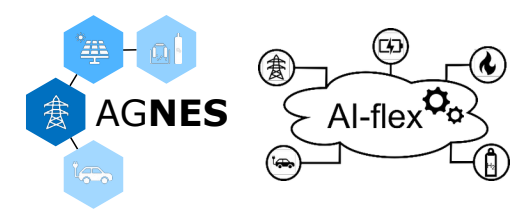
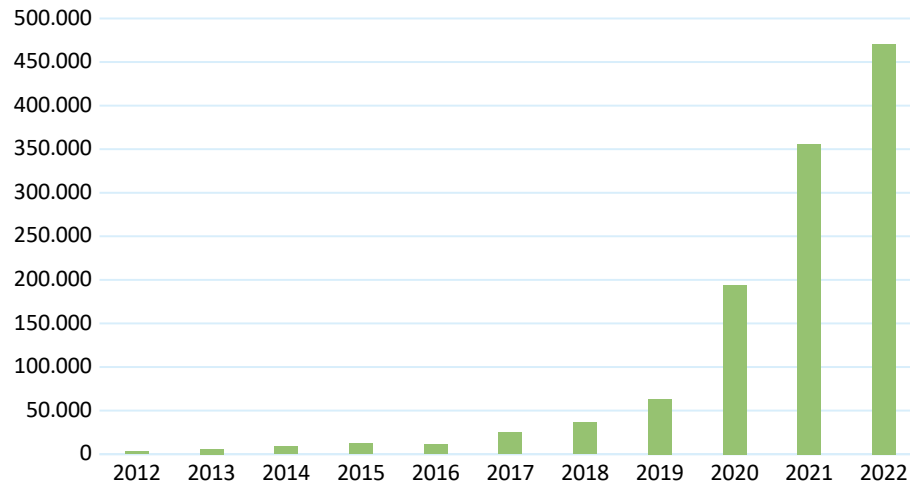


AI-flex – Autonome KI für zellulare Energiesysteme zur Erhöhung von Flexibilitäten auf Basis von Sektorkopplung und dezentralen Speichersystemen – Lars Quakernack

