



Long term Approach: A possible Way to Self-sufficiency and Climate Neutrality in 2035

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- Municipal Utilities Pfaffenhofen (Stadtwerke Pfaffenhofen - SWP)
- Municipality Pfaffenhofen, Sustainability Department (Stadt Pfaffenhofen, Sachgebiet Klimaschutz und Nachhaltigkeit)

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Some information about my home town Pfaffenhofen

Right in the middle of a boom region



Some information about my home town Pfaffenhofen

The best of city and country

Population:

27.318 (as of 31.12.2022)

Area:

92,6 km²

District Town:

Capital of
County of Pfaffenhofen a. d. Ilm

HALLERTAU:

Largest contiguous
hops growing
area in the world



PFAFFENHOFEN A. D. ILM
Guter Boden für große Vorhaben

Some information about my home town Pfaffenhofen

- Medium-sized centre in the heart of Bavaria
 - located between Munich (50 km) and Nuremberg (120 km)
- very low unemployment rate ($\approx 2\%$ as of August 2023, Germany: 5,8 %)



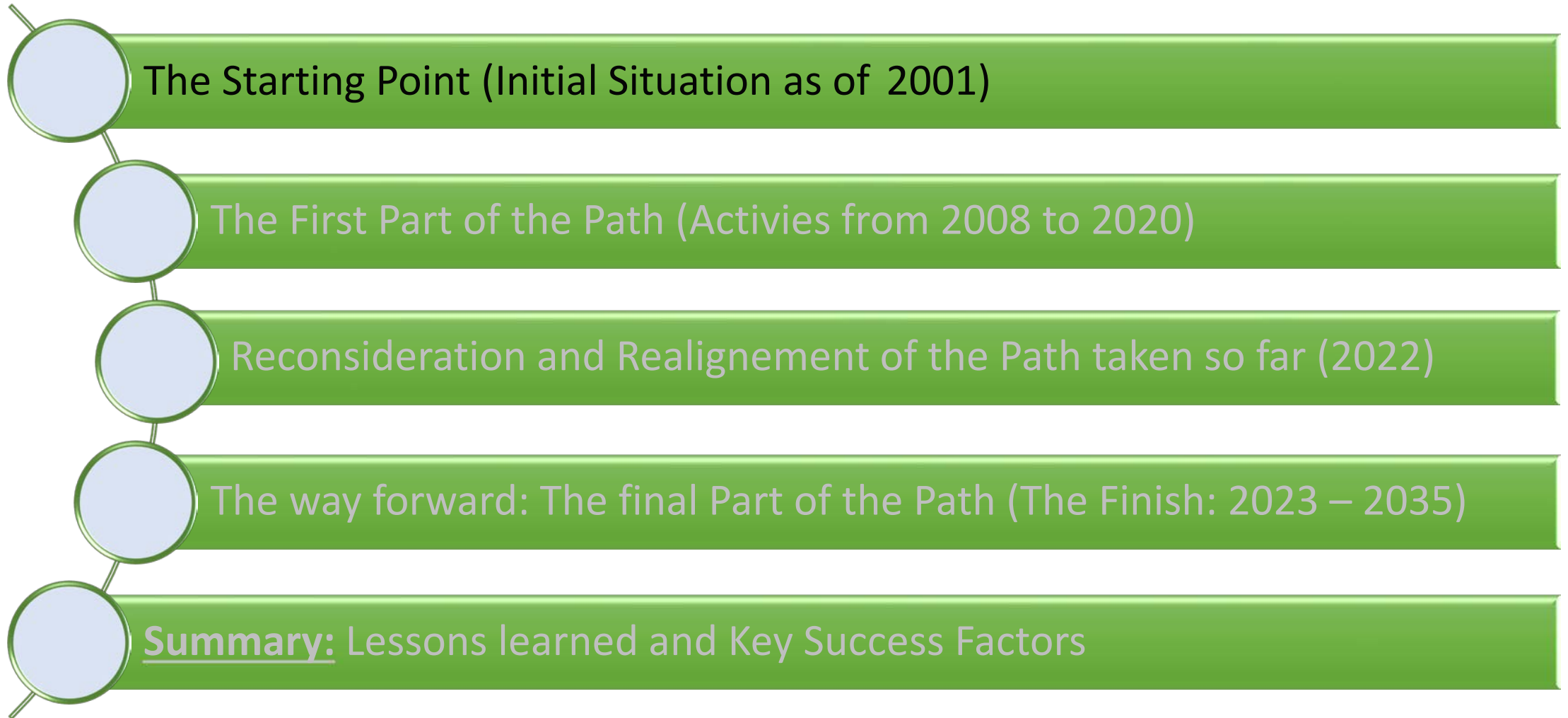
- very strong economy in the region
 - automotive industry (Audi, BMW)
 - aerospace industry (Airbus)
 - some petrochemistry (LyondellBasell)

AWARD-WINNING LIVEABILITY

Pfaffenhofen a.d. Ilm, one of the world's most liveable communities
www.pfaffenhofen.de/livcomawards



A Possible Way to Climate Neutrality: Outline of my Presentation today



Situation as of 2001

- In Pfaffenhofen a privately owned **Biomass Combined Heat and Power (CHP) Plant** started operation in 2001
- It burns about 46.000 tons of natural wood residues from the region
- The annual output is about 40.000 MWh of electricity and 54.000 MWh of heat, as well as about 20.000 MWh of steam
- It supplies > 6.500 households with heat and about 10.000 households with electricity
- By using renewable energies, the amount of **22.000 tons of CO2** is saved per year



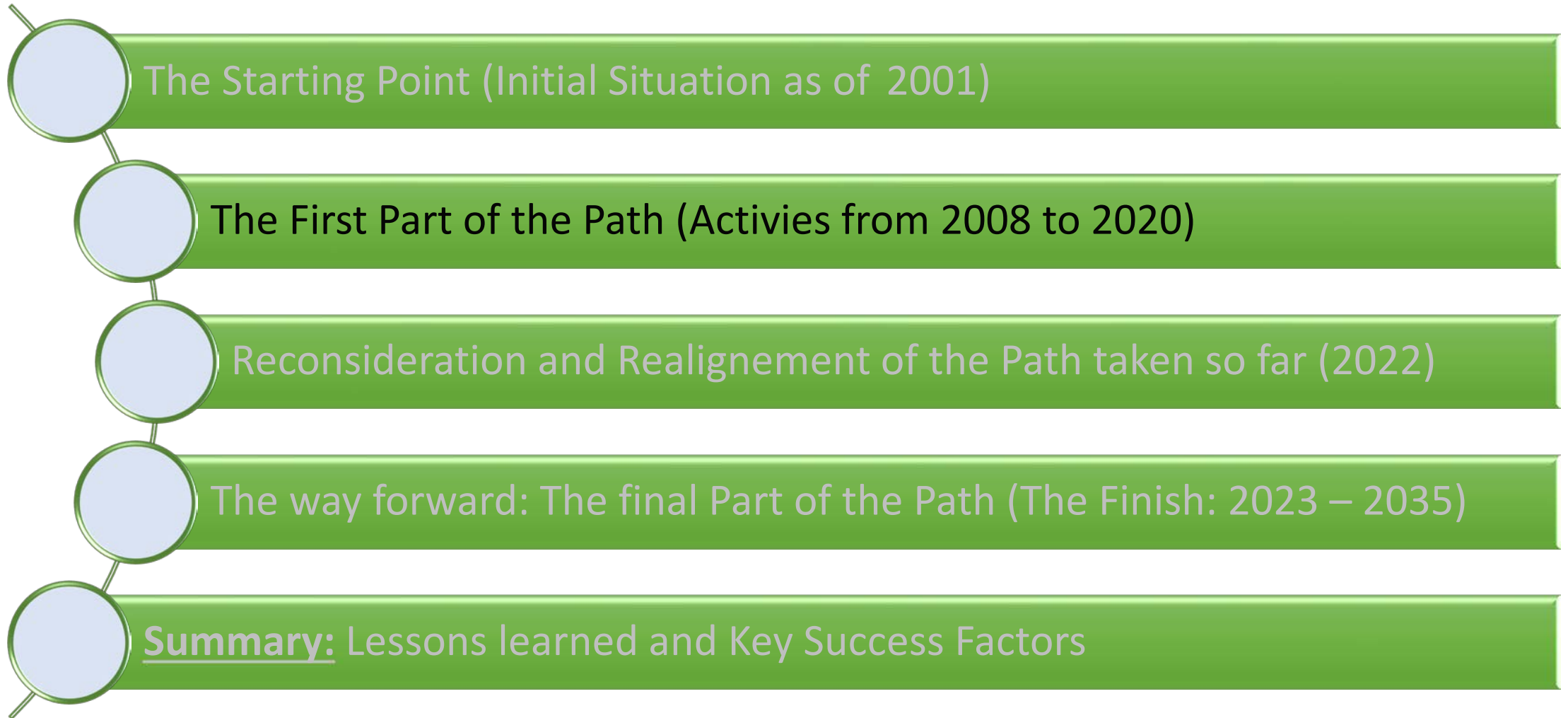
Benefits of Pfaffenhofen Biomass Combined Heat and Power (CHP) Plant

Role Model Pfaffenhofen



- Press Release of **German Environment Agency** (Umweltbundesamt – UBA) as of 27. July 2001:
- *As the first German municipality, Pfaffenhofen fulfilled the Climate Protection Goals of the the German Federal Government, derived from the Kyoto Protocol (1997) of the United Nations*
- *Pfaffenhofen reduced its CO2-Emissions by **32 %** compared to the base year 1990 (the German goal was -25% until 2005)*
- Calculated down to the CO2-Emissions per citizen and year this resulted in about **6,6 tons** CO2/capita/year in 2013
- (For comparison: this value for Germany was about **10** tons CO2/capita/year)

A Possible Way to Climate Neutrality: Outline of my Presentation today



Change in Political Responsibility

New election of the City Council Pfaffenhofen 2008

- New political landscape:
- A "colourful" political coalition was elected (social democrats, independent party, ecological party, green party)
- The new representatives payed more attention to the upcoming Climate Change and the need for an Energy System Transformaton (away from fossil energies)
- A public initiative was started to inform the citizens about the new challenges
- Some preparatory work was carried out in the background:
 - Find appropriate and willing stakeholders for the transformation process
 - Define a format how to process the planning and how to involve the public
 - Prepare the communication process



Bürgerservice Pfaffenhofen aus Pfaffenhofen

mitwissen . mitreden . mitgestalten



BÜRGERENGAGEMENT IN PFAFFENHOFEN

Energy and Solar Society (Energie- und Solarverein, ESV)

- Founded in 2008
- Registered, non-profit society ("*a club*")
- About 20 „active“ members
Professionals from the fields of construction, physics, energy, environmental protection, supply engineering, etc.
- About 70 supporting members
- Objectives (excerpt):
 - Energy autonomy of Pfaffenhofen
 - socially acceptable implementation of the energy turnaround
 - keeping energy generation and value creation on site



Energy and Solar Society (Energie- und Solarverein, ESV)



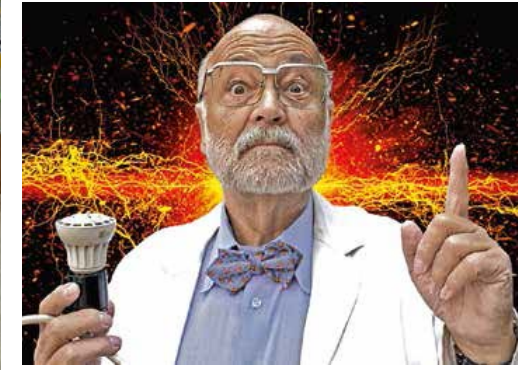
Annual **Energie-für-Alle-Woche** (Energy-for-All Week) THE ENERGY TRANSITION CONGRESS for the Pfaffenhofen region

Presentations | Exhibitions | Discussion | Networking | Excursions | Entertainment
for citizens, pupils, students, companies and municipalities

