RegioEnergie+++ Dreieich
am 8. und 9. September 2012

Sind wir noch zu retten?

Eine kritische Bestandsaufnahme
unserer Energieinfrastruktur

Arno A. Evers FAIR-PR, Starnberg

www.hydrogenambassadors.com
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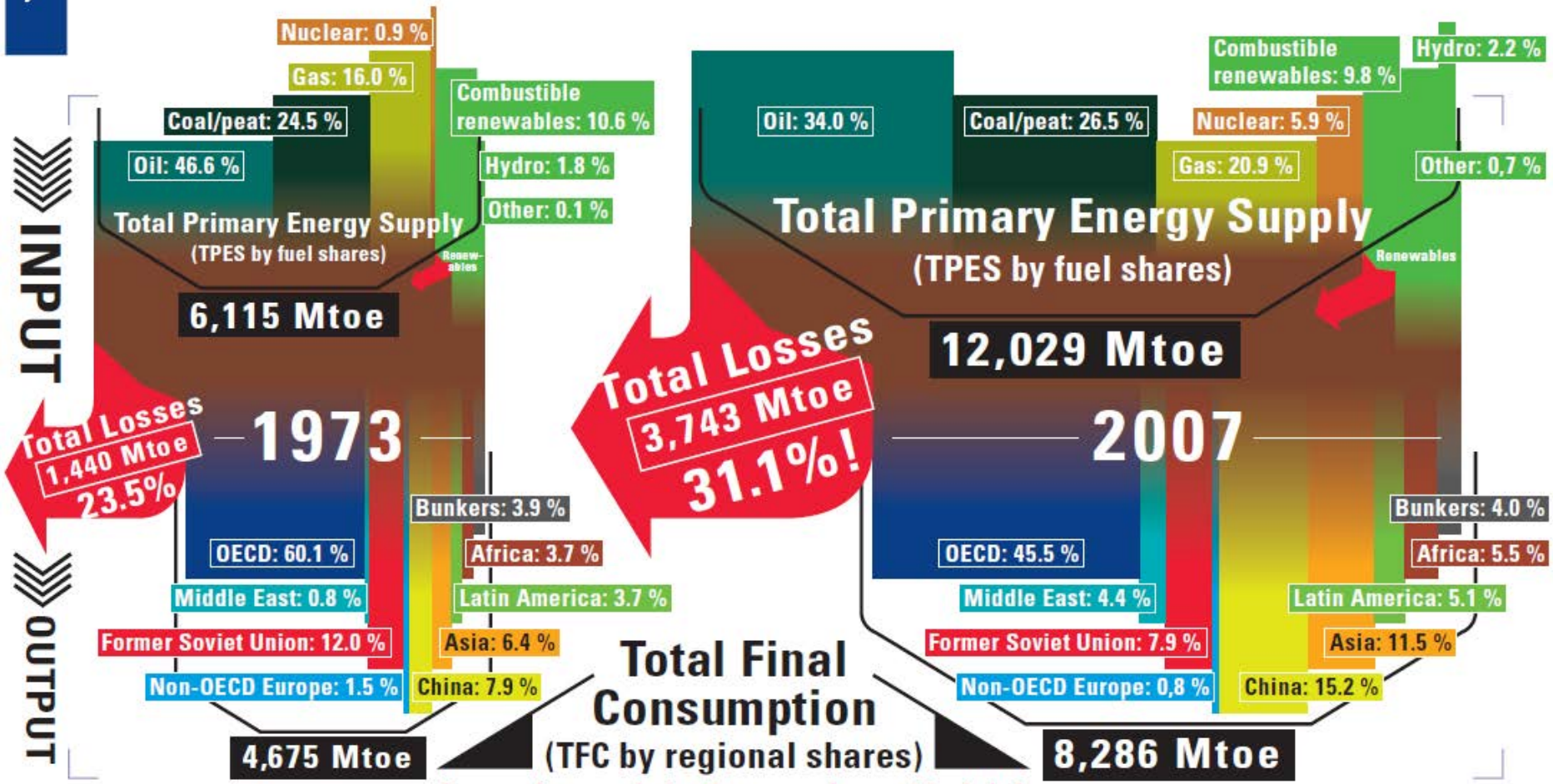
am 8. und 9. September 2012

Inhalt

Energiebilanz der Welt und Deutschlands
Prozess der Stromerzeugung
Deutsches Hochspannungsnetz
Erneuerbare Energien in Deutschland
Revolution in der Garage
3P+

World Energy Balance, Comparison 1973 to 2007



Losses of energy during the usage phase not included

Data sources: International Energy Agency (IEA), 2009

EVERS

First released: February 2010

Deutsches Hochspannungsnetz

Stromkreislänge gesamt in Deutschland in km

> Niederspannung [0,4 Kilovolt]	1.070.000
> Mittelspannung [6 bis ≤ 60 Kilovolt]	494.000
> Hochspannung [> 60 bis < 220 Kilovolt]	74.700
> Höchstspannung [220 und 380 Kilovolt]	36.000
gesamt:	1.674.700

Leistungsverbindungen

- 380 kV
- 220 kV
- HGÜ-Freileitung/Kabel
- Stomrichterstationen
- Umspannwerke
- Städte

Anzahl der Transformatoren*

> Mittelspannung [6 bis ≤ 60 Kilovolt]	557.700
> Hochspannung [> 60 bis < 220 Kilovolt]	7.500
> Höchstspannung [220 und 380 Kilovolt]	1.100
gesamt:	566.300

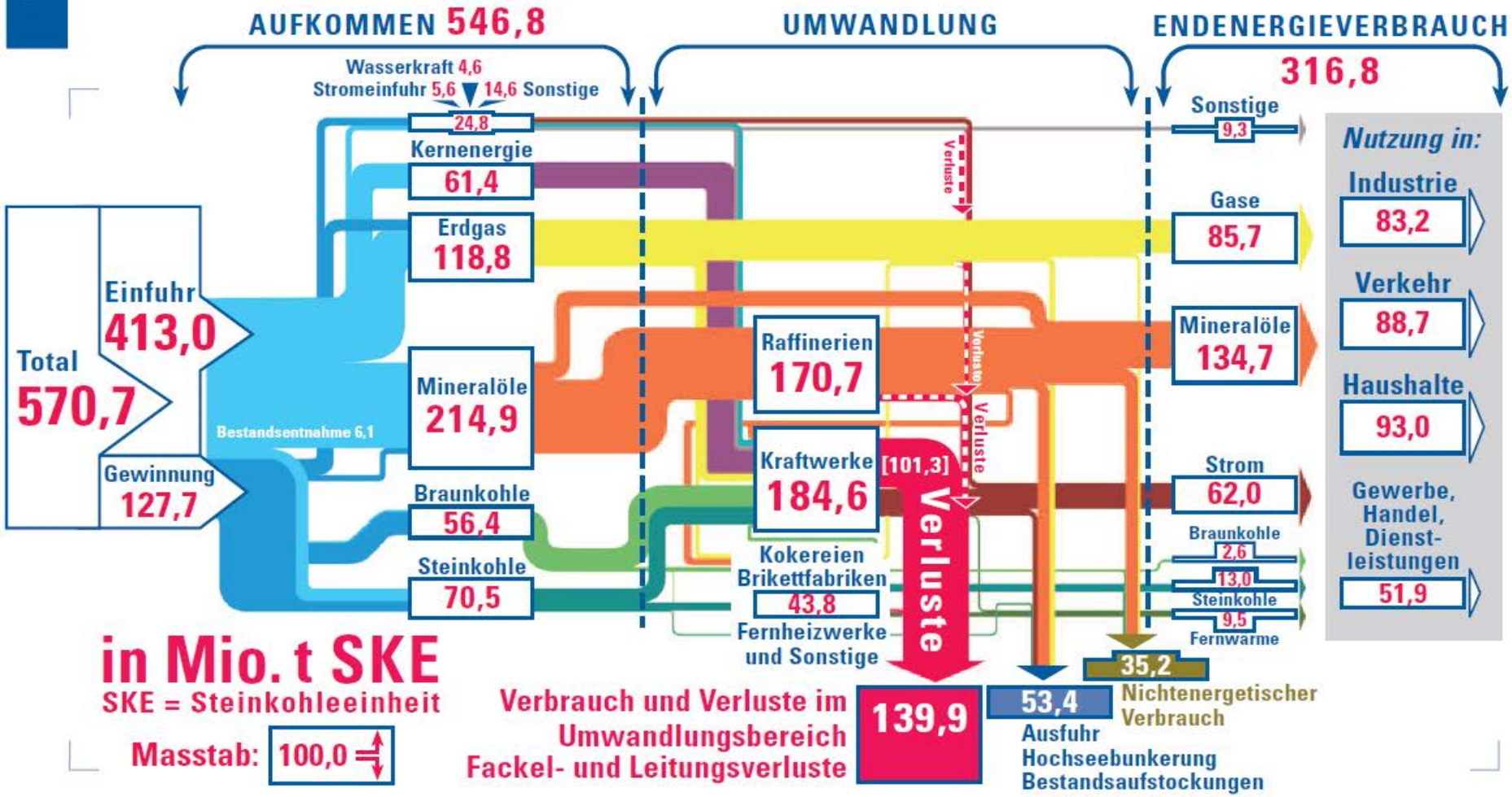
Nennleistung der Transformatoren [Mega-Volt-Ampere]*

> Mittelspannung [6 bis ≤ 60 Kilovolt]	268.200
> Hochspannung [> 60 bis < 220 Kilovolt]	260.000
> Höchstspannung [220 und 380 Kilovolt]	311.000

* Schätzung

Quelle: VDN, Verband der Netzbetreiber, 2006; VDEW, Verband der Elektrizitätswirtschaft

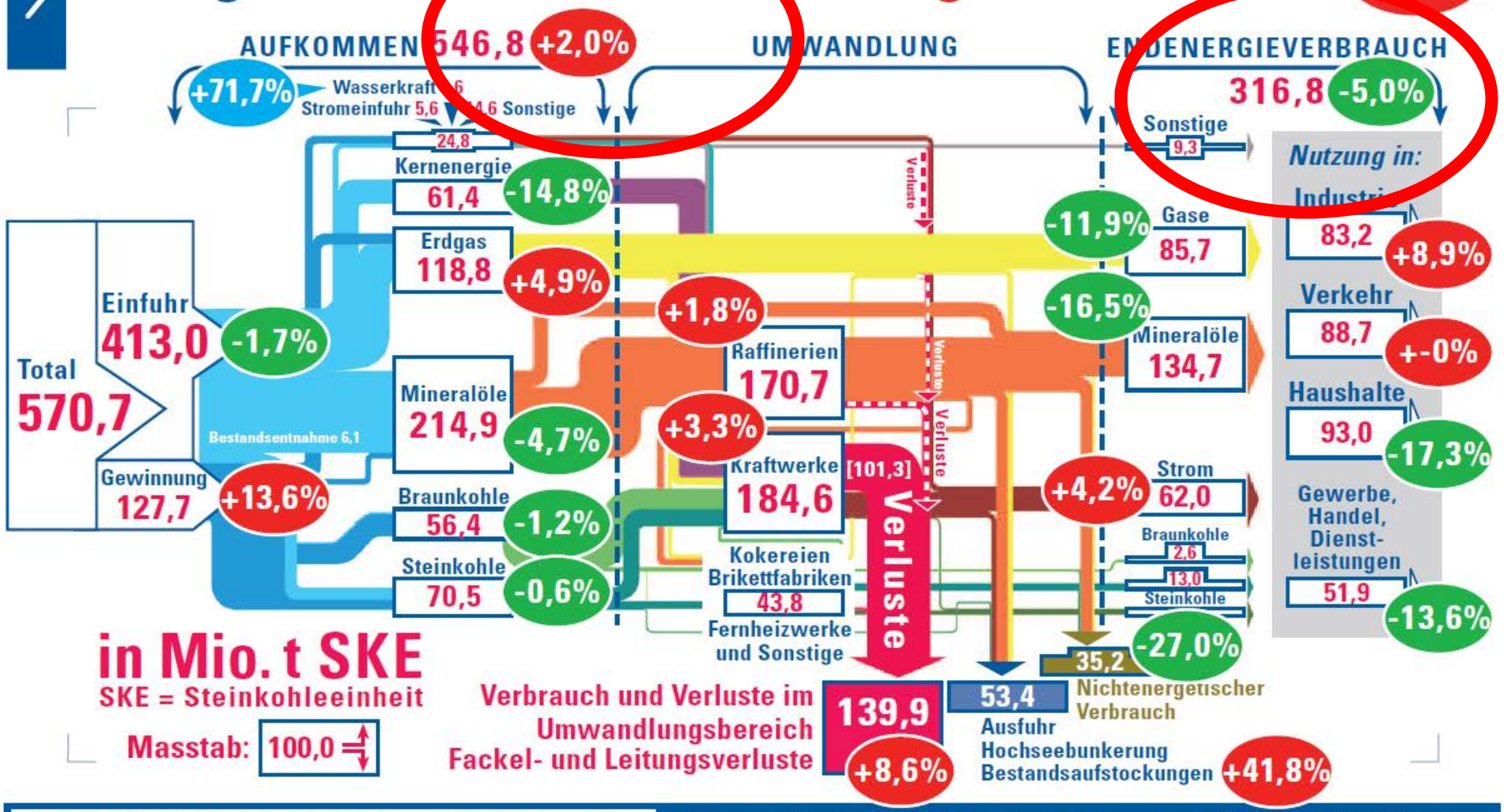
Energiefluss Deutschland 2003 in Mio. t SKE



Source: Arbeitsgemeinschaft Energiebilanzen e.V.

