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2018
MCM/ICM
Summary Sheet

Out of Gas and Driving on E

Currently, the automotive market is moving from a fuel-era time of pure electric time, countries in the development of policies to encourage the shift to electric vehicles, the need to design a plan most suitable for their own country.While formulating policies that encourage the shift to electric vehicles(replace with EVs below), countries also need to design a plan that best suits their countries.This paper first studies the existing Tesla charging station network in the United States and uses the Voroni diagram to conclude that the existing charging network in the United States can be converted to full electrification(All electrification means: In order to protect the driving ability of the electric vehicle, the owner can find the charging station to charge at any position within a certain maximum distance l).The establishment of a total demand for the charging station measurement model ,when Tesla is on track to allow a complete switch to all-electric in the US.To meet the needs of owners and to ensure that the charging station construction and operating costs on the minimum premise,using the Voroni diagram to determine the charging station radiation area.The Floyd algorithm is used to determine the shortest distance between two charging stations and the optimal distribution model of the charging station is established to get the location and distribution of charging stations in the United States and Ireland.Analyze various influencing factors of electric vehicle charging station, choose Delphi method to establish comprehensive evaluation index system of charging station, and then use AHP method to determine the weight of each influencing factor index. By comparison, we can draw the key factors that affect the development of EV charging station.Analyzing the growth trend of the number of electric vehicles in Ireland in the past few years and predicting the future growth trend in Ireland based on Irish traffic conditions, natural resources, economic conditions and the proportion of urban and rural areas, formulating a timetable for the complete conversion of Ireland into electric vehicles;Considering different countries have different geographical, population density distribution and wealth distribution, the use of (Fuzzy) cluster analysis method of different countries are divided into three categories, each category has its corresponding development of charging network plan;Using technology foresight, analyzing the popularization of electric vehicles from the present automatic driving vehicles and electric vehicle rapid switching substations; finally, it puts forward suggestions for the plan of national development charging network.

Key words : EV all-electric Charging station site Voroni diagram (Fuzzy) cluster analysis Delphi method Prediction

Contents

1 Introduction

1.1 Background

With the increasingly prominent energy and environmental problems, all countries in the world are trying to reduce the use of fossil fuels and increasing the promotion of electric vehicles.In the United States and other countries, more affordable Tesla Model 3 has been sought after, released a large number of pre-order list received.At present, some countries, including China, have already announced that gasoline and diesel engines will be banned in the coming years,This further accelerates the transition from consumers of gasoline engines and diesel engines to electric vehicles.However, due to limited resources, consumers need time to convert,therefore, the location and convenience of the charging station are crucial to the user's transition.It need to consider the final charging station network and charging network development and evolution when in the transition,At present, almost all countries are making efforts to formulate a policy to promote the conversion of electric vehicles.

1.2 Our work

This article ignores the way the owner charges at home, we discussed problems mainly about two ways of the destination charging and super-charging:

- The problem about whether Tesla on track to allow a complete switch to all-electric in the US:

Study the existing Tesla charging station network in the United States and use the Voroni diagram to conclude that the existing. charging network allow a complete switch to all-electric in the US.

The problem about total demand of charging station:

Establish a demand model of charging station,using this model to analyze a country's per capita GDP, population density, car ownership, highway density, urban-rural area ratio and other factors can predict the total demand for charging stations when Tesla is on track to allow a complete switch to all-electric in this country.

- The problem about the location and distribution of charging stations:

Building and operating a charging station requires a certain cost,We must make sure to meet the needs of the owners under the premise of the total cost (introduce convenience charge coefficient α) mini-mum,At the same time , determine the charging station radiation area by the Voroni map,and determine the shortest distance between two charging stations by Floyd algorithm ,Thus, the optimal distribution model of charging station is established and the location and distri-bution of charging stations in the United States and Ireland are obtained.

- The problem about The problem about the plan of Irish charging station network development :

Analyze the growth trend of the number of electric vehicles in Ireland in the past few years and predict the future growth trend of Ireland based on Irish traffic

conditions, natural resources, economic conditions and urban-rural area ratio, and set a timetable for the complete conversion of Ireland into electric vehicles.

