CHAIRE EUROPEAN ELECTRICITY MARKETS
Fondation Paris-Dauphine

DAUPHINE UNIVERSITÉ PARIS

L'*Energiewende* en Allemagne
Contours, Implications, Perspectives

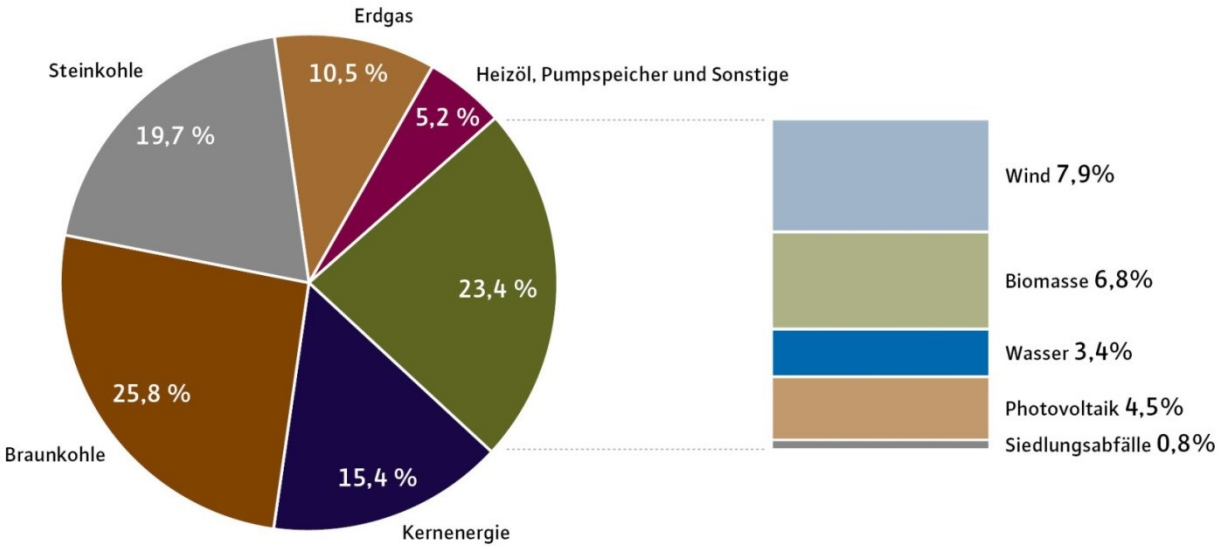
Jan Horst Keppler
Professeur d'économie à l'Université Paris-Dauphine
Directeur scientifique de la Chaire European Electricity Markets (CEEM)

