ANALYSE VON GESCHÄFTSMODELLE FÜR BETREIBER VON HYBRIDEN-VIRTUELLEN-KRAFTWERKEN

14. Symposium Energieinnovation
TU Graz, 10.-12.02.2016

Georg Lettner, Lukas LEIMGRUBER , Tara ESTERL, Jan W. BLEYL , Gregor TALJAN , Christoph GUTSCHI, Ernst MEIßNER

Inhalt

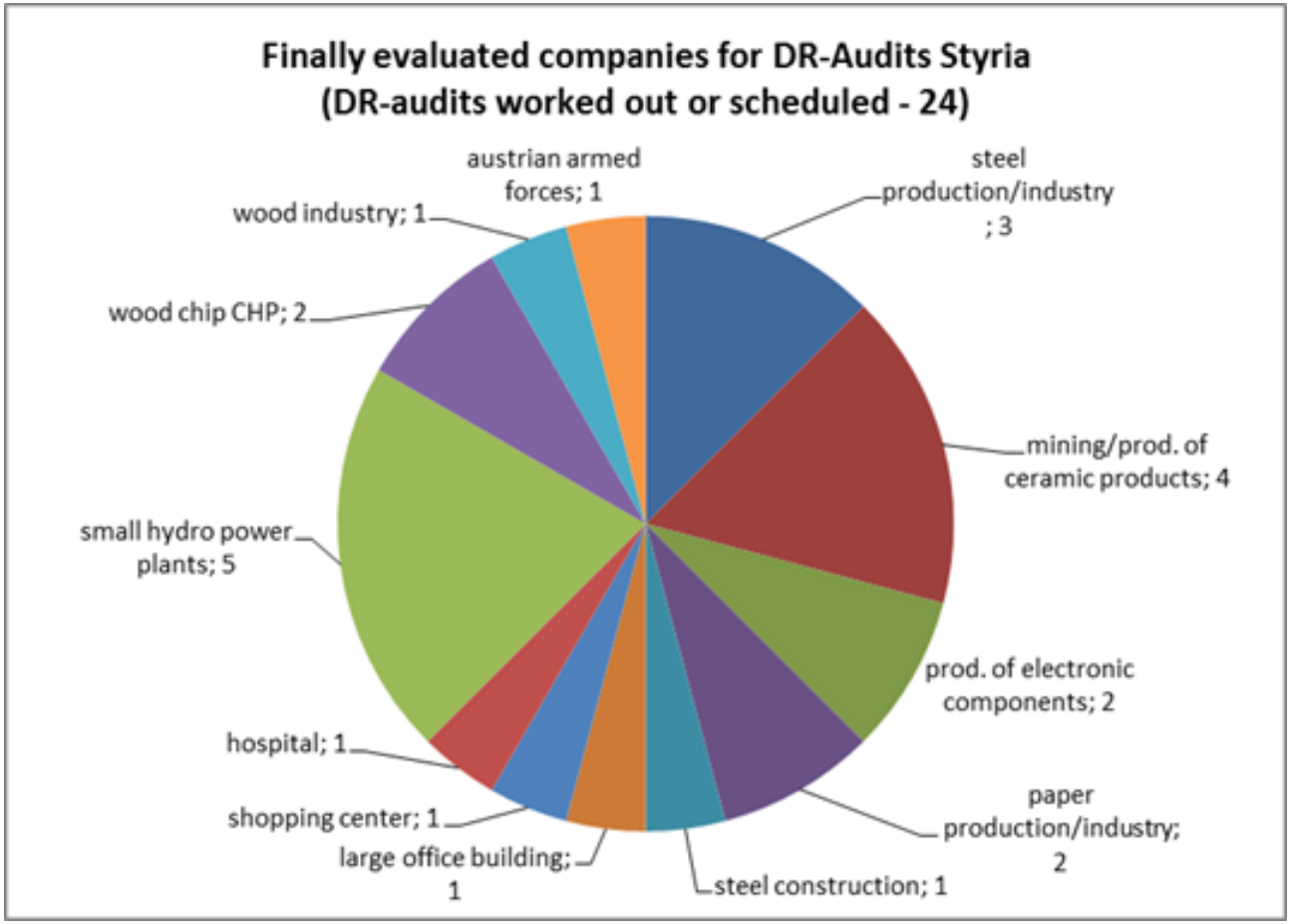
- Demand Response Audits
- Betriebsarten Hybride-Virtuelle-Kraftwerke
- Geschäftsmodelle und Bewertungskriterien
- Analyse
- Schlussfolgerungen

