Workshop on Smart Grid Technologies and Implications for Inclusive Development in Sri Lanka

3-4 April 2018 • Galle, Sri Lanka

What is 'smart grid'?
What are the social risks, benefits, opportunities?

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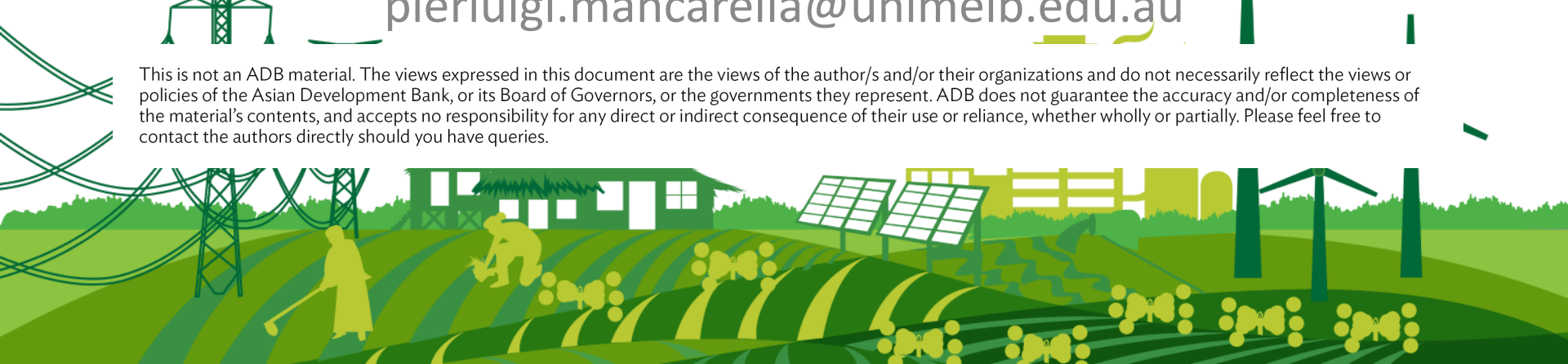
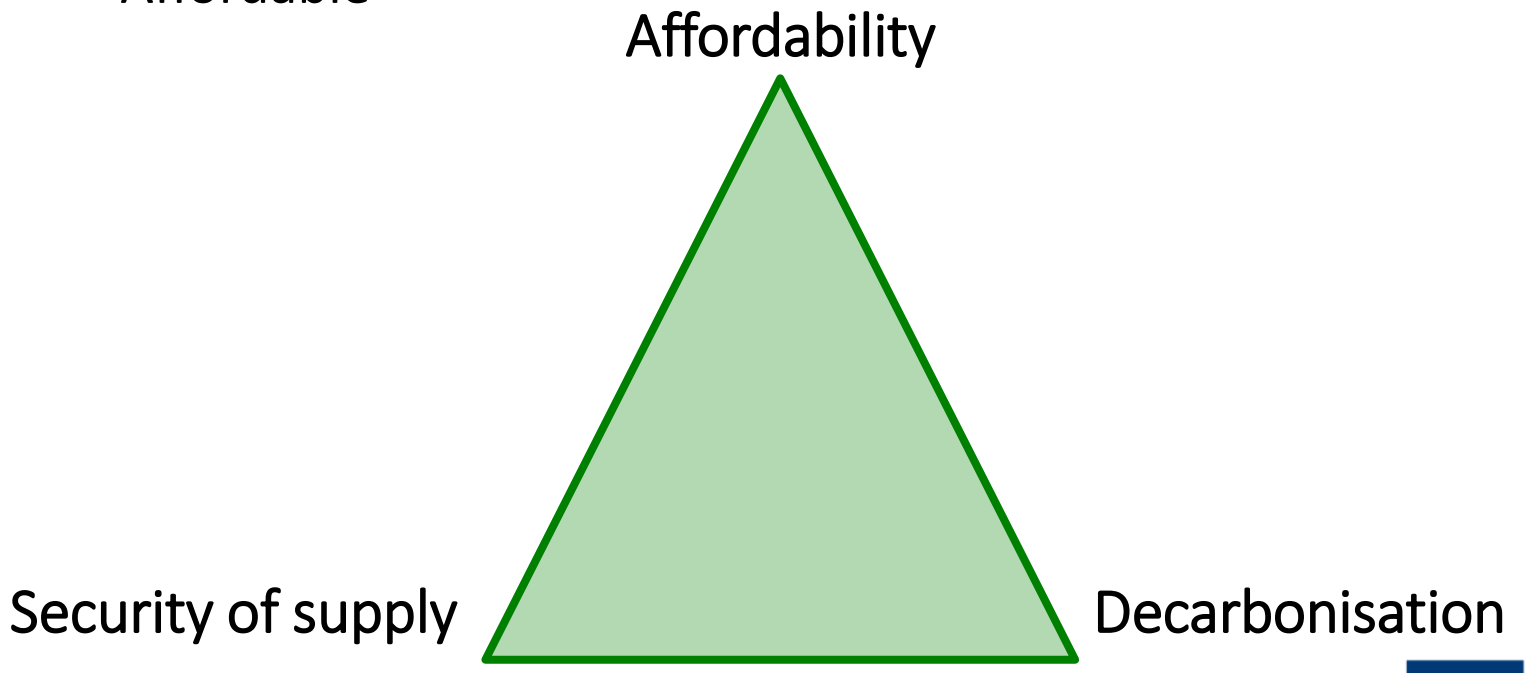
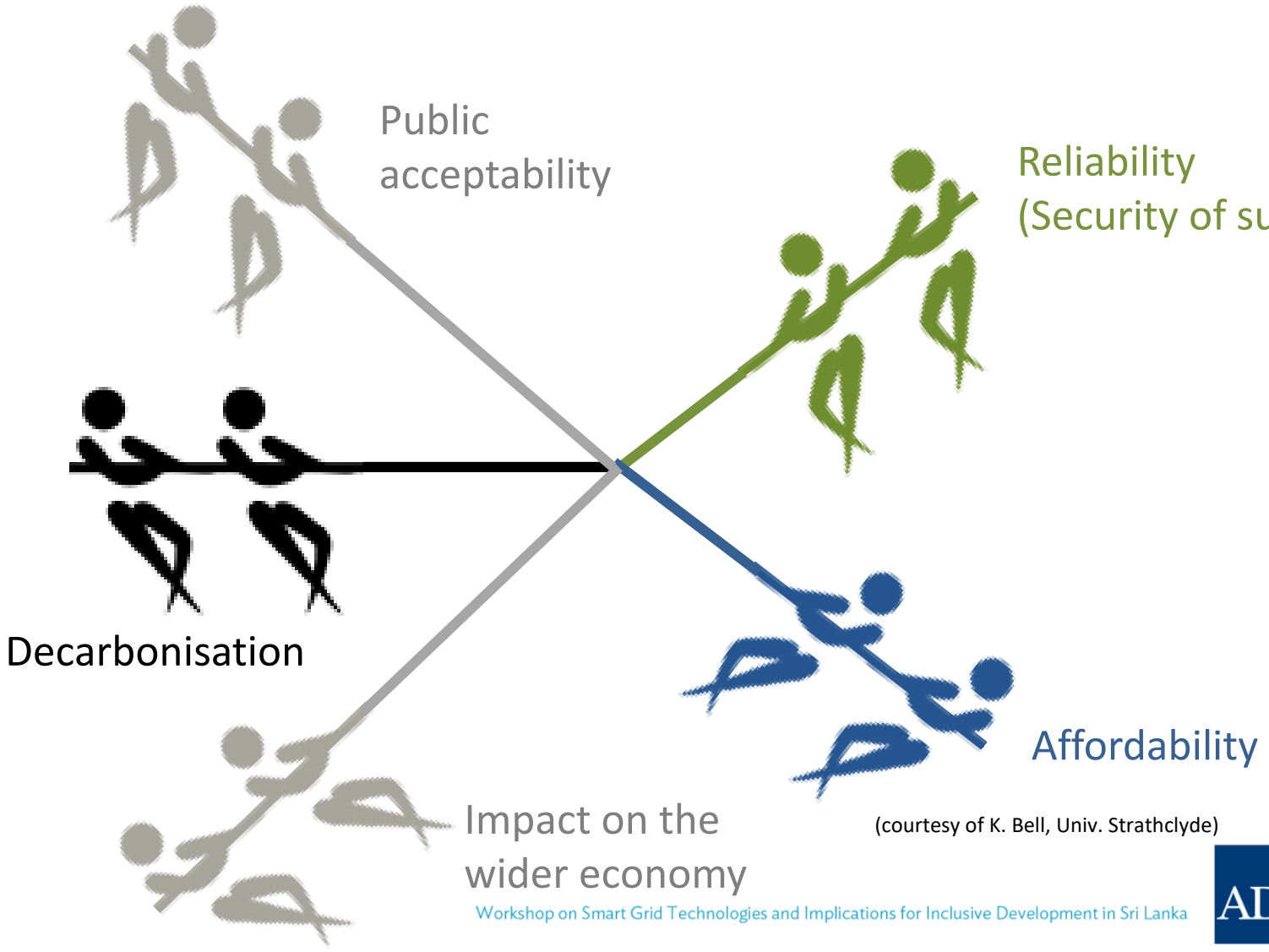