First released: Sep. 2007; latest update: Dec. 2009

Energiefluss Deutschland: Vergleich 2003 zu 2007



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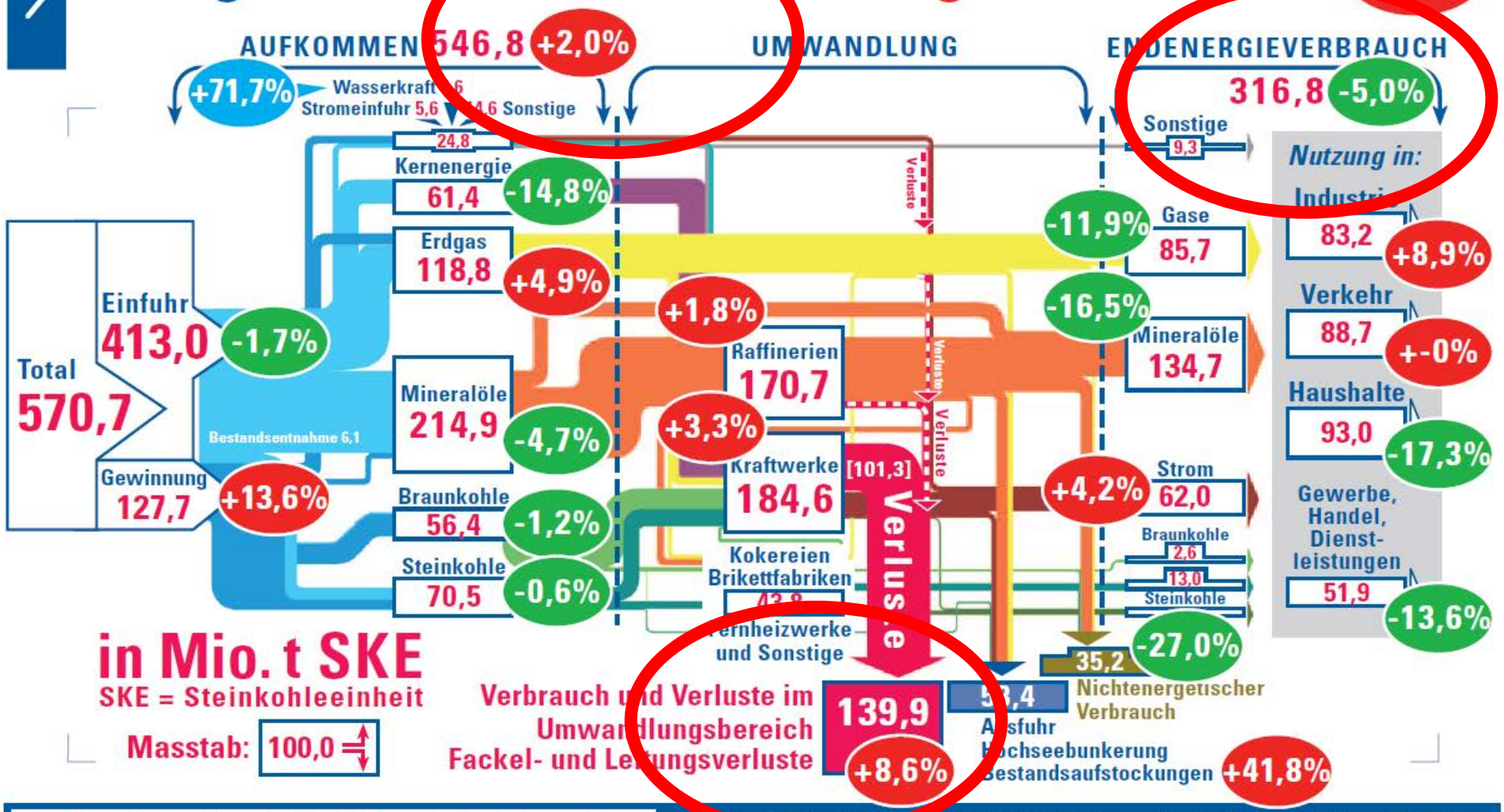
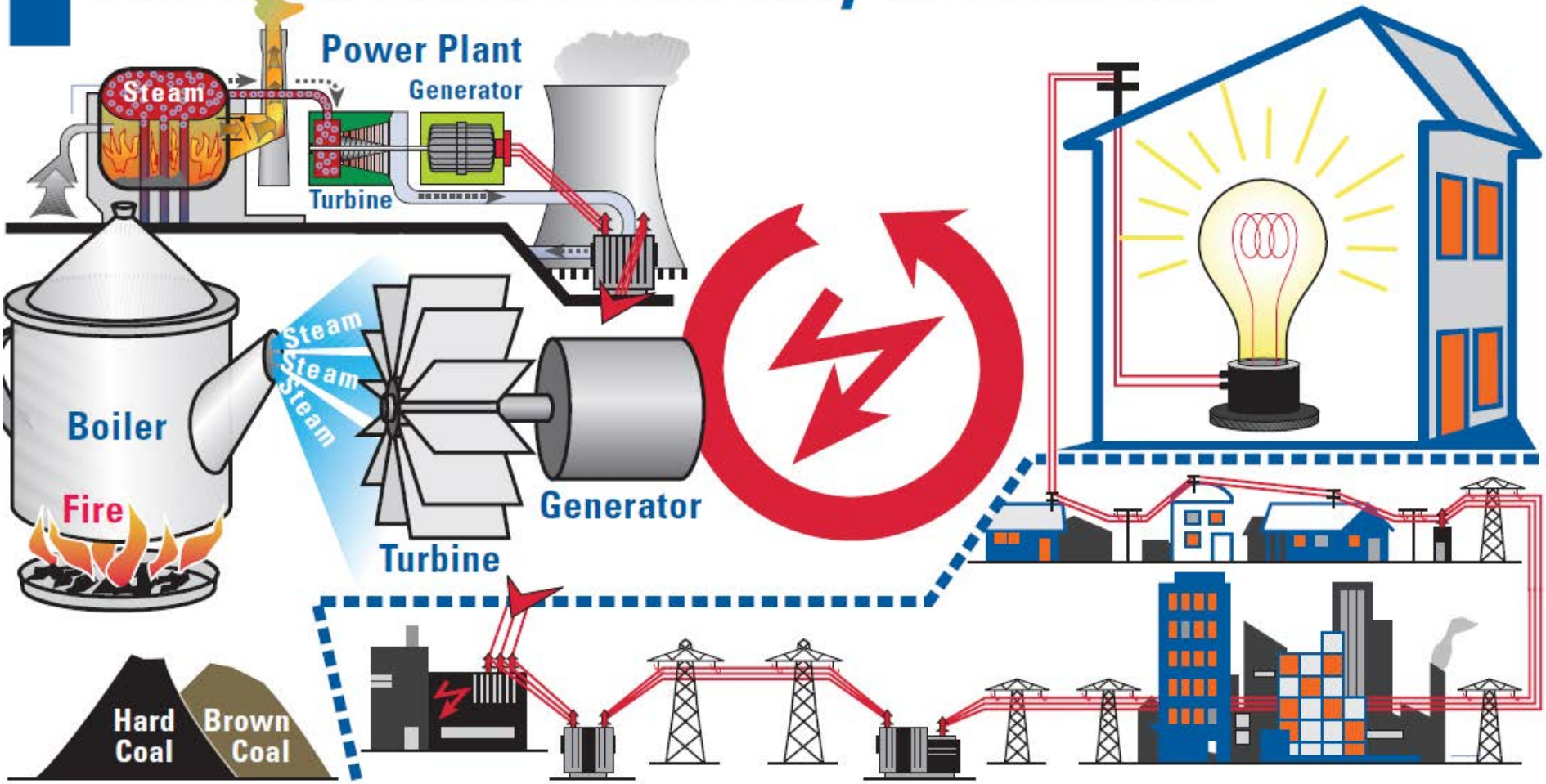


Source: Arbeitsgemeinschaft Energiebilanzen e.V.

EVERS

First released: Sep. 2007; latest update: Dec. 2009

The Process of Electricity Generation



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Source: Electric Power Industry, PennWell (1998); own Research (2008)