The German Electricity Mix

Bruttostromerzeugung

nach Energieträgern 2013

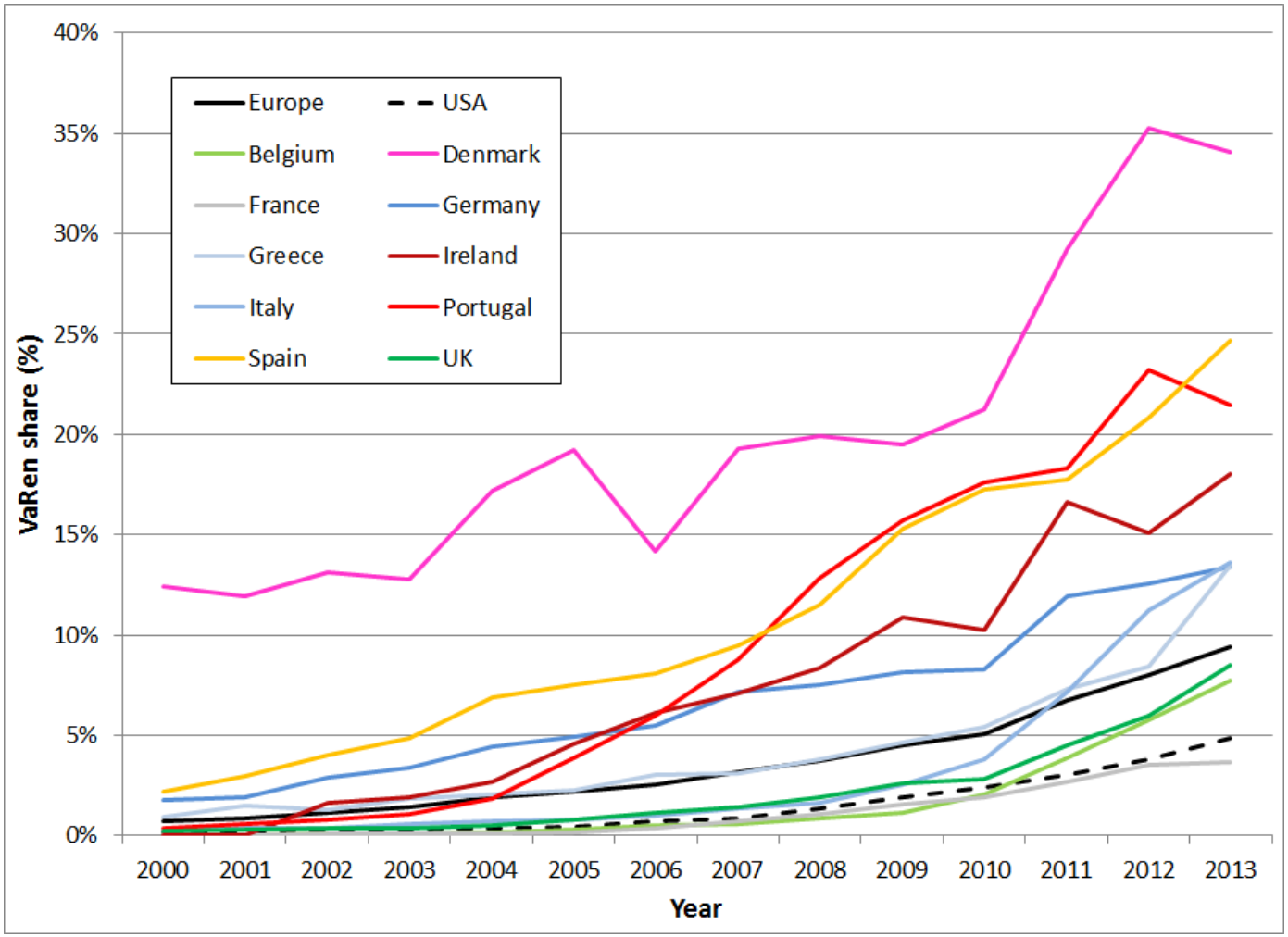
Brutto-Stromerzeugung 2013 in Deutschland: 629 Mrd. Kilowattstunden*



