ENERGIE INSTITUT
an der Johannes Kepler Universität Linz

EU PROJECTS CLUSTERING EVENT
SMART ENERGY SERVICES
April 25, 2023 - 9:00 AM -12:00 PM CET

"EU Project Clustering event: Smart Energy Services"

eCREW | eSTABLISHING COMMUNITY RENEWABLE ENERGY WEBS

„Alternative Energy Community Concepts"

Business models to aim for?

Individual motivation and collective actions

Dr. Johannes Slacik
Energieinstitut an der JKU Linz, Austria

25th of April 2023

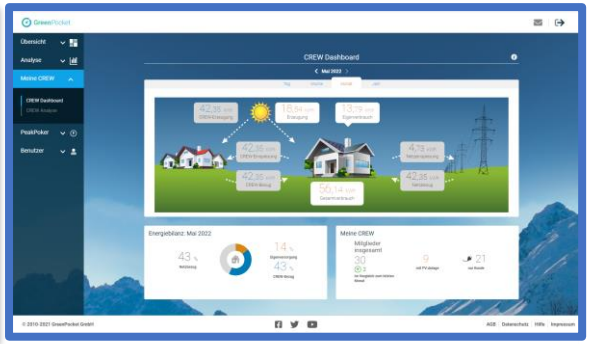
A Business Model to aim for?

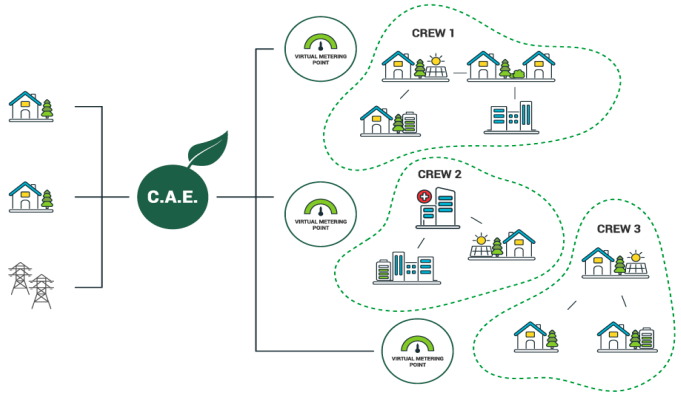
Local renewable energy system with potential for expansion
Integration for efficiency, demand response optimization, security and green energy

