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КВАЛІФІКАЦІЙНА РОБОТА

на тему: Поступальний розвиток бізнесу в кризових умовах, керований клієнтськими потребами: кейс-дослідження компанії в галузі зарядки для електромобілів

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INCREMENTAL CUSTOMER-DRIVEN BUSINESS DEVELOPMENT IN CRISIS CONDITIONS: A CASE OF EV CHARGING COMPANY

MOBIUS ENERGY / OIFA YULIAN

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Chapter 1: Market Overview

1.1 History

1.1.1 Fossil fuel and industrialization

Prior to the latter half of the 18th century, windmills and watermills provided the energy needed for work. Those technologies were not capable to satisfy the growing needs for energy sources. As result migration to fossil fuel (coal and later oil and gas) was made. This product was able to be burned in open atmosphere to produce the heat and heat-based energy.
Usage of fossil fuel in steam engines enabled the Industrial revolution[7] .
When combustion engine was developed, different types of transportation vehicles was created, including trains, cars, trucks and busses.
The result was human population and living time growth worldwide, which in turn required more and more fossil fuel resources to supply the electricity, transportation and other needs.

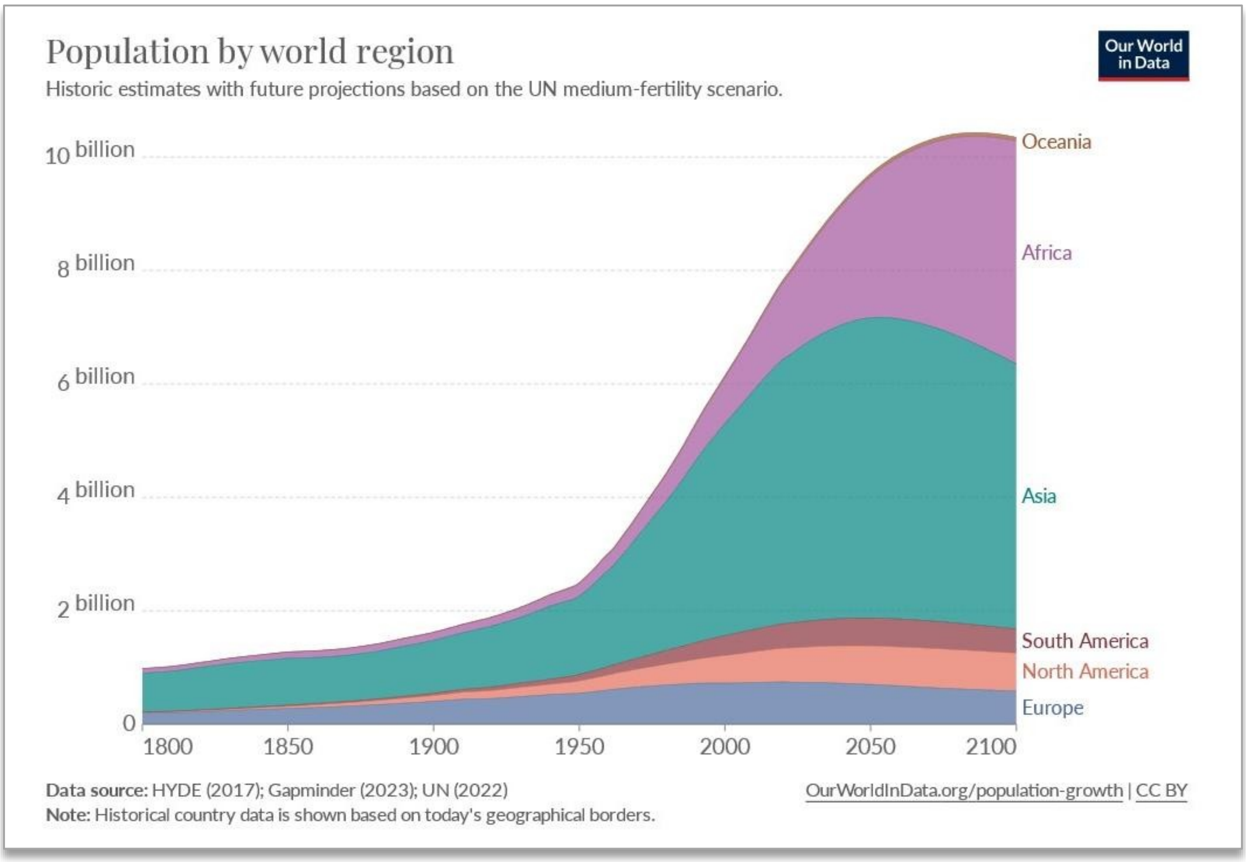


Figure 1: Population growth and expected growth[8]

The fossil fuel usage resulted in 2 critical problems
Resources limitation – coal, oil and gas that were created on earth during millions of years, started to exhaust with human population growth.
Several revolutionary technologies were introduced during the time (latest shale gas and oil production) to allow mining enough resources
Energy independency – All the resources are not equally distributed over the globe. Some countries have many resources on their territories, while other have zero or close to zero resources.
Price instability – Since resources need to be exported/imported globally, their availability highly depends on many factors (weather, war, political situation, etc.)
Global warming – Many fossil fuel resources were burned in open atmosphere and many CO2 where polluted into the air, which resulted in global warming (will discuss it in next chapter)

1.1.2 Global warming

All fossil fuels when burned release CO2 and other gases into atmosphere. Some of the CO2 is absorbed by trees, however most of the gases are remaining in atmosphere. This leads to global warming and other climate changes.

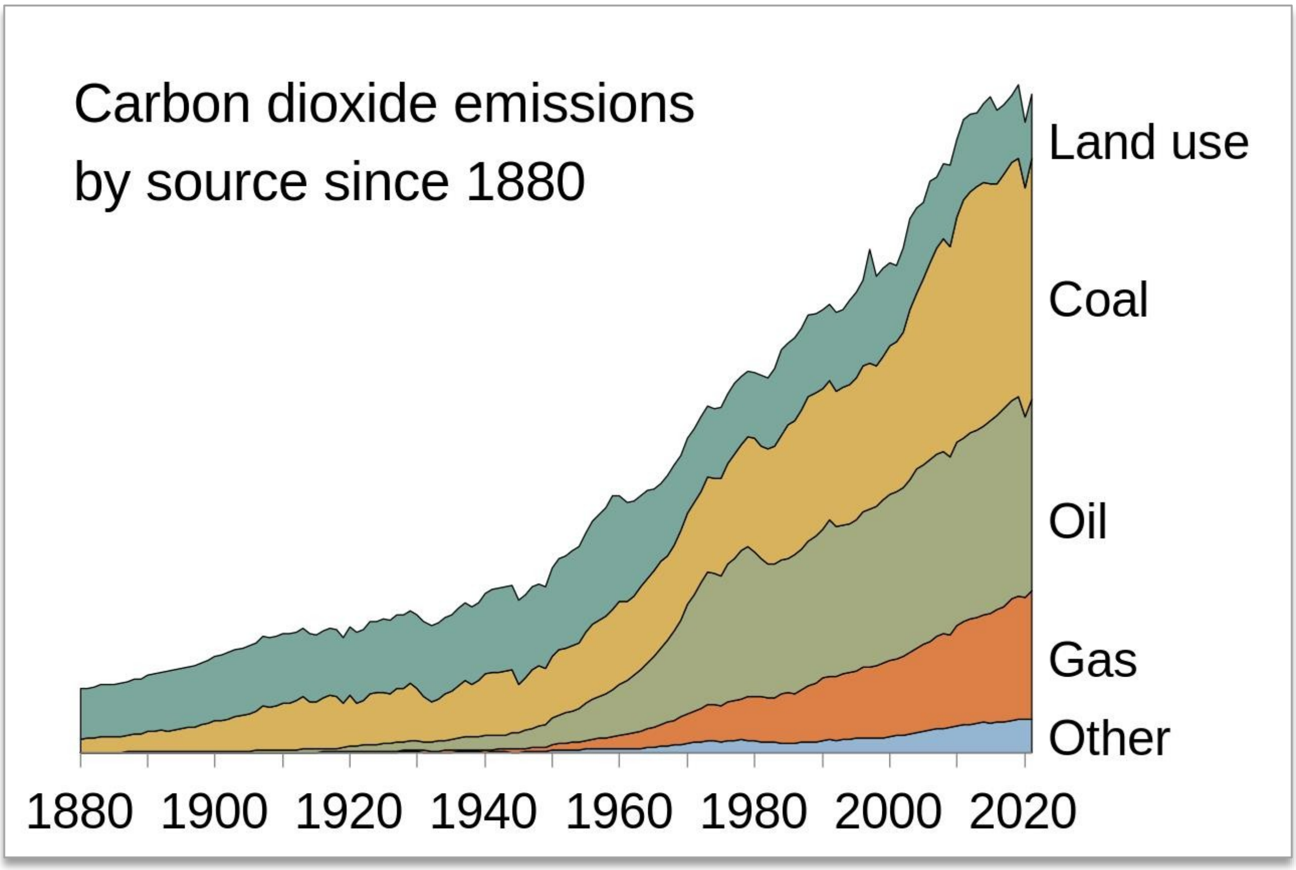


Figure 2: CO2 emission by sources

In most parts of the world climate changes negatively impact on the ecosystem. This reduced the ability to produce the food (as result increasing world hunger) and causes other effects on both ecosystem and humans.

World Health Organization Defined the Global Warming as the highest threat for humanity in 21st century.

The air pollution from fossil fuel causes the illness and death when inhaled. According to Wikipedia number of deaths from producing 1terawatt – hour from coal causes 24.6 death, oil 18.4 and gas 2.8. Below table provides the overall production per year for different types of energy sources

Energy source	Nos. of deaths per TWh	Greenhouse gas emissions (tonnes/TWh)
Coal	24.6	820
Oil	18.4	720
Natural gas	2.8	490
Biomass	4.6	78–230
Hydropower	0.02	34
Nuclear energy	0.07	3
Wind	0.04	4
Solar	0.02	5

Table 1: No of death per Twh

The researches shows that not only those numbers would increase, the raise of global temperature on average by 2 Celsius degrees will put far more of the population at risk of deadly extreme weather and will increase the likelihood of the planet reaching irreversible tipping points. At current time we have reached the raise by 1 degree in 2016 and 2020.

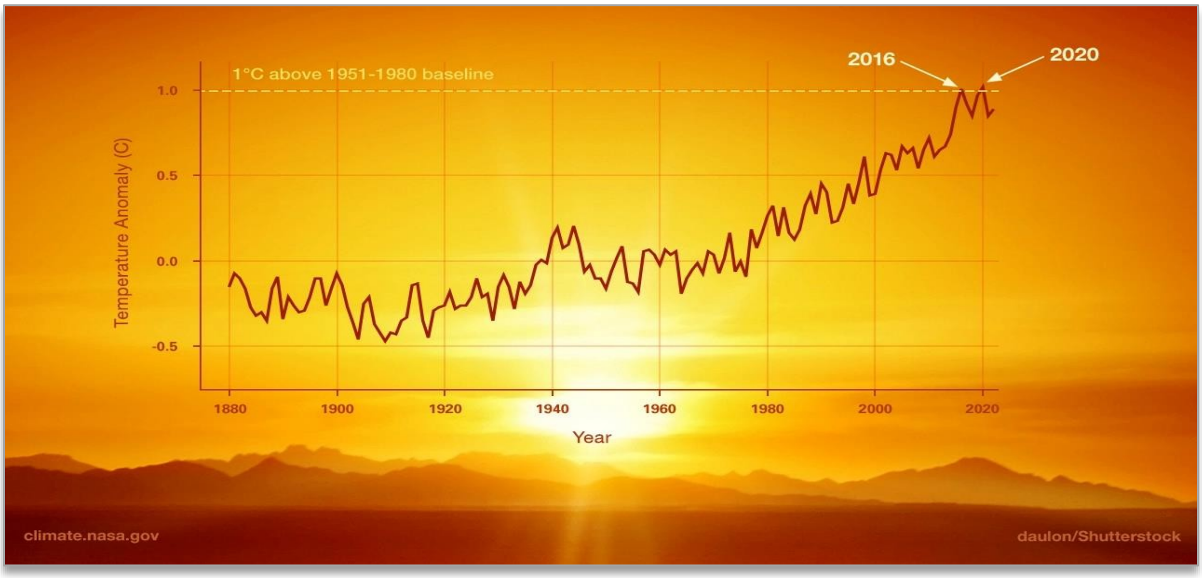


Figure 3: Temperature by year[9]

All those facts led to understanding that things need to be changed, and they can be changed in following possible ways

- decrease of the energy consumption
- population control
- usage of different source of energy

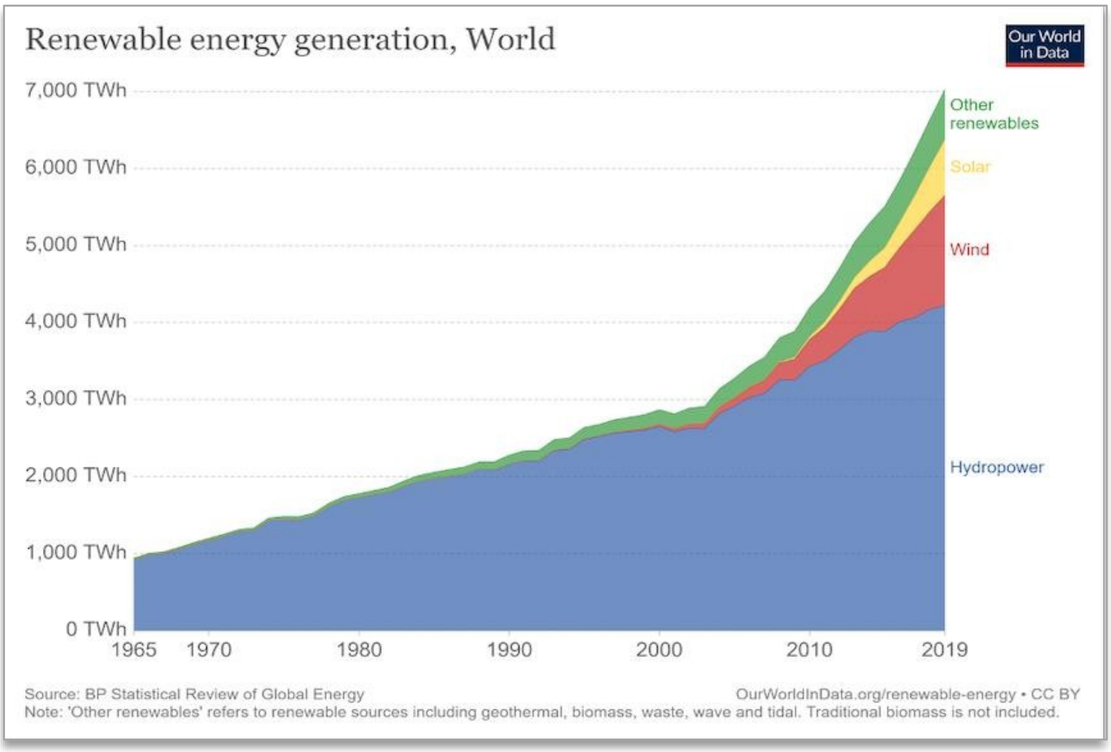
1.1.3 Transition to green energy

Different source of energy should be having at least following capabilities

- There should be enough resources
- Resources should be distributed globally
- The environmental damage should be minimal or none

As result several new sources of energy has been identified. Solar, Wind and Hydro energy among them.