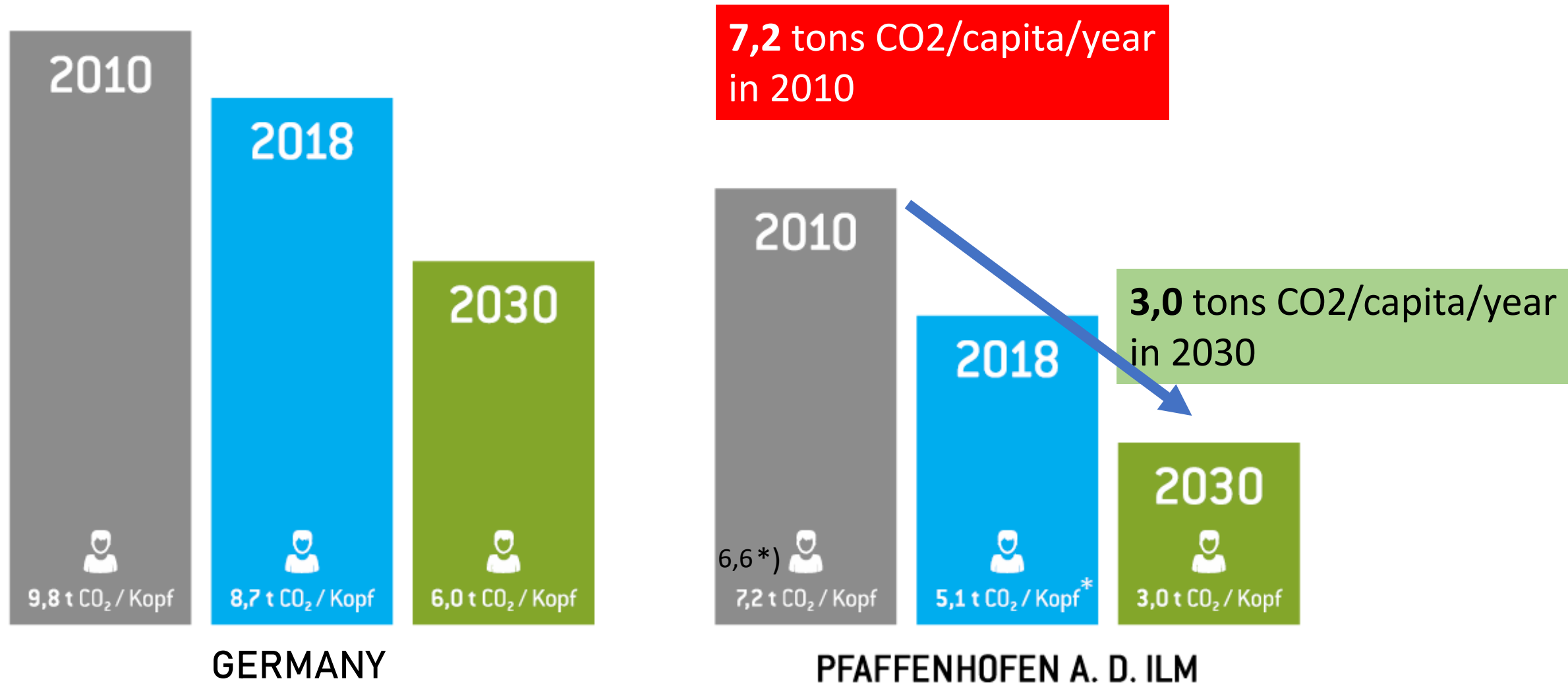
From 2010 - 2019

EFA

ENERGIE FÜR ALLE WOCHE



A clear comittment for CO2 reduction was developped



*) Assessment Criteria had been adapted to a generally recognized procedure

Mobilizing the Public –Awakening of Awareness for the big Challenge



Starting Point of our Renewable Energies Activities: Reduce Fossils!



KLIMASCHUTZ IN PFAFFENHOFEN

Wo steht die Stadt und was ist möglich?

AUFTAKTVERANSTALTUNG
14. MAI 2012

Mirjam Schumm, Green City Energy

CLIMATE PROTECTION IN PFAFFENHOFEN

Where stands the City and what is possible?

Public workshops

on 16. June 2012 and
on 21. July 2012
with experts and
citizen participation

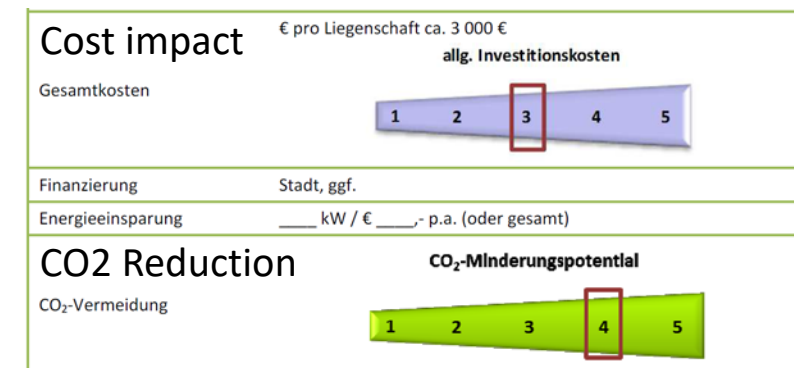
Kick-off Event
14. May 2012



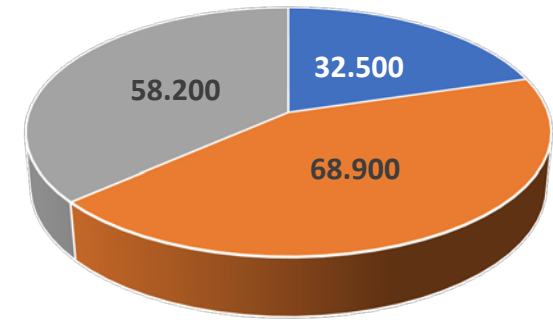
Result: the First Integrated Climate Protection Concept (ICPC I) 2012



- Analysis of starting position
 - Energy demand:
 - Total Energy
 - Electricity
 - Heat
 - Mobility
 - Carbon footprint
 - Energy cost and value creation in Pfaffenhofen
- Potential analysis
 - Savings and efficiency improvement
 - Photovoltaics and solar thermal
 - Biomass potential (agricultural, forests, biogenic waste, ...)
 - Windpower
 - Waterpower
 - Geothermal
- Scenario assessment
- Action Plan 2013 – 2017 established (≈ 80 actions)



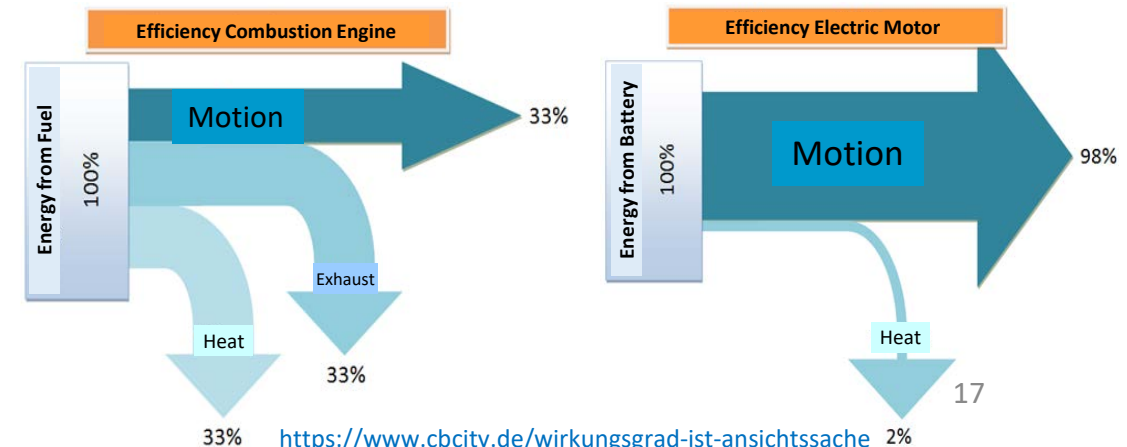
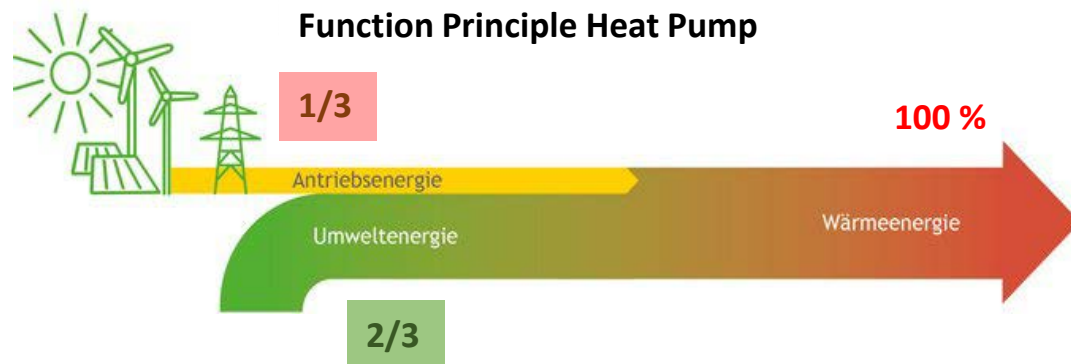
CO2 Emissions by Energy Sector
in tons/year



Strategic Decisions

Although the **biggest** contribution to CO2 emissions originate from **HEAT** and **MOBILITY**,
it was decided to start with a focus on **ELECTRICITY**!

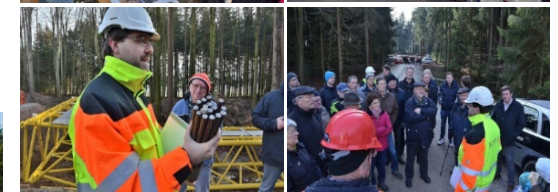
- This would allow us to achieve "quick wins" in a timely manner
- In this field we were relatively independent from federal legislation
- It would not require a rapid change in citizen's behaviour
- More available renewable electricity would pave the way for an "all-electric" future, i.e. for heat generation by heat-pumps and for electro-mobility



Citizen Energy Cooperative PAF (Bürgerenergiegenossenschaft, BEG)

Founded in **2012**, resulting from an initiative of Energy and Solar Society (ESV)

- 2023: more than 1.000 members, > 10.000 shares
- 2012: first cooperative solar carport in Bavaria
- 2015: ground-breaking ceremony for the 1st public-funded wind turbine
- 2016: wind turbine in full operation
- 2023: ground-breaking ceremony for the 1st citizen windfarm (3 wind turbines, now under construction)



Citizen Energy Cooperative PAF (Bürgerenergiegenossenschaft, BEG)

How to become a member of the Cooperative?

- Buy (at minimum) **one cooperative share**
- One share costs **100 €**
- You are allowed to buy up to 50 shares (equiv. to 5.000 €)
- You become co-owner of the cooperative with **one vote**, independent of the number of shares you acquire
- As a member of the cooperative you are entitled to participate in profits of the cooperative
- More important:
- Only as a cooperative member you are entitled to invest into the different Renewable Energy Projects the Cooperative is launching



Citizen Energy Cooperative PAF (Bürgerenergiegenossenschaft, BEG)

Public Acceptance of Projects by Profit Sharing

Well-elaborated offers for private investments by members of the cooperative acc. to their preferences, e.g. Wind, Solar, Water power, Biomass, ...

