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Infrastructures of consumption and changing user role

Energy Business and Innovation (21E16100)

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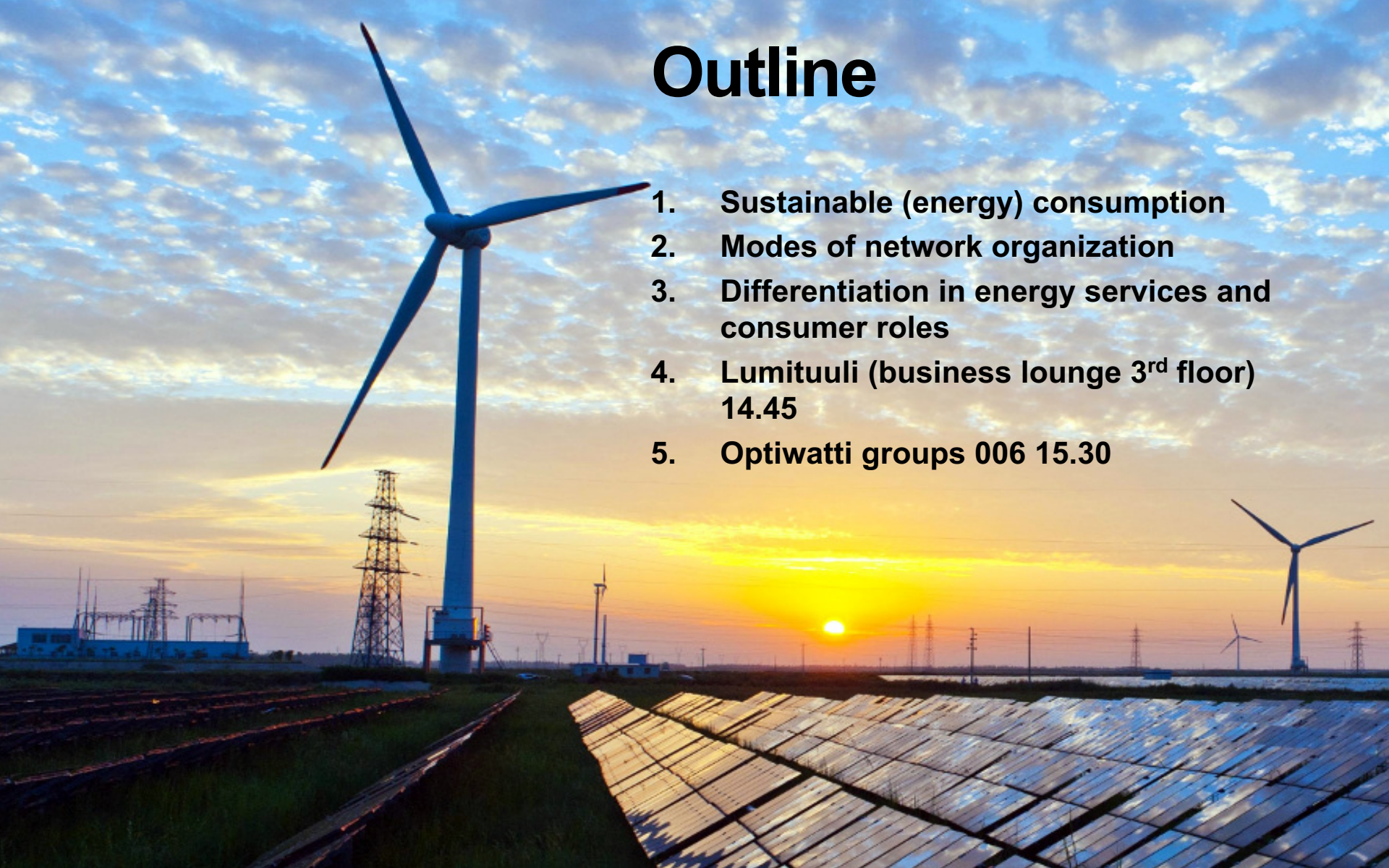

Outline

1. Sustainable (energy) consumption
2. Modes of network organization
3. Differentiation in energy services and consumer roles
4. Lumituuli (business lounge 3rd floor) 14.45
5. Optiwatti groups 006 15.30

1. Sustainable (energy) consumption?

Why consumption on unsustainable levels?

- **It's widely believed that current levels of consumption are unsustainable**
- **Capitalist system of production and resource distribution**
  - Profit before ecological concern.
  - Economic growth as the key indication or social progress.
  - Advertising and marketing of mass manufactured goods driving increased consumption.
- **Identity and social status are anchored through one's role in a moral community**
  - Consumption shapes and maintains our identity
- **Contemporary ordering of ways of life**
  - Individuals have little option but to consume in unsustainable ways if they want to participate fully in society.
- **Limited autonomy of the consumer**

Southerton, D., H. Chappells, and B. van Vliet. 2004. *Sustainable Consumption: The Implications of Changing Infrastructures of Provision*. Cheltenham: Edward Elgar.

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What is sustainable consumption?

