The rapidly shifting objects of processes of social acceptance of renewables' innovation

Maarten Wolsink

"Communities, Renewables, and the Low-Carbon Transition"

Opening talk to the Conference of 'MISTRAL'
Multi-Sectoral Approaches to Innovative Skills Training for Renewable Energy and Social Acceptance

Northern Ireland Parliament Building
Stormont, Belfast

12 September 2019

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MULTI-SECTORAL APPROACHES TO INNOVATIVE SKILLS TRAINING FOR RENEWABLE ENERGY AND SOCIAL ACCEPTANCE

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Additional text:

Photograph: project in 1984 of
- municipality owned (city of Amsterdam) energy company GEB (Gemeente Energie Bedrijf)
- in small community (village Durgerdam 3 km from Amsterdam) of 400 inh.
- 1 wind turbine, at pre-selected site

First recorded report with Social Acceptance (Dutch: Maatschappelijke Acceptatie) as core concept:

Wolsink, M. (1984) Een windmolen in Durgerdam. IVAM/UvA, Centrale Dorpenraad, Holysloot.

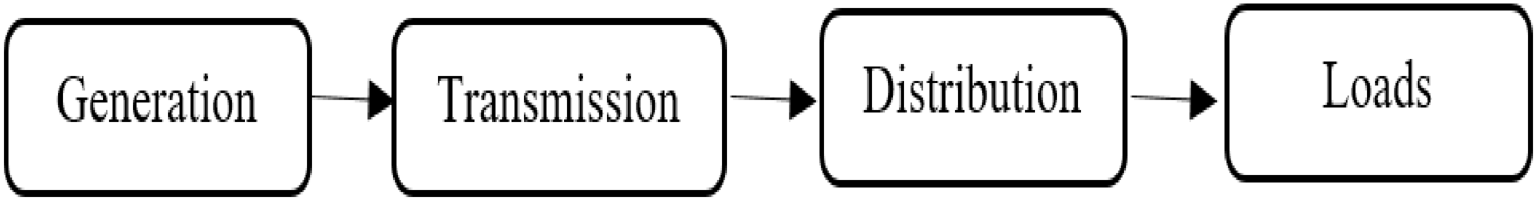
Community opposition (minority), dynamic attitudes, unclear proposal of Municipality and GEB

Main attributes of attitudes to project:

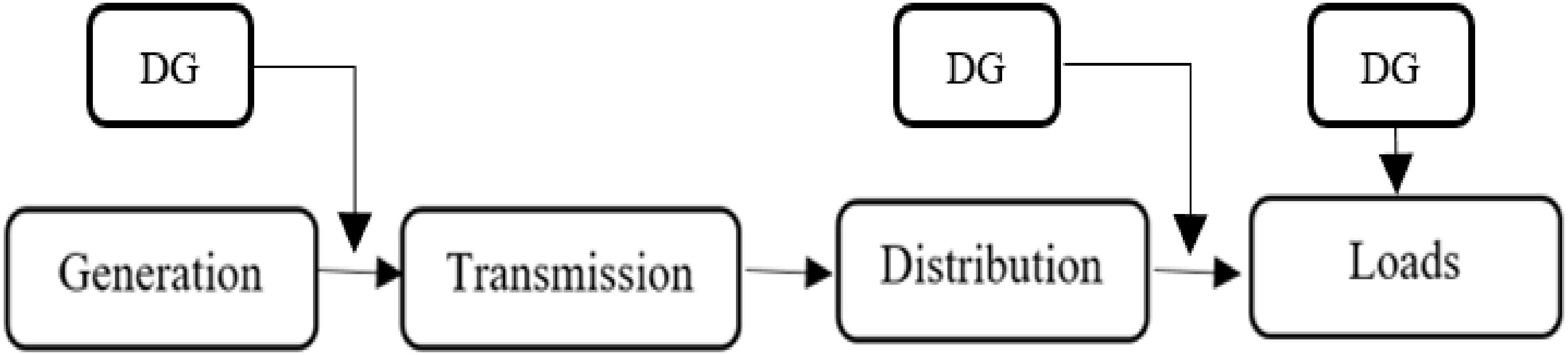
- **Why this location (some alternatives proposed); selected site main argument against project.**
- **Why initiated by the energy company, instead of community wind turbine delivering power directly to community?**
- **Why wind, why not solar?**

Climate Change was no argument at all.

In public hearing a question on CC from the public: the ‘experts’ , alderman municipality of Amsterdam and director GEB did not have any idea what this question was about.



MODEL CURRENT S T S
CENTRALIZED POWER SUPPLY



MODEL HYBRID S T S
WITH DISTRIBUTED GENERATION
(SIMPLIFIED)

DEFINITIONS

- **Distributed Generation (DG)…**
  Ackermann, 2001; Dondi et al 2002
  DG Renewables' Systems (DGRS)
  … *is an electric power source*
  - connected directly to the distribution network
  - at the customer side of the meter
- ***'distributed' goes far beyond 'decentralized'***
- ***Enormous diversity: no single sources,***
  all communities different, dynamic (variation in time)
- ***Impossible to control from above,***
  no uniform standards (so, highly undesirable)

Additional text:

Decentralized, only geographical dispersion of installations

'Distributed' also completely different control, ownership and management characteristics

'At the customer side of the meter' fundamentally questions the location of the meter

Current location of meter is fully framed by central control and central design of the grid; Distributed Energy Systems ask for reconsideration of the location of meters.

