

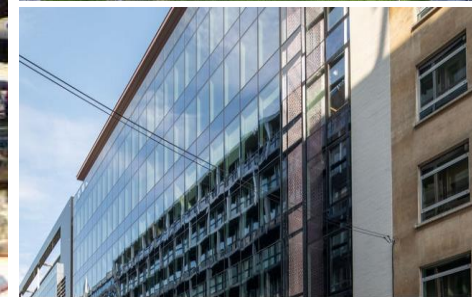
中国分布式可再生能源与新型电力系统协调发展 ——德国实践的政策启示

Coordinated Development of Distributed Renewables and New Type of Power System in China: Insights from Germany

尹明 YIN Ming

博众智合能源转型论坛 Agora Energy Transition China

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1 项目背景 Background

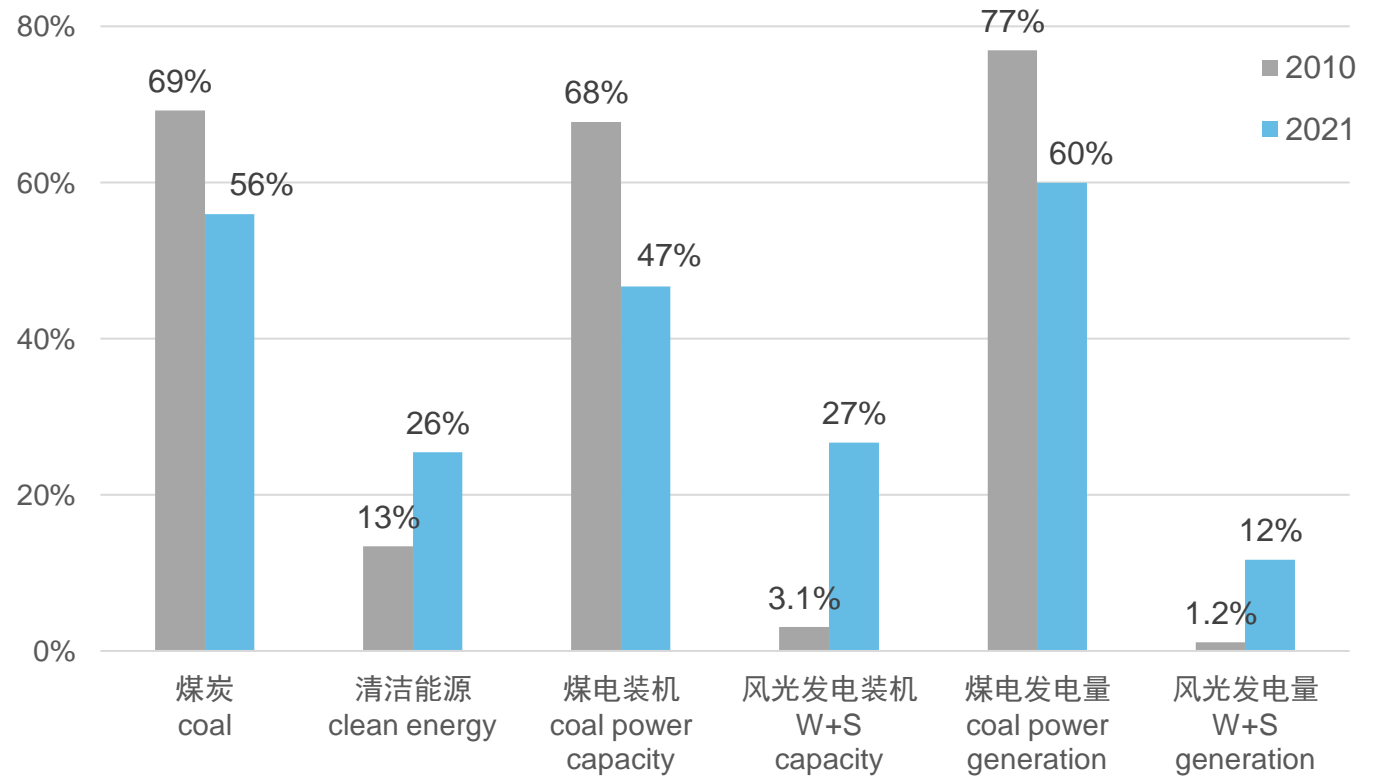
2 研究成果 Research findings

3 政策建议 Policy recommendations

1 项目背景 Background (1/3)

