

Energy and Climate

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My background

- Master of science DTU
- PhD Reactor Physics Risø
- Head of Business Development Elsam (Former Danish Power Company)
- Vice President Business Development DONG Energy Generation
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Conclusion

Research, Innovation and Education

- There is an enormous need for research in new Power Systems and new Energy Technologies
- Money is not the main issue - We have to reorganize the energy sector in a way, in which engineers regain influence
- We can wait for the system to collapse, or we can try to convince society and the politicians of the need for these changes
- Universities should play an important role in convincing politicians about the need for organisational changes. This requires
 - very pedagogical explanations of complex technical problems
 - multidisciplinary collaborations at university level

Contents

- History (Liberalization has changed the organisation of the energy sector dramatically)
- Status (Economists are not impressed by technical visions, they are focusing on the short term business cases)
- Example: Smart Grid in Denmark
- Conclusions

The power utilities in 1950-1970

Engineering pioneers designed the power system based on long term technical visions



Specialists (System)

Specialists (Production)

Specialists (Grid)

Data/communication

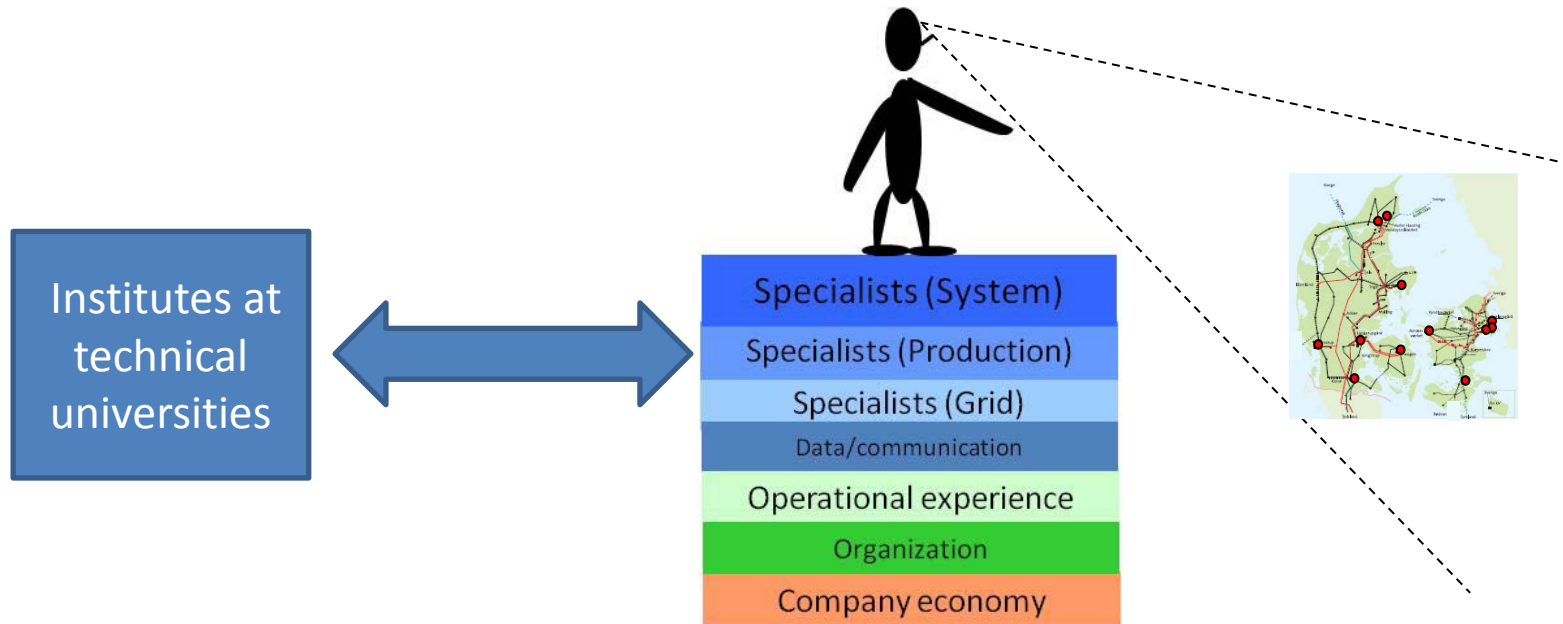
Operational experience

Organization

Company economy

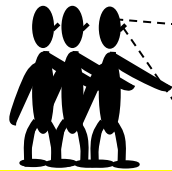
1950 – 1970

The utilities had strong relations to technical universities

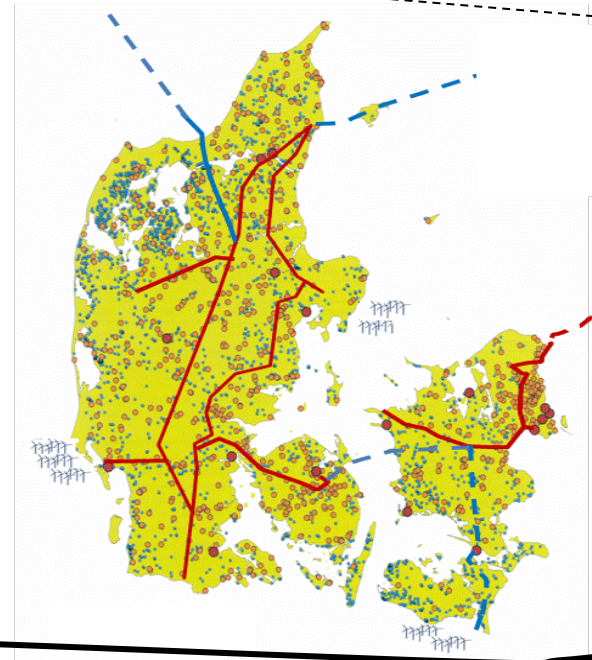
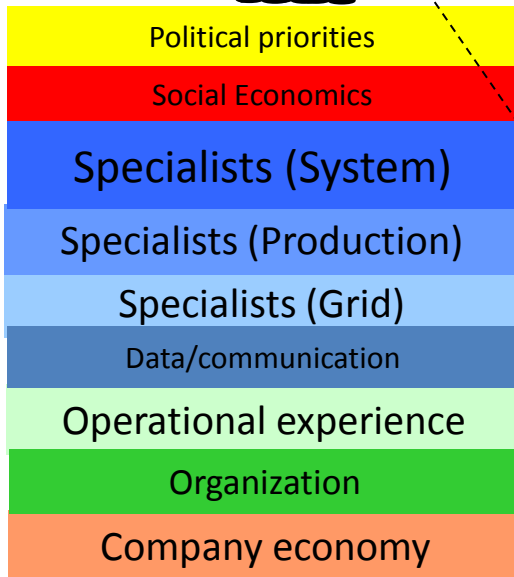


Power System Planning 1970 - 1995

Engineering pioneers with a
“Master degree in Economics”
designed the Power System