# Energiewende im Verteilnetz



### Zulassungszahlen Elektrofahrzeuge

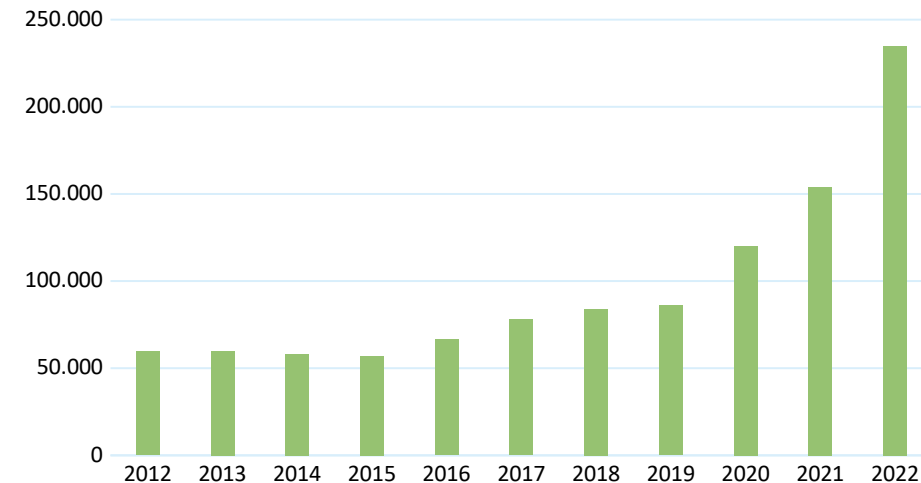


Quelle: Kraftfahrtbundesamt

- **Prognose Bundesregierung: 15 Mio. Elektrofahrzeuge bis 2030**

Quelle: Koalitionsvertrag aktueller Bundesregierung

### Absatz Heizungs-Wärmepumpen



Quelle: Bundesverband Wärmepumpe

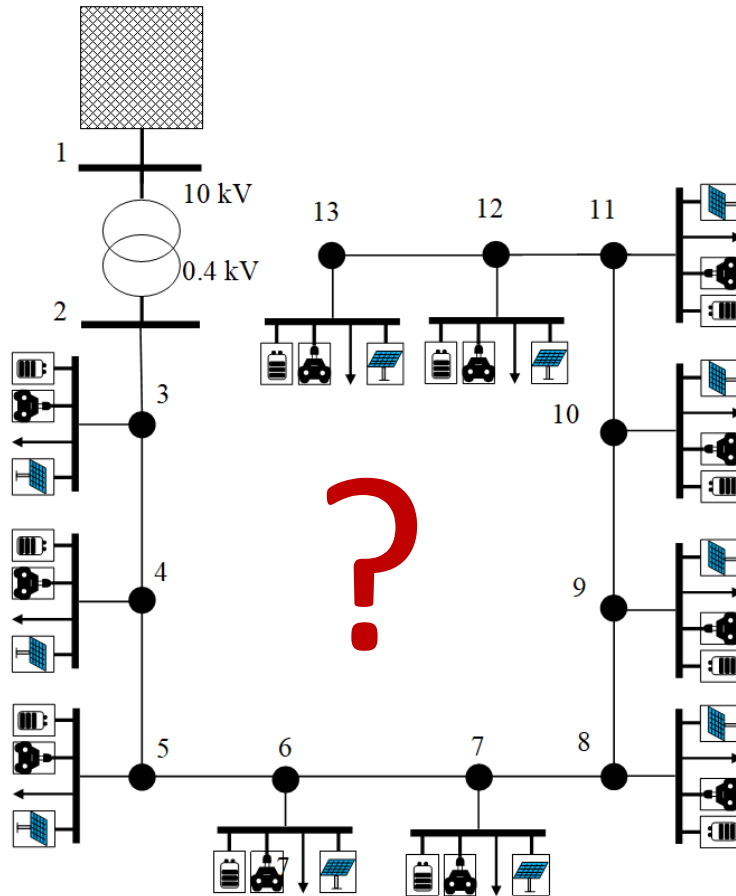
Erneuerbare Energien

**Habeck will 500.000 Wärmepumpen jährlich**

Stand: 29.06.2022 16:27 Uhr

Quelle: Überschrift Tagesschau.de

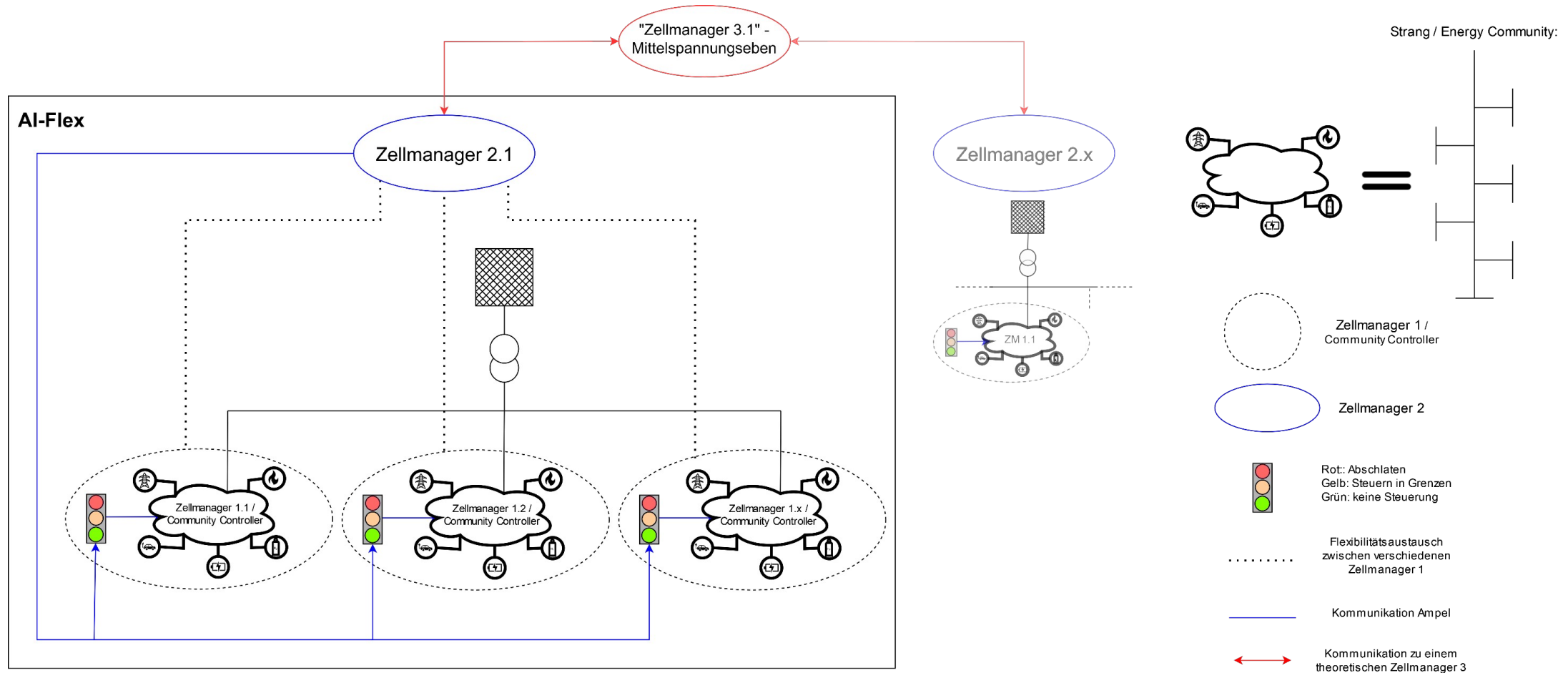
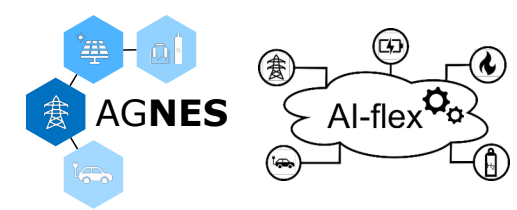