DISTRIBUTED ENERGY SYSTEMS

- ***MOVING AWAY FROM CENTRALIZED AND HIERARCHICALLY ORGANIZATION***

- ***TOWARDS POLYCENTRIC OWNERSHIP AND CONTROL***

- **EXTENDED CONCEPT: DISTRIBUTED ENERGY SYSTEMS (DES)**

  Including all distributed systems serving DGRS

  - distributed storage (including V2G)

  - distributed demand-response (DR) systems

  - with intelligent metering and control devices (≠ 'smart meter')

  - transmission systems (including LV and DC)

SOCIAL-TECHNICAL SYSTEMS

Power supply system(s) is an STS
def. ***A system be made up of scientific and technological, as well as socio-economic and organizational components.***

Transforming this STS into renewables and distributed-based, [zero-carbon] is *innovation*….
……… including *creative destruction*

Key of innovation is institutional change North, 2001
which includes 'regime change' Geels, 2014
to escape from the 'lock-in' Unruh, 2000

Move the STS away from centralized design & hierarchical and centralized management

CENTRALIZED ‘UTILITY-SOLAR’
Les Mées, Alpes-Haute Provence (F)

Additional text:

Photograph of solar plant, owned by project company of EDF (French State Power company) at a site already owned by the state

Centralized design, simple feeding in to the grid as a central power plant.

Easy access (also centralized) to land use, many solar plant in France on former army sites).

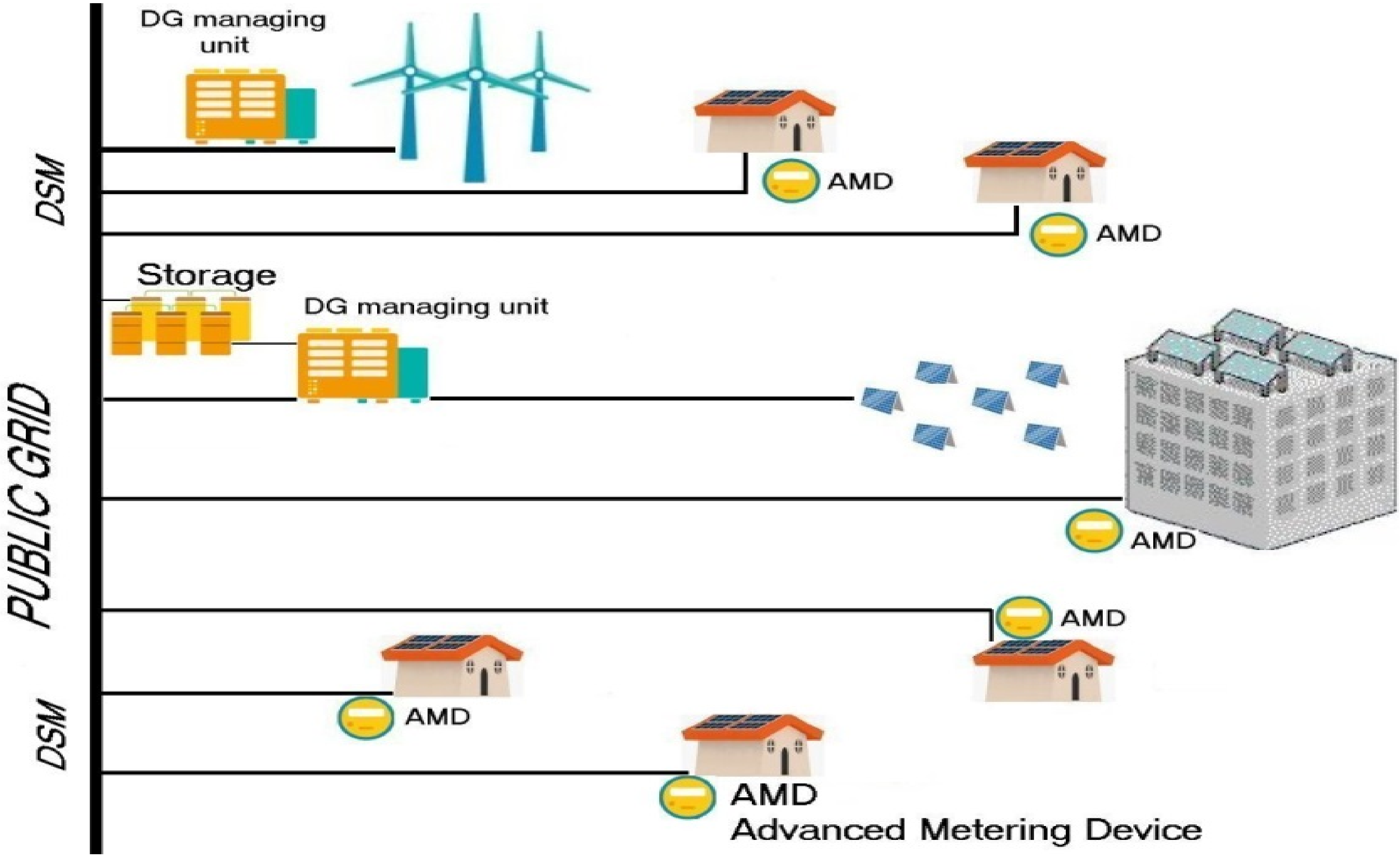
Access to the grid not problematic issue, because of EDF ownership.