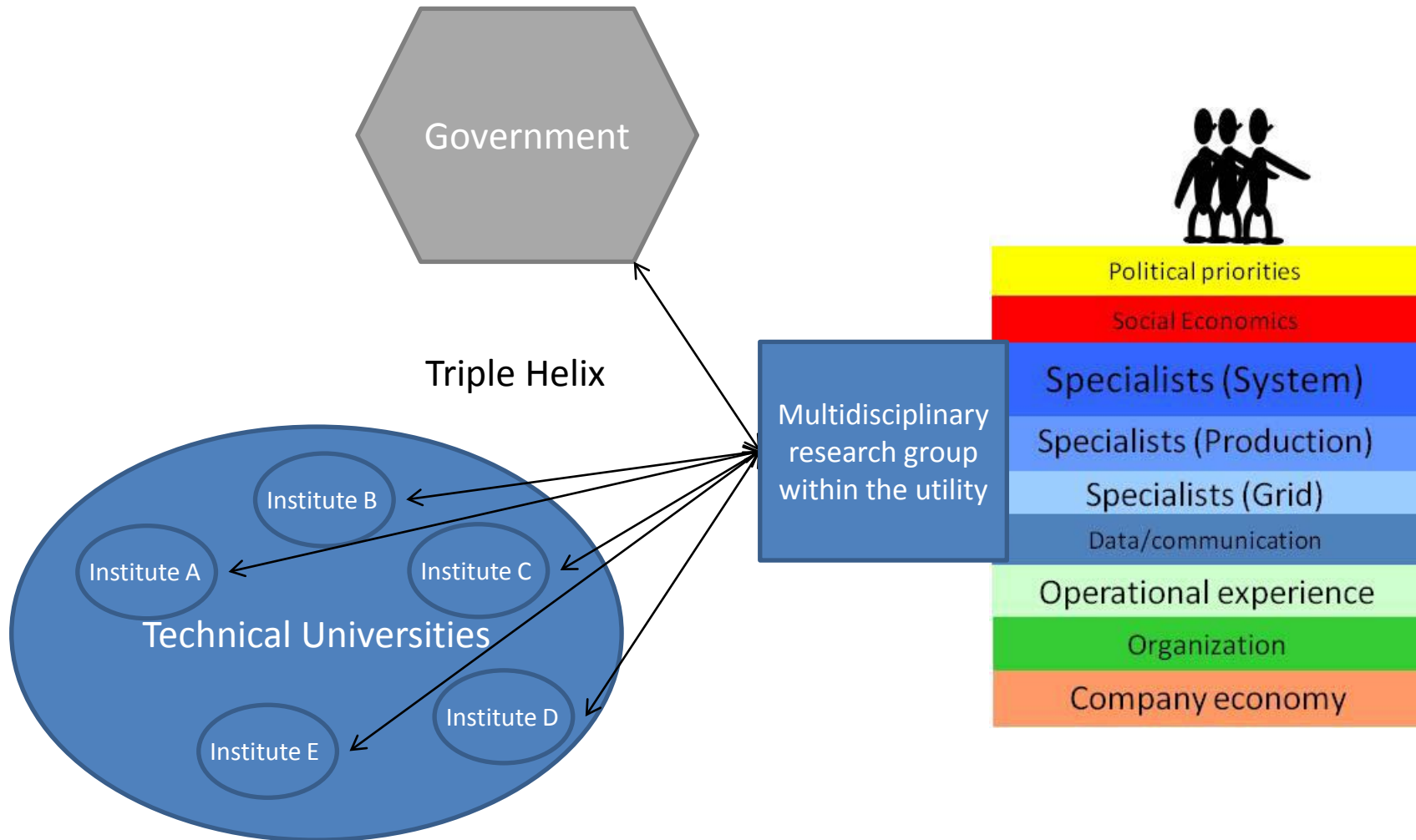


Design of the energy system



1970 - 1995

The utilities had very strong links to technical universities and to government



Liberalization of the energy sector



Political priorities

Social Economics

Specialists (System)

Specialists (Production)

Specialists (Grid)

