Electricity (25 kWh/t)	150	6.5%
Total	1,000	43.5%

Maximum electricity potential is about 120 kWh per tonne of cane with 90 kWh for export (54% efficiency)

Bagasse generation: current status

Bagasse generation - kWh/t sugar cane produced in 2014



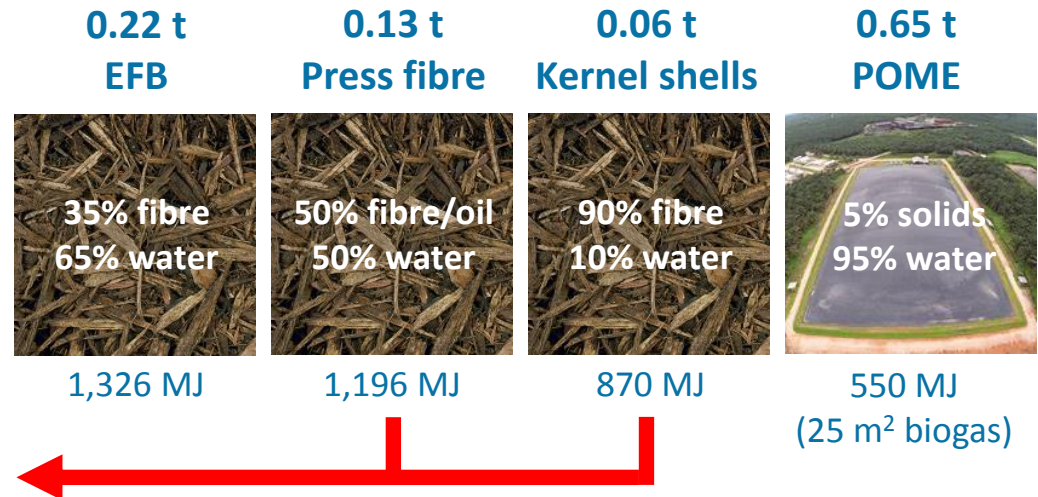
(Based on real reported data for sugar production and bagasse generation in 2014)

Oil palm mass/energy flows



Energy use (MJ/t fruit bunch)

Process	Energy	Efficiency
Sterilising	350	16.9%
Digesting	200	9.7%
Clarification/refining	620	30.0%
Electricity (20 kWh/t)	75	3.6%
Total	1,245	60.2%