No measures for integration in the grid

Grid only applied as ‘storage’ capacity; impossible to maintain when variating sources (wind, solar, geothermal, tidal etc.) become more common

Land use issue: easy access sites are rare; solar power landscape problematic in terms of social acceptance, for reasons of landscape impact (wider concept than ‘visual impact’, Wolsink, 2018), landscape ecology, and competing land uses.

CENTRALIZED GRID CONNECTING RES, STORAGE, DSM CURRENT MODEL / DOMINANT DISCOURSE (IN POLICY AND E-SECTOR)



Additional text:

All consumers individually connected to the (central) public grid

All installation (possibly except PV at rooftops of individual households) individually connected to the grid, feeding in all power into the centralized grid

Advance Metering Devices (commonly referred to as 'smart meters', which is a biased policy frame) for all individual connections, consumers and producing installations, and storage capacities alike. Any use for Demand Side Management is problematic, because of the centralized control.

The model tries to fit in renewables generation as a 'fuel' replacing old fossil fuels, without fundamentally changing the social side of the Social-Technical System (STS).

DISTRIBUTED ENERGY SYSTEMS (DES)

(elaborated definition) Gui et al 2017; Wolsink 2018

… are based on networks of multiple, smaller generating units

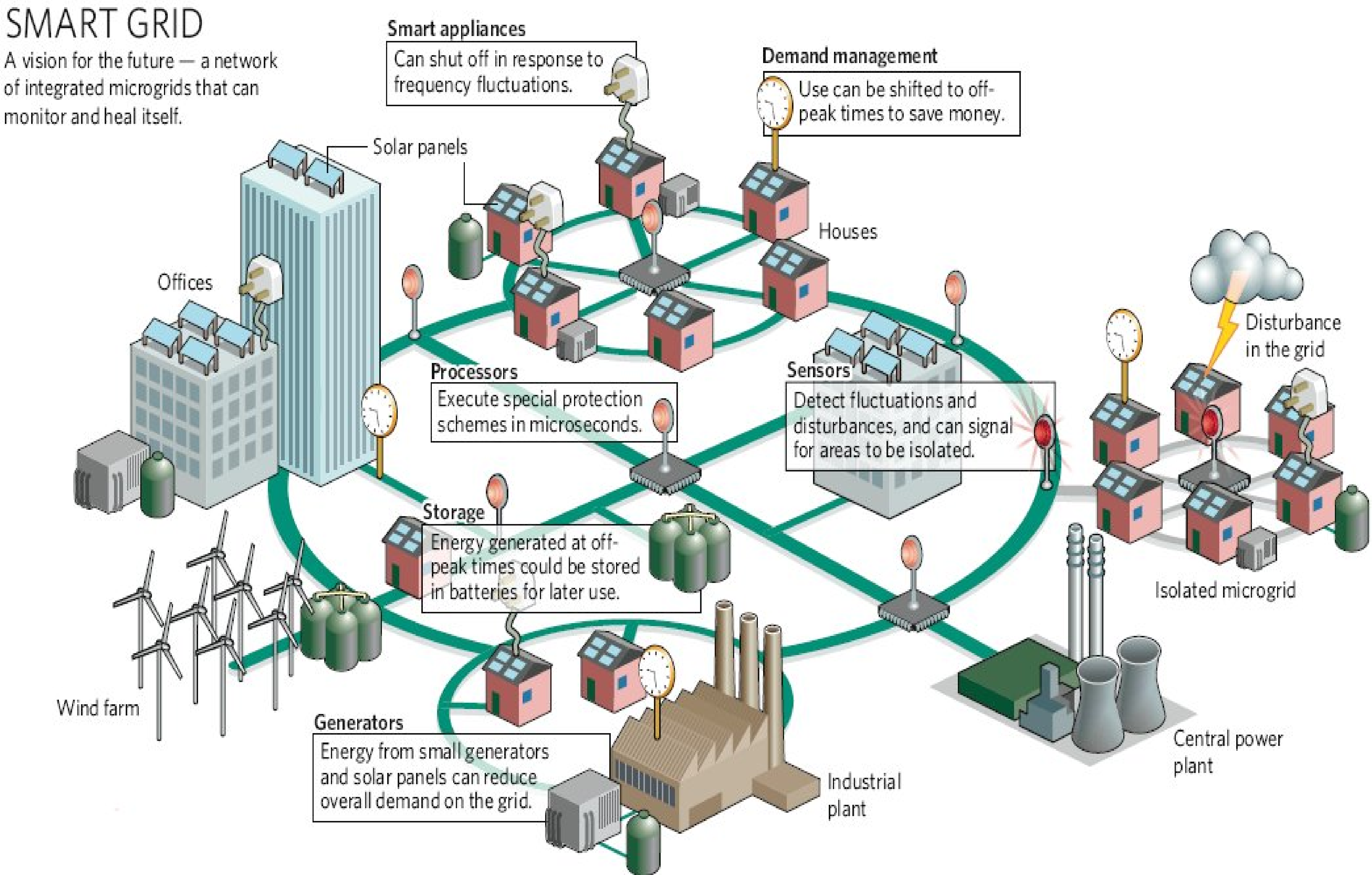
and other infrastructure – storage, transmission, demand-response, ICT –