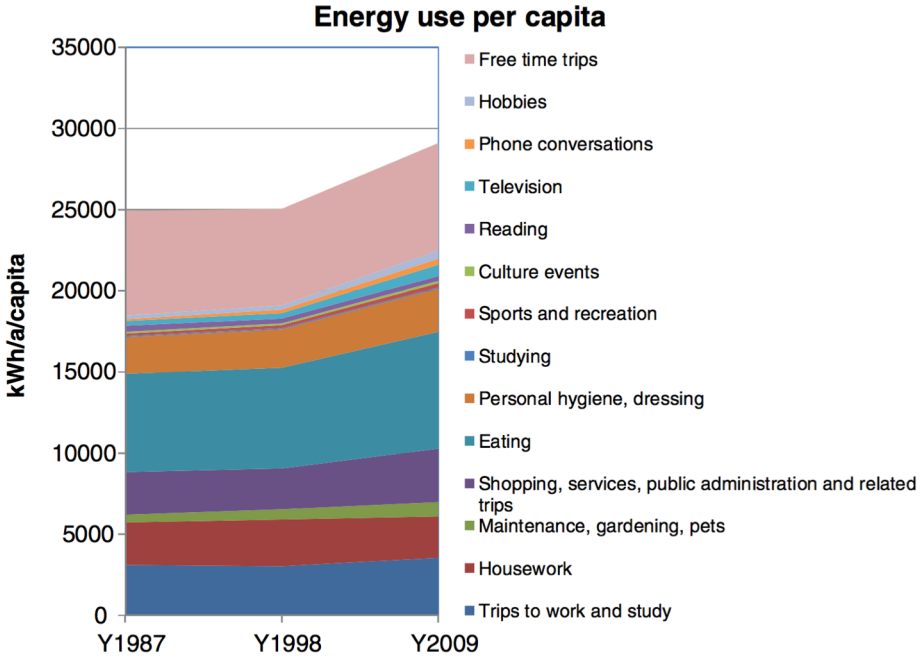
An energy consuming issue

- **This is business and innovation course (inherently company viewpoint). Why do we talk about consumption?**
- **Consumption is predominantly understood in too individualistic terms**
  - Problem if the objective is to create sustainable behavior (meet the needs of the present without compromising the ability of future generations)
  - Focus on actions and decisions of individual consumers – consumer choice.
  - Policy makers and market instruments have a narrow view of the users (assumption of a consumer who makes conscious rational choices)
- **Changing systems of provision from monopoly providers to competition in liberalized markets.**
  - New possibilities for business and sustainability reform
  - Solution is not just technological efficiency
  - We need institutional change: new types of relation between supply and demand, redesign of links between utilities and users

Raising consumption

- **Regardless of progress towards more energy – efficient appliances overall levels of energy consumption continue to raise.**
  - Increased usage or tech
  - New tech
  - Rebound

Activity specific embedded energy requirements of consumption expenditures in Finland (heating energy not allocated!)



Infrastructures shape consumption

- Actions of individual households are directly dependent upon the infrastructures to which they are attached
- Large technological systems in shape consumption
- Contemporary household routines suppose the existence of constant uninterrupted supply of energy and water supply and waste management.
  - Interruption of supply poses wider consequences
  - Precondition for successful modern life
  - Consumption is routinely invisible (traditionally bill have come months later than consumption occur)
- Sustainable consumption talk and environmental policy usually focus on isolated technical fixes:
  - Eco-efficient devices (note rebound effect).
  - Allow people to maintain current lifestyles and practices.

What is special in infrastructural consumption e.g. energy?

- **Consumption is routinely invisible**
- **Utility bills come after consumption (energy smartmeters have not really changed anything)**
- **Energy is used in course of achieving services (cooking, heating…)**
- **Wide range of technologies involved**
- **Importance of social and cultural norms and conventions**
  - Comfort, cleaniness, convenience

Sustainable consumption – 3 ways or conceptualizing

1. Individual action leads to change

- The fate of the planet depends upon the cumulative consequences what people do.
- Idea of autonomous shoppers.
- Idea that consumers respond to social, economic or psychological stimuli
- Design packages of incentives, information, signals and these generated desired form of behavioral change
- Green consumer practice reflects underlying values and commitments