- ◆ 环境治理、应对气候变化已成为全球高度共识 Environmental governance and combating climate change have become a global consensus
- ◆ 中国面临来自CO₂排放总量、人均排放量的双重压力 China is under pressure due to both national CO₂ emissions and per capita emissions
- ◆ 中国电力绿色转型既成效显著，又矛盾突出 China's clean power transformation is not only remarkable but also full of contradictions

图1 能源消费结构、电源装机结构和发电量结构 2010 vs. 2021
Fig. 1 Structure of energy, power capacity & generation: 2010 vs. 2021



Source: National Bureau of Statistics, CEC

Note: Clean energy includes natural gas, hydro, wind, PV, etc..

1 项目背景 Background (2/3)

中国能源电力需求面临着存量与新增规模都很大的现实挑战。

China's energy and power system faces the practical challenge of meeting not only existing high demand but also soaring incremental growth.

中国能源电力消费方面，工业用能用电的比重虽有所降低，但依然过高。

The share of industry in national power mix has declined to certain extent, but is still too high.

东西部发展不平衡是中国能源清洁低碳转型需要统筹解决的“拦路虎”。

Unbalanced development between east and west China is a “bumper” that retards China's clean and low-carbon energy transition, and required integrated solution.

中国的东、西部发展分布式可再生能源发电具有显著的内生动力和外部压力。

Noticeable internal drivers and external pressure are moving distributed renewable agenda forward in east and west China .

1 项目背景 Background (3/3)



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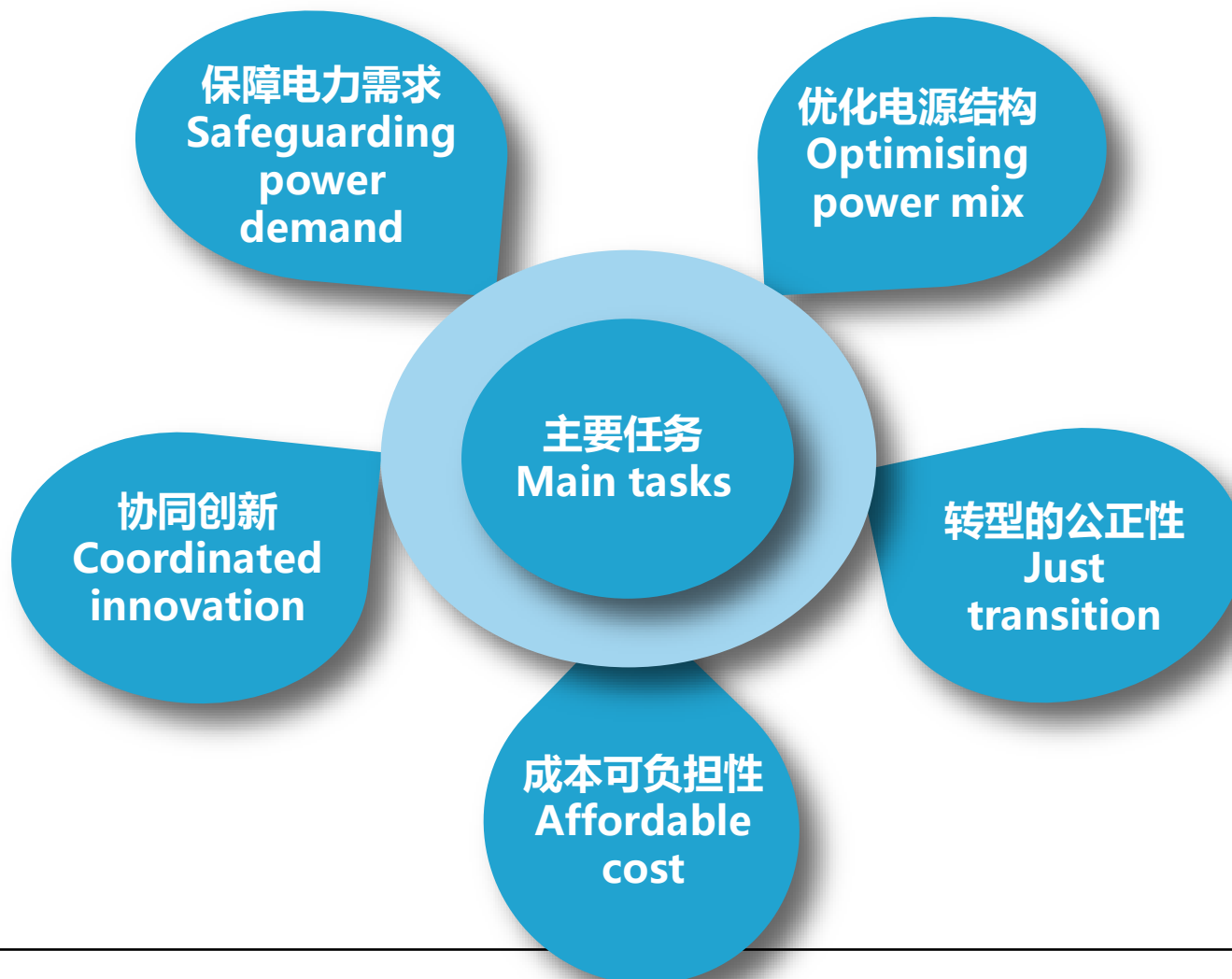
2.1 研究框架 research framework