situated close to – and possibly controlled by – energy consumers (prosumers) Parag Sovacool 2016

integrated in microgrids that together should constitute an intelligent grid

DECISIONS TO ESTABLISHE INTELLIGENT GRID
→ ALL SOCIAL ACCEPTANCE OBJECTS

marris 2008; wolsink 2012



Additional text:

“A network of integrated microgrids that can monitor and heal itself.”

Intelligent Grid (buzz-word ‘smart grid’) definition; picture and definition 10 years old now, still the most comprehensive image (Marris 2009; Wolsink, 2012).

The IG, as well as the microgrids, are all social-technical systems (Geels)

The picture shows (simplified !!) the infrastructure and the position in the integrated network.

Behind it are all organizational, management, investment, usage, and above all, control issues. All these are social acceptance issues, about which fundamental research questions (RQ’s) can be phrased.

For example, the location of the ‘central power’ plant; it is no longer central, but peripheral.

In SA research practice, most RQ still concern cases of projects that are not fundamental to the new power grid, for example individual preferences for investing in individual PV panels (not integrated in microgrid) or public attitudes towards single sources farms (like a wind farm in the picture, or a solar farm like on slide 8) *which are also peripheral* in the IG in the picture.

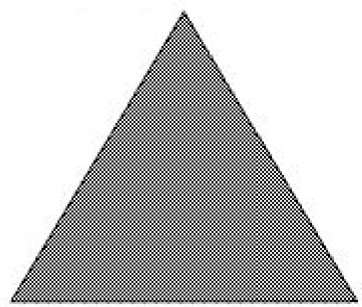
An ongoing project of mine is to generate fundamentally different social acceptance research questions that can be found in this picture, with the help of students in class. Currently I have collected 93 different RQs, most of these not yet covered by any published study.

(Broad categories of RQs are phrased in Wolsink, 2012 and Wolsink, 2018/2019).

DECISIONS ABOUT ALL ELEMENTS – social design (pol., cult., econ.), techno design, space for infrastructures, about control… are PROCESSES OF SOCIAL ACCEPTANCE (≠ public acceptance)

Socio-political acceptance

* of technologies
* of institutional change
* by key stakeholders
* of policies
* by policy makers
* by the public



Community acceptance

* place attachment
* landscape identity
* fairness of process
* by residents
* by local authorities
* trust

Market acceptance

* by consumers
* of green tariffs
* of new parties
* by investors
* intra firm
* by incumbents

Wüstenhagen et al. 2007

Additional text:

Mainstream conceptualization of Social Acceptance (SA), already revealing what has been neglected in most social acceptance studies:

SA is a bundle of processes, within three broad domains (or levels), so it is dynamic by definition.

SA is not simply measuring certain positions (pro-contra) at a certain moment

SA is not about public acceptance (public is conceptually divided in all three domains: public opinion on technologies and polices; residents with regards certain projects; consumers confronted or engaged in renewables innovation)

The object of SA is rapidly changing:
all elements of changing the STS of the centralized, fossil fuel based power supply into intelligent grids as a foundation of integrating different varying sources with demand, become objects of acceptance processes (Wolsink, 2018)
All issues related to the enormous demand for 'space' (land use) for all infrastructure needed to transform power supply into renewables' based zero-carbon, are part of SA
Scarcety fact #1 is space; renewables are mainly energy flows
William Thompson, born in this city (Belfast; later know as Lord Kelvin) phrased the 2nd law of Themodynamics; as a consequence, the Density of RE is low compared to all energy carriers containing large flows of energy over long periods of time (=fossil fuels, uranium etc.)

