EEPS 517
Energy Crises
(and the World of Energy)

Lecture 6 – German Energiewende

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Week 6

Week 1 – Overview and Course outline

Week 2 – Coal transition in UK & Timber crises in US

Week 3 – Oil Crisis of 1973-74

Week 4 – Oil Crisis of 1979-1980

Week 5 – California electricity crisis & Enron

Week 6 – German Energiewende

Week 7 - Chernobyl to Fukushima: Nuclear accidents and their aftermath

Week 8 - Natural gas disruptions and European experience

Week 9 - Forces of Nature: Hurricanes, Pandemics, Volcano Eruptions, Sun

Week 10 – Australian Energy Crisis: Blackouts, Renewables and Storage systems* (may shift)

Week 11- Climate Change

Week 12 - Turkey’s energy crises and shaping of present energy system

Week 13 - Analytical methods : Building up scenarios, structured analysis and crisis management

Week 14 – Making of the next crisis

Reading List and Resources

Reading:

Energy Democracy: Germany's Energiewende to Renewables, Craig Morris , Arne Jungjohann, 2016, Chapter 1. Energiewende: The Solution to More Problems Than Climate Change

Energy Democracy: Germany's Energiewende to Renewables, Craig Morris , Arne Jungjohann, 2016, Chapter 5. The Power Rebels of Schönau

Energy Democracy: Germany's Energiewende to Renewables, Craig Morris , Arne Jungjohann, 2016, Chapter 7. The 1990: Laying the Foundations for the Energiewende

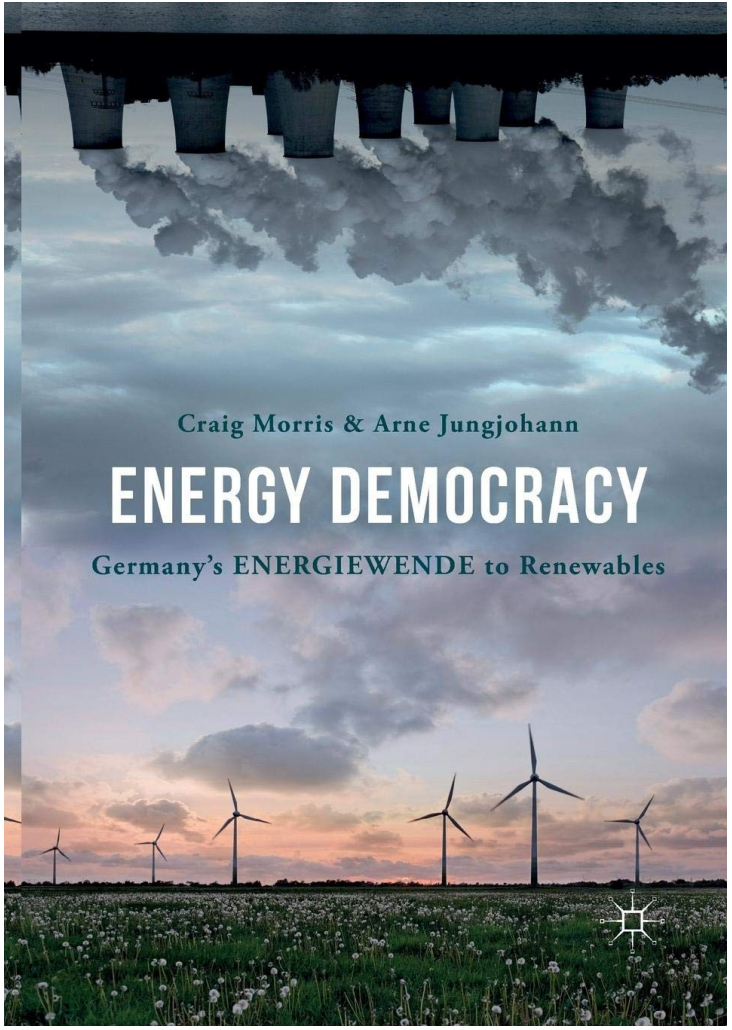
The German Energiewende – History and status quo, Jürgen-Friedrich Hake, Wolfgang Fischer, Sandra Venghaus, Christoph Weckenbrock, Energy, Volume 92, Part 3, 2015, Pages 532-546, ISSN 0360-5442, https://doi.org/10.1016/j.energy.2015.04.027