Towards low carbon energy systems

- How will we deliver energy that is
  - Sustainable (low to almost zero carbon)
  - Reliable and secure
  - Affordable

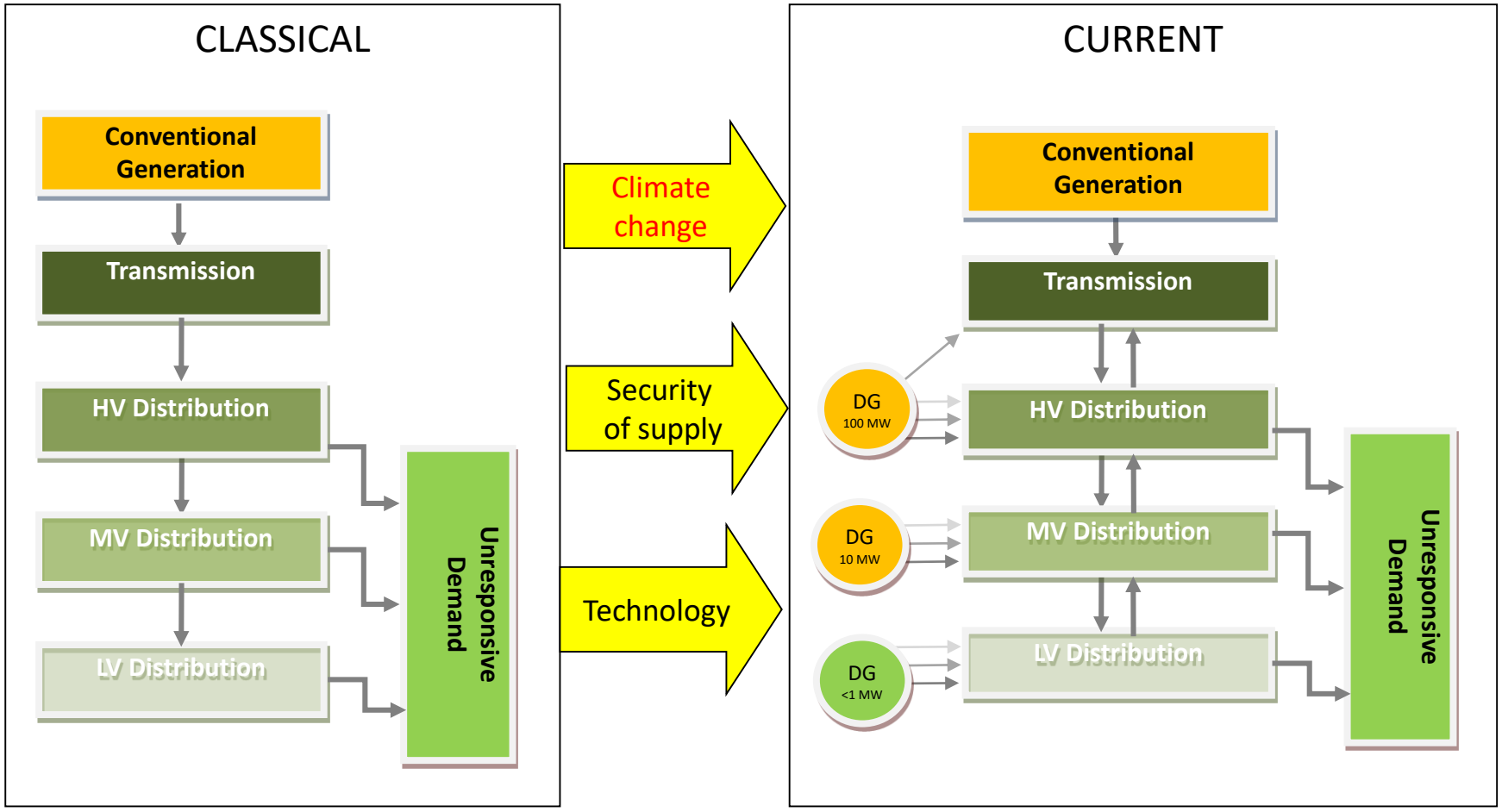


Is it a tri- or quad-lemma?