EVERS

First released: Dec. 07; latest update: 2.05.08

Deutsches Hochspannungsnetz

Stromkreislänge gesamt in Deutschland in km

> Niederspannung [0,4 Kilovolt]	1.070.000
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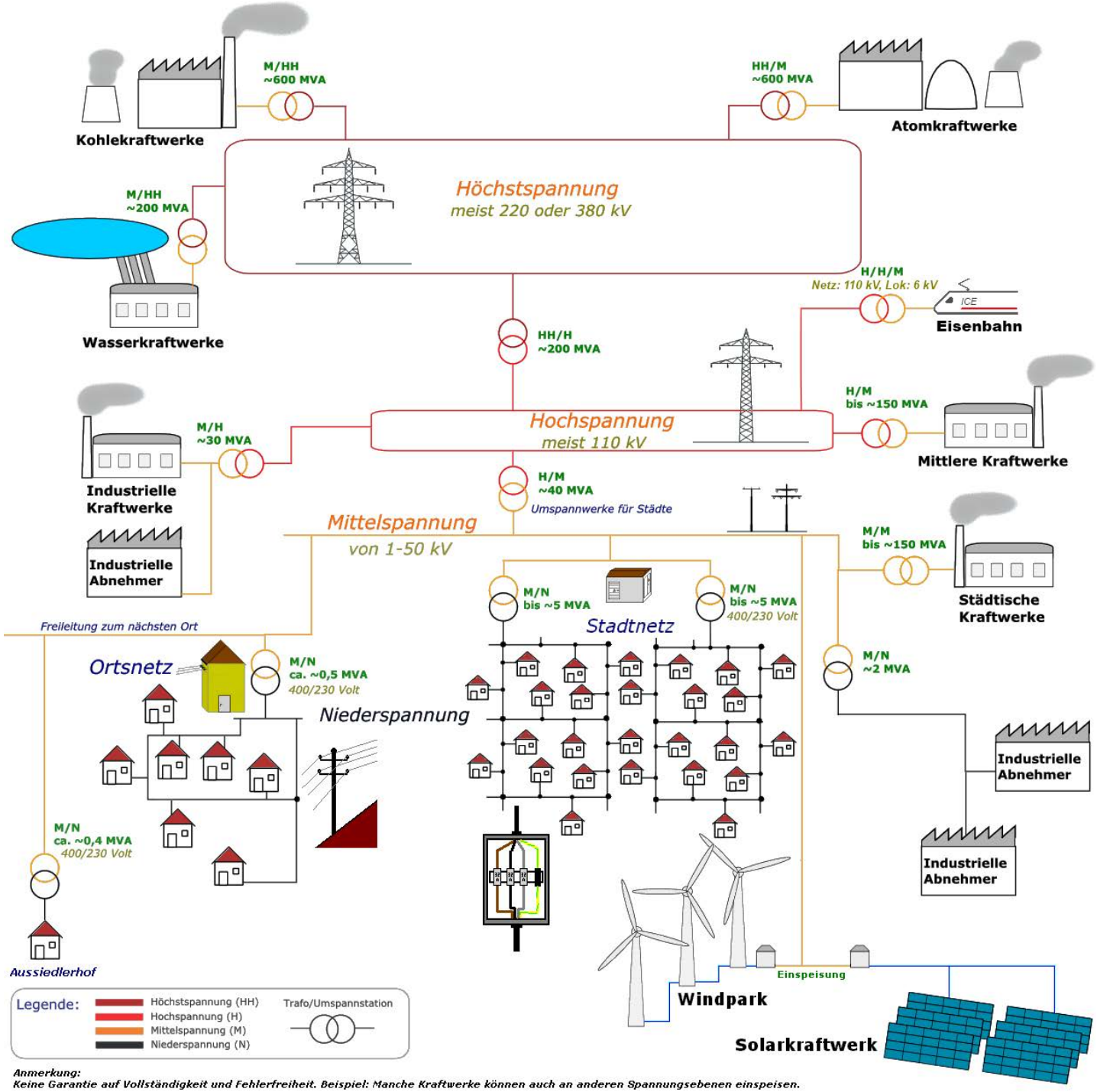
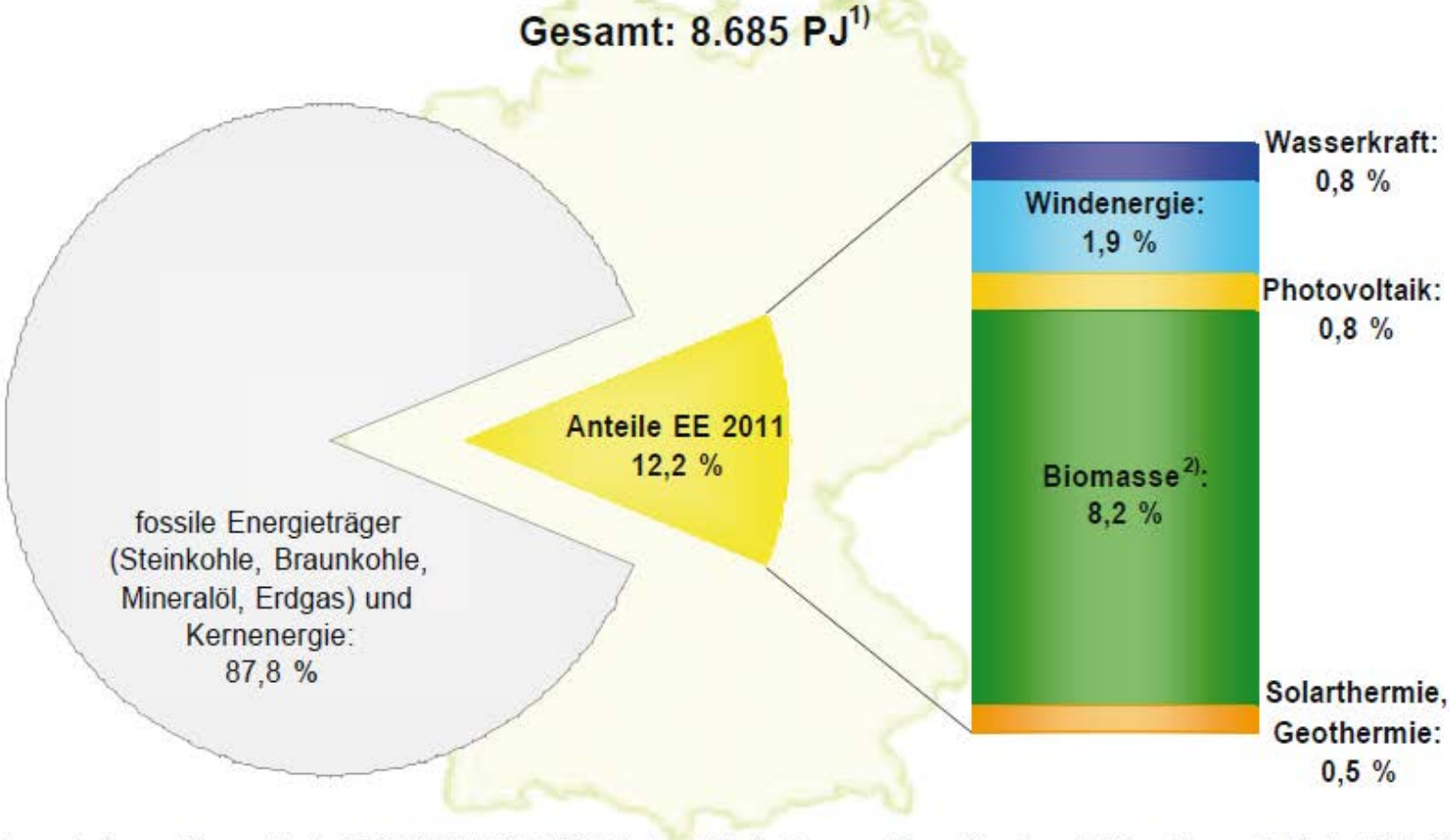


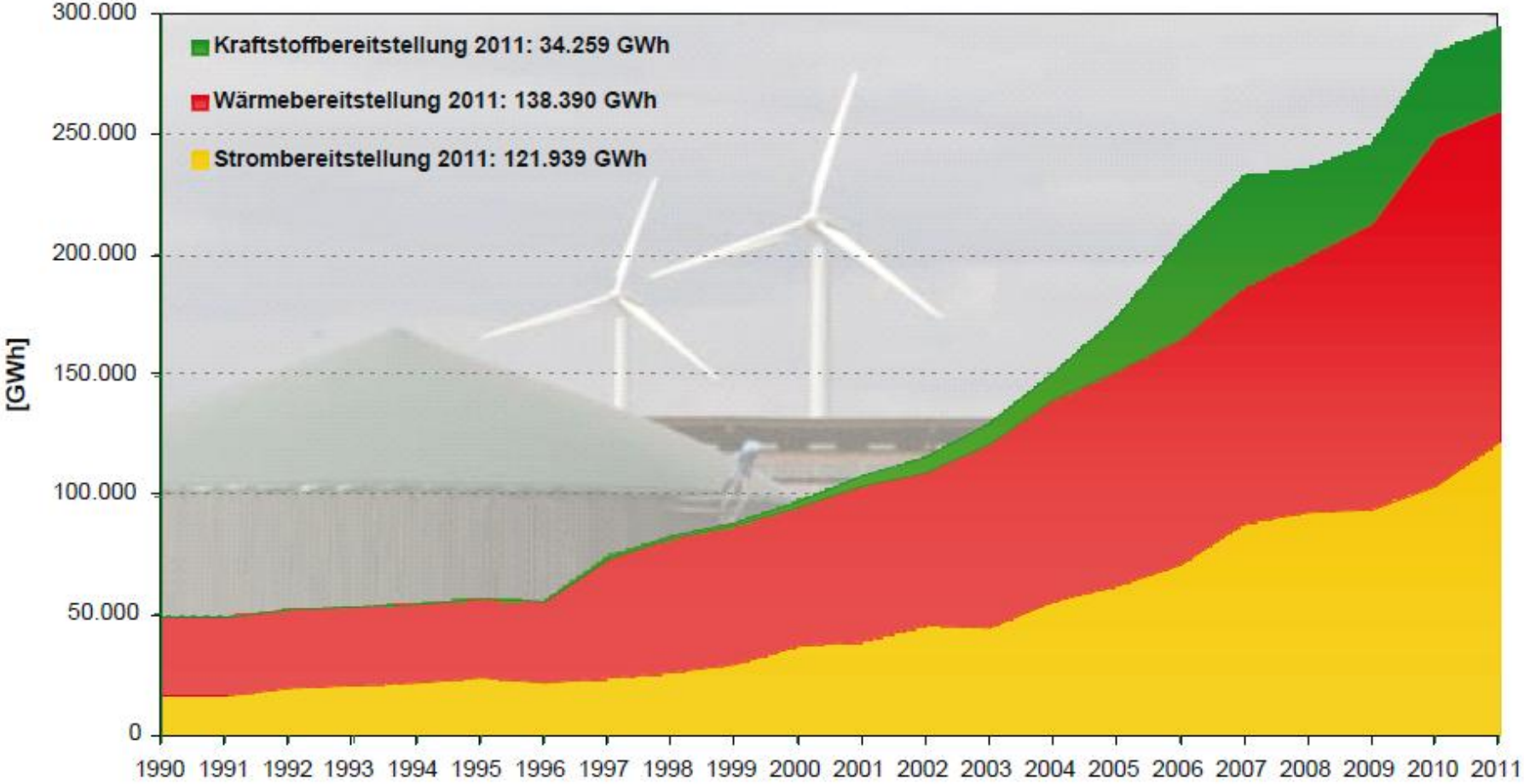
Anmerkung:
Keine Garantie auf Vollständigkeit und Fehlerfreiheit. Beispiel: Manche Kraftwerke können auch an anderen Spannungsebenen einspeisen.

Anteil erneuerbarer Energien am Endenergieverbrauch in Deutschland im Jahr 2011



1) Quelle: Energy Environment Forecast Analysis (EEFA) GmbH & Co KG; 2) Feste und flüssige Biomasse, Biogas, Deponie- und Klärgas, biogener Anteil des Abfalls, Biokraftstoffe; Quelle: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat) und ZSW, unter Verwendung von Angaben der Arbeitsgemeinschaft Energiebilanzen e.V. (AGEB); EE: Erneuerbare Energien; 1 PJ = 10^{15} Joule; Abweichungen in den Summen durch Rundungen; Stand: März 2012; Angaben vorläufig

Beitrag der erneuerbaren Energien zur Endenergiebereitstellung in Deutschland

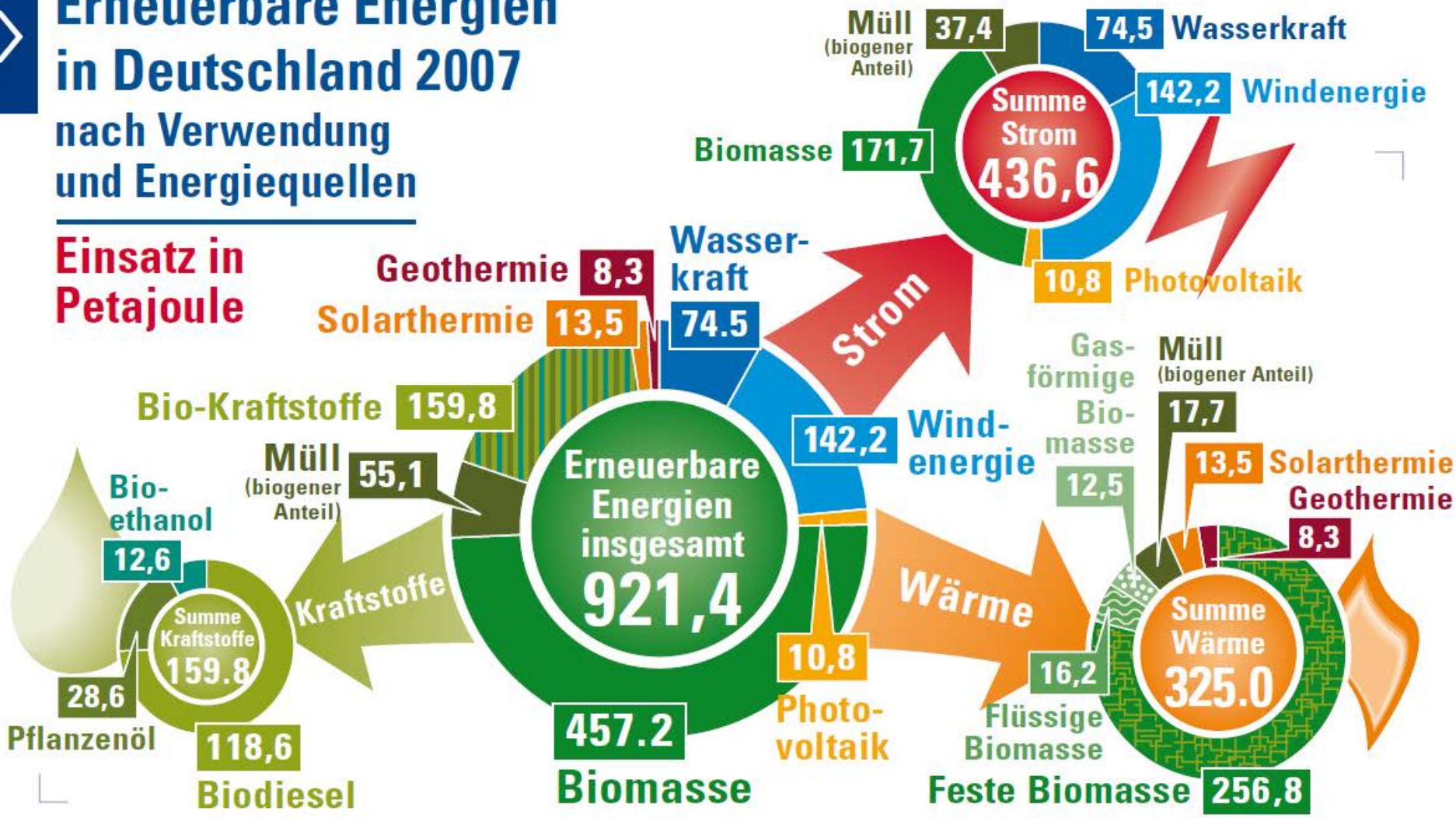


1 GWh = 1 Mio. kWh; Quelle: BMU-KI III 1 nach Arbeitsgruppe Erneuerbare Energien-Statistik (AGEE-Stat); Hintergrundbild: BMU / Bernd Müller; Stand: März 2012; Angaben vorläufig