Sustainable consumption – 3 ways or conceptualizing

2. Influencing the environmental options on offer

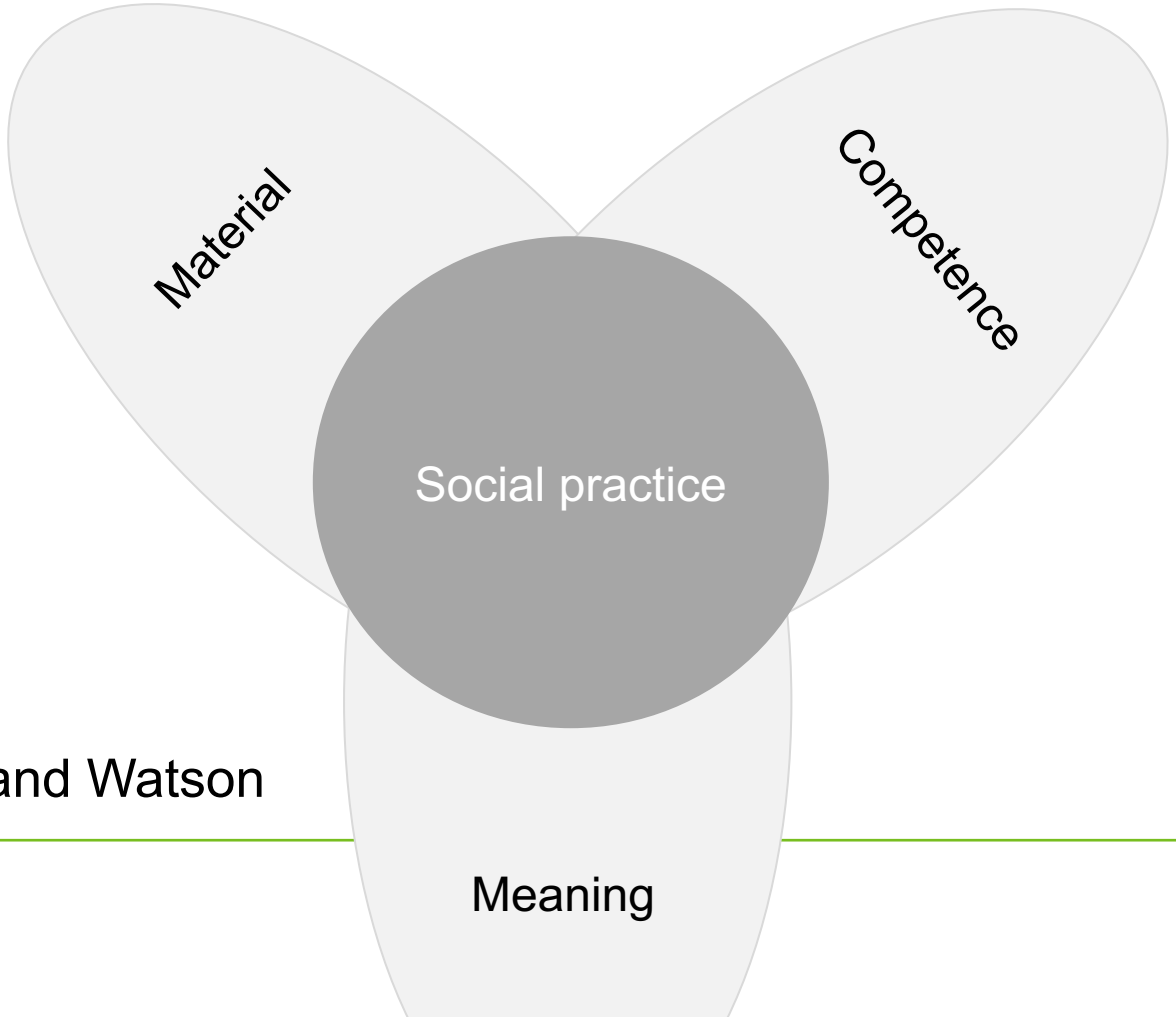
- There is more to consumption than shopping
- Green consumers do not have power and potential to shape the range of options on offer
- People are not just end-consumers entirely isolated from the production process. They participate in the organization of production-consumption cycles.
- Policy should not limit itself to consumer behavior on the market
- Importance of intermediary organizations and systems

Sustainable consumption – 3 ways or conceptualizing

3. Reproducing more and less sustainable ways of life

- Consumption is woven into everyday life
- Moves focus from moments of acquisition to routines of use (practices)
- People are practitioners rather than consumers
- Different forms of consumption are more sustainable than others. It's important to change conventions of everyday life.
- Sustainable consumption requires and depends upon the development of correspondingly sustainable socio-technical regimes.
- Important to recognize turning points at which socio-technical trajectories might be nudged to different direction

Social practice and changing social practice



Shove, Pantzar and Watson

2. Modes of network organization

van Vliet, B., H. Chappells, and E. Shove. 2005. *Infrastructures of Consumption: Environmental Innovation in the Utility Industries*. London: Earthscan.

Modes of network organization and contexts for consumption

1. Autonomous
2. Piecemeal
3. Integrated
4. Universal
5. Marketized

What are the key characteristics?

How differs from previous one (if there is any)?

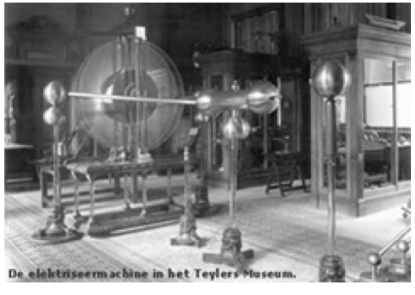
Role of provider and consumer?

Historical notes (optional)?

Modes of network organization and contexts for consumption

1. Autonomous,

- This mode of organization revolves around a model of demand management in which self-providers meet their own needs
- Demand and management in which self-providers meet their own needs. Local supply.
- Log wood -> dry it-> heat fireplace
- Cf. modern concept of “prosumption”
- Full control in consumer/user hands.