Figure 4: Renewable energy generation by type[10] [10]



Together with selecting those sources new problems has been arisen (and effectively slow down the transition to new sources)

- As every new technology, the technology is expensive for early adopters

- The renewable energy power in difference from fossil fuel which may be burned equally during the day, depends on time of the day, time of the year and weather condition
- Energy generation is done in many places and in most cases by small generation sources, which requires power grid redesign

Currently we have already passed the stage for early adopters and therefore energy produced from selected sources becomes cheaper and competitive to the fossil fuel price. The grid redesign is also taking a place in the countries where the green energy percentage is going up. The changing power generation power problem is the main problem currently persist.

Currently its handled by balancing the green energy with fossil fuel energy generation and by storing the energy temporarily. However, as the green energy generation will grow and less share will remain for fossil fuel, the balancing would not be possible. Storage options are currently very expensive and cannot fully support complete transition. The latest approach is to use hydrogen-based technology for storing the energy and hopefully this technology will become mature enough up to 2030.

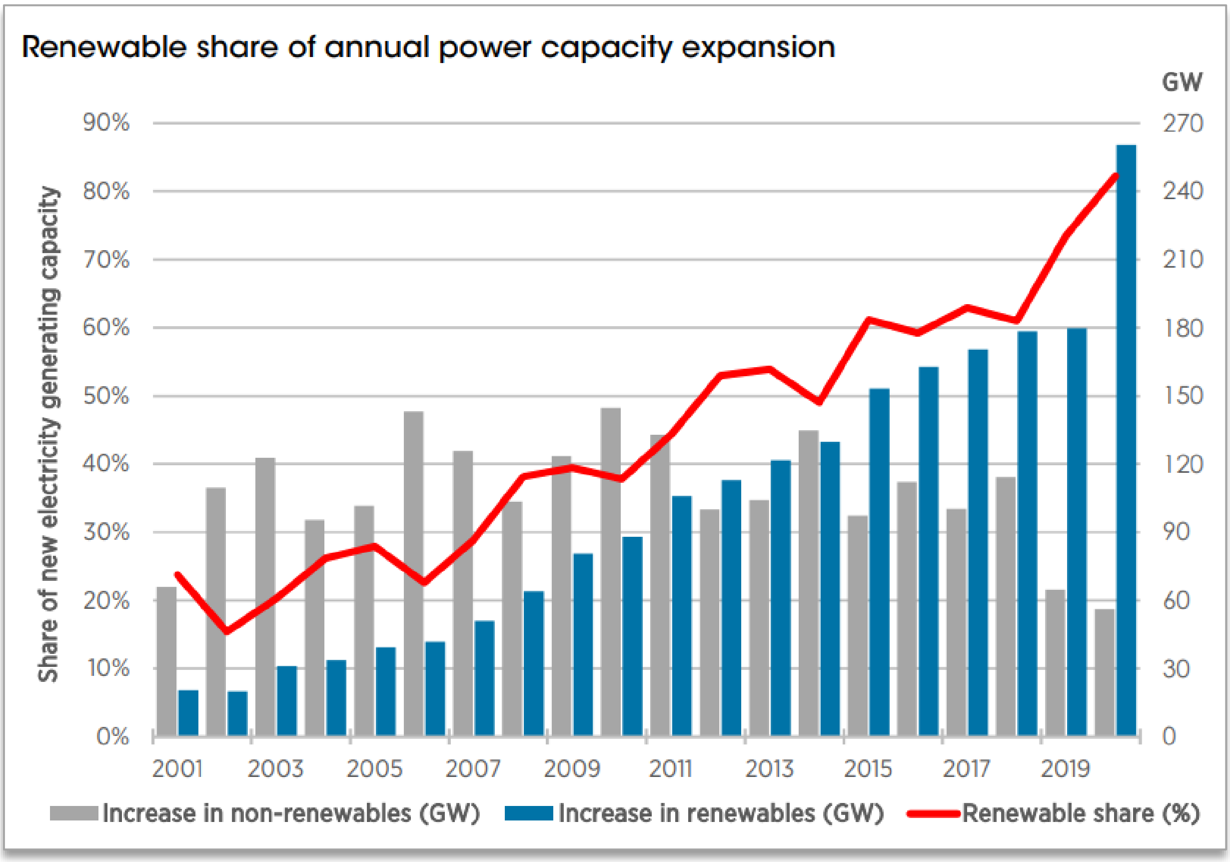


Figure 5: Share of newly installed generation capacities by year[11]

1.1.4 EV in general

Transportation sector is consuming 25-30% of overall global energy consumption. Therefore, full transition toward the green energy would not be possible without changing the transportation sector.

The fossil fuel era transportation vehicles (car, trucks, trains, planes, etc.) are all using internal fossil fuel-based engine, therefore it is not possible to use different type of fuel (the only change possible is to use different fossil fuel type with same engine, like switching from oil based to gas). Due to that different engine types where required to allow transition. The main option that has been chooses in electricity-based engine. The vehicles either have multiple engines (one of fossil fuel and one electric) or have only one or more electric engines (together with hydrogen technology progress there are prototypes that are based on hydrogen engine and hydrogen storage however they are at prototype/poc level only).

The first really successful electric car manufacture became Tesla company. They manufactured first electric car in 2008 and proved effectively that electric car is possible.

Starting from that point the adoption is electric cars is increasing from year to year, and today most of cars manufactures either have or soon will have a full line of electric vehicles. Some of the manufactures even announced the phase off of fossil fuel-based models. Additionally to that some countries decided to disallow selling fossil fuel cars starting from specific year (2025+ depending on the country).

We are at irreversible point of transition for the private cars.

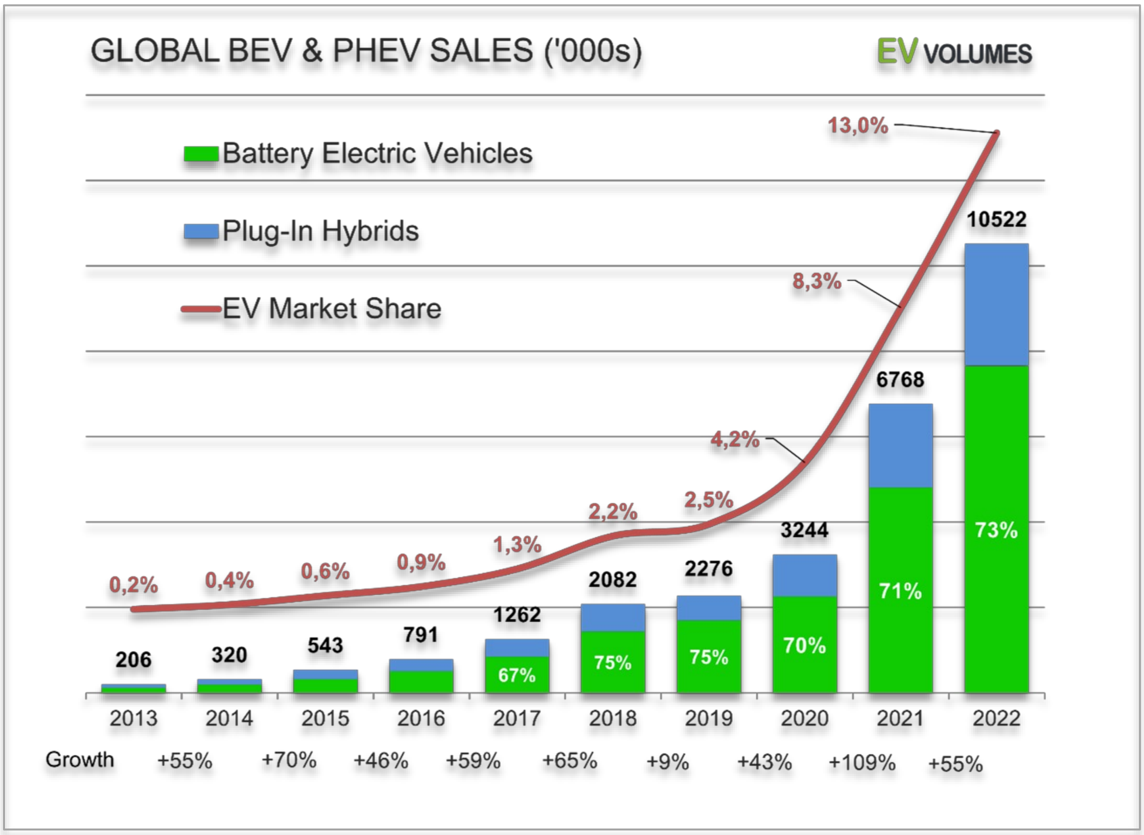
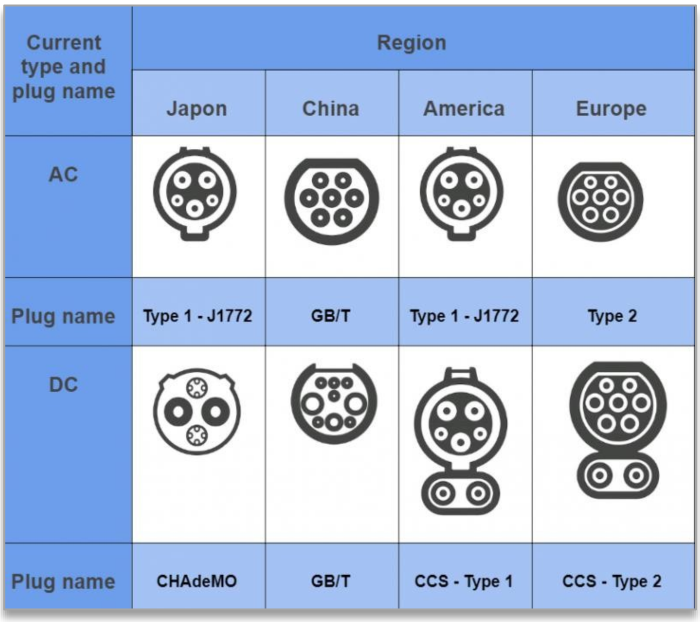


Figure 6: EV sales and share by year

It is clear that electric vehicles require electricity to drive. For that they are using batteries that are located inside the cars itself (mostly on the bottom of the cars). Since there is no almost any generation capability in car itself (besides energy recuperation from breaks and using fossil fuel engine to charge the EV batteries) the cars need to be charged. While using cars in cities or close to home the cars can be charged at home from regular power jack (Type 1).
It is also possible to install more advanced power jacks that will allow faster charging (Type 2) at home.
However, the EV cars are limited between 250 up to 500 KM range for 0-100% battery (effectively the range is lower in some cases). As result while driving far from home, traveling, etc., the cars need to be charged from non-home sources.
Today batteries on EV allows up to 110KWh battery capacities and depending on charging architecture (400V, 800V, 1000V, etc.) may allow charging speed of up to 240KWh at peaks.
The recommendation is to allow discharge to 20% of the battery and charge up to 80% of the battery. Discharging below this level may hurt the battery. Charging above 80% may not only hurt the battery but is also very slow comparing to charging speed for 20-80 range.

Figure 7: Approximate charging time

Depending on architecture and manufacture of the car, additionally to supporting Type1 and Type2 chargers, car may (or may not) support either Chademo, GBT, CCS charging type. In some cases, there are adapters from one type to another, however we may not count that those adapters are available for each EV car.
Chademo – chademo effectively has 3 versions. First version that was widely adopted is allowing to charge up to 62.5Kwh at peaks. Due to the fact that currently this speed is not good enough, the 1.2 and 2.0 versions were developed allowing 200Kwh and 400Kwh charging speed.
CCS – is European standard allowing also up to 400Kwh charging (800V architecture, with dual cable). This type effectively won the battle against Chademo and today most of US's vehicles which were using Chademo has transitioned to CCS version 2.
GBT – is Chinese standard allowing up to 250Kwh charging (effectively seen on market cars up to 160kwh)
In order to provide comfort travel far from home it is required to have proper infrastructure, that takes into account popular charging connector types, and number of vehicles expected to travel in specific area.