SOCIAL ACCEPTANCE OF RENEWABLES' INNOVATION ADVANCED

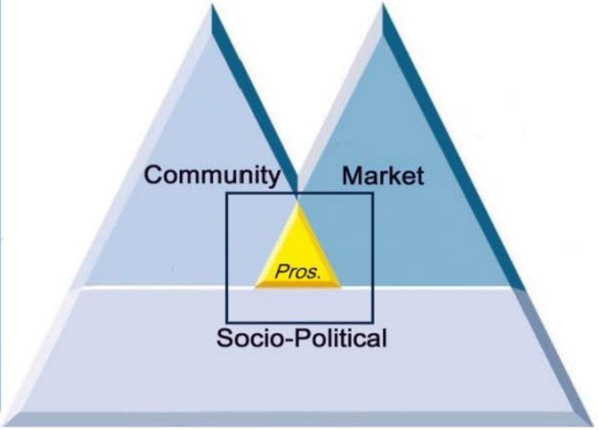
Pros. prosumers

institutional conditions

information

Wolsink, 2018b

ZOOMING IN ON D E S & PROSUMERS



Wolsink, 2019

Additional text:

Social Acceptance of Distributed Energy Systems increasingly becomes the SA of all elements relevant for creating favorable options for prosumers.

Prosumers, coproducing:

- **Common infrastructures (generation, storage, distribution, demand response systems)**
- **Common management schemes (possibly - but not necessarily - involving other actors, like ESCO's, local authorities, civil society organizations, public grid managers**
- **Common locations for all infrastructures, supplying individual property (space on rooftops, facades, gardens, fields, in-house for storage or intelligent meters, etc.) or commonly deciding upon common and/or publicly owned space.**

And eventually, in the intelligent microgrid prosumers co-produce electricity, to be consumed immediately, or stored first and then consumed with the microgrid, and finally any residue feeding in to the public grid.

ANOTHER WAY TO DEFINE Social Acceptance: – IN TERMS OF COMMON POOL RESOURCES THEORY

Recognition: Establishing Renewables and DES for harvesting natural resources becomes a

- ***COMMON* Good**
- **distinguished from *Private* (commercial) of *Public* goods (governmental or state-controlled monopolistic provision)**
- ***Common* goods based on (community) cooperation**
- **Social acceptance of renewables' innovation becomes all processes of organizing 'co-production'**

  Ostrom, 1996; Wolsink 2018

TWO ESSENTIAL TYPES OF “CO-PRODUCTION”.

1.

LITERALLY :

THE COPRODUCTION OF THE COMMON GOOD –

distribution and management of electricity

In one STS, including many ‘prosumers’

– CONSUMERS INVOLVED IN CO-PRODUCTION OF POWER

– IN ESTABLISHING ‘MICROGRID-COMMUNITIES

TWO ESSENTIAL TYPES OF "CO-PRODUCTION". 2

- COOPERATION IN ESTABLISHING INFRASTRUCTURE :

- INVESTING RESOURCES (social, finances, space)

