ENERGY TRANSFORMATION
OCEANIA

Regional analysis covers countries and territories between the Indian, Pacific and Southern Oceans.:

- Australia
- Christmas Island
- Cocos (Keeling) Islands
- Fiji
- Heard Island and McDonald Islands
- The Federated States of Micronesia
- New Caledonia
- New Zealand
- Norfolk Island
- Papua New Guinea
- French Polynesia
- Solomon Islands
- Vanuatu

STATUS/CHARACTERISTICS AND NEEDS:

Population (millions)

Current: **0.5% of global population,** mainly in Australia (60%) followed by Papua New Guinea (21%) and New Zealand (12%).

2050 outlook: Average **0.7% per year increase** to **52 million**, or 0.6% of global population.

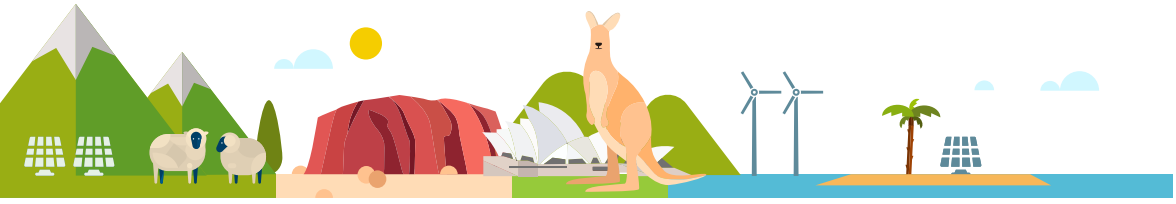
Source: IRENA analysis.

GDP per capita* (thousand USD 2015)

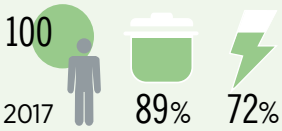
Current: **Well above the global average** (10.9).

2050 outlook: **Adequate development;**
▶ **PES:** CAGR = 2.5%

IRENA analysis based on E3ME.
*Due to data gaps, the economic analysis only includes Australia and New Zealand.



Energy consumption (GJ/capita) and **energy access** (%)



Energy consumption per capita:

Current: well above global average (51 GJ/year).

Electricity access:

Only 54.4% in Papua New Guinea.

Clean cooking access:

Less than 13% in Kiribati.

Source: Access to electricity, 2017 values (World Bank Group, 2019a), access to clean cooking, 2016 values (World Bank Group, 2019b), TFEC, 2017 values (IEA, 2019), 2050 values based on IRENA analysis.

Fossil fuel net import

Current status: **Region produces 3.6% of global fossil fuels**, with Australia as leading coal and Liquefied Natural Gas (LNG) exporter; New Zealand's coal mines are closing; small island states import diesel for power generation.

2050 outlook: **Enormous untapped renewable energy potential.**

- **PES:** The total generation (est. 477 TWh) just represents **1%** of overall renewable power potential.

Note: Current status, IRENA analysis based on proportion of net imports of fossil fuels in TPES, 2017 values (IEA, 2019). 2050 outlook, IRENA analysis and potential based on Deng *et al.* (2015).

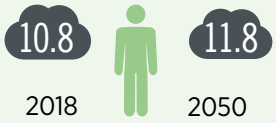
Energy-intensive industries (% in global consumption)

Current status: Concentrated mainly in Australia and New Zealand. At regional level, highest demand for **non-ferrous metal** and **food and tobacco industries.**

2050 outlook: Need for **alternative emission-free technological solutions.**

IRENA analysis based on 2017 values (IEA, 2019).

Energy-related CO_2 emissions per capita (tCO_2/capita)



Recent: **Region's annual emissions: 0.45 Gt** (2018). 1% of global energy-related emissions.

2050 outlook:

- **PES: 36% increase to 0.61 Gt** with enabling policies.

Note: 2050 values based on IRENA analysis and historical data based on Global Carbon Atlas (2019).

Urban air quality (%)

96%
Good

28 Cities

Good Moderate Unhealthy

Mainly due to **city transpor**t; Light-vehicle sales set to grow with population; Ambitious plans promise to ramp up use of **electric vehicles** in New Zealand (IEA, 2017).

IRENA analysis based on PM 2.5 concentration, 2016 and 2017 values (WHO, 2019).