Current type and plug name	Region			
	Japon	China	America	Europe
AC				
Plug name	Type 1 - J1772	GB/T	Type 1 - J1772	Type 2
DC				
Plug name	CHAdeMO	GB/T	CCS - Type 1	CCS - Type 2

Figure 8: Connector types available[12]

1.1.5 Trucks and Busses

The rail / train system was capable to migrate to electric engine a long time ago.
Due to successful transition of private cars toward renewable energy the trucks and buses which are used for delivering cargo or people massively has also been marked for phasing to electric based engines.
The difference from private cars is due to the fact that both trucks and busses requires much more power to move one kilometer in compare to cars. As result even the most progressive charging capabilities at 400Kwh are not always enough. More than that due to the fact that private cars are not currently not going over 240Kwh charging speed (and in 99% not even > 180Kwh) and because of batteries size that reach up to 1Mwh (1000 Kwh) using same chargers may be very problematic.
The charging would last much longer, and also the chargers would not be available for cars for the time truck or bus is charging.
Due to increased adoption of EV trucks and busses this may lead to complete infrastructure halt at some stage.

Image 1: Volvo electric trucks line[13]

Image 2: ABB And Scania testing on 1Mwh connector[14]

As result the charging architecture and connector types are evolving for trucks. At current time the maximum charging connector speed in advanced development is 1Mwh. Assuming same development as in car segment, the charging speed may be expected to double up and reach 1.5-2Mwh in nearest future.

Therefore, development of the proper infrastructure should be analyzed and prepared today to make the transition more comfortable and smoother.

1.1.6 EV network planning for Europe

Europe is the main market for EV adaptation for all the types on vehicles. Therefore, the EU took the step forward and prepared the EV charging infrastructure masterplan[15].
Even while current situation does not look good (number of fast chargers is very low) the plan looks very promising and takes into account most of developments in the industry.

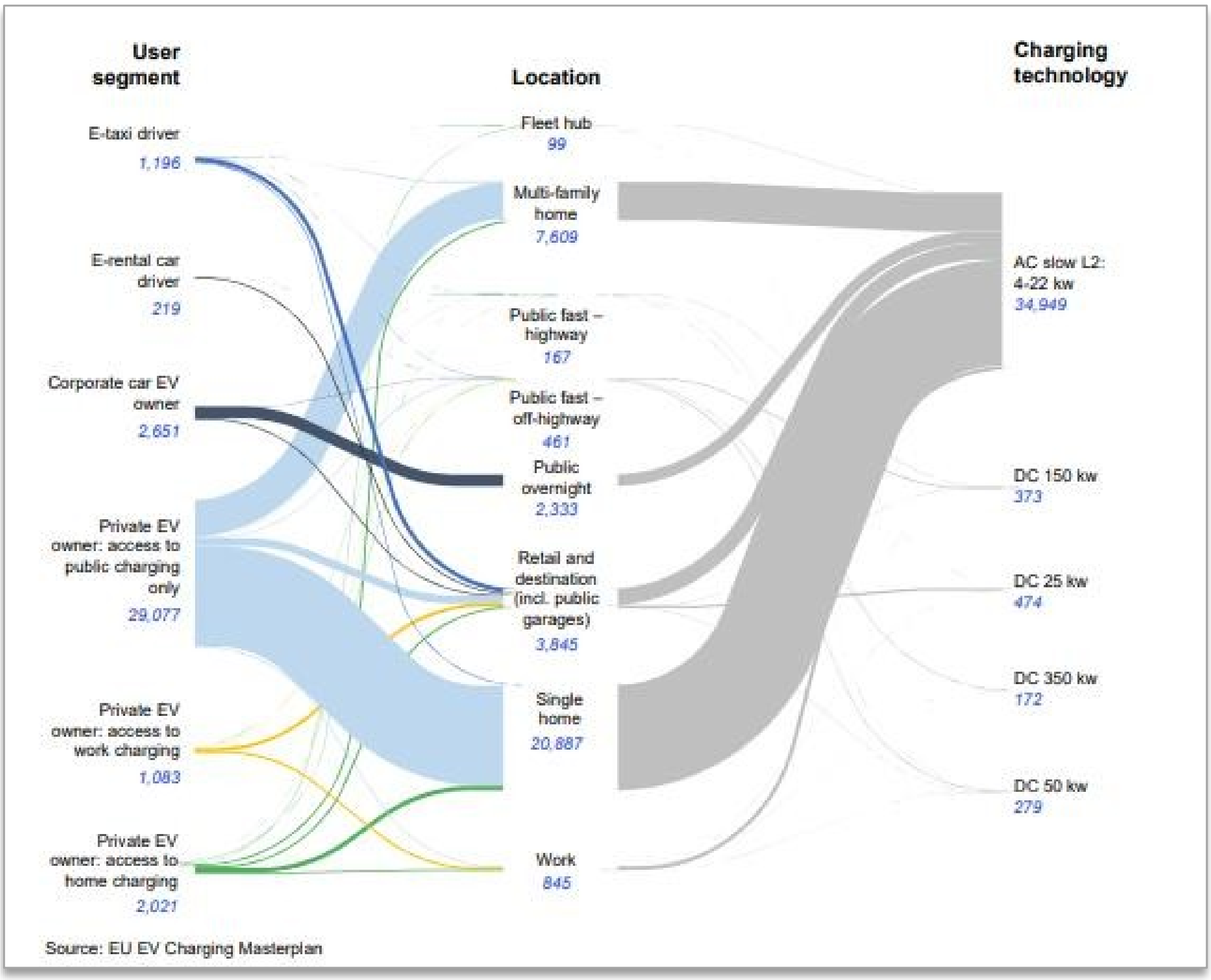


Image 3: Current charging network state in EU[16]

According to the plan 280Bln euro investment is required up to 2030 and up to 1Trln euro up to 2050.
This amount includes charging network, grid upgrade and installation of new renewable capacities that would be required due to increased amount of energy consumption
Up to 2030 the number of **private** vehicles will grow from 3.5 mln in 2021 up to 42.3 mln in 2030, the estimated investment needed for charging stations is 30-70 bln euro,
LCV (small trucks) - will grow from 0.1 mln in 2021 up to 4.4 mln in 2030, and up to 5 bln euro would be required for charging

Trucks – from 0 in 2021 to 0.23 mln in 2030, and up to 5bln euro investment into charging stations
Busses – from 0 in 2021 to 0.05 mln in 2030, and up to 500 mln euro investment into charging stations
Additional EU and UK initiative called Fit for 55 [17] defined the following requirements for charging infrastructure:

Charging plazas must be placed every 60km along TEN-T[18] core network highways—Europe's continental highway system.
Each plaza will need to deliver a minimum of 400kW of total charging capacity and include at least one 150kW+ charger. Charging stations must be installed by 2026.

In 2028, the EU plans to raise the minimum total charging capacity for each charging plaza to 600kW and at least two 150kW+ chargers.

The rules also outline requirements for commercial vehicle charging: Charging points every 120km with total output of 1.4-2.8 MW, depending on the road.

1.2 Infrastructure development

1.2.1 Ownership and financing

Historically local authorities (government, city council, etc.) where responsible for infrastructure development, including electricity grid, roads and highways, water, etc.
However, over the time it has been proven the private companies can be much more efficient in developing the infrastructure projects.

As for current time most of infrastructure projects in developed countries are either fully operated by private companies (in some cases for limited amount of time after which the ownership is being transferred to local authorities), while the overall planning is completely done by local authorities.

In developing countries, the situation is different. The planning is usually taking more time due to many problems. Therefore, in some cases the infrastructure is being developed by many private players, without global picture existing.

At current time the ownership of NEW infrastructure projects is approximately at 50% private and 50% public (local authorities) worldwide.

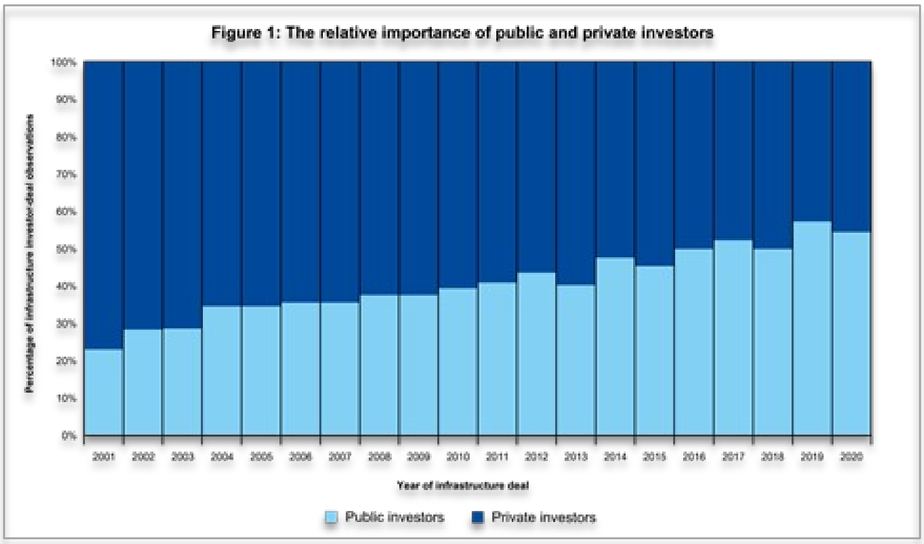


Figure 9: Private vs public investors

Due to the fact that in many developed countries the planning is done completely by local authorities, the local authorities are interested in successful development on the projects. As result many programs exists for private investors to receive financing for the infrastructure projects. The financing may be coming as subsided loan through the banks (where local authorities pay or refund for part of the loan costs), grants, or investment into private companies' equity.

Such a financing dramatically decreases the risk for private sector, because they "share" this risk with public sector through these financial mechanisms.

Developed countries allows much wider options of financing in the infrastructure (as in many other areas). Developing countries in terms do not allow many options due to financial situation of many countries. However, financing still may be available for specific projects that are defined as top priorities.

1.2.2 Sustainable infrastructure

Infrastructure plays an important role in climate changes problem. Green infrastructure or blue – green infrastructure refers to the network of ingredients to solving climate changes problem. Green infrastructure is defined as part of Sustainable and Resilient Infrastructure which has its own standard called "the Standard for Sustainable and Resilient Infrastructure".

SuRe® is a third-party-verified, global voluntary standard, developed through a multi-stakeholder approach incorporating inputs from developed and emerging nations to drive the integration of sustainability and resilience aspects into infrastructure development and upgrade by providing guidance and serving as a globally applicable common language tool for infrastructure project developers, financiers and public sector institutions.

The applicability of SuRe®[19] includes (but is not limited to) the following types of infrastructure services:

- Water (harvesting, storage, management, distribution, treatment and recycling);
- Energy (generation, storage and distribution);
- Solid waste (collection, distribution, processing, recycling and storage);
- Transport networks, nodes and fleet (pedestrian, bicycle, vehicular, rail, water-borne and air transportation);
- Communication networks (telephone, cellular and data);
- Social infrastructure (education, healthcare, sports and recreation, law enforcement, fire and emergency services):
- Food systems (production, storage, processing and distribution);
- Mining and extractive sites.

A Project wishing to be SuRe® certified may apply for and retain SuRe® certification in any of the following development phases:

- Planning and design;
- Construction;
- Commissioning;
- Operation;
- Upgrade, augmentation and/or

1.2.3 Modern approaches

As in many other sectors, infrastructure development may benefit highly through the innovative technologies.

While implementing the infrastructure we may use smart and connected elements to bring them together into network that efficiently manages the available resources.

The connected part is required to allow better planning of the resource’s usage. For example, a person that need to move from city A to city B, may consider several different public transport systems (trains, busses, plains), using the personal car, or use the service like bla bla car to share the ride with others.

While calculating the best option to travel, the timelines, exit time, arrival time, traffic chance and other parameters may improve dramatically the planning and make the expected result close to real.

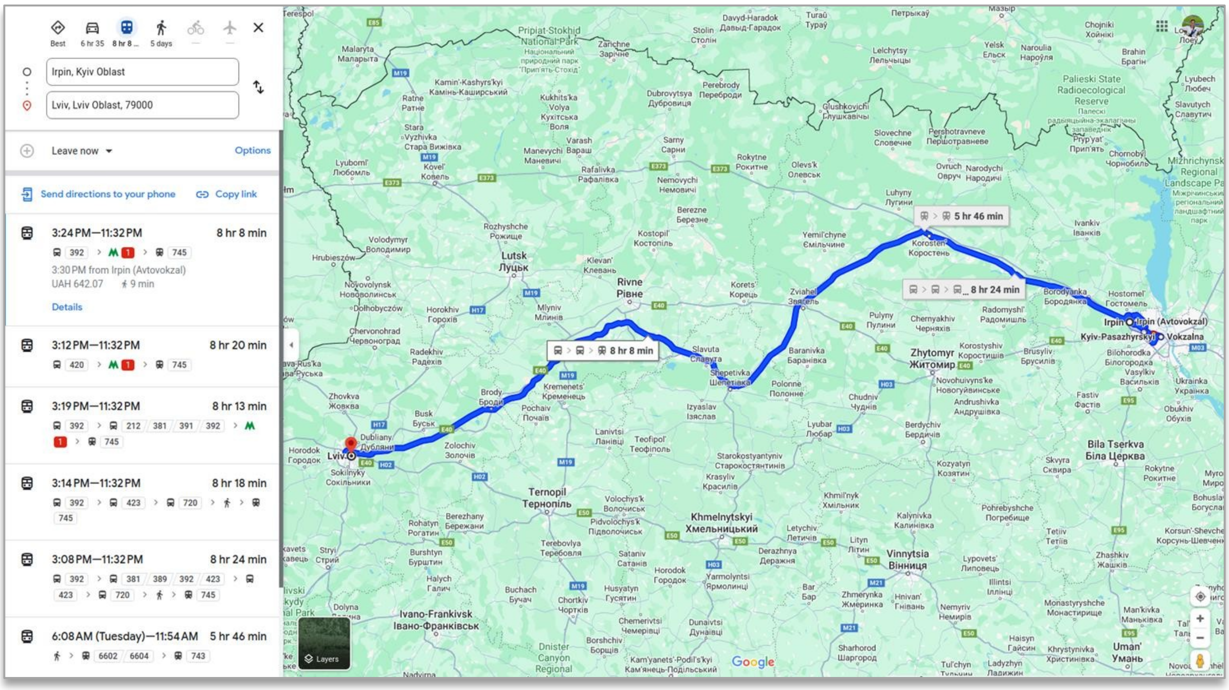


Image 4: Trip planning with google maps

The option to book the resource is also very important. Without it you may need to waif uncertain amount of time for resource to become available, and this may hurt the planning dramatically.