- Project participation starting from 1.000 €
- Investors are granting a partial loan to the cooperative
- Annual return of interests and of a proportionate repayment of the loan (usually 20 years of duration)



GENOSSENSCHAFTSANTEIL
 1 bis max. 50 Anteile á 100,- EUR
 mittel-, bzw. langfristige Geldanlage
 durch Gewinnbeteiligung an der BEG
 Ihre Einlage ist mind. 5 Jahre gebunden

Mitgliedschaft ist Voraussetzung für Projektbeteiligung
 Sie sind Miteigentümer der BEG mit einer Stimme
 (unabhängig von der Anzahl der Anteile)
 Sie fördern die Energiewende im Landkreis Pfaffenhofen

PROJEKTBETEILIGUNG
 projektabhängig
 z.B. ab 1.000,- EUR
 nachhaltige Geldanlage (Partiari-
 sches Darlehen) mit jährlicher
 ausgewiesener Rendite

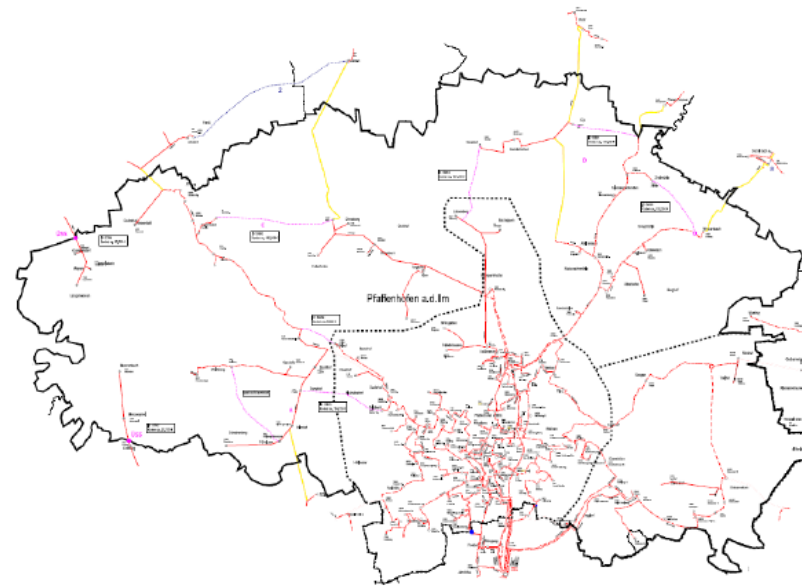
BEISPIEL WINDRAD	BEISPIEL BIOGAS- ANLAGE	BEISPIEL PV-Anlage FFW PAF	BEISPIEL SOLAR- CARPORT
3-5%	6%	4%	3%
jährl. Rendite	jährl. Rendite	jährl. Rendite	jährl. Rendite
			

Citizen Energy Cooperative PAF (Bürgerenergiegenossenschaft, BEG)

Actual Projects are



Back in the hands of the citizens: Our own Gas & Electricity Grid since 2016



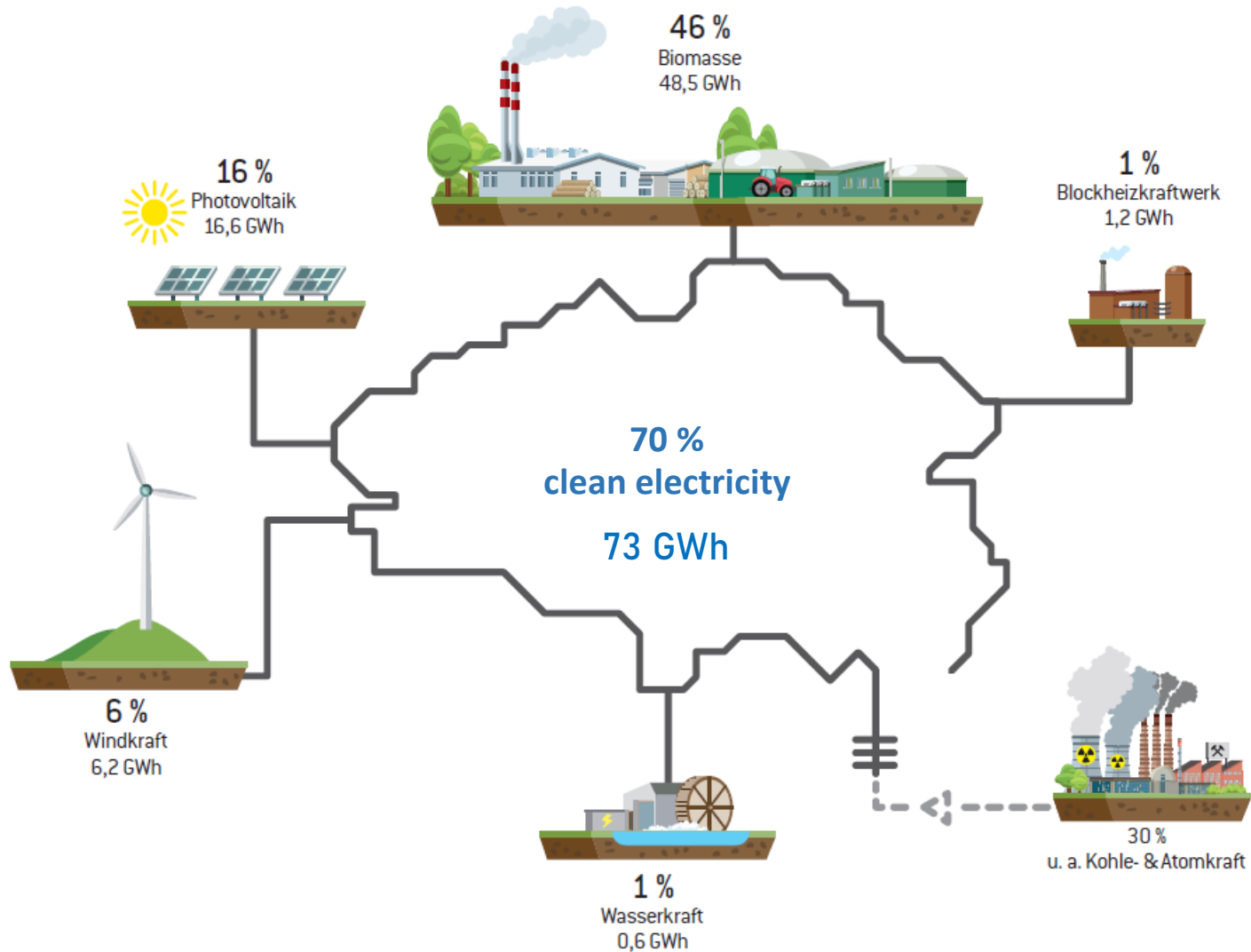
Gas & Electricity Grid in possession
of the City of Pfaffenhofen



PFAFFENHOFEN A. D. ILM
Guter Boden für große Vorhaben



Electricity Transition: Starting Point 2016

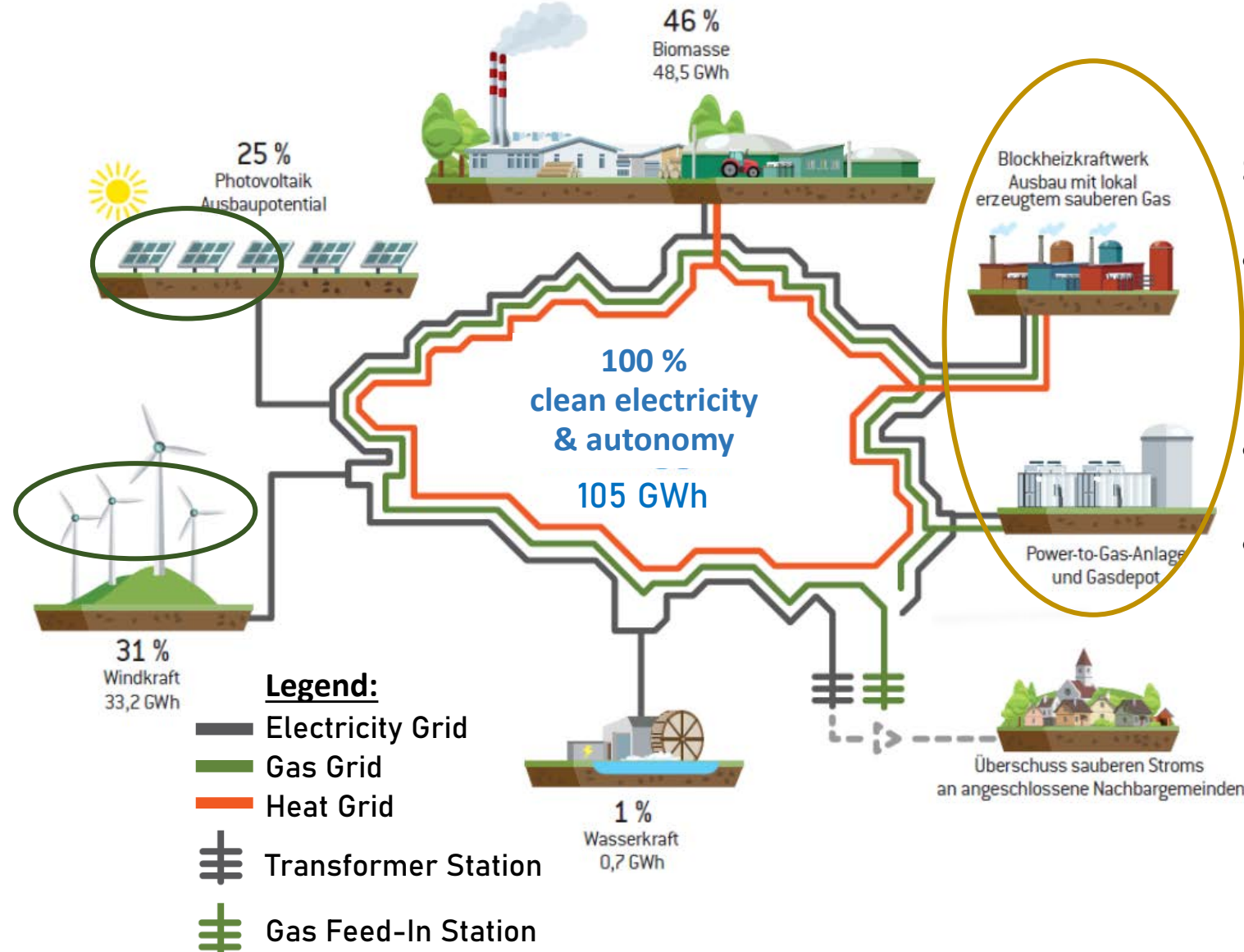


70 % sustainable electricity distributed by our grid

- In total, 30 % of electricity are procured externally from the public grid
- Nevertheless, about 8 GWh/year of electricity are „exported“ into the grids of neighbouring local communities
- Our grid is not yet balanced and we have only limited options for electricity storage
- 100 % sustainable electricity supply is within reach:
 - 3 more wind turbines (BEG)
 - 2 solar parks (BEG, private owners)

Electricity Transition: Final Goal 2024

100%
SAUBERE ENERGIE
FÜR PFAFFENHOFEN



100 % sustainable electricity

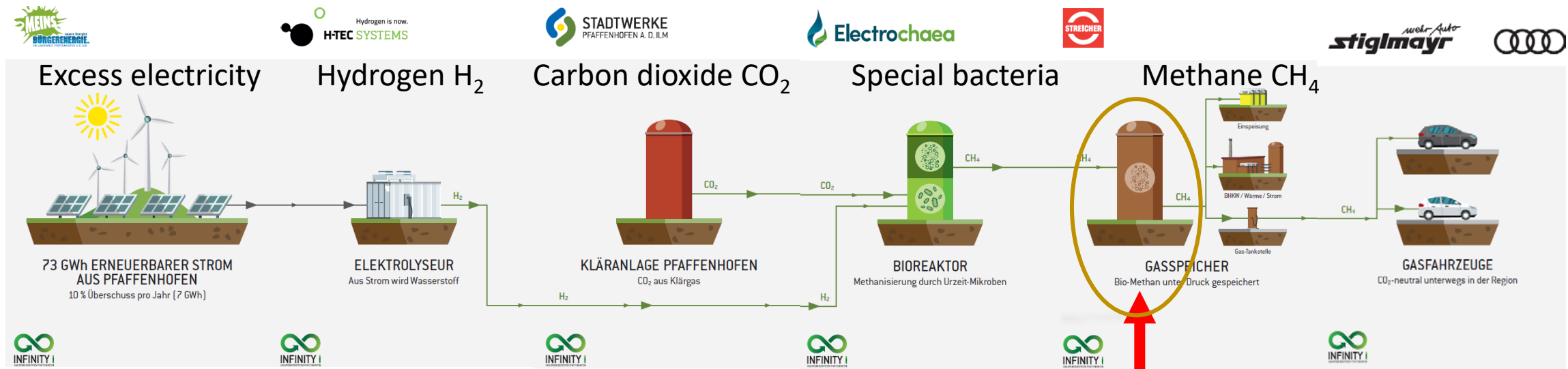
Single steps to achieve this goal:

- prompt connection of power plants to our own grid (since 2016)
- Expansion of our E-mobility activities (since 2017)
- Distribution of PV plants (since 2018)
- Combined Heat Power (CHP) Heat grids (beginning in 2000)

2018: start of planning process for energy storage system (Power-to-Gas) (Citizen Energy Cooperative BEG + Municipal utilities SWP)

Energy Storage by Power-to-Gas (starting in 2024)

- To store energy produced in Pfaffenhofen for Pfaffenhofen
- applying the Power-to-Gas-Principle utilizing excess electricity from the wind park



Interseasonal
Energy Storage

Next Sector to reduce the CO2 Footprint: Mobility

Free Public Bus Transport since 2018



STADTBUS- UND EXPRESSLINIEN
Überblick Liniennetz



in order to reduce private car traffic in-town

Next Sector to reduce the CO2 Footprint: Mobility



Next Sector to reduce the CO2 Footprint: More Trees in the City

More than 250 new trees per year in the City



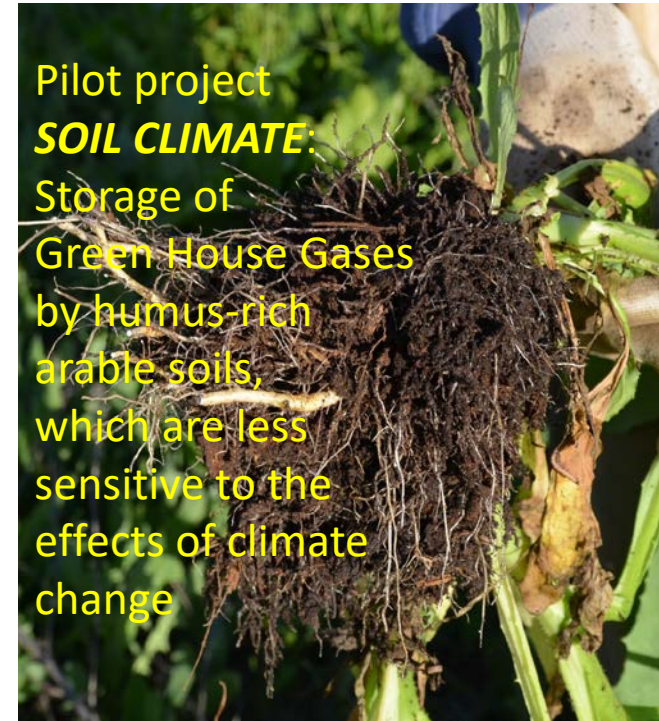
By 2030, we plan to have 20% more urban trees - as a natural air conditioning system.



