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Prioritized challenges of energy transition in Thailand's power sector

- The concept of energy transition and explored its global context
- Challenges of Energy Transition in Thailand's Power Sector
- Prioritized challenges using likelihood of issue being solved and impact level of issues on energy transition in Thailand's power sector

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**The future of energy: The CASE of Southeast Asia's transition to
Affordable, reliable and secure energy**

The 3rd international conference on energy and environmental economics

ENERCON 2022

“The farewell from coal and gas has long begun (...). The Paris Agreement is just the beginning, not the end.”.

Barbara Hendricks, Environment
Minister of Germany
The Berlin Energy Transition Dialogue

Concepts of Energy Transition

The concept of energy transition and explored its global context.

The energy transition is "*A pathway for transformation of the global energy industry from fossil-based to zero-carbon,*" according to the International Renewable Energy Agency (IRENA).

"Energy transitions are complicated processes with significant uncertainties and ambiguities in management and governance since energy systems are exceedingly complex and at the core of any nation's economy", according to the World Economic Forum (WEF).

The energy shift in the electricity sector is primarily driven by three trends:

- **Electrification**

Electrification in the transportation and industrial sectors remains an essential step toward a low-carbon future.

- **Decentralization**

Driven by the significant cost reductions in distributed energy resources (DERs) such as distributed storage, distributed generation, demand flexibility, and energy efficiency

- **Digitalization**

both the grid with smart metering, smart sensors, automation, and other digital network technologies, including the Internet of Things (IoT) and a surge of power-consuming connected devices.

