

**Electrification, flexibility or both?  
Emerging trends in recent Swiss and  
European policy**

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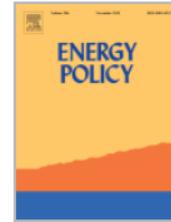
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# Today's PATHFNDR lunch talk: policy review



Energy Policy  
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## Electrification, flexibility or both? Emerging trends in European energy policy

+ an emphasis on Switzerland specifically

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# Motivation

# Higher (demand-side) flexibility needs

## Evolving electricity supply

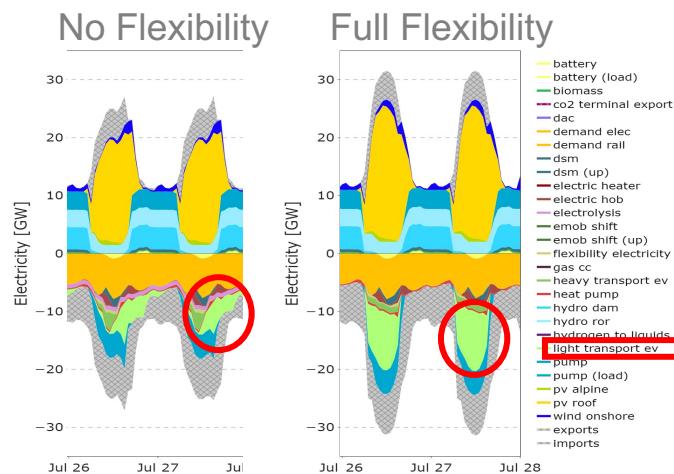
- Intermittent renewables
- Decentralised production
- Smaller share of dispatchable and thermal plants

## Evolving electricity demand

### Sector coupling :

- EVs
- Heat Pumps
- Electrolysis
- etc.

European flexibility needs will  
**double** by 2030  
(ACER 2023)

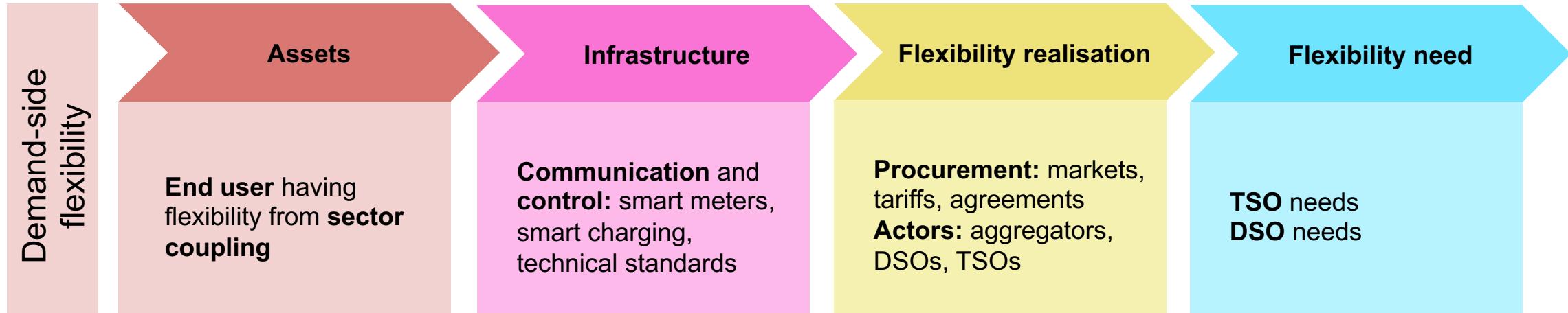


Figures from SR II: Sanvito, F., Garrison, J. (2024). The role of flexibility and sector coupling in the Swiss energy system. SWEET PATHFNDR.