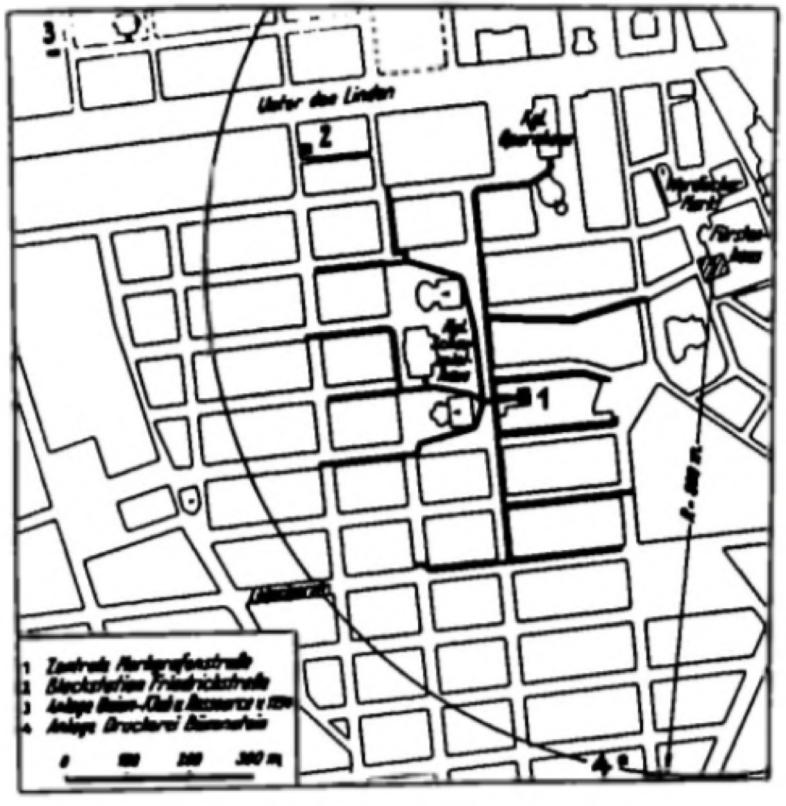


2. Piecemeal

- Built around localized supplies.
- A key difference is that independent suppliers are involved in providing services to a somewhat extended customer base.
- Typical of this mode are the electricity systems developed by private companies and municipalities during the early 1900s in the UK and The Netherlands.
- These initially incorporated small generating sets designed to provide lighting services to limited numbers of commercial and domestic consumers in urban centres.

Autonomous’ modes require consumers to act as the co- managers of demand, ‘piecemeal’ systems shift the balance of control toward the provider.

Hughes, T. P. 1993. *Networks of Power: Electrification in Western Society*. London: Johns Hopkins University Press.



Distribution system, Berlin, 1885. From Matschoss et al., 50 Jahre, p. 13.

Modes of network organization and contexts for consumption

3. Integrated,

- Importance of load factor
- The centralized coordination and management of loads
- Target to achieve an acceptable load factor on the assumption that optimal efficiency meant maximizing the utilization of network capacity as a whole

$$f_{Load} = \frac{\text{Total load}}{\text{Maximum load in given time period}}$$

Modes of network organization and contexts for consumption

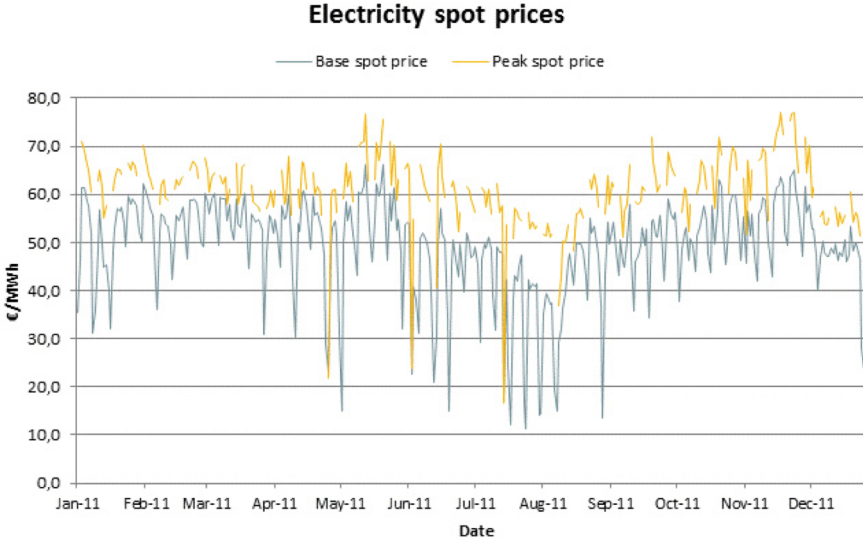
4. Universal

- Expansionary approaches dominated electricity management in Europe from the 1950s up to the 1970s
- Grids were incrementally extended and interconnected
- Demand had to be generated in order to sustain these systems of mass production.

