TRANSITION TOWARDS SUSTAINABLE ENERGY

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Image courtesy: <https://www.en.plan.aau.dk>
Image: <http://www.suzieagelopoulos.com>

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Part 1

INTRODUCTION

GERMANY IN IMAGES

FACTS AND FIGURES

- **Area:** 357,022 km² (62nd)
- **Population:** 83,166,711 (18th)
- **GDP (PPP):** \$4.444 trillion (5th)
- **Human Development Index:** 0.939 (4th)

Part 2

CURRENT ENERGY CONSUMPTION PROFILE INDONESIA VS. GERMANY

TOTAL FINAL ENERGY CONSUMPTION BY SECTOR

INDONESIA

Source: IRENA 2017

GERMANY

DAILY ELECTRICITY DEMAND IN INDONESIA

INDONESIA

Source: SEAD 2015

GERMANY

(Kerner 2014)

Part 3

CURRENT POWER SUPPLY AND GENERATION PROFILE INDONESIA VS. GERMANY

ON GRID POWER GENERATION

INDONESIA

Source: MEMR 2015

GERMANY

2015

2020

Source: Fraunhofer

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ON GRID POWER GENERATION BY REGION

Source: IRENA 2017

Part 4

RENEWABLE ENERGY POTENTIAL IN INDONESIA

RENEWABLE POWER CAPACITY POTENTIAL IN 2030 (IN GW)

Indonesia

GW	Reference Case 2030		Theoretical potential for renewable power capacity	Theoretical potential by renewable energy power technology						
	On-grid power capacity	On-grid renewable power capacity		Solar PV	Large hydropower	Small hydropower	Bioenergy	Geothermal	Marine energy (tidal)	Wind (onshore)
Total Indonesia	193.5	55.8	716.4	532.6	75.0	19.4	32.7	29.5	18.0	9.3
Sumatra	39.2	17.6	196.2	137.1	15.6	5.7	15.6	12.9	8.3	1.0
Java-Bali	119.8	19.1	71.5	38.7	4.3	2.9	9.2	10.1	2.4	3.9
Kaliman-tan	10.3	5.4	184.2	149.0	21.6	8.1	5.1	0.2	–	0.3
Sulawesi & Nusa Tenggara	20.3	11.6	97.6	66.8	10.8	1.8	2.6	4.8	6.9	3.9
Maluku & Papua	3.9	2.1	166.8	140.9	22.8	0.8	0.2	1.5	0.4	0.3
Germany 2018	118.3			46.1	16.5		51.3	0.7		92.3

Source: IRENA 2017

SOLAR PV

7.2 GW

2.1 GW

Total captured in 2030 only
1% of the theoretical potential

Challenges: Evening Peak

HYDROPOWER

24.3 GW

Captured in 2030 (est.)
32% of the theoretical potential

Java-Bali, Sumatra

4.3 GW

Captured in 2030 (est.)
22% of the theoretical potential

Kalimantan, Sumatra

Challenges:
Protection of forest from
resettlements

BIO FUEL

Captured in 2030 (est.)
22% of the theoretical potential

50% in **Sumatra**

GEOHERMAL

- 40% of the world's geothermal reserves
- Concentrated in Java-Bali and Sumatra

Captured in 2030 (est.)

30% of the theoretical potential

MARINE

Captured in 2030 (est.)
25% of the theoretical potential

Challenges:

- Remoteness
- Availability:
only about two hours of the day

(Purba et al 2015)

WIND

Captured in 2030 (est.)
28% of the theoretical potential

**Java-Bali, Sulawesi,
Nusa Tenggara, Maluku**

GENERATION COSTS

Source: IRENA 2017

Part 5

INTEGRATION OF RENEWABLE ENERGY THROUGH IT

THE EVOLUTION OF ENERGY SYSTEM

I

From **centralized** to **decentralized** production

II

From **planned** production to **intermittent** production

III

From **fixed prices** to **price signals; automatization**

THE INTEGRATION: SMART GRID

Source: Eolas Magazine

BREAKDOWN OF ELECTRICITY PRICE IN GERMANY: PROMOTING RENEWABLE ENERGY

DEMAND RESPONSE

- The goal of DR / DMS is to shift the peak demand (red) to the top of the generation of renewable energies (yellow).
- The power consumption is shifted from red to green, (green) shows the increased consumption of energy that is not wasted.

(Cooney, 2019)

DEMAND RESPONSE

- **Dynamic electricity price** (market mechanism)
- Forecast of demand and generated **electricity using** statistical analysis and **artificial intelligence**

**THANK YOU FOR
YOUR ATTENTION.**