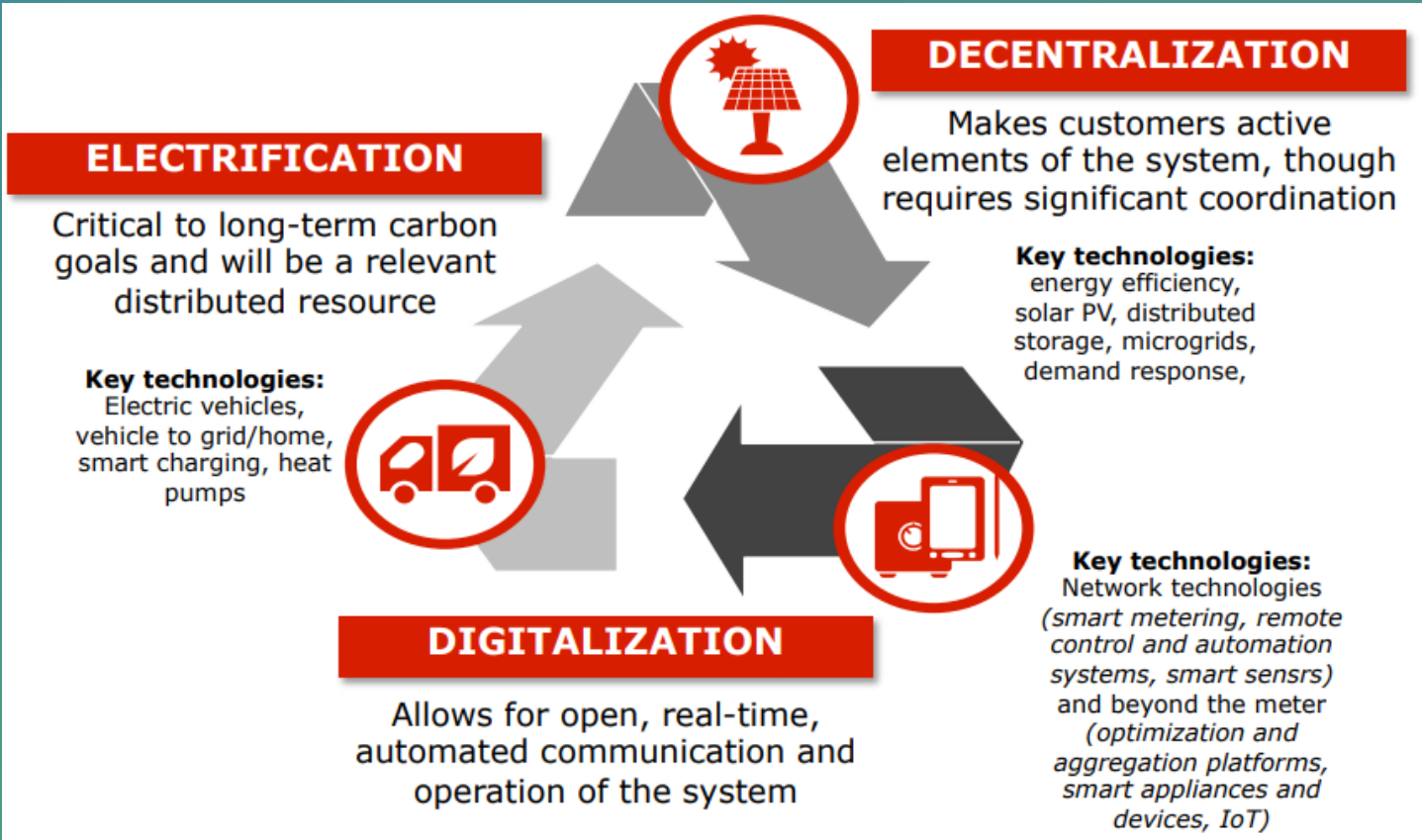


Fig 1. Three trends of the grid edge transformation (WEF 2017)

Thailand's Energy Transition

Definition in Power sector

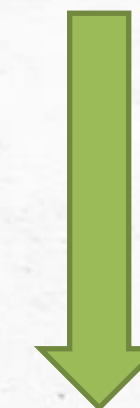
CASE TH described the energy transition for Thailand's power sector as “a move toward a cleaner generation system and efficient electricity consumption”.

The energy transition will be driven by disruptive technologies such as energy storage systems (ESS), electric vehicles (EV), monitoring and control, political will such as high-level signals, government ownership, consistency of policies and strategies, and joint visioning such as cross sector alignment, legitimacy, and stakeholder coordination

However, it must also be socially inclusive in order to achieve long-term liberalization with consumer benefits and a fair and appropriate market structure for stakeholders

Clean electricity generation and efficient electricity consumption

- Renewable energy (solar, biomass, waste, etc.)
- Other new technologies to increase grid flexibility and demand side management such as EE, Demand response, storage, smart grid and EV.



Sustainability growth

(Affordability, Security, Inclusive economy)

9 Challenge Groups of Energy Transition in Power Sector

1. Investment challenge

This challenge consists of four potential challenges: Power market risk, Financial risk, Access to capital, Regulatory risk

2. Entry challenge

This challenge consists of four potential challenges: Permits risk, Grid-access barrier, Market barriers, Regulatory barriers

3. Supply chain challenge

This challenge consists of three potential challenges: Hardware availability risk, Skilled staff, Developer risk

4. Grid integration challenge

This challenge consists of six potential challenges: Load balancing and reserve, Monitoring and control, Stability related challenges, Network congestion, Reduced use of dispatchable plants, System balance and negative residual load

5. Social acceptance challenge

This challenge consists of three potential challenges: Societal engagement in policymaking, social engagement on energy issues, consumer engagement and influence,

6. Fossil industry challenge

This challenge consists of four challenges: Geopolitics and perception of energy security on fossil fuel, Incumbent's dominance to fossil fuels, Public finance dependencies on fossil fuels, Lock-in of fossil fuel infrastructure developments.

7. Capability challenge

This challenge consists of potential three challenges: Stakeholder's knowledge gap, Lack of knowledge infrastructure, Barriers in entrepreneurship,

8. Political will and joint visioning challenge

This challenge consists of four potential challenges: High-level signal on clean energy, Cross-sector alignment, Government ownership of ET process, Consistency of policies and strategies

9. Actors and Institutional challenge

This challenge consists of five potential challenges: Legitimacy challenges, Institutional inertia, Coordination of actors and institutions within the power sector, Vertical and horizontal coordination of policy action, Transparency

Likelihood of issue being solved and impact level of challenge

issues on energy transition in Thailand's power sector

CASE TH conducted a survey with academia from the energy sector to identify prioritized challenges in Thailand's power sector for energy transition by CASE Thailand. In the survey, the respondents were asked to provide a rating to each sub-challenge based on its likelihood of being solved and its impact on the ET and other challenges.