Modes of network organization and contexts for consumption

5. Marketized

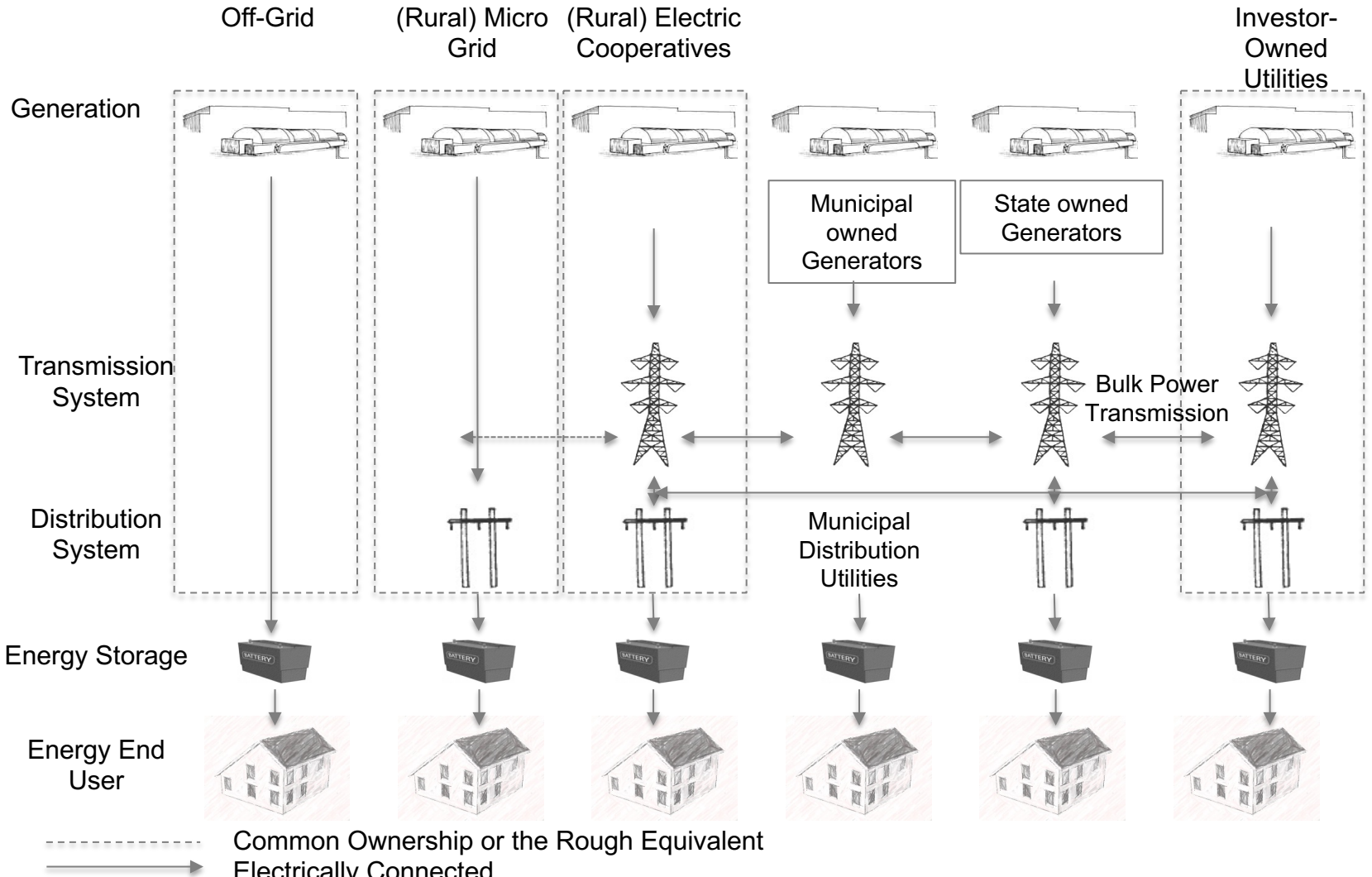
- The privatization of public service monopolies
- The associated restructuring of generation, distribution and supply networks has inevitably had a significant influence on how demand is coordinated and managed nationally and regionally
- Privatized utilities have developed a closer interest in the operational efficiency of their networks
- Demand is understood as a complex of highly differentiated loads that can be managed or manipulated through market mechanisms