Digital Innovation

Sustainable Business Models

Community Engagement





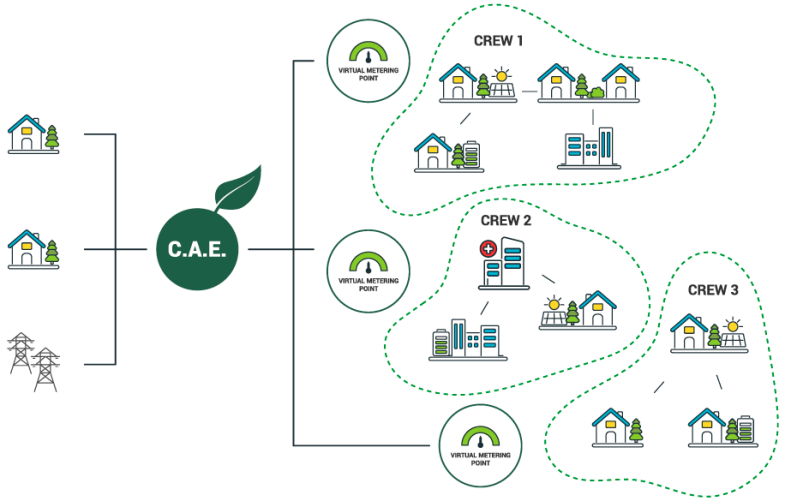
The eCREW concept

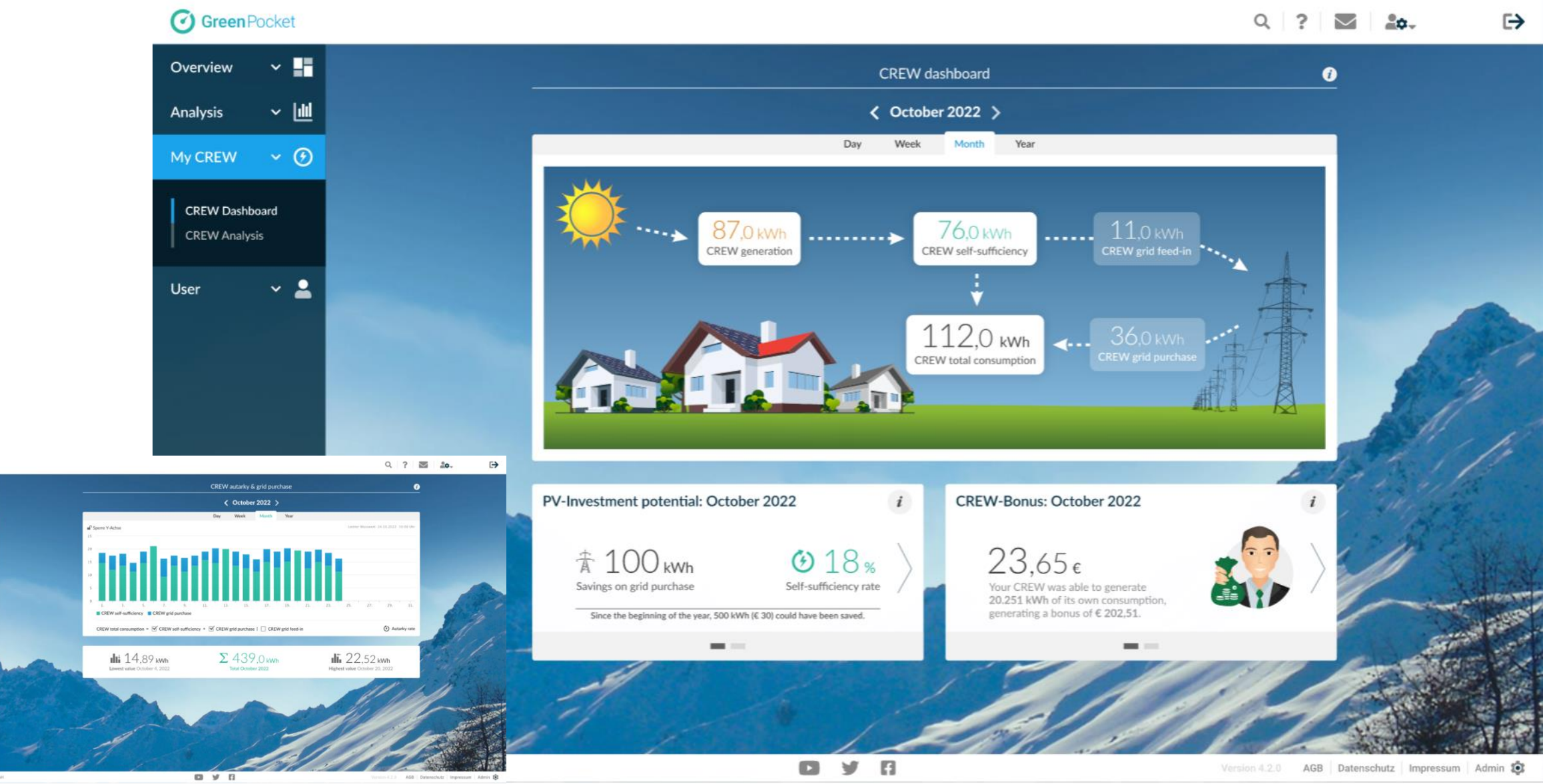
- **Virtually connecting consumers and prosumers** for energy efficiency
- Small and large energy communities
- Energy utility management & service partner
- Decentralization and integration

- Digital platform
- Nudging & push-up messages change the consumption behavior
- Shared incentive systems
- **Individual and collective actions**
- Win-win-win Situation