German energy policy and the way to sustainability: Five controversial issues in the debate on the "Energiewende", W. Fischer, J.-Fr. Hake, W. Kuckshinrichs, T. Schröder, S. Venghaus, Energy, Volume 115, Part 3, 2016, Pages 1580-1591, ISSN 0360-5442, https://doi.org/10.1016/j.energy.2016.05.069

Exporting the Energiewende: German Renewable Energy Leadership and Policy Transfer, Karoline Steinbacher,Springer, Chapter 8 – Case Study California

Overview

- A bit of review
- History
- Energy Democracy Book (Energiewende)
- What are the lessons?
- Student presentations (not included)
- Quiz (as usual)



Why?

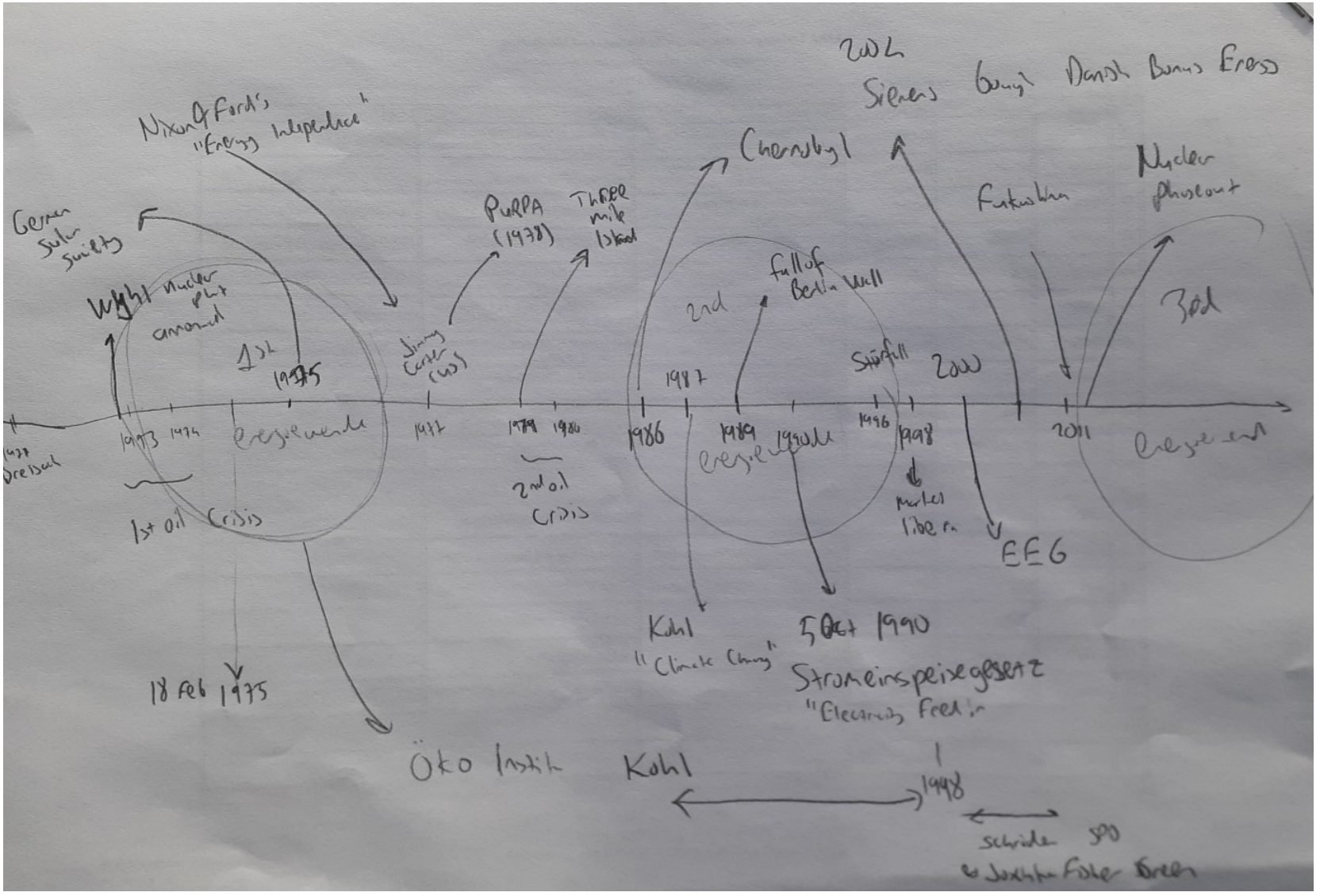
- Energiwende : A model renewables transition?
- Is it an industrial strategy shaped by crises?
- Is it a grass roots movements shaped by accidents?
- Is it transferrable?
- A historical example of what we may see in the future?
- Lessons