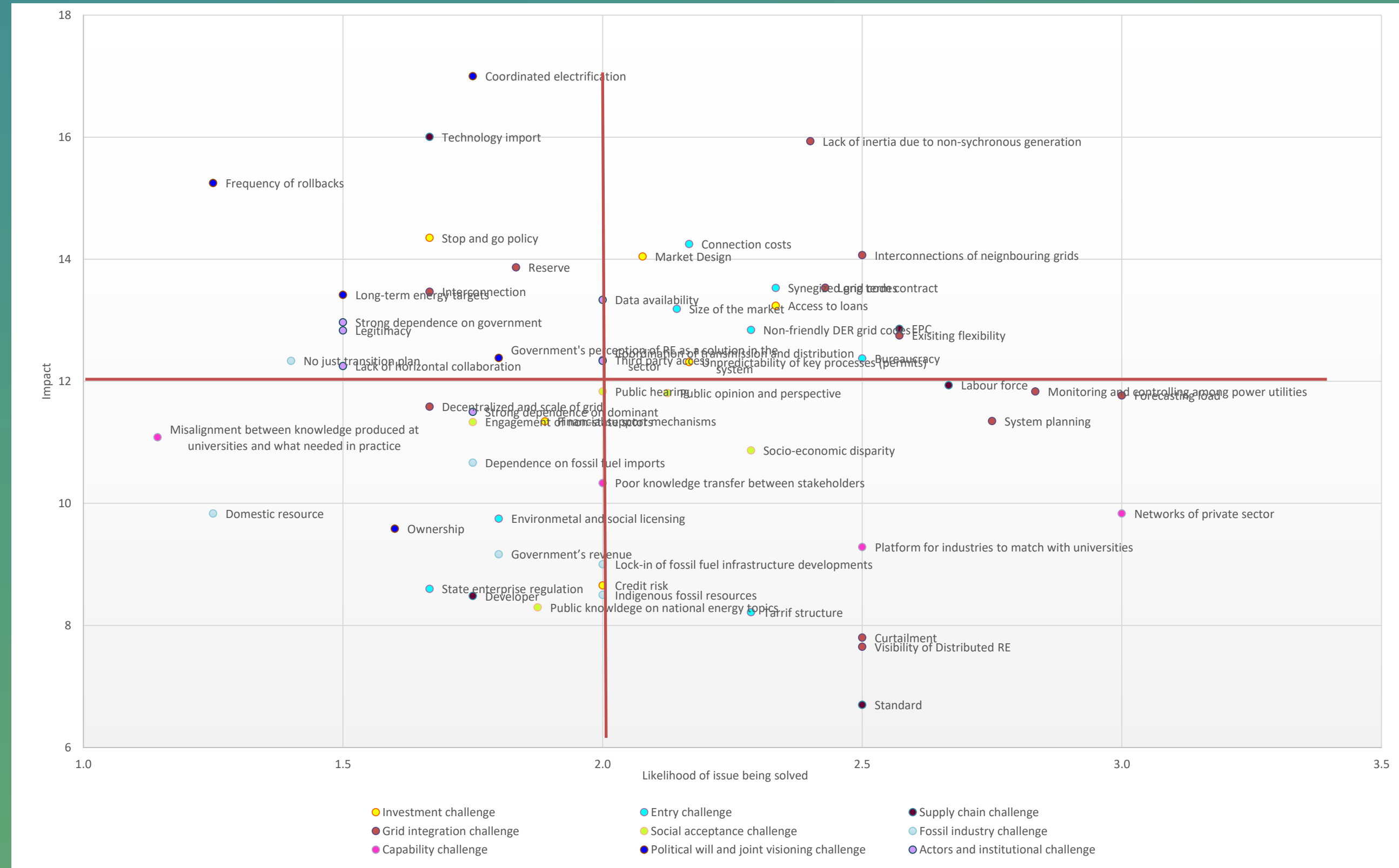
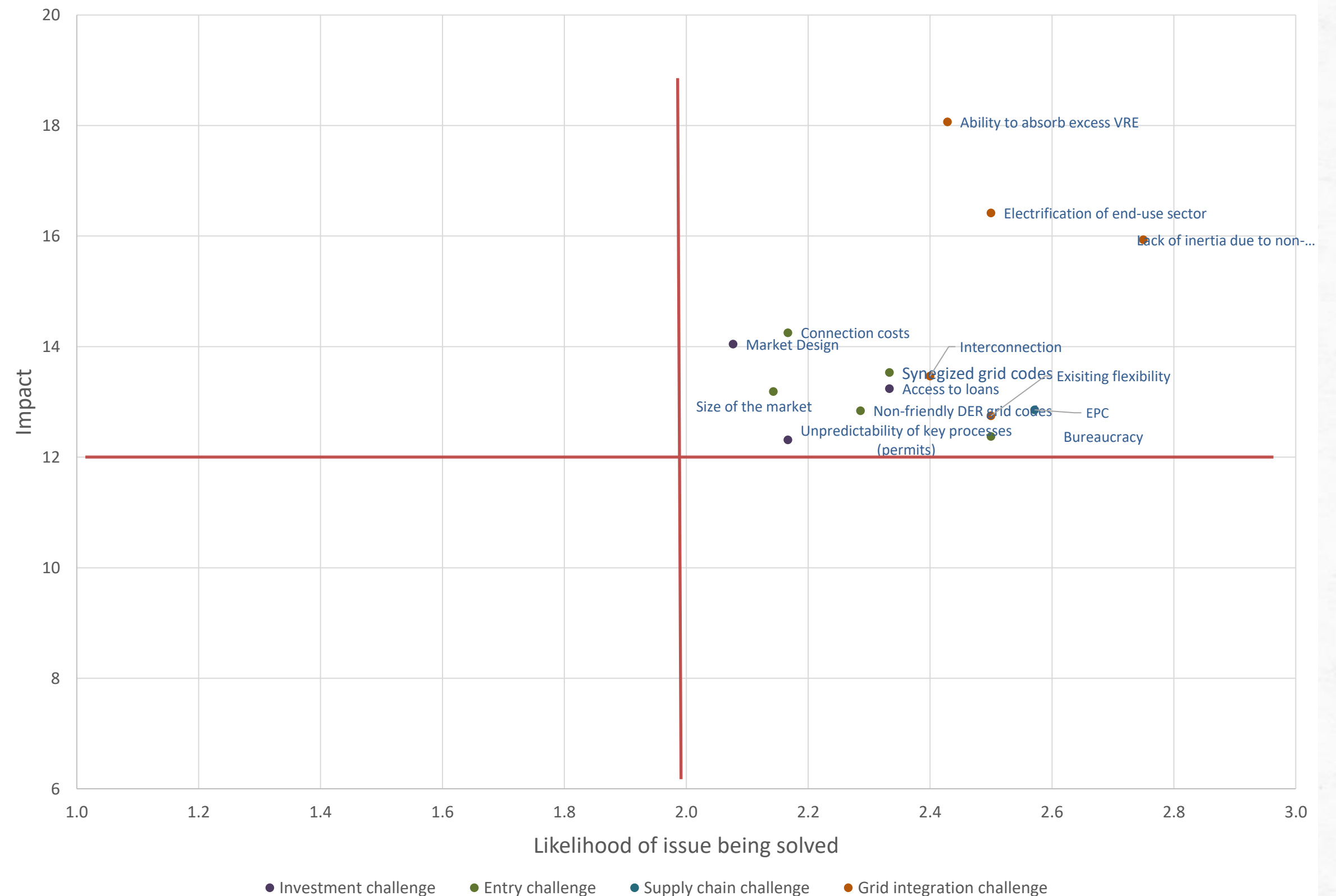