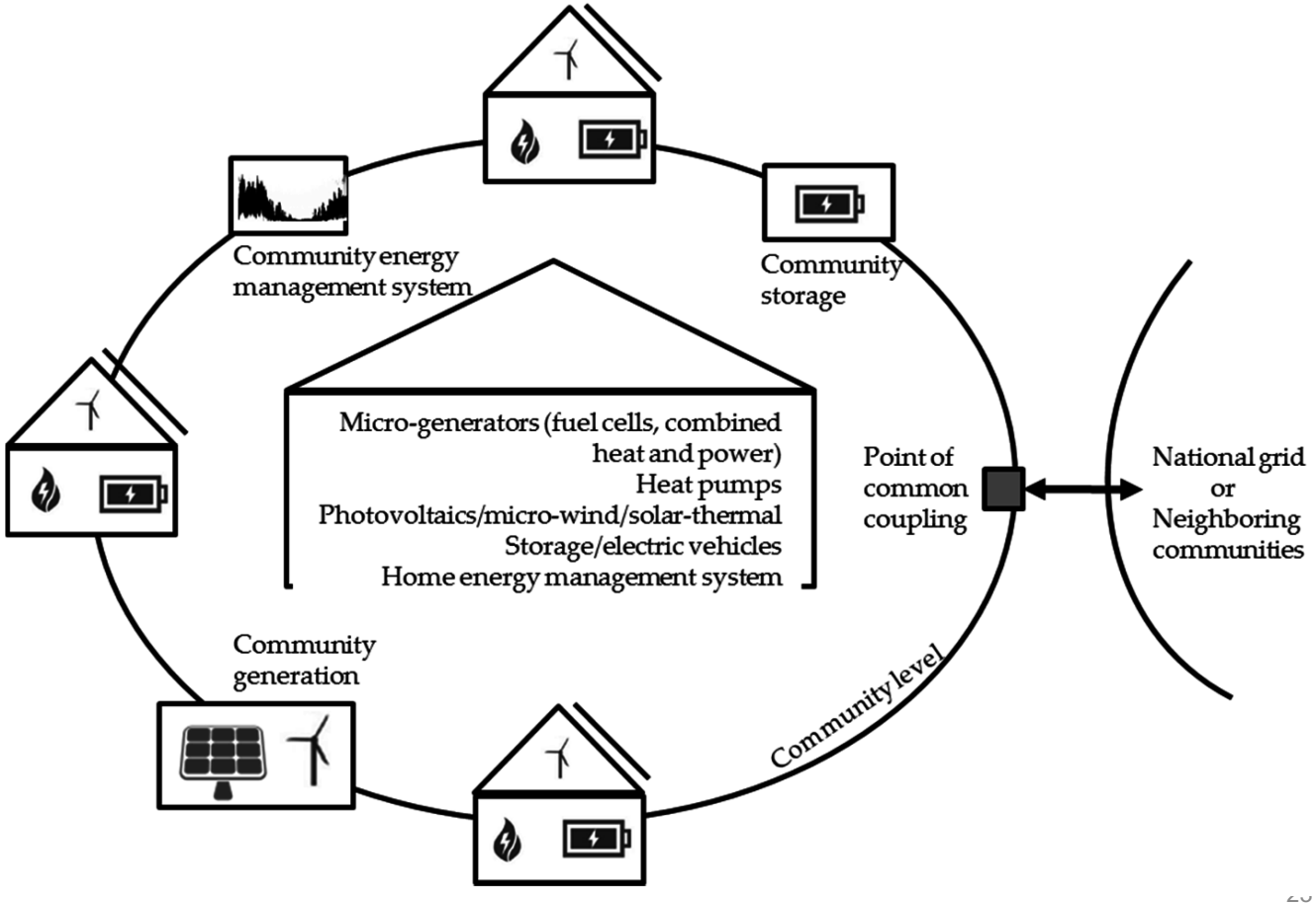
Modes of network organization and contexts for consumption

Mode of organization	*Autonomous*	*Piecemeal*	*Integrated*	*Universal*	*Marketed*
Representation of consumer–provider roles	Co-providers of highly localized resources	Customers and suppliers of newly created services	Consumers and promoters of diversified demand	Passive beneficiaries and public providers of uniform services	Purchasers and promoters of differentiated products and services
Supporting infrastructural arrangements	Stand-alone self-managed grids at local scale	Patchwork of local grids providing unregulated and non-standardized services	Semi-integrated grids connecting 'compatible' loads at local and regional scale	Highly integrated national and regional 'super grids' delivering uniform resources	Partially fragmented grids matching the socially and economically defined needs of diverse utilities and users
Representation of consumption	Personal and collective need to be negotiated and managed in-house	Customer defined need to be met	Diverse needs to be nurtured, coordinated and combined	Universal and non-negotiable need to be met	Highly negotiable needs to be manipulated and managed
Model of demand management	Responsive and reflexive	Manufacture and meet	Diversify and develop	Predict and provide	Monitor and manipulate