Guest Lecturers

https://arnejj.org/the-book-energy-democracy/

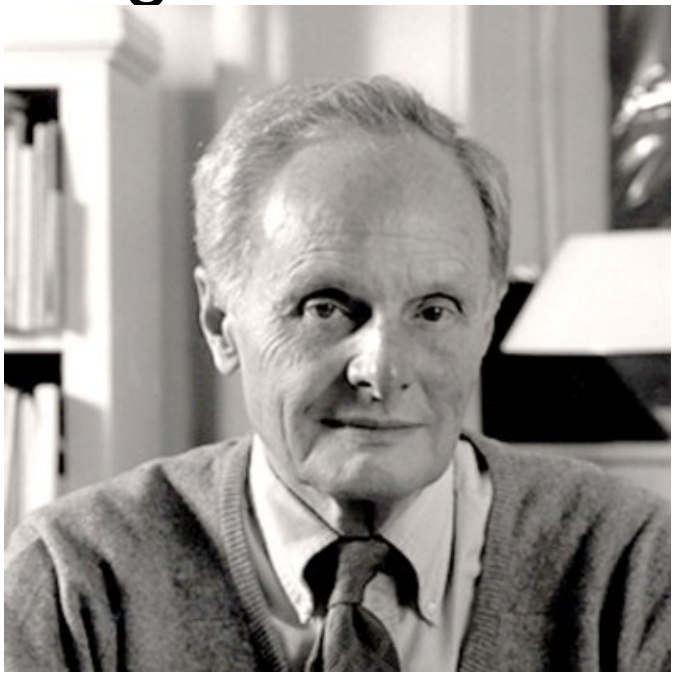
Lessons learned

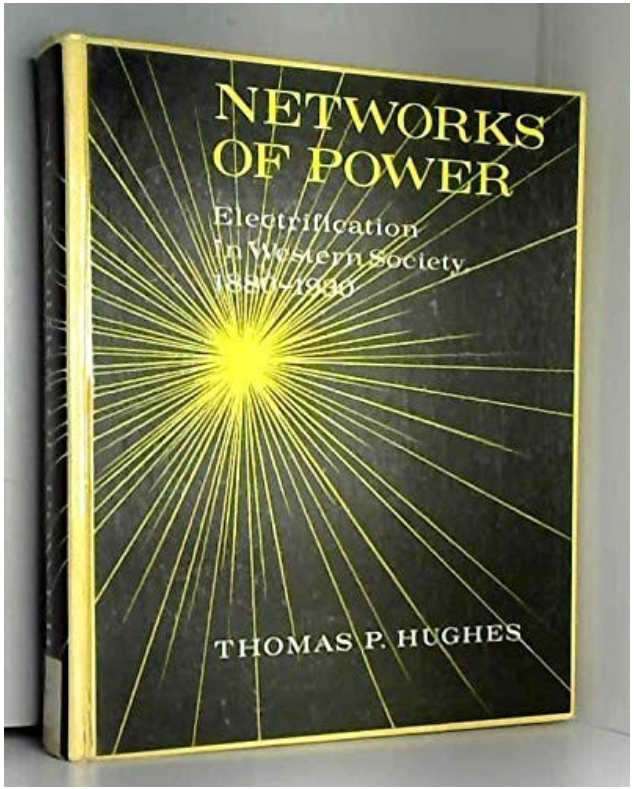
- When demand/supply close to 1
  - Anyone may exercise market power
- The lag in cash flow creates imbalances
- Markets are highly affected by tech change
- Since price is constructed – flaws are inevitable
- Electricity market is not plug&play (grid maybe)


