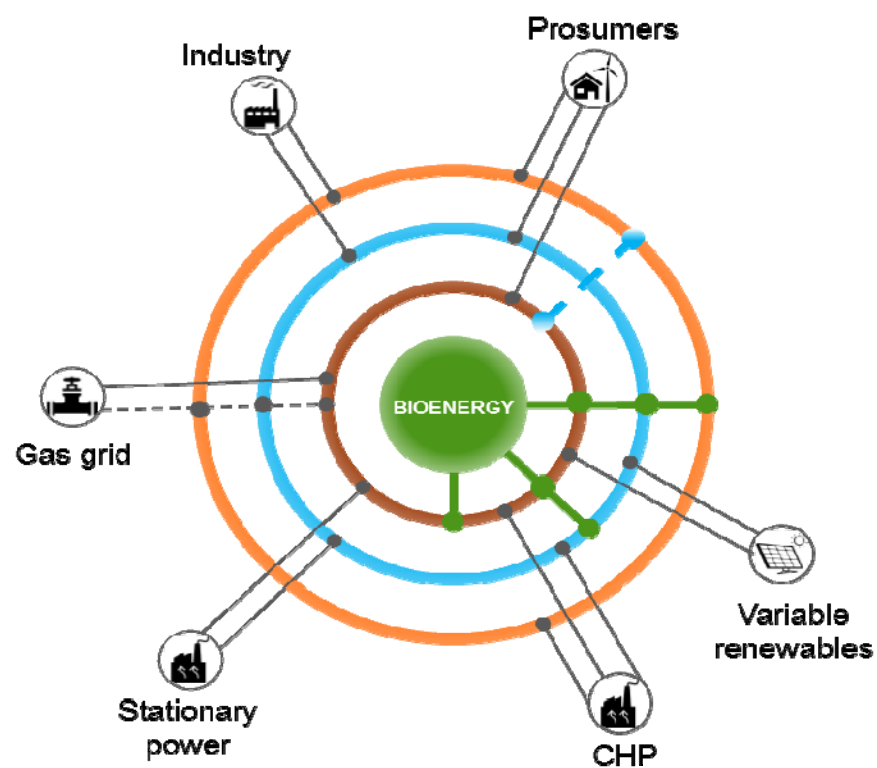




Workshop: Bioenergy grid integration





FACTS AND FIGURES



Offering reliable, affordable and sustainable energy remains a challenge but also represents an opportunity.

Renewable energy continued to expand globally with record RE being commissioned.

Global new investment in renewable power and fuels amounted to USD 242 billion (2016).



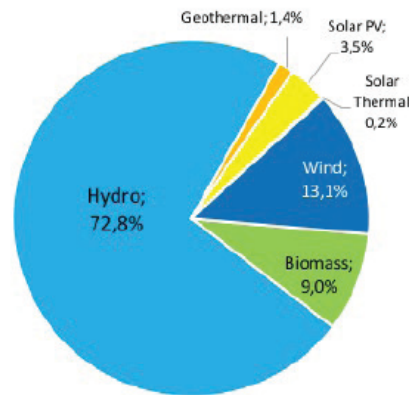
FACTS AND FIGURES

Total primary energy supply of renewables globally

	Total	Biomass	Hydro	Geothermal	Solar PV	Solar Thermal	Wind	Tide, wave and ocean
2000	55.0	43.0	9.43	2.19	0.00	0.21	0.11	0.002
2005	60.9	47.4	10.6	2.25	0.01	0.30	0.37	0.002
2010	71.2	54.2	12.4	2.62	0.12	0.66	1.23	0.002
2014	80.7	59.2	14.0	2.99	0.68	1.31	2.58	0.004
Growth (%)	2.78%	2.30%	2.87%	2.26%	45.1%	13.8%	25.1%	4.41%

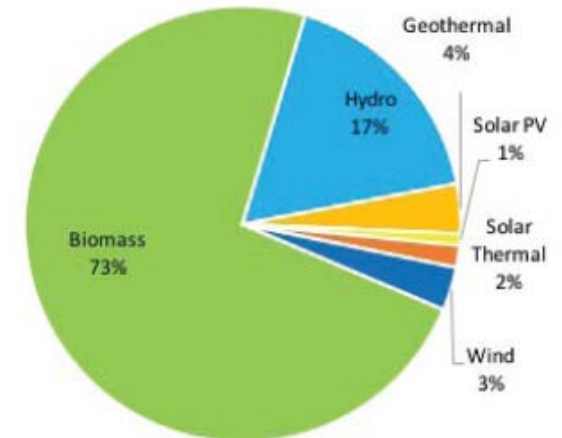
All values in EJ. Source: IEA Key World Energy Statistics

Electricity generation from renewables globally (2014)



Source: WBA, 2017

Total primary energy supply of all renewables (2014)





FACTS AND FIGURES

Derived heat generation from renewables globally

	Renewables	Biomass	Geothermal	Solar Thermal
2000	0.43	0.41	0.02	0.00002
2005	0.55	0.53	0.02	0.00006
2010	0.81	0.78	0.03	0.00019
2014	0.95	0.92	0.03	0.00074