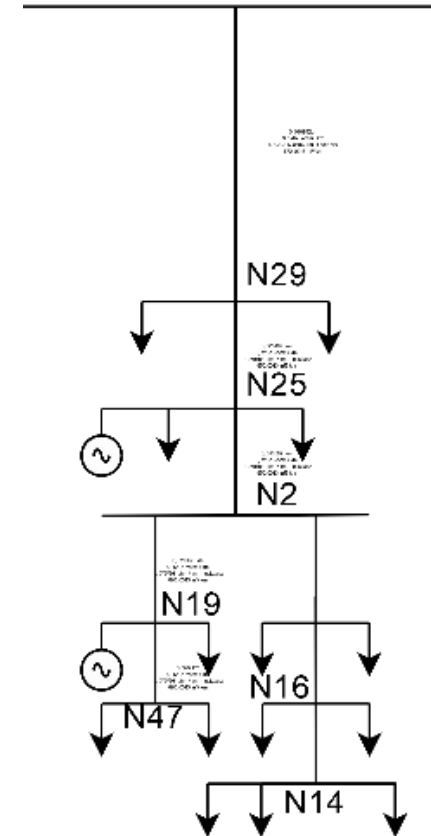
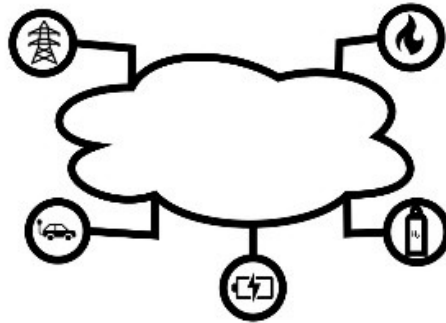
## Herausforderungen:

1. Höhere Energie- und Leistungsbedarf bedarf durch Sektor gekoppelte Systeme (Elektrofahrzeuge, Wärmepumpe, ...)
2. Volatile, dezentrale Erzeugungsanlagen
3. Niedrige Beobachtbarkeit durch historisch wenig Messpunkten und Datenschutz
4. Bereitstellungen von Flexibilitäten

# Konzept

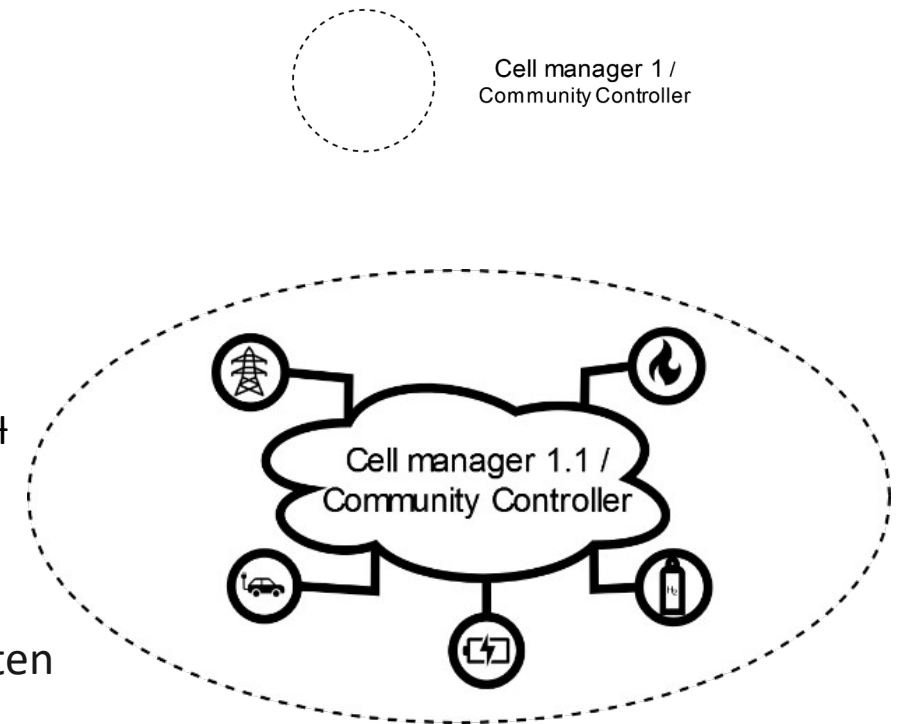
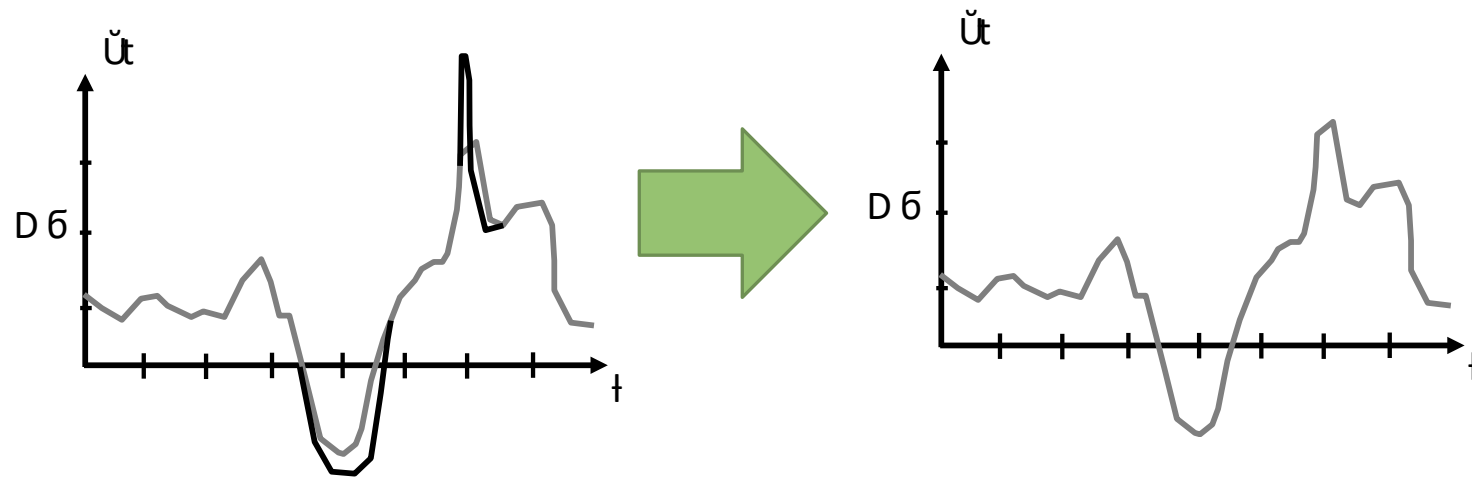