2002
Siemens
Nixon & Ford's "Energy Independence"
Chernobyl
Nuclear phaseout
Fukushima
German Solar Society
PURPA (1978)
Three mile Island
Jimmy Carter (US)
Wyhl nuclear plant announced
1st
1975
2nd
Fall of Berlin Wall
Störfall
2000
3rd
1973
1974
1972
1979
1980
1986
1987
1989
1990
1996
1998
2011
1st oil Crisis
2nd oil Crisis
Market liberal.
EEG
Kohl
"Climate Change"
5 Oct 1990
Stromeinspeisegesetz
"Electricity Feed-in"
18 Feb 1975
Öko Institut
Kohl
1998

Networks of Power: Electrification in Western Society, 1880-1930."

- Thomas Hughes

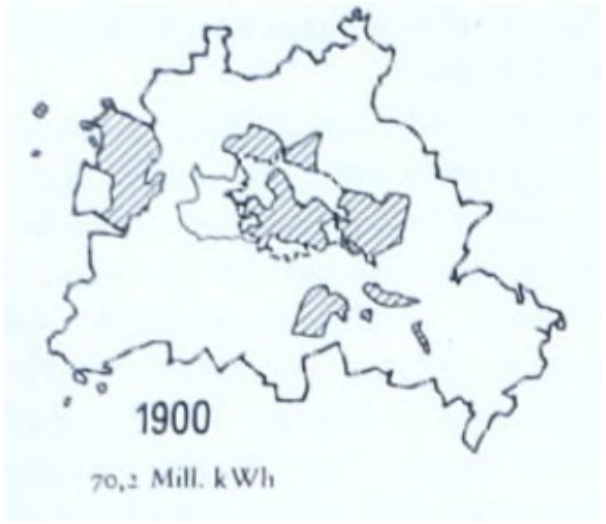




http://news.mit.edu/2014/tom-hughes-remembering-non-lifer

Berlin - Elektropolis

- Berlin was the center of “electrical technology”
- 40-50% of all electrical engineers



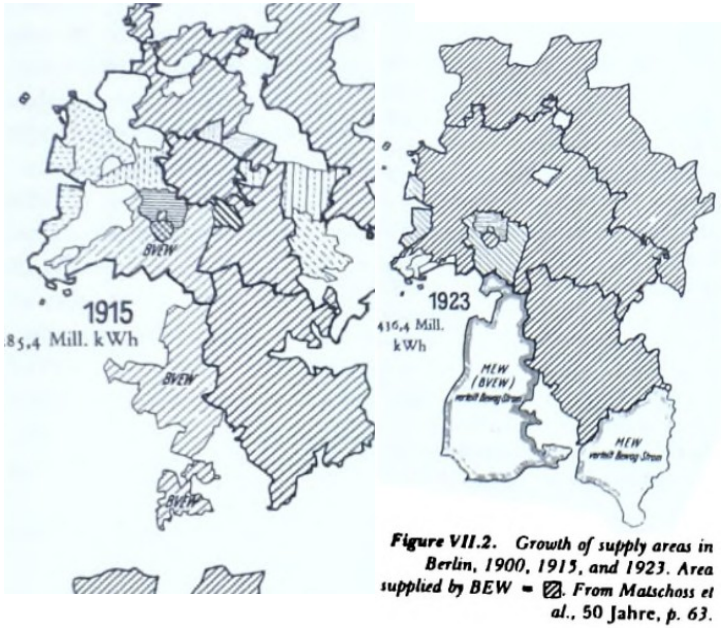


Figure VII.2. Growth of supply areas in Berlin, 1900, 1915, and 1923. Area supplied by BEW = ▨. From Matschoss et al., 50 Jahre, p. 63.