* vorläufig, teilweise geschätzt

Quellen: BDEW, AG Energiebilanzen, Stand Dezember 2013

Solar PV and Wind as a Share of Electricity Production



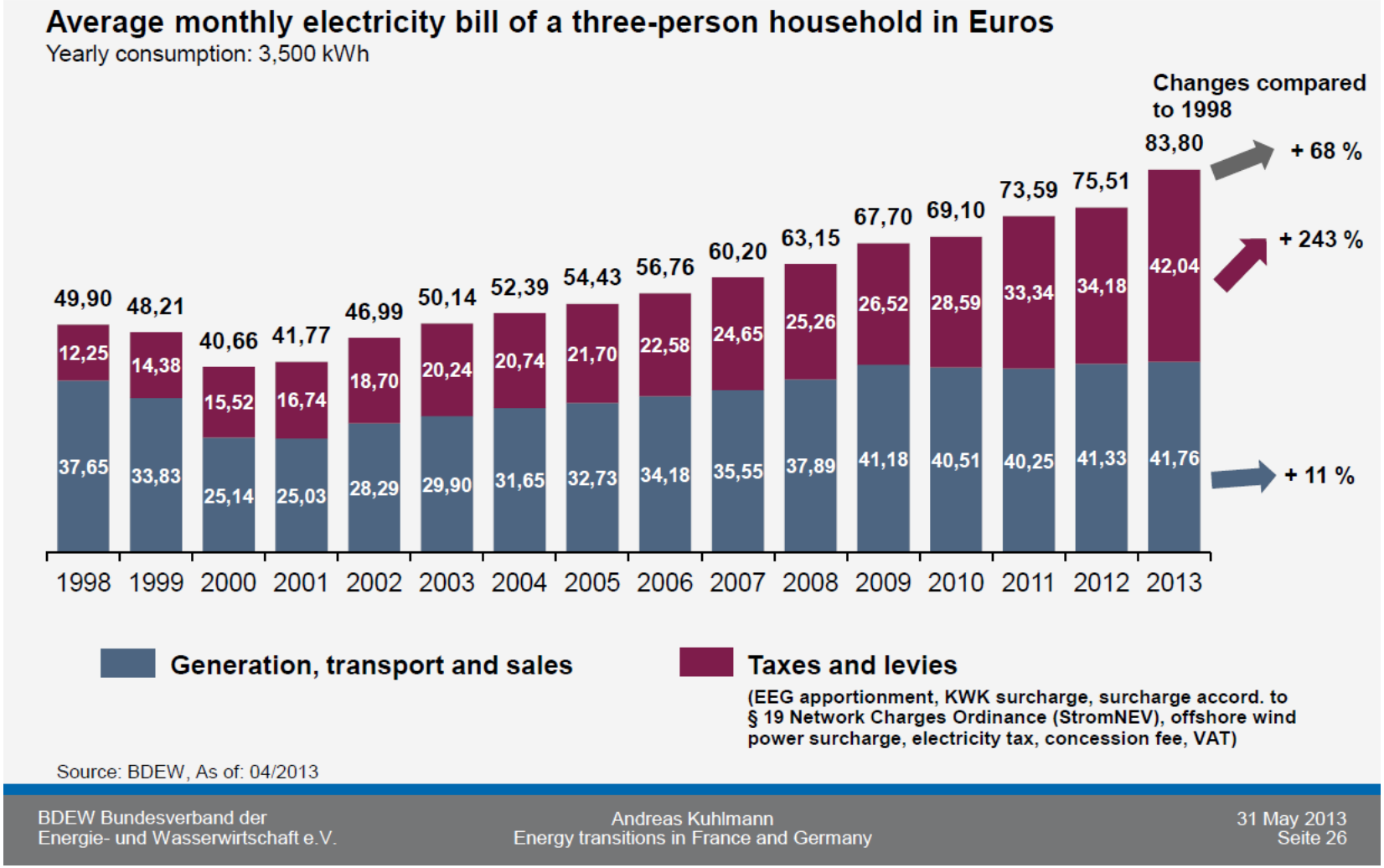
Iberia

Ireland

Germany
Italy
Greece

Source: IEA Electricity monthly reports

Le coût d'électricité pour un ménage allemand



Le coût d'électricité pour un ménage français

En comparaison : une famille française avec une consommation annuelle de 3 500 kWh (Tarif bleu, 9 kVA) aura