Collectivelly and individually,

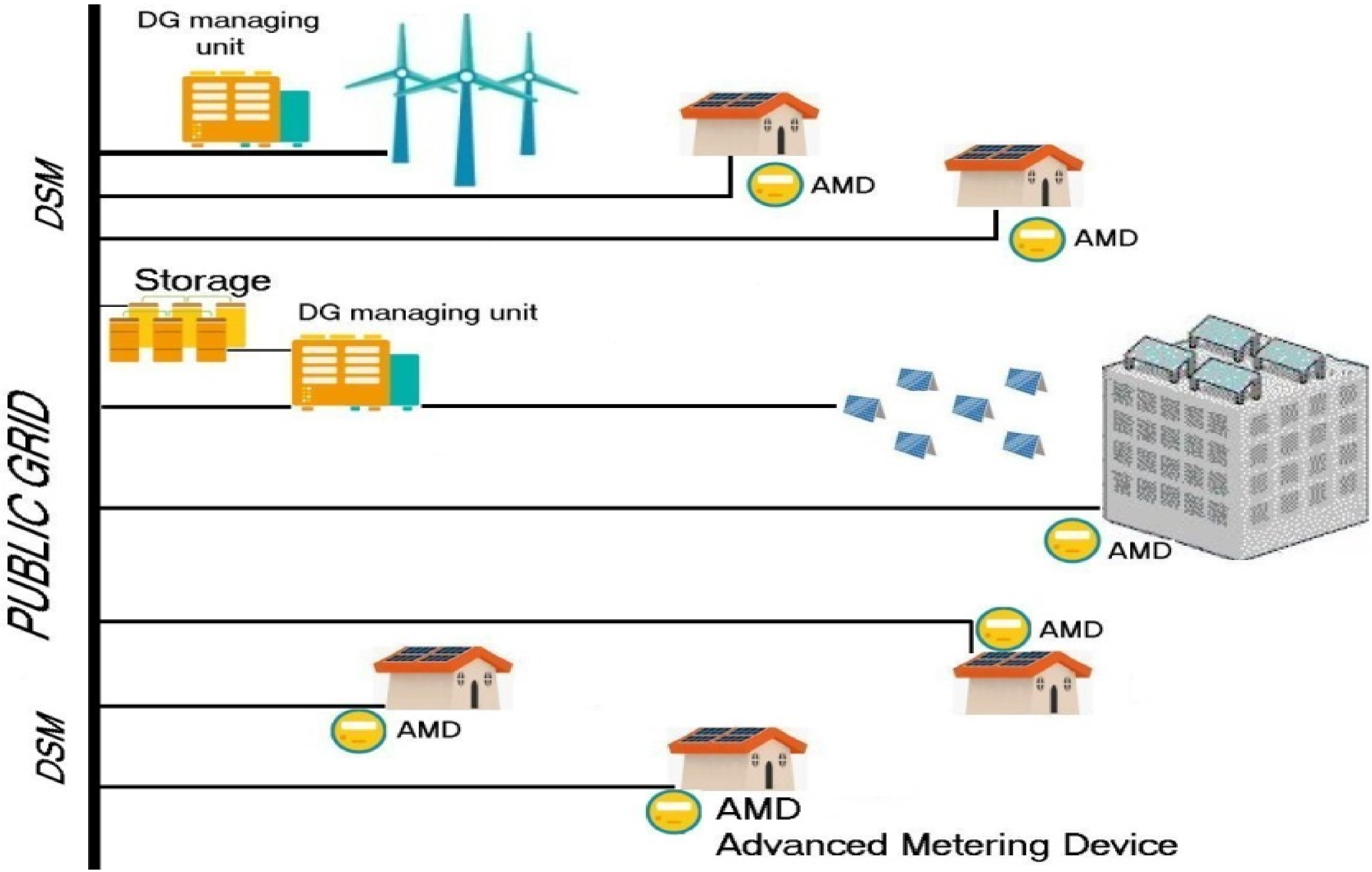
as input in a common S T S

- IN MAKING REQUIRED SPACE AVAILABLE /

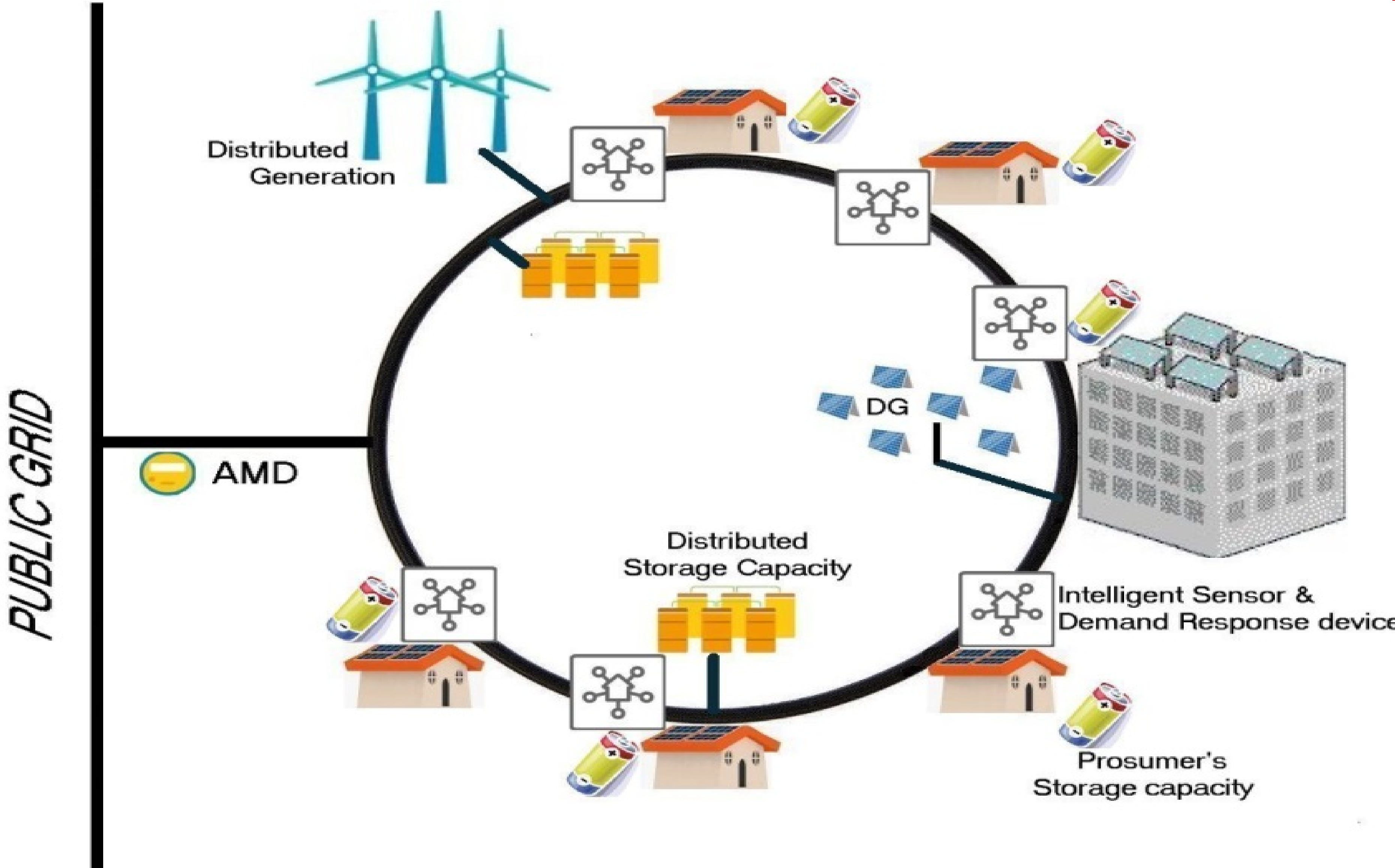
LAND USE (OF SEVERAL KINDS OF OWNERSHIP)

FOR INFRASTRUCTURE

CO-PRODUCTION FOR THIS COMMUNITY ?