Green and colorful spaces improve the urban climate: climate- and insect-friendly.

Next Sector to reduce the CO2 Footprint: Healthy Soil

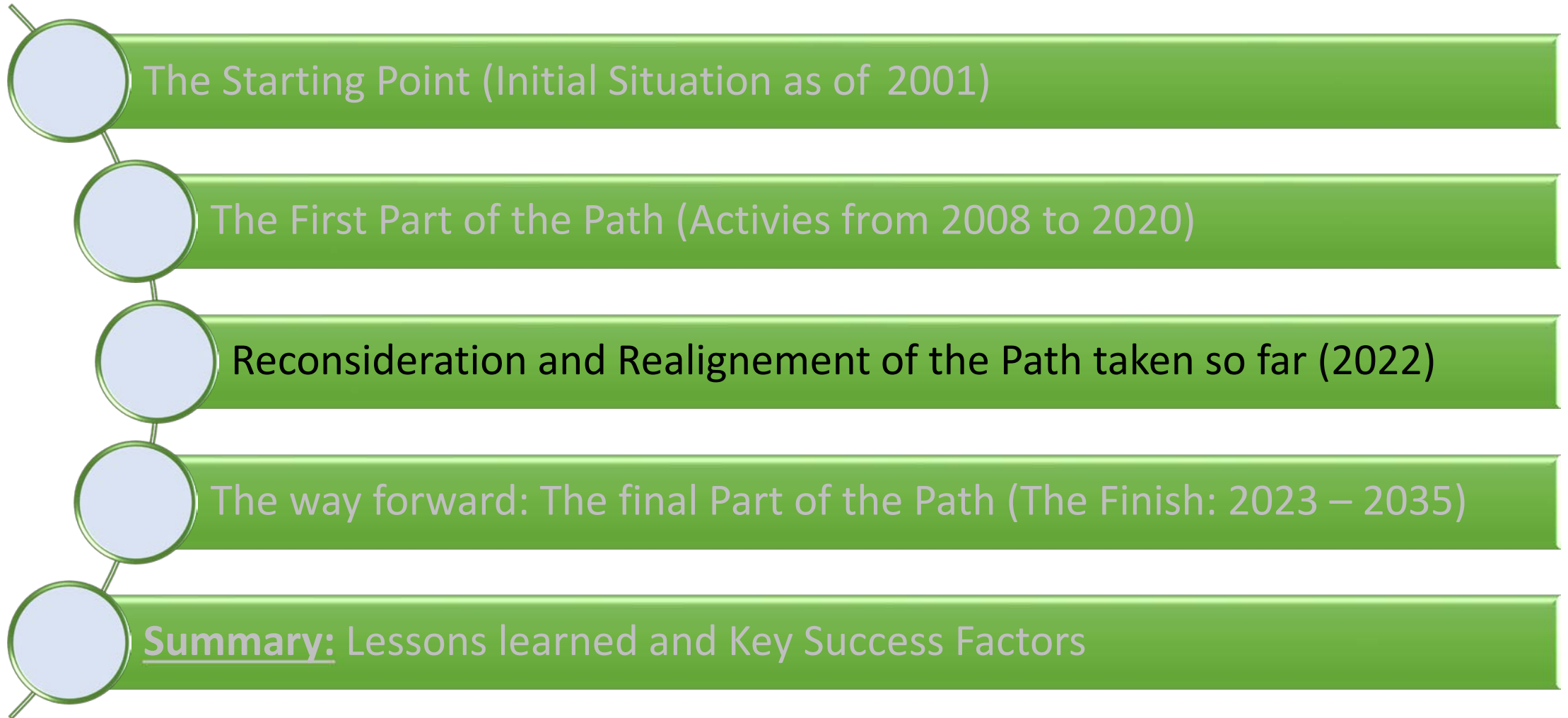
Soil Alliance (Bodenallianz) for sustainable agriculture since 2017



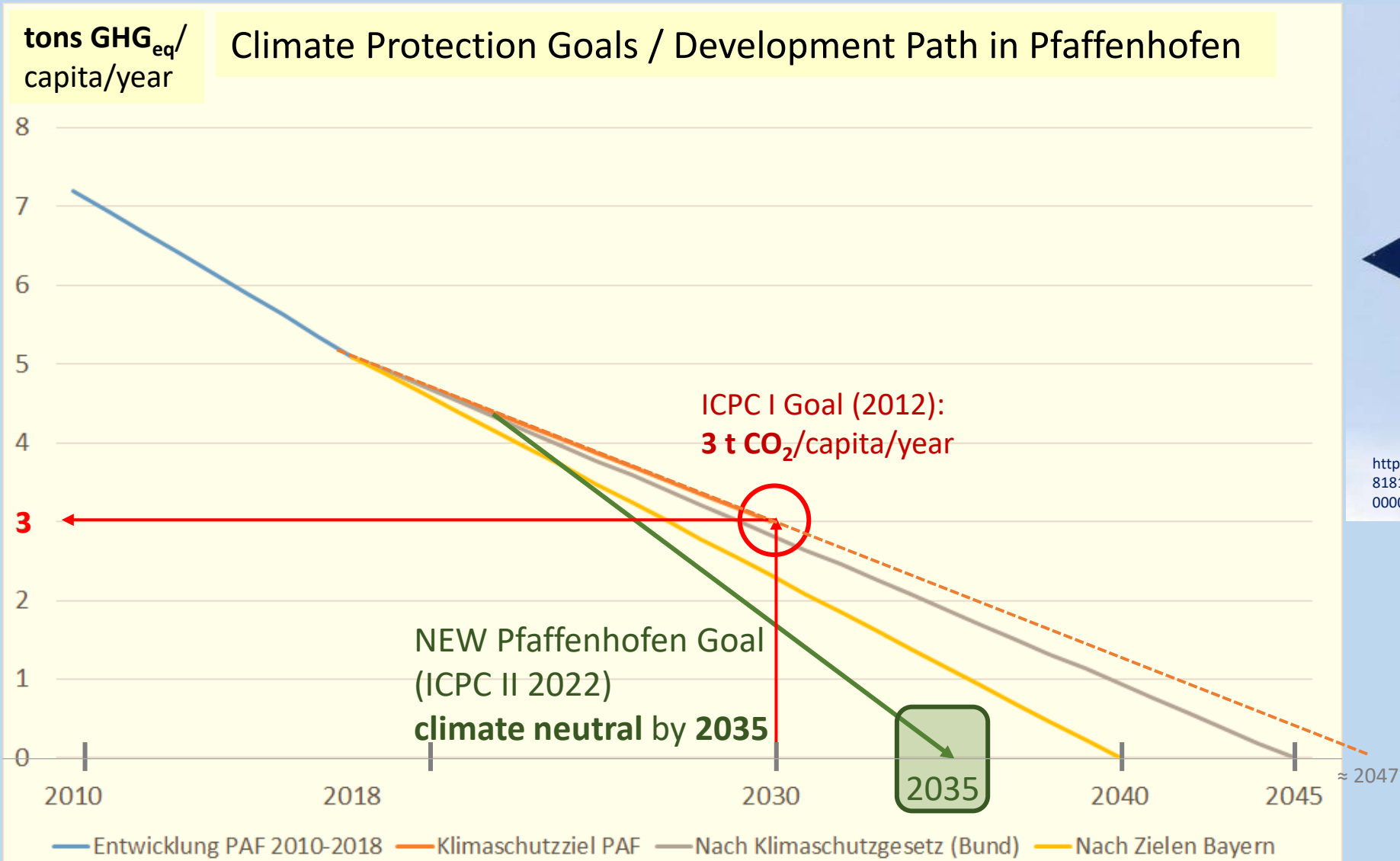
> 100 participating farms



A Possible Way to Climate Neutrality: Outline of my Presentation today



Reconsider and Readjust the Path taken so far !



Result: the Updated Integrated Climate Protection Concept (ICPC II)

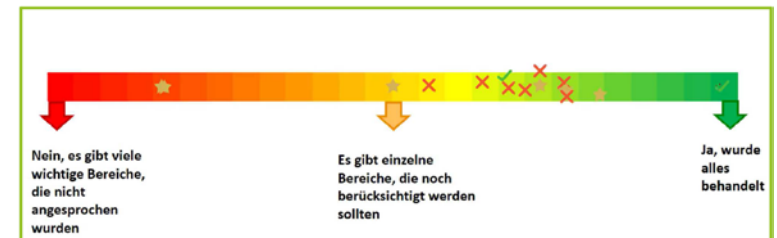
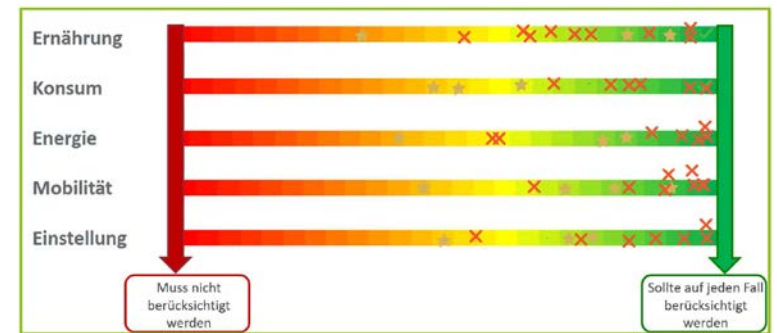


Due to the constraints of COVID-19 in the years 2020 and 2021 we worked a lot online in virtual work spaces:

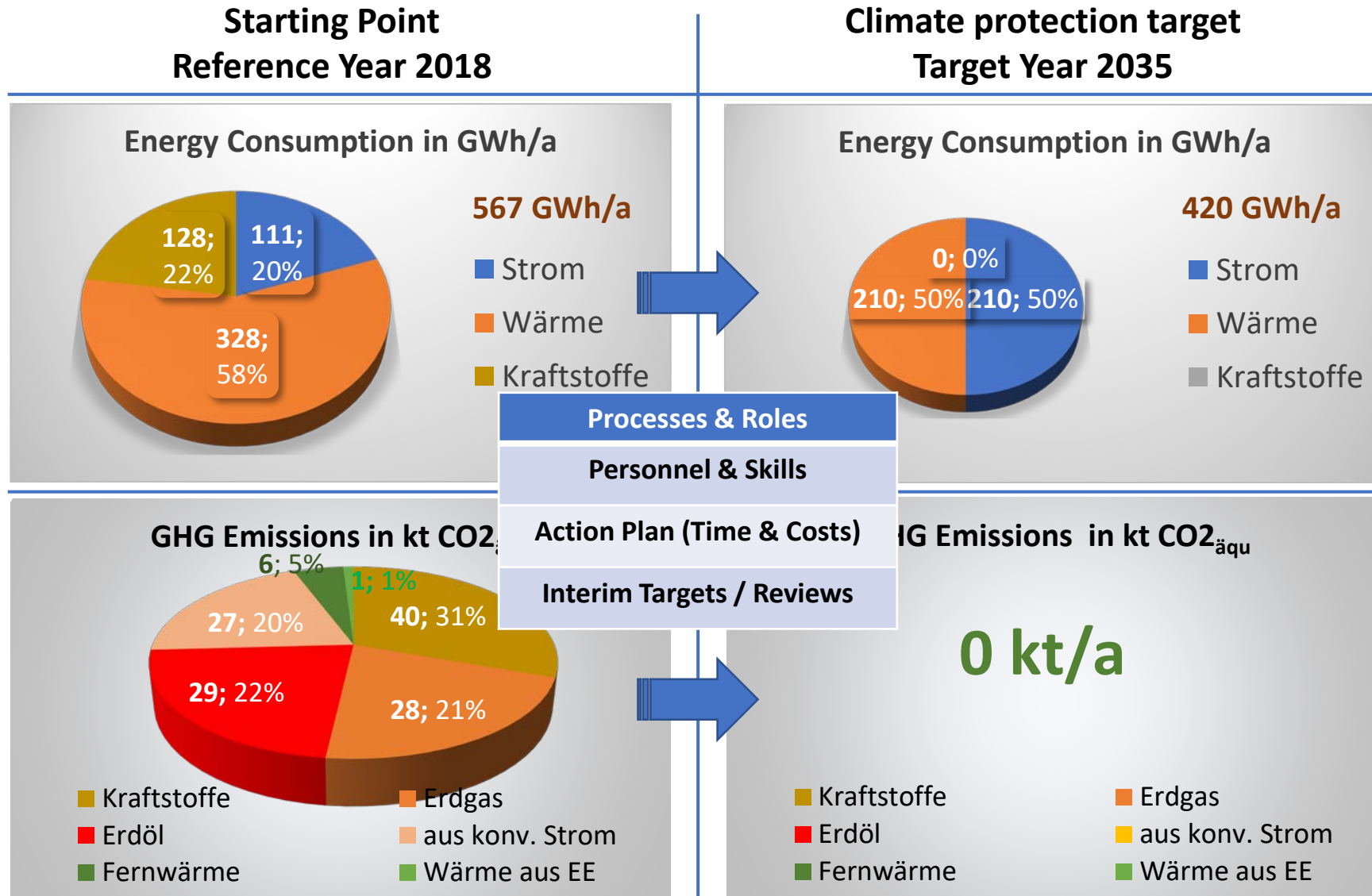
Examples for virtual collaboration:



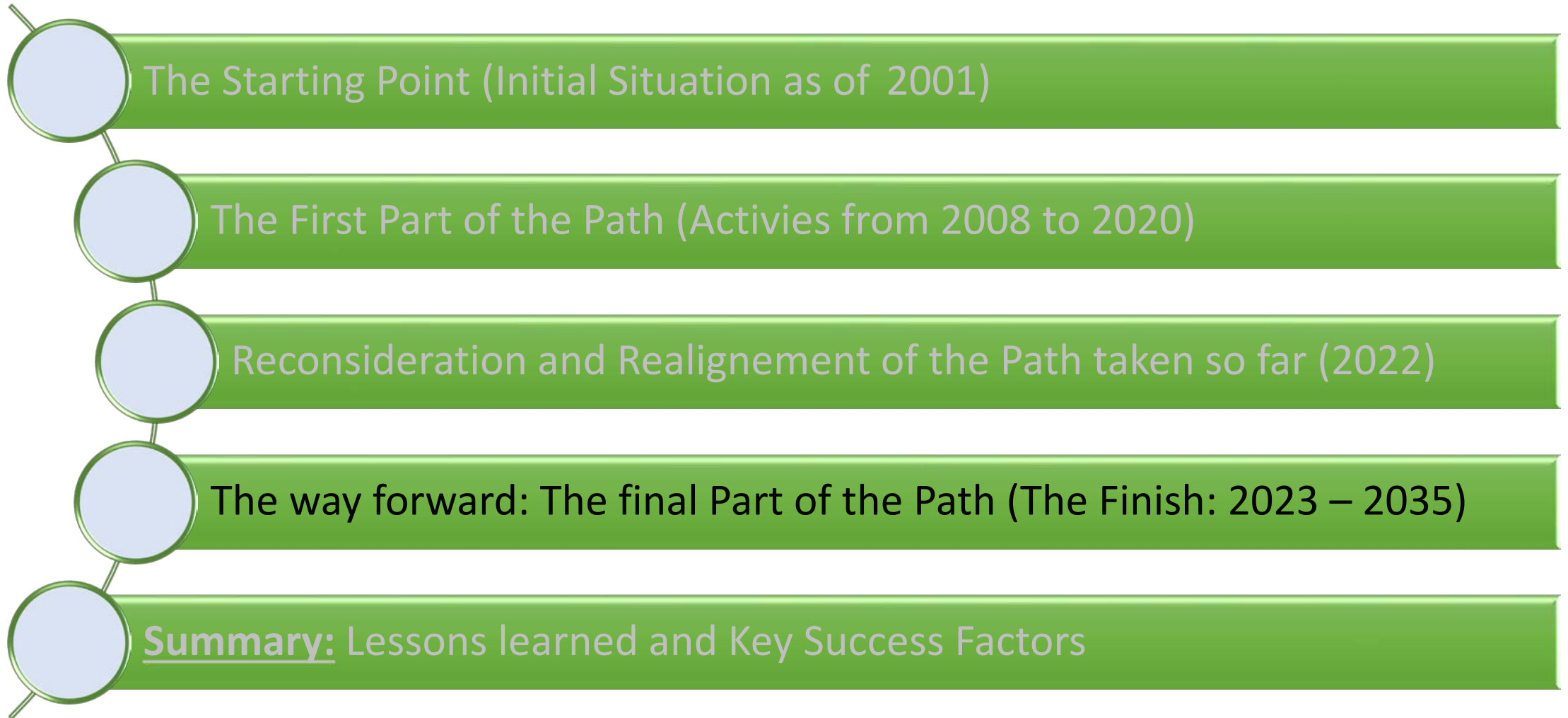
but we also asked the public:



Transformation Needs for Pfaffenhofen by 2035 acc. to ICPC II



A Possible Way to Climate Neutrality: Outline of my Presentation today



Efforts Break-Down for Climate Neutrality in 2035

	Climate Protection Goal 2035	What does this mean for Pfaffenhofen?	Assumptions/Consequences/Remarks
New Building Construction	NO additional GHG emissions from new constructions	highly efficient new buildings with 100 % renewable energies	Independent from the number of new buildings
Renewable Electricity Generation	100 % of the future electricity demand from renewable Energies	Addition of approx. 10 wind turbines and 60 ha open space PV	Because of new applications (E-Mobility and HP Heating) we assume an electricity consumption almost twice that of today (actual ≈ 111 GWh per year)
Heat Generation	NO fossile Heating; Replacement by renewable district heating and renewable energy or fossil free gas network, respectively	Replacement of about 230 fossile heating systems per year	About 80 fossile heating systems per year will be replaced by renewable district heating and about 150 heating systems by other non-fossil heatings (mainly heat pumps, geothermal heat, wood pellets, ...)
Building Refurbishment (private buildings)	(partial) energetic reconstruction of all buildings	About 130 buildigs per year will be fully and 210 partly refurbished (corresponds to about 5% of the existing buildings)	Average heat consumption value after reconstruction shall be 85 kWh/m²/year . (The actual refurbishment rate is about 70 buildings per year → five fold increase)
Mobility	Reduction of GHG emissions by 100 % (2030: -50 %)	About 1.000 new electric vehicles per year plus reduction of the motorized individual traffic by 25%	Replacement of the entire vehicle fleet within 14 years as well as prioritization of sustainable traffic (pedestrian and bicycle traffic, public transport, ...)

Next Sector to reduce the CO2 Footprint: Buildings and Heat

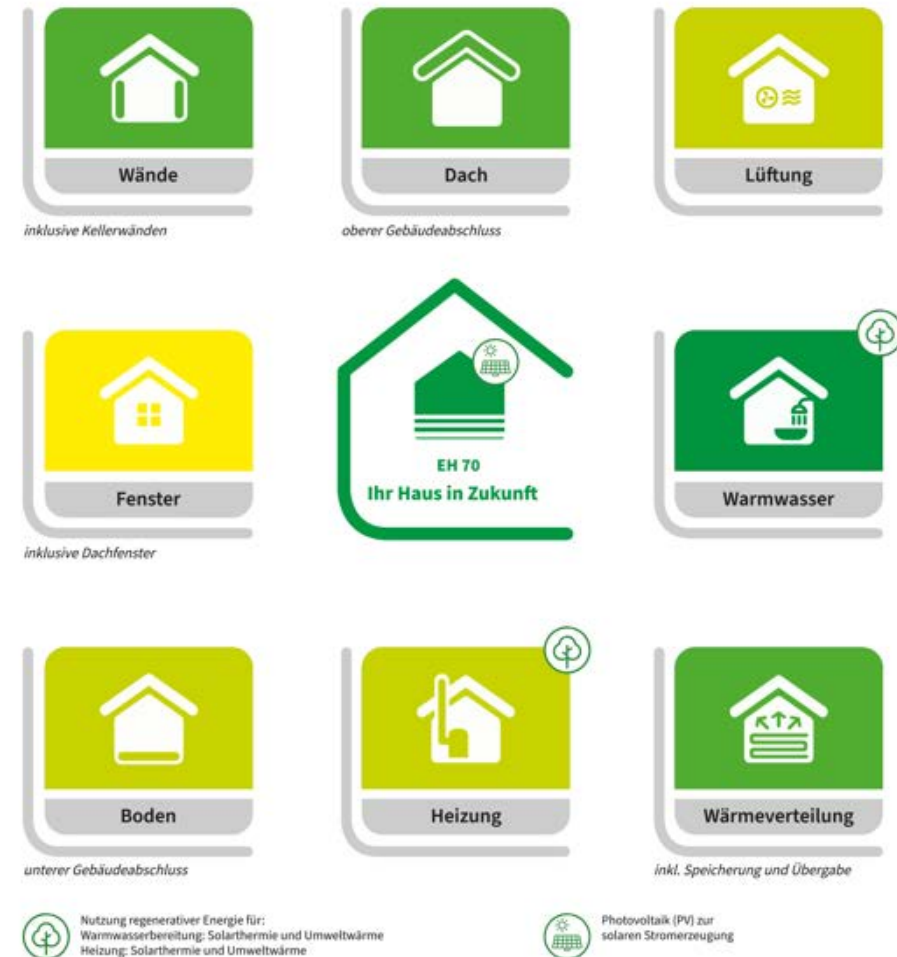
your building *before* refurbishment

Skala zur Energieeffizienz:



your building *after* refurbishment

Skala zur Energieeffizienz:



Source: FEDERAL MINISTRY FOR ECONOMIC AFFAIRS AND CLIMATE ACTION

Next Sector to reduce the CO2 Footprint: Buildings and Heat

Climate-friendly heat as a key factor

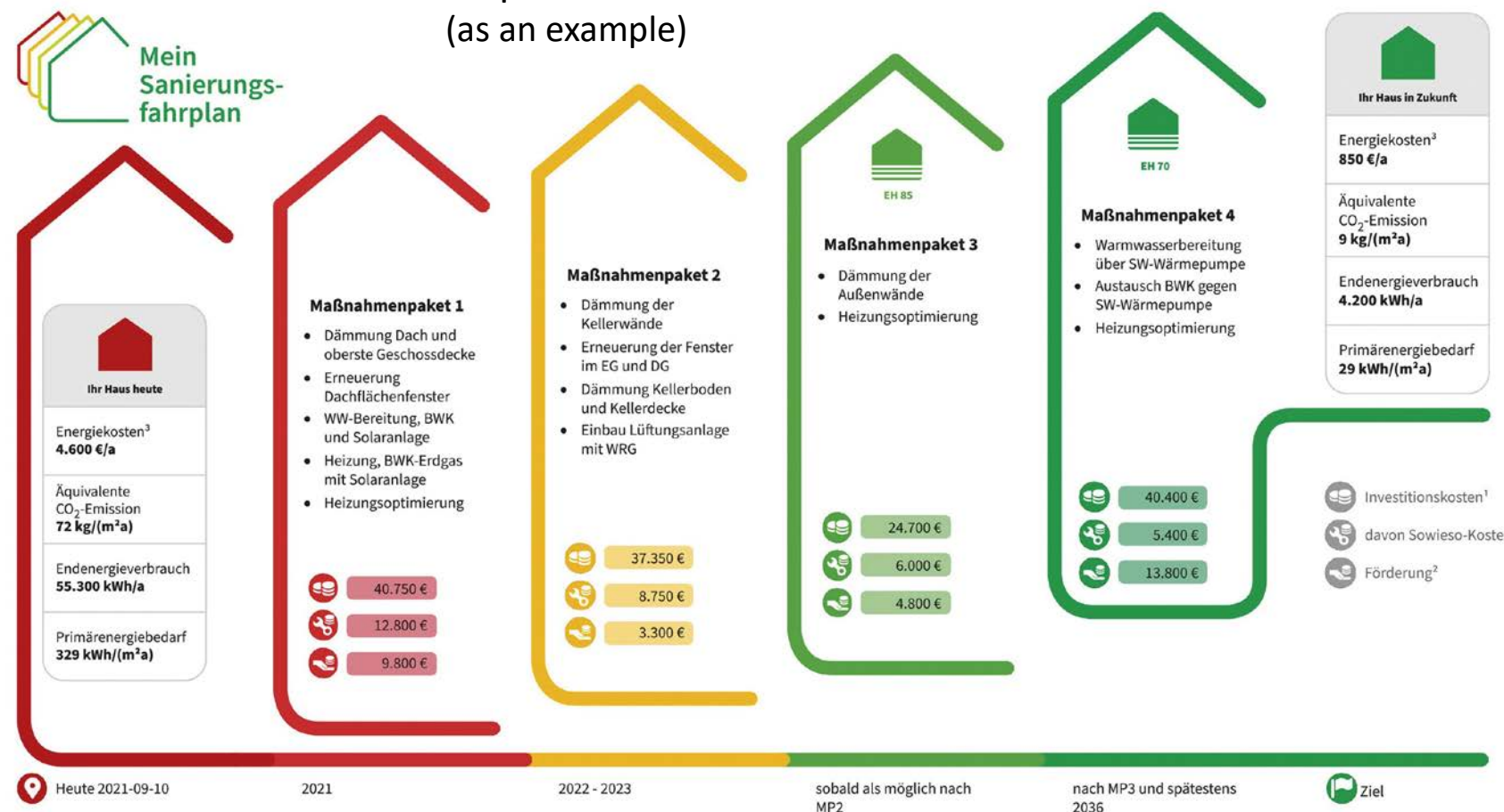
Renovation Roadmap as a first step

Sequential set of measures
(as an example)

Initial Phase of Renovation:

Financial subsidy for an
energy consultant:

- Federal funding 80%
- Municipal support 20%

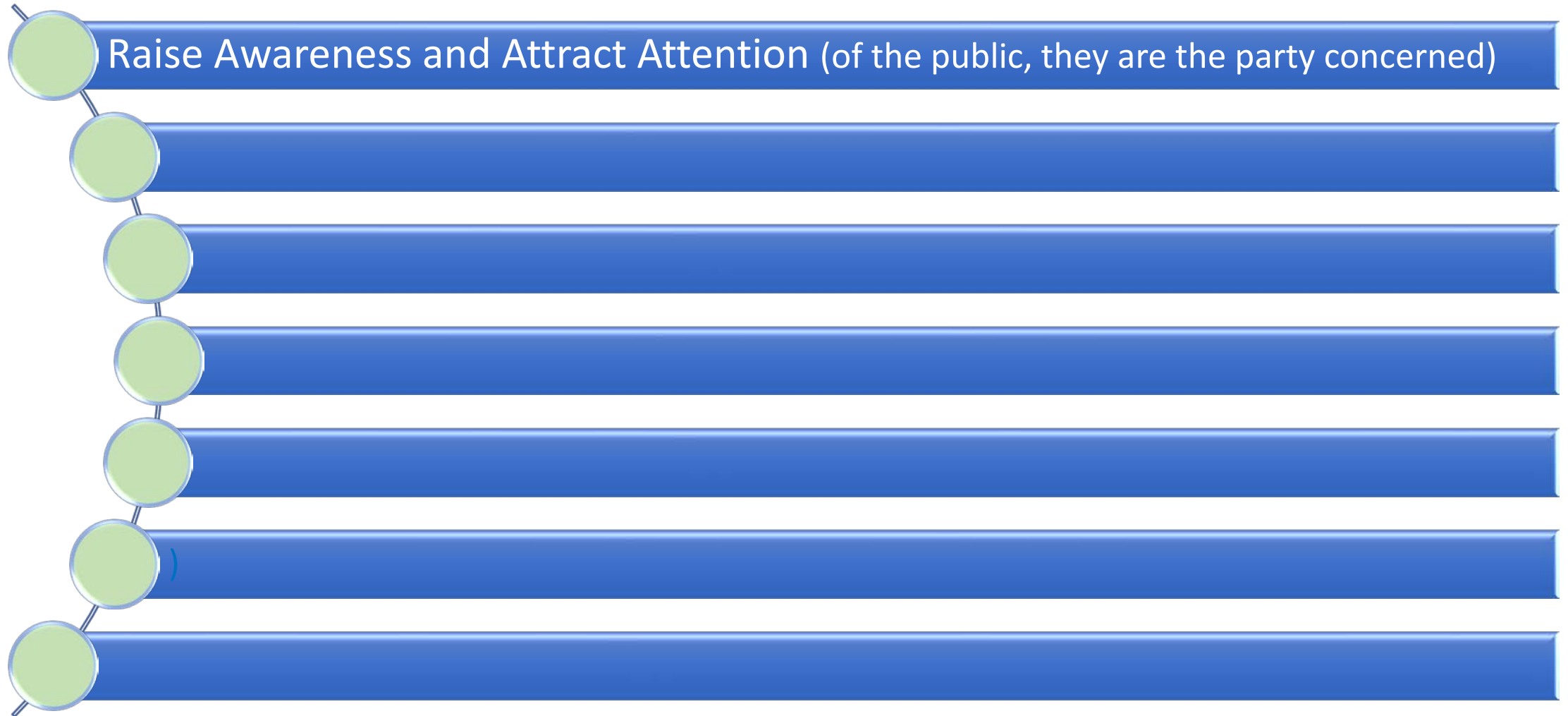


A Possible Way to Climate Neutrality: Outline of my Presentation today



Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)



Awareness Raising Activities

- In order to define accepted targets and to involve people in decision making it helps to start from where the people usually are



- And sometimes one even has to shock them:
"Is this how you want to live in the future?"



Climate Protection and Sustainability Days & Climate Protection Awards

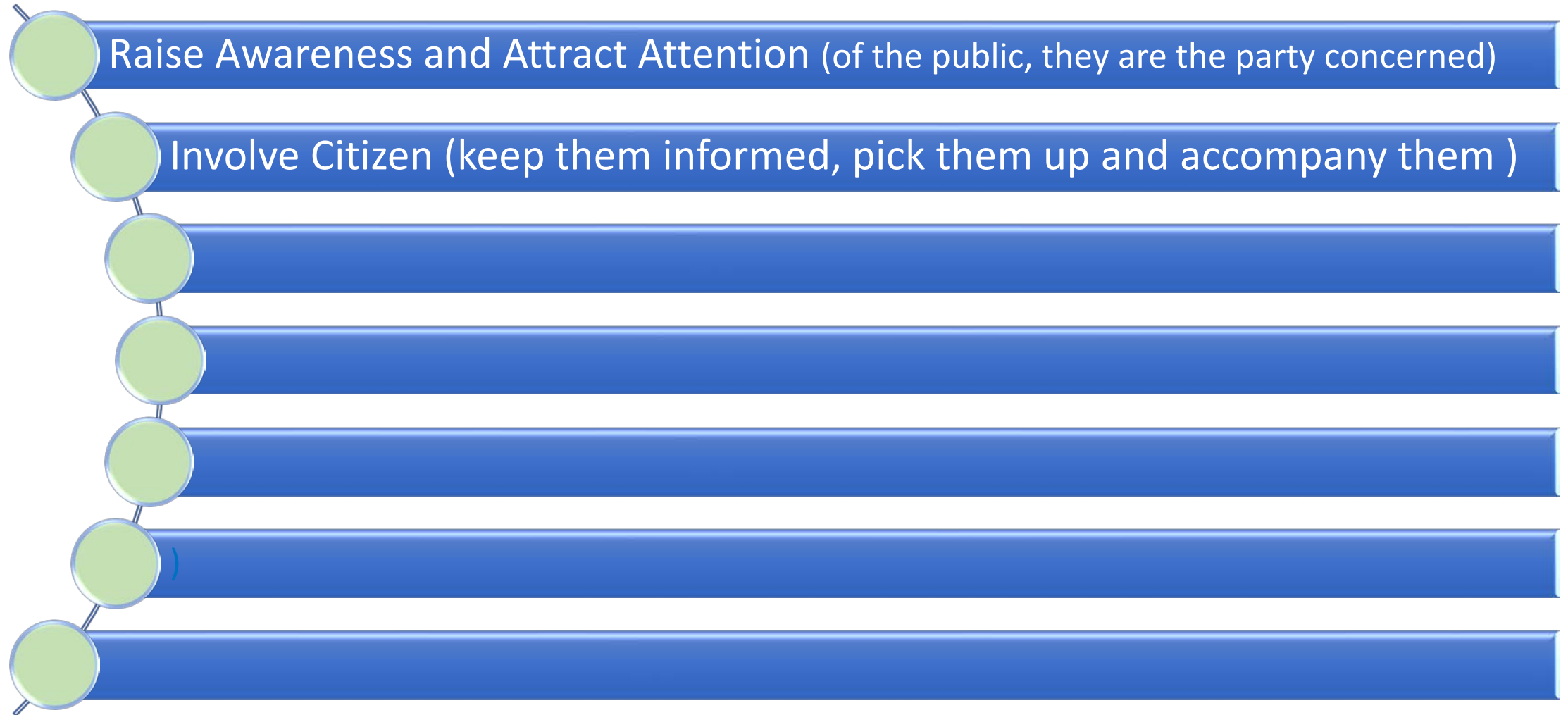


Communication, Information and Participation



Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)





Communication, Information and Participation

The Pfaffenhofen Power Monitor



Stündliche Erzeugung und Verbrauch der letzten Tage



The Pfaffenhofen Climate Clock



Involve the public in decision making: Ask for Vote

- 2016: intensive involvement of citizens by information events / road shows to inform about the plans for „*clean energy by wind power*“