Infrastructure and networking



Energy autonomy



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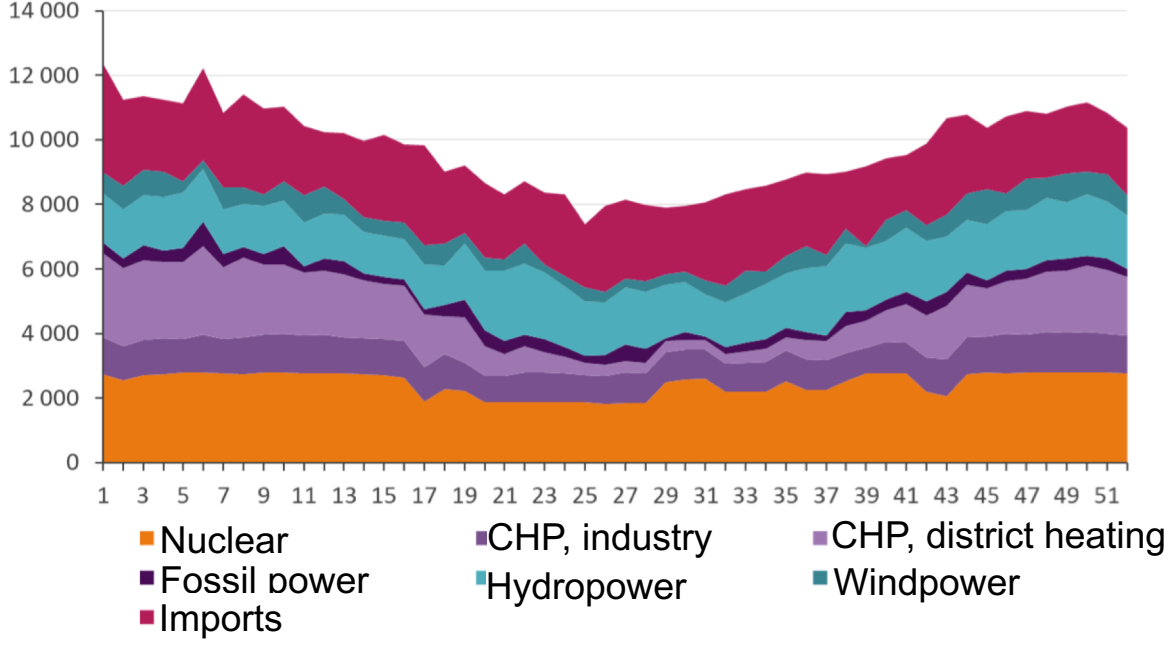
Why energy autonomy matters or does it matter at all?

Energy autonomy: TBL view

Environmental		Economic		Social	
EN1	Achieved energy self-sufficiency.	EC1	Profitability and risk: Profitability of investment in the long term. Financial indicators. Involved economic risk for the owner.	S1	Safe: Stable provision of heat or electricity.
EN2	Achieved carbon emission reductions.	EC2	Affordability and ability to reduce variability in energy costs.	S2	Reciprocal relation between the energy producer and user based on fair contractual agreements.
		EC3	Equitable distribution of economic costs and benefits: ownership structure	S3	Benefits stakeholders and society: e.g. tax revenues
		EC4	Equitable distribution of economic costs and benefits: Goverment subsidies (Who receives and on what basis?)	S4	Development intensity and impact on landscape aesthetics.
		EC5	Potentiality to alter established economic models.	S5	Job creation.
		EC6	Ability to make decisions about future expansion.	S6	Greater participation for users when decision making: e.g. the active participation of citizens in energy production or technological delelopment

Sustainable energy: It's complicated – technologies and countries have different profiles

Emission factor:
Annual average in Finland 89 g CO2-ekv/kWh in 2017



g CO2-ekv/kWh

Technology	Min.	Median	Max.
Currently commercially available technologies			
Coal – PC	740	820	910
Biomass – Cofiring with coal	620	740	890
Gas – combined cycle	410	490	650
Biomass – Dedicated	130	230	420
Solar PV – Utility scale	18	48	180
Solar PV – rooftop	26	41	60
Geothermal	6.0	38	79
Concentrated solar power	8.8	27	63
Hydropower	1.0	24	2200
Wind Offshore	8.0	12	35
Nuclear	3.7	12	110
Wind Onshore	7.0	11	56
Pre-commercial technologies			
CCS – Coal – PC	190	220	250
CCS – Coal – IGCC	170	200	230
CCS – Gas – combined cycle	94	170	340
CCS – Coal – oxyfuel	100	160	200
Ocean (Tidal and wave)	5.6	17	28

3. Differentiation in energy services and consumer roles

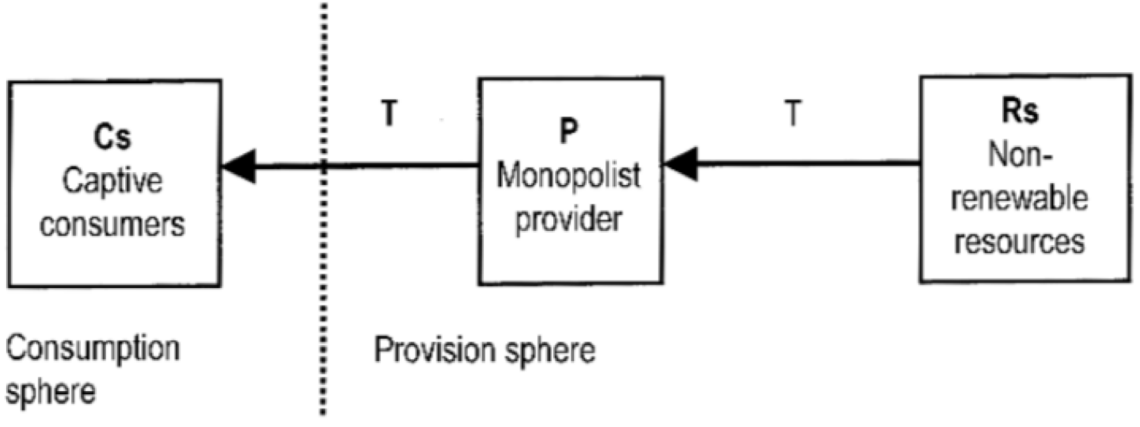
van Vliet, B., H. Chappells, and E. Shove. 2005. Infrastructures of Consumption: Environmental Innovation in the Utility Industries. London: Earthscan.