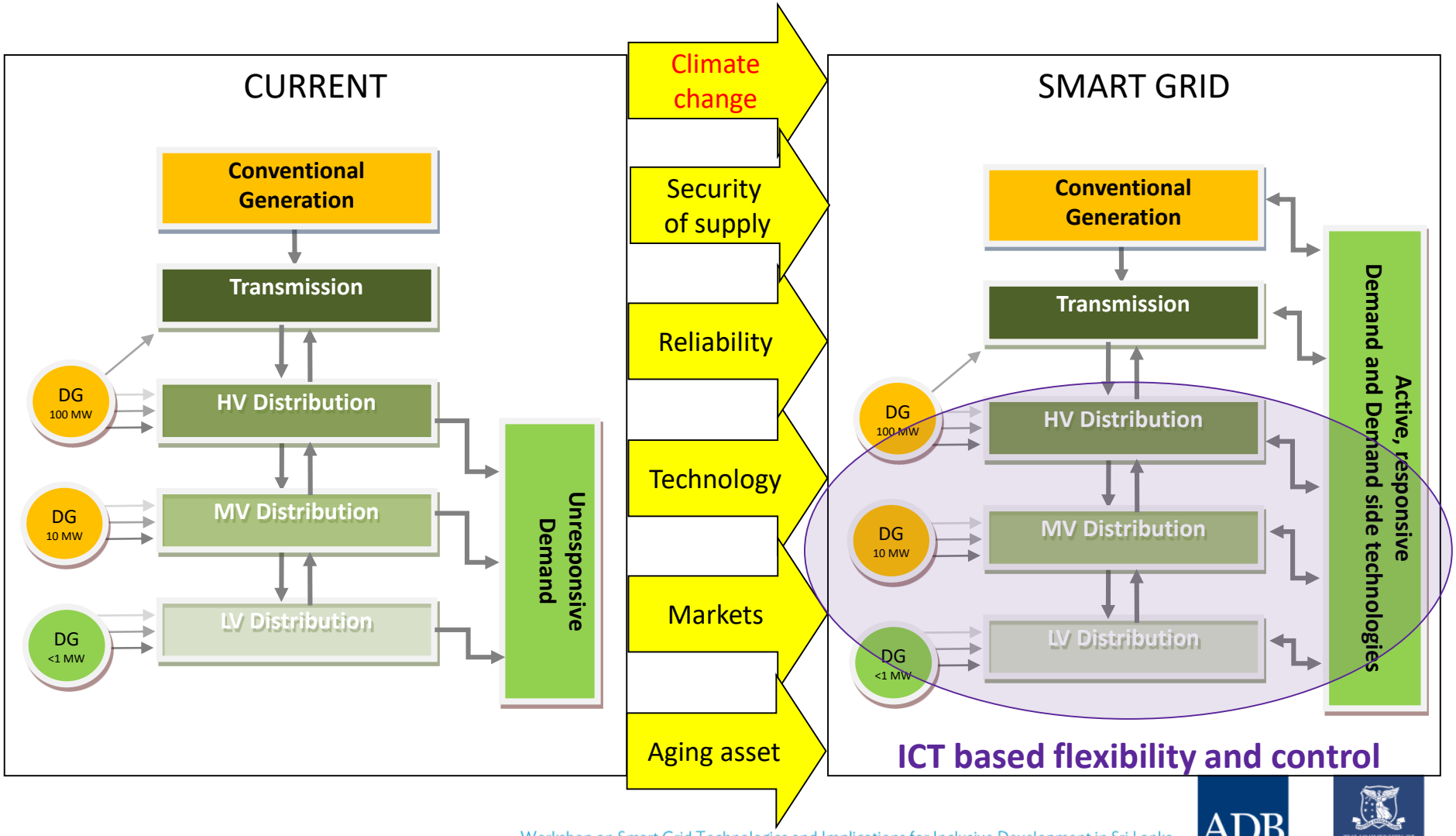


(courtesy of K. Bell, Univ. Strathclyde)

From classical to current power systems ("fit & forget")



From current systems to the “Smart Grid”

