



Experiences from the Power System Flexibility Campaign

Policy findings and experiences in implementing CEM workstreams

Prepared by the Renewable Integration and Secure Electricity Unit
International Energy Agency
23rd September, Pittsburgh



GLOBAL
CLEAN ENERGY
ACTION FORUM
CEM13/MI•7 USA 2022

State Secretary Patrick Graichen
Federal Ministry for Economic Affairs and Climate Action
Germany, Campaign Co-lead



Germany has been honoured to co-lead the Power System Flexibility campaign together with Denmark, China and Sweden since 2018. PSF has been fostering the exchange on regulatory framework conditions for a secure and cost-efficient grid and system integration of ever higher shares of variable renewable energies, especially wind and solar energy. Well-managed flexible power systems are key to building power systems primarily based on renewable generation. Our domestic experience in Germany illustrates that renewable shares reaching up to 100% at times and ensuring a very high level of supply security can go hand in hand. We look forward to the continuation of international cooperation on this vital issue within CEM under the International Smart Grid Action Network (ISGAN).



**Thérèse Hindman
Persson**
**Deputy Director General
and Chief Economist**
**Swedish Energy
Markets Inspectorate**
Campaign Co-lead

Power system flexibility and smart grid technologies and practices are key building blocks for advancing power system integration and transformation, in support of more competitive and innovative lower-carbon economies. The current energy crisis in Europe has also highlighted the urgent need for transformative change. To reap the full benefits of such technologies and practices, effective market design plays a pivotal role, both in relation to developments on the local/decentralized level and the regional/interconnected level, including areas such as distributed energy resources, geographic integration of power systems, dispatchable generation, storage, demand-side measures, and system integration of renewables. Going forward, market design will be even more important as flexible power systems and especially demand-side flexibility are vital for a sustainable energy future.

Transformative change can be advanced when working together and sharing knowledge. The PSF campaign has been a highly successful platform through which we have engaged with other actors as well as peers from across the world; sharing experiences and learning from each other. Our aim has been to identify best practice principles and examples in energy market design that can be applied in a wide range of circumstances by governments and regulators. Going forward, we will continue to emphasize the importance of collaboration and shared knowledge, and we will definitely continue the work we have started on demand-side flexibility, enhanced grid technologies and market design principles for well-functioning markets.

The PSF Campaign at a glance

An international diverse network

Active from CEM9 to CEM12

- Follow up to the Advanced Power System Flexibility Campaign

Hosted under the 21st Century Power Partnership and the Multilateral Solar and Wind working group

Three key pillars:

- Electricity Market Design
- Digitalisation
- Sector Coupling

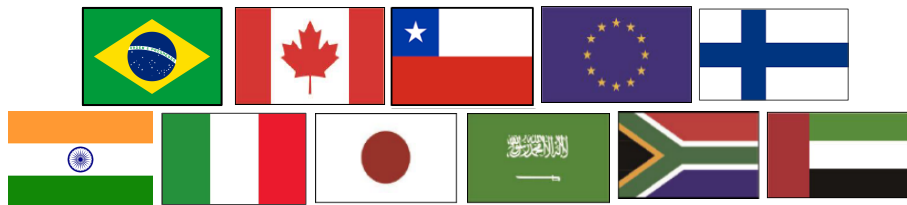
Portfolio of activities

- Bilateral direct assistance
- Senior expert technical workshops
- High-level ministerial engagement
- Policy briefs and reports

Co-lead countries



Members from the CEM community



Non-government members



Establishing an active and engaged network of governments, industry and academia at the forefront of power system flexibility as one of the core strengths of the campaign

Key outputs of the campaign



2018

- June: International kick-off workshop - Yokohama, Japan
- October: Forum on Power System Transition – Suzhou, Japan
- November: Challenges and Approaches for Power System Planning - Rio de Janeiro, Brazil