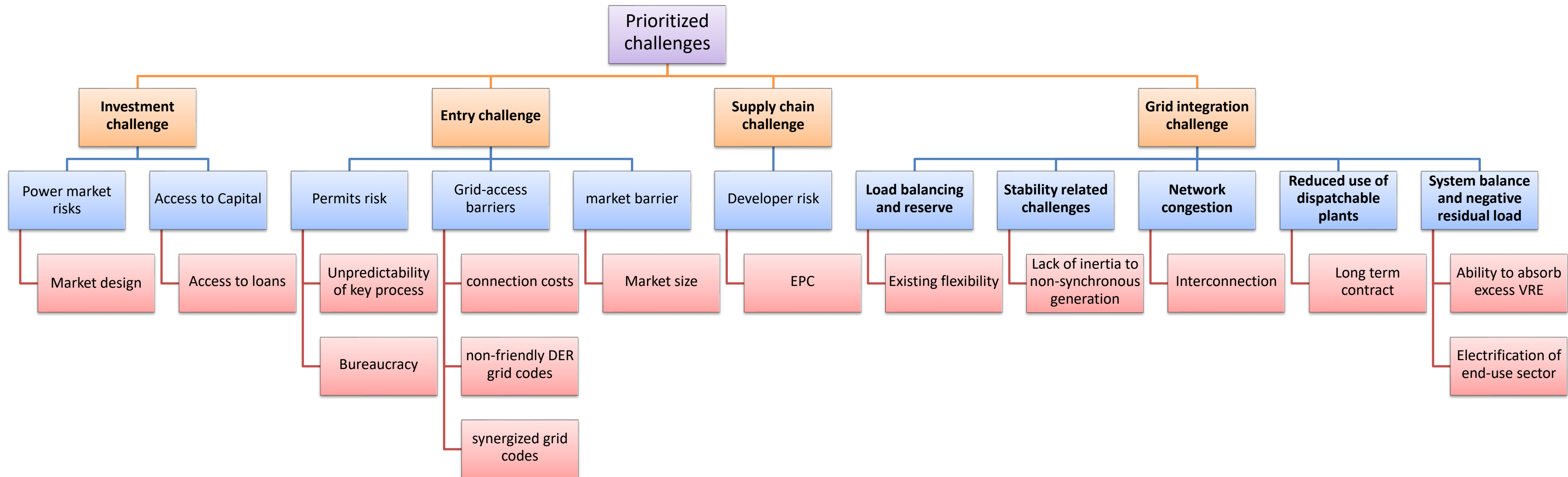
Figure 2: The challenges with high likelihood of being solved and high impact to energy sector relative to the average overall challenges (orange lines)