Simulation of the view



Referendum on „*clean energy by wind power*“

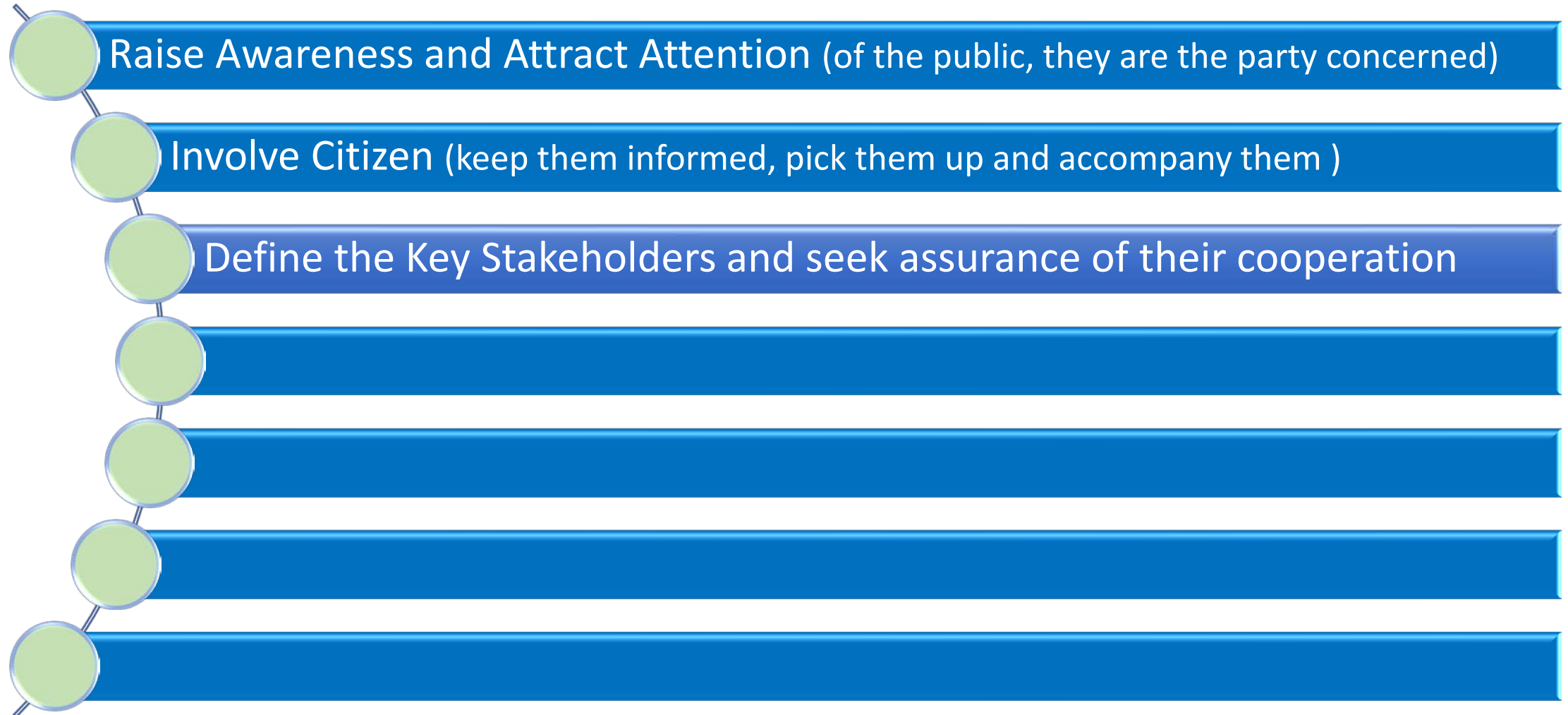
Endergebnis
11 Stimmbezirke

Ja (Niederschr.: C 01 insg.)	<div style="width: 56.9%;"></div>	56,9 %
Nein (Niederschr.: C 02 insg.)	<div style="width: 43.1%;"></div>	43,1 %

Wahlberechtigte: 19.766
Wahlbeteiligung: 59,6%

Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)



The relevant Stakeholders in Pfaffenhofen (beside public citizens)

- **City Council Pfaffenhofen** – a colourful political coalition (since 2008) (social democrats, independent party, ecological party, green party)
- **Energy and Solar Society** Pfaffenhofen – creative ideas provider (think tank) (since 2008)
- **Citizen Energy Cooperative Pfaffenhofen (BEG)** – development and operation of citizen owned power plants (since 2012)
- **Municipal Utilities Pfaffenhofen (SWP)** – sustainable and comprehensive public service in Pfaffenhofen (since 2013)
- **Municipality Pfaffenhofen** – climate protection and sustainability administration department (since 2014)
- **Sustainability Advisory Board** – Panel of 16 Experts of different ecological, economic, social, cultural entities of Pfaffenhofen community (since 2020)



The relevant Stakeholders in Pfaffenhofen

Jugendparlament since 1998 = Youth Parliament



Parliament Session



Rehearsal Room

**WER DIE JUGEND HAT,
HAT DIE ZUKUNFT**
stadtjugendpflege pfaffenhofen
**HE WHO HAS THE YOUTH
HAS THE FUTURE**

"Bus on Demand"
(Weekend Nightline)



Dirt Park

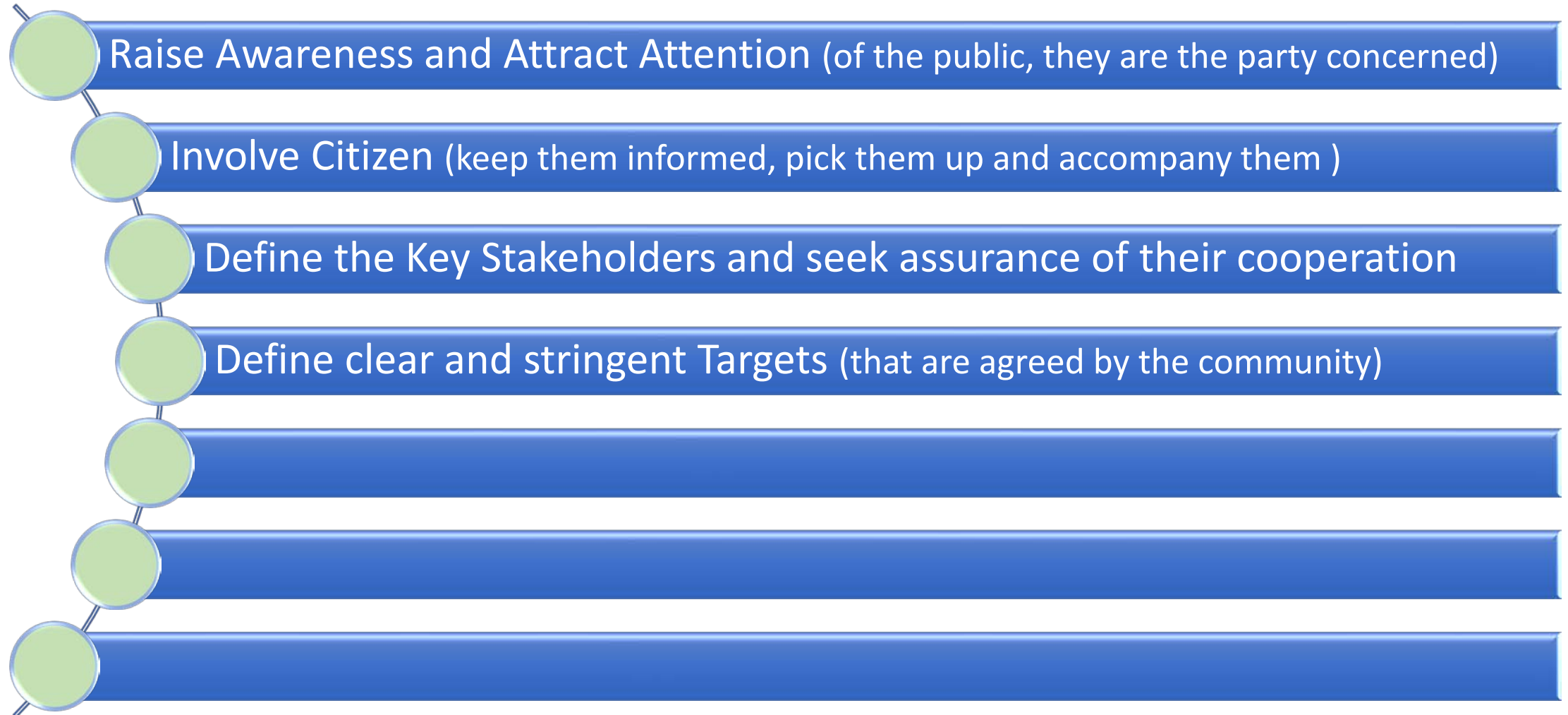


Skater's Hall

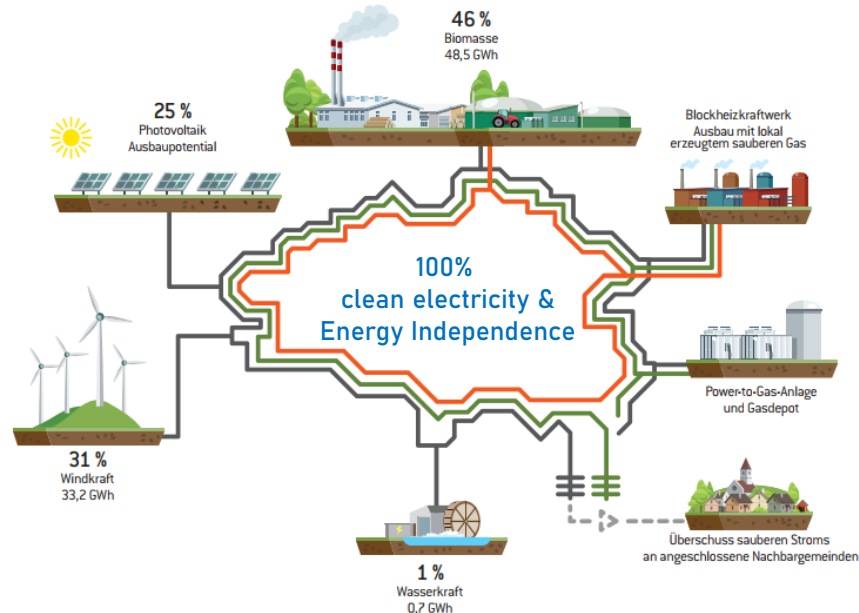
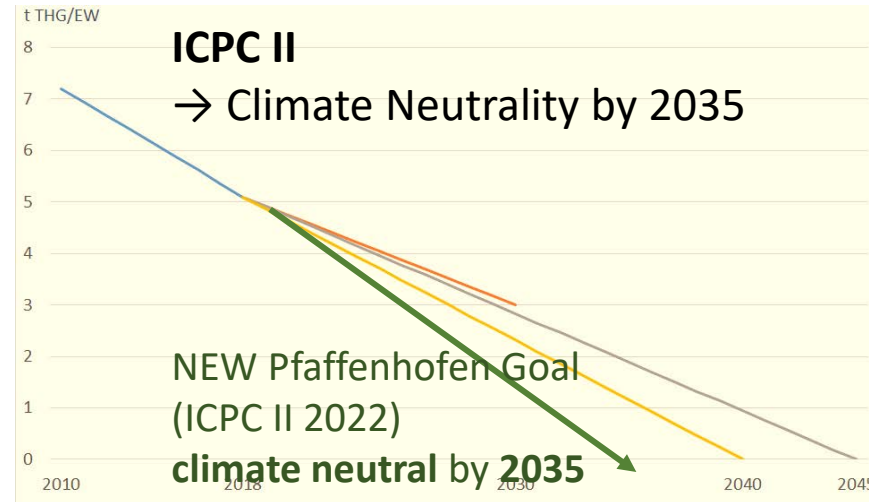
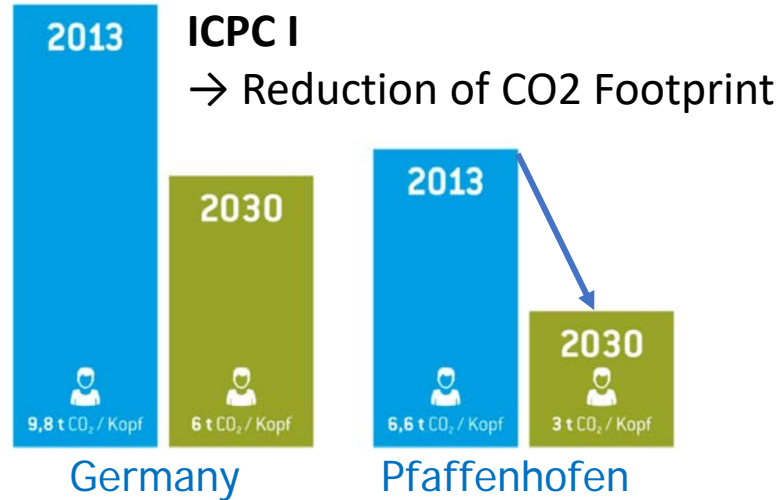


Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)



Define stringent and binding targets



Our future energy system:

sustainable / renewable,
decentralised,
affordable,
citizen-owned / democratic

Point out the way how to reach the target (Implementation Strategy)