SIMILAR CONFIGURATION, based on CO-PRODUCTION



Additional text:

The Intelligent Sensor and Demand Response Device is a real 'smart meter', to be distinguished from the current ADM which is currently rolled out in Europe (only 'smart' from the perspective of energy companies, as remotely readable and generating data for managing their central power generation capacity)

The 'meter' (controlled by the external public grid manager) is located at a fundamentally different place.

The meters in the microgrid are under control of the microgrid-governance system, generating data and management of storage capacity and energy flows.

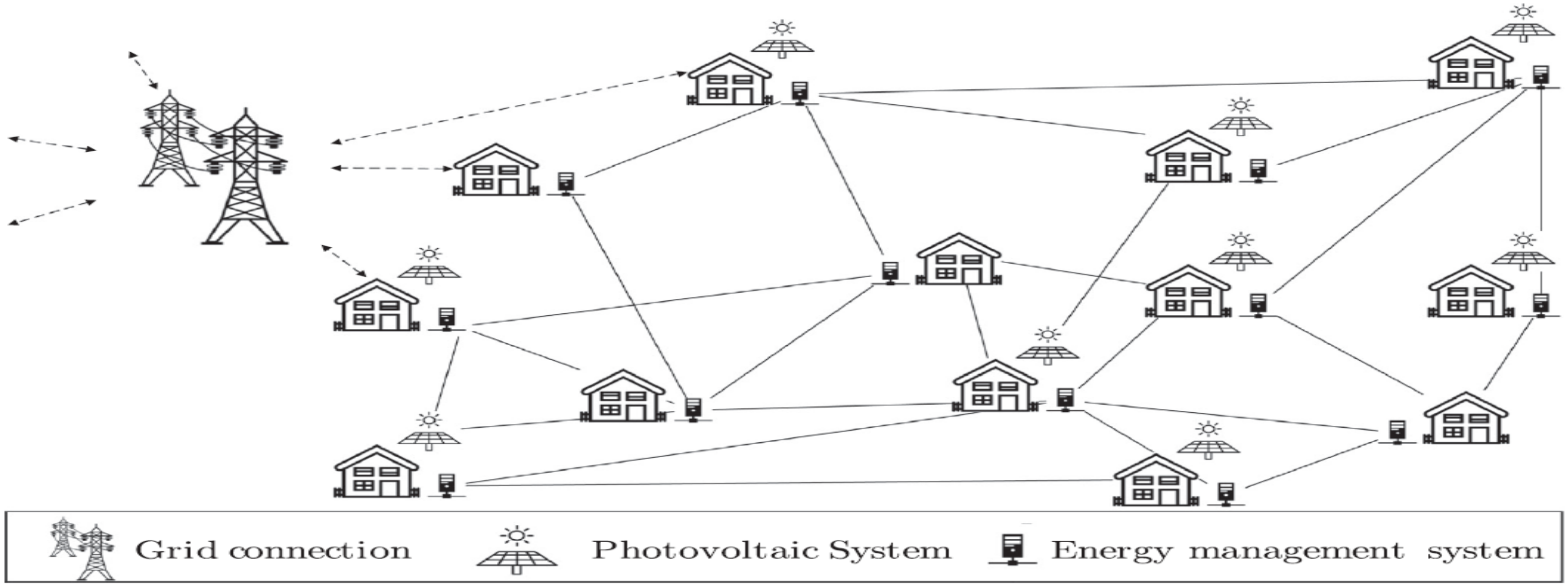
Mutual accounting also based on the micro-managing systems, possibly applying distributed ledgers (blockchain technology) avoiding transaction costs based on 3rd party interventions.

This microgrid is opening all options to balance different supplies (by different sources, and from different actors) with all individual consumption within the microgrid, including DR.

Hence, several new options for commonly owned/controlled infrastructure come to the fore

SA issues with regards land use and use of other spaces become questions of investments (spatial) in the interest of the community members, instead of (untrusted) central energy companies and national, regional, or local authorities.

IN REALITY IT WILL MORE LOOK LIKE THIS: MICROGRID WITH PEER-TO-PEER DELIVERY



Technological / game-theoretic studies of STSs Tushar ea 2018 based on 'co-production' of common pool resource
Ostrom, 2006,2009; Wolsink 2012, Acosta ea 2018

- mutual accounting of P2P delivery Giolitsas ea 2015; Mengelkamp et al 2018
- 'distributed' ledgers instead of centralized tariffs Pop et al 2018

Additional text:

Coproducing power for mutual supply, and for storage in commonly owned storage capacity, requires a fundamental shift to the option of P2P delivery of electricity.

As the ‘meter’ is now controlled by the external public grid manager, P2P is now only physically possible with the grid manager as intervening 3rd actor.