### Sector-coupling is part of the challenge but also the solution

- New loads can shift in time
- New sources of flexibility, instead of being only a problem

# Problem: in practice, it's not that simple



*Electrification policies*

*Smart meters*

*Tariffs, load control, incentives*

*Electricity mix*

*e.g. V1G, V2G infrastructure*

*Market access regulations*

*Competition/complementarity with other flexibility sources*

*New flexibility markets and products*

# Problem: in practice, it's not that simple

The need for an **evolving policy and regulatory framework**

Modelling flexibility from heat pumps:  
a bottom-up approach for Swiss  
buildings

Curtis Meister (HSLU)



- Standards
- Smart control

Modelling flexibility from electric  
vehicles: where, when, why, and how

Siobhan Powell & Maria Parajeles (ETH Zurich)



- Automation
- Infrastructure
- Tariffs
- Aggregation
- Incentives

End-user flexibilities for electrical  
distribution grid planning

Yaman Evrenosoglu (ETH Zurich)



- Incentives
- Tariffs
- Flexibility-aware planning

Impacts of electric vehicles and  
heat pumps flexibility:  
European and Swiss perspectives

Jared Garrison (Swissgrid, formerly ETH Zurich)

Patricia Mayer (ETH Zurich)

Francesco Sanvitto (TU Delft)



- Access to flexibility
- Incentives
- Coordination across actors

# Our policy review



Review of policies and regulations for sector coupling and demand-side flexibility

- ① What are policymakers currently doing about this?
  
- ② Compare Switzerland to its neighbours and the EU
  
- ③ Identify potential policies for Switzerland
  
- ④ Understand whether a shift was happening: from electrification to towards also considering flexibility



# Methods

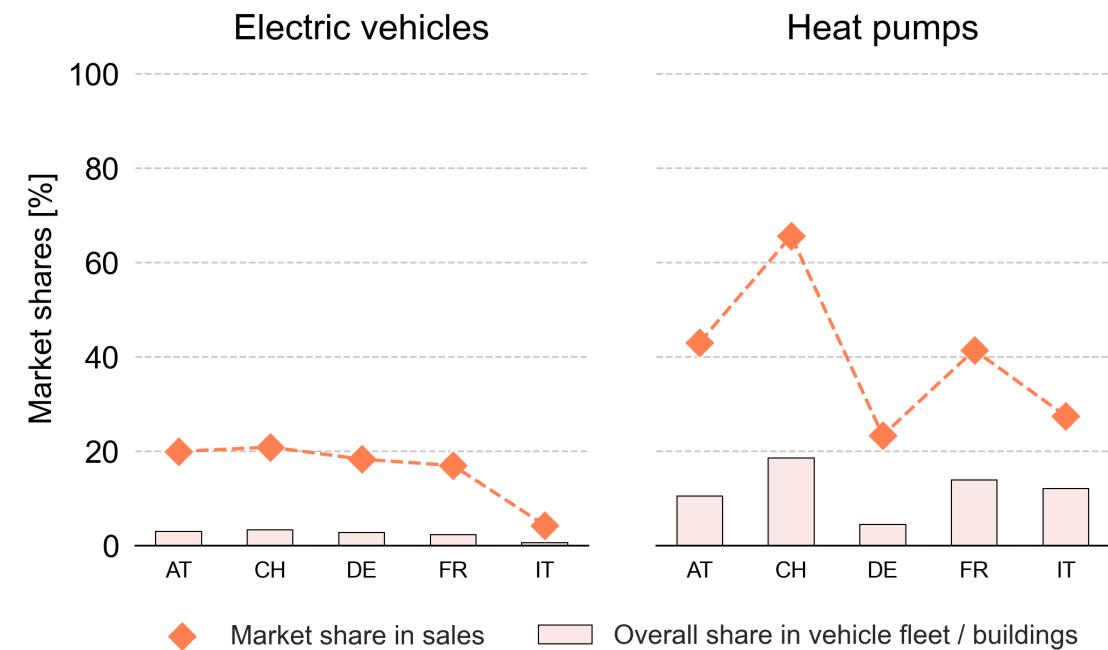
# Scope of our review

## Technologies which are...

- ✓ New
- ✓ Sector coupling
- ✓ Flexible
- ✓ Growing fast
- ✓ Growing big

1. Electric vehicles
2. Heat pumps (buildings)
3. Electrolysers
4. New industrial loads

No PV + batteries, No data centres



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## Jurisdictions

- ✓ Switzerland
- ✓ its neighbours
- ✓ the EU



Neighbours with:

- different flexibility needs
- different decarbonisation strategies
- different legislations

# Analysis framework



1. Directed data collection



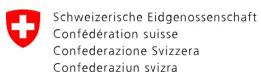
2. Data classification



3. Synthesis and comparison



Swiss federal authorities

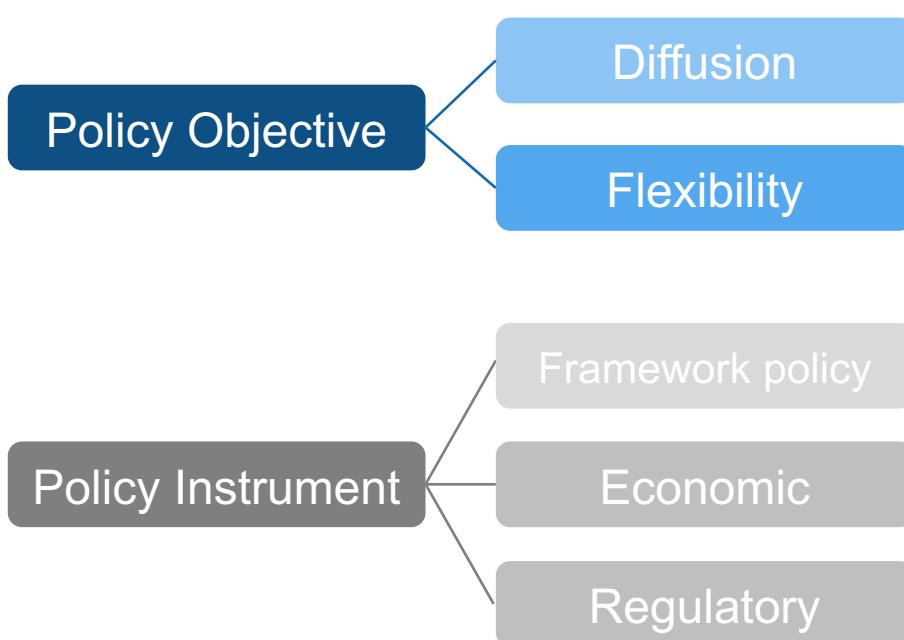


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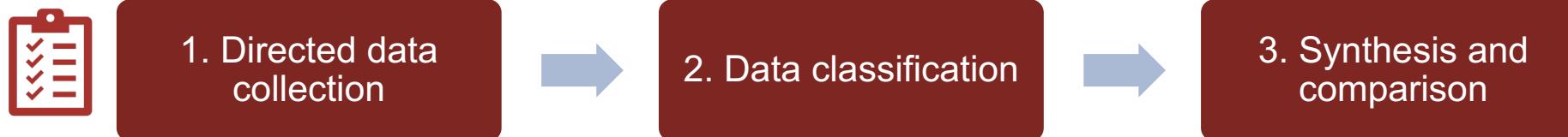
Gesetz über die Elektrizitäts- und Gasversorgung



## Comparison:

- Across countries
- Across technologies
- Over time

Data is available in the paper



 Indian Institute of Public Administration

## Electrification, flexibility or both? Emerging trends in European energy policy

Consistently coded: country, year in/out, targets, policy objective, instrument, design

# Results

# R1: Electrification policy support is at different stages across technologies, but things are happening

← Technologies →

← Instruments → ← Countries →

Technology diffusion policies by technology and country. Only policies in effect in June 2024 are shown. For targets, we only include technology-specific explicit targets set out in strategies, NECPs or in law.