CHAPTER VII

Berlin: The Coordination of Technology and Politics

Networks of Power, T.P.Hughes

Major Companies

- AEG
- Siemens

Figure V.14. Oil-filled, three-phase transformer used in the Lauffen-to-Frankfort transmission system. From Offizielle Zeitung . . . Frankfurt am Main 1891, *p. 1045.*

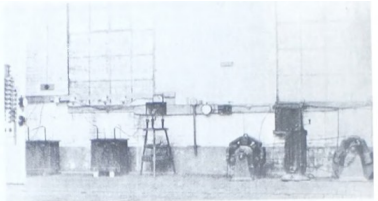


Figure V.15. Model designed by Charles E. L. Brown for testing alternating-current transmission system (January 1891): Generator (center); *two oil-insulated transformers* (left); *and motor* (right) *which drove the generator. Courtesy of Brown, Boveri & Co., Baden, Switzerland.*

Figure V.16. Three-phase motor designed by Dolvo-Dobrowsky (the type used in the Lauffen-to-Frankfort transmission system). From Offizielle Zeitung . . . Frankfurt

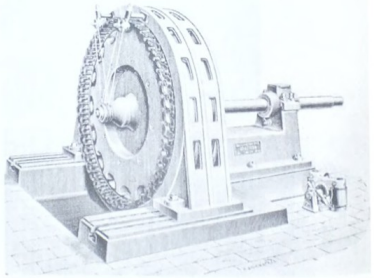


Figure V.17. Three-phase generator (designed by Charles E. L. Brown of the Maschinenfabrik Oerlikon) driven by water turbines at Lauffen. From Offizielle Zeitung . . . Frankfurt am Main 1891, *p. 599.*

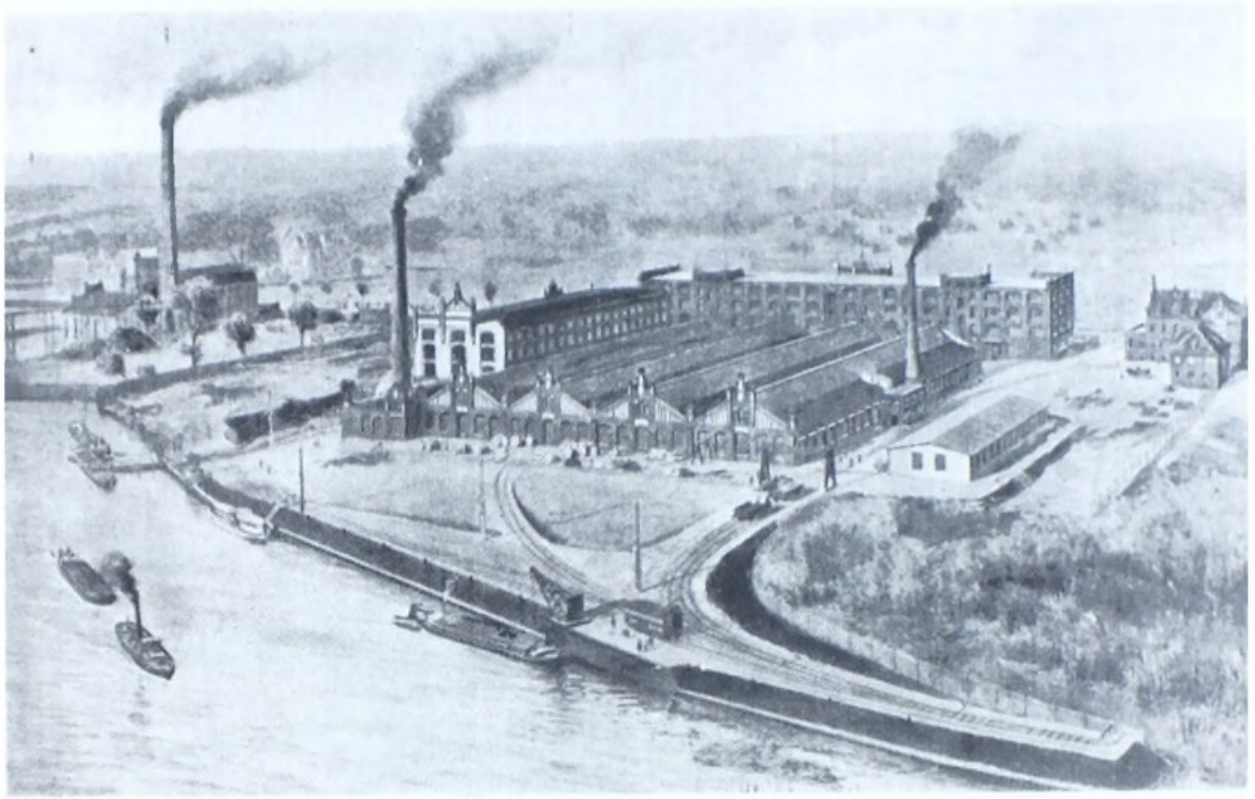
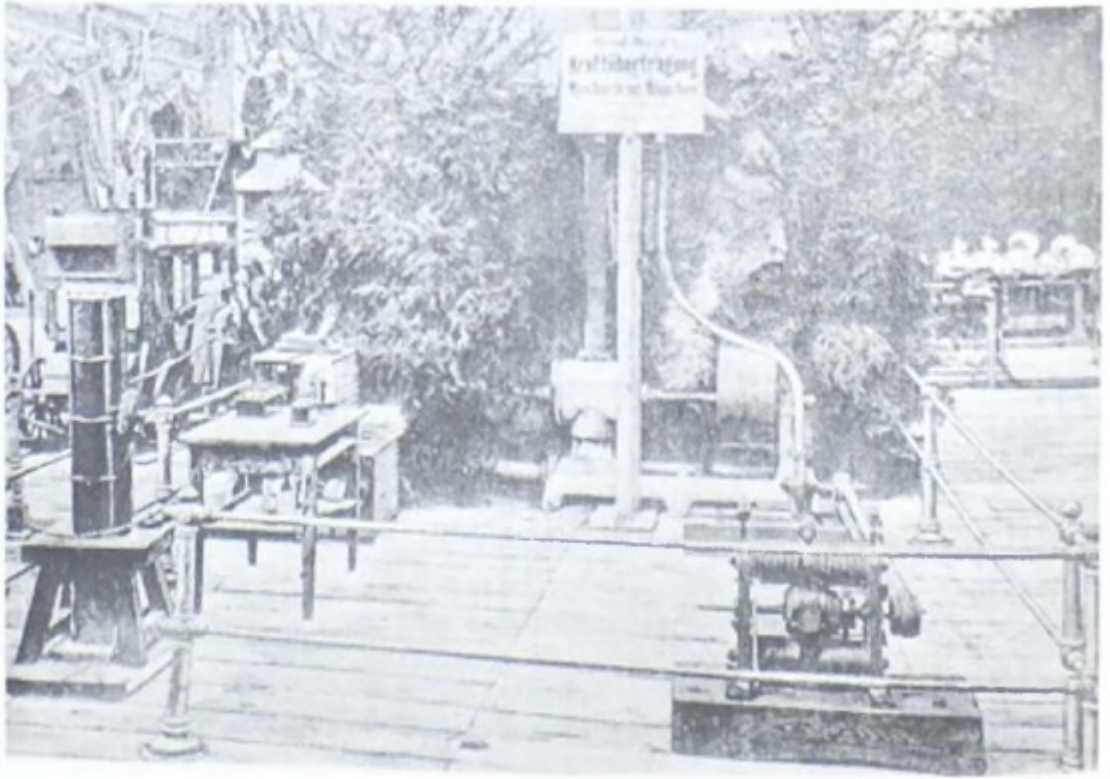