1. 电力系统转型与分布式可再生能源 (DRG) 的发展驱动因素 Power system transition, drivers for DRG development

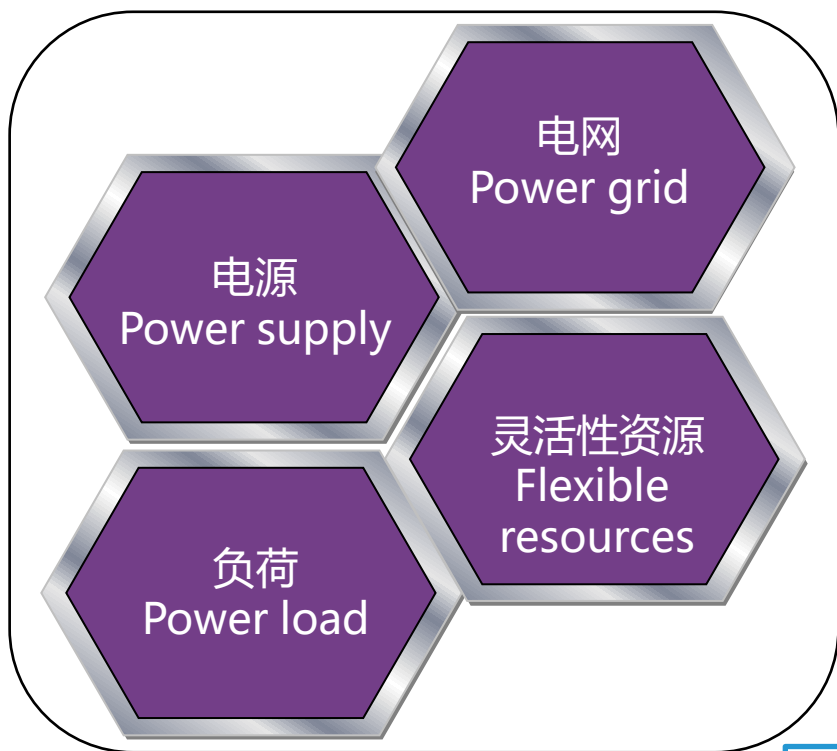
2. DRG规模化发展现状及面临的主要瓶颈问题 Current status of large-scale development of DRG and the main bottlenecks

3. DRG发展趋势, 德国发展经验与措施、建议 DRG development trend, German experience, measures and recommendations

2.2 新型电力系统建设面临的主要任务 Main tasks of establishing new type of power system



2.3 电力系统各环节转型重点 Main focus of transition at different segments of the power system