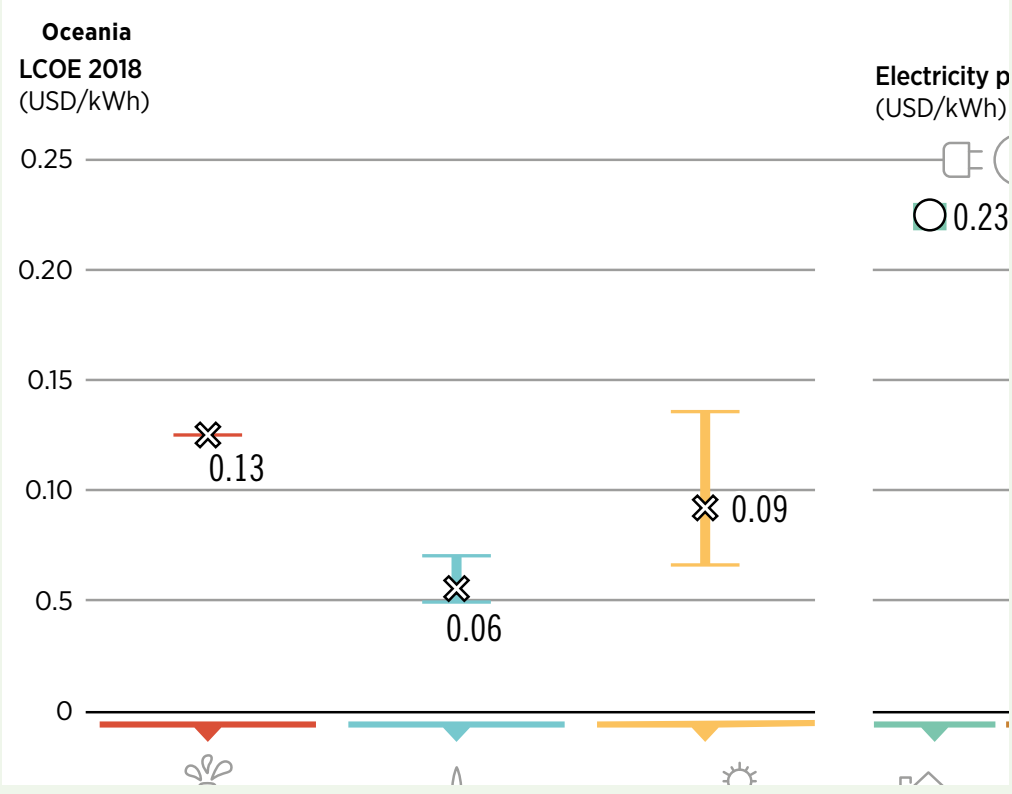
Electricity prices and renewables costs

Electricity price:

The highest values for industries and the second-highest for households compared to the other regions.

Renewables cost and auctions:

In 2017, an auction for concentrated solar power (CSP) was held in the state of South Australia and 150 MW was awarded at a price of USD 0.061/kWh (IRENA, 2019a).



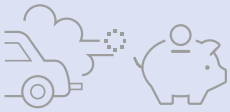
Source: LCOE based on IRENA (2019b) and electricity prices based on Global Petrol Prices (2019).
Note: The LCOE data is for projects commissioned in 2018. Real weighted average cost of capital (WACC) is 7.5% for OECD countries and China and 10% for the rest of the world. Small firm electricity price analysis is based only on Australia values.

ENERGY TRANSFORMATION: KEY BENEFITS

1

AFFORDABILITY AND SUSTAINABILITY

- Diversified clean energy mix
- Lower CO_2 emissions
- Lower prices
- Greater competition



2

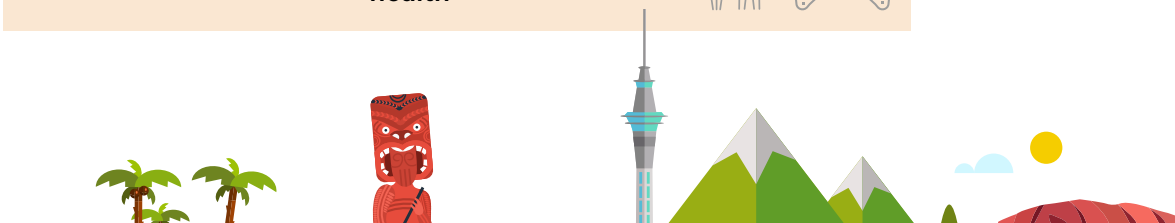
ENERGY INDEPENDENCE AND ACCESS

- Increased renewable energy use
- Effective power generation
- Improved energy security
- Sustainable power to rural/remote areas

3

SOCIO-ECONOMIC DEVELOPMENT

- Job creation
- Improved education and skills development
- Reduced respiratory disease and improved health