The location of the meter is not a ‘natural thing’, but a fully path dependent institution; in fact it is a cornerstone of the centralized grid and the supporting fully centralized tariff system (Houthakker, 1952).

So, the location of the meter can e changed, as it is part of the social dimension of the STS; however, it is put in ‘concrete’ as it is regulated in legislation in all developed countries.

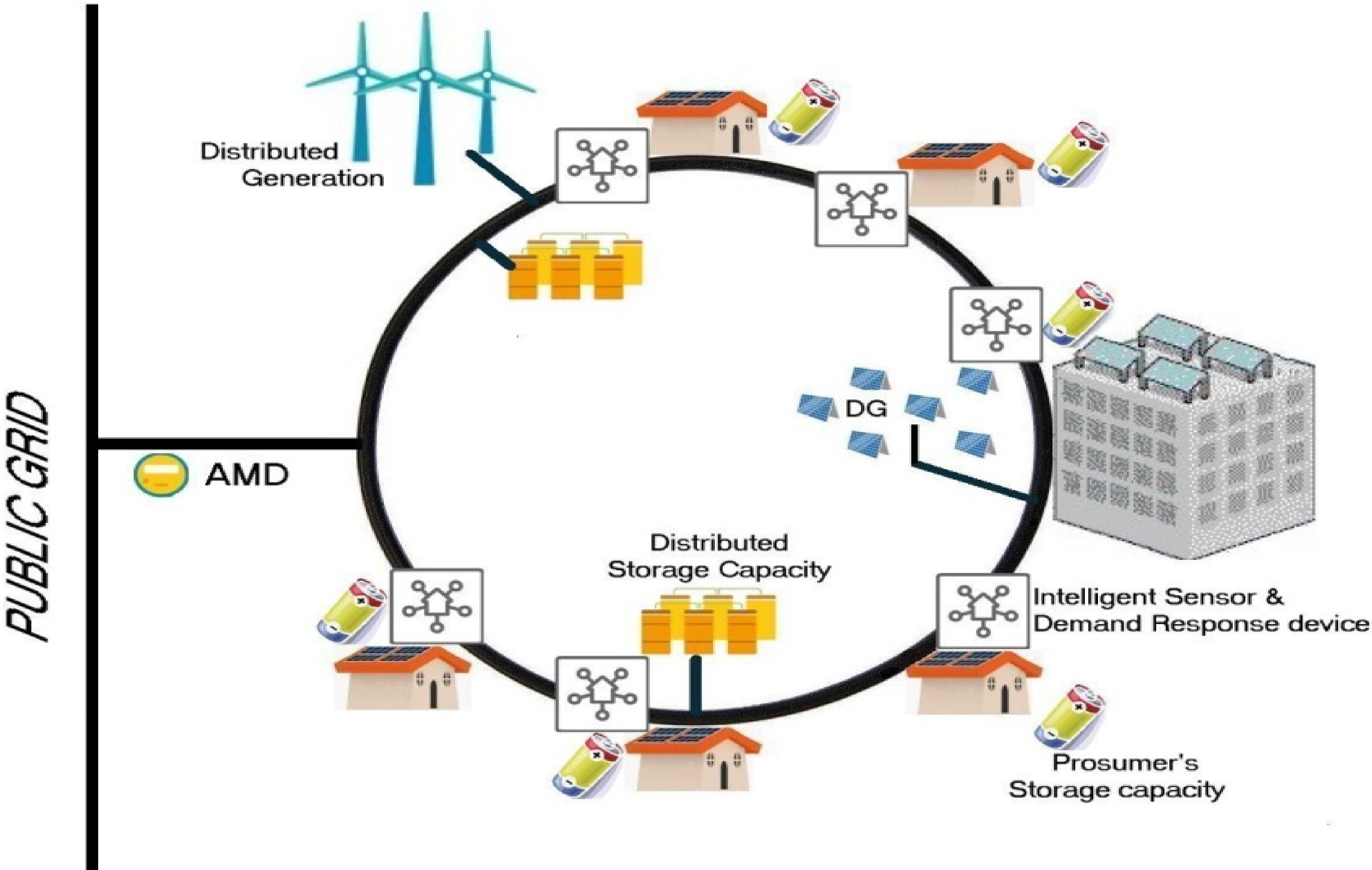
Hence, in the social-political dimension of SA, there is strong resistance against such institutional changes.

- *Does it happen ?*

- *Rephrasing the question:*
  How do social acceptance processes proceed?

  - New elements of STS not accepted easily……
    → particularly socio-political acceptance of institutional change
  - Institutional “lock-in” Existing configuration energy sector emerged in history (path dependency) Unruh, 2000 ; Bakke, 2017
  - Including governments / politics Geels 2004
  - Now vested interests based on centralism and hierarchy is the dominant paradigm / policy belief system
  - → resistance, creating barriers; → inertia

Thank you


PUBLIC GRID
Distributed
Generation
AMD
DG
Distributed
Storage Capacity
Intelligent Sensor &
Demand Response device
Prosumer's
Storage capacity

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