Erneuerbare Energien in Deutschland 2007

nach Verwendung und Energiequellen

Einsatz in Petajoule



Data-Source: AGEB, AG Energiebilanzen e .V. 2009

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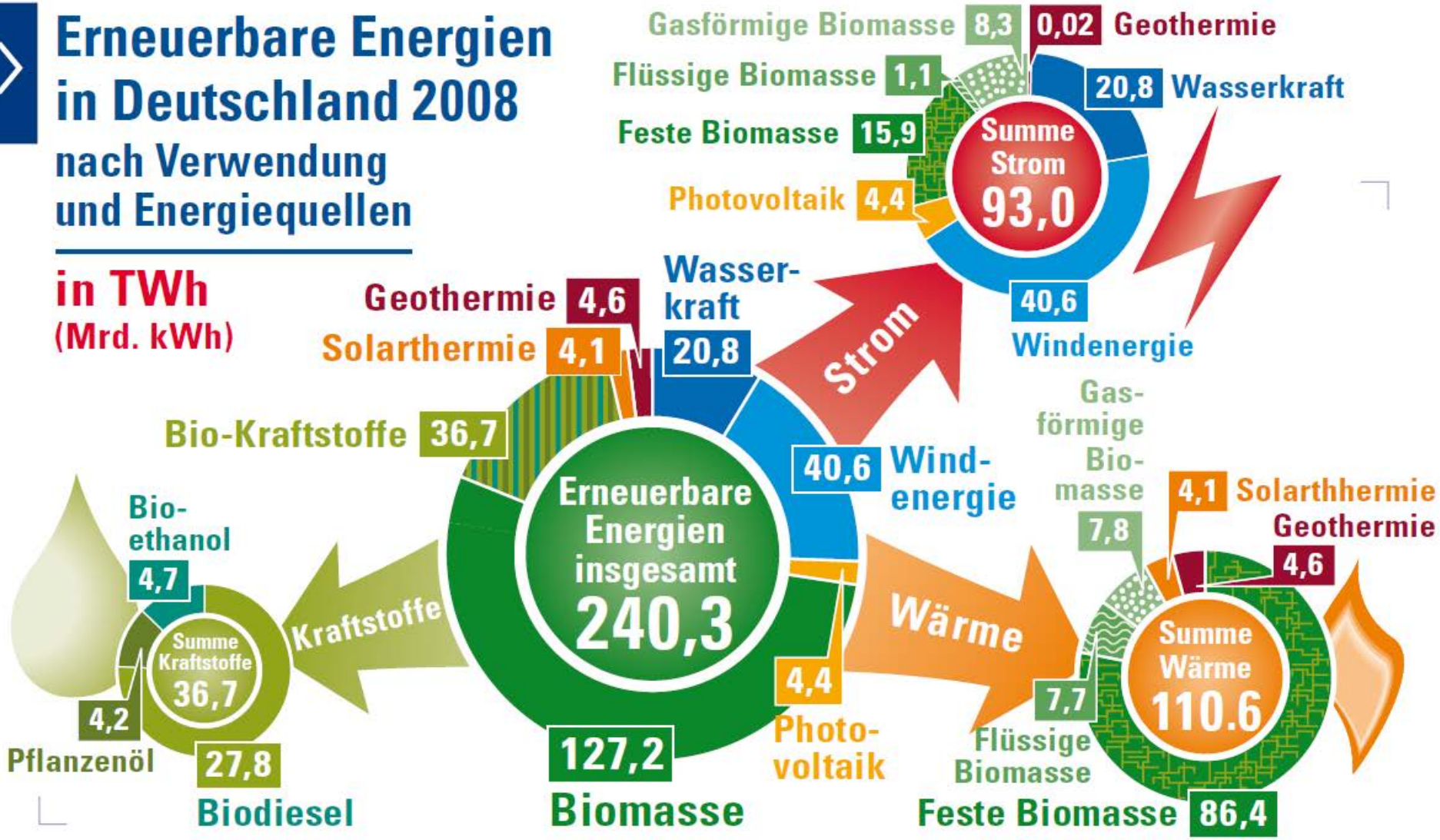
First release: May 2008

Erneuerbare Energien in Deutschland 2008

nach Verwendung und Energiequellen

in TWh
(Mrd. kWh)



Data-Source: BMU-Brochure "Erneuerbare Energien in Zahlen – Internet-Update", Version: December 2009

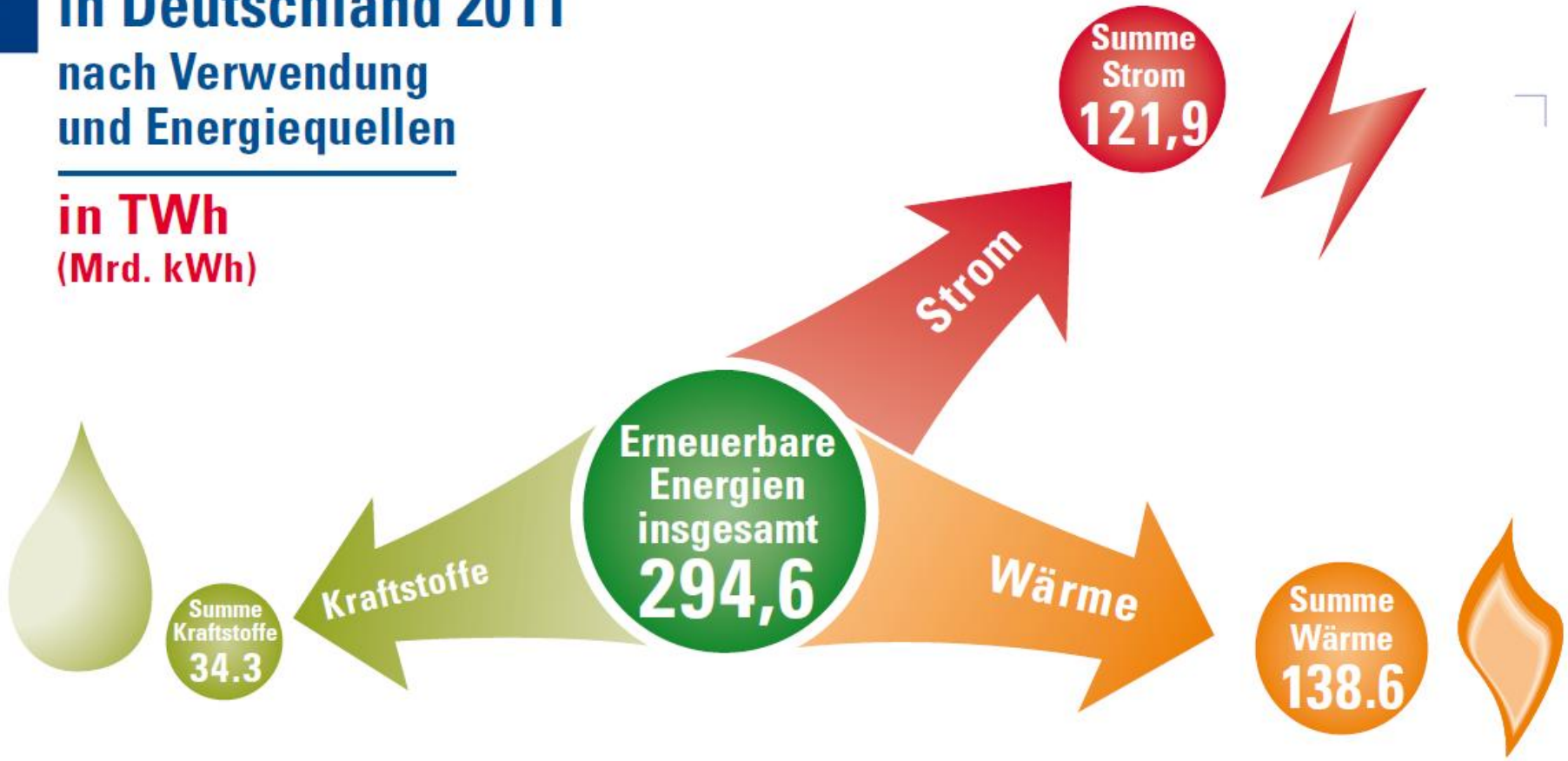
EVERS

First release: March 2010

Erneuerbare Energien in Deutschland 2011

nach Verwendung und Energiequellen

in TWh
(Mrd. kWh)



Data-Source: BMU-Brochure "Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011", März 2012

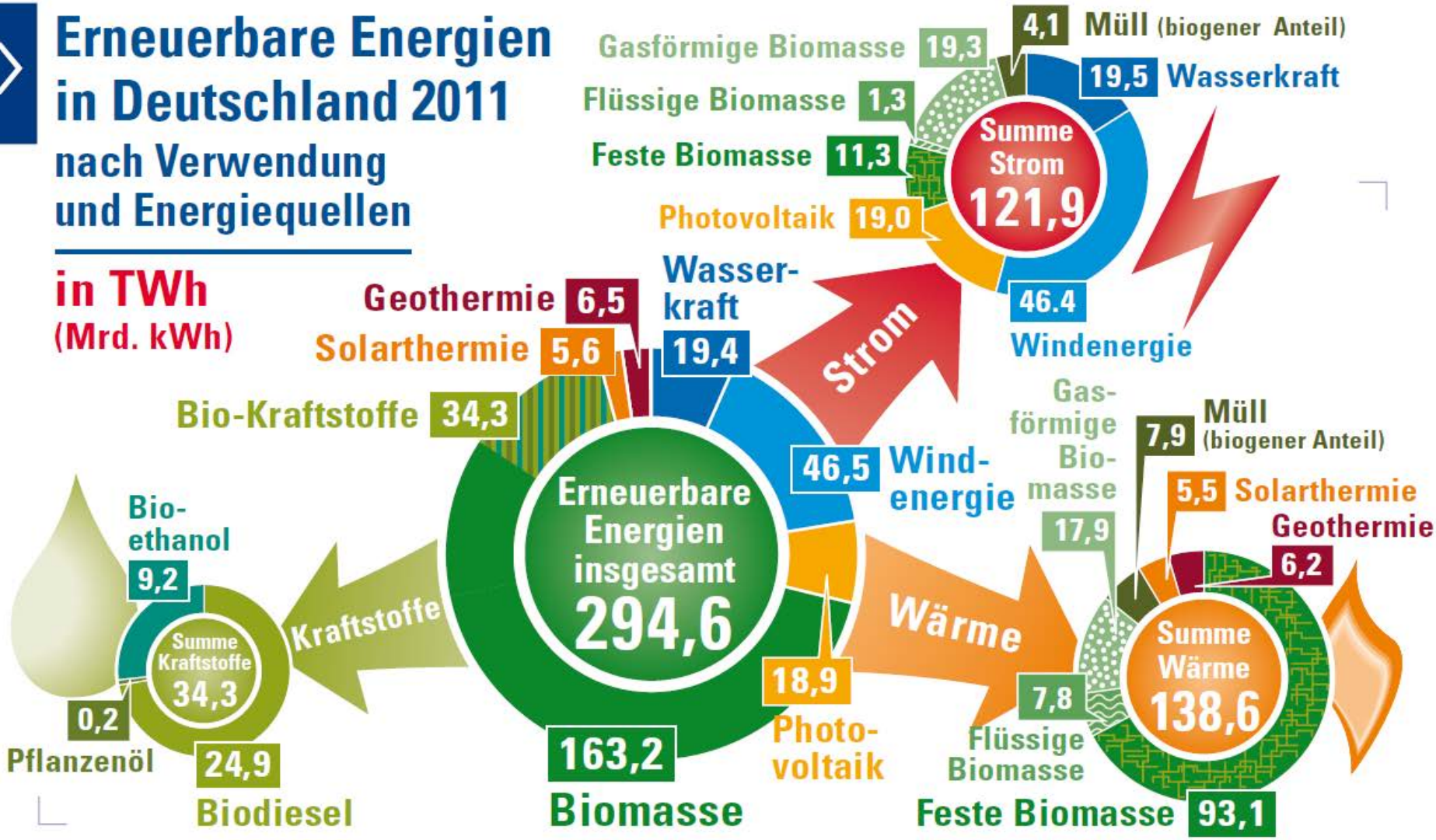
EVERS

First released: March 2010; latest update: Sept. 2012

Erneuerbare Energien in Deutschland 2011

nach Verwendung und Energiequellen

in TWh
(Mrd. kWh)