- The problem about affecting the proposed charging station program:

Analyze various influencing factors of electric vehicle charging station, choose Delphi method to establish comprehensive evaluation index system of charging station, and then use AHP method to determine the weight of each influencing factor index. By comparison, we can draw the key factors that affect the development of EV charging station

- The problem about impact of emerging technologies on the usage of EVs:

Take advantage of the key technologies that have emerged from the electric car industry, such as autonomous vehicles, EV rapid change stations, and transportation modes such as flying cars and super loops. From the economy, the development environment and the technical foresight of its ancillary industries to analyze the popularity of electric vehicles

- The problem about the country's classification and taking different approaches to the development of charging networks:

Considering different countries have different geographical, population density distribution and wealth distribution, different countries are divided into three categories by using (fuzzy)clustering analysis based on principal component analysis, each of which has its own plan to develop a charging network.

2 Assumptions

1.Assuming that charging station candidates are considered of the distribution of needs,and meet the charging station construction environment and safety conditions;
2.Assuming that each demand point represents a small area,2. The demand at the corresponding demand point is the total number of electric vehicles (EV) with charging needs in the area;
3.Assuming that Within the allowable range of charging station configuration,Demand points to the charging station distribution according to the principle of near-by distribution;
4.Taking into account the daily personal vehicles' repair and maintenance,This article assumes that the vehicle's exit rate is 95%;
5.Electric cars can continue to run at full power 500km, but in the driving process, the driver will need to retain part of the power to find the charging station, the other due to the regular battery charge and discharge have also been depleted, so the actual process of battery travel distance is about 400km[1].

3 Charging pile classification

We do not consider Tesla users charging at home,charging pile will thus be divided into two categories:Destination charging pile and super charging pile,classification criteria and comparison results are as follows:

Charging time	Each charge for 30 minutes	A full charge for many hours or one night
Price	More expensive	More cheaper
power	40kw	350kw
advantage	Save time	Low battery loss
Disadvantages	A certain battery loss	Long time consuming

Table 1

4 US automatic conversion to achieve

4.1 Tesla can achieve electrification

A complete switch to all-electric that is: To protect the driving ability of electric vehicles,vehicles owners in any position can not exceed a maximum distance l can find the charging station to charge.

US existing destination charging station and super charging station location map is as follows:

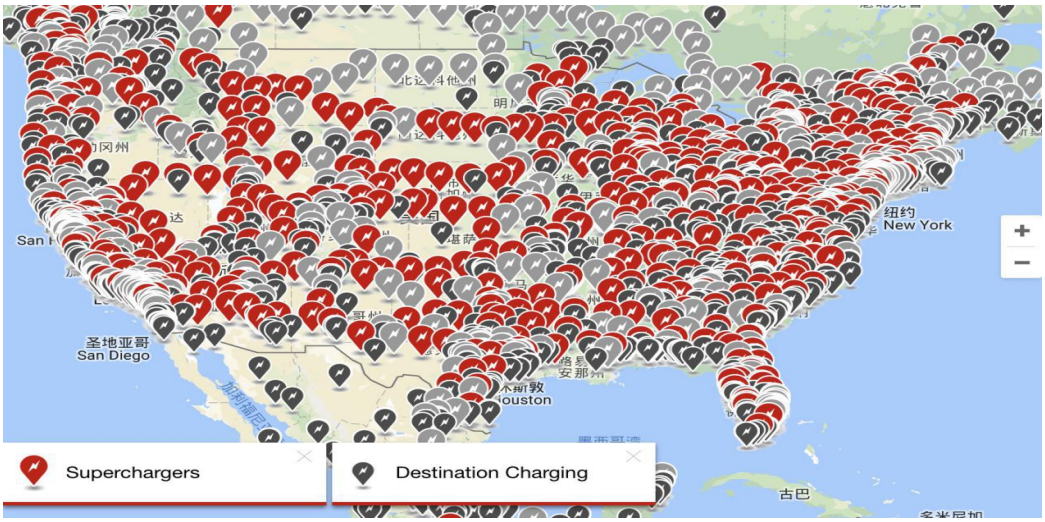

Figure 1

After knowing the location of the charging station,according to the Voronoi diagram, the area covered by the charging node served by each charging station is calculated.We found that no matter Tesla electric vehicles in any location, you can always find a qualified charging station.Therefore, the existing distribution of

destination charging stations and super charging stations in the United States can be fully electrified.