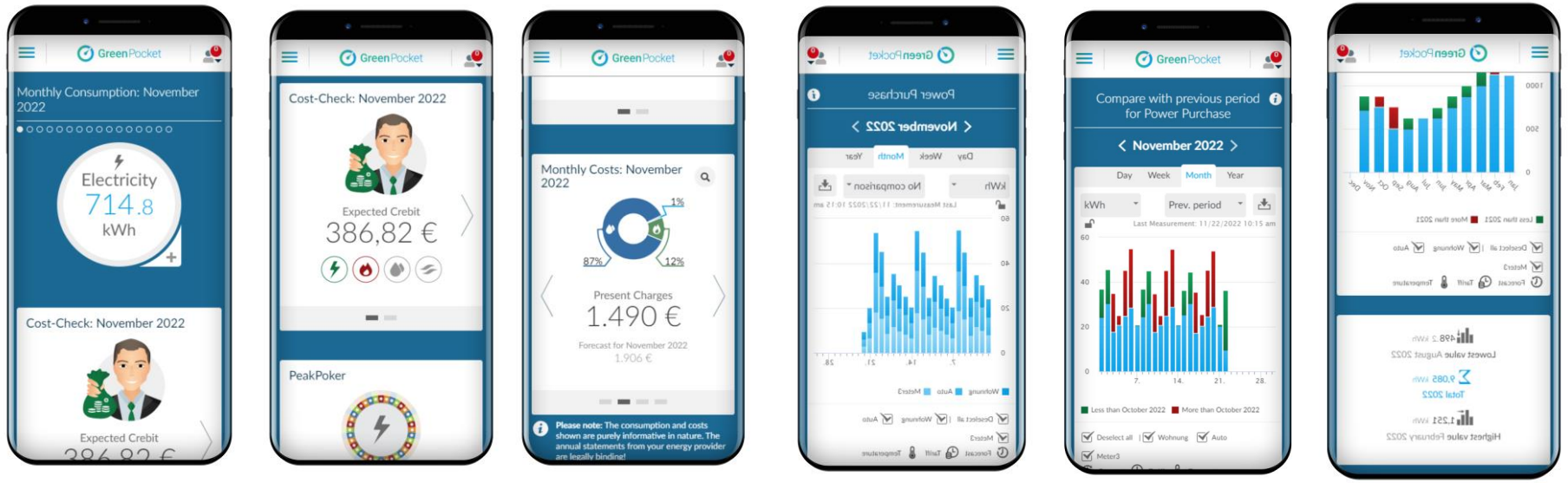
Data availability and framework

- Smart meters



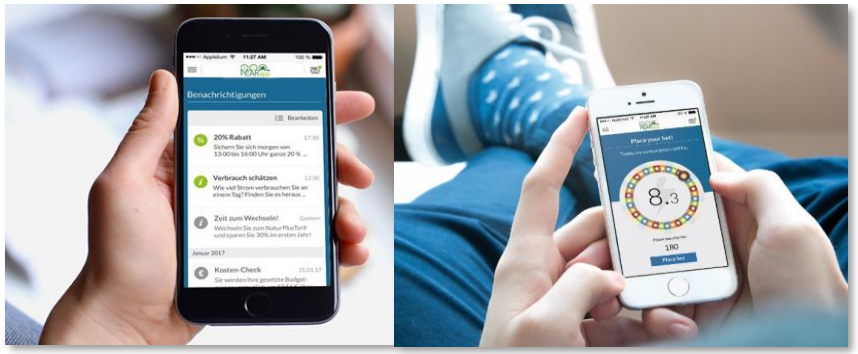

GreenPocket
Overview
Analysis
My CREW
CREW Dashboard
CREW Analysis
User
CREW dashboard
October 2022
Day
Week
Month
Year
87,0 kWh
CREW generation
76,0 kWh
CREW self-sufficiency
11,0 kWh
CREW grid feed-in
112,0 kWh
CREW total consumption
36,0 kWh
CREW grid purchase
PV-Investment potential: October 2022
100 kWh
Savings on grid purchase
18 %
Self-sufficiency rate
Since the beginning of the year, 500 kWh (€ 30) could have been saved.
CREW-Bonus: October 2022
23,65 €
Your CREW was able to generate 20.251 kWh of its own consumption, generating a bonus of € 202,51.
CREW autarky & grid purchase
14,89 kWh
439,0 kWh
22,52 kWh
Version 4.2.0
AGB
Datenschutz
Impressum
Admin

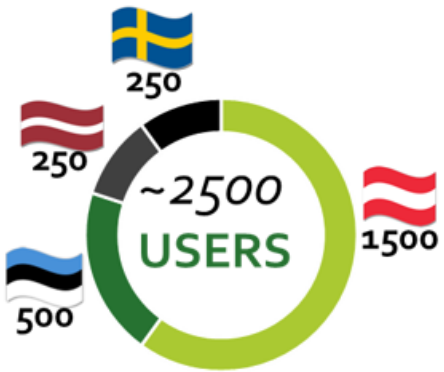
Demand-Side Management - Potential Consumer Roles