Data-Source: BMU-Brochure "Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011", März 2012

EVERS

First released: March 2010; latest update: Sept. 2012

Erneuerbare Energien in Deutschland 2011

nach Verwendung und Energiequellen

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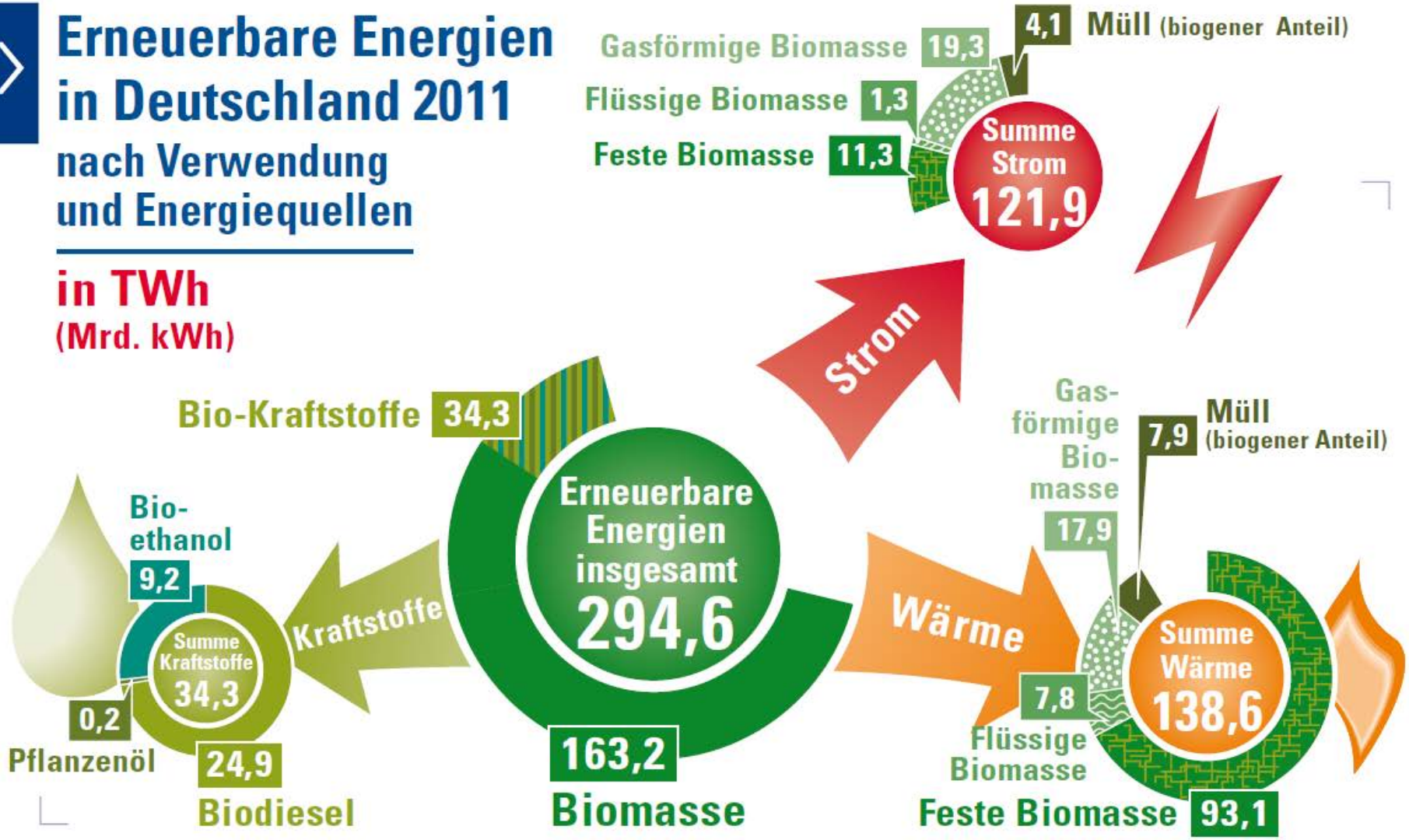

Data-Source: BMU-Brochure "Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011", März 2012

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First released: March 2010; latest update: Sept. 2012

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in TWh
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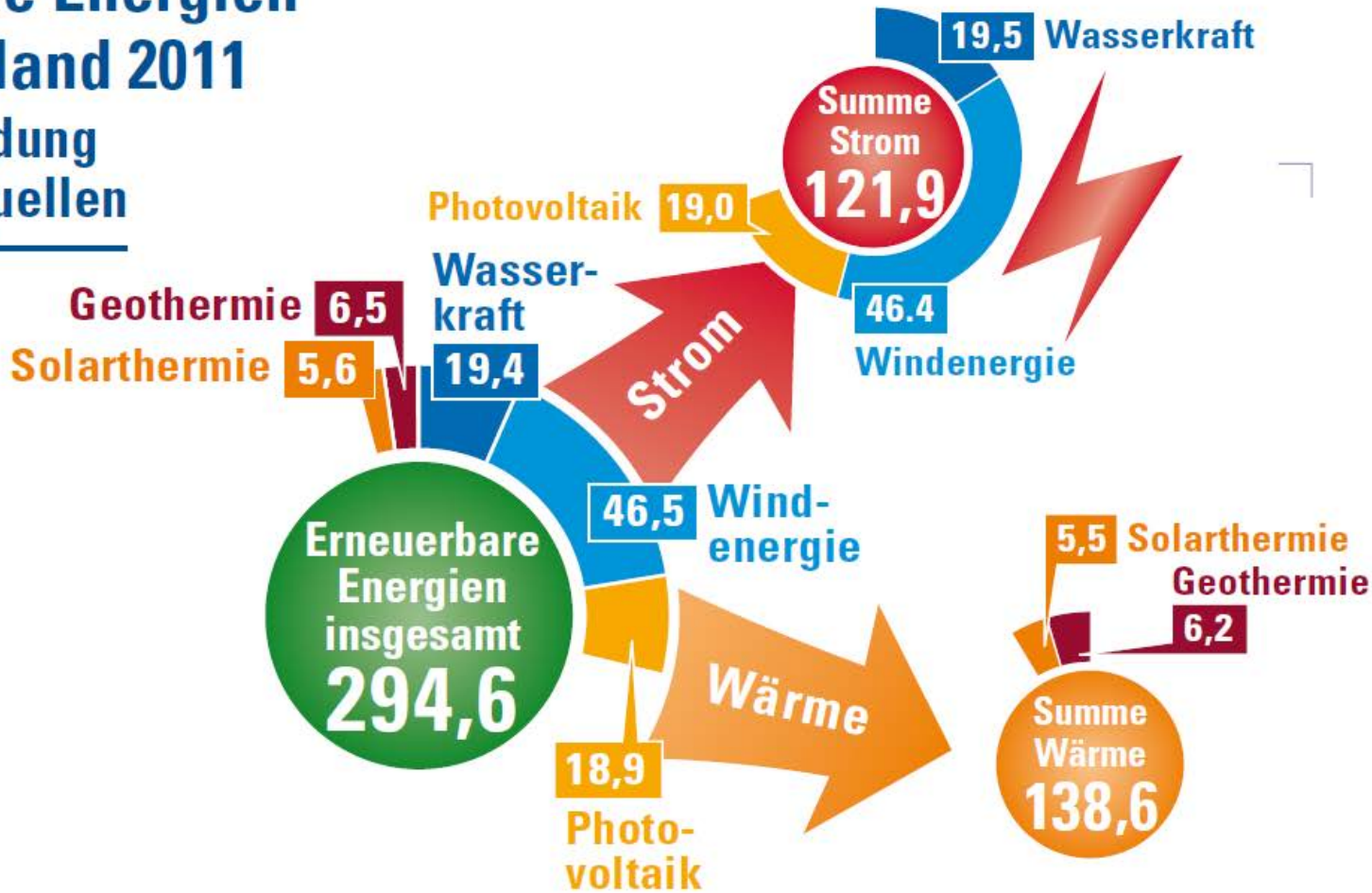

Data-Source: BMU-Brochure "Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011", März 2012

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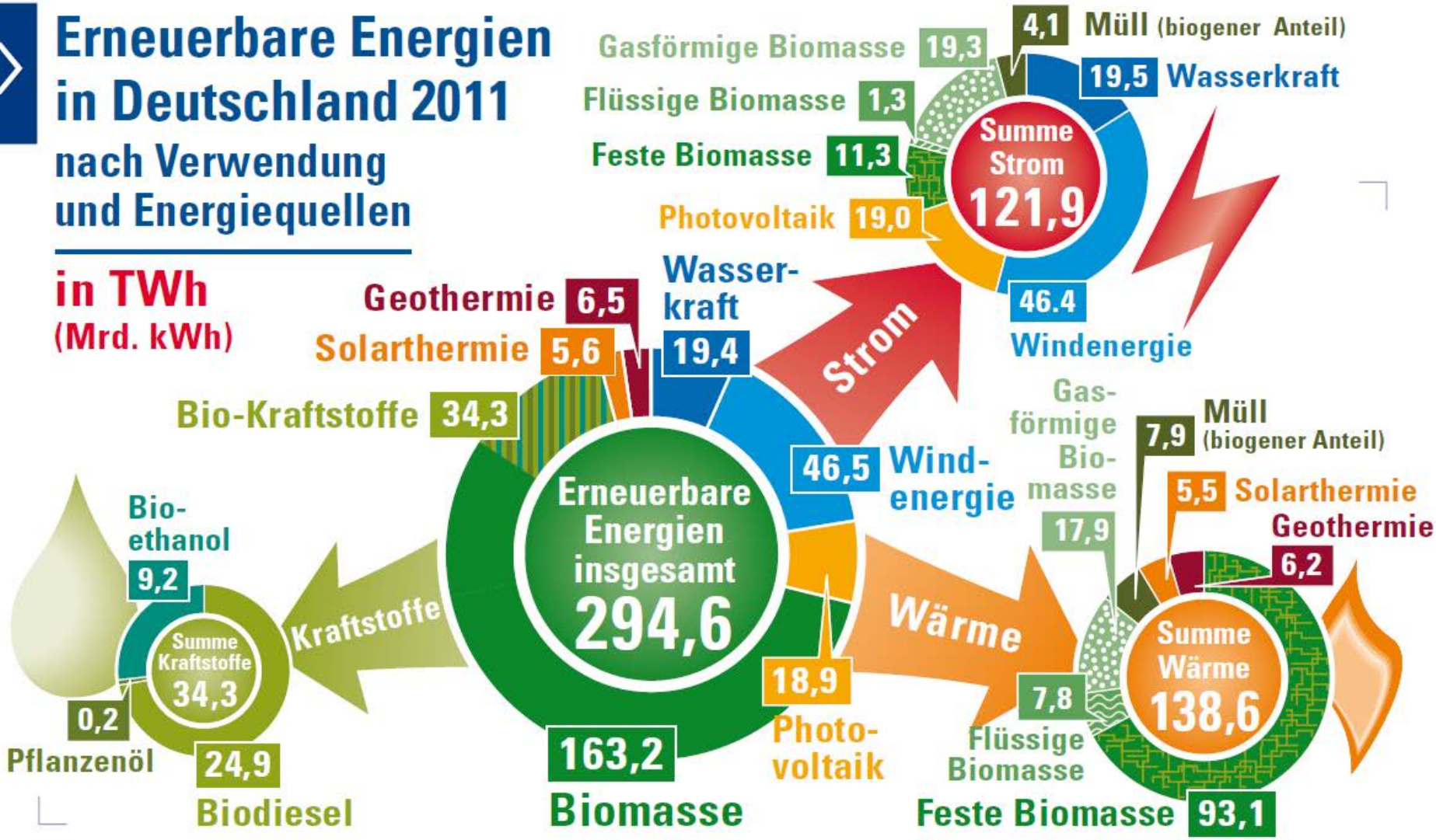