4.2 The number of charging stations

4.2.1 A model charge demand calculation

（1）EV Day Demand Calculation

- Super charge demand estimates

$$C = N_0 \times \frac{S/T}{D} \times \alpha \times \gamma \tag{1}$$

- Destination charge demand calculation

$$B = N_0 \times \frac{S/T}{D} \times \alpha \times \lambda \tag{2}$$

Among them, C： EV daily super-charging needs,Unit: trips / day; N_0： Electric vehicle number; T： Days that EV exit D： EV battery life mileage; α： The car's exit rate; γ :All electric vehicles in the choice of super-charging vehicles ratio; λ :ll electric vehicles in the choice of destination-charging vehicles ratio;

(2) Total demand for electric vehicle charging station estimates

- Calculation of motor charging demand

The charging station mainly studied in this paper mainly serves individual passenger cars,A said that the need for super-charging vehicles,B indicates the vehicle using the destination charging method.The total charging station should include two parts,part should meet the charging needs of charging vehicles,the other part should meet its own operational needs [2]. Now calculate the total charge of vehicle charging demand W

$$W = W_A + W_B \tag{3}$$

Among them, W： The total demand of Charging station charging vehicle charging at charging station; W_A： Class A vehicles daily average demand for recharge; W_B： Class B vehicle daily average demand for charging.

Average daily demand for Class A vehicles:

$$W_A = W_{AV} \times N_0 \times \rho \tag{4}$$

Electric vehicle users have the characteristics of a regional distribution of different types of land, vehicle charging needs are also different. Therefore, when calculating the EV daily charge, the forecast can be made based on the land properties of the area. Now suppose a test area is divided into n areas, then the area of the daily

charge of the car is:

$$W_B = \sum_{i=1}^{n} W_{B_i} \times n_{B_i} \times T_{B_i} \times \rho \tag{5}$$

W_{B_i} : The average daily electricity demand of Class B vehicles in the ith small area; n_{B_i} : Number of Category B vehicles in the i-th sub-area; T_{B_I} : The average charging times of Class B vehicles in the ith small area; ρ : Passenger car exit rate.We can draw the charging station vehicle charging demand:

$$W = \left(W_{AV} \times N_0 \times \rho\right) + \sum_{i=1}^{n} W_{B_i} \times n_{B_i} \times T_{B_i} \times \rho \tag{6}$$

This can be calculated charging station charging needs of the vehicle power distribution,then according to the charging station construction standards, calculate the number of charging stations to be configured.

- Determine the required number of EV charging stations

In determining the number of EV charging stations, but also according to the actual situation in the planning area[3] 。

4.2.2 Solve the charging station demand total measurement model

The US has a vast territory, a small population density and uneven distribution. Most cities and populations are distributed in the eastern coastal and western coastal areas, the lower Mississippi River and the Great Lakes region, while the vast western region is sparsely populated.

The United States into the relevant data is brought into the charging station total demand calculation model to solve each person in the United States converted to all-electric personal car, about 30 million charging stations.