If we will take as an example the EV charging, which usually lasts between 20 to 90 minutes (depending on battery size and charger speed), if booking option is not available, we may arrive at charging location with limited amount of energy remaining, while we have one or more cars before us waiting for same resources. In worse case it may lead to increased waiting time from 20-30 minutes to several hours.

1.2.4 Incremental development

While using smart and connected infrastructure elements we don’t need to build up a complete max capacity planned network from day zero.

We may collect and analyze the data of the usage for specific infrastructure resources, or even do analysis based on day of week, day of month, vacation season, holidays, etc., and as result prepare the minimal required resource stack at any specific time.

The result would be project that is constantly developed by minimal cost, that provides certain (well defined) level of required infrastructure that meets the needs of infrastructure consumers.

Image 5: Tesla supercharging location, loaded by 5%

Assuming geography of the infrastructure project increments may be either “horizontal” or “vertical” – we either would add new infrastructure consuming point – charging location, add new city to fast train connections, connect another solar power station, or we will increase the number of available resources for one specific location – add more charging capacities, add more train wagons, increase the trains frequency, etc.

Additionally, to that we may start building the infrastructure project by isolating it in small area. For example, if we plan to build the country wide EV network, we may first divide it into several sectors, and start develop one or more sectors first. Later on, we may add more sectors, till we cover up complete area.

1.3 Local Market

1.3.1 Pre 2013 situation

Prior to 2014 the Ukrainian infrastructure market was completely under governmental control. The local authorities on different levels ordered infrastructure development services from local companies. Due to high level of corruption the competition on the market was very low, and the development was very slow.

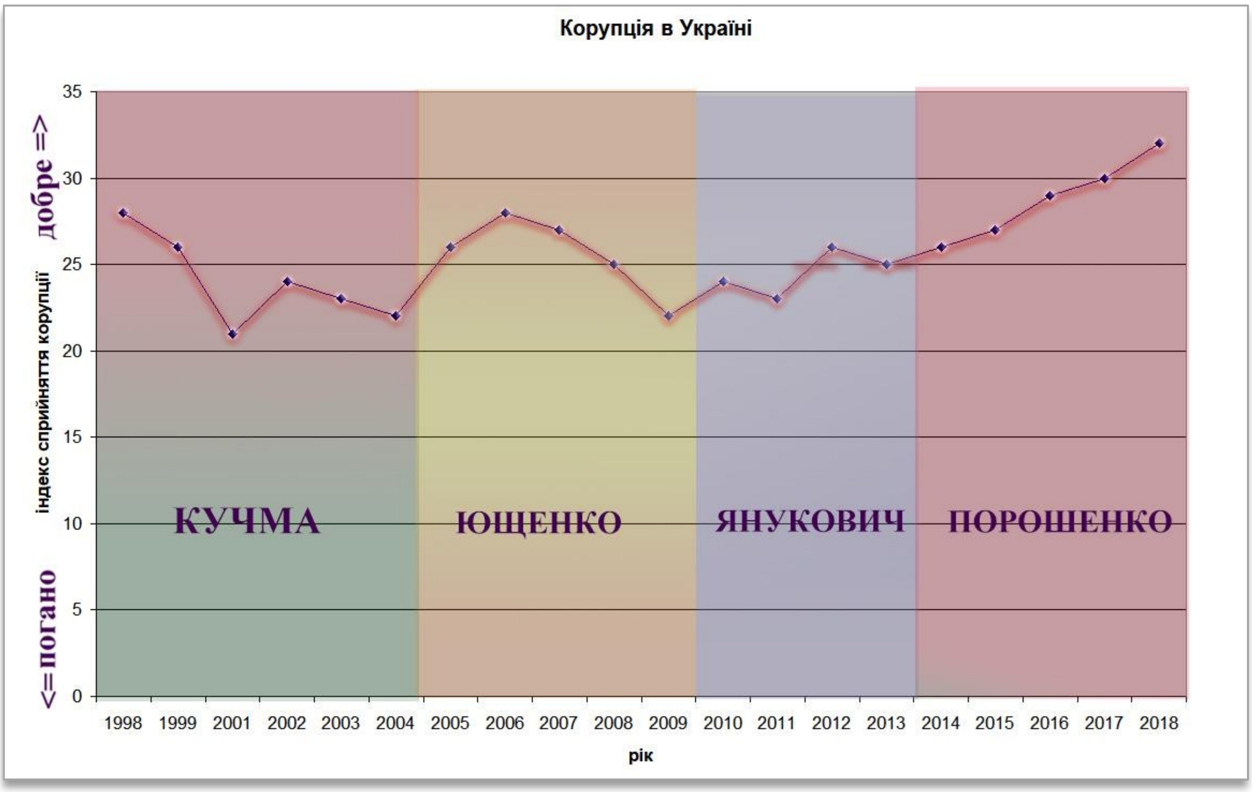


Figure 10: Corruption level in Ukraine by years[20]

Private infrastructure development was not possible due to the law limitations, and additionally to that the investment into Ukraine was treated as high risk due to problematic law system.

Electric vehicles, and EV chargers’ market was naturally unavailable at that time. Tesla was only at the beginning of its way toward becoming the most expensive car manufacturer company in the world, and was mainly sold in USA. Other car manufacturers where mostly ignoring the EV market.
As result the EV charger’s investment in local market was not financially justified.

1.3.2 2013 – 2022

In 2013 Ukraine started the transition toward the Association with European Union. The corruption level, institutional and other problems make people to believe that this step will improve the country situation in general and will improve the people quality of living.

The president at that time Victor Yanukovich, at last minute decided not to move forward with original plan, and rejected the Association with European Union from one side, while trying to get partnership with ruSSia , controlled by Dictator Putin.

At 30th of November small number of students came to protest in center of Kyiv and where violently dispersed by police, which lead to revolution that ended up with Yanukovich (and many other politics) flee to ruSSia.

RuSSia itself started a military operation against Ukraine on 20th February 2014. First the operation was isolated in Crimea, but later on extended to Donetsk and Luhansk regions.

From other side, Ukraine slowly but steady started the reforms in all the areas. This including the anti-corruption structures (NABU – national anti-corruption bureau, NAZK - National Agency on Corruption Prevention, High Anti-Corruption Court of Ukraine).

Together with anti-corruption structures changes took place in the way local authorities are purchasing products and services – auction/tender systems like Prozorro allowed better visibility of what and how being purchased, whether the auctions are competitive enough, etc. Another important change was allowance for international companies to take a part in the auctions/tenders. This improved dramatically the competition, including in infrastructure level.

Taxation reform made tax management and payment much simpler and clearly.

Governmental online services (and centers for providing governmental services) improved the services time and quality, while eliminating the corruption and other problems dramatically.

Reform on connection to infrastructure services (electricity, gas, etc.) also improved the business establishment.

High court reform aimed to decrease the risks related to law system dramatically.

In overall Ukraine, despite the war, made huge progress in moving toward developed world, improving the business climate, trust in institutions, and other aspects that was blocking and/or stopping the development and investments.

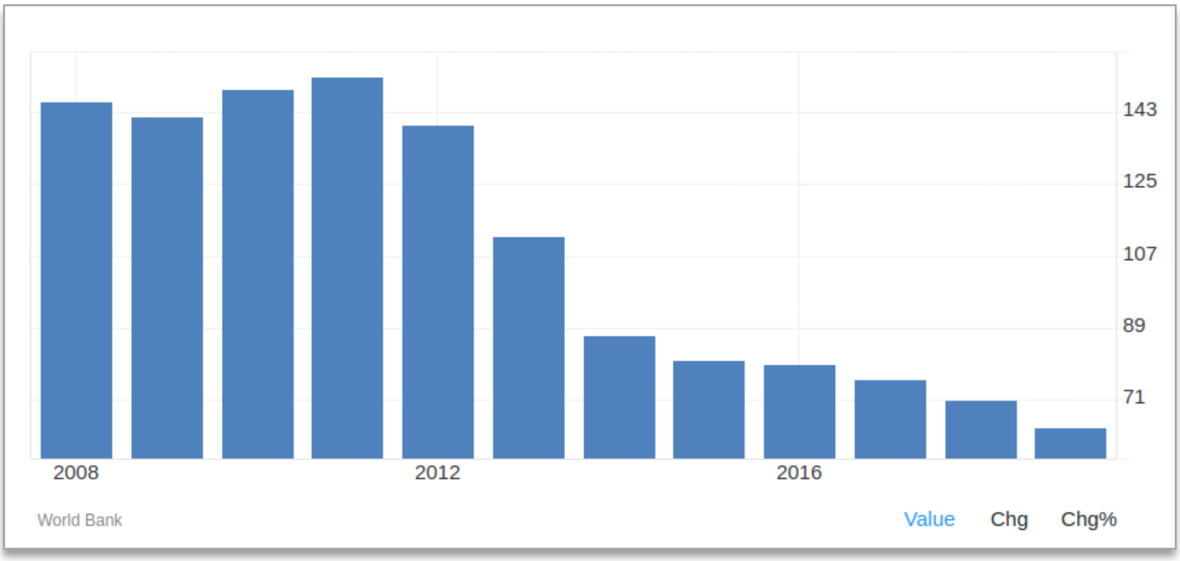


Figure 11: Doing business rating of Ukraine

In EV area, the huge development that was taking place globally, caused trends changing in Ukraine.

The number of EV cars started to grow up. As result several charging networks established in Ukraine, including Yasno Mobility, Auto Enterprise, and Toka. Even while most of the chargers were allowing speed up to 40KW, it became possible to move from one city to another.

1.3.3 Current status

24.02.2022 Nazis ruSSia started a full-scale invasion into Ukraine. This caused huge damages, including for infrastructure, death of people, and big population migration between different areas of the country, and into many developed countries worldwide (mainly Europe).

At first days of the war, the EV cars, even with current infrastructure proved themselves pretty well. People were able to evacuate their families, and shortage of fossil fuel was not influencing people.

During the 2023 the amount of EV cars available on market was grown dramatically, and as of 2024, almost all cars' manufactures are having EV lines similar to the fossil fuel lines, and in some cases EV cars become cheaper than fossil fuel cars. The best example for this may be Volkswagen with its ID4 and ID6 cars.

Many people lost their cars due to the invasion and many others needed more cars to travel (in some cases inside the country in other cases all over the Europe).
Due to all those factors the number of EV cars has been doubled in 2023, and is planned to grow further in coming year.

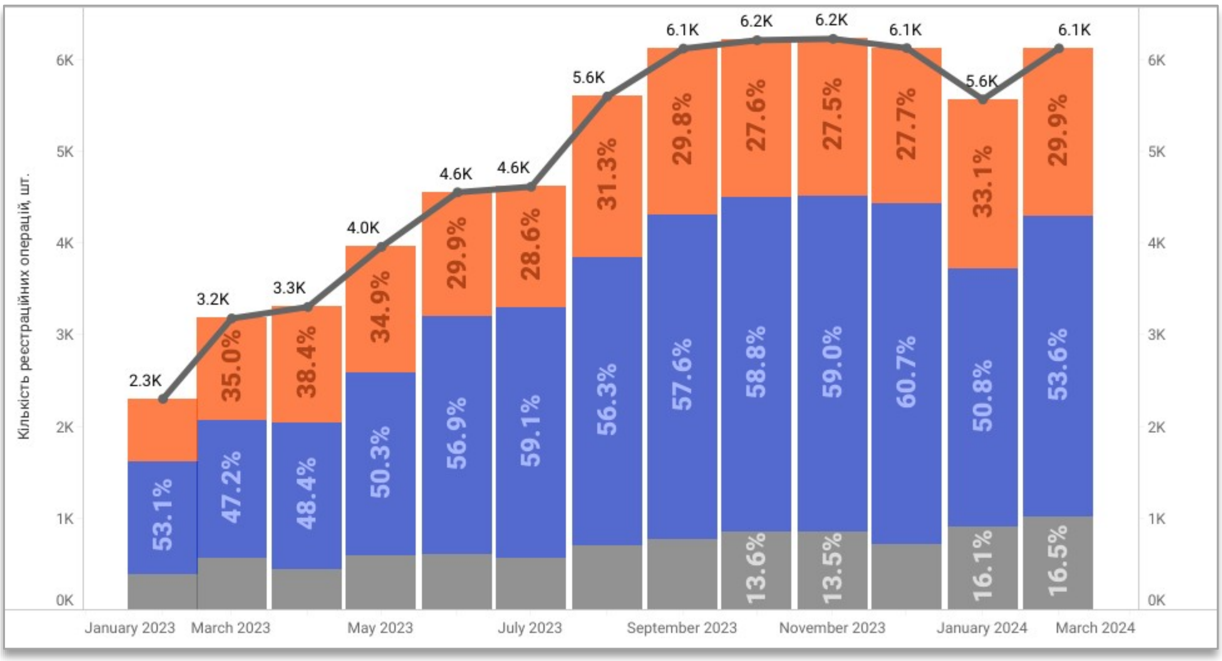


Figure 12: EV sales by month[21]

1.3.4 Opportunities and risks

As of today, all parameters are pointing up to the huge potential grows of the EV cars market in Ukraine in upcoming years.

Additionally, to cars, big local companies start to consider the EV trucks and EV busses as alternative for fossil fuel options.

The vehicles become cheaper their fossil fuel competitors, the electricity prices in both households and commercials allows cheaper travel costs (between 20 to 50 percent from fossil fuel depending on vehicles for commercial electricity and charging networks, and for 90% for households), and the maintenance costs for EV vehicles (due to how its and fossil fuel vehicles being structured) are much lower.