Differentiation and Choice in Electricity Services

- **The liberalization and deregulation of markets has facilitated the entry of many service options**
  - The result is a consumer choice.
  - We see differentiation strategies and new options such as
    - *green electricity schemes*
    - *variable and fixed tariffs for 'green' and 'normal' electricity*
    - *Traditional utilities and newly established energy companies.*
- **Next:**
  - Categorization of four possible types of differentiation in utility systems.
  - Not only to a greater selection of products or tariffs, but also to the new consumer and provider roles associated with novel forms of provision.
  - Differentiation constitutes a landscape of provision quite unlike that associated with nationalized or Fordist systems of utility organization.

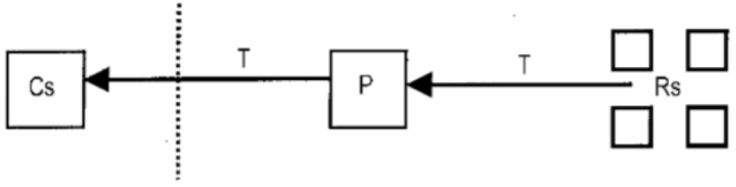
Form of differentiation in utility systems

A large technological system linking natural resources, providers and consumers

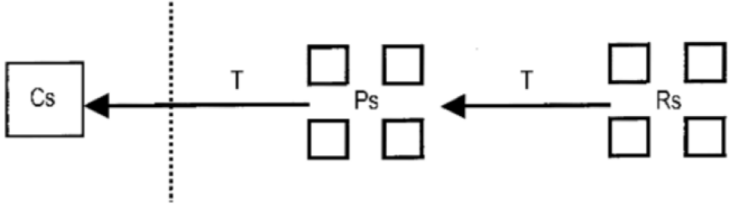


Differentiation on provision side

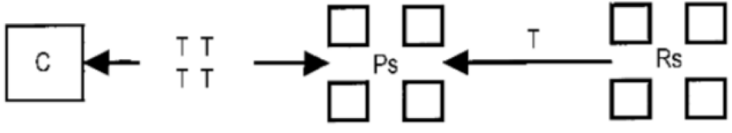
Differentiation of resource use



Differentiation of providers



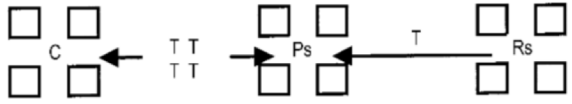
Differentiation of mediating technologies



Differentiation of consumer roles

Captive consumers

- Normally associated with monopolistic modes of provision.
- Although it might be possible to choose between providers, switching supplier can be difficult due to high transaction costs, obligations to use provider-specific meters or because information on tariffs and conditions are not transparent

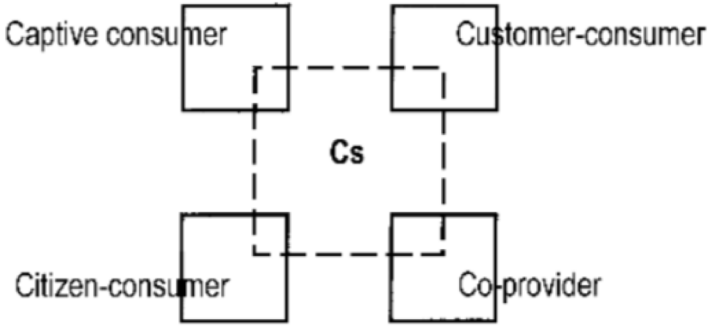


Customers

- Consumers now have some choice between competing providers and services.
- Developing new products and services and in strengthening customer relations.

Citizen-consumers

- Environmentally conscious citizens whose actions are informed by social or environmental goals.
- Differented products for specific segments: Green electricity schemes



Co-providers

- New technological and institutional opportunities enable consumers to generate electricity on th own.
- Consumers with solar panels on their homes provide some of their own energy services

Summary

Consumption is more than rational independent choices between the shop selves.

Energy markets and utilities have gone through liberalization but there change is not over.

You can look consumers inside energy networks in many different ways. When designing new services it helps to understand what users really do i.e. help in changing the whole energy system.

Assignment 1

Personal energy consumption, infrastructure and change

The main topic of this assignment is to think your personal energy consumption. Write about the following sub topics. What options do you have to reduce your energy consumption or impact to your energy choices? How infrastructures have an impact your possibilities of change? What are the low hanging fruits for you to change your consumption? What innovation would help your everyday consumption, change your behaviour?

Deadline 1st of May.