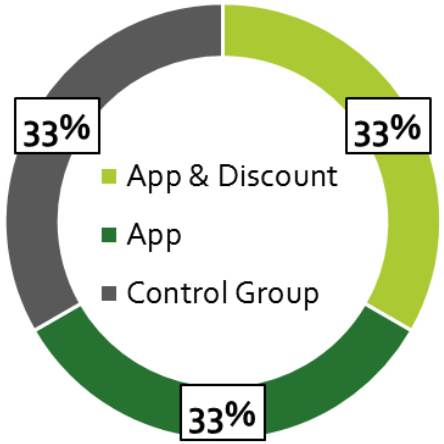


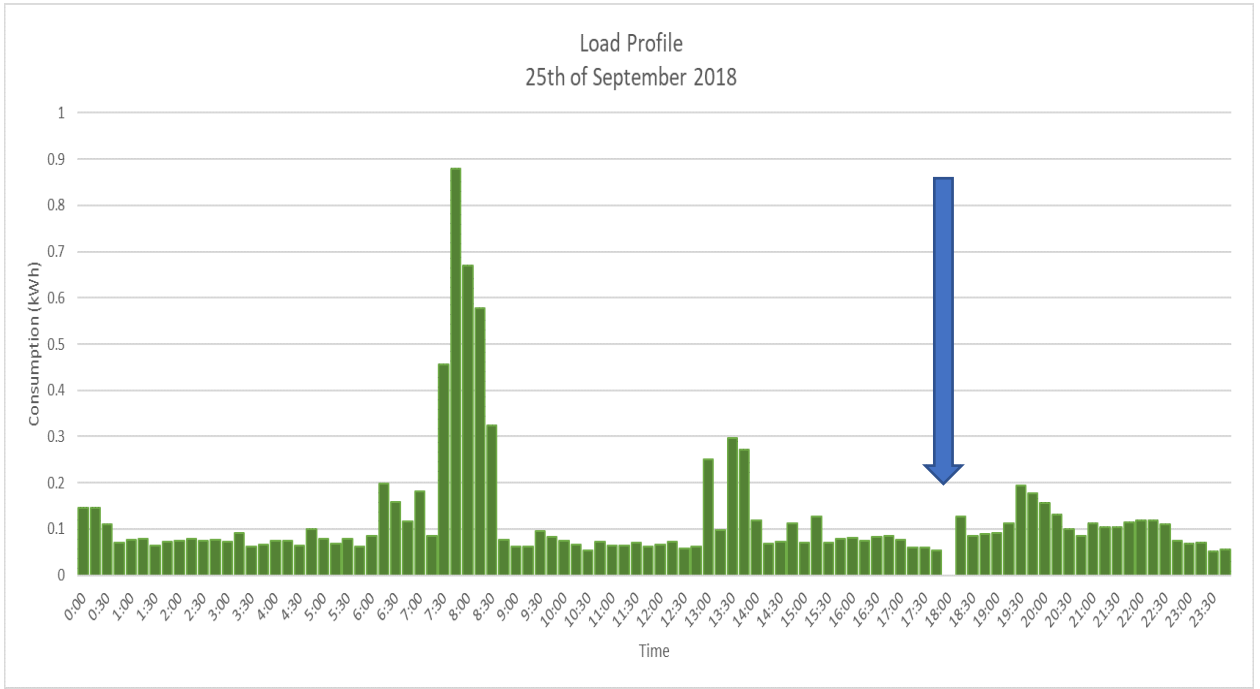
- ENERGIE Efficiency through transitory strategic behavioral change

Demand-Side Management - Potential Consumer Roles

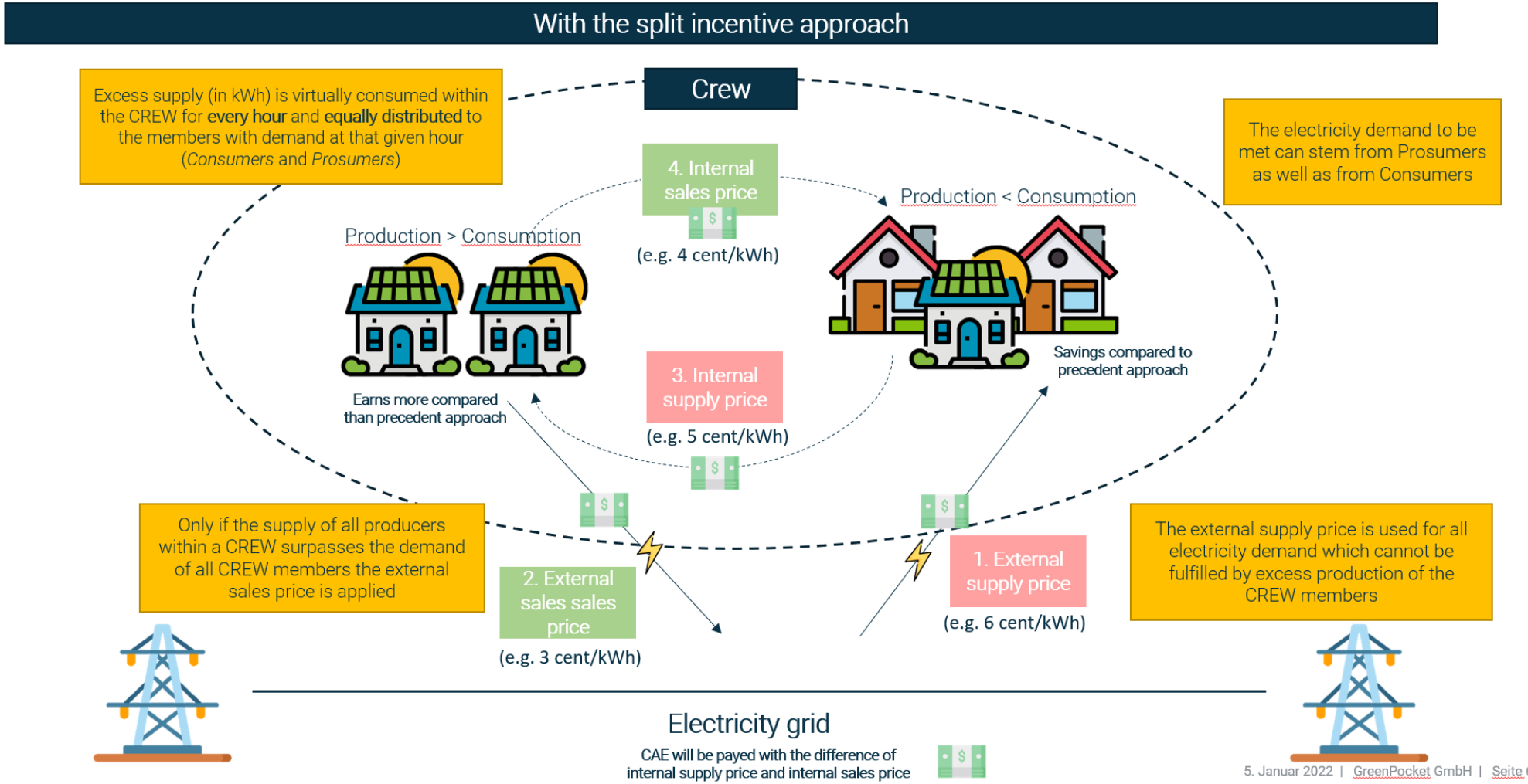








Split Incentive System



eCrew – establishing community renewable energy webs

Our Pilot Sites:

Lighthouse Communities in
SPAIN; TÜRKIYE; GERMANY

The eCREW roll-out

- Three Lighthouse Communities (LCs)

SPAIN

118 households

TÜRKIYE

1823 households

GERMANY

105 households

- Different situations, different regulative barriers, different sun/wind exploitation
- eCREW is sucessfully lounged in Türkiye, Germany and Spain
- However, national regulatory differences challenge the Business Model (prices, tariffs, regulations, lack of prosumers)

eCREW – Lighthouse Community Tasks

Tasks for consumers and prosumers:

- Understand the portal and the energy flows
- Reduce consumption on cloudy days
- Schedule the consumption to sun hours
- Interact with Community-Members
- Reach the highest possible Amount of exchanged Energy
- Spread the word and reach more potential participants

eCREW-Project KPIs

Social KPIs

Table 1. eCREW Social KPI list

Category	Indicator	Objective	Type of indicator	Type of metric	Calculation	Units	Scope	Frequency	Input source
Social	Household and Members joining	CREW participation rate	objective	absolute	count	number of members	CREW	twice	LC
	App usage rate	CREW participation rate	objective	abs/rel	number of people in LC actively using app vs. number of people in LC	%	CREW	monthly	Matomo
	App Time of usage	CREW participation rate	objective	absolute	avg of hours per user and week	average (h/user)	CREW	monthly	Matomo
	Support service inquires	CREW participation rate	objective	absolute	total number of inquiries received	Number of inquiries	CREW	monthly	LC
	Satisfaction with app	App satisfaction	subjective	average	average of 1-5 scale	scale	CREW	once at the end	survey
	Satisfaction with eCREW services	CREW satisfaction	subjective	average	average of 1-5 scale	scale	CREW	once at the end	survey

eCREW-Project KPIs

Environmental and economic KPIs

Table 2. Energy, environmental and economic KPI list

Category	Indicator	Objective	Type of indicator	Type of metric	Calculation	Units	Scope	Frequency	Input source
Energy and Environmental	Energy consumption at CREW level	energy performance	objective	Abs / avg	metering	kWh,	CREW	monthly	meters
	Energy self-consumption and surplus	energy performance	objective	relative	target consumption - actual CREW metering	% gap of kWh	CREW	monthly	calculated
	CREW self-consumption coverage	energy performance	estimated	relative	PV/(PV+grid)	%	CREW	monthly	calculated
	CREW RES generation	energy performance	objective	Abs / avg	PV metering aggregation of members	kWh	CREW	monthly	meters
	CREW Emissions avoided	GHG reduction	estimated	absolute	emission factor x PV metering	kg CO2/month	CREW	monthly	calculated
Economic	Economic savings from self-consumption	economic performance	estimated	absolute	PV gen x energy unit cost	€/CREW	CREW	monthly	calculated
	Energy costs	economic performance	estimated	absolute	sum of consumption - savings	€/CREW	CREW	monthly	calculated

Lighthouse Community CEA Alginet, Spain (2400 customers)

118 CREW members = 330 people; Mostly homeowners

7 Prosumers = 24,2kWh generation capacity

7 workshops/56 attendants (47% participating)

