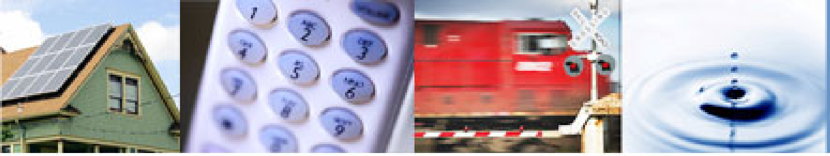
California and Germany

A Thought-Leaders Session

California Public Utilities Commission
Policy and Planning Division
June 5, 2014



California / Germany Comparison

Footnotes:
1. 2012
2. 2013

	California	Germany
Population	38 million[1]	81 million[2]
GDP	$2.0 trillion[1]	$ 3.6 trillion[2]
In-state generation resource mix	see table below	see table below
Annual electricity consumption	302 TWh[1]	591 TWh[1] (Gross)
Electricity net imports	100 TWh[2]	(33) TWh[1]
Peak load	60 GW[1]	80 GW[1]
Emissions rate for delivered electricity	693 lbs. of CO_2 per MWh [1] 2	1,269 lbs. of CO_2 per MWh [1]

California – In-state generation resource mix:

	Gen[2]	Capacity[2]
Nat. Gas	61%	62%
Nuclear	9%	3%
Hydro	10%	16%
Coal	<1%	<1%
Renewable	20%	19%

Germany – In-state generation resource mix:

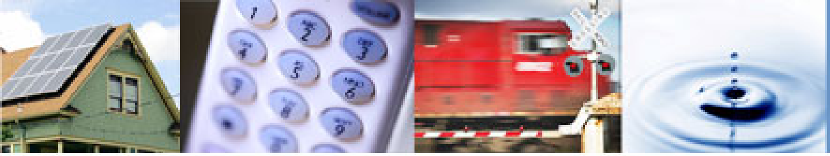
	Gen[1]	Capacity[1]
Nat. Gas	12%	15%
Nuclear	16%	8%
Hydro	4%	6%
Coal & oth.	48%	33%
Renewable	20%	37%

Company Comparison

Footnotes: 1. 2013	PG&E Pacific Gas and Electric Company	RWE The energy to lead
Employees	22,000	66,341
Annual operating revenue	$ 16 bn	$ 74 bn
Market capitalization	$ 21bn	$ 24 bn
Number of end-use electric customers	Residential: 5 million Commercial: 0.5 million	16 million
Total system deliveries **Deliveries to bundled customers**	87 TWh[1] 76 TWh[1]	278 TWh[1]
Renewable Supply	<u>Total: 22.5%</u>[1] Wind: 29% / Solar: 21%	Wind: 1% Solar: < 1%
Total customer solar installations	900 MWs 100,000 customers	Very few
Other businesses	Natural gas transmission and distribution	Natural gas distribution

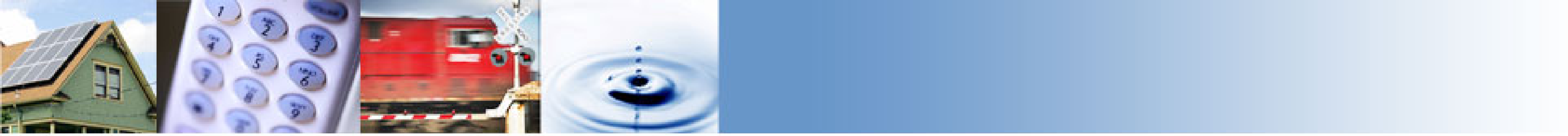
Value Chain Comparison

Footnotes: 1. 2013	CALIFORNIA REPUBLIC	PG&E Pacific Gas and Electric Company		RWE The energy to lead
Generation Capacity[1]	IPP: 50 GW UOG: 26 GW Total: 76 GW	UOG: 8 GW	IPP: 91 GW UOG: 80 GW Total: 176 GW	UOG: 22 GW
Transmission	Operations: CAISO Ownership: Utilities	18,600 miles	Ownership: 4 unbundled operators	None – only minority interest in Amprion
Distribution	6 IOUs 48 POUs	141,000 miles	~900 municipalities	215,000 miles
Retail	Utilities Direct Access (DA) CCA	Utility: 87.6% DA: 10.8% CCA: 1.2% BART: 0.4%	Municipalities (large four power companies have shares in some munis)	143 TWh sold through municipalities with varying degrees of ownership