€ 46.79 de facture mensuelle (€ 84 en D), dont

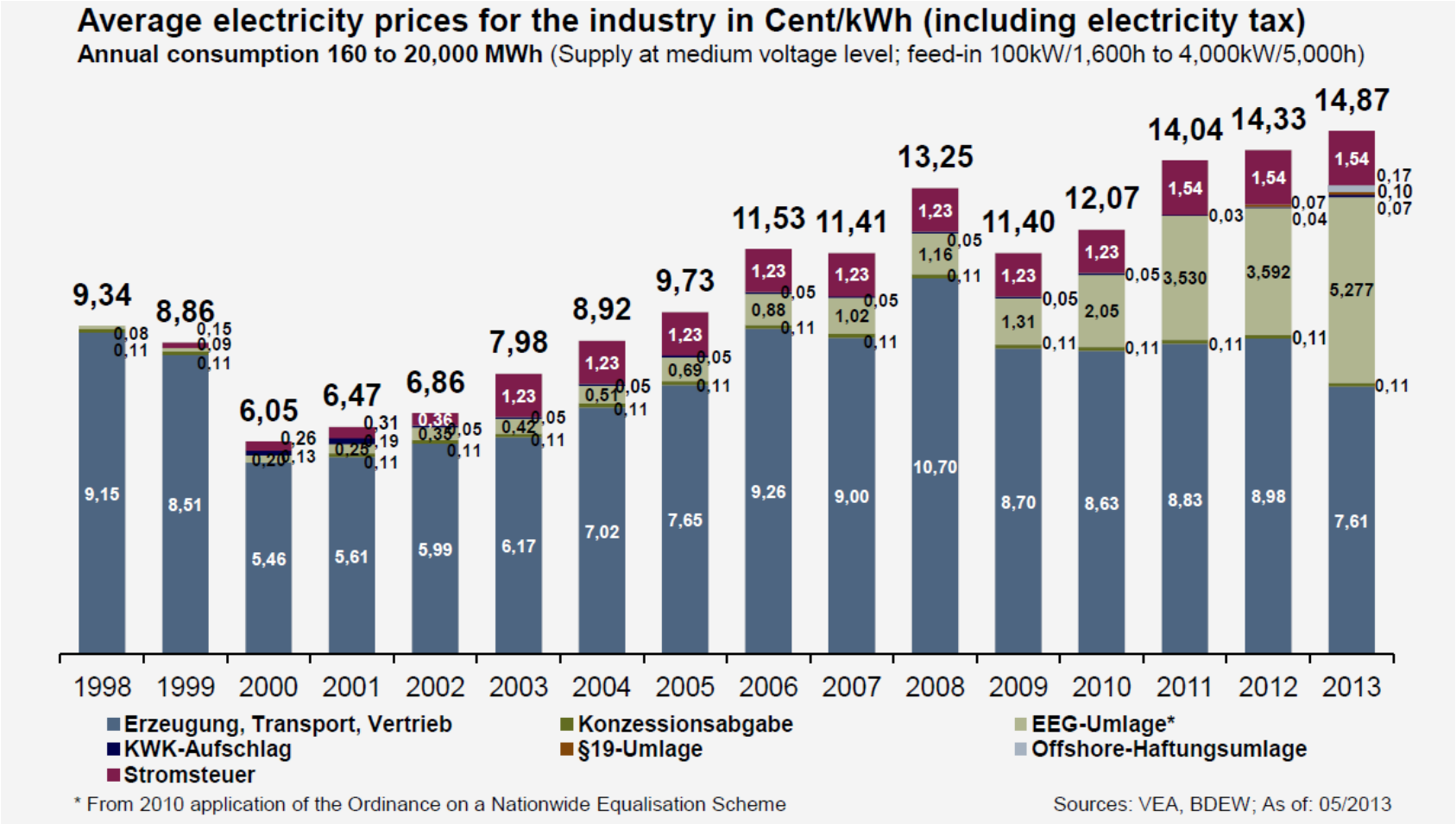
€ 27.25 électricité et acheminement,

€ 6.34 abonnement (€ 42 en D), et

€ 13.20 taxes et charges (TVA, TFCE et CSPE), (€ 42 en D).