2019

- February: PSF Annual Expert Workshop – Paris, France
- April: Deep-dive workshop on digitalisation – Berlin, Germany
- May: Market Design and Flexibility – CEM10 Vancouver, Canada
- May: Ministerial and CEO roundtable - CEM 10 Vancouver, Canada
- October: Flexibility and Digitalisation at APEC summit – Santiago, Chile
- November: Implications of DER for distribution companies, Rio de Janeiro, Brazil

2020

- February: PSF Annual Expert workshop - Paris France
- April: Next steps for energy systems integration with Agora Energiewende – BETD, Online
- September: A holistic approach to low emission energy systems with ISDAN – CEM11, Saudi Arabia

2021

- February: PSF-3DEN Annual Expert workshop – Online
- March: Hydrogen and the role of synthetic fuels in power system flexibility – Online
- June: Ministerial roundtable “Three years of Power System Flexibility” – CEM12, Chile

12 International deep-dive workshops

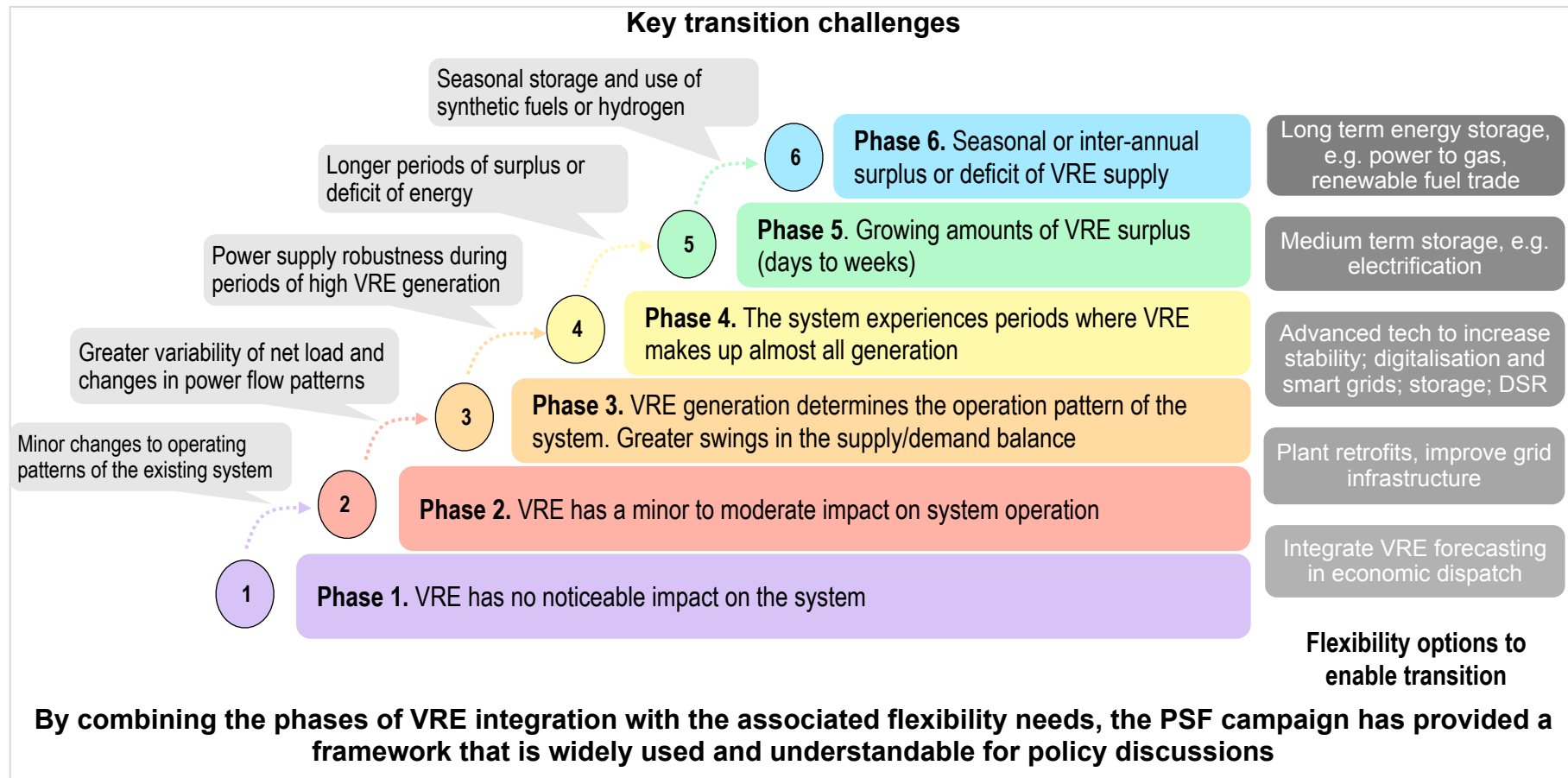
4 Ministerial and CEO roundtables

2 Policy input collaborations

2 Co-authored reports

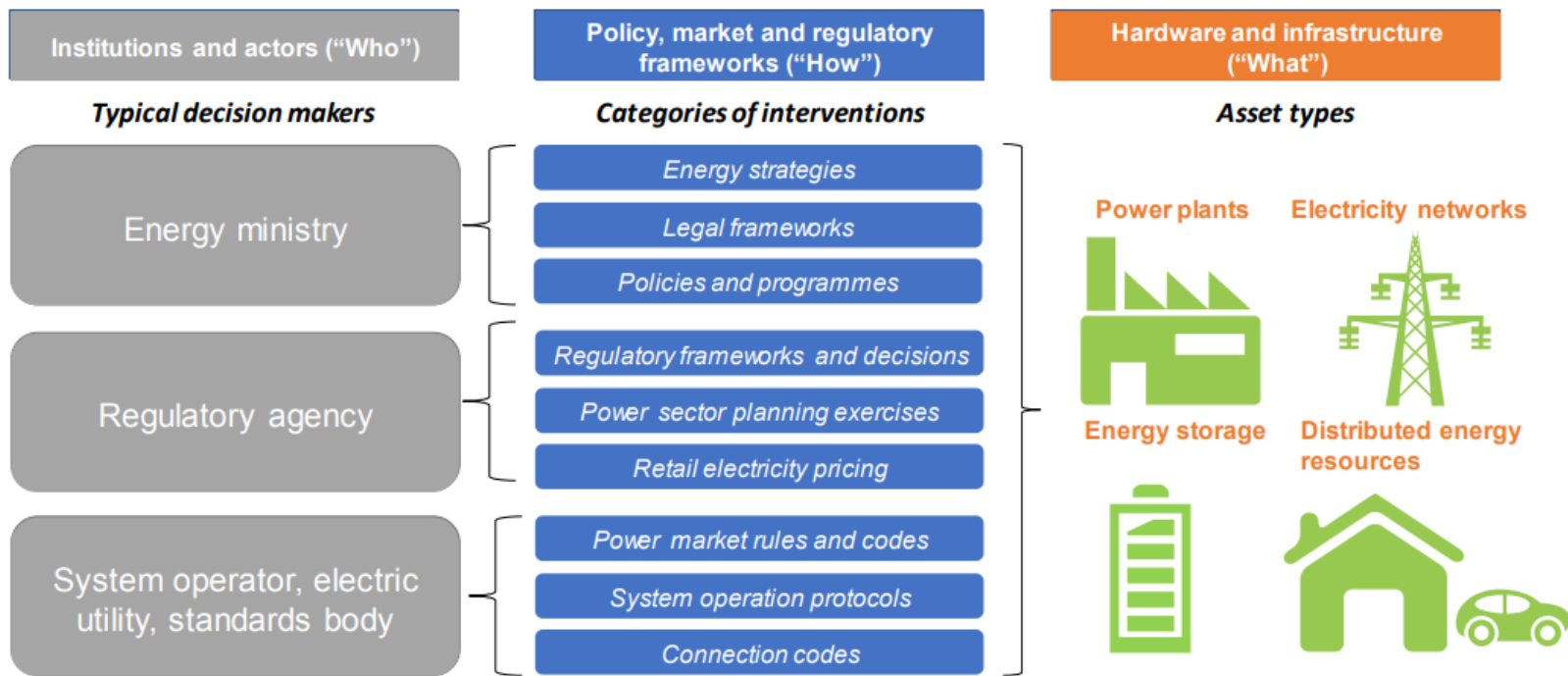
Key analytical outputs

Key contributions to policy analysis