4.3 Distribution of the charging station

4.3.1 A mathematical model of electric vehicle charging station layout optimization

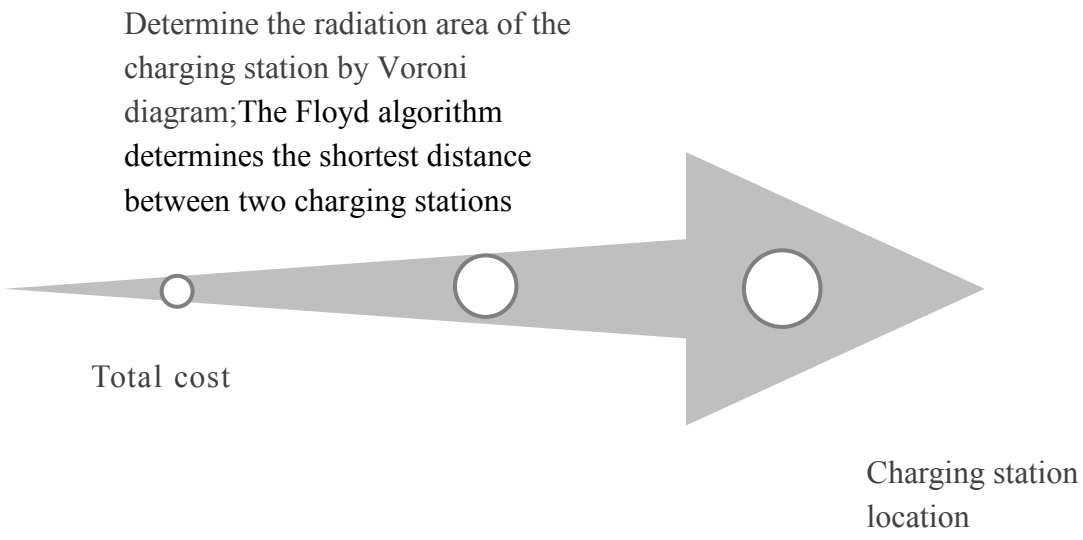

Figure 2

Assuming that electric vehicles need to be charged during the exercise, they are charged to the nearest charging station.The service area of the charging station can be divided by the Voronoi diagram.When a large number of charging stations, the corresponding charging station service area Voronoi diagram area is small, the owners of the small driving costs [4] .Therefore, the cost of vehicle owners is significantly related to the number of EV charging stations. A large number of charging stations will reduce the cost of traveling, but at the same time increase the cost of building charging stations.Therefore, we need to consider the cost of vehicle owners and charging station construction costs.We have to ensure that the owner in any position can not exceed a maximum distance l can find the charging station to charge.Obviously, this distance is related to the driving range L of the electric vehicle, and also relates to the charging portable coefficient α .They have the following relationship:

$$l = L \times \alpha \tag{7}$$

- Driving range of electric vehicles

Driving range of electric vehicles refers to the electric car starting from the full power battery, to the standard provisions of the test by the end of the mileage.It is an important reference for the construction of electric vehicle charging station and the distance between two adjacent charging stations must be less than the driving range of a full electric vehicle.

- Electric car charging portability

Charging coefficient of electric vehicle α directly affects the construction cost of the city electric vehicle charging station, the driving cost of the vehicle owner and the waiting time of the line waiting of the vehicle owner in the charging station:when α is larger, the cost of vehicle owners and owners queuing at the charging station will increase the cost [5] .The value of α is determined according to the principle of charging station construction cost, vehicle owner running cost and the minimum waiting time cost of the vehicle owner standing in the charging station.The total cost

is as follows:

$$C_{all} = C_1(\alpha) + C_2(\alpha) + C_3(\alpha) \tag{8}$$

Among them, $C_1(\alpha)$ is the construction cost of electric vehicle charging station; $C_2(\alpha)$ for electric vehicles to charge the cost of electricity generated on the way and time-consuming costs; $C_3(\alpha)$ is the queuing waiting cost incurred by the electric vehicle in charging and queuing at the charging station.

Charging station construction costs include fixed investment and operating costs.The total cost of charging station is converted to everyday as follows:

$$C_1(\alpha) = \frac{1}{365}\sum_{i=1}^{h}\left[f_1(Q_i)\frac{r_0(1+r_0)^m}{(1+r_0)^m - 1} + f_2(Q_i)\right] \tag{9}$$

$Q_i = f(\alpha)$ indicates that the number of charging stations is a function of the portable charging factor;

$f_1(Q_i)$ is the fixed investment associated with the i-th charging station for the number Q_i of its configured charging machines;

Fixed charging station charging station using the number of second-order multi-mode model that[6], which is:

$$f_1(Q_i) = a_1 + a_2 Q_i + a_3 Q_i^2 \tag{10}$$
$$f_2(Q_i) = 0.5a_1 + 0.5a_2 Q_i + 0.5Q_i^{\,2}$$

Among them, a_1 is a fixed investment such as business buildings; a_2 is the charging cost of the charger and other costs proportional to the number of related costs; a_3 for transformers, cables and chargers proportional to the number of square-related costs.