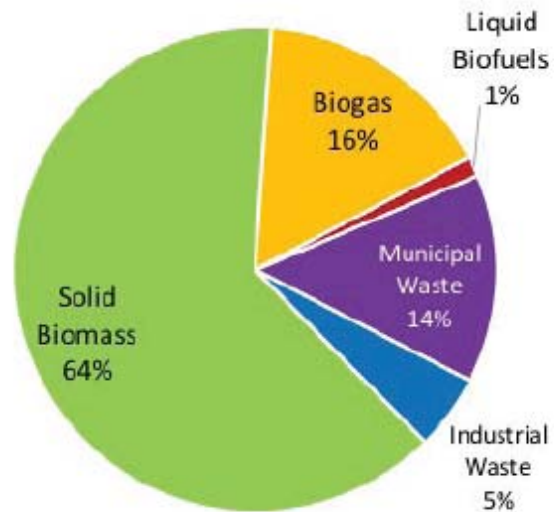
All values in EJ. Source: IEA Key World Energy Statistics

Source: WBA, 2017

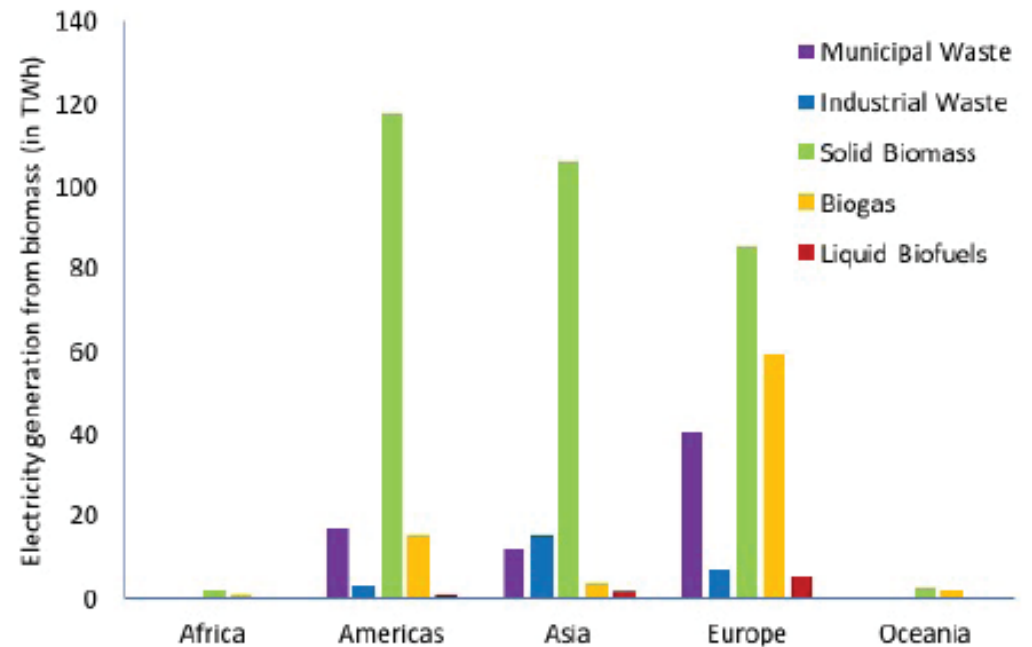


FACTS AND FIGURES

Electricity generation from biomass (2014)



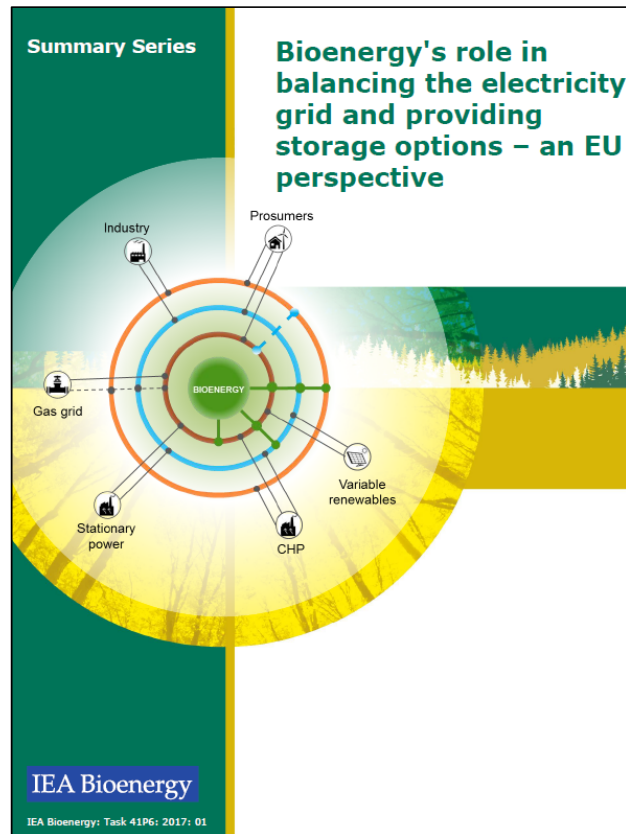
Electricity generation from biomass in continents (2014)



Source: WBA, 2017



FACTS AND FIGURES



Integration of intermittent energy sources places significant pressure on the grid operation as the supply of the power especially from wind cannot be controlled or rapidly predicted.

Bioenergy has the potential to play a focal role as a stabilizing element in the renewable power supply system.

Seasonality, i.e. energy demand fluctuations in the winter and summer seasons, is one of the key challenges for future smart energy system management.

However: the use of bioenergy for balancing and frequency control is currently limited.

Three development paths can be identified:

- (1) Increasing flexibility of existing assets by increasing the flexibility of individual biomass installations
- (2) Developing more advanced biomass based energy carriers capable of balancing operation
- (3) Developing next generation concepts including biogenic CO₂ utilization

Source: <http://www.ieabioenergy.com>



LET'S GET STARTED