Technology	Policy instrument type	Policy instrument sub-type	Instrument details	AT	FR	DE	IT	CH
Electric vehicles	Framework policy	Roadmap	Transport decarbonisation strategy	✓	✓	✓	✓	✓
		Targets	2035 effective ban of thermal engine cars	✓	✓	✓	✓	✓
	Economic	Fiscal/Financial	Targets of EV numbers	✓	✓	✓	✓	✓
			Targets of EV chargers	✓	✓	✓	✓	✓
			EV Purchase subsidy	✓	✓	✓	✓	✓
			EV Tax credit, reduction or exemption	✓	✓	✓	✓	✓
			Extra purchase tax on polluting cars	✓	✓	✓	✓	✓
	Regulatory	Codes & Standards	Social leasing programme	✓	✓	✓	✓	✓
			EV Charger subsidies	✓	✓	✓	✓	✓
			EV Charger tax credit, reduction or exemption	✓	✓	✓	✓	✓
			Company EV benefits	✓	✓	✓	✓	✓
			CO <sub>2</sub> pricing as ETS	✓	✓	✓	✓	✓
Heat pumps	Framework policy	Roadmap	Heating decarbonisation strategy	✓	✓	✓	✓	✓
		Targets	Targets of HP installations	✓	✓	✓	✓	✓
	Economic	Fiscal/Financial	Heat pump purchase subsidy	✓	✓	✓	✓	✓
			Heat pump tax credit, reduction or exemption	✓	✓	✓	✓	✓
			Energy economy loan programmes for households	✓	✓	✓	✓	✓
			Energy economy loan programmes for companies	✓	✓	✓	✓	✓
			Heating consulting subsidy	✓	✓	✓	✓	✓
	Regulatory	Codes & Standards	Reduced grid fees for smart meter-connected heat pumps	✓	✓	✓	✓	✓
			Energy economy certificates	✓	✓	✓	✓	✓
			CO <sub>2</sub> tax on heating fuels <sup>3</sup>	✓	✓	✓	✓	✓
			CO <sub>2</sub> pricing as ETS	✓	✓	✓	✓	✓
			—	—	—	—	—	—
Electrolyser	Framework policy	Roadmap	Hydrogen strategy	✓	✓	✓	✓	✓
		Targets	National hydrogen infrastructure plans	✓	✓	✓	✓	✓
	Economic	Fiscal/Financial	Targets of electrolyser capacity/production	✓	✓	✓	✓	✓
			Targets of H <sub>2</sub> pipeline infrastructure	✓	✓	✓	✓	✓
			Support for hydrogen fuel vehicles	✓	✓	✓	✓	✓
			Support for hydrogen-based heating	✓	✓	✓	✓	✓
			Support for hydrogen-based electricity production and storage	✓	✓	✓	✓	✓
	Regulatory	Codes & Standards	Reduced grid fees for electrolyzers	✓	✓	✓	✓	✓
			Emissions trading system (ETS)	✓	✓	✓	✓	✓
			Govt. support for H <sub>2</sub> production	✓	✓	✓	✓	✓
			Govt. support for H <sub>2</sub> infrastructure	✓	✓	✓	✓	✓
			Hydrogen taxonomy in law	✓ <sup>4</sup>				
Industrial loads	Framework policy	Roadmap	Regulatory framework for hydrogen markets and networks	✓	✓	✓	✓	✓
		Targets	—	—	—	—	—	—
	Economic	Fiscal/Financial	Subsidy programme for industrial heat pumps	—	—	—	—	—
			Energy economy loan programmes for companies	✓	✓	✓	✓	✓
			Carbon Price for Differences (CCfD)	✓	✓	✓	✓	✓
			Emissions trading system (ETS)	✓	✓	✓	✓	✓
			CO <sub>2</sub> tax on industrial fuels	✓	✓	✓	✓	✓
	Regulatory	Codes & Standards	Energy economy certificates	✓	✓	✓	✓	✓
			Govt. support for ind. electrification projects	✓	✓	✓	✓	✓
			—	—	—	—	—	—