Altogether EV cars, and vehicles in general become a good alternative, first for newly bought cars. It is expected that same situation would become correct in used vehicles market in next 5 years.

From other side, current charging network does not meet the requirements of the EV flee existing in market. The amount of fast and super-fast chargers that allows to use maximum charging speed defined by the car are relatively low. This factor slows down dramatically the increase in usage of EV vehicles for traveling, delivering cargo and EV bus as public transport growth option.

Due to the war factor the risk of investment is very high, and become critical closer to the front line. Usage of the drones, missiles, ignorance of law of war, and other international laws by nazis ruSSia make this even closer to the edge…

Last (but not least) important factor is due to the fact that Ukraine is still having the corruption problem. Even while new anti-corruption bodies and reforms described previously improved the situation, there are still some problems. Together with that most if not all of those problems may be treated properly if the company that does investments knows and works according to the law, knows it’s right and fights for them. However, this fight usually will increase the implementation time, and time as known is a money.

Chapter 2: Proposed Solution

2.1 Integration / Partnership into existing EV charging network

In most cases EV Charging business may be seen as B2C business. Not only 99% of the cars currently existing in Ukraine are the private vehicles.

In order to grow on B2C market you will need to attract new customers by yourself (marketing), allow them using the service properly, provide a support service in case car cannot be charged or something is wrong with EV charger, manage or buy the software that would allow you to charge or establish local payment options (either automatic or by using payment deck with seller).

However, in case you will join EV charging network, you will not need to do all that. The EV charging network customers would be using the network solution (Mobile Application), will top up the network, and will receive automatic update on all new locations that are added to that network.

Whenever they will plan the trip, they will not need to consider tens, hundreds or may be even thousands of possible chargers, but will be able to use single EV charging network solution to plan their trip.

Additionally, to that advantage the EV charging network may provide a support service for the customers and control the charging station (restart it if needed, do other operations)

Our solution due to partnering with EV charging network would focus only on its main business – plan, build and control the charging locations.

The simplicity of business is not coming for free, of course. Each charging network charges the commission for their services. However, it has been decided not to build independent network and stay focused, even while in future the profit may be higher with separate charging network (the analysis of such step has not been done).

As for current time there are following main charging networks that exists on Ukrainian market

- Auto Enterprise
- Toka Energy
- Ionity
- Ecofactor
- GoToU

There is other EV charging network that currently exists on the market however most if not all are private charging networks which do not allow joining their network and are built completely by single operator. So how should we choose the proper network we should join?

The first and the main filter would be personal experience. I am the EV owner 3 years as for now, and had to travel a lot in Ukraine during that time. Due to this factor I had to use all of the charging networks listed above.

Second of course is customer experience. Since I am active android user and don't really like iPhone. I did the analysis based on the reviews, number of reviews and marks for the application in play market.

Next, we need to see what is the current network status, what is driving its growth and what are the plans for future. Some of the charging networks are more developed, some are less. The goal was to have the network that would be allowing you to scale and grow with it, while doing a smooth start without bringing too much competition into network itself.

Fourth would be current feature set, and how the feature set matches our vision of how the solution should look and what it should provide to end user. In addition to existing feature set it is important that there is the possibility for changes of the features set.

In overall the decision fall to the GoToU network. When the network has an opportunity for new location Mobius Energy has been established and the agreement has been signed.

The most important differentiators for GoToU are:

- Reservation of the charger – this feature allows the user to reserve specific charger at specific location for specific period of time. This is very important and effective feature while driving for long ranges
- Good support service – The support service offered is 24/7, uses web cameras at charging location which allows to provide help to consumer based on visual image
- Optimized load for multiport charging locations – this option is constantly developing, and for example will direct the 60KWh car to the 60 or 80 Kwh port (if available on charging location) while will not allow to use higher speed chargers and will keep them for vehicles with higher charging speed.
- Custom price management – the network allows to provide unique / custom pricing models for corporate customers, or companies that has vehicles fleets.
- Dynamic Load Management – In case one charger has multiple port of different types, the network allows to optimize the division of the energy between different ports based on OCPP protocol.
- Wide range of marketing tools to stimulate customers usage for specific locations – this includes creating product bundles with other products and/or services that are not related to the charging itself (coffee, restaurant food, shop products, etc.)
- Real time analytics – all the results are seen in real time, including those vehicles that are currently charging.

2.2 Location Services and requirements

Charging process takes time, and during that time people that are in vehicles would need to have the ability to consume supplementary services.

The services may be divided into 2 main types: basic services, and advanced services.

Basic services include toilet and minimal food and beverage services (coffee, mineral water, sandwiches, etc.).

Advanced services may include shopping center / mall, restaurants, car services (car wash, car diagnostics, etc.), beauty services for both male and female and others.

Considering wide number of options, we need to decide what would be the desired level of services that we need to provide on each and every location that would be opened.

After checking all the feasible options, the decision has been made to have at least one advanced service on each location, depending on location configuration scenario (would be explained further) and of course the basic services.

Due to the fact that the project would be implemented on main roads of Ukraine, and lack of shopping malls/centers outside the urban areas, the advanced services would be mostly restaurants / mini markets or shops and optionally the car services.

2.3 Considered EV charger

After analyzing the current market requirements, the main chargers that would be installed are 160KW charger + 22-60Kw slow chargers.

Additionally, as the consumption will grow, faster chargers would be added (240KW, 320KW, or 360KW)

160KW chargers would be having 2 ports – either one CCS2 and one GBT, or two CCS2 ports.

Faster chargers as for now would be having only CCS2 ports (up to 3 ports on 240KW, and up to 4 ports on 320-360KW)

Slow chargers would come either with 1 Type 2 Charger + 1 ChaDemo charger, or 2-3 Type 2 chargers.

Such separation allows to optimally load the faster chargers, and isolate the slow ports. This will improve planning since scaling when needed would be done separately for slow and fast charging ports.

In terms of manufactures of the chargers mostly UGV (local Ukrainian Company) chargers would be used for fast chargers, and in some cases European ABB.

For slow chargers there is wide range of the options, and focus would be also mostly on local manufacturers. Additionally, some European manufacturers would be considered.

The list of currently available chargers (that are relevant for defined requirements) for UGV is below.

Model	Max Power	Max CCS2 Power + Limitations	Max GBT2 Power + Limitations
UGV-FC-A240	240	Up to 200(<=400V)	
2 CCS2		Up to 240(<=500V)	
UGV-FC-A240	240	Up to 200(<=400V)	Up to 100(<=400V)
1 CCS2 + GBT		Up to 240(<=500V)	Up to 120(<=480V)
			Up to 160(<=640V)
UGV-FC-A240	240	Up to 200(<=400V)	Up to 100(<=400V)
2 CCS2 + GBT		Up to 240(<=500V)	Up to 120(<=480V)
			Up to 160(<=640V)
UGV-FC-A160	160	Up to 160	
2 CCS2			
UGV-FC-A160	160	Up to 160	Up to 100(<=400V)
CCS2 + GBT			Up to 120(<=480V)
			Up to 160(<=640V)
UGV-FC-A160	160	Up to 160	Up to 100(<=400V)
2 CCS2 + GBT			Up to 120(<=480V)
			Up to 160(<=640V)

There are plans for UGV to develop 320KW charger, however as for now there are no details for it. Also, there are plans to have 150 and 180KW chargers.

ABB provides chargers of up to 360KW. ABB Chargers are more expensive and practically less stable; therefore, they are planned to be used only where UGV chargers are not capable to provide required charging speed/capacity. Naturally using single (or main) vendor for chargers may bring advantages in terms of pricing, repairing and maintaining the chargers, and other aspects.

Each location should have minimal charging capacity and initial stage (that will grow according to the consumption on this location)

At current the minimal would be 320KW+ for fast charger and at least 50KW for slow chargers, overall 370KW+.

Each location would have 1 GBT port, at least 3 CCS2 ports, 1 Chademo Port, and 1-3 Type 2 ports.

The exception would be only “secondary” location that is installed close to another location that is already developed, that does not have enough power capacity.

2.4 Scenarios

As already described in each location there are charging stations and there are additional services.

Charging stations are requiring the electricity power to provide it to consumer. And for that it needs to be connected to the power grid.

2.4.1 Electricity Leased – Existing Scenario

This scenario is effective when there is existing location with owner that has some facility that is capable of providing required services (restaurant, hotel, mini market, etc.), and it has unused power capacity that is enough to establish minimal location (370KW+)

The goal of location owner is to attract more potential customer for its business and get some extra revenue of existing power capacity that is not used.

Together with that this is very rare condition. Grid connection takes a lot of time, and costs money (especially before reform that standardized the connection costs). Therefore, such an option is possible only in case some business did not work as originally planned / decreased the operation due to some unexpected problems (war is one of them) / or there was a mistake in calculation.

If the reason for extra capacity is not a mistake the huge risk of such location is that at some stage the power capacity it has may be needed for the main business and as result no capacity will remain for the charging.

The main advantage of such location is that there is minimal cost required to start. All the setup costs are related to chargers only, no need to invest into land, land development, grid connection /capacity increase, etc.

2.4.2 Electricity Owned – Existing Scenario

In some cases, location owner, is interested in installing charging location in its location, but does not have enough capacity and does not plan to handle the power grid line upgrade by himself.

In this case the agreement is possible to purchase some part of the land or sign a long-term rent for the land (or purchase another piece of land close to existing location), and initiate new grid connection by electricity company

The advantage of such approach is that risk taken by not controlling the capacity is not present in compare to previous option

This scenario would be optimal scenario, however has scale limitation, especially in case of purchasing the part of existing land.

2.4.3 Mixed up Electricity Owned + Leased – Existing Scenario

This approach is a mix of previous two. At initial stage due to the interest of location owner the grid connection/upgrade etc. is taken by the location owner. However, due to the fact the owner is not interested in charging business, the further location development would require transition from leased to owned electricity (either by purchasing or renting part of existing land or by purchasing new land close to existing location).

In this scenario it is not required while scaling to cancel leased connection and use only owned grid connection, both may be used in parallel.

2.4.4 Electricity Owned - Newly initiated Scenario

Not always it’s possible to find partners/location owners that are interested in attracting EV owners to their locations.

Some are not seeing the potential in EV customers; another is not ready for cooperation.

In case in some geographical area there are not partnering options the only option to go is to develop new location for scratch. The process begins with finding a proper land to purchase and check whether there is potential power capacity on the electricity grid that is nearby the location. The electricity capabilities / validation is one of the most critical points in the process, because the cost of connection to grid is built up from 2 parts – the power (per kilowatt) price and range (per meter) price. In case there are no satisfying capacities available nearby, then the connection should be developed / modernized to the grid which is located further from the location. And as result the price of connecting to the grid grows dramatically.

When the proper land is found and purchased the development stage begins. In this stage it is required to change the land type (from agriculture for example to industrial) if needed, get approval to allow enter/exit from the road (lands that are considered for this project should be all located at first line from the main Ukrainian roads), prepare the development plan, and of course, order the electricity grid connection.

While developing the land, for this scenario it would be very important to find the partner that is interested in establishing additional/supplementary services facilities (mini market, restaurant, etc.). As for time when this document has been written Mobius did not found strategic partner that is interested in doing such development for all the locations that Mobius will develop in future. However, there are several negotiations ongoing. The main goal of the partnership is to stay focused on the charging business and not to add more complexity by dealing with retail / restaurant business, or construction business, all of which has its own complexities.

The proposed configuration is that Mobius after developing the land and gets all the approvals, divides the land into 2 pieces, one for parking lot and charging stations, another for supplementary business.

The partner from its side receives the second piece for free with required electricity power needed. In exchange for that the partner is obligated to do the land works (raise the land to one level, asphalt, etc.) and build up the supplementary services during defined period of time (6 month to 1 year). Such an approach promises from one side that our customers would be able to receive proper additional services, while from other side the money are not flowing between the partners (instead of selling the land, then paying for development work we just sign an agreement - which simply management)

2.4.5 Fully Owned Scenario

Fully owned scenario is the most complex scenario, which is extended from previous scenario. In this scenario Mobius does not finds the partner for supplementary services and need either develop the land further (build the supplementary services building/facilities which would be later on rented or sold) or implement supplementary services by its own (build the building, establish a new business either through franchising or completely from scratch).

This is the less desired scenario, since the complexity of the single location development grows dramatically, and as results the cost of overall projects. However, as for now, this option is still on table.

2.4.6 Summary

So far, we have learned all the possible scenarios for developing a single location. It is important to state that 2 to 4 are leading to same result in the end of the process. All of them leads to result where there are 2 partners – Mobius that is owning the electricity connection (for option 3 partially), and there is supplementary service partner that is focusing on its own business. There is clear synergy for those options for 2 partners, and those are easiest option to maintain after the development stage.

The big different between options 2,3 and 4 is that fourth option takes more time to start, while it allows better future scaling and planning in everything that is related to charging (the land plan may be designed according to future needs and land itself may be selected according to it).

Differentiator	Leased	Owned - Existing	Mixed – Leased + Owned	New - Owned	New – Full
Future risk	High	Low	Low	None	None
Initial Startup time	Low	Medium	Low to Medium	High	High
Future Scaling	Minimal	Medium	Medium	High	High
Investment	Minimal	Low	Low	Medium	High
Return of Invest-ment	Fast	Medium	Fast	Medium	Medium to Slow

2.5 Proposed Initial Configuration

2.5.1 Electricity Leased Scenario and Mixed-up Electricity Owned + Leased – Existing Scenario

For leased and mixed-up scenarios, the initial development starts with the existing location that has existing power line with some predefined amount of available energy capacity. The capacity is completely out of our control however we can set a basic rule that will allow us to provide same level of service at all our locations.

As already mentioned, the minimal desired power capacity on leased locations should be 370Kwh+ for the primary location at defined geographical area.

There would be 2 reasons for developing backup locations – decreasing or even blocking the competition inside same network (Go To U) and decreasing the risks related to leased locations.