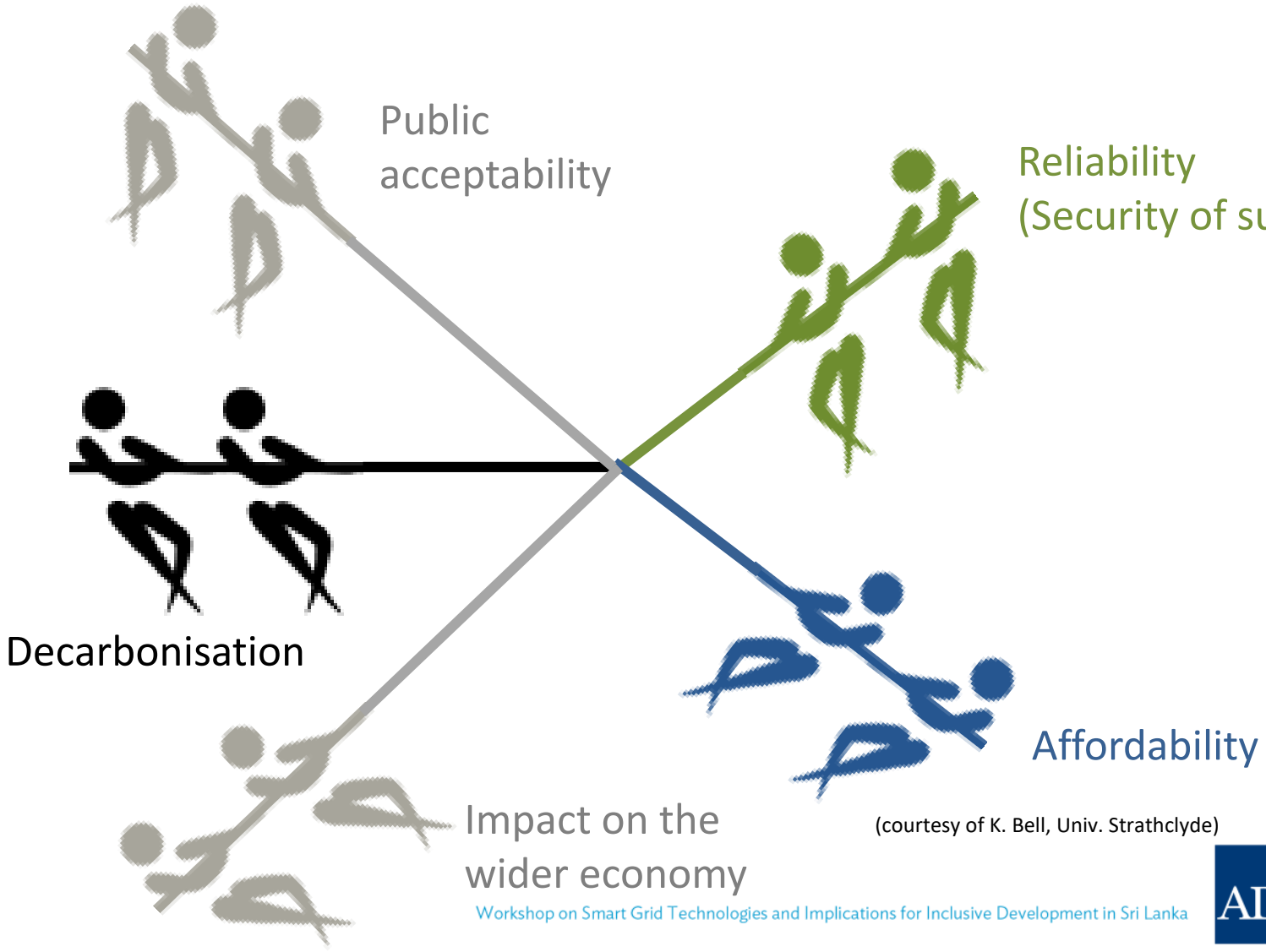


Sustainable = Smart?

- Can we deliver a sustainable energy system?
- Technology-wise, it's a 
- This is primarily a socio-economic question, not of engineering
- We have the choice to go for business as usual and keep on investing in "wire"
- Or alternatively, we can invest in innovative, more intelligent operation practices (smart-er infrastructure)

- What's the missing link?

Is it a tri- or quad-lemma?



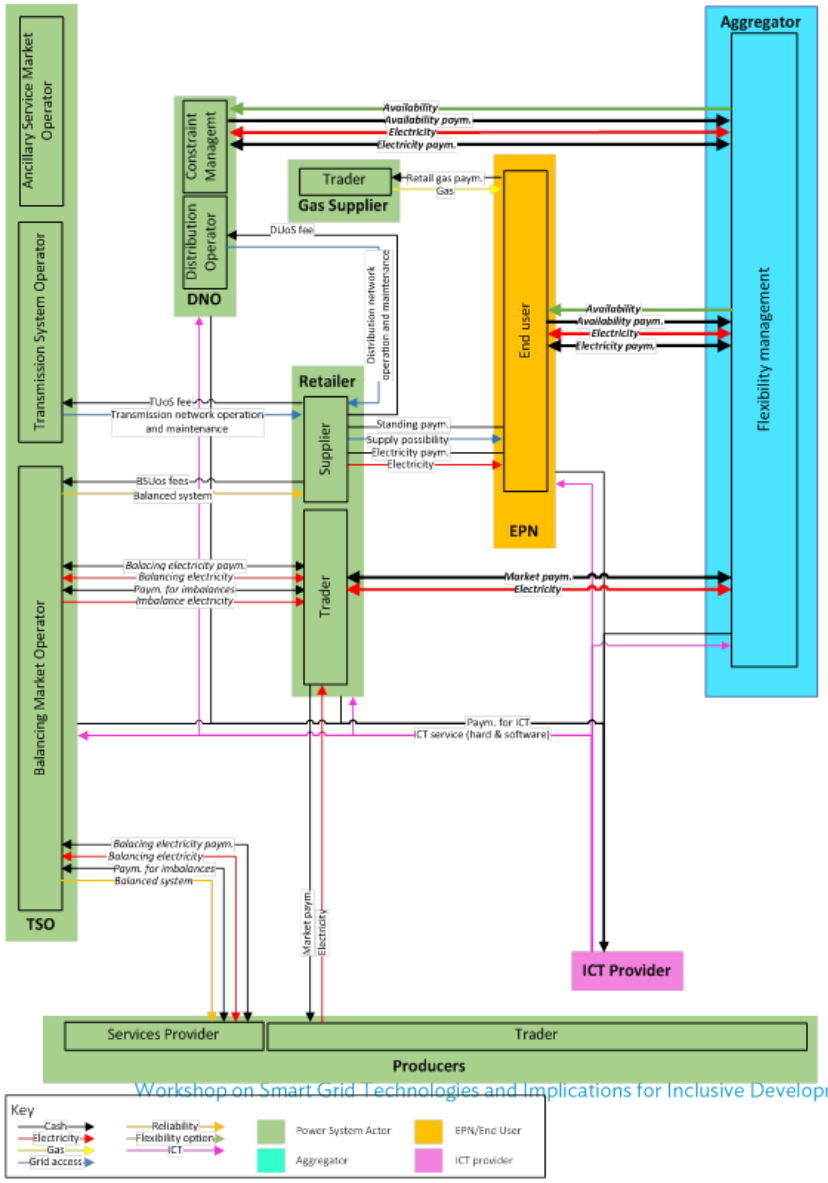
(courtesy of K. Bell, Univ. Strathclyde)

Modelling, market and regulatory failures in a low-carbon energy system

- **Engineering models** often fail to (properly) capture socio-economic aspects
- **Electricity markets** have mostly failed to (properly) involve consumers (first and second demand side flaws*)
- Renewables may severely affect consumers, particularly in terms of affordability of some categories and in the presence of **weak regulation**
  - "and the weak suffer what they must" (cit. Y. Varoufakis)
- **Challenges and risks** for social development and inclusiveness

*Stoft, Power System Economics, 2002

Value chain complexity and "death spiral" of networks



Assumptions & Risks

- Consumer willingness to pay
- Low levels of consumer engagement
- Consumers willingness to change behaviour patterns
- Utilities willingness to engage with consumers
- Consumers loss of control
- Loss of privacy
- Uneven distribution of benefits – lack of IT access and literacy

Source: European Commission, JRC, Institute for Energy and Transport (2013)

Is it all doom and gloom?