资产子系统
Subsystem: Assets

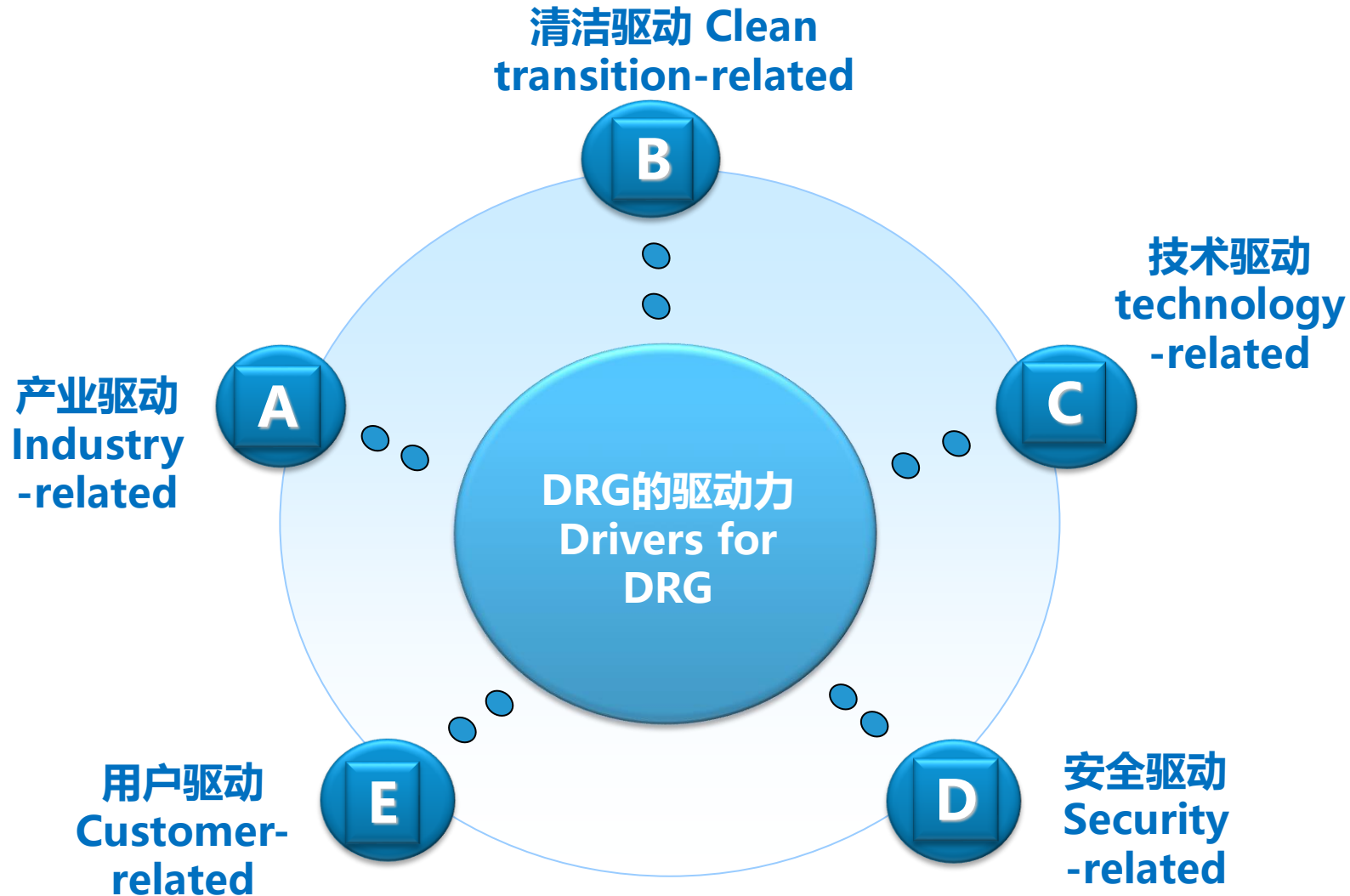
功能+模式+特点
Function + Mode
+Feature



运行子系统
Subsystem: Operation

2.4 DRG规模发展驱动力

Drivers underlying DRG development at scale



2.5 中国DRG发展趋势

Trends of DRG development in China

1— 在开发建设上，加强城镇、乡村、园区等DRG规模化发展

To strengthen large-scale DRG development in towns, villages and industrial parks.

2— 在补贴上，减少补贴和市场扭曲，仅保留户用分布式光伏补贴

To phase out all subsidies and eliminate market distortion, with residential distributed PV-related subsidies as exception.

3— 在消纳方面，强制性消纳政策与丰富的用电场景保障新能源消纳

Mandatory renewable portfolio standards and abundant utilization scenarios are expected to ensure integration of incremental new energy.