Secondary's location may be started with less electricity capacity, especially if they were established in locations where previously there where another network presence with less power capacities. The minimal secondary location power should be 120-160Kwh and it is important the willing of the owner either to develop the location further by him/herself or the willing to allow Mobius to develop the location further.

2.5.2 Electricity Owned – Existing Scenario

In this case we start with connecting to power grid, and therefore may plan the grid connection according to our needs. However, there may or will be a limitation in terms of number of parking lots/charging places.

In general, it would be desired that same capacity of 370Kwh+ would be installed in each and every location with 2 160Kwh chargers (with 3 ports of CCS2 and one port of GBT) plus slow chargers (1 Chademo and one or more type 2 ports).

2.5.3 Fully Owned Scenario, Electricity Owned - Newly initiated Scenario

The difference with this scenario would be that we are fully control the design of the land development and may prepare for the future as we see it accordingly.

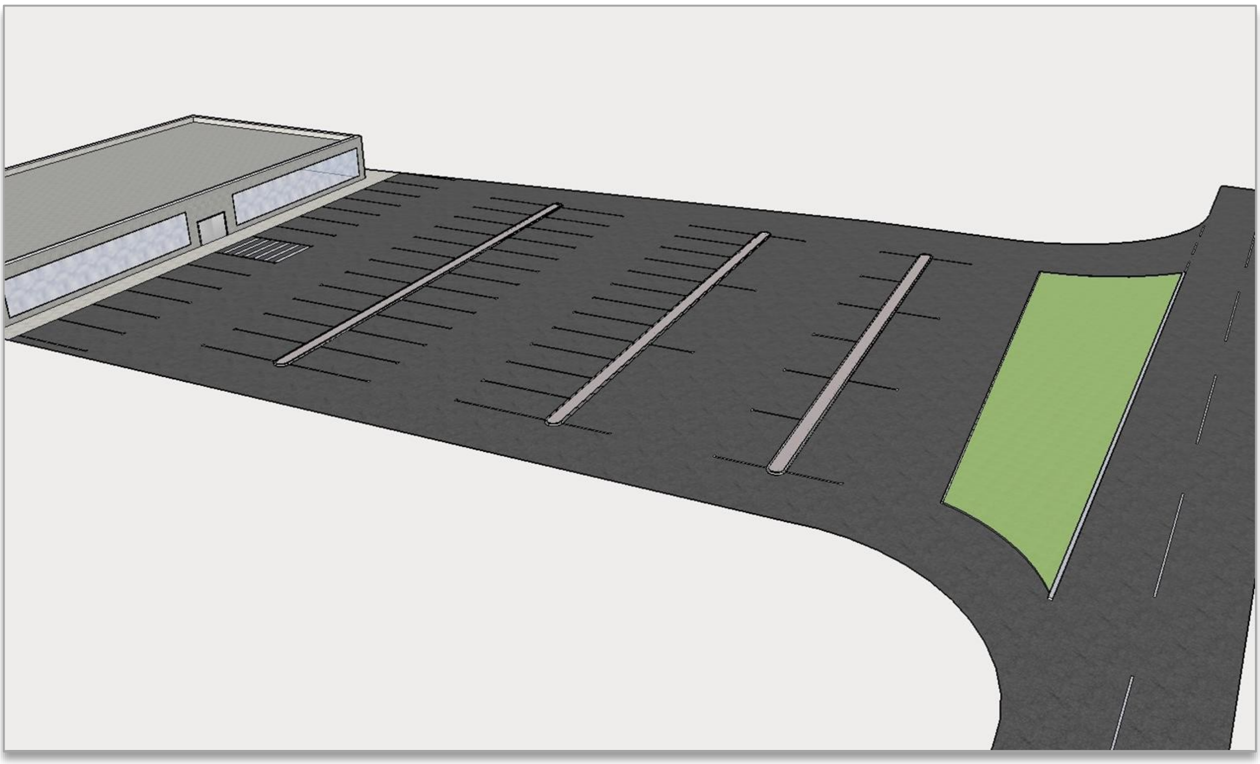


Image 6: General location development master plan

Of course, the location development may be changed from location to location due to its natural limitations, width and height of the land, and other parameters, however following are important points

- Size of land – the optimal size of land should be between 2500 to 4000 square meters, from which 1500-2500 should be planned for future location development for EV charging
- At initial stages the design would allow using most of the land of parking lots for the supplementary services. At further stages in case the supplementary services partner (or Mobius if Mobius will develop such services) will be interested in providing additional parking lots for non-EV vehicles it may purchase the land lots that are next to existing location.

- The EV area would be divided into 4 different areas that would be able to answer all the future development options
- First line (close to road) is trucks/buses only area. It would be developed in case there would be needs for charging trucks and busses which are using new connectors (like 1MWh ABB connector described)
- Second line is the mixed line where from one side private vehicles may be parked, while on other side bus and/or trucks may be parked.

For private vehicles the minimal unit would be built up of 4 parking lots (3m each), while on other side one truck/bus of up to 12meters may be parked.
If possible 2 or 3 lots would be built into single line. This will allow trucks and busses longer than 12 meters to part freely and charge.

Due to the fact that currently there are trucks and busses that may use 2 connectors concurrently (2 CCS connectors), 2 160Kwh chargers would be installed on parking lots 2-3 (middle parking lots), each of 2 connectors (one with 2 CCS, one with either 2 CCS or 1 CCS and one GBT). This way all EV vehicles that are using current standards would be able to get charged from same chargers.

- Third line is pure for EV vehicles that are capable to charge from fast chargers. The line would be developed after line 2 development has been completed, and will add extra super chargers to locations incrementally.
- Line 4 is for slow chargers (type 2 + Chademo), according to the growth need. At initial stage 1 charger of 1 Chademo and one or more Type 2 would be installed.

In General, the new locations would be developed with initial requirements similar to other locations (370Kwh+) which would promise consistent level of services for the customers (which in most cases would need to use multiple charging due to their trip), however the development plan and incremental steps possible are much bigger for these types of locations.

2.6 Stage 1 – MVN (minimum viable network)

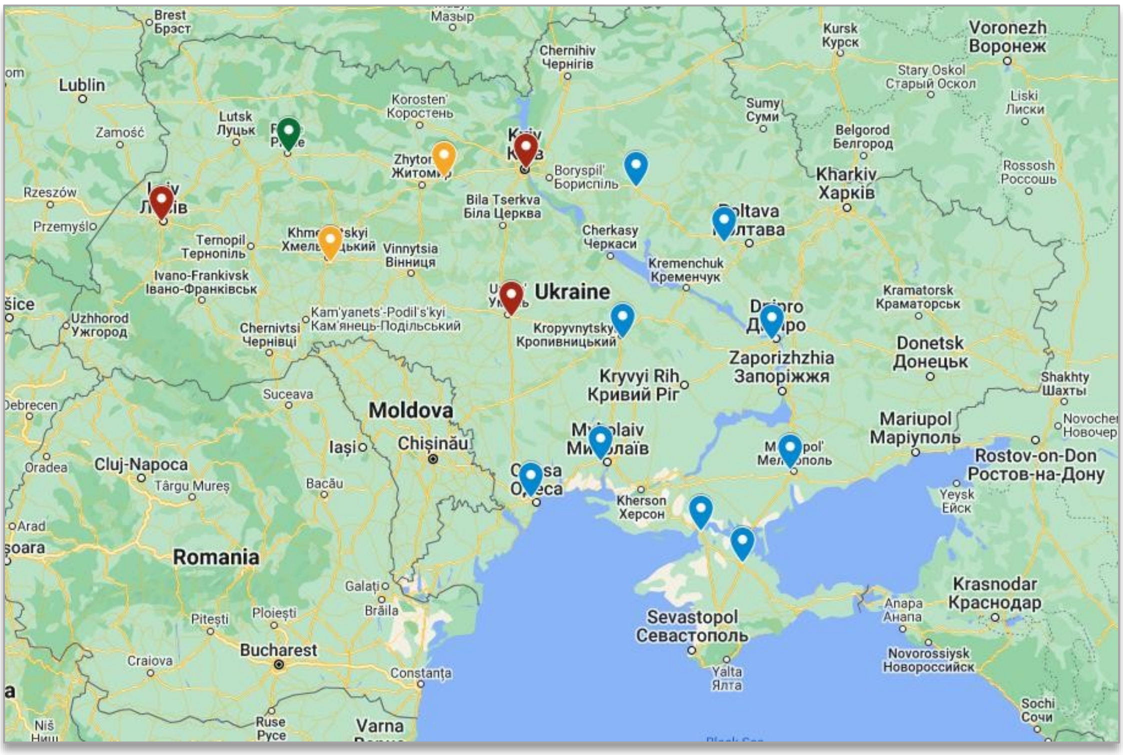


Image 7: Stage 1 (initial) planning

The minimal network planning takes into account that that are other operators of charging stations presence for Go To U in Lviv, Kyiv and Uman'.

Also 3 locations currently cannot be developed (Armyansk, Dzhankoi and Melitopol'), because they are temporarily occupied by ruSSians.

Overall, the initial plan 12 locations, which are further divided into 4 steps:

- 3 locations in **Western par**t: Rivne, Khmelnitskiy and Korostyshiv (last was choosen because there are roads from Zhytomir to Rivne and Zhytomir to Vinnitsya which should be covered up).
- 3 locations in **Eastern part**: Pyryatyn (road Kyiv Kharkiv and road to Sumy), Reshetilivka (road Kyiv Dnipro and Kyiv Kharkiv) and Dnipro (for connection between Kharkiv and Zaporizzhia)
- 3 locations in **South**: Odesa – for those that are continue the travel through Odessa, Mykolaiv and Kropyvnytskyi.
- Last 3 location are in temporary occupied territories.

* - Donetsk area is not taking into master plan due to massive infrastructural damage that is being taken due to ruSSian aggression and occupation. Not only it will be released last, the roads plan may be changed dramatically after the victory. However, as soon as this will become possible the Donetsk and Luhansk area would be added into master plan.

From	To	Distance
Lviv	Rivne	215 KM
Lviv	Khmelnytskiy	241 KM
Khmelnytskiy	Rivne	208 KM
Khmelnytskiy	Korostyshiv	240 KM
Rivne	Korostyshiv	224 KM
Korostyshiv	Kyiv	108 KM
Khmelnytskiy	Uman’	289 KM
Korostyshiv	Uman’	245 KM
Uman’	Odessa	245 KM
Uman’	Kropyvnytskiy’	165 KM
Odessa	Mykolaiv	135 KM
Kropyvnytskiy’	Mykolaiv	183 KM
Kyiv	Uman’	215 KM
Kyiv	Pyryatyn	166 KM
Pyryatyn	Reshetylivka	157 KM
Reshetylivka	Kropyvnytskiy’	231 KM
Reshetylivka	Kharkiv	177 KM
Reshetylivka	Dnipro	170 KM
Kharkiv	Dnipro	221 KM
Dnipro	Melitopol	219 KM
Mykolaiv	Melitopol	270 KM
Melitopol	Dzhankoi	240 KM
Mykolaiv	Armyansk	250 KM

The goal of initial stage was to keep the distance between all locations up to 250 km distance. The distance between Khlmelnytskyi and Uman’ is bigger, however there is another charging location in Vynnytsya that currently allows to charge at 160Kwh, so it’s not feasible to add another location at sage 1 there.

2.7 Incremental Growth

After the initial stage would be successfully completed and implemented the continuous usage monitoring, market trends and market analysis would be done in order to understand when and in what direction to expand / grow
As already mentioned, the grows may be horizontal or vertical.

While from one side we may add more chargers at specific location, or introduce the new charger types (especially for trucks and / or busses), from another side we may be adding the new locations that will expand our network.

The main problem of incremental development for existing location is that every time you need to upgrade / increase the connectivity to grid.

Connection Type	Max Power	Connection time
Standard	50Kw	60 days
Non-Standard	160 Kwh	120 days
Non-Standard	400 Kwh	230 days
Non-Standard	1000 Kwh	280 days
Non-Standard	5000 Kwh	350 days

Standard connectivity upgrade (up to 50Kwh) may be used when we want to add additional slow connectors to the location.

In all other cases we need Non-Standard connection upgrade. For initial stage we use up to 1Mwh for new location and 400 Kwh for existing location where we add capacity solely for chargers.

For upgrades we may consider using 160Kwh upgrade or 400 Kwh upgrade for faster connection. However, each upgrade additionally to the line upgrade would require electricity transformator / entrance point. Due to this the 400Kwh step may be optimal (we may do multiple upgrades in multiple locations at same time, so transformators would be moved from one location to another location to allow cost savings.

In term of location distance between the locations according to European master plan the distance between the locations should be 60 KM for private vehicles and 120 KM for trucks/busses.

Initial configuration (almost in all cases) is having 240 KM distance, which is 2X for trucks/busses and 4X for private vehicles. Therefore, the next step naturally would be expanding the network to allow 120 KM distance between all the locations or close to it. This distance would be comfortable for all known cars. However, in case some locations would not be able to handle the load and there would not be a place to scale it should be consider bringing another location in between 2 locations to bring the distance to 60 KM.
Location would be counted as secondary if it’s being location in radius of 30 KM (60 KM diameter) from another location. This would match the European plan.

2.8 Summary

The optimal configuration would be using Owned – Existing, Mixed – Leased + Owned and New – Owned configuration. The Leased locations may be added where possible, especially in secondary locations.

It is highly undesired to go to fully managed locations at this stage.

Initial recommended configuration for single location is 2*160 Kwh fast chargers and at least one slow charger (with at least 2 ports)

The incremental location growth for slow chargers may be done relatively fast and easy, while fast chargers should be added in 400 Kwh capacity (part of which lately may be used for slow chargers, for additional services if needed of for further stages). New charging ports should be planned and considered separately.

The network is planned to support private vehicles and trucks/busses charging, without service disruption from one type toward another.