Clean Electricity in
the Pfaffenhofen Grid

"AS IS" STATE 2016

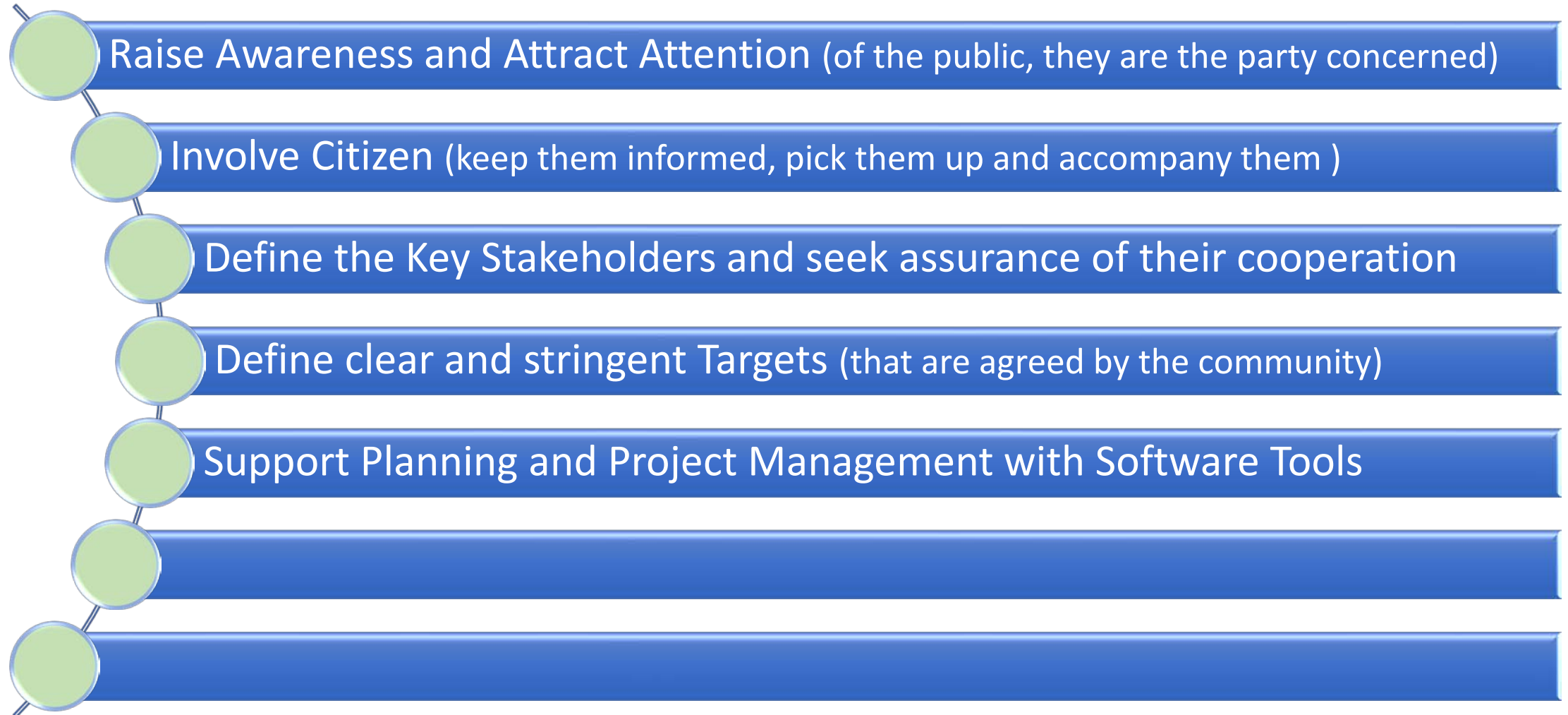
Clean Electricity in
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TARGET 2024



Key Success Factors towards a sustainable community

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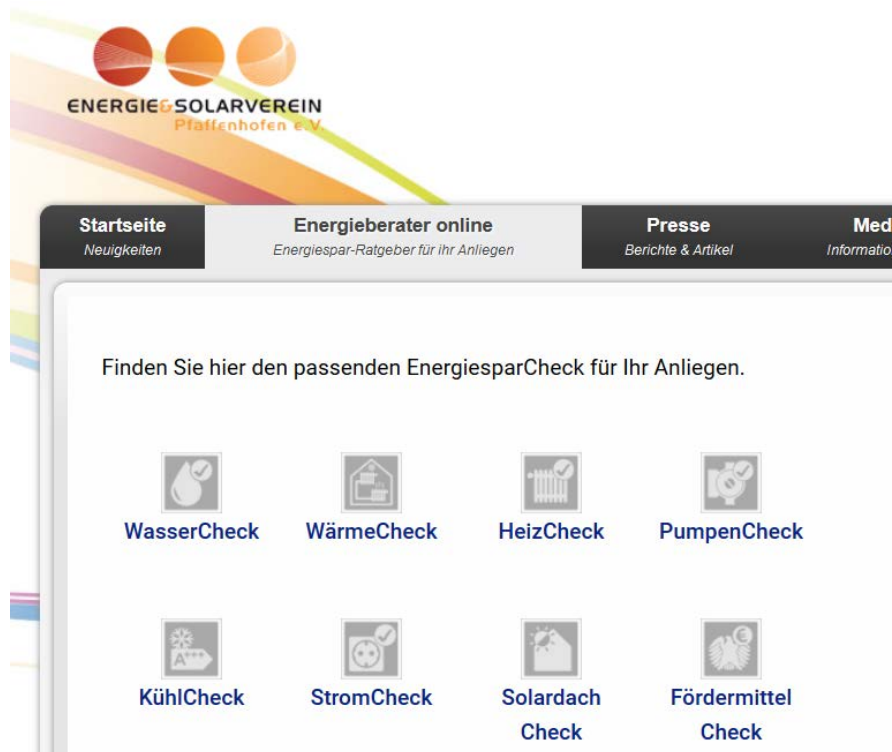
Planning support by appropriate Software Tools

1. Small scale, residential scale systems:

For example, online planning tools for building photovoltaik systems, including technical and economic evaluation

Website Service from ESV

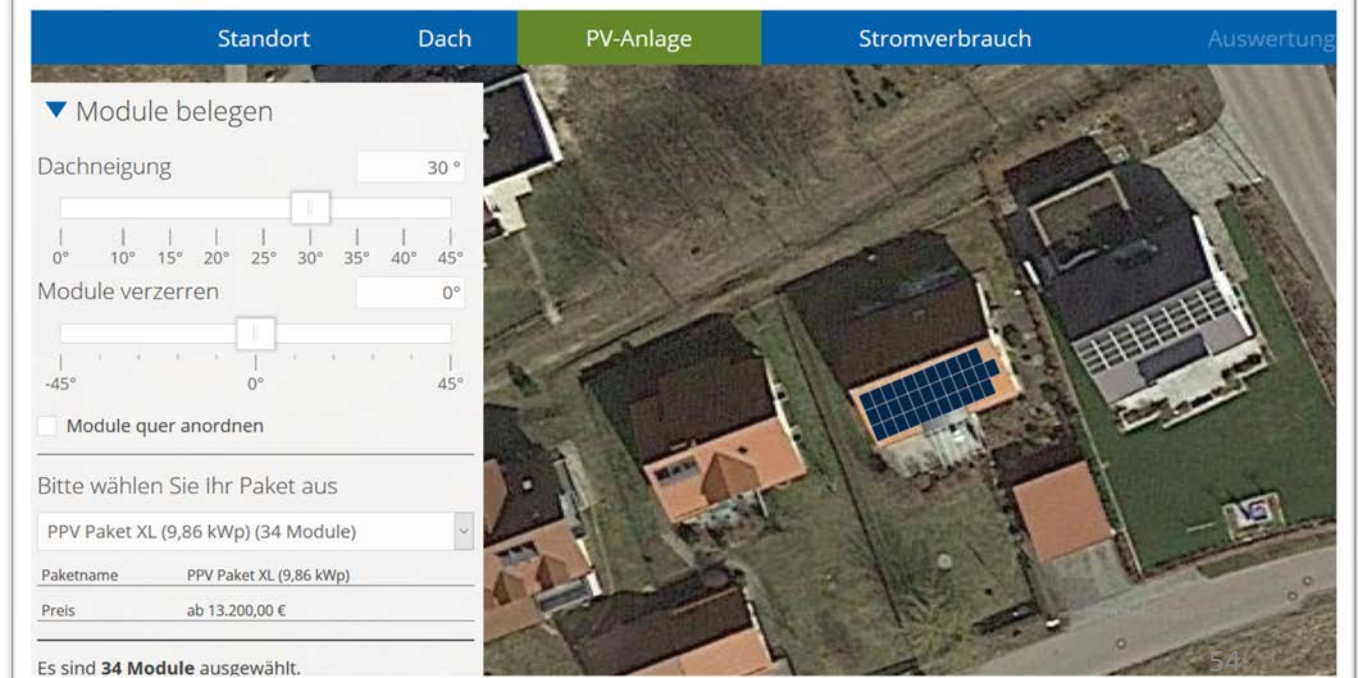
<https://www.esv-paf.de/energieberater-online>



Consulting Service from SWP

<https://www.stadtwerke-pfaffenhofen.de/mein-haus/photovoltaik/fuer-hauseigentuemer-ppv>

How can my house benefit from a photovoltaic system?

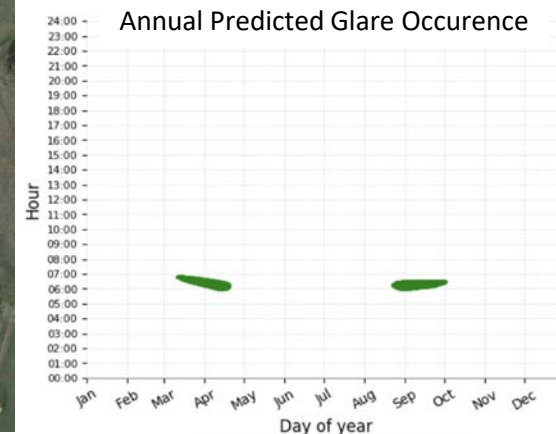
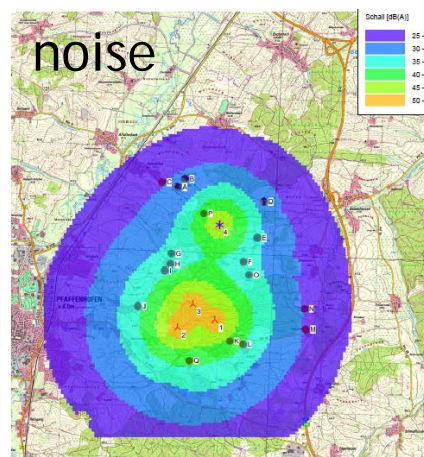
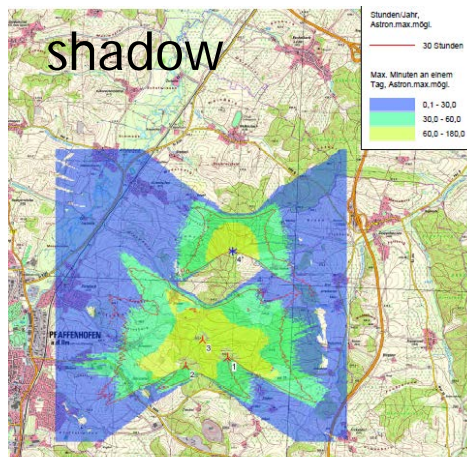


Planning support by appropriate Software Tools

2. Large scale, district/city scale systems:

For example, Planning Tools for energy storage systems (Citizen Energy Cooperative + Municipal Utilities)

Involvement of engineers, technical experts, lawyers, economists, etc. needed



<http://octokopter.net/animiertes-gif-oder-cinemagram-mit-der-drohne/>

https://www.researchgate.net/figure/Annual-predicted-glare-occurrence-and-its-daily-duration-for-Zone-8_fig5_340162928

Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)



Citizen Energy Cooperative PAF (Bürgerenergiegenossenschaft, BEG)

Public Acceptance of Projects by Profit Sharing

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- Project participation starting from 1.000 €
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GENOSSENSCHAFTSANTEIL
 1 bis max. 50 Anteile á 100,- EUR
 mittel-, bzw. langfristige Geldanlage
 durch Gewinnbeteiligung an der BEG
 Ihre Einlage ist mind. 5 Jahre gebunden

Mitgliedschaft ist Voraussetzung für Projektbeteiligung
 Sie sind Miteigentümer der BEG mit einer Stimme
 (unabhängig von der Anzahl der Anteile)
 Sie fördern die Energiewende im Landkreis Pfaffenhofen

PROJEKTBETEILIGUNG
 projektabhängig
 z.B. ab 1.000,- EUR
 nachhaltige Geldanlage (Partiari-
 sches Darlehen) mit jährlicher
 ausgewiesener Rendite

BEISPIEL WINDRAD	BEISPIEL BIOGAS- ANLAGE	BEISPIEL PV-Anlage FFW PAF	BEISPIEL SOLAR- CARPORT
3-5%	6%	4%	3%
jährl. Rendite	jährl. Rendite	jährl. Rendite	jährl. Rendite
			

Key Success Factors towards a sustainable community

(not universally valid but the way Pfaffenhofen did it)



Involve the public in decision making: Explain your Projects



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Guter Boden für große Vorhaben