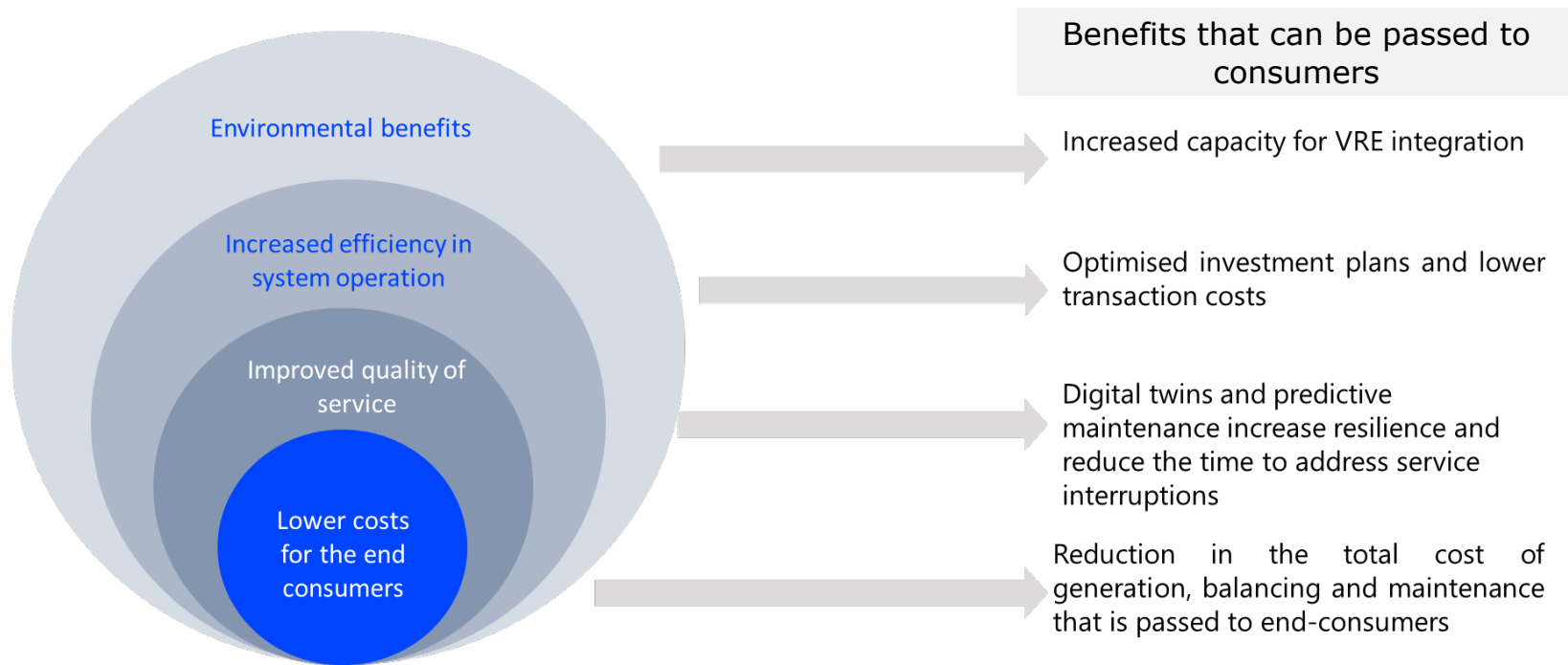
Furthering previous policy insight for market design

Layers of system flexibility



Following on the power plant flexibility campaign, the PSF shifted from technical to policy-centred advice, highlighting the key areas for policy intervention to accelerate system transformation

Maximising the benefits of digitalisation



In collaboration with 3DEN – Digitalisation will be essential to enable flexibility in increasingly decarbonised, decentralised systems. Identifying the benefits to effectively engage consumers will be essential.