Data/communication

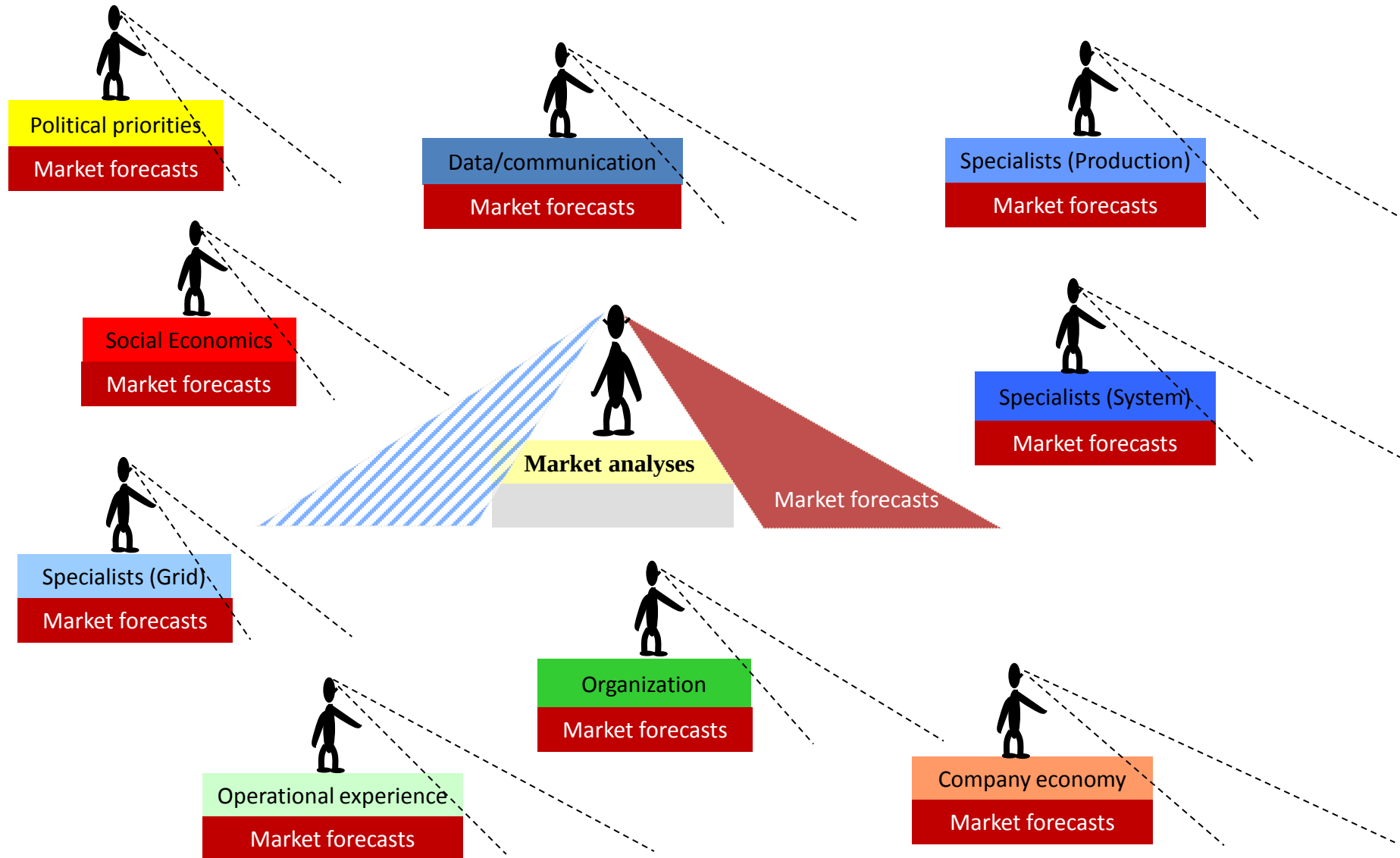
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