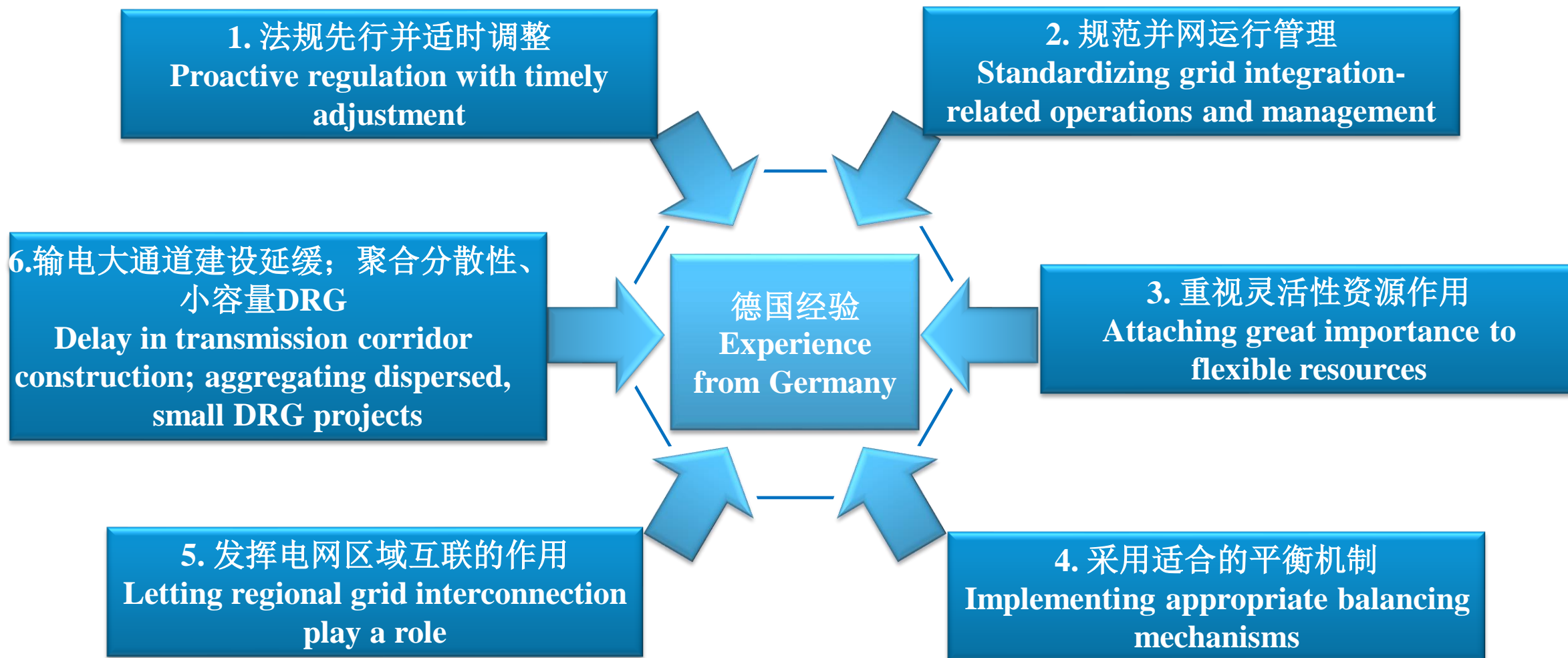
4— 在并网运行方面，合理配置储能、改善运行性能，促进DRG与电网友好互动

Rational configuration of energy storage & improvement of operational performance will contribute to increased compatibility between DRG and power grid.