The technological diversity of approaches for sector coupling remained a challenge to identify clear policy recommendations

Transport and heat electrification for flexibility are well understood, hydrogen's role is still unclear

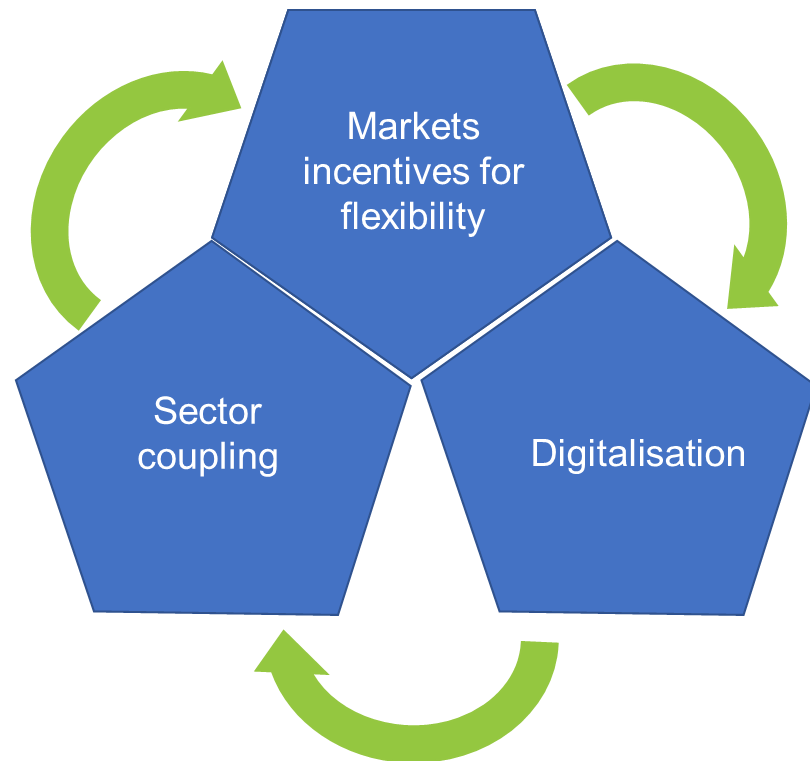
The event contrasted various perspectives:

- Grid connected hydrogen production for green steel
- Industry readiness to deliver co-firing and pure hydrogen peakers at scale
- Off-grid colocation of electrolyzers and solar PV
- Off-shore colocation of electrolyzers
- Challenges in the establishment of value chains for green hydrogen



Early identification of the pros and cons of various hydrogen deployment cases provided policy makers insight on the ways sector coupling can contribute to system flexibility

- Shift from a hardware-oriented understanding to a software oriented. **Focus on the institutional context**
- Not so much specific markets for flexibility, but focus on market designs that **make the most of flexibility resources**
- Importance of **linking all parts of the system through clear price signals** and regulatory innovation
- **Need for clear digitalisation strategies**, linking use cases and data governance to new system services
- Policy-making needs to go **beyond specific sectoral constraints**, EV-Power System integration is an example
- As we move towards more complex sector integration, **interoperability and standards are key for new business ecosystems but also enhanced reliability**



Uptake of PSF findings by member countries

Contributing to Chile's long-term energy strategy

The PSF provided inputs to Chile's energy ministry:

- Written input and consultation round for the country's flexibility strategy
- Information on business models for retail reform strategy
- Participation in national expert consultation on smart grids