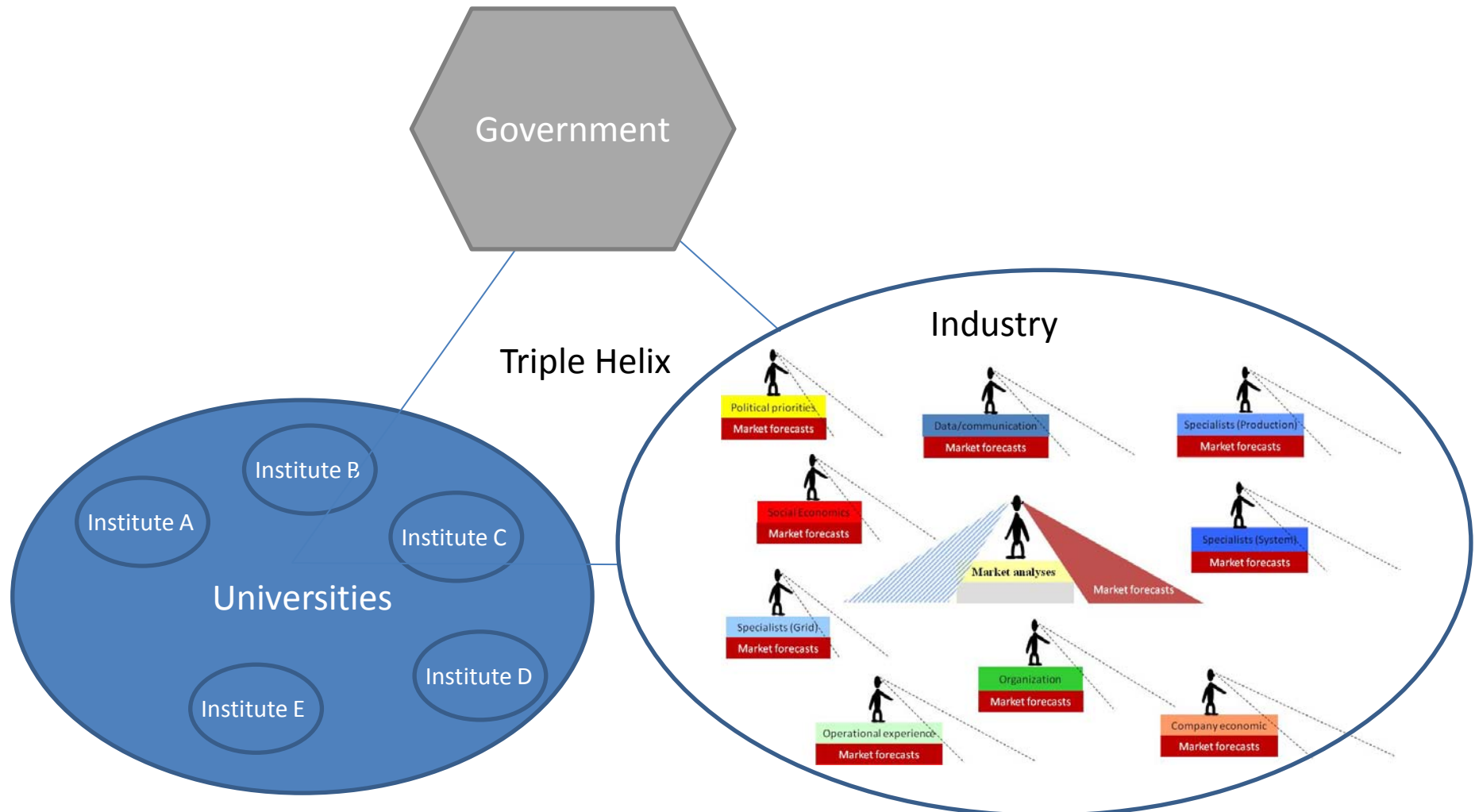
After liberalization