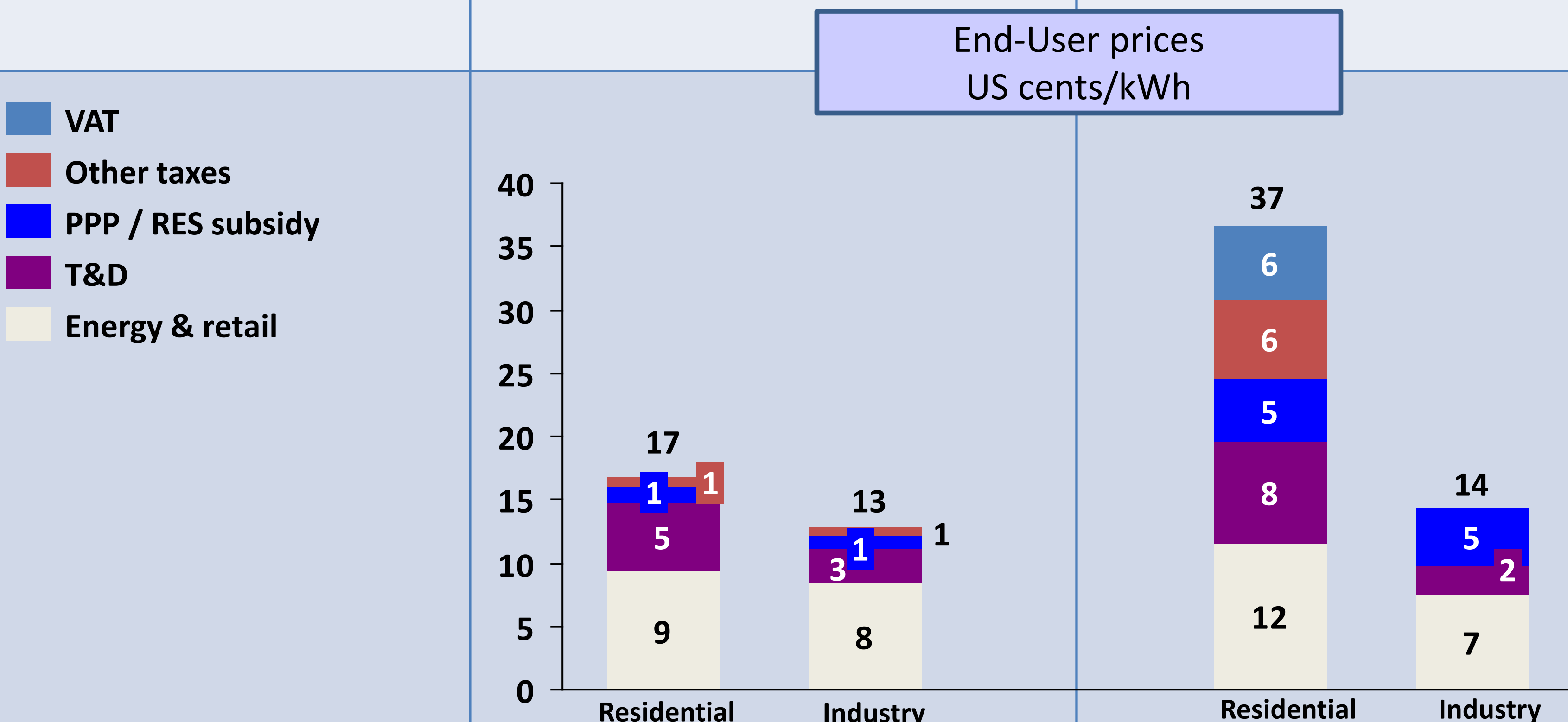


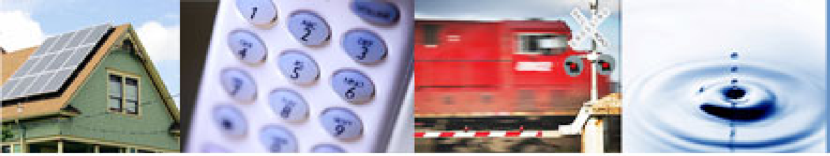
Markets and Organizational Structure

		
Output of conventional plants	Some enjoy “cost-of-service” approach; others sell on merchant basis into ISOs	All dispatched based on variable cost basis through power exchange – no guarantee of investment and fixed cost recovery
Output of renewables plant	Developers depend on long-term PPAs from creditworthy buyers. Generally self scheduled by buyers into the ISO unless curtailed for reliability	Have priority of dispatch (“must run”) but low/zero marginal cost ensures they have priority. Rewarded through fixed FITs and paid for through surcharge on bills
Key organizational units: 1. Conventional gen 2. Renewables gen 3. Power exchange 4. Transmission 5. Distribution 6. Retail 7. Regulation	 Mix of merchant generators (50 GW) and UOG (26GW) Mainly private investors CAISO Utilities 6 IOUs and 48 POUs Utilities, Direct Access and CCA CPUC	 1. Four large generators (all merchant) and industry / municipalities 2. Mainly private investors 3. EEX (“European” Energy Exchange) 4. Four transmission companies 5. 900 municipalities 6. 900 municipalities 7. Bundesnetzagentur (transmission & distribution tariffs); Cartel Authority



End-User Price Structures





Thank you!

For Additional Information:

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