# Konzept: Strang



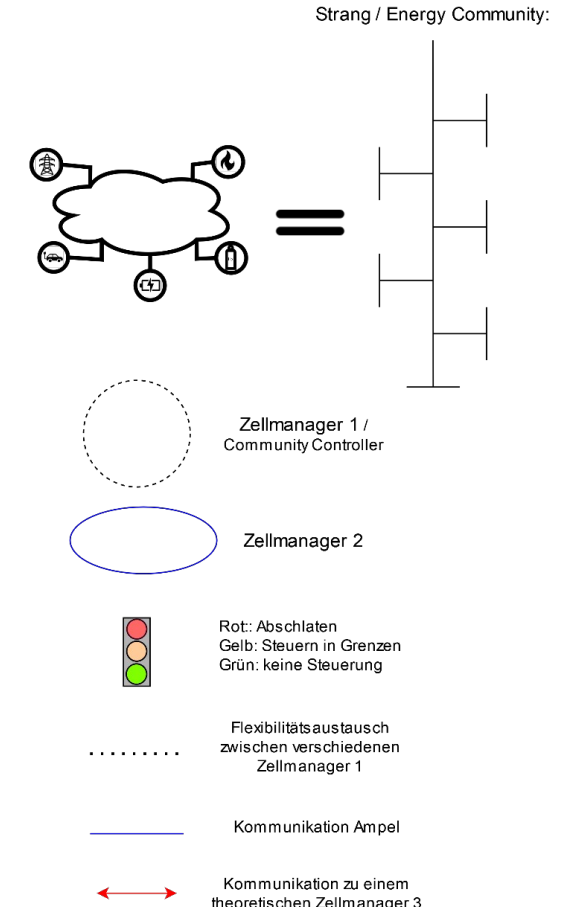
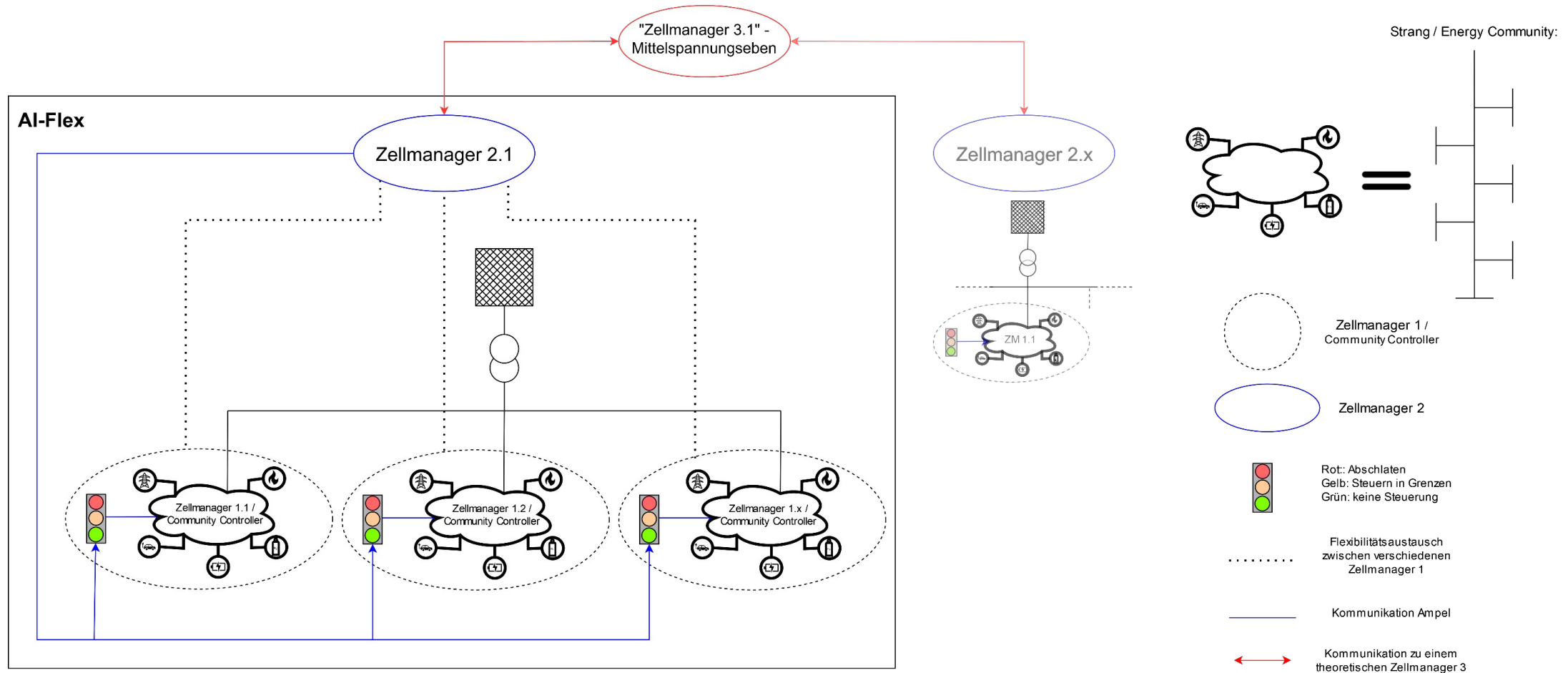
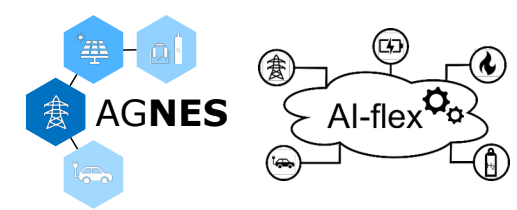
- Zusammenfassung von PV, EFZs, WP, etc. eines Strangens
- Signifikanter Anteil an Flexibilitäten