“Market is designing the energy system”



After liberalization

“Market is designing the energy system”



Consequences of liberalization

Before liberalization of the energy sector, the energy companies were managed primarily by engineers, and the decisions were based on detailed modelling of the technical energy system. Engineers with the capacity to also overview company economics, social economics, law, organisation etc. were in charge of the process of designing the development of the energy system. They involved all the other needed competences in the process - still keeping the main technical details as the major part of the decision groundwork

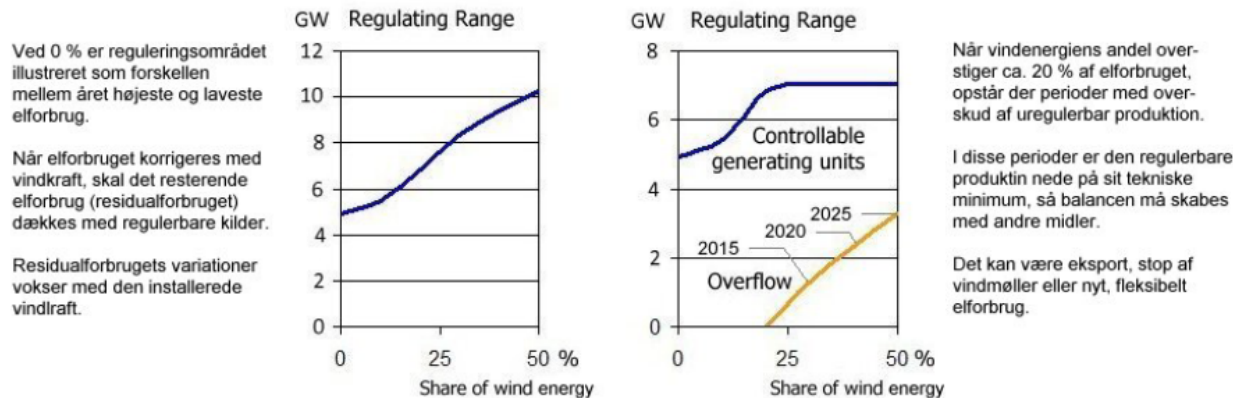
After liberalization the economists have taken over managing the energy sector. They are typically not able to overview the technical system. They therefore evaluate one technology at a time, and use market data which is generated based on prolonging historical data. They are not interested in the complex understanding of the optimal operation of the physical energy system.

The managers with economical background have succeeded in making the existing system more efficient, but they have reduced the efficiency of innovation in the energy sector.

The engineers are expressing their concerns in the report

Smart Grid i Danmark

Bilagsrapport



Figur 23: Reguleringsområde ved stigende andel vindenergi.

Behovet for reguleringskapacitet vokser jævnt med tilgangen af vindkraft.

Der anbefales gennemført mere grundige analyser til kvantificering af behovet for reguleringskapacitet samt kortlægning af potentielle virkemidler, som kan bidrage til reguleringen. Markedsordninger og styresystemer til aktivering af nye reguleringskapaciteter anbefales ligeledes undersøgt.