Chapter 3: Business Plan

3.1 Model

The business model elements have been partially described in previous chapters. This chapter will start with summarization based on Canvas model.

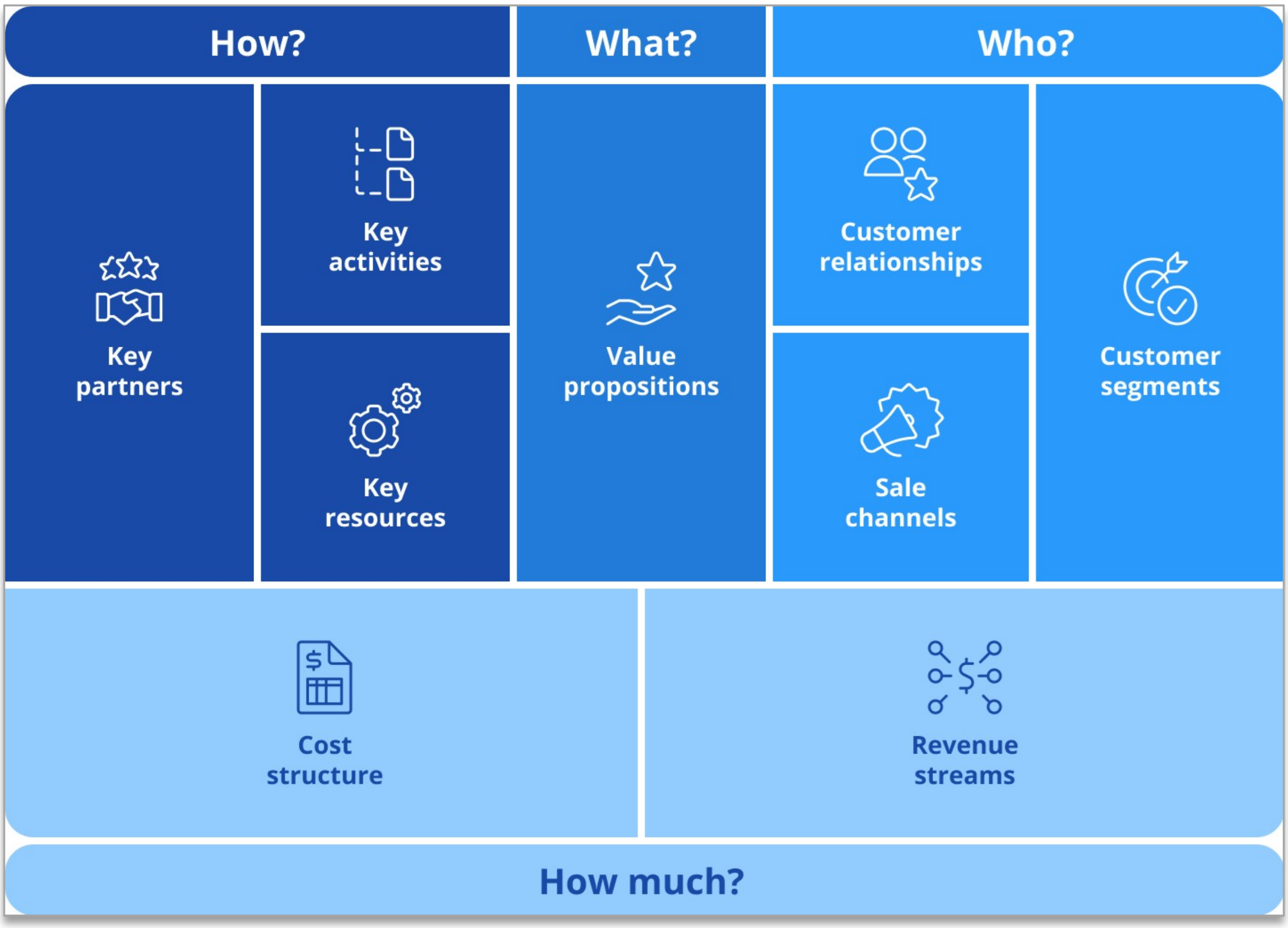


Image 8: Canvas Model

Key Partners:

It is planned to partner with EV Charging Solution – Go To U as part of the implementation.

From other side additional services providers are also very important for success of the project. Without them the implementation time and costs would grow dramatically.

For Electricity grid connectivity / upgrade and EV chargers' installation partnering with private electricity design and works companies is also necessary.

Key Activities:

As for internal procedures the company will focus on 2 main aspects of the network implementation:
The EV charging network itself – this is the core business activity which would require to purchase, install and manage EV chargers.

Another key activity is the land development for all the configurations but leasing. The land development takes time and requires many resources.

Key Resources:

Electricity is the main key resources that is required for this project implementation. At this stage there is no importance to have green electricity, but in future company may need to start generating its own energy + sign agreements only with renewable energy manufacturers.

EV chargers and/or ports are second key resource. The optimal load of this resource would allow to maximize the profit.

Time is also the critical resource. Properly managing time of our customers (for example by pushing them to 20-80 scheme instead of charging up 100% of the battery) and no or minimal queue, would improve dramatically user experience and as result increase the customers' base.

Value Proposition:

Our proposition is well planned charging network that answer today customers' needs and allow them to travel with their EV vehicles in similar to fossil fuel vehicles manner (no need to save energy during the traveling time, comfortable charging locations with satisfying supplementary service, time spent on charging close to fossil fuel fueling time – considering the rest needed during the travel).

Customer relationship:

Together with our partners we plan to provide best service possible for our customers. 24/7 technical support would be there for them (through Go TO U) in case of any problems they have.

Additionally, we plan to bundle the supplementary service with charging and offer discounting for specific customers.

Sale Channel:

The only channel we currently build on is the Go-TO U Solution. All the customers would be registered in their system, would be able to charge at all the locations for Go TO U Network in general, and all our chargers.

Customer Segmentation:
Customers may be segmented into 3 main segments

I. Private vehicles owners – those are the customers that are having one or multiple EV vehicles they use for their daily traveling.
II. Trucks / Busses owners – those are the trucks and bus owners that are having EV vehicles that is being used for their work. It is important to maintain this segment, because of the higher consumption of single vehicles in terms of electricity. Together with next segment management proper customers handling would allow to maximize the usage of the chargers, shave the usage peaks, and decrease the queues for charging in future.
III. Corporate customers – those are the companies that have a fleet of vehicles for their workers. The flee may be of private vehicles, trucks, busses or mix of any of them.

Cost Structure:

For the fixed costs for each location following elements are present for initial location development:

- Land
- Land development (not including the electricity grid connectivity, upgrade, etc.) (includes changing the land type, road exit, etc.)
- Electricity connection / upgrade
- EV chargers
- Installation and configuration work

For the location upgrade following are the fixed elements:

- Electricity connection / upgrade
- EV chargers
- Installation and configuration work

Variable costs are:

- EV chargers’ maintenance (cable replacement, any other damage fix)
- Go To U commission
- Land owner commission (in case of leased or mixed configuration)
- Electricity prices

Additionally, to those costs we need to maintain some administrative costs for accounting, management and other operations.

Revenue streams:

Currently It is planned to have revenue only from EV charging for all but fully owned scenario, which is not planned to be implemented currently.
In case fully owned scenario would be implemented one day, it would add supplementary services revenue stream and/or rental revenues.

Electricity generation (in case not exceeding the total consumption) may be treated as part of EV charging revenue.

Two more possible revenue streams that may be considered in future are: advertisement on charging locations and land lease services (for example for mobile cell towers). Both are not planned at this stage and are not part of this document.

3.2 Costs calculations

3.2.1 Fixed costs per location

Item	Description	Effective Scenarios	Costs (UAH)
Land	2500-4000 square meters	Owned	550,000-1,100,000
Land Development	Mostly administrative	Owned	385,000-500,000
Electricity Connection	470Kwh fully included, region dependent	All but leased	2,500,000 – 3,500,000
Chargers	Type 2 + Chademo	All	400,000 – 450,000
Chargers	2 Fast 160Kwh with 2 ports each	All	3,500,000-4,000,000
Installation	Installation and other initial works + materials	All	230,000-440,000

The pricing is represented in local currency, and are highly dependent on the region where the works are being maintained and USD and/or EUR currency exchange rate. As for today min – max ranges should be covering all the regions.

Based on these costs we may estimate the initial steps development of new location based on type:

Location Type	Min (UAH)	Max (UAH)	Average (UAH)
Leased	4,130,000	4,890,000	4,510,000
Mixed	6,630.00	8,390,000	7,510,000
Electricity owned	6,630.00	8,390,000	7,510,000
Owned	7,565,000	9,990,000	8,777,500

For further calculation average amount would be used. According to big numbers theory as the number of locations would grow, the real costs would get close to average per location.

3.2.2 Location upgrade costs – fast chargers

Item	Description	Effective Scenarios	Costs (UAH)
Electricity Connection	400Kwh fully included, region dependent	All but leased	1,800,000 – 2,700,000
Chargers	2 Fast 160Kwh with 2 ports each	All	3,500,000-4,000,000
Installation	Installation and other initial works + materials	All	180,000-340,000

Based on these costs we may estimate the costs of location upgrade based on type:

Location Type	Min (UAH)	Max (UAH)	Average (UAH)
Leased	3,730,000	4,340,000	4,035,000
Mixed	5,530.00	7,040,000	6,285,000
Electricity owned	5,530.00	7,040,000	6,285,000
Owned	5,530.00	7,040,000	6,285,000

The 400kwh is considered in offering, due to the fact that 80kwh brings minimal costs changes for transformator and grid connectivity. Therefore, it is better to upgrade by maximum possible amount for this step (up to 400kwh, 230 days). Later on, this 80kwh may be resold to supplementary services if required, used for slow chargers' upgrade or even aggressively used for fast chargers upgrade later on.

From the resulted number it is clearly seen that it is cost effective to upgrade the existing location, then developing a new location. Additionally, to costs the upgrade is done faster and therefore return of investments is better during the first year.
For further calculation average amount would be used.

3.2.3 Location upgrade costs – slow chargers

Item	Description	Effective Scenarios	Costs (UAH)
Chargers	3 Ports Type 1 + 2 or Chademo Single Port	All	75,000-308,000
Installation	Installation and other initial works + materials	All	80,000-150,000

Based on these costs we may estimate the costs of location upgrade based on type:

Location Type	Min (UAH)	Max (UAH)	Average (UAH)
Leased	155,000	458,000	306,500
Mixed	155,000	458,000	306,500
Electricity owned	155,000	458,000	306,500
Owned	155,000	458,000	306,500

The bottom costs price is for 3 Ports Type 1 + 2 (which are much cheaper due to AC type), while higher price is for single Chademo port. Since almost no new cars are being manufactured with Chademo port, the chance for adding new Chademo to any location is very low. Therefore, for further calculation minimal amount would be used.

3.2.4 Variables costs estimates

All the variable costs would be based on price per kilowatt. The pricing for EV Chargers maintenance would be calculated based on the current experience with charging stations that are in service in existing location in Rivne + existing in other locations of other owners. Those chargers are on market for 3 years; therefore, the estimation may change after 3 years. Together with that the chargers we have choose are built up of quality materials, and we choose only quality cables and other materials for installation. This should decree
se dramatically the maintenance cost in long term.

Type	Price Per Kilowatt	Price For Leased
Electricity	7.38	7.38
Owner Commission	0.74	0
Go to U Commission	1.8 – 2.1	1.8 – 2.1
Maintenance	0.4	0.4

Administrative costs may be estimated as 36,000 UAH per month for every 3 locations (432,000 UAH per year).

3.3 Incomes

Currently income price per kilowatt is 12 UAH for slow chargers (only Type 1 + Type 2), and 14 UAH for fast chargers (including Chademo). This including all the commission (Owner Commission, Go To U Commission).

Profile per kilowatt is show below

Connector	Price Without Leasing	Profile for Leasing	Profit for Other
Type 1 + Type 2	10.32	1.68	2.42
Fast	10.62	3.38	4.12

Based on current estimates we may estimate how much kilowatts per location should be sold in order to return the investment

For that we will calculate weighted average profit per kilowatt for Leasing and for other based on current estimate of 4% overall usage on Type1+Type2, Chademo – 6% and 90% on CCS2+GBT.

Weighted Profit for Leasing: 1.68*0.04 + 3.38*0.96 = 3.31 UAH
Weighted Profit for Non-Leasing 2.42 * 0.04 + 4.12*0.96 = 4.05 UAH

3.4 Return of investment

Based on profit per KW we may calculate how much kilowatts we need to sell in order to return our investments:

Location Type	Average (UAH)	Profit per KW	Number of KW for ROI
Leased	4,510,000	3.31	1362537
Mixed	7,510,000	4.05	1854320
Electricity owned	7,510,000	4.05	1854320
Owned	8,777,500	4.05	2167283

Same calculation can be done to calculate number of kilowatts for each increment , however since the increments are having well defined charging types we will calculate them based on proper profit

Calculation for fast chargers:

Location Type	Average (UAH)	Profit per KW	Number of KW for ROI
Leased	4,035,000	3.38	1193786
Mixed	6,285,000	4.12	1525485
Electricity owned	6,285,000	4.12	1525485
Owned	6,285,000	4.12	1525485

Calculation for chademo:

Location Type	Average (UAH)	Profit per KW	Number of KW for ROI
Leased	458,000	3.38	135502
Mixed	458,000	4.12	111165
Electricity owned	458,000	4.12	111165
Owned	458,000	4.12	111165

Calculation for Slow Chargers (Type 1 + Type 2):

Location Type	Average (UAH)	Profit per KW	Number of KW for ROI
Leased	155,000	1.68	92261
Mixed	155,000	2.42	64049
Electricity owned	155,000	2.42	64049
Owned	155,000	2.42	64049

3.5 P&L Estimation

In order to fully estimate the P&L 3 scenarios would be introduced: current (with starting point of 9000KW for first month, and growth of ~5% per month in consumption). The number is based on practical confirmation for location in Rivne, and estimation plan from Go to U.
Second – optimistic scenario would be based on same start point, but with growth of 10% per month.
Third – pessimistic scenario would be based on 3% growth per month.
After 85Mwh new location should be developed with shorter distance between the locations, therefore new location should take the load and old location should remain not overcome 100Mwh (there would be some continuous growth even after new location has been introduced, because customers will get used to old location). At some stage development of the locations may be resumed, but for simplicity this is not taken into account, as not taken into account new chargers for trucks and busses and their usage (which is currently hard to estimate).