Data-Source: BMU-Brochure "Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011", März 2012

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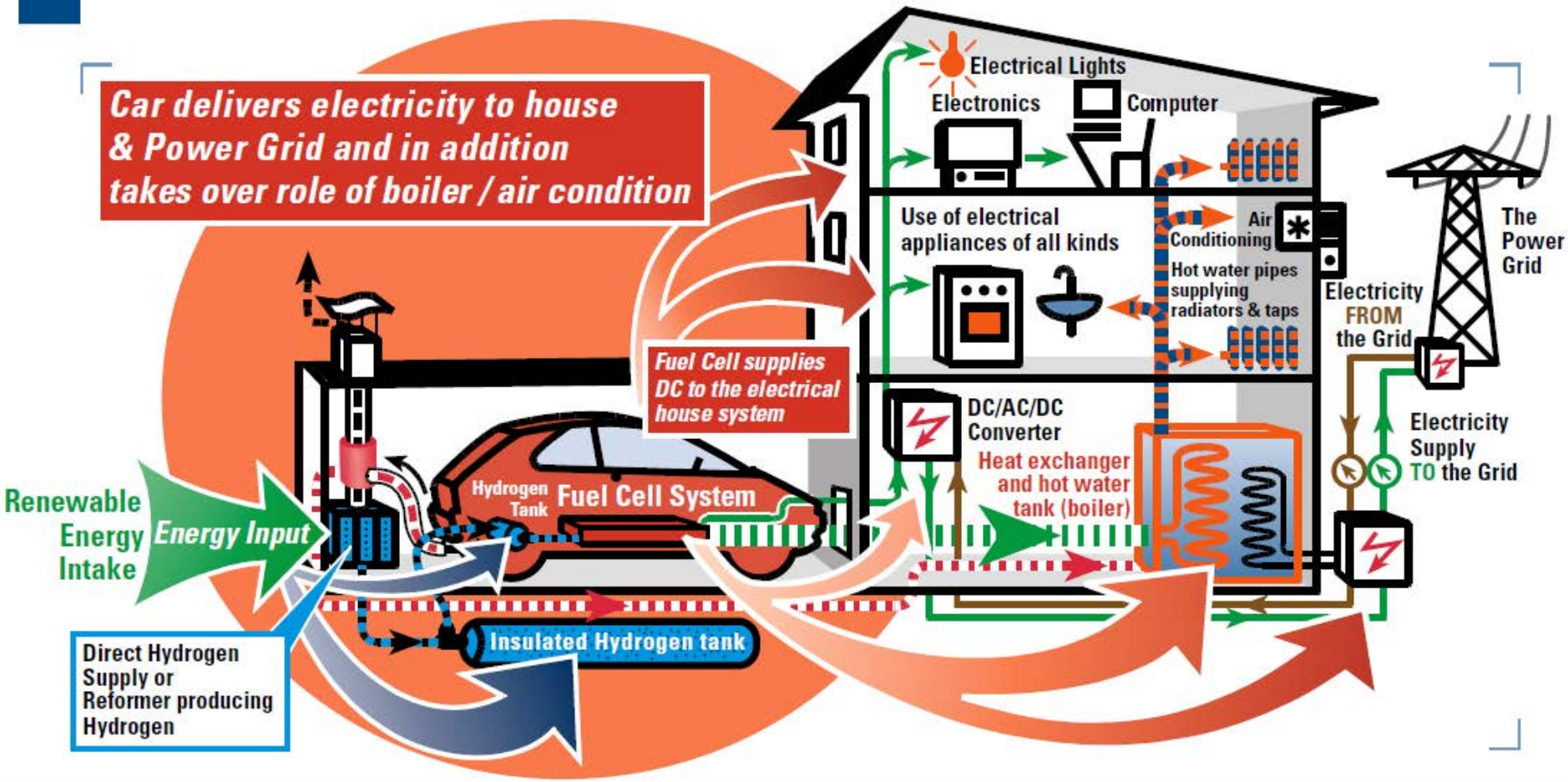
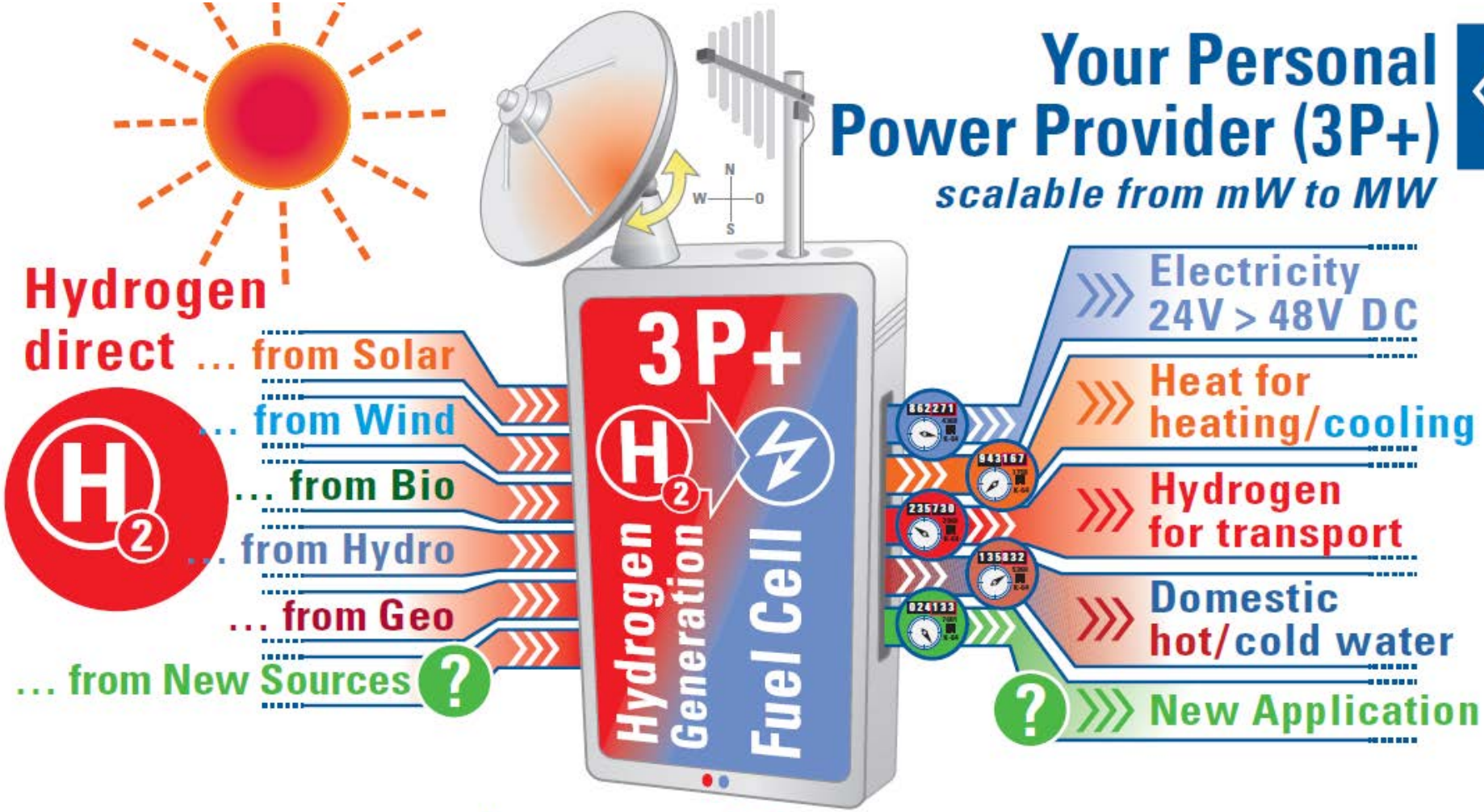
First released: March 2010; latest update: Sept. 2012

Revolution in the Garage



Your Personal Power Provider (3P+)

scalable from mW to MW



All Renewable Energies Input »» Output All personal power demands

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Source: Own Research
First released at:
2008 Fuel Cell Seminar & Exposition, Phoenix, AZ, USA

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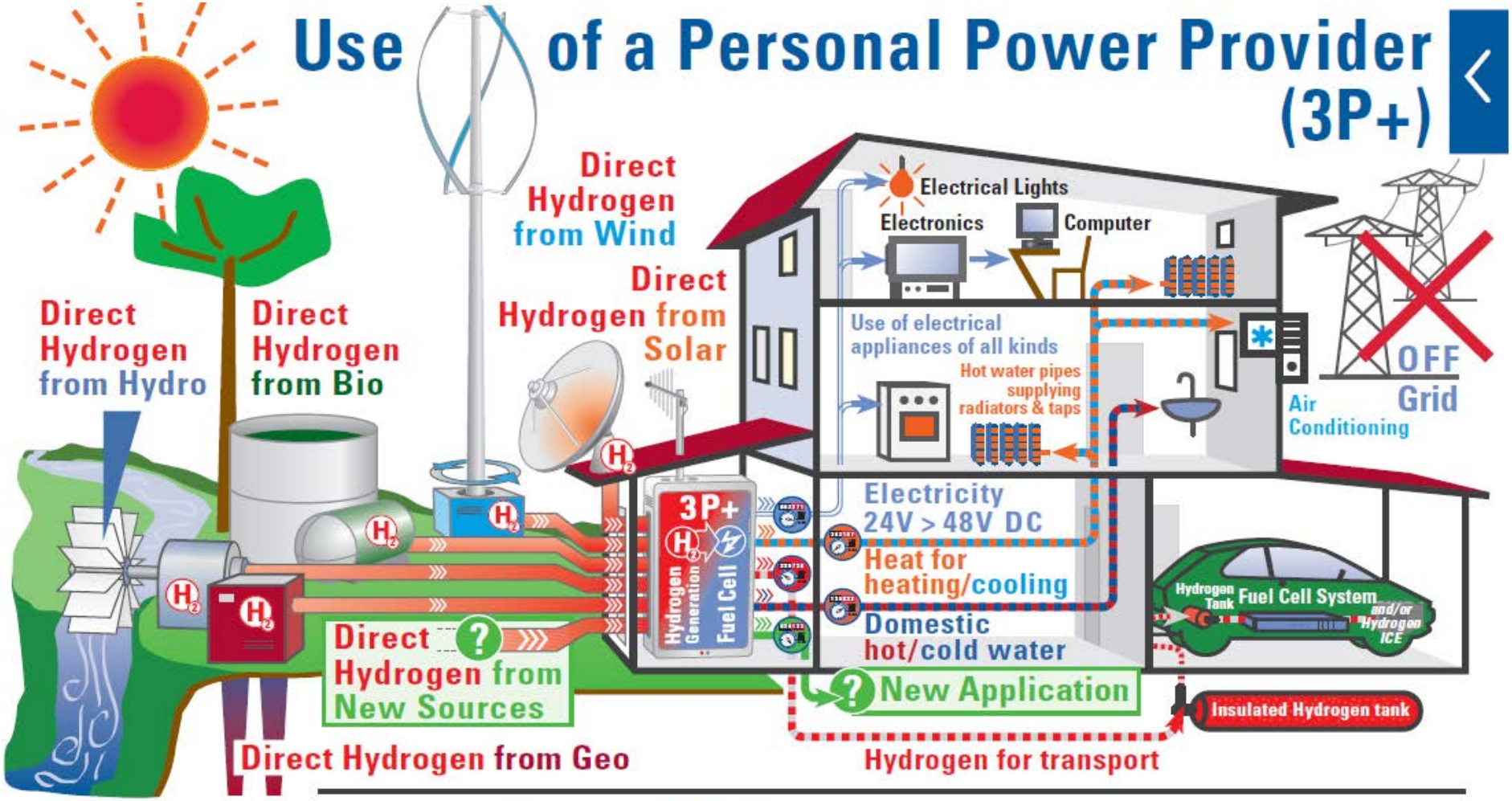
Latest update: October 22, 2008

Use of a Personal Power Provider (3P+)



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Latest update: October 22, 2008

Weiterführende Informationen

Arno A. Evers FAIR-PR:
www.hydrogenambassadors.com

Arbeitsgemeinschaft Energiebilanzen:
www.ag-energiebilanzen.de

Lawrence Livermore National Laboratory
US Energy Flowcharts:
https://flowcharts.llnl.gov

Arno A. Evers

The Hydrogen Society

... more than just a Vision?