Executive summary

Smart Grid i Danmark



The technical problems are not mentioned at all

Vejen frem

Vi vil først se den fulde udrulning af Smart Grid om mange år. Men fundamentet skal skabes nu. En række netelskaber er enten i gang med eller planlægger udskiftning af elmålere hos private forbrugere, og udskiftningen af oliefyr med eldrevne varmepumper er allerede godt i gang. I forhold til el- og plug-in hybridbiler ligger den store udbredelse nogle år ude i fremtiden, men der foregår i dag meget arbejde med konceptudvikling, udvikling af ladeinfrastruktur og planlægning af udbygning af hele ladeinfrastrukturen.

Der bør

Faciliteringsfasen (2010-2012)

I perioden fra 2010 til 2012 vil samfundet opleve, at der i stigende grad sker en udbredelse af elektriske varmepumper, og de kommercielle aktører kommer med den første reelle lancering af plug-in hybridbiler.

Ved udgangen af 2012

Denne udvikling gør, at man ved udgangen af perioden skal have et Smart Grid, hvor den grundlæggende infrastruktur til Smart Grid er i place, og systemet er i stand til at håndtere de tekniske problemer, der opstår.

Etableringsfasen

Denne udvikling gør, at man ved udgangen af perioden skal have et Smart Grid, hvor den grundlæggende infrastruktur til Smart Grid er i place, og systemet er i stand til at håndtere de tekniske problemer, der opstår.

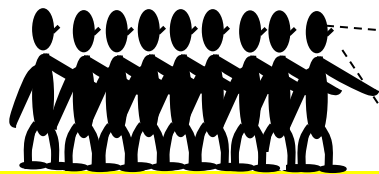
Etableringsfasen (2012-2020)

Fra cirka 2012 til cirka 2020 vil ændringerne på forbrugssiden begynde at tage form, da varmepumperne nu vil have en væsentlig udbredelse, og da forbrugerne så småt er begyndt at købe el- og plug-in hybridbiler.

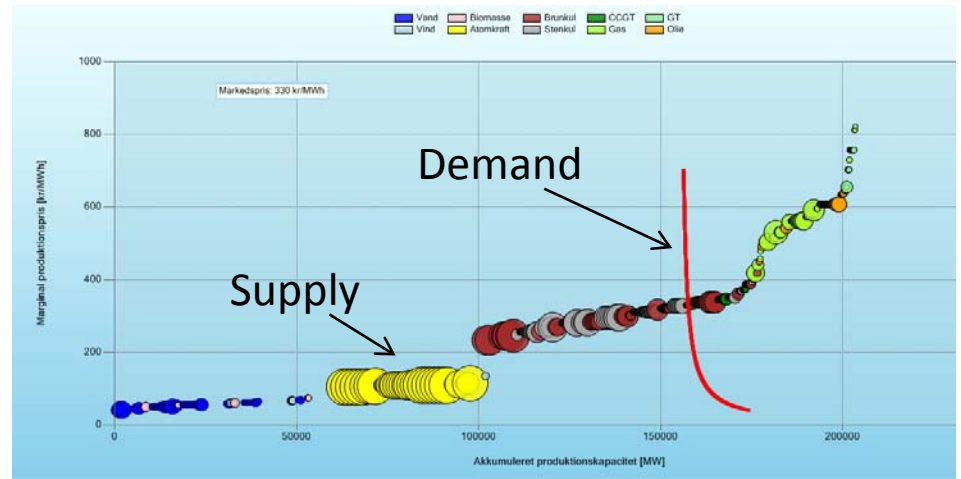
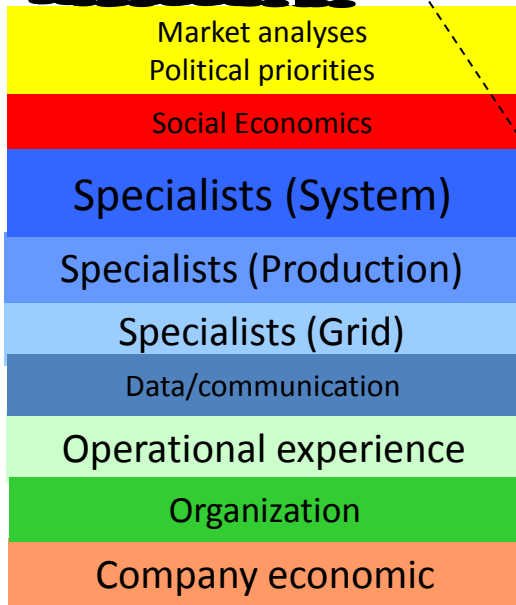
Denne situation gør, at elsystemet kan balanceres via Smart Grid-funktionalitet i form af intelligent og automatisk styring af forbrugernes fleksible apparater samtidig med, at der skal være videreudviklet på Smart Grid-ydelserne, så der nu er en lang række produkter at vælge imellem for forbrugerne.