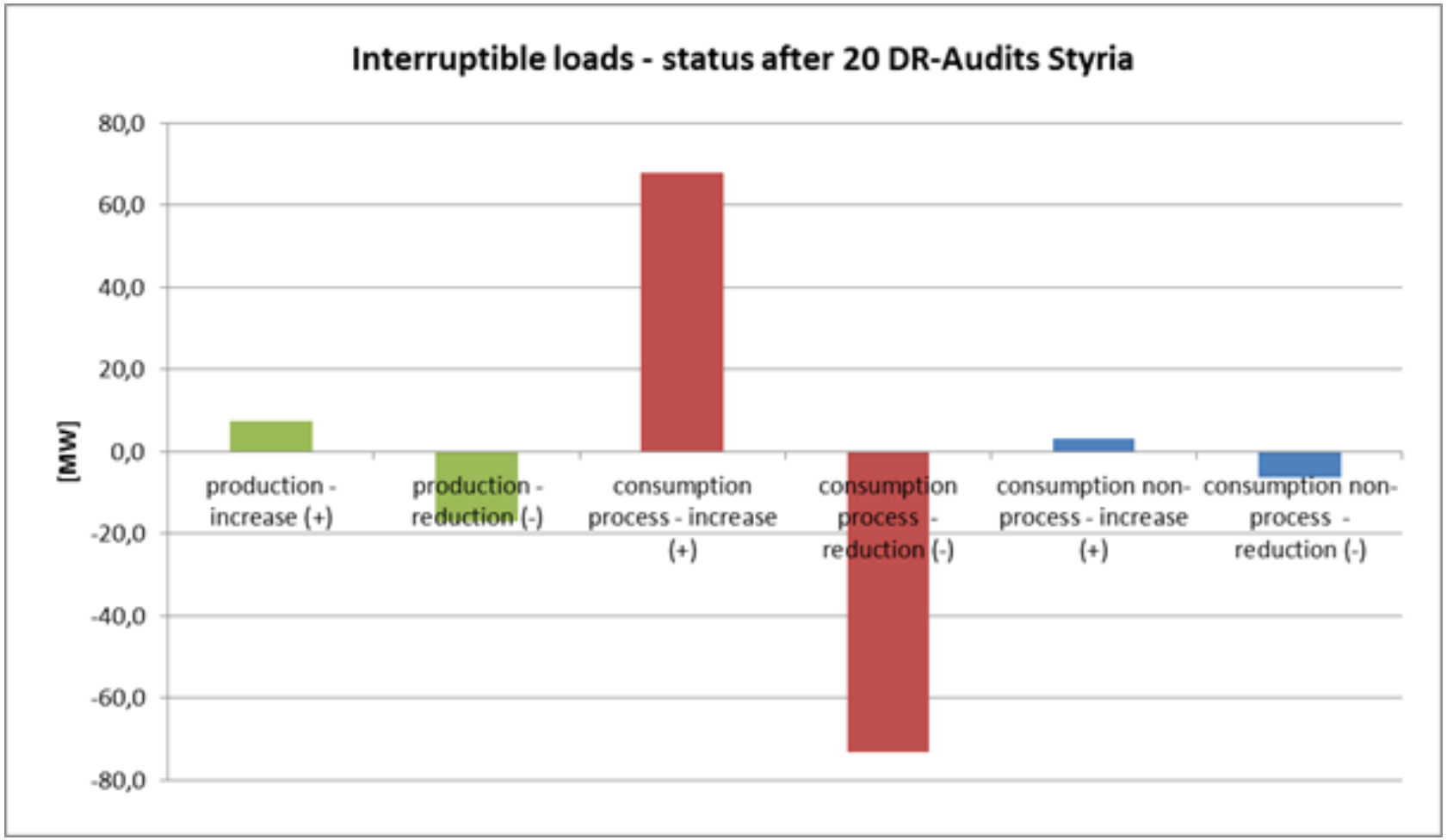
Projektdaten Hybrid-VPP4DSO:

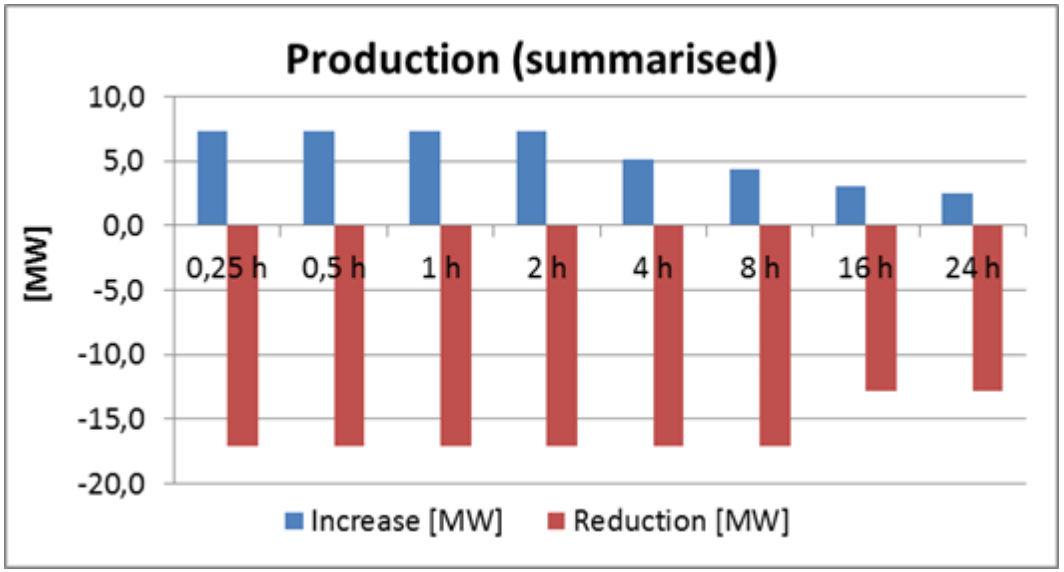
- Laufzeit: 10/2014-09/2016
- 9 Projektpartner
- Weitere Informationen http://www.hybridvpp4dso.eu/

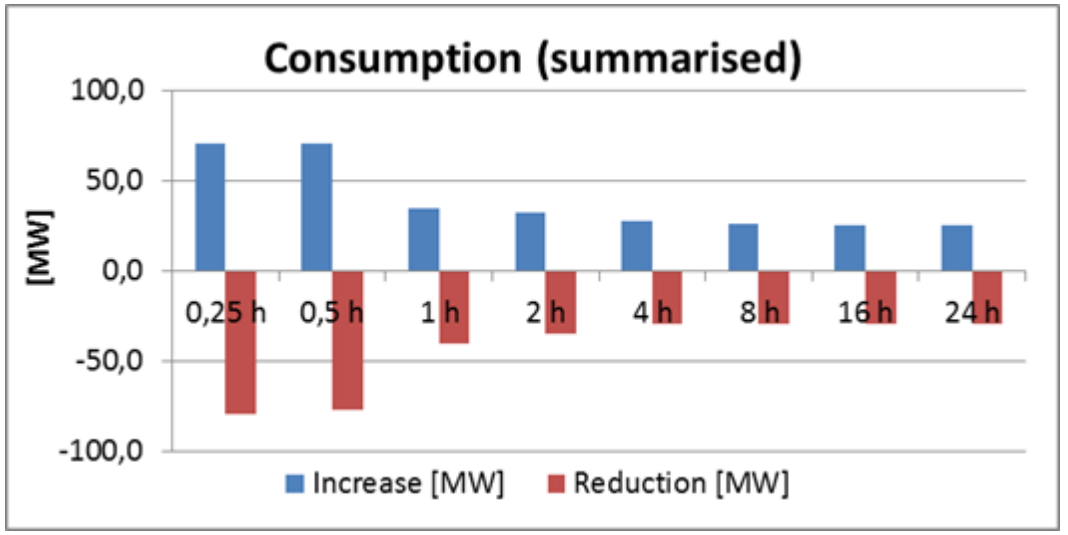
Demand Response Audits - Steiermark

- Durchgeführt von Grazer Energieagentur, Energie Steiermark Kunden GmbH und Energienetze Steiermark GmbH
- Ziel:
  - 20-30 Unternehmen mit unterbrechbaren Lasten
  - Über 50% der Unternehmen in den kritischen Netzabschnitten
  - Anschlussleistung Last/Erzeugung > 100kW