ENERGY TRANSFORMATION ROADMAP TO 2050

Oceania	2017	Where we are heading 2030 (PES)	2040 (PES)	2050 (PES)	Where we need to be 2030 (TES)	2040 (TES)	2050 (TES)
Energy (EJ)							
Supply (TPES)	7	10	11	12	9	10	12
Consumption (TFEC)	4	6	7	8	6	6	5
Renewables shares (modern)							
Supply (TPES)	10%	22%	27%	34%	39%	71%	85%
Consumption (TFEC)	11%	14%	15%	18%	26%	58%	75%
Power generation	25%	45%	51%	61%	66%	92%	93%
Electricity share in final energy consumption							
End-use consumption	23%	20%	19%	20%	22%	32%	45%
Industry	27%	19%	18%	18%	20%	48%	67%
Transport	1%	1%	1%	1%	6%	13%	33%
Buildings	57%	60%	60%	61%	64%	36%	34%
Renewable installed capacity (GW)							
Bioenergy	1	1	1	2	3	2	3
Hydropower	13	17	14	14	21	20	22
Solar PV	6	11	17	27	27	84	109
Wind	6	11	18	26	25	46	65
Biofuels							
Liquid biofuels (billions of litres per year)	0.2	0.5	1	1	3	3	3
CO_2 emissions (energy-related)							
Annual level (Gt CO_2/yr)	0.4	0.6	0.6	0.6	0.4	0.2	0.1
Reduction vs. today	NA	32%	38%	37%	-8%	-54%	-73%

Oceania	Where we are heading **Planned Energy Scenario 2016 - 2050** (PES)	Where we need to be **Transforming Energy Scenario 2016-2050** (TES)
Energy system investments (average annual, 2016-50) USD billion/year		
Power	7	16
– Renewable	3	10
– Non-renewable	1	1
– Power grids and system flexibility	2	4
Industry (RE + EE)	2	3
Transport (electrification + EE)	2	5
Buildings (RE + EE)	6	11
Biofuel supply	0.1	0.3
Renewable hydrogen – electrolysers	0	1.1

Note: RE = renewable energy; EE = energy efficiency

The findings in this report consider targets and developments as of April 2019. The wind and solar PV capacities in the Transforming Energy Scenario in 2030 in this report are slightly higher than the estimates presented in IRENA's reports (IRENA, 2019c; 2019d) which consider developments as of the third quarter of 2019.

SOCIO-ECONOMIC OUTLOOK TO 2050*

Oceania	2019e	2030	2050
Population (thousands) region-wide	29 739	32 982	37 063
GDP (USD 2015)			
GDP (million): PES	1 361 509	1 935 173	3 618 538
GDP (million): TES	1 311 801	1 936 844	3 595 574
GDP changes (million): TES vs. PES	-49 708	1 671	-22 964
GDP changes (%): TES vs. PES	-3.7	0.1	-0.6
Per capita GDP (thousand): PES	45.8	58.7	97.6
Per capita GDP (thousand): TES	44.1	58.7	97.0
Employment			
Economy-wide employment (thousands)			
Employment: PES	16 479	18 955	19 816
Employment: TES	16 471	19 020	19 923
Employment changes: TES vs. PES	-8	65	107
Employment changes (%): TES vs. PES	-0.05%	0.34%	0.54%

* Due to data gaps, only Australia and New Zealand are considered for the socio-economic analysis.

Oceania	2017	2030 (PES)	2050 (PES)	2030 (TES)	2050 (TES)
Energy sector jobs (thousands)					
Nuclear power	-	-	-	-	-
Fossil fuels	215	266	227	240	193
Renewables	37	54	61	116	293
Energy efficiency	3	52	56	97	62
Power grids and energy flexibility	53	60	54	66	78
Total	**307**	**432**	**398**	**519**	**626**
Energy jobs in economy-wide employment (%)		2.3%	2.0%	2.7%	3.1%
Renewable energy jobs (thousands)					
Bioenergy	19	24	22	42	56
Solar	8	14	30	54	216
Hydropower	8	9	2	9	3
Wind	1	4	5	9	12
Geothermal	1	3	1	3	5
Ocean	-	-	-	0	1
Total	**37**	**54**	**61**	**116**	**293**
Renewable energy jobs in energy-sector employment (%)		12.5%	15.3%	22.4%	46.8%

Job differential in 2050 (thousands) TES vs. PES	
Economy-wide	107
Changes in conventional energy (A)	-34
Changes in transition related technologies (B)	262
Net energy sector jobs (A+B)	228

Jobs in 2050: TES / Oceania

Technology jobs (thousands)		Segment value chain (thousands)		Occupational requirements (thousands)	
Solar PV	52	Construction & installation	134	Workers and technicians	203
Solar water heaters (SWH)	159	Manufacturing	27	Experts	11
Onshore wind	11	Operation and maintenance	67	Engineers and higher degrees	9
Offshore wind	0	Biofuel supply	-	Marketing and administrative	4
Geothermal	5				
Total	**227**		**227**		**227**

Welfare improvement (%): TES vs. PES	2030	2050
Indicator		
Economic	0.0	0.0
Social	5.0	12.3
Environmental	2.2	5.0
Total	**7.2**	**17.3**

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