## EVs and Heat Pumps:

- End-user adoption policies
- Targets, strategies are in place

→ Ready to phase out fossil technologies

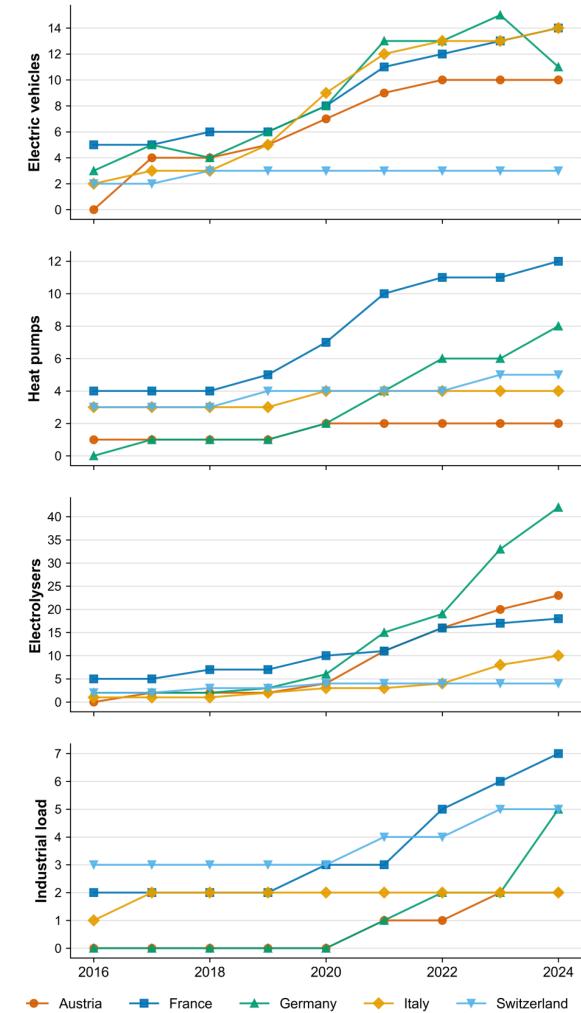
## Hydrogen:

- Strategies are mostly there but changing
- Some support, mostly by direct government funding