# Zellmanager 1

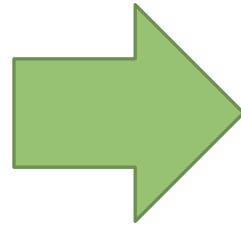
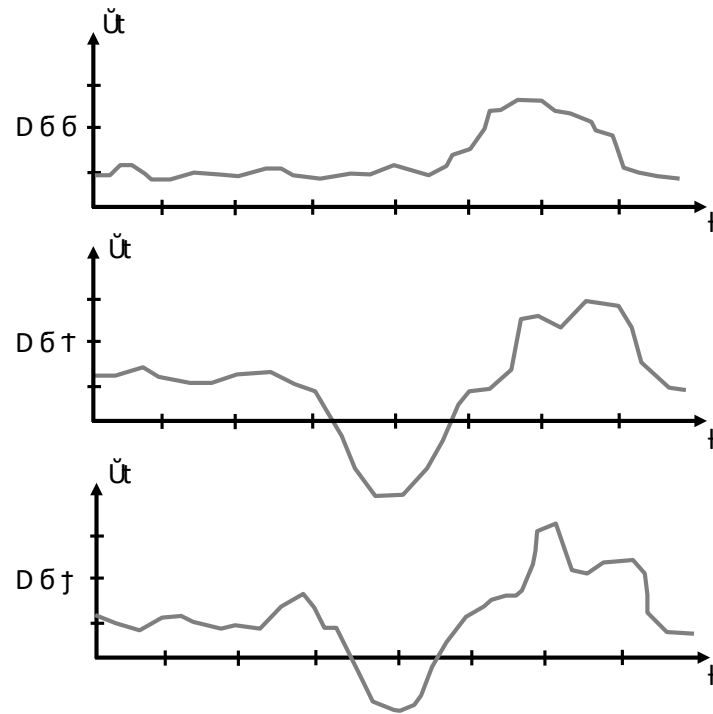


- Zellmanager 1 optimiert die Erzeugung und Verbrauch aller Flexibilitäten anhand von Prognosen
- Schickt seinen gesamten „Fahrplan“ an Zellmanager 2