- New distributed technologies (**storage**, **demand response**) and concepts (e.g., **microgrids**, **community energy systems**) involve more and more consumers
- New actors are emerging ("**prosumers**")

- Great **benefits** can be achieved and new **opportunities** do thus also emerge!

Benefits

- Improving access and household electrification rates
- Enhanced environmental sustainability
- More control (“empowering”)
- Lower electricity bills
- Increased resilience and therefore safety (reduction of hazard exposure, fewer emergency workers)

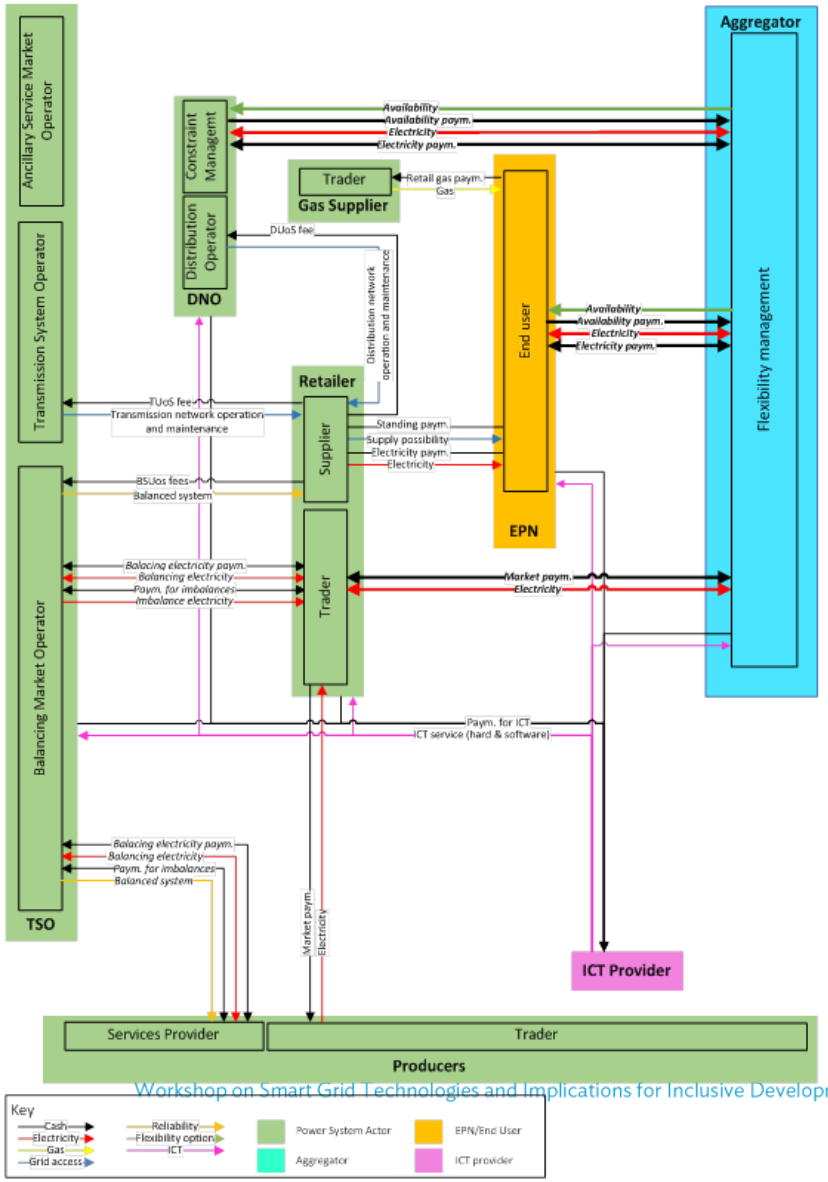
Source: European Commission, JRC, Institute for Energy and Transport (2013)