Finally evaluated companies for DR-Audits Styria
(DR-audits worked out or scheduled - 24)
austrian armed forces; 1
steel production/industry ; 3
wood industry; 1
wood chip CHP; 2
mining/prod. of ceramic products; 4
small hydro power plants; 5
prod. of electronic components; 2
hospital; 1
paper production/industry; 2
shopping center; 1
large office building; 1
steel construction; 1


Interruptible loads - status after 20 DR-Audits Styria
[MW]
80,0
60,0
40,0
20,0
0,0
-20,0
-40,0
-60,0
-80,0
production - increase (+)
production - reduction (-)
consumption process - increase (+)
consumption process - reduction (-)
consumption non-process - increase (+)
consumption non-process - reduction (-)


Production (summarised)
10,0
5,0
0,0
-5,0
-10,0
-15,0
-20,0
[MW]
0,25 h
0,5 h
1 h
2 h
4 h
8 h
16 h
24 h
Increase [MW]
Reduction [MW]


Consumption (summarised)
100,0
50,0
0,0
-50,0
-100,0
[MW]
0,25 h
0,5 h
1 h
2 h
4 h
8 h
16 h
24 h
Increase [MW]
Reduction [MW]

Sector	Potential	Specifics	Shifting times [h]
Steel production	High	Reduction with electric arc furnace for raw materials but the **higher the requirement for the good the less the chance for load shifts**; nearly no chance for load shifts in thermal treatment processes	0.25 - 24
Mining/ ceramics	High	Mainly depending on **level of automation**, **storage capacity** and actual degree of their **capacity utilization**	0.5 - 8
Paper	Small/ medium	Mainly depending on **storage capacity** before/after shredders, grinding machines, mills etc.	0.5 - 24
Large office building	Small	From **ventilation**, **air conditioning**, etc.	0.25 - 1
Hospital	Small	Emergency generators cannot be used in general (**disaster protection**); but small potential from ventilation, air conditioning, steam humidifiers, etc.	0.25 - 2
Small hydro power	Medium	Depending on **capacity level**: April to June 100%; consideration of **feed-in regulation**	up to 24
Wood chip CHP	Medium	Reduction possible if **bypass for heat production** is foreseen; consideration of **feed-in regulation**	up to 12

Betriebsarten Hybride-Virtuelle-Kraftwerke

Market-VPP	Hybrid-VPP (passive)	**Hybrid-VPP (active)**	Grid-VPP
The grid is robust enough to permit the operation of VPPs in the Electricity Market while not being jeopardised by it.	The degree of participation of the VPPs in the Electricity Markets is agreed with the DSO beforehand. This agreement guarantees that the grid limits are not violated.	The VPPs participate in the Electricity Markets as long as the grid limits are not violated. If a critical situation is identified during the VPPs operation, an algorithm takes care of it by limiting the participation of the VPP.	The VPPs do not participate in any Electricity Market, but only provide active local services to the DSO.

Geschäftsmodelle

- 4 Geschäftsmodell je nach Hybrid-VPP Betreiber
  - Verteilnetzbetreiber
  - Energiehändler
  - Unabhängiger Aggregator
  - Kunden VPP

- Wechselwirkung mit anderen Interessensgruppen
  - Verteilnetzbetreiber
  - Energiehändler
  - Aggregator
  - Flexible Kunden im VPP
  - Andere unflexible Kunden

Bewertungskriterien

- Technische Anforderungen
  - Lösung von Netzproblemen
  - Datensicherheit
  - Einschränkung Geographisch bzw. Teilnehmer
- Organisatorische Anforderungen
  - Systemkomplexität
  - Bestehendes Wissen
  - Bestehende Kundengruppe
- Regulatorische Rahmenbedingungen
- Politische Zielsetzungen
- Andere Vorteile
  - Grünes Image
  - Neue Tarifstrukturen

Bewertungskriterien

- Ökonomische Aspekte
  - Erlöse aus Marktsicht
    - Energy-only Markt
    - Regelenergiemarkt
    - Minimierung Ausgleichsenergiekosten
    - Kapazitätsmechanismen
  - Erlöse aus Netzsicht
    - Minimierung der Netzanschlusskosten
    - Minimierung Netzinvestitionskosten
    - Versorgungssicherheit
    - Minimierung der Kosten für das übergelagerte Netz
  - Investitionskosten in notwendige IKT-Lösung
  - Vermiedene Netzverstärkung