Direct engagement with countries and linking ministry requests with expert advice provided an opportunity for timely, direct policy recommendations

Constant collaboration enabled multiple policy enhancements in Brazil

The collaboration on-site and through dedicated bilateral workshop series has provided inputs to multiple documents:

- Informed decisions on capacity and flexibility for the 10-year energy plans
- Information contributed to the development of new adequacy criteria
- New adequacy criteria contributed to new auction products
- Information on market design has also contributed to the power sector modernisation project



The organisation of workshops and provisions of examples on methodologies to account for flexibility have helped policy makers in Brazil planning for system transformation

Campaign experience as the groundwork for further analysis

The expertise developed through the campaign has been adopted in analyses beyond the CEM network, with direct relevance for policy makers:

Renewables Integration in India



The dissemination of findings and analytical frameworks has contributed to building expertise within organisations like the IEA and the Swedish Energy Markets inspectorate and integrated into further analyses

What's been achieved and what are the challenges ahead?

The PSF campaign derived many of its insights from country and industry case studies, interviews, and power system modelling exercises with the objective of raising awareness and bringing this to policy makers' attention.

3 key points underpin the road ahead for power system flexibility:

Power system flexibility will continue to be a relevant topic but mainly as one aspect of broader policy questions on the road to net zero

Lessons from campaign implementation

Establishing a structure and ensuring policy relevance

The Power System Flexibility Campaign was initially established through co-lead funding for the first two years, with activities in the last cycle funded through voluntary contributions from Sweden and the US.

- A **nimble cost-free membership model** enabled the engagement one of the –at the time– largest CEM membership bases as well as industry and academic participation.
- The **IEA secretariat acted as a sounding board** for new requests **and a filter** for industry and academic solutions before redirecting to countries requesting input.
- **Collaboration**, mainly with 21st CPP and subsequently with EVI, ISGAN, Agora Energiewende and the IEA's 3DEN programme, was **key to ensure the analysis was sound and relevant** to policy-making audiences

Advantages

- Lack of membership fees facilitated the membership of a wide range of stakeholders, both geographically and in terms of size
- Open events and webinars increased the reach and visibility of the events
- Regular update calls helped establish the campaign as a trusted partner and enable a flow of ongoing requests by member countries
- Open communication with other initiatives reduced the potential for work duplication across CEM initiatives
- Connecting analysis to present technical challenges helped make the messages and case studies relatable to the campaign's membership-base

Challenges

- Loose membership structure complicated continuity both in terms of engagement and funding, particularly through administration changes
- The “campaign” model is more suited to single-year visibility efforts, which complicates the possibility of in-depth country analysis
- Trade-off between addressing technically complex system and market challenges and communicating actionable policy items for ministerial counterparts
- Most recent challenges in flexibility require resource-intensive analysis
- Maintaining relevance as flexibility is too specific and embedded in more pressing issues for policy makers (e.g. affordability and reliability)

- Identify the **right match between are of work and CEM models (campaign, initiative)**: Is this a one-year communications push to bring a topic to policy-makers attention or an area that will require ongoing analysis and awareness-raising?
- **Scan the landscape** to gauge ministerial appetite and momentum: Is this just technically interesting for operating agents, driven by a single ministry or requested by various member governments?
- Identify the **right skill-set in operating agents**: Effective communication is just as important as in-depth analysis, make sure your operating team has both!
- Develop a **consistent engagement and communications strategy**: Do your members have a clear picture of how everyone is expected to contribute? Periodicity and transparency are key to success
- **Network with other workstreams**, sharing workplans and findings: Are all the elements in your workstream adding value or could you provide visibility to another workstream's ongoing and previous work?
- Assess **resource requirements and define a funding model**: Is your workstream better suited for open participation enabled through a few donors, or do you want to link participation benefits to a membership fee? Does this change depending on the stakeholder type?

Setting up workstreams with a user-oriented mindset from the start is essential to ensure that workstream effectiveness and specific objectives are met