## Industrial electrification:

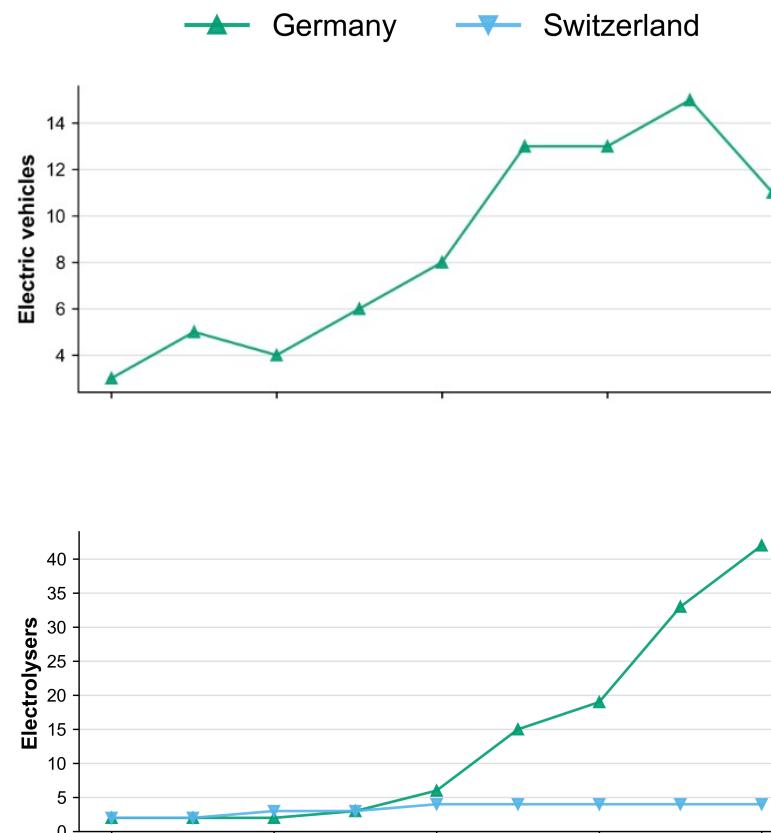
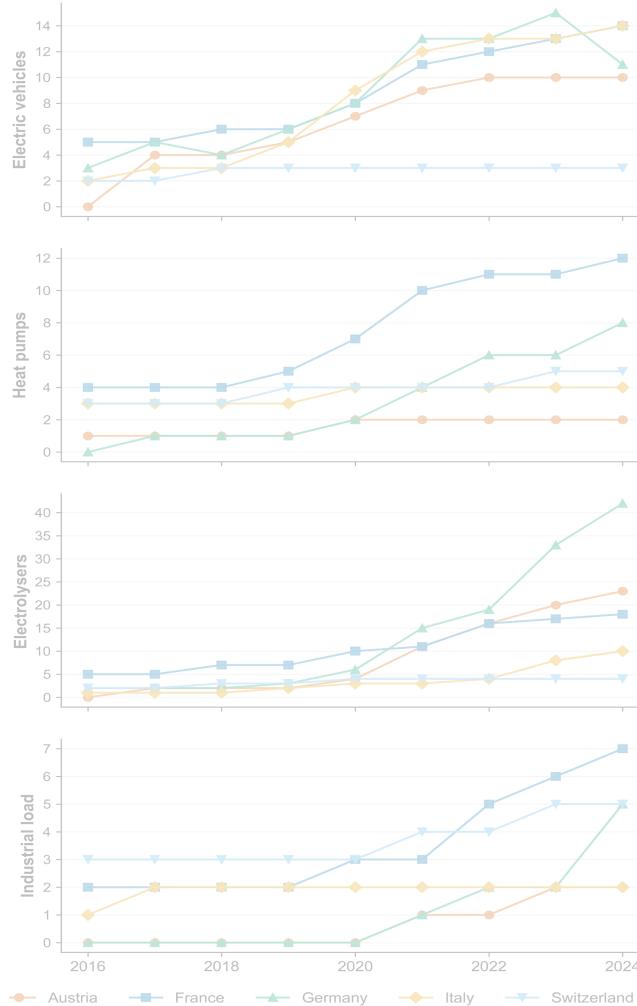
- Lack of policies, beyond EU ETS