Opportunities

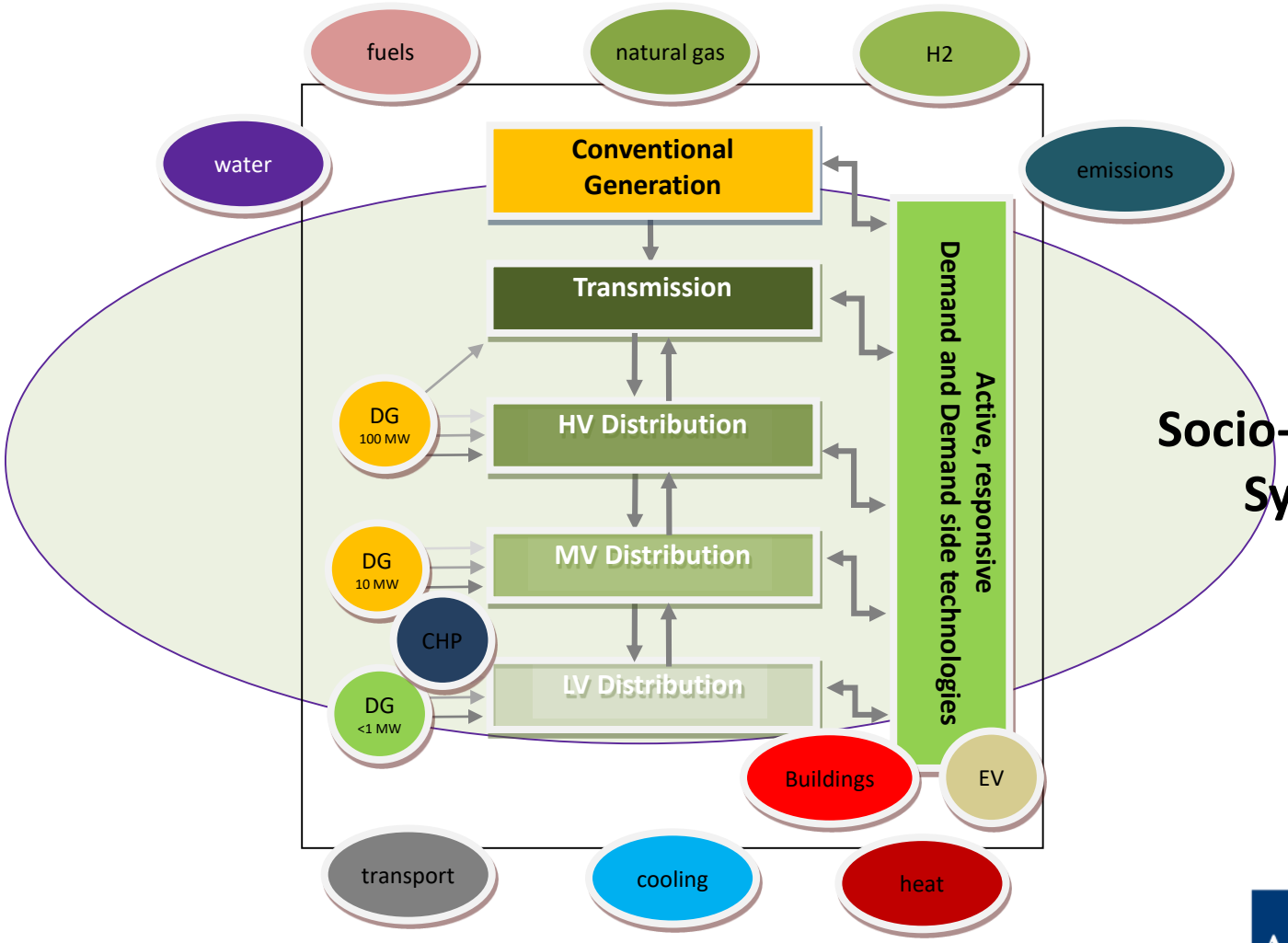
- Solving the access problem
- Greater empowerment of end-user households and communities
  - Decentralisation provides greater opportunities for diversity and inclusion in management/participation
- Employment generation
- Income generation through energy sales
- Reduce vulnerability of 'energy poor' (pre-paid meters and energy displays)

Source: European Commission, JRC, Institute for Energy and Transport (2013)

From “death spiral” to “creative destruction”? Prosumer-centric energy systems



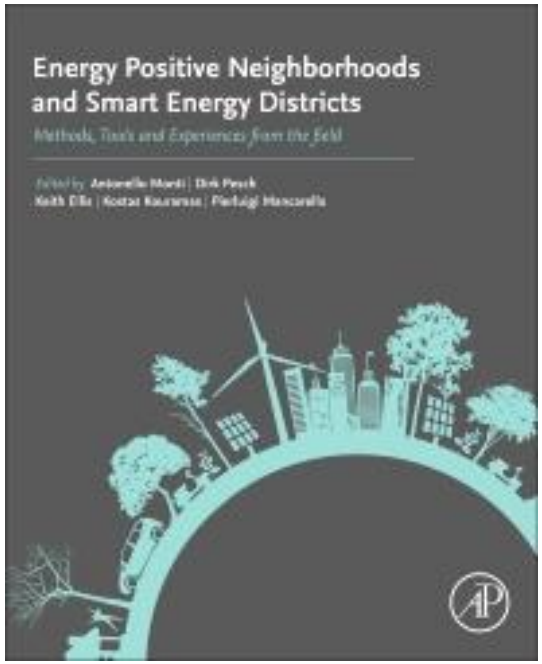
Towards a whole-system approach to future energy