The Vision

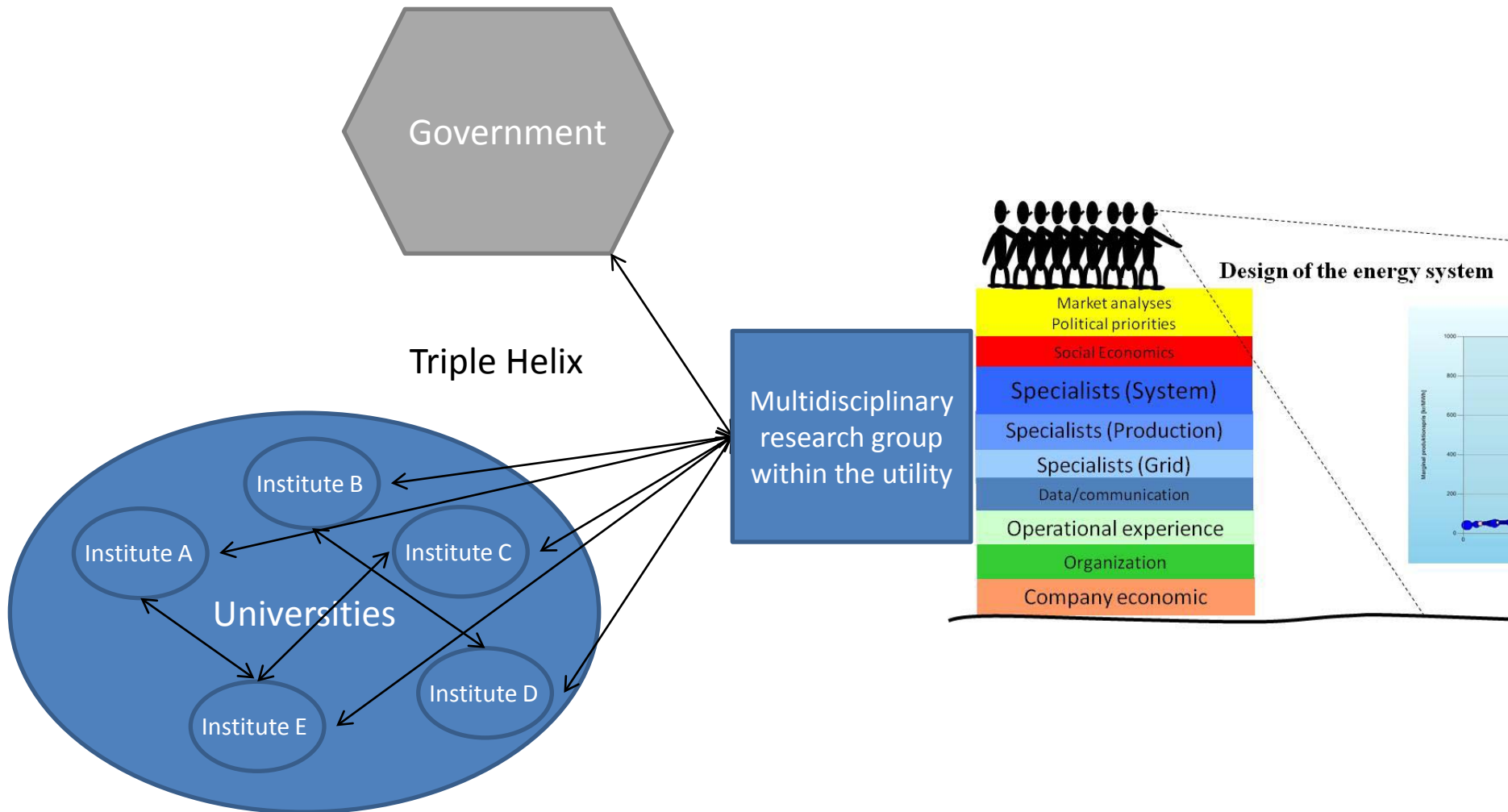


Design of the energy system



Electricity markets

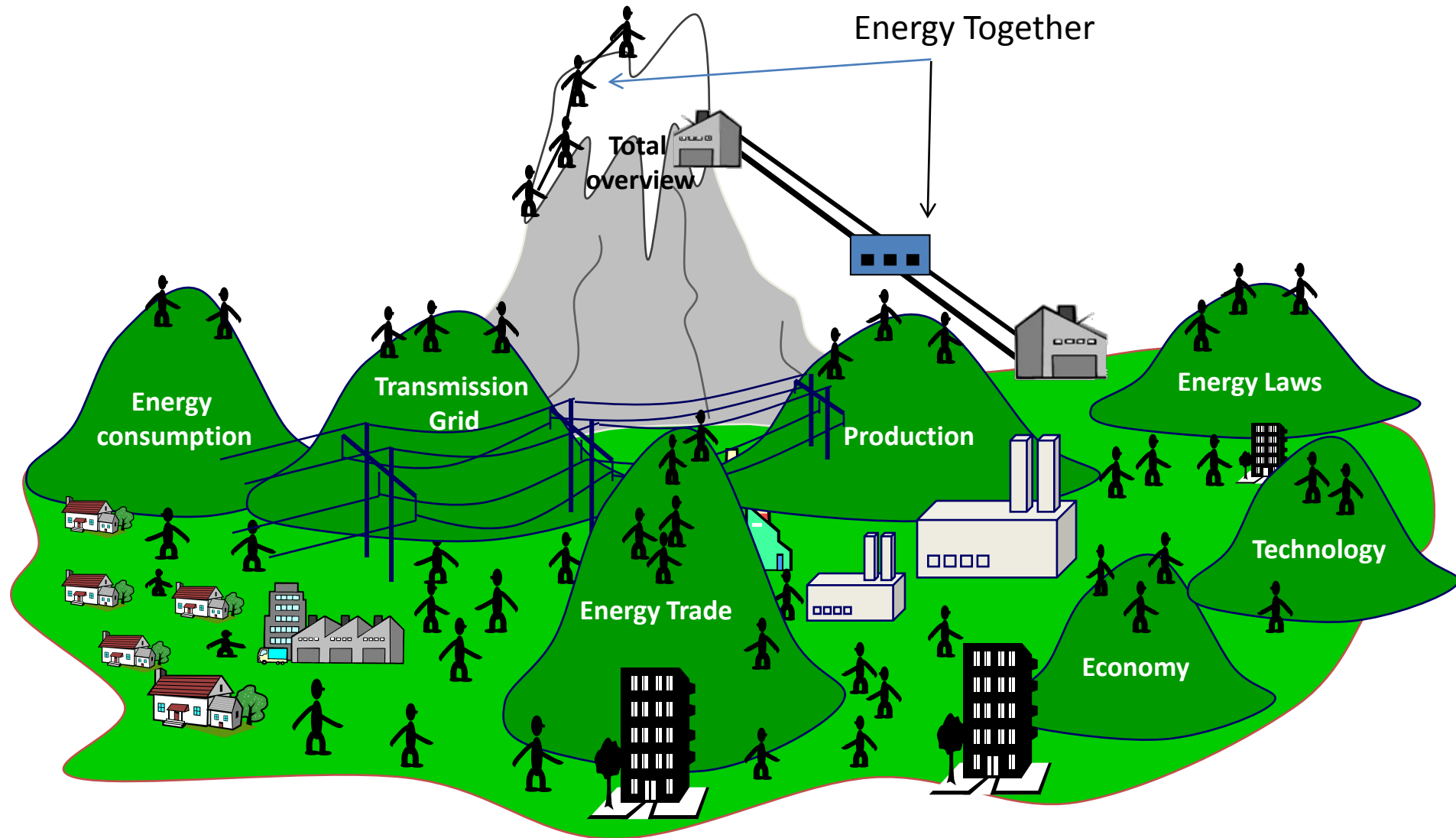
The Vision



But how can we reach this Vision

- Economists are interested in staying CEO's
- Politicians are listening to positive and understandable stories calming that they can full fill their dreams without problems
- Collapse and black-outs will make the politicians act, but it will be extremely expensive for society
- Can we – together – convince the politicians before collapse of the system?

Building a common knowledge of the main mechanisms in the energy system



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Thank you for your attention

Read more on

www.energy-together.com

and on my blog

www.flemmingnissen.dk

(Both in Danish language)