15 challenges of Likelihood of issue being solved and impact level of challenge issues on energy transition in Thailand's power sector

- Market Design
- Access to loans
- Unpredictability of key processes
- Bureaucracy
- Connection costs
- Non-friendly DER grid codes
- Synergized grid codes
- Size of the market
- Long term contract
- EPC
- Existing flexibility
- Interconnection
- Ability to absorb excess VRE
- Electrification of end-use sector
- Lack of inertia due to non-synchronous generation



4 groups with 15 subgroups of energy transition with high likelihood of being solved and high impact to energy sector relative to the average overall challenges



Four groups with fifteen subgroups of energy transition with high likelihood of being solved and high impact to energy sector relative to the average overall challenges

1 Investment challenge

- *Access to loans and market design* were identified as the prioritized challenges for renewable energy investment in Thailand. The majority of large RE projects are dependent on the government's power purchasing policies, in which the market favors RE-generated electricity and provides easy access to funds. Access to funding from smaller and community-based RE projects for self-consumption and distribution (i.e., prosumers) is now more difficult. The regulatory tool must be amended to allow prosumers or third parties to access the grid via an open TPA regime and allow various types of market to enhance the RE investment in Thailand.

2 Grid-access barrier

- *Permit risks included the unpredictability of vital processes (permits) and bureaucracy* as a result of the complex permit and licensing systems. Several entities must be contacted by the project developers. One-stop service should be formed to save time and cost of developers.
- *Connection costs, non-friendly DER grid codes, and synergized grid codes as grid-access barrier* were identified as the major challenges for RE entry in the Thai electricity market.
- The current structure of the electricity market is single buyer, and the third-party access (TPA) is not yet open. So, the *market size* of RE is limited. This challenge is linked to investment challenge.

Four groups with fifteen subgroups of energy transition with high likelihood of being solved and high impact to energy sector relative to the average overall challenges

3 Supply chain challenge

- *EPC* as a developer risk was identified as the most important challenge in the supply chain challenge. Despite the fact that most EPC for DPV installations is reliable, there should be a monitoring standard/platform for residential DPV installations due to consumers' inaccurate information. A monitoring process should be designed to follow the progress of the project.

4 Grid integration challenge

- *Existing flexibility* was identified as prioritized challenge for RE integration to the grid for load balancing and reserve. To support the future increase in the share of RE, studies on flexibility should be conducted to stabilize power systems and promote smart grid systems.
- *lack of inertia to non-synchronous generation* was identified as a priority challenge to be overcome in order to stabilize grid integration to promote RE and prosumer entry.
- Considering the current target of RE, the system has no problems of congestion. However, the increase of RE or prosumers can cause this problem, which *network congestion* was identified as challenges with high likelihood of being solved and high impact to power sector.
- This challenge is related to *interconnection*, which must be assessed in order to plan to support RE and prosumers in various places for future transmission line extension.
- *Ability to absorb excess VRE and electrification of end-use sector* as system balance and negative residual load were identified as priority in Thailand. Even though the system's ability to take in surplus VRE is low right now, it can't take in too much additional VRE. This leads to the idea of electrifying the end-use sector by promoting electric vehicles (EVs) and batteries as possible solutions for the future.

Conclusion

- *Investment, entry, supply chain, and grid integration challenges* are the most identified as prioritized challenges with high likelihood of being solved and high impact on energy transition to power sector in Thailand.
- To encourage more renewable energy investment in Thailand, the regulatory mechanism must be amended to allow prosumers or third parties to join the grid through *an open TPA system* and to allow for different types of markets and increase the size of market.
- Under the structure of enhanced single-buyer model, private companies or prosumers are not allowed to trade electricity among each other at the distribution grid. Under existing regulations, *emerging business models such as peer-to-peer (P2P) energy trading* cannot be fully implemented. Major renewable energy plants have few opportunities to sell electricity with the national grid.
- To support the growing amount of distributed energy resources such as VRE, EV, and energy storage, third party access and grid codes must be addressed and synergized. Furthermore, the capacity to absorb excess VRE must be increased. This gives rise to the idea of *electrifying the end-use* industry by pushing EVs and batteries as potential future solutions.

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Thank you