Number of policy items



# R2: All countries are doing something, some do it differently

Number of policy items

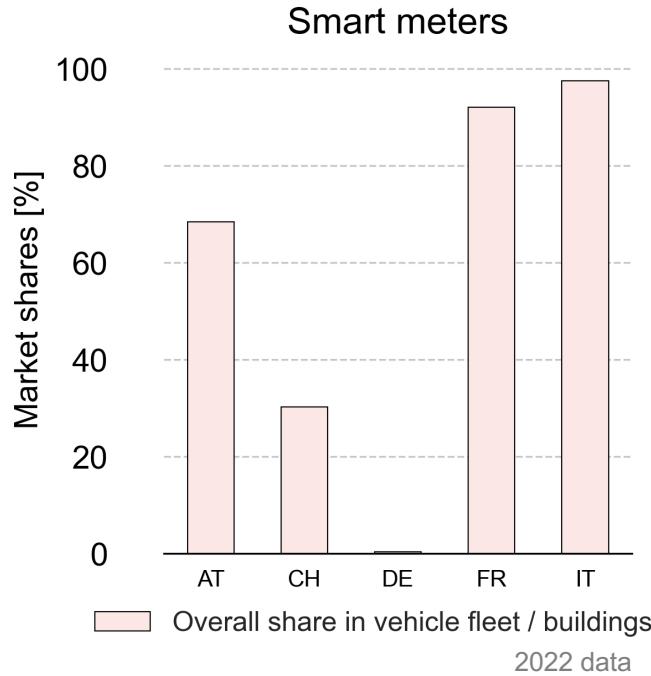


EV support in is going down

- Removed support for EVs
- Removed support for chargers

pushing hard for H<sub>2</sub>,  
 is not

## R3: Infrastructure policies & readiness are very different across countries



- are far ahead
- far behind
- share is growing but still low

Instrument details	AT	FR	DE	IT	CH	EU
Target of smart meter installation	✓	✓	✓	✓	✓	✓ <sup>a</sup>
Financial penalty for households without smart meters		✓				
Reduced grid fees for appliances if smart meter is installed			✓			
DSOs mandated to install smart meters	✓	✓ <sup>b</sup>	✓	✓ <sup>b</sup>	✓	✓ <sup>a</sup>

- getting last households on board with financial penalties
- trying financial incentives
- All have mandates: has 80% target by 2027

# R3: Infrastructure policies & readiness are very different across countries



Technology	Policy instrument type	Instrument details	AT	FR	DE	IT	CH	EU
EV V1G/V2G chargers	Framework policy	Target of V1G public chargers					✓	
		Subsidy or tax credit for V1G chargers	✓	✓			✓ <sup>c</sup>	
		Subsidy or tax credit for V2G chargers					✓ <sup>c</sup>	
	Economic	No double taxation of electricity for V2G chargers			✓	✓		✓
		Public chargers must be technically controllable by DSOs	✓				✓	
		Local charging network must be co-designed with DSOs		✓				
		All new EV chargers must be technically controllable by DSOs	✓		✓		✓	✓
		DSOs must be notified of all new EV chargers			✓			
	Regulatory	Requirement to assess the role of infrastructure for EV flexibility every 3 years					✓	

## In general:

- Lots of **regulation** with standards & mandates
- are lagging on economic support for V1G (smart charging)
- are ahead

## Switzerland :

- **Uneven support across cantons:**
  - e.g, Bern subsidises V2G at 3000 CHF, some others barely support V1G
- Some standards & requirements set, but no mandates or right-to-charge