Figure VII.8. *The polyphase central station at Oberspree* (left) *and the AEG Cable Works, its primary load* (right), *1897. From Matschoss et al.,* 50 Jahre, *p. 30.*

Networks of Power, T.P.Hughes

1882 - Munich

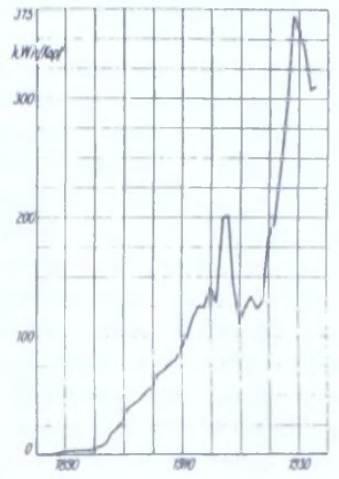
NETWORKS OF POWER



Electricity consumption in Berlin

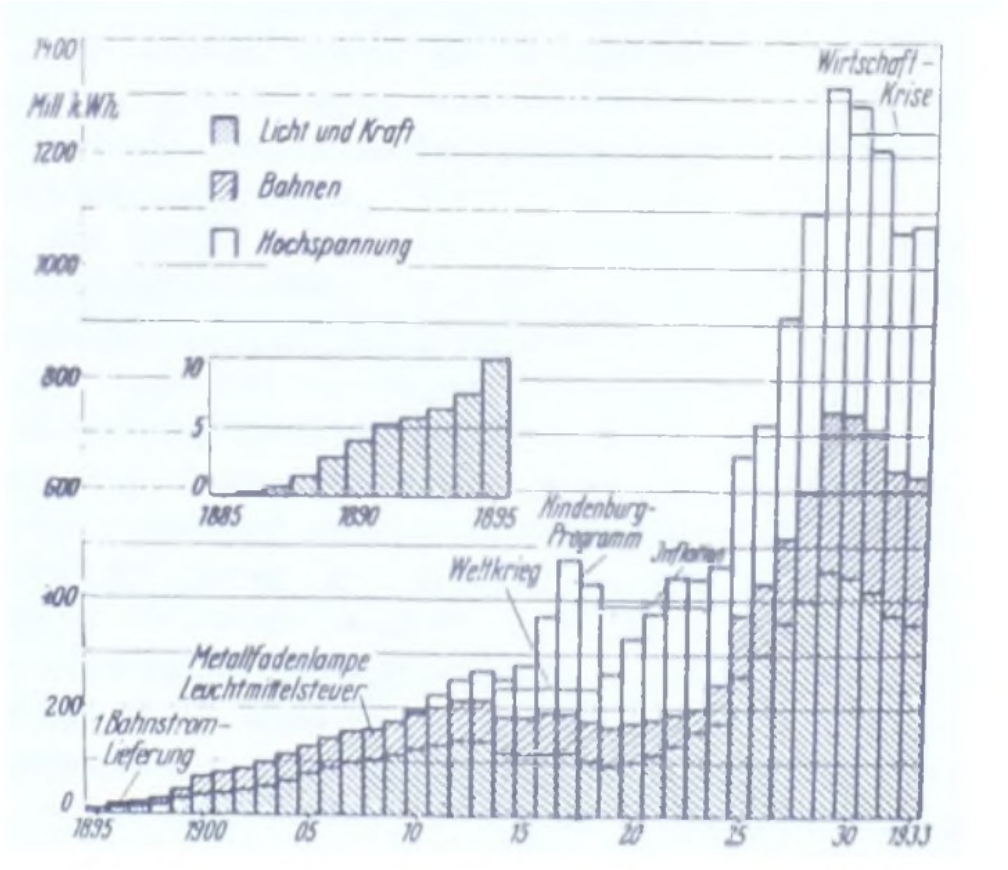
Figure VII.5. *Increase in electricity consumption in Berlin: Percentage of Berlin households connected* (table left); *increase in kilowatt-hours consumed per capita* (graph right). *From Matschoss et al.*, 50 Jahre, *p. 56.*

Jahr	angeschlossene Berliner Wohnungen vH
1910	3,5
1914	5,5
1918	6,6
1922	11
1925	25
1927	50
1928	55
1929	60
1930	68
1931	70
1932	74
1933	76