17 CEA requests

60% women, 40% men

Average satisfaction with the app **3.6**/5

Many challenges for app implementation

tariffs, monthly co-efficient, prosumer regulation

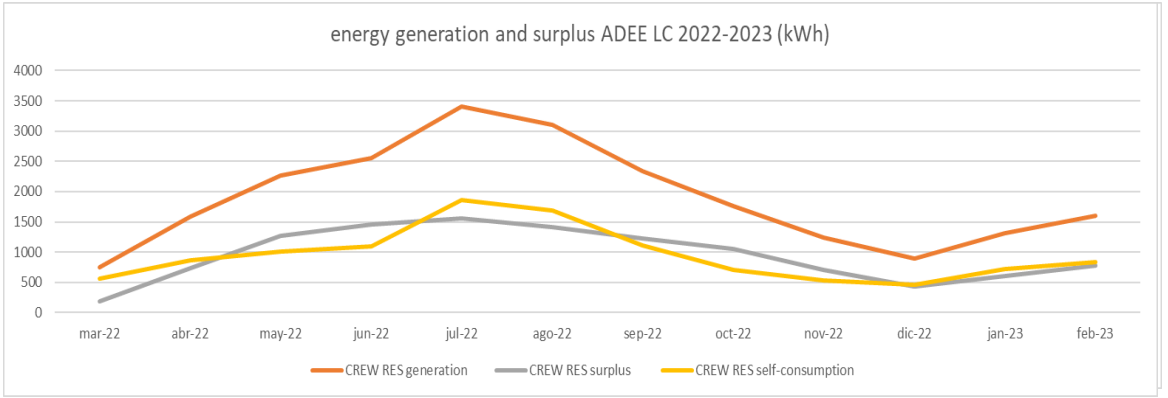
Lighthouse Community CEA Alginet, Spain

52% surplus over generation

2.3% self-consumption in the CREW

2.6% potential to increase self-consumption

4.9% max. CREW (RES) energy coverage



87.23 t CO2 average carbon footprint

2.7t CO2 emission savings/year

Could be doubled

Table 5. ADEE LC annual and monthly energy metrics

ADEE LC energy metrics	Total year kWh	Average month kWh	Average per month and per dwelling kWh
CREW grid consumption	375,989	29,429	249
CREW RES generation	22,838	1,365	12
CREW RES surplus	11,396	712	6
CREW RES self-consumption	11,442	653	6
CREW demand	387,431	30,082	255

Lighthouse Community CEA Alginet, Spain

99€/month average energy costs/dwelling

3.2€/month savings only

4,471€ saving for self-consumption/CREW/year

8,828€ = potential savings/CREW/year

Table 7. ADEE LC Economic metrics per month

Economic metrics estimation	Unit	mar-22	abr-22	may-22	jun-22	jul-22	ago-22	sep-22	oct-22	nov-22	dic-22	ene-23	feb-23
Energy costs	€/ month	20,065 €	10,744 €	10,050 €	11,624 €	16,671 €	19,721 €	12,849 €	7,041 €	5,767 €	7,612 €	8,061 €	9,996 €
Energy savings	€/ month	291 €	333 €	387 €	423 €	818 €	848 €	491 €	245 €	135 €	123 €	153 €	224 €
Energy potential savings	€/ month	386 €	614 €	875 €	986 €	1,503 €	1,558 €	1,036 €	607 €	312 €	237 €	281 €	433 €

Lighthouse Community Hassfurt, Germany (8947 customers)

105 CREW members

52 Prosumers = 538 kWh generation capacity

3 workshops/48 attendants (46% participating)

- **37% women**/ 63% men

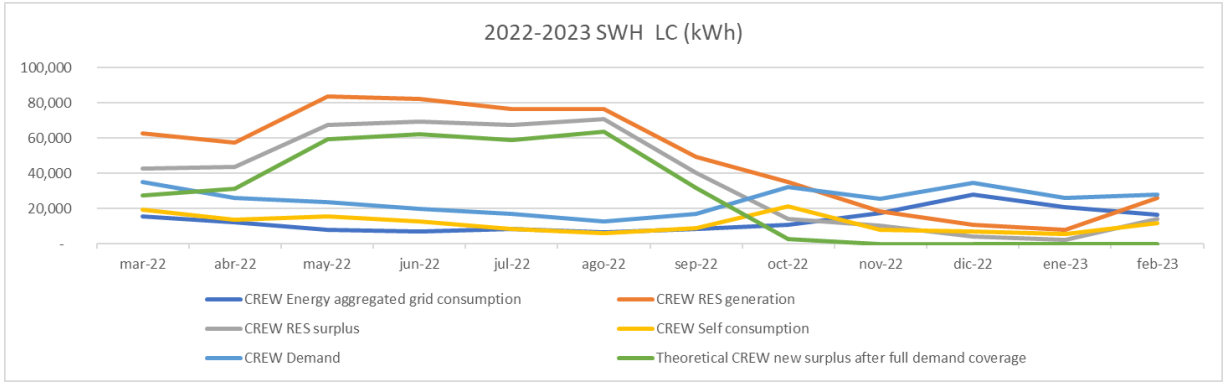
139 CEA requests – regarding the App

Average satisfaction with the app **3.9**/5

- **86% men**

Lighthouse Community Hassfurt, Germany

66% surplus over generation (Mar-Feb)
47% self-consumption in the CREW
85%/month potential self-consumption
85% average CREW (RES) energy coverage
weak winter month (Nov-Jan)



22.1 t CO2/year average c-footprint
19.1 t CO2 emission savings/year
23.3 t CO2 potential savings

Table 10. SWH LC energy metrics in average per month and per dwelling

SWH LC energy metrics	Average per month	Average/month/user in kWh/month
Grid consumption = Demand + surplus - generation	13.415	128
Generation = consumption + surplus	48.920	466
Energy surplus = generation - demand	37.330	356
Self-consumption = generation - surplus	11.590	110
Demand = grid consumption + generation - surplus	25.005	238
New surplus = former surplus - grid consumption	28.223	269

Lighthouse Community Hassfurt, Germany

50€/month average energy costs/dwelling

40€/month savings

17,200€ saving for self-consumption/CREW/year

= 164€/month/dwelling (only 40€ are enjoyed)