# R4: Demand-side flexibility support is increasing Different countries → different ways

← Instruments →

← Countries →

Procurement mechanism		Supporting policy instrument	AT	FR	DE	IT	CH	EU
Tariffs	Grid tariffs	Framework for experimental grid tariffs	✓			✓		
		Allowing dynamic grid tariffs	✓	✓			✓	✓
	Electricity tariffs	Free choice of electricity supplier <sup>d</sup>	✓	✓	✓	✓	✓ <sup>a</sup>	✓
		Allowing TOU electricity tariffs	✓	✓	✓	✓	✓	✓
		Allowing CPP electricity tariffs	✓					✓
		Allowing RTP electricity tariffs	✓	✓ <sup>b</sup>	✓	✓	✓	✓
		Mandating suppliers to offer RTP electricity tariffs	✓	✓				✓
Direct Load Control	Through regulations	DSOs may use DLC in general, in exchange for reduced grid fees	✓		✓ <sup>b</sup>			
		DSOs may use DLC in grid emergencies		✓ <sup>b</sup>				✓
		TSOs may use DLC in grid emergencies		✓				
	Through contracts	DLC contracts are allowed at DSO level	✓ <sup>a,c</sup>	✓		✓	✓	
		DLC contracts are allowed at TSO level	✓ <sup>a,c</sup>	✓				✓
Local flexibility markets		Regulatory sandbox enabling pilot projects	✓		✓			
		Undertaking of pilot projects for local flexibility markets	✓	✓	✓	✓	✓ <sup>b</sup>	
		Established local flexibility market		✓				
		DSOs shall procure flexibility through markets only			✓			✓
Wholesale markets	Day-ahead and intraday markets	DSF may participate in wholesale markets	✓	✓	✓	✓	✓	✓
		Facilitating access conditions for DSF		✓				✓
TSO markets	Ancillary markets	DSF can participate in ancillary markets	✓	✓	✓	✓	✓	✓
		Platform facilitating conditions for market access	✓		✓	✓	✓	
	Interruption schemes	DSF can participate in TSO interruption schemes	n.a	✓	n.a	✓ <sup>a</sup>	n.a	✓
		Facilitating DSF access by reducing bid size	n.a	✓	n.a		n.a	
	Strategic grid reserves	DSF must be considered when establishing strategic grid reserve needs	✓		n.a	n.a		
		DSF can participate in strategic grid reserve auctions	✓		n.a	n.a	✓ <sup>a</sup>	
	Capacity mechanisms	DSF can participate in capacity mechanisms	n.a	✓	✓ <sup>a</sup>	✓	n.a	✓
		Facilitating conditions for market participation	n.a	✓		✓	n.a	
		Government economic support for DSF participation	n.a	✓			n.a	✓

## Tariffs

- Dynamic tariffs are now allowed. Mandates haven't kicked in
- stands out as a non-liberalised market

## Direct load control

- Different types: regulated | emergencies | contracts
- Quite common in contracts in   

## Local energy / flexibility markets

-  established market
- Others: mostly pilot projects, rarely with a follow-up

## Wholesale markets

- Pooling & access conditions are improving

## TSO-level markets

- access is improving
-  is focusing on capacity
-  doesn't really involve demand-side flexibility

## R5: Flexibility policies arrived late, but are catching up



- Flexibility policies are showing up, fast in many countries
  - 2019: EU's new electricity packages
  - > 2022: Ukraine – Russia energy crisis
- EVs, heat pumps: low penetration coincided with low renewables and flexibility needs initially
  - Future policy needs to include flexibility *with* electrification

2023: France stops subsidizing conventional chargers  
+ increases subsidies for V1G chargers

+ as did Austria & some Swiss cantons

# Key takeaways, recommendations

# Key takeaways (for Switzerland)

- 1. Electrification is unevenly supported across technologies:**
  - EVs & heat pumps well supported
  - Hydrogen & industry lack support and strategies
- 2. Switzerland's flexibility infrastructure is catching up**
  - Smart meters appearing (federal policy mandate)
  - EV infrastructure lacks federal guidelines
- 3. Demand-side flexibility is on the agenda of policymakers, but barriers remain**
  - Dynamic tariffs are allowed, Direct Load Control contracts often utilised
  - No free choice of supplier for households
  - Some efforts to allow market access for small loads are being made (pooling, reduced bid sizes)
- 4. Policy timing was consistent with the system's needs**
  - Initially: support for electrification without considering flexibility as much
  - Now: policies increasingly consider flexibility, as electrification & intermittent renewables penetrate

# Recommendations

- 1. Consider flexibility & electrification together**
  - Policies to support new loads  $\Leftrightarrow$  Policies to operate them flexibly
    - Example: EV charger support  $\Leftrightarrow$  Smart chargers, not conventional
    - Data centres ?
- 2. Support industry's electrification**
  - Whether it's direct electrification or through hydrogen, it lacks support
  - Untapped decarbonisation potential
- 3. Address small loads' participation in flexibility**
  - Continue improving market access
  - Address non-liberalisation's barriers: if your supplier doesn't offer flexibility incentives, you're very limited in flexibility utilisation

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