Qualitative Analyse: Geschäftsmodell „DSO“

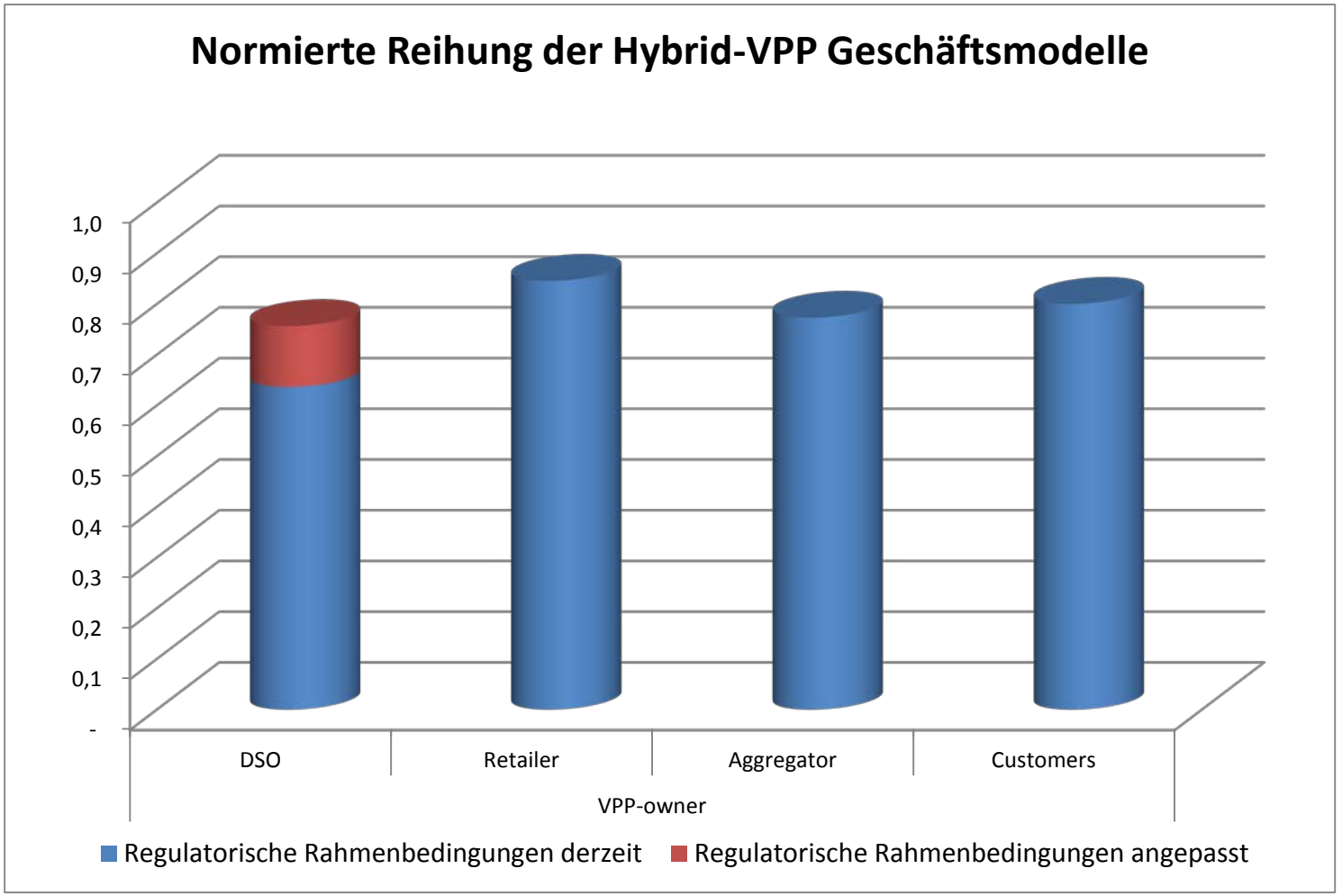
active hybrid-VPP		VPP-owner	Stakeholders					
		Affiliation of VPP - DSO	DSO (comp. without VPP)	Energy Retailer (comp. without VPP)	Aggregator (comp. with market-VPP)	hybrid-VPP-participant (flex. load/gen)	Other Customers	Total
Technical	Solution of grid problems	++	o	++	++	++	++	++
	Data safety and security	o	o	o	o	+	o	+
	Geographical limitation / limitation in participating units							
	> geographical limitaion	-	o	o	o	-	o	o
	> limitation in participating units	+	o	o	o	o	o	+
Organisational	High system complexity	++	o	o	o	++	o	+
	Existing information / know-how							
	> information about own facilities	--	o	o	o	-	o	o
	> know-how about trading / energy markets	--	o	o	o	-	o	o
	Existing customer pool	+	o	-	--	o	o	o
Regulatory	Compliance with regulatory framework	--	o	o	o	--	o	o
Political	Fullfilment of political framework conditions e.g. climate targets							
	> share of RES	o	o	-	+	+	++	+
	> energy efficiency	o	o	-	+	+	++	+
Monetary	Possibility to get revenues by business cases - market view							
	> energy only market	--	o	+	+	--	o	o
	> balancing market	--	o	+	+	--	o	o
	> minimizing imbalance costs	--	o	o	o	--	o	o
	Possibility to get revenues by business cases - grid view							
	> minimizing connection costs for customer	o	o	o	o	++	o	+
	> minimizing grid investments for the DSO	++	-	+	+	++	++	++
	> energy provision during failures	++	-	+	+	++	++	++
	> Minimizing grid tariffs charged by DSO / TSO	o	o	+	+	+	+	+
	Low investment costs: ICT, infrastructure, etc.	++	o	o	--	+	o	+
	Avoided grid enhancement	+	-	++	++	++	++	++
Other	Green image	++	--	o	o	++	o	+
	New tariff structures / products	++	--	o	o	++	o	+
Total		+	o	+	+	+	+	+