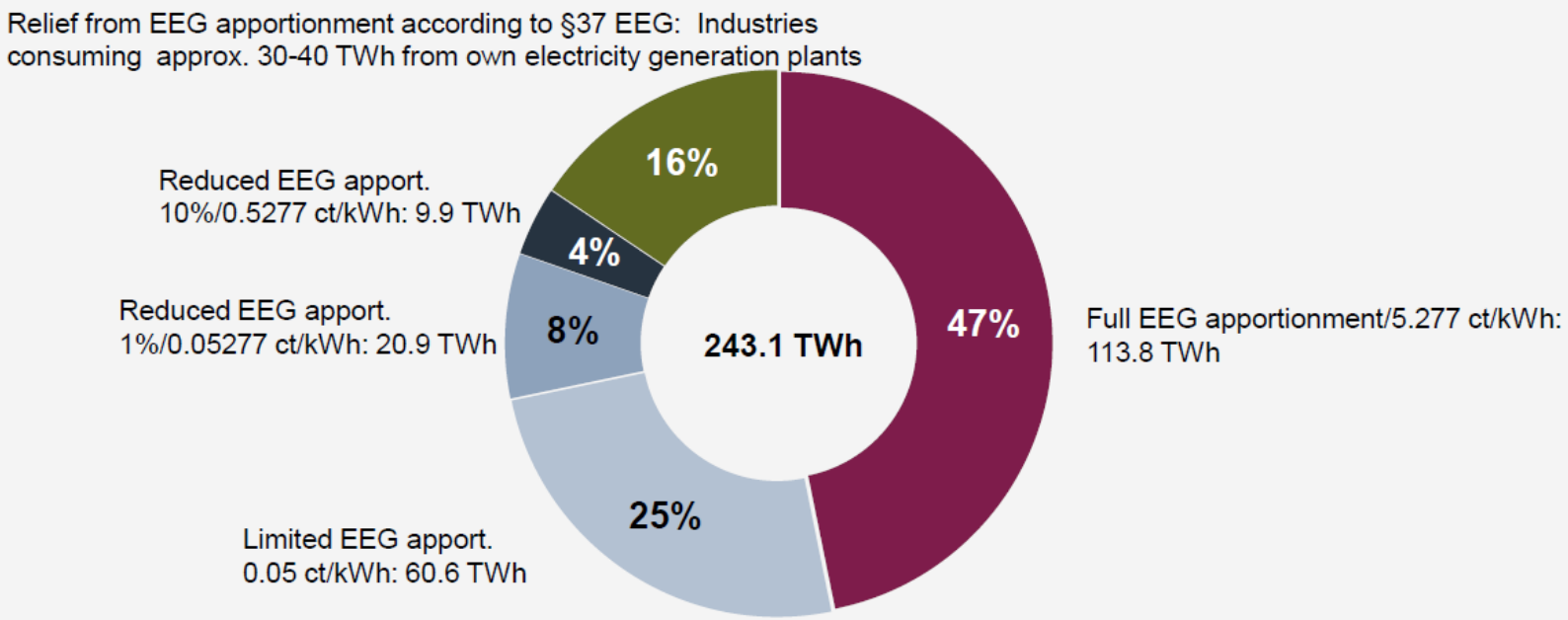
- La facture mensuelle d'une famille française en 2014 correspond à la facture d'une famille allemande en 2002.