5880€ = potential savings/CREW/year (56€/month/dwelling)

Table 12. SWH LC Economic metrics

Economic metrics estimation	Unit	mar-22	abr-22	may-22	jun-22	jul-22	ago-22	sep-22	oct-22	nov-22	dic-22	ene-23	feb-23
Energy costs	€/ month	5,262 €	4,213 €	2,733 €	2,408 €	2,912 €	2,318 €	2,847 €	3,775 €	6,053 €	9,515 €	11,246 €	8,923 €
Energy savings	€/ month	6,702 €	4,626 €	5,403 €	4,331 €	2,984 €	2,020 €	3,013 €	7,272 €	2,705 €	2,355 €	2,995 €	6,336 €
Energy generation value	€/ month	21,283 €	19,559 €	28,393 €	27,919 €	25,992 €	26,039 €	16,742 €	12,042 €	6,245 €	3,766 €	4,387 €	14,057 €
Potential energy savings	€/ month	11,964 €	8,839 €	8,136 €	6,739 €	5,896 €	4,338 €	5,860 €	4,770 €	3,540 €	1,411 €	1,392 €	7,721 €

Lighthouse Community ULUG, Türkiye (2.3 mio customers)

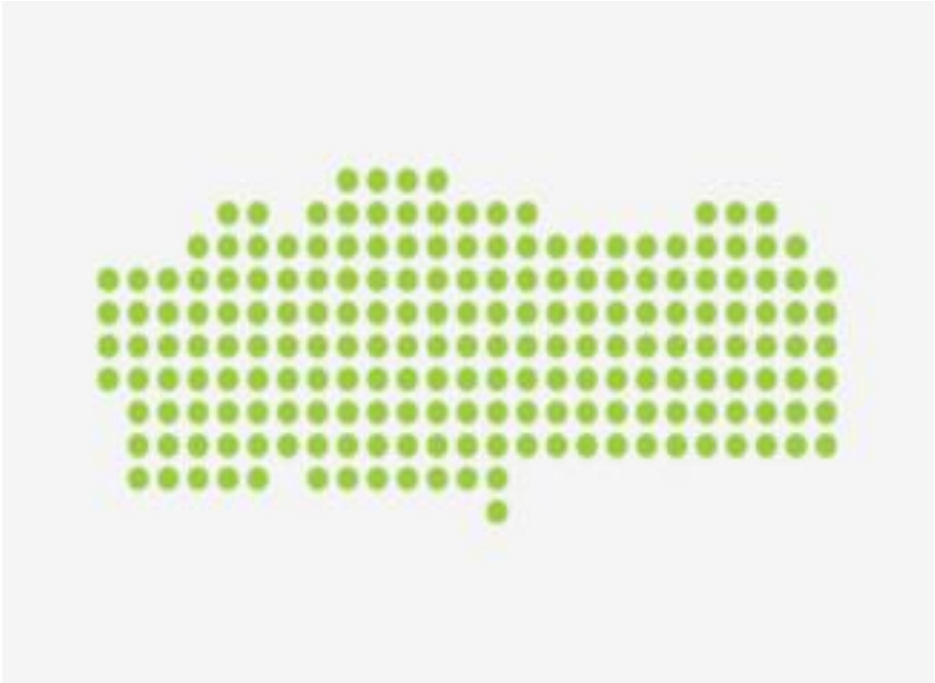
1823 CREW members, three appartment buildings