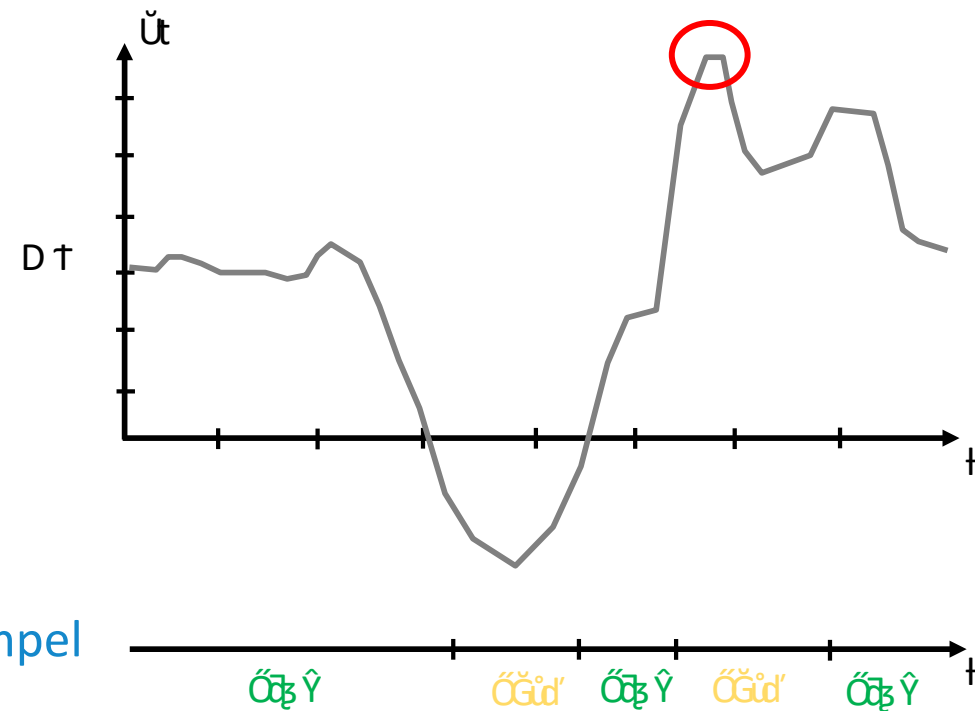
# Konzept



# Zellmanager 2

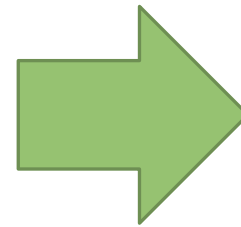
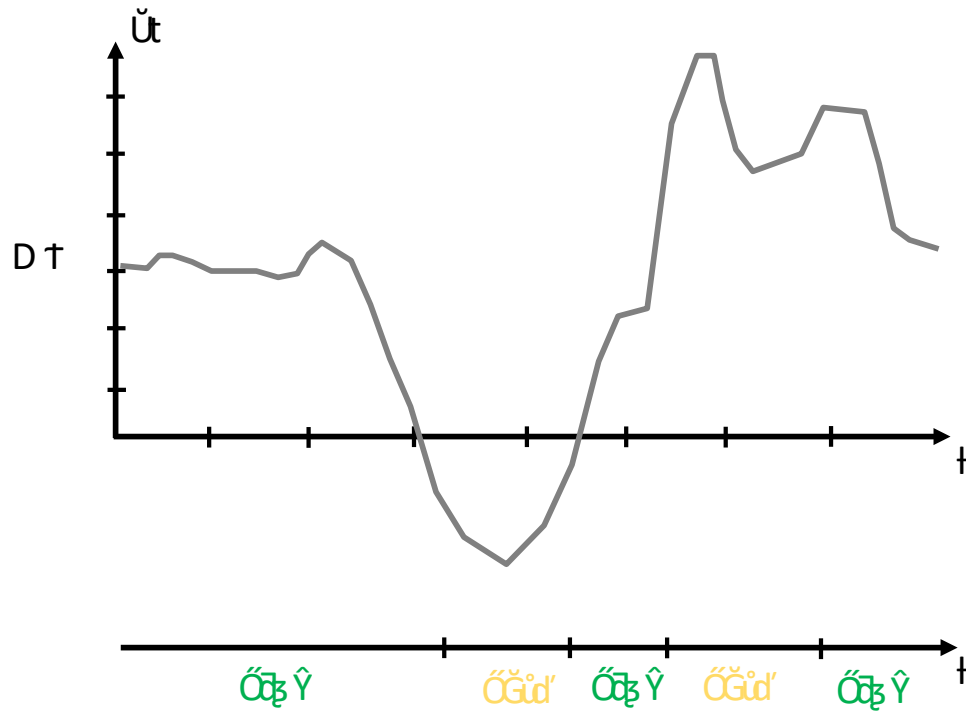


## Summenprofil

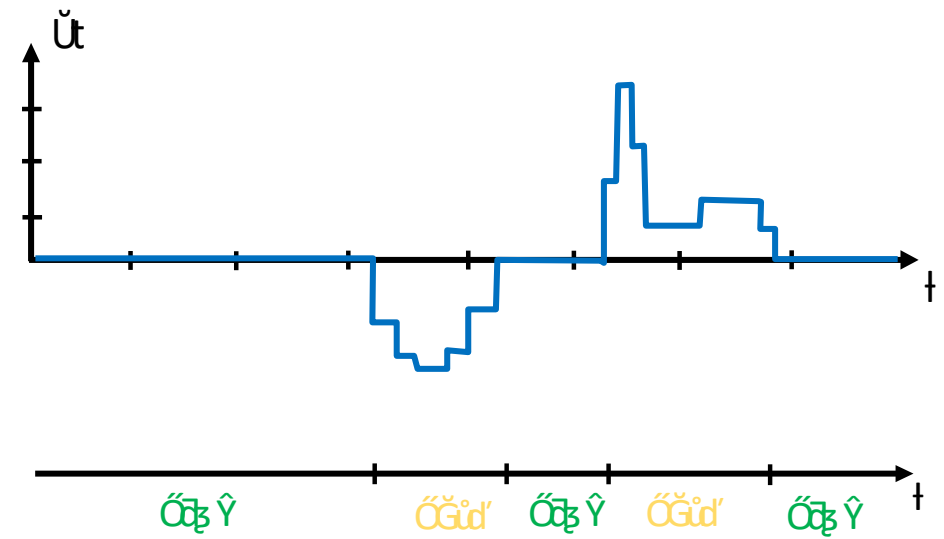




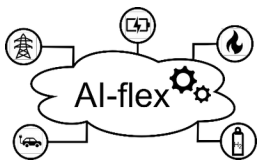
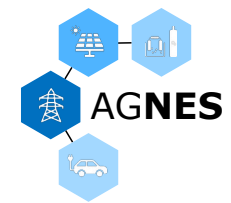
# Zellmanager 2