Bewertung bei Veränderung regulatorischer Rahmenbedingungen	VPP-owner
	Affiliation of VPP - DSO
Solution of grid problems	++
Data safety and security	o
Geographical limitation / limitation in participating units	
> geographical limitaion	-
> limitation in participating units	+
High system complexity	++
Existing information / know-how	
> information about own facilities	--
> know-how about trading / energy markets	--
Existing customer pool	+
Compliance with regulatory framework	++
Fullfilment of political framework conditions e.g. climate targets	
> share of RES	o
> energy efficiency	o
Possibility to get revenues by business cases - market view	
> energy only market	++
> balancing market	++
> minimizing imbalance costs	++
Possibility to get revenues by business cases - grid view	
> minimizing connection costs for customer	o
> minimizing grid investments for the DSO	++
> energy provision during failures	++
> Minimizing grid tariffs charged by DSO / TSO	o
Low investment costs: ICT, infrastructure, etc.	++
Avoided grid enhancement	+
Green image	++
New tariff structures / products	++
	+

Qualitative Analyse: Geschäftsmodellvergleich

active hybrid-VPP		VPP-owner			
		DSO	Retailer	Aggregator	Customers
Technical	Solution of grid problems	++	++	++	++
	Data safety and security	o	-	--	+
	Geographical limitaion	-	++	++	+
	Limitation in participating units	+	+	+	--
Organisational	High system complexity	++	+	-	-
	Information about own facilities	--	+	+	++
	Know-how about trading / energy markets	--	++	+	-
	Existing customer pool	+	++	--	+
Regulatory	Compliance with regulatory framework	--	++	++	++
Political	Share of RES	o	+	++	++
	Energy efficiency	o	+	++	++
Monetary	Energy only market	--	++	++	++
	Balancing market	--	++	++	++
	Minimizing imbalance costs	--	++	+	++
	Minimizing connection costs for customer	o	o	o	++
	Minimizing grid investments for the DSO	++	+	o	o
	Energy provision during failures	++	+	+	+
	Minimizing grid tariffs charged by DSO / TSO	o	+	+	+
	Low investment costs: ICT, infrastructure, etc.	++	-	--	--
	Avoided grid enhancement	+	+	+	+
Other	Green image	++	++	++	++
	New tariff structures / products	++	++	++	+
Total		+	++	+	+

Qualitative Analyse: Geschäftsmodellvergleich



Schlussfolgerungen

- Regulatorische Anpassung für Geschäftsmodell „DSO“ notwendig
- Neue Tarifmodelle (v.a. Netz) notwendig
- Anreizemechanismen für Netzdienstleistung schaffen
- Notwendige IKT Strukturen schaffen (Smart Grids)
- Robuste Datensicherheit
- Optimale Kombination unterschiedlicher DR-Potentiale erhöht bestmöglichen Einsatz von aktiven Hybrid-VPP

TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

Energy Economics Group

HYBRID VPP4DSO

Vielen Dank für die Aufmerksamkeit!

Georg Lettner
lettner@eeg.tuwien.ac.at