Le coût d'électricité pour l'industrie allemande



Exemptions du financement des ENR pour ca. 50% de la consommation industrielle

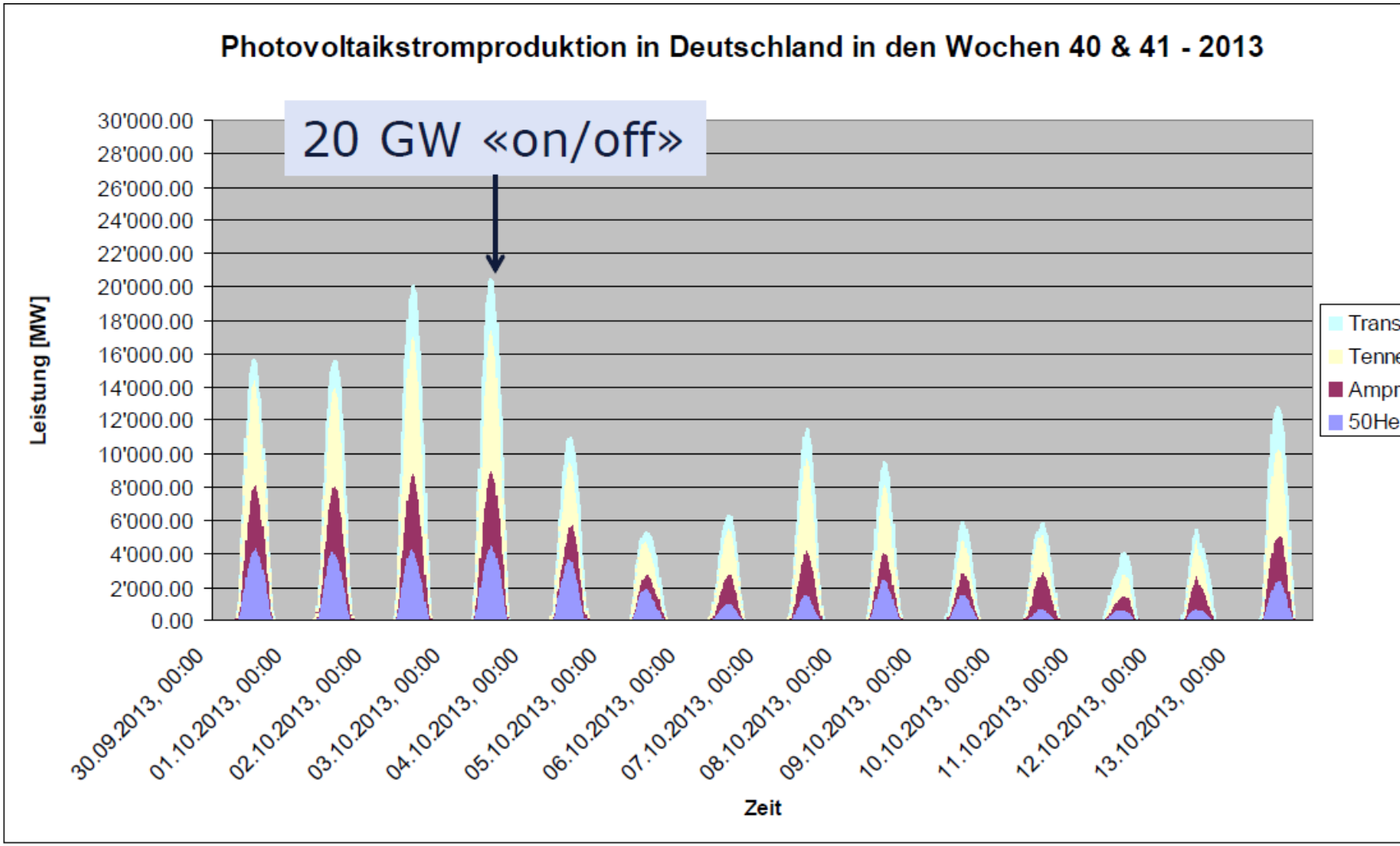
Industrial electricity consumption in 2013 according to EEG forecast 2013: **243,1 TWh**



- **Full EEG apportionment for nearly half of the industrial electricity consumption!**
- **Without exeptional rules according to §40 EEG 2012, the surcharge in 2013 would be 4.23 ct/kWh, thus 1.05 ct/kWh lower.**

Source: BDEW (own calculation based on EEG 2013 forecast data of 15/10/2012)

L'intermittence des ENR

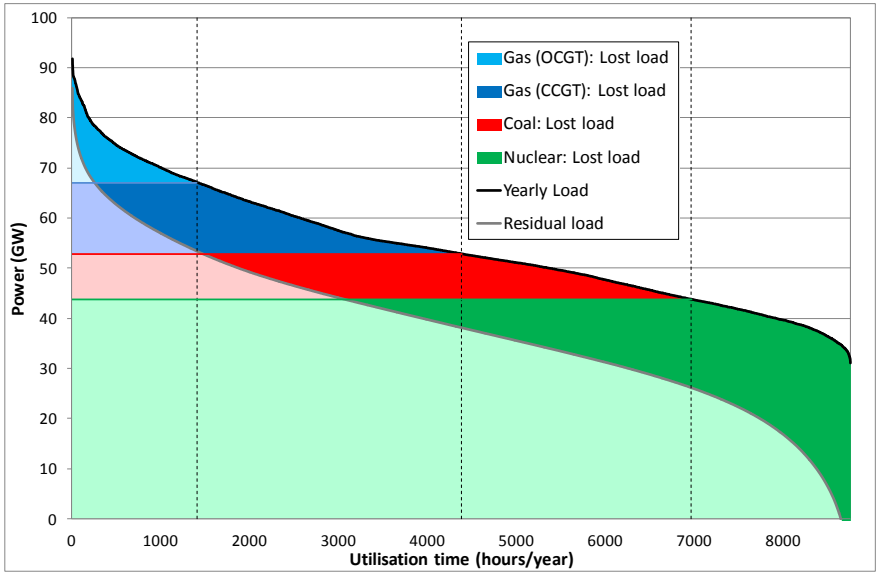


Datenquelle: transparency.eex.com

Short-Run Impacts

In the ***short-run***, renewables with zero marginal costs replace technologies with higher marginal costs. This means:

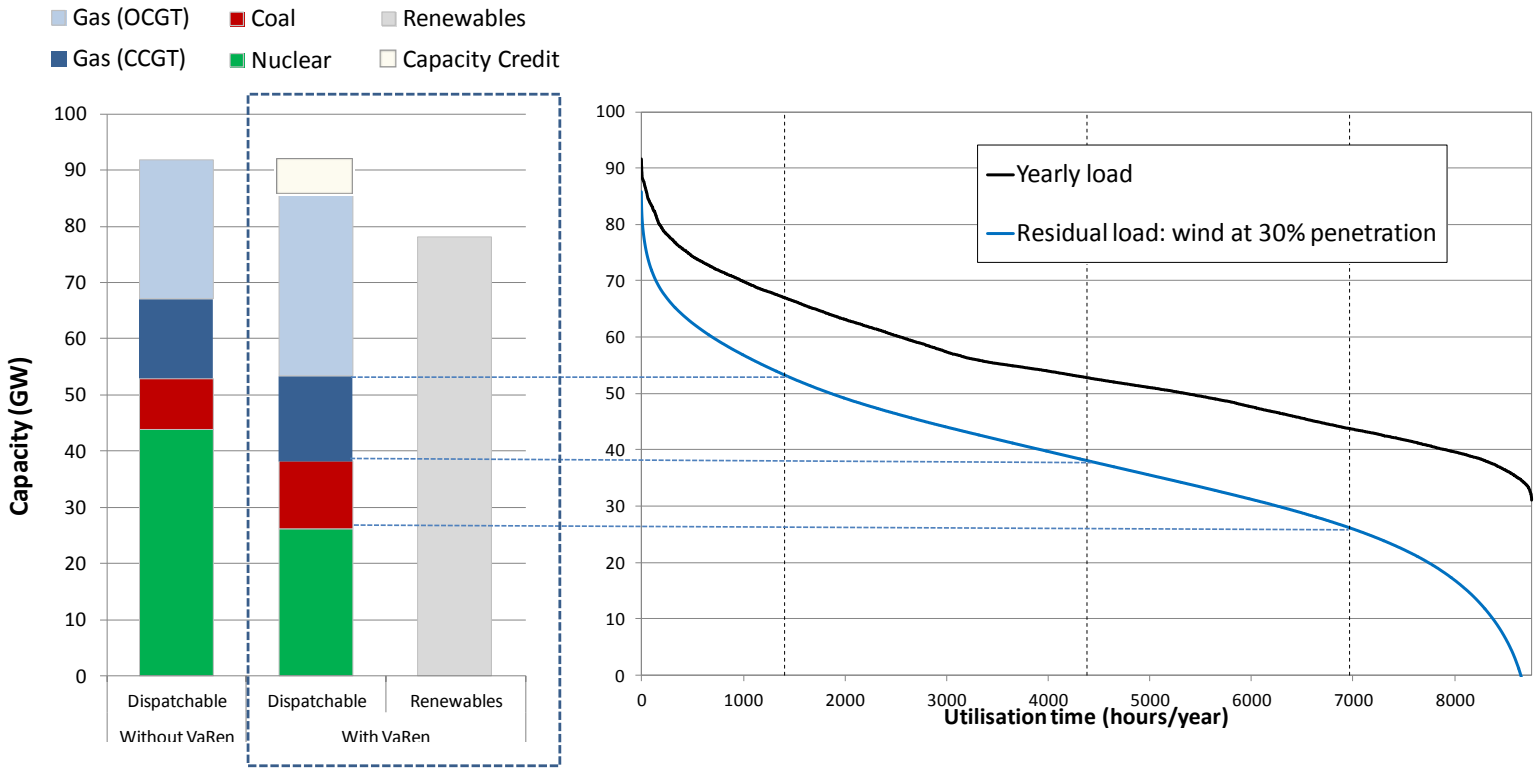
- Reductions in electricity produced by dispatchable power plants (lower load factors, *compression effect*).
- Reduction in average electricity prices on wholesale power markets, *merit order effect* (by 13-14% and 23-33%).