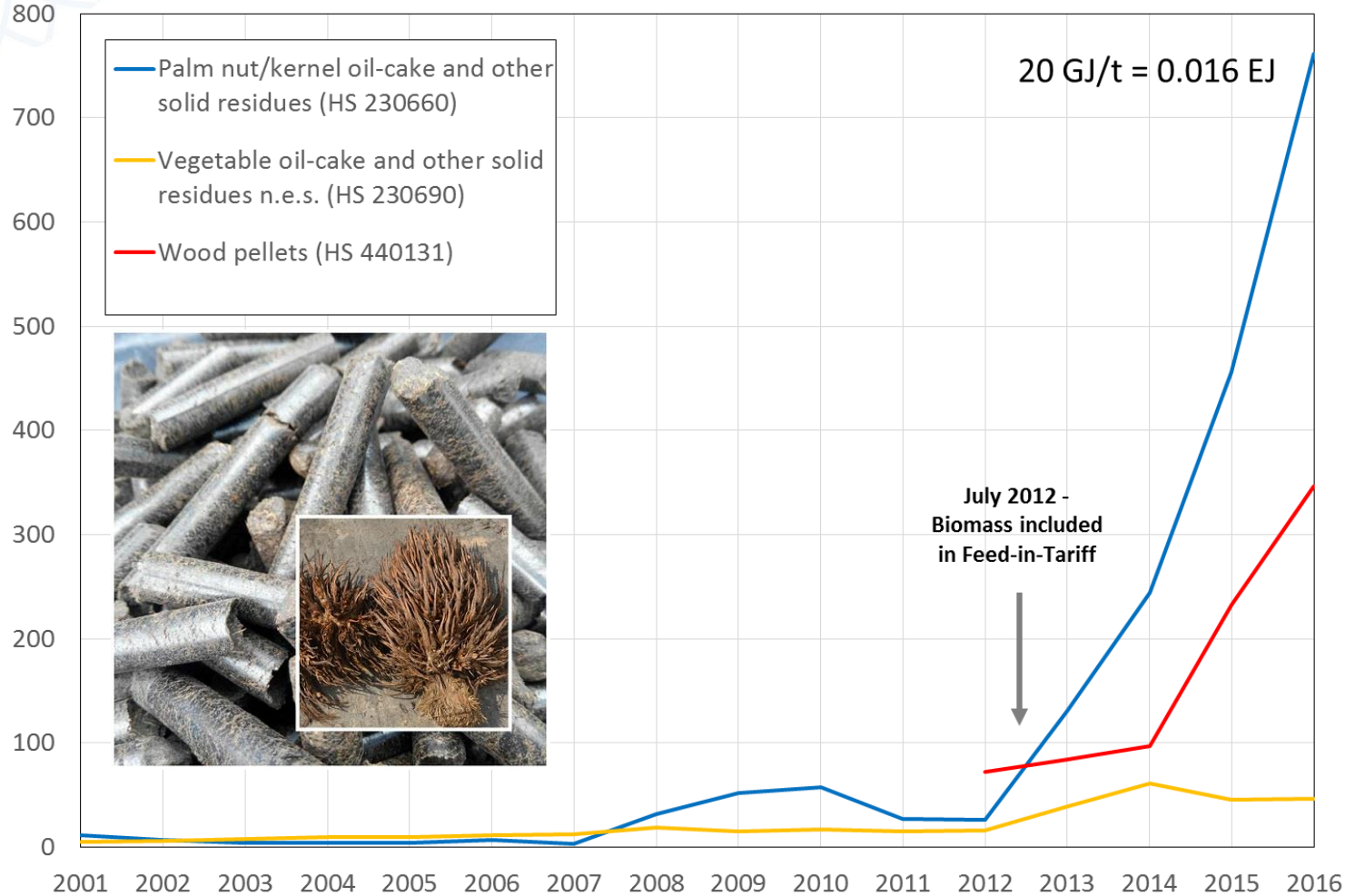


Including the biogas, maximum electricity potential is about 190 kWh/t (48% efficiency)

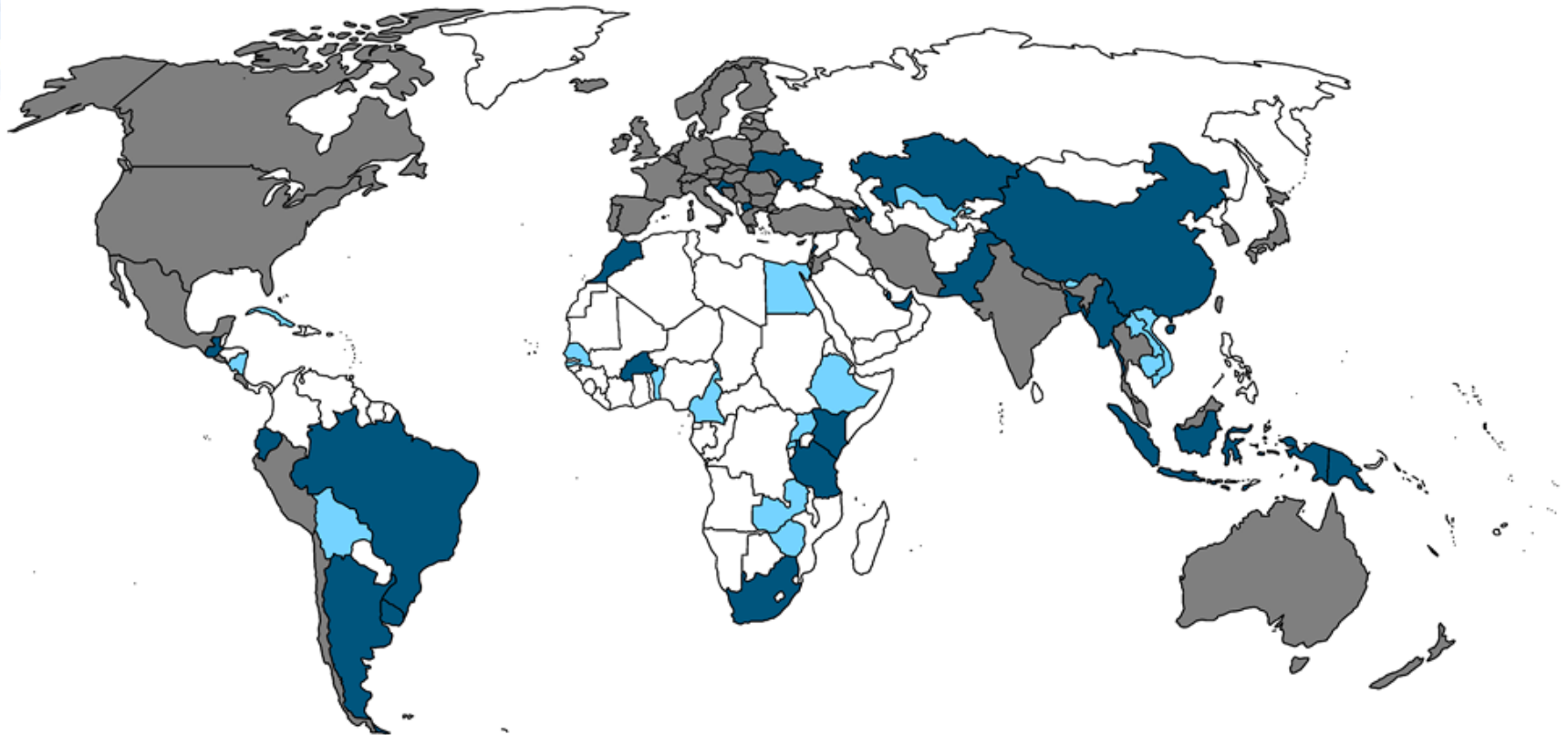
Trade in EFB pellets

'000 t

Japanese imports of selected agricultural waste products



Biogas developments



Countries in grey reported by IRENA/IEA/UNSD

Additional IRENA data from countries in blue (dark = electricity, light = gas only).

Additional capacity = 347MW (+25% of non-OECD biogas capacity)

Other opportunities?

Renewable heat:

Expanding, but has not been developed to its full potential.



Renewable waste:

In 2010, MRW= 1.5EJ/yr (3.2 EJ/yr in 2025). Most is in open dumps and landfills (2-5% of GHG emissions). Almost none is used for energy.



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