Following rules would be applied:

New Fast Chargers Increment would be done after every 30Mwh per month has been reached on specific locations (2.7 full load hours per day)

New Chademo Chargers would be done after location reaches 67.5Mwh (calculated as same 2.7 full load hours * 50 full load speed * 30 days in average per month / 0.06 the chademo percent)

First Slow Chargers increment would be done after location reaches 14 Mwh (calculated as same 2.7 full load hours * 7 full load speed * 30 days in average per month / 0.04 the slow charger percent). The speed is treated as 7 Kwh due to the fact that most of the cars are not capable to go beyond this point).
Second and further incremental however should be calculated as 42 Mwh (calculated as same 2.1 full load hours * 7 full load speed * 3 chargers * 30 days in average per month / 0.04 the slow charger percent), which means that second increment would be at 56 Mwh and third at 98 Mwh.

The number of 2.1 is used because it’s very unrare that all the chargers would be working under the full load. Effectively it would be translated into 6 used hours during the day in average. Assuming that peak hours are approximately 12 hours per day, we get to 50% of the full load. Increment takes 9 months to implement for fast chargers, which will push this number higher and may create a risk of queuing and service quality downgrade.

Before moving forward let’s validate for first increments whether we will have enough energy for providing slow chargers upgrade without increasing the connectivity to the grid:

Stage	Max Capacity	Max Consump-tion - Fast	Max Consump-tion - Slow	Total Usage
Initial	420	320	72	392
14 Mwh – Slow Increase	420	320	123	443
30 Mwh – Fast Increase	820	640	123	763
56 Mwh – Type 1,2 Increase	820	640	174	814
60 Mwh – Fast Increase	1220	960	174	1134
67.5 Mwh – Chademo Increase	1220	960	224	1184

As we can see there is 23Kwh overload for first incremental, however its almost unreal to get practically to the full load, and also the transformator may handle 20% extra load for peak 30 minutes. Therefore, according to electrician such a handling can be treated as safe.

The stages have been marked with number to allow setting the stage for each month. Now let’s calculate the estimated investment and consumption according to all 3 stages.

Month	Usage 1	Investment 1	Investment 1 Leased	Usage 2	Investment 2	Investment 2 Leased	Usage 3	Investment 3	Investment 3 Leased
1	**9,000**	8,143,750	4,510,000	**9,000**	8,143,750	4,510, 000	**9,000**	8,143,750	4,510,000
2	**9,450**			**9,900**			**9,270**		
3	**9,923**			**10,890**			**9,548**		
4	**10,419**			**11,979**			**9,835**		
5	**10,940**			**13,177**			**10,130**		
6	**11,487**			**14,495**	155,000	155, 000	**10,433**		
7	**12,061**			**15,944**			**10,746**		
8	**12,664**			**17,538**			**11,069**		
9	**13,297**			**19,292**			**11,401**		
10	**13,962**			**21,222**			**11,743**		
11	**14,660**	155, 000	155,000	**23,344**			**12,095**		
12	**15,393**			**25,678**			**12,458**		
13	**16,163**			**28,246**			**12,832**		
14	**16,971**			**31,070**	6,285,000	4,035, 000	**13,217**		

15	**17,819**			**34,177**			**13,613**		
16	**18,710**			**37,595**			**14,022**	155,000	155,000
17	**19,646**			**41,355**			**14,442**		
18	**20,628**			**45,490**			**14,876**		
19	**21,660**			**50,039**			**15,322**		
20	**22,743**			**55,043**			**15,782**		
21	**23,880**			**60,547**	6,440,000	4,190, 000	**16,255**		
22	**25,074**			**66,602**			**16,743**		
23	**26,327**			**73,262**	458,000	458, 000	**17,245**		
24	**27,644**			**80,589**			**17,762**		
25	**29,026**			**88,648**			**18,295**		
26	**30,477**	6,285,000	4,035, 000	**97,512**			**18,844**		
27	**32,001**			**100,000**			**19,409**		
28	**33,601**			**100,000**			**19,992**		
29	**35,281**			**100,000**			**20,591**		
30	**37,045**			**100,000**			**21,209**		

31	**38,897**			**100,000**	**21,845**		
32	**40,842**			**100,000**	**22,501**		
33	**42,884**			**100,000**	**23,176**		
34	**45,029**			**100,000**	**23,871**		
35	**47,280**			**100,000**	**24,587**		
36	**49,644**			**100,000**	**25,325**		
37	**52,126**			**100,000**	**26,085**		
38	**54,733**			**100,000**	**26,867**		
39	**57,469**	155, 000	155,000	**100,000**	**27,673**		
40	**60,343**	6,285,000	4,035, 000	**100,000**	**28,503**		
41	**63,360**			**100,000**	**29,358**		
42	**66,528**			**100,000**	**30,239**	6,285,000	4,035,000
43	**69,854**	458,000	458,000	**100,000**	**31,146**		
44	**73,347**			**100,000**	**32,081**		
45	**77,014**			**100,000**	**33,043**		
46	**80,865**			**100,000**	**34,034**		

47	**84,908**	**100,000**	**35,055**
48	**89,154**	**100,000**	**36,107**
49	**93,611**	**100,000**	**37,190**
50	**98,292**	**100,000**	**38,306**
51	**100,000**	**100,000**	**39,455**
52	**100,000**	**100,000**	**40,639**
53	**100,000**	**100,000**	**41,858**
54	**100,000**	**100,000**	**43,114**
55	**100,000**	**100,000**	**44,407**
56	**100,000**	**100,000**	**45,739**
57	**100,000**	**100,000**	**47,112**
58	**100,000**	**100,000**	**48,525**
59	**100,000**	**100,000**	**49,981**
60	**100,000**	**100,000**	**51,480**

Now we can summarize the data by years to use them in P&L

Year	Usage 1	Investment 1	Investment 1 Leased	Usage 2	Investment 2	Investment 2 Leased	Usage 3	Investment 3	Investment 3 Leased
1	**143,254**	8,298,750	4,665,000	**192,459**	8,298,750	4,665,000	**127,728**	8,143,750	4,510,000
2	**257,264**	-	-	**604,017**	13,183,000	8,683,000	**182,110**	155,000	155,000
3	**462,009**	6,285,000	4,035,000	**1,186,160**	-	-	**259,645**	-	-
4	**829,702**	6,898,000	4,648,000	**1,200,000**	-	-	**370,192**	6,285,000	4,035,000
5	**1,191,903**	-	-	**1,200,000**	-	-	**527,805**	-	-

Now let's calculate P&L for all the P&L scenarios. The P&L will not include the electricity price, commission and other expenses, but only clear profit per kilowatt
The P&L would be calculated for each location and separately for Leased and non-Leased locations. However, the development of the locations would be done according to the following:

Year	Leased 1	Non-Leased 1	Leased 2	Non-Leased 2	Leased 12	Non-Leased 13
1	1	2	1	2	1	2
2	2	4	2	4	2	4
3	3	6	3	6	3	6
4	4	8	5	10	4	8
5	4	8	6	12	4	8

In optimistic scenario (scenario 2) it would be required to scale horizontally and add new locations at years 4 and 5 for first areas that has been developed.

3.5.1 Scenario 1 – 5% growth Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	8,298,750	580,179		
	Administrative	432,000			
	Total	**8,730,750**	**580,179**	**-8150571.00**	**-8150571.00**
2	Investments	-	1,041,919		
	Administrative	432,000			
	Total	**432,000**	**1,041,919**	**609919.00**	**-7540652.00**
3	Investments	6,285,000	1,871,136		
	Administrative	432,000			
	Total	**6,717,000**	**1,871,136**	**-4845864.00**	**-12386516.00**
4	Investments	6,898,000	3,360,292		
	Administrative	432,000			
	Total	**7,330,000**	**3,360,292**	**-3969708.00**	**-16356224.00**
5	Investments	-	4,827,209		
	Administrative	432,000			
	Total	**432,000**	**4,827,209**	**4395209.00**	**-11961016.00**

Since we don’t plan further investment, the location would get into profit in year 7. **The average investment return would be 4.5 years** (due to investment done in years 3 and 4).

3.5.2 Scenario 1 – 5% growth Non-Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	8,298,750	580,179		
	Administrative	432,000			
	Total	**8,730,750**	**580,179**	**-8150571.00**	**-8150571.00**
2	Investments	-	1,041,919		
	Administrative	432,000			
	Total	**432,000**	**1,041,919**	**609919.00**	**-7540652.00**
3	Investments	6,285,000	1,871,136		
	Administrative	432,000			
	Total	**6,717,000**	**1,871,136**	**-4845864.00**	**-12386516.00**
4	Investments	6,898,000	3,360,292		
	Administrative	432,000			
	Total	**7,330,000**	**3,360,292**	**-3969708.00**	**-16356224.00**
5	Investments	-	4,827,209		
	Administrative	432,000			
	Total	**432,000**	**4,827,209**	**4395209.00**	**-11961016.00**

Since we don’t plan further investment, the location would get into profit in year 8. **The average investment return would be 5 years** (due to investment done in years 3 and 4).

3.5.3 Scenario 2 – 10% growth Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	4,665,000	637,038		
	Administrative	432,000			
	Total	**5,097,000**	**637,038**	**-4,459,962**	**-4459962**
2	Investments	8,683,000	1,999,298		
	Administrative	432,000			
	Total	**9,115,000**	**1,999,298**	**-7,115,702**	**-11575665**
3	Investments	0	3,926,189		
	Administrative	432,000			
	Total	**432,000**	**3,926,189**	**3,494,189**	**-8,081,475**
4	Investments	0	3,972,000		
	Administrative	432,000			
	Total	**432,000**	**3,972,000**	**3,540,000**	**-4,541,475**
5	Investments	0	3972000		
	Administrative	432,000			
	Total	**432,000**	**3,972,000**	**3,540,000**	**-1,001,475**

Since we don’t plan further investment, the location would get into profit in year 6. **The average investment return would be 5 years**.

3.5.4 Scenario 2 – 10% growth Non-Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	8,298,750			
	Administrative	432,000			
	Total	**8,730,750**	**779,457**	**-7,951,293**	**-7,951,293**
2	Investments	13,183,000	2,446,270		
	Administrative	432,000			
	Total	**13,615,000**	**2,446,270**	**-11,168,730**	**-19,120,022**
3	Investments	0	4,803,948		
	Administrative	432,000			
	Total	**432,000**	**4,803,948**	**4,371,948**	**-14,748,075**
4	Investments	0	4,860,000		
	Administrative	432,000			
	Total	**432,000**	**4,860,000**	**4,428,000**	**-10,320,075**
5	Investments	0	4,860,000		
	Administrative	432,000			
	Total	**432,000**	**4,860,000**	**4,428,000**	**-5,892,075**

Since we don't plan further investment, the location would get into profit in year 7. **The average investment return would be 6 years.**

3.5.5 Scenario 3 – 3% growth Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	4,510,000	422,781		
	Administrative	432,000			
	Total	**4942,000**	**422,781**	**-4,519,219**	**-4,519,219**
2	Investments	155,000	602,784		
	Administrative	432,000			
	Total	**587,000**	**602,784**	**15,784**	**-4,503,435**
3	Investments	0	859,426		
	Administrative	432,000			
	Total	**432,000**	**859,426**	**427,426**	**-4,076,010**
4	Investments	4,035,000	1,225,336		
	Administrative	432,000			
	Total	**4,467,000**	**1225336**	**-3,241,664**	**-7,317,674**
5	Investments	0	1,747,036		
	Administrative	432,000			
	Total	**432,000**	**1,747,036**	**1,315,036**	**-6,002,638**

The investment has not been competed at this scenario yet, therefore **it's harder to estimate when the aggregated total will get into profit**.

3.5.6 Scenario 3 – 3% growth Non-Leased

Year	Items	Expenses	Profit	Balance	Aggregated
1	Investments	8,143,750	517,299		
	Administrative	432,000			
	Total	**8,575,750**	**517,299**	**-805,8451**	**-805,8451**
2	Investments	155,000	737,545		
	Administrative	432,000			
	Total	**587,000**	**737,545**	**150,545**	**-7,907,905**
3	Investments	0	1,051,563		
	Administrative	432,000			
	Total	**432,000**	**1,051,563**	**619,563**	**-7,288,342**
4	Investments	6,285,000	1,499,278		
	Administrative	432,000			
	Total	**6,717,000**	**1,499,278**	**-5217722**	**-12,506,064**
5	Investments	0	2,137,612		
	Administrative	432,000			
	Total	**432,000**	**2,137,612**	**1,705,612**	**-10,800,452**

The investment has not been competed at this scenario yet, therefore **it's harder to estimate when the aggregated total will get into profit**.

3.6 Summary

For Scenario 1 the overall investment for stage 1 is approximate 123,000,000 UAH (3.3 million USD at current exchange rate). The expected return time is 7 years from the beginning of stage implementation.

Scenario 2 allows faster return of investment, however due to faster growth, the investment amount required is higher and is 133,000,000 UAH (3.45 million USD at current exchange rate). The expected return of investment is 6 years.

Scenario 3 is the slowest growth and as result the return of investment is longer. However, the investment that is required for stage is is less, 99,000,000 UAH (2.56 million USD at current exchange rate).

All the prices are calculated based on current time. The electricity as other related prices, including the sell price to customer most likely will grow up, which may speed up the return time in UAH, however it’s impossible to estimate those changes.

All 3 scenarios providers satisfying return of investment time for such project time (up to 10 year

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