		10% Penetration level		30% Penetration level	
		Wind	Solar	Wind	Solar
Load losses	Gas Turbine (OCGT)	-54%	-40%	-87%	-51%
	Gas Turbine (CCGT)	-34%	-26%	-71%	-43%
	Coal	-27%	-28%	-62%	-44%
	Nuclear	-4%	-5%	-20%	-23%
Profitability losses	Gas Turbine (OCGT)	-54%	-40%	-87%	-51%
	Gas Turbine (CCGT)	-42%	-31%	-79%	-46%
	Coal	-35%	-30%	-69%	-46%
	Nuclear	-24%	-23%	-55%	-39%
Electricity price variation		-14%	-13%	-33%	-23%

- Declining profitability especially for gas (nuclear less affected).
- No incentives for new investment.
- Security of supply risks as 30 GW of gas plants close.

Long-Run Impacts



- Renewable production will change generation structure also for back-up.
- Without countervailing measures (carbon taxes), nuclear power will be displaced by a **more carbon-intensive mix** of renewables and gas.
- Cost for residual dispatchable load will rise with more expensive technologies.

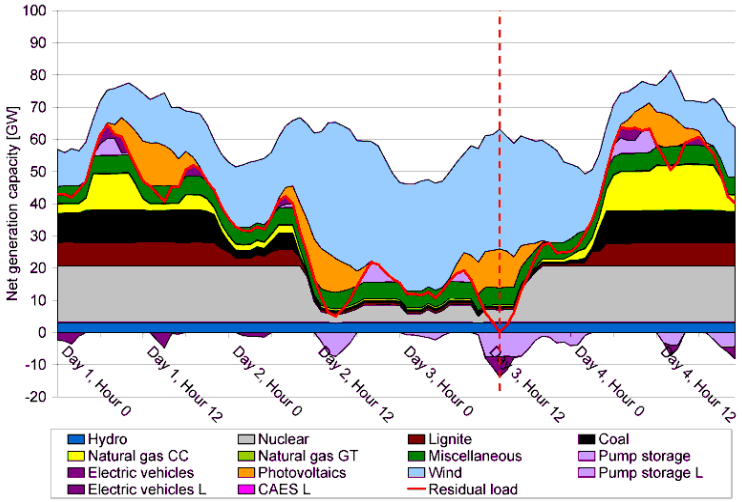
What Needs to Be Done

A. Markets for short-term flexibility provision

For greater flexibility to guarantee continuous matching of demand and supply exist in principle four options that should compete on cost:

1. Dispatchable back-up capacity and load-following
2. Electricity storage
3. Interconnections and market integration
4. Demand side management

So far dispatchable back-up remains cheapest.



B. Mechanisms for the long-term provision of capacity

There are always moments when the wind does not blow or the sun does not shine. Capacity mechanisms (payments to dispatchable producers or markets with supply obligations for all providers) can assure profitability even with reduced load factors and lower prices.

C. A Review of Support Mechanisms for Renewable Energies

Subsidising output through feed-in tariffs (FITs) in Europe or production tax credits (PTCs) in the United States incentivises production when electricity is not needed (including *negative prices).* Feed-in premiums, capacity support or best a substantial carbon tax would be preferable.

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What Is likely to Be Done

Likely new provisions in the EEG in line with the coalition agreement of the new government (currently under discussion):

- Continuing commitment to GHG reductions (-40% in 2020, -80% in 2050), Germany is currently slightly more than 20% below 1990 levels, but emissions are going up since 2012. ENR 40-45% en 2025, 55%-60% en 2035.
- Efficiency, efficiency, efficiency…
- Decrease of future FIT. Incentives for direct marketing of REN.
- Incentives for choosing right locations (energy increase MUCH less than capacity!)
- TSO can cut up to 5% of REN production w/o compensation (stability, positive prices…)
- Large producers must possibly guarantee share of production as reliable baseload (balancing obligation)
- Limitation of exemptions for industry
- Capacity mechanisms (strategic reserves, *ad hoc* regional CRMs, generalised CRM in medium run…)
- Investing into transport and distribution
- No principal objections but strong reserves against fracking for shale gas.