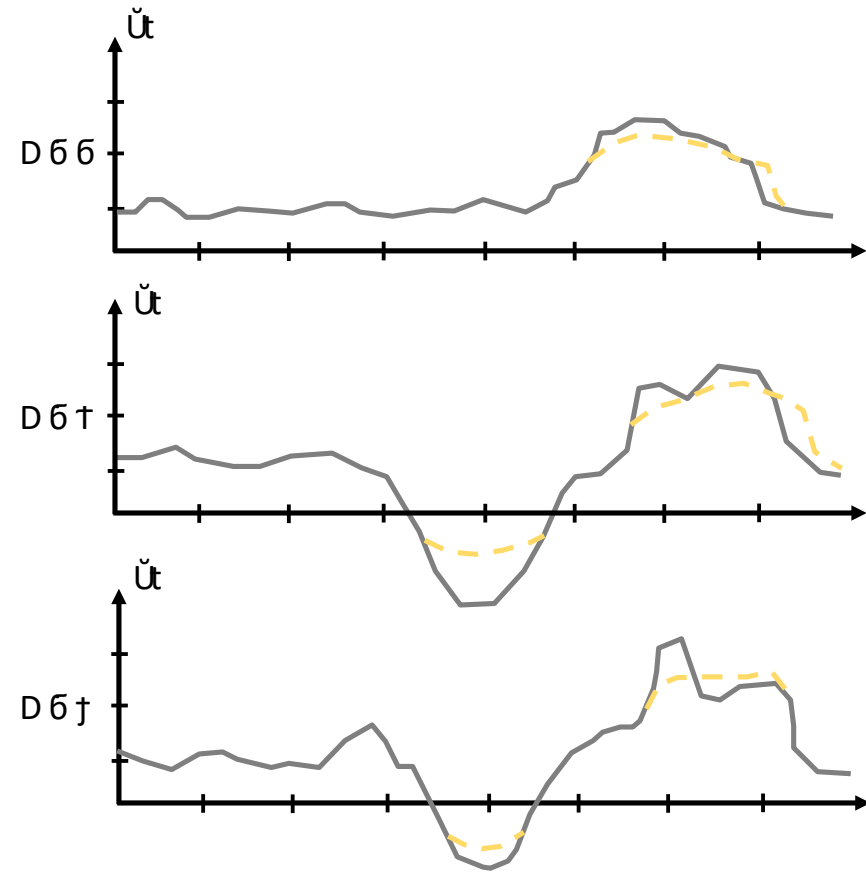
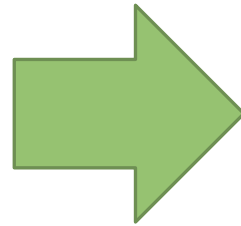
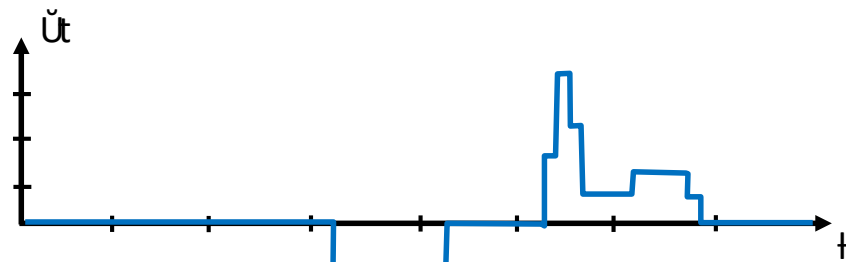
## Flexibilitäten



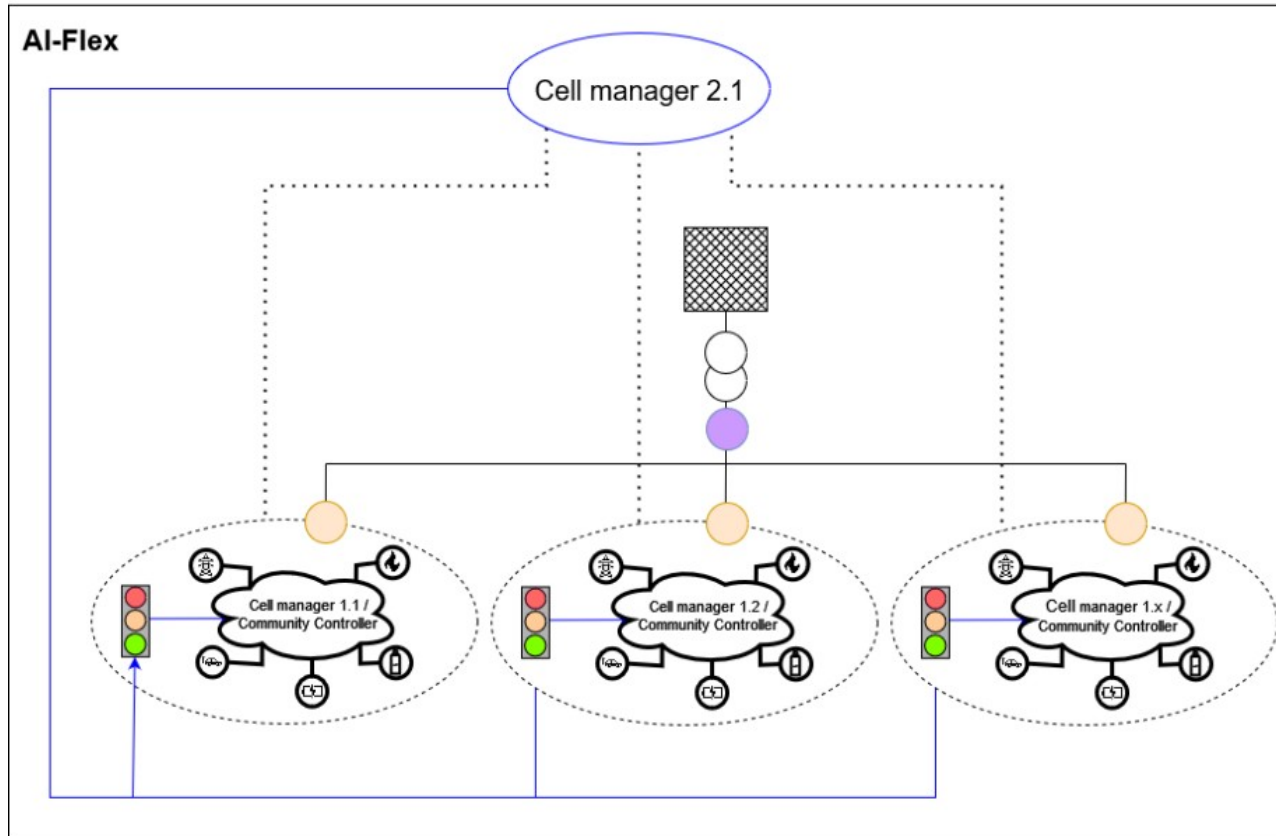
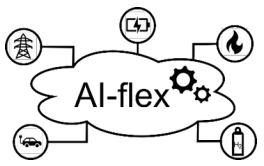
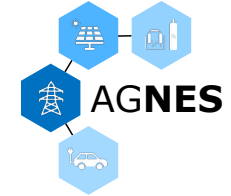
# Zellmanager 2