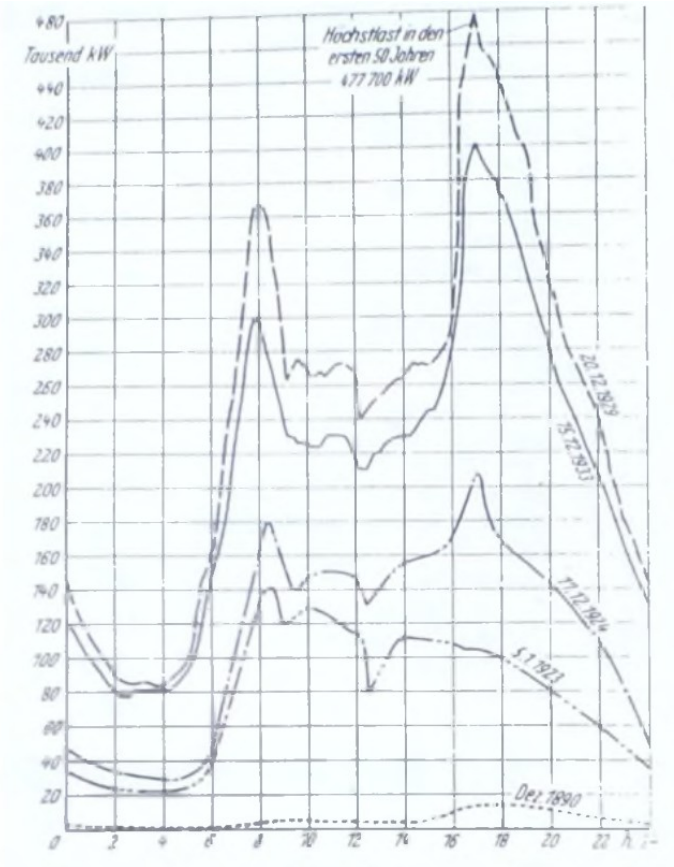
Electricity Consumption - Berlin

Figure VII.6. *Development of various loads. BEW: Light and power* (Licht und Kraft); *electric traction* (Bahnen); *and high-voltage transmission* (Hochspannung). *From Matschoss et al.,* **50 Jahre**, *p. 89.*



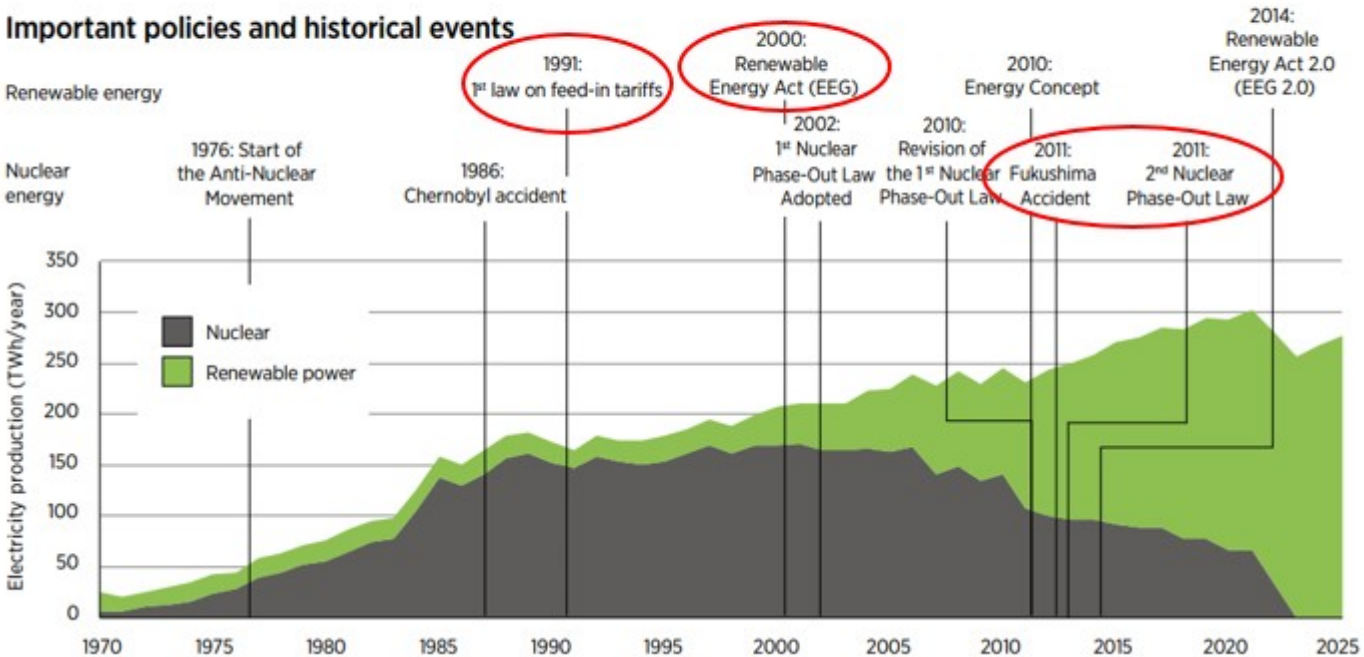
Electricity Consumption in Berlin

Figure VII.7. *BEW load curves on days of highest load* (Höchstlast). *From Matschoss et al.,* 50 Jahre, *p. 71.*



Events

1. Take away: There is no silver bullet.



End of Lecture 6