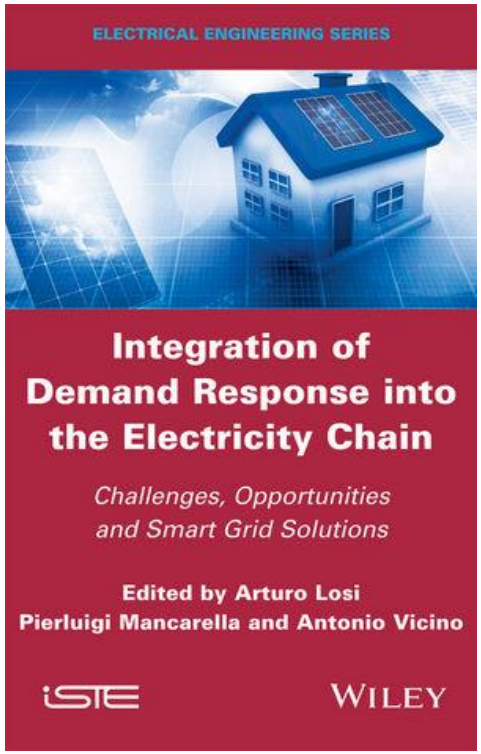
Key take-aways

- Big challenges in energy system transition to address the trilemma and even more the quad-lemma
- We need to rethink engineering modelling so as to incorporate socio-economic aspects
- Big social opportunities, not only risks and challenges
- Key role played by energy policy and regulation to address what is fundamentally a “Copernican” revolution

Gladly, things are moving…



Monti, Pesc, Ellis and Mancarella,
Energy Positive Neighborhoods
and Smart Energy Districts,
Elsevier 2016



Losi, Mancarella and Vicino,
Integration of Demand Response into
the Electricity Chain:
Challenges, Opportunities and Smart
Grid Solutions,
ISTE Wiley, 2015

If you want to hear more…

Tomorrow, 9am:

"Smart grid methodologies and models to address affordability, sustainability and system reliability and resilience"

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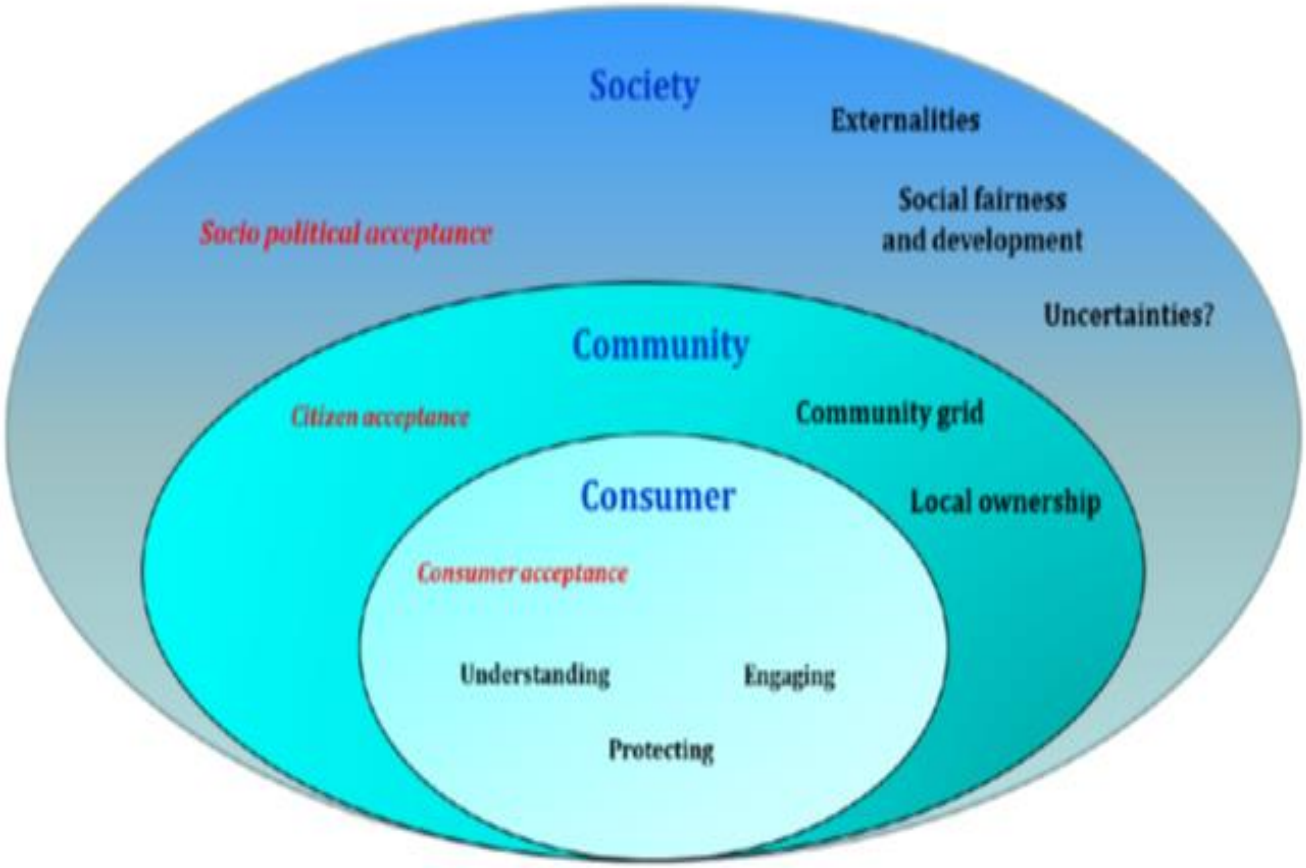
The social dimension of Smart Grid: A framework



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