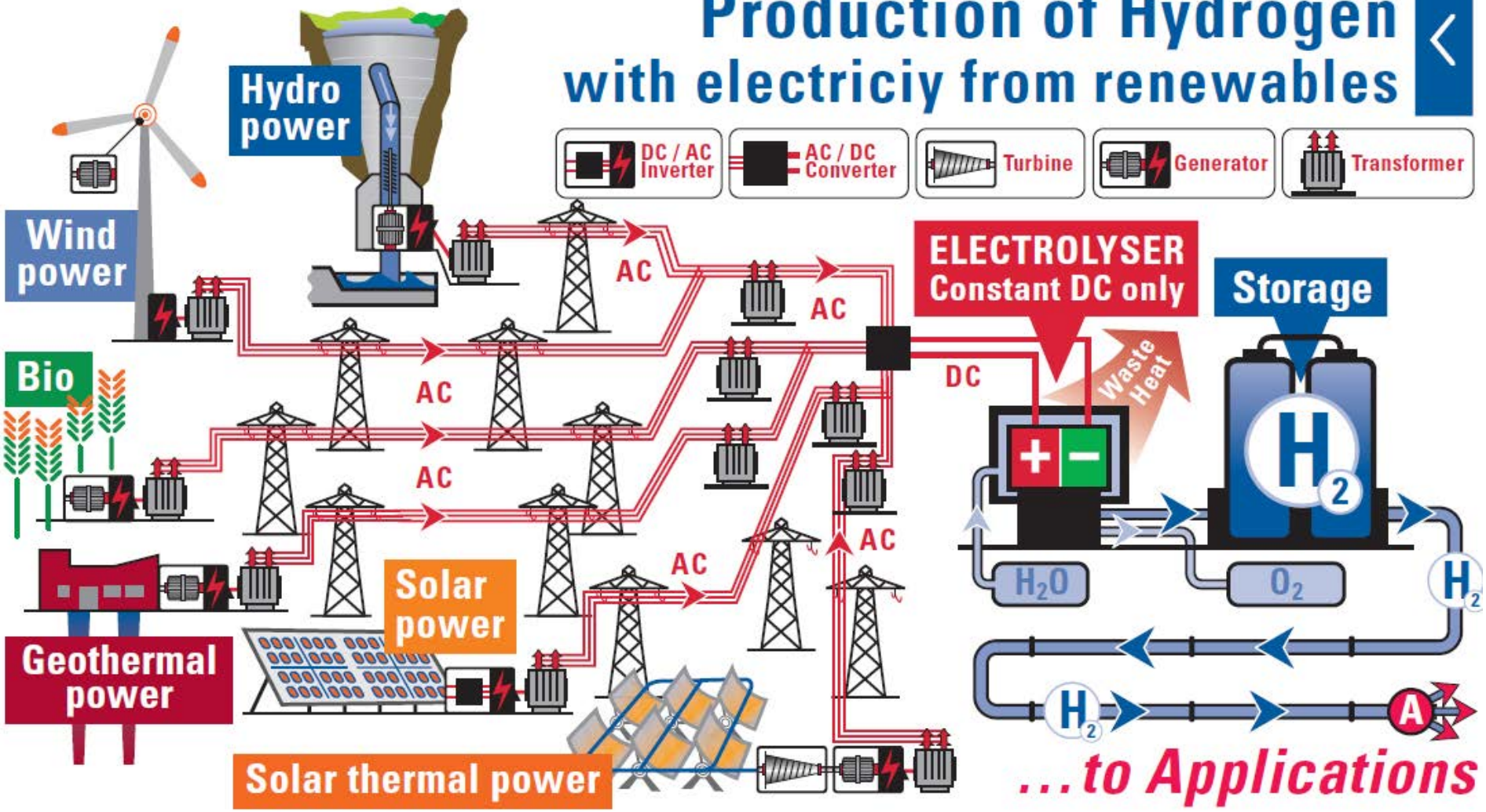
With a Preface by Prof. T. Nejat Veziroğlu

ISBN 978-3-937863-31-3

H2YDROGEIT Verlag

Additional Slides

Production of Hydrogen
with electriciy from renewables

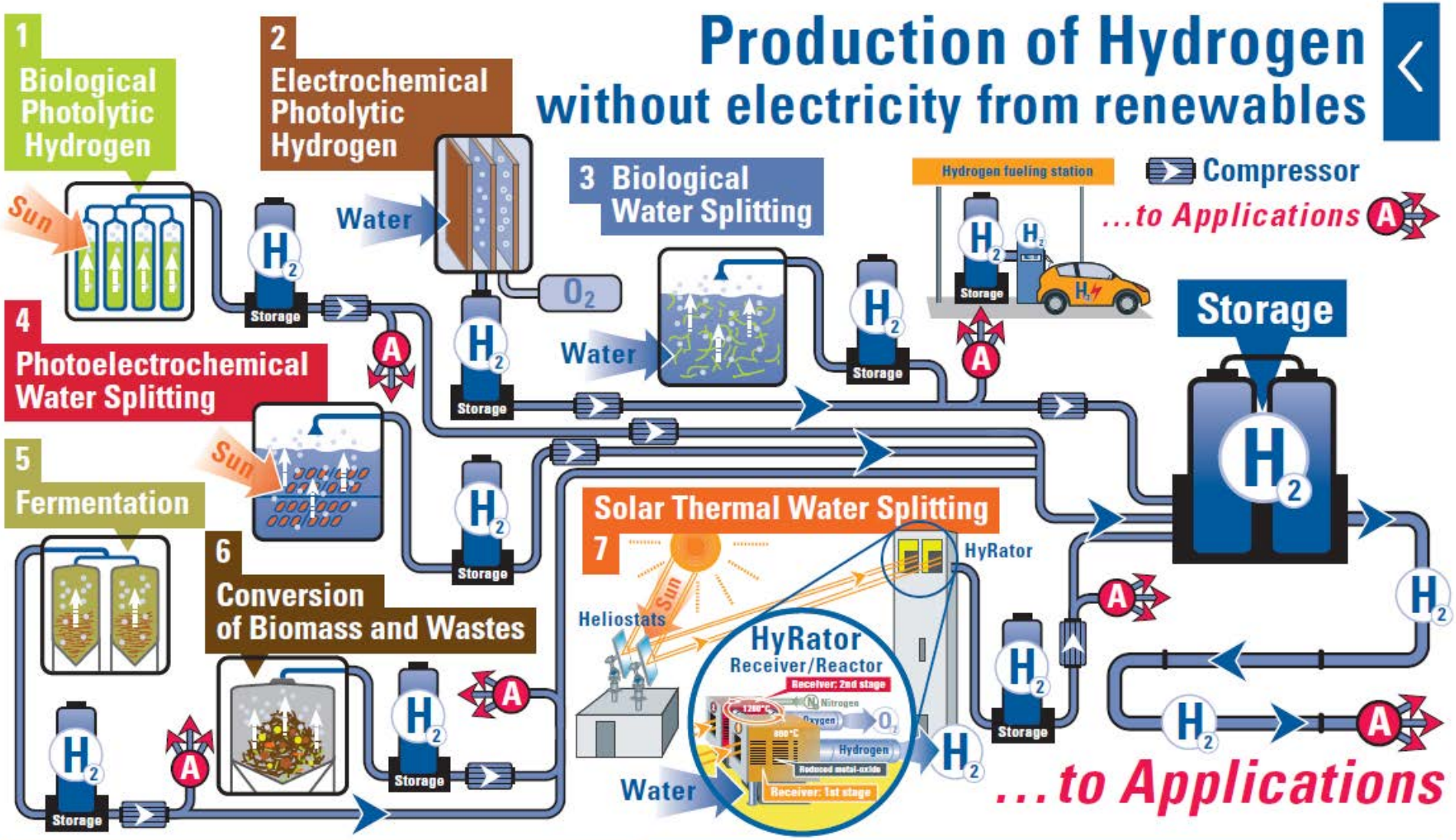


Data Sources: Own Research

EVERS

First released: February 2010

Production of Hydrogen without electricity from renewables



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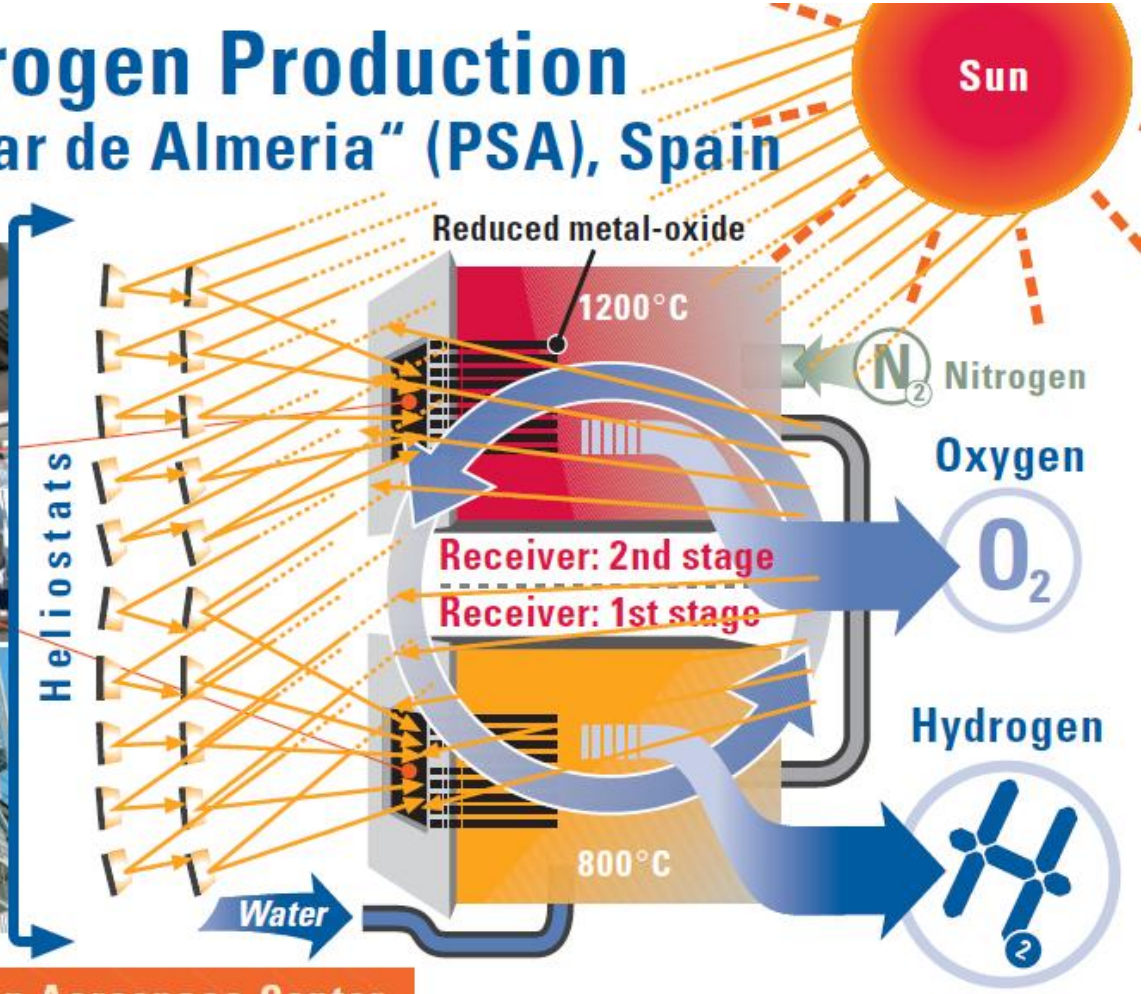
Data Sources: Own Research