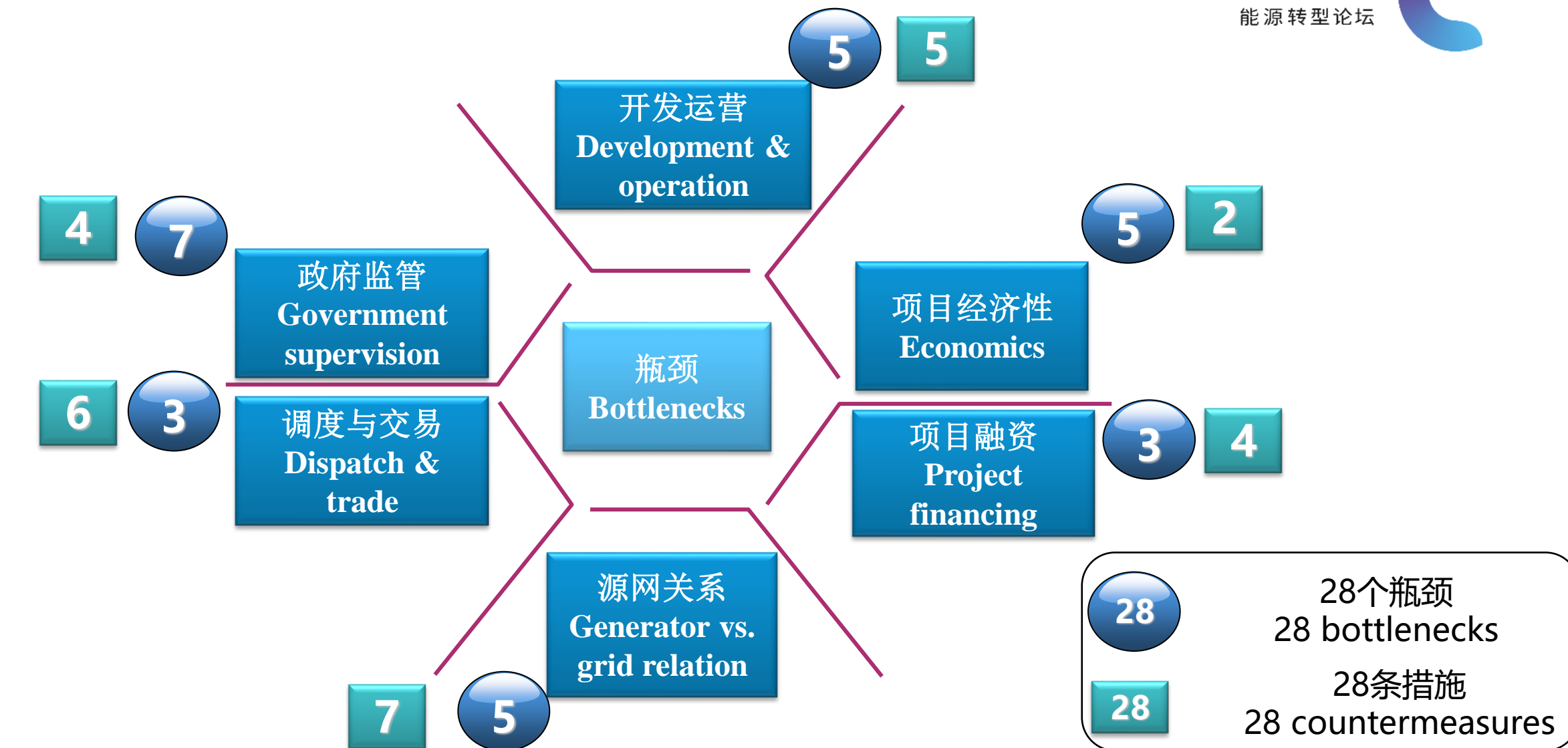
5— 在市场交易方面，分布式发电规模化发展，更多非自用电需通过市场进行交易

Once DRG is developed at scale, excessive power is expected to be sold through electric power markets.

2.6 德国发展DRG的经验 Experience from Germany



2.7 瓶颈与解决措施 Bottlenecks and solution measures



2.8 基础、关键和核心 Basis, key and focus of DRG development



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3 政策建议 Policy recommendations (1/2)

- 1. 加快完善相关法规政策，指导地方政府制定DRG发展战略，推动DRG高质量发展**
Accelerating improvements of DRG policies and guiding local governments in formulating local strategies to promote large-scale DRG development
 - 2. 以“价格、调度和市场”三类机制创新为重点，理顺源网荷储各方利益关系**
Focusing on three types of mechanism-related innovations in areas of pricing, dispatching and market, aiming to rationalise the relationship among major stakeholders including generators, grid, end users and energy storage owners
 - 3. 以“规划、技术和灵活性资源”三类创新为重点，全面提升配电网对高比例新能源的适应能力**
Focusing on three types of innovations in areas of planning, technology and flexible resources, aiming to comprehensively improve the ability of distribution grids to integrate high shares of variable renewables
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3 政策建议 Policy recommendations (2/2)

4. **兼顾系统安全与可持续发展，因地制宜制定DRG并网技术标准体系** Developing technical standards related grid integration of DRG in accordance with local conditions, with consideration of both power system safety and sustainable development of DRG
 5. **积极推动DRG乡村振兴发展基金，促进DRG的发展红利惠及“三农”** Actively promoting the DRG Rural Revitalisation Development Fund to facilitate distribution of DRG-related dividends, aiming to benefit farmers and agriculture development in rural areas.
 6. **以激发社会资本和全民参与为重点，进一步深化电力体制改革** Focusing on attracting social investment and public participation in DRG development, and further deepening the institutional reform of the power sector
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