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LOCK-INS OR RAPID CHANGE : FACTORS TO BLOCK OR ENABLE ENERGY SYSTEM TRANSFORMATION

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- ▶ The urge for transition is dramatic (IPCC oct 2018)
- ▶ New technologies are present, in standardized production and costs are low
 - ▶ Relevant technologies are often linked to a more decentralized structure
- ▶ System changes are then dependent on political and market factors
- ▶ From a niche to a regime, how ? (Geels)
 - ▶ Sometimes a «good niche» is OK until it threatens a regime
- ▶ Sociotechnical system changes are historically known to :
 - ▶ Be unpredictable
 - ▶ May happen very fast under certain conditions
 - ▶ And leave old technology as stranded assets (Schumpeter) unlike most literature on energy system development (Schumpeter)
 - ▶ May be blocked by lock-in mechanisms
- ▶ Our suggestions of decisive factors : 1. Fundamental beliefs 2. Institutional setup 3. Regulation 4. Market and production

THE SITUATION IN ENERGY SYSTEM TRANSFORMATION TO SUSTAINABLE SYSTEMS

- ▶ Background data for this paper:
 - ▶ Sancoop project on sustainable energy (Brazil, China, India, South-Africa)
 - ▶ Interviews with key actors in all countries, documents
 - ▶ Evaluation study of the Norwegian change to electrical ferries
 - ▶ General observations/literature at the system level

DATA

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- ▶ BLOCK The problem of political and scientific beliefs in economy making Norwegian oil sector continuing and growing («the ghost of cost-efficiency»)
 - ▶ Textbook theoretical resource economy in universities and government
 - ▶ The theoretical elegance of CO2-quota (ETS) trading
- ▶ BLOCK The engineering perspective of the grid in regulating authorities in South Africa: Generations of experiences with «big grid-few suppliers» makes the solar panels look «ugly» and «not possible to use on a large scale».
 - ▶ CHANGE But remember the computer revolution 1980-2000 !
 - ▶ CHANGE And remember the strong belief that electricity= progress 1900-70 !!
 - ▶ CHANGE And the «Tesla» revolution: still not «profitable», but carried on a wave of belief and enthusiasm

1. FUNDAMENTAL BELIEFS AS A CRUCIAL CHANGE OR BLOCK FACTOR

- ▶ Institutions and their surroundings reflect certain solutions and powerful actors. (Companies, trade unions, bargaining rules, formal procedures of influence)
 - ▶ Norway and the non-implementation of solar and wind energy
 - ▶ (these sectors are not institutionalized and present)
 - ▶ (these sectors threaten the continuing oil investments (was shut down), but when investments were not profitable, a window opened)
 - ▶ Norway and the regional electrification of ferries
 - ▶ Companies with solutions and capacity, unemployment, politicians with a problem of lacking means for CO2-reduction and **formal public structural power**
- ▶ The «coal» solution in South Africa
- ▶ The institutional lock-in of local electricity in SA
 - ▶ National Coal Energy monopoly, municipal reselling for profit (tax)
 - ▶ Solar roof panels = «tax avoidance»

2. INSTITUTIONAL SETUP

- ▶ (tender/procurement competition + protection)
 - ▶ REIPPP 1-5 in SA, well-regulated success
 - ▶ But only when the main power player allows (=grid and supply breakdown)
 - ▶ Wind power in Brazil
 - ▶ Electrical ferries in Norway
 - ▶ Key factors
 - ▶ CO2-reduction becomes a competitive factor
 - ▶ Price competition AND protection
- ▶ Electrical installation regulation makes solar almost impossible (SA)
- ▶ Economic regulation blocks the inclusion of solar panels and SWH in housing financing in SA (and the opposite in US Solar City project)
- ▶ The problems of Nuclear phase IV

3. REGULATIVE STRATEGIES AND PRACTICES

- ▶ China wind and solar: The power of manufacturing, markets and profit (J. Mathews)
 - ▶ But : always need startup (regulative)help
- ▶ Investment policies favours the small/medium, the predictable with clear buyer structure
 - ▶ = renewable solar, wind, SWH units
- ▶ Direct and indirect consumer demands
 - ▶ SA: medium size solar on institution rooftops, political climate consumers
- ▶ Norway and electrical cars: huge demands, thousand of consumers are waiting (and Tesla has huge stockholder value)

4. MARKET AND PRODUCTION FORCES

- ▶ Norway 1+2 The special «resource economy belief» is supported by institutional interests of the oil sector (owners , workers, bureaucrats)
- ▶ SA 1+2 The trust in «Big state» invites «Big Solutions» that again points to coal and nuclear in SA, supported by institutionalized interests of government, workers and national companies
- ▶ SA 3+4 REIPPP success combines buying power through tender, protective regulation and market conditions
- ▶ Brazil 2+3 The success of introducing wind power in Brazil creates institutions and interests that makes a new «path»
- ▶ Norway 2+3+4 Electrical ferries combines buying power through tender, strong regulation and market players
- ▶ China 2+4 The Chinese success of wind and solar linked to startup support and regulation
 - ▶ But now (Oct 18)the effects is threatened by corruption and regional interests (?)

COMBINATION OF FACTORS

- ▶ State or market or is it the wrong question ?
 - ▶ State and regulation in early phase of almost all change
 - ▶ Market based implementation crucial
 - ▶ Sometimes without state help: Heat Exchangers (N), Rooftop solar (SA)
- ▶ Consumers generating indirect demands for sustainable energy
 - ▶ Supermarket roofs (SA)
 - ▶ Insurance companies and their capital handling (No)
- ▶ The power of networks :
 - ▶ demonstration units-politicians-business-citizens, activists, mainstream companies and consumers etc (ANT,
 - ▶ Ampere, Norway→ The Clean Energy Maritime Cluster

COMBINATION OF ACTORS

- ▶ WE STARTED WITH THE AIM OF GETTING A RECIPE FOR CHANGE TO SUSTAINABLE ENERGY AND ENDED WITH THE DISCUSSION OF A SMALL GROUP OF FACTORS IN SEVERAL MIXES AND ROLES:
 - ▶ 1. Fundamental beliefs
 - ▶ 2. Institutional setup
 - ▶ 3. Regulative arrangements
 - ▶ 4. Market and production forces

A CONCLUSION ?

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SOURCES