EVERS

First released: February 2010

Direct Solar Hydrogen Production
at the "Plataforma Solar de Almeria" (PSA), Spain



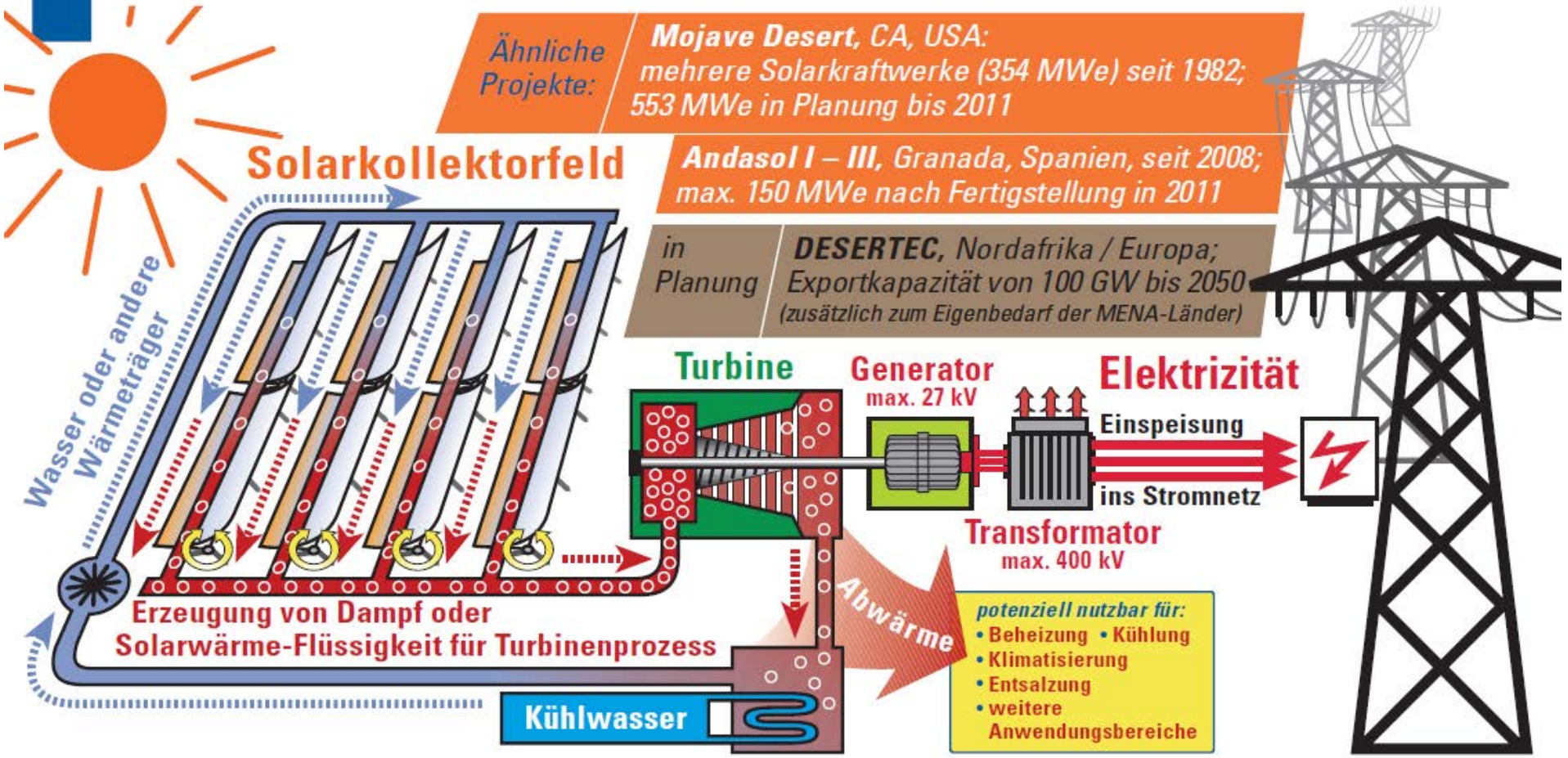
Successfully set up in 2008 by German Aerospace Center
(Deutsches Zentrum für Luft- und Raumfahrt; DLR) in the context of the HYDROSOL I and II EU projects

Source: Photos: Arno A. Evers

EVERS

First released: July 2006; latest update: Nov. 2009

Solarthermisches Kraftwerk



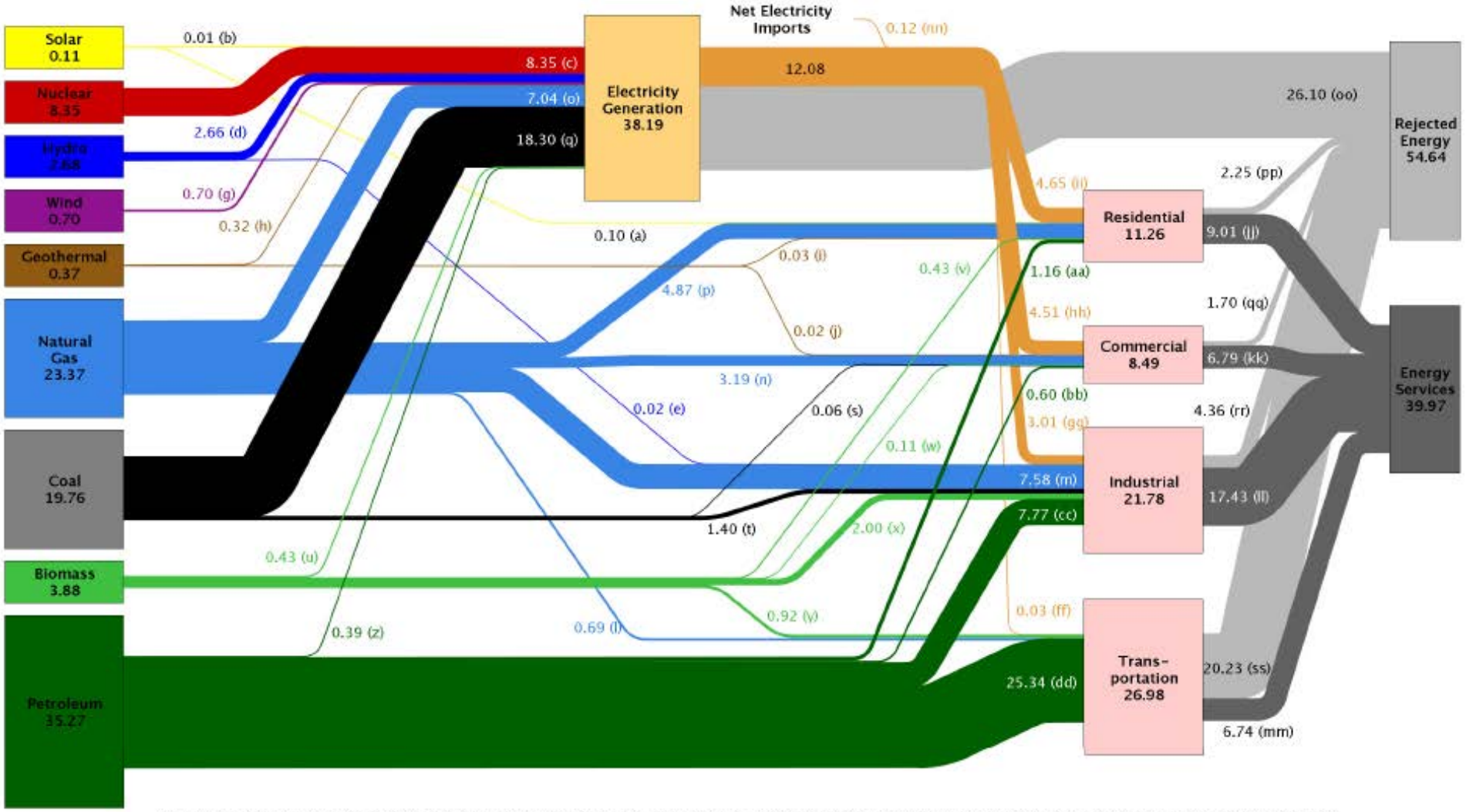
Quelle: www.shp-europe.com, own research

EVERS

First released: August 2007; latest update: July 2009

Estimated U.S. Energy Use in 2009: ~94.6 Quads

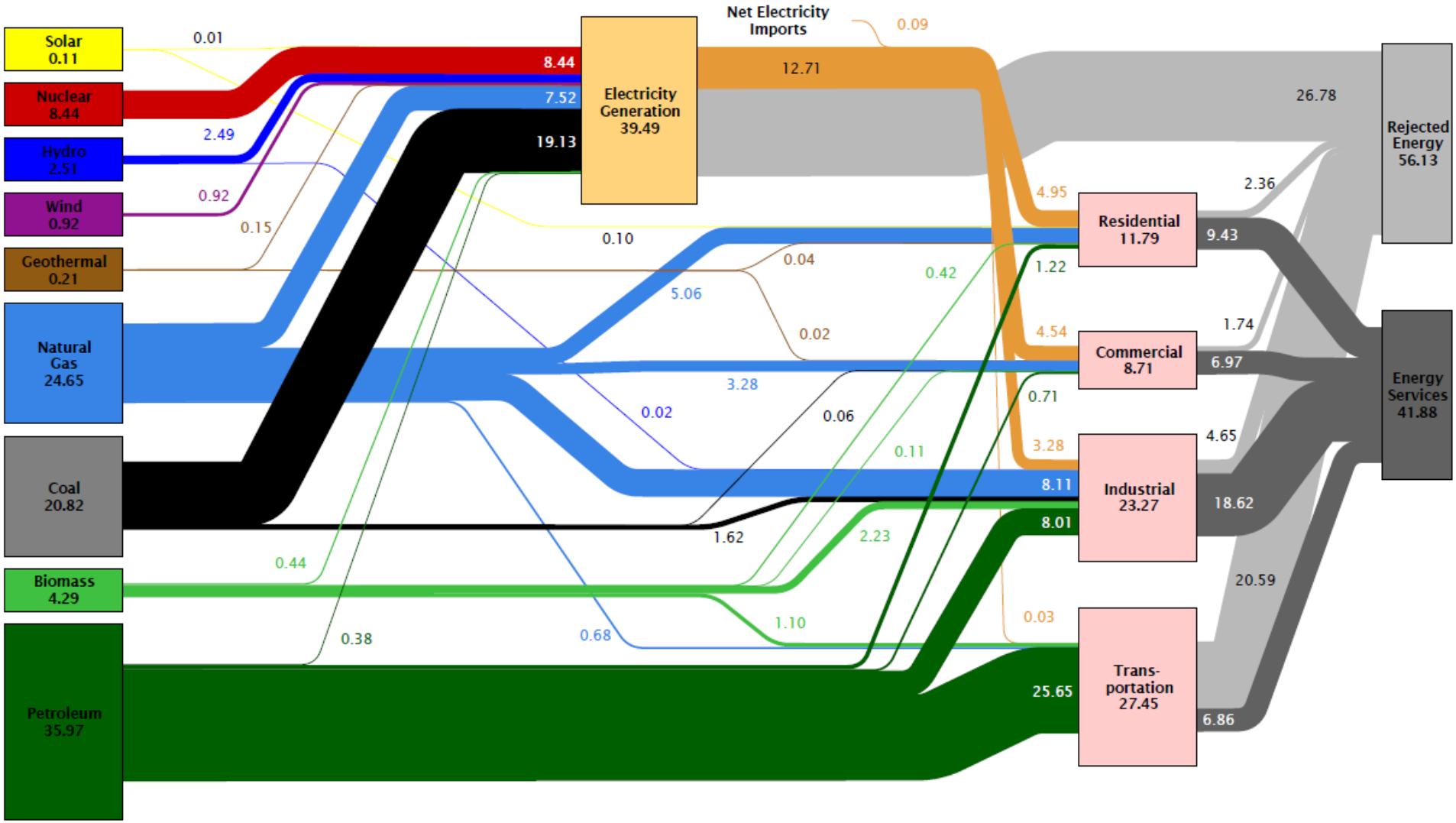
Lawrence Livermore National Laboratory



Source: LLNL 2010. Data is based on DOE/EIA-0384(2009), August 2010. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

Estimated U.S. Energy Use in 2010: ~98.0 Quads

Lawrence Livermore National Laboratory



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