## Flexibilitäten

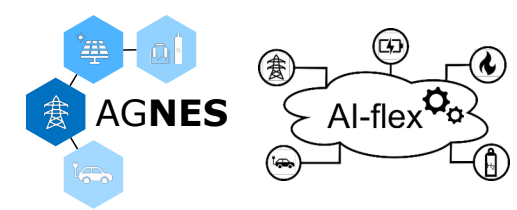


# Zusammenfassung



-  Red: switching off <-> >100% curative  
Yellow: control <-> >80% predictive  
Green: increase share of renewables
-  Flexibility exchange between different cell manager 1
-  Communication traffic light
-  Optimization point CM1  
80% utilisation of supply line
-  Optimization point CM2  
80% transformer utilisation

# Zusammenfassung



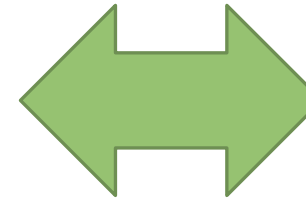
## Prognose:

- EV(Leistung)
- HP(Leistung)
- PV
- Last(HH)
- Batterie  
(berechnet)



## Zellmanager 1

1. Zusammenfassung der einzelnen Prognosen zu einem Summenprofil
2. Optimierung des Gesamtsystems nach lokalem Optimierungsziel
3. Optimierte Prognose an ZM2 weiterleiten



## Zellmanager 2:

1. Zusammenfassung der einzelnen ZM1 Profilen
2. Überprüfung der Ampelphasen
3. Optimierung nach globalen Optimierungszielen
4. Schickt Flexibilitätsbedarf an ZM1

## Optimierungsziel:

1. Hardwaregrenzen des Abganges
2. Hardwaregrenzen des Stranges
3. Erhöhung des Anteils erneuerbaren Energien

# Vielen Dank für Ihre Aufmerksamkeit!

Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages

Lars Quakernack  
T: +49.521.106-70341  
E: Lars.Quakernack@hsbi.de



Arbeitsgruppe Netze und  
Energiesysteme (AGNES)



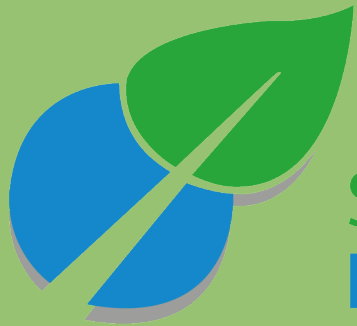
Über AI-flex:  
<https://www.linkedin.com/showcase/ai-flex-fh-ites-agnes>



ERA-Net:  
[www.eranet-smartenergysystems.eu/  
Projects/AI-flex](http://www.eranet-smartenergysystems.eu/Projects/AI-flex)



# Funding Partners



Smart  
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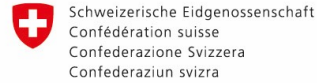
This initiative has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements no. 646039, no. 775970 and no. 883973.



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Agence de l'Environnement  
et de la Maîtrise de l'Energie



Swiss Federal Office of Energy SFOE



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BUSINESS  
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eUDP  
Energiteknologisk udvikling og demonstration

Innovation Fund Denmark



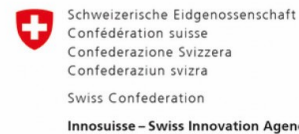
The National Centre  
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Swedish  
Energy Agency



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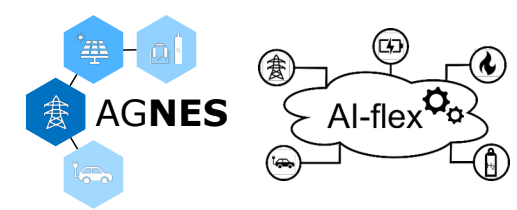


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