no Prosumers - regulation still block self-consumption

5 workshops/554 attendants

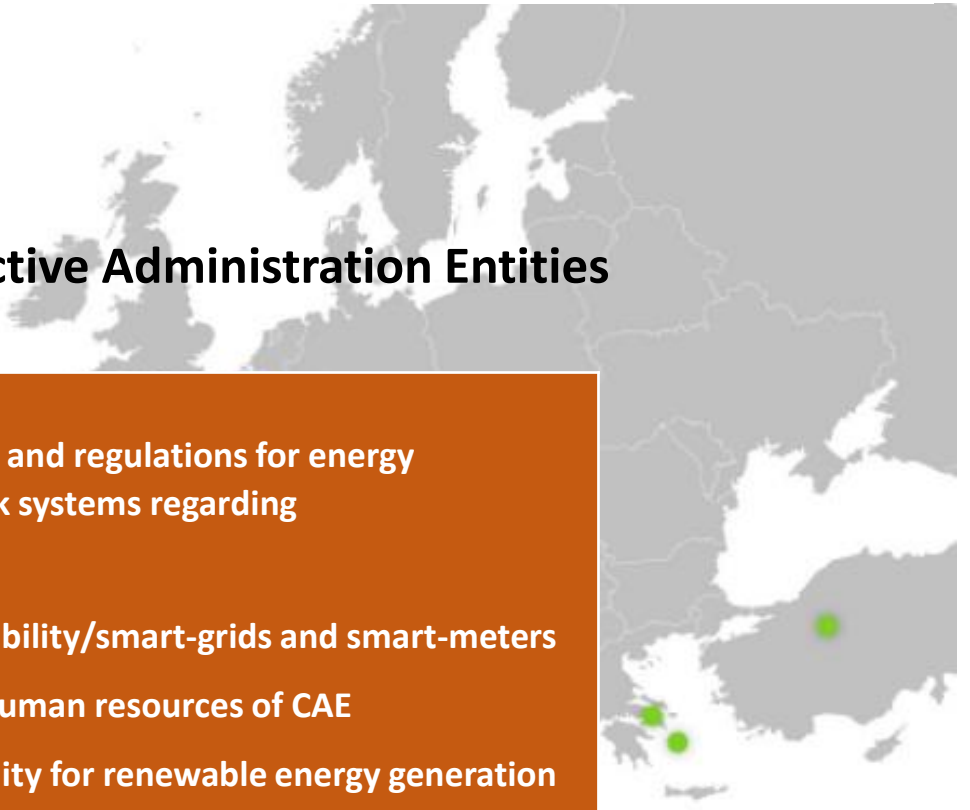
30% women/ 70% men

4.6%/5 average satisfaction



Learnings – take aways

- Enablers and barriers for companies/utilities to become **Collective Administration Entities**



- **Shared sustainability values with citizen (consumers & prosumers)**
- **Proactive engagement of community as CAE**
- **Technological appliance implementation (smart grids; smart meters)**
- **Digital platform and support application**
- **Innovation and eagerness to improve performance and peak-load shifting**
- **Existing and cooperative prosumers**
- **Awareness programs**
- **Community and network building**
- **Be at the forefront of the energy transition**
- **Eagerness to become self-sufiicient**

- **Legal restrictions to and regulations for energy community network systems regarding**
- **Tariff-setting**
- **Technical incompatibility/smart-grids and smart-meters**
- **Lack of additional human resources of CAE**
- **Resource availalability for renewable energy generation (wind, water, solar)**
- **Limited motivation for innovation and change**
- **Lack of consumer and prosumer trust**
- **Consumer rejections**

Learnings – take aways

- **Small communities** not enough flexibility to produce and consume enough energy to make significant changes. **Large communities** harder to manage (face-to-face relationship, administrators build loyalty. Communities around **100 members** seem good for handling.
- **App training sessions** directly impact the usage rate. Few users with highest participation rate.
- Energy savings are not coupled with energy usage. Economic metrics for prompting to faster action. **Awareness programs** to show **energy consumption behaviour** and communicate the behavioural adjustment possibilities by gaging the app and the daily consumption.
- **Low PV generation** communities have the maximum potential to reuse the energy surplus. **Large PV generation** communities have less room for improvement and still could generate surplus outside the community.
- **PV surplus potential** can be maximised with behavioural changes by acting on implicit demand response methods, showing users the **best time to consume** available RES energy.

Learnings – take aways

- The Business Model supports the **integration in the energy system**
- **Different Business Models** are necessary to fit the local and national frames
- A unified regulatory **EU-policies** for tariff-settings, regulations and market conditions is recommended to foster the energy community development
- A **holistic digital approach** for managing the different energy sources is needed
- **PV investments – amortization calculator** is needed to attract prosumer engagement/investment – the more prosumers, the less savings, the longer the amortization

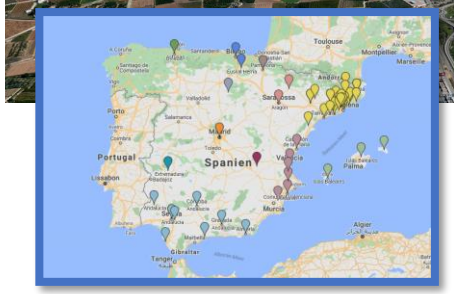
ENERGIE INSTITUT
an der Johannes Kepler Universität Linz

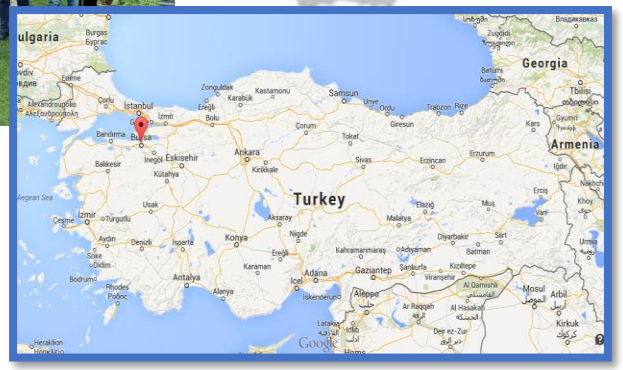
eCREW | eSTABLISHING COMMUNITY RENEWABLE ENERGY WEBS

eCREW – Progress and Outlook

Three **CREWs + ACEA (Italian energy utility)**

And more to come





"EU Project Clustering event: Smart Energy Services"

eCREW | eSTABLISHING COMMUNITY RENEWABLE ENERGY WEBS

slacik@energieinstitut-linz.at