The cost of charging an electric car depends on the distance to the charging station and the time it takes during that time.

$$C_2(\alpha) = \sum_{i=1}^{h}\left[\bar{d}_i(\alpha)k_1 c + \beta \bar{d}_i(\alpha)/v \right] \times V_i(\alpha) \tag{11}$$

Among them, $\bar{d}_i(\alpha)$ is the average distance between the electric vehicle and the i_th charging station; k_1 for electric cars every 100 miles power consumption; c for electric vehicles in the charging station charge 1KW · h electricity paid by the electricity; β is the loss of electric vehicles due to the time-consuming income; $V_i(\alpha)$ is the number of EV's that need to be charged to the first charging station daily.

Tesla currently offers two types of charging stations:

- Destination charge-a full charge hours or night
- Super charge-30 minutes long enough to travel 170 miles long journey,

generally used for emergency charging. For supercharged owners, queuing at the

charging station incurs a waiting cost.The queuing cost of this part of the electric vehicles in the process of queuing is related to the average waiting time:

$$C_3(\alpha)=\sum_{i=1}^{h} w_{qi}\times r_i(\alpha)\times 24 \tag{12}$$

Among them, w_{qi} is the average value of waiting time for the electric vehicle supercharged at the i th charging station; ； $r_i(\alpha)$ is the number of EV's that are charged supercharged per hour to the i th charging station.

Charging station site is directly related to the charging station construction costs,therefore, the charging station site needs to meet the constraints under the premise of making the construction of the charging station as little as possible.

The charging station construction site model is:

$$\begin{cases} \min\left(length(N)\right) & \\ \min\left(d_{ij}\right)\le l & \forall i\in N, j\in M \\ \min\left(d_{im}\right)\le L/2 & \forall i,m\in N \end{cases} \tag{13}$$

L is electric car driving range; d_{ij} is the distance between any charging station construction node and non-charging station construction node; d_{im} is the distance between any two charging stations

Starting from a charge-load node, there are multiple paths to a charging station to choose from.Therefore it is necessary to calculate the shortest path between any charging node and the alternative charging station.With Floyd algorithm can be obtained.

4.3.2 Solve the model

After selecting the location of the charging station, calculate the area covered by the charging node served by each charging station according to the voronoi diagram.The final number of destination charging stations in the United States is roughly as follows:

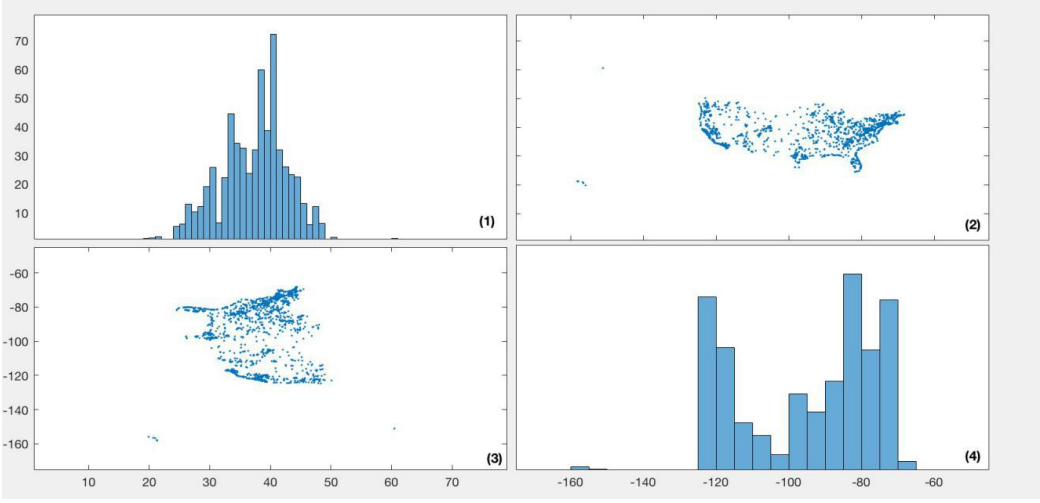

Figure 3

The number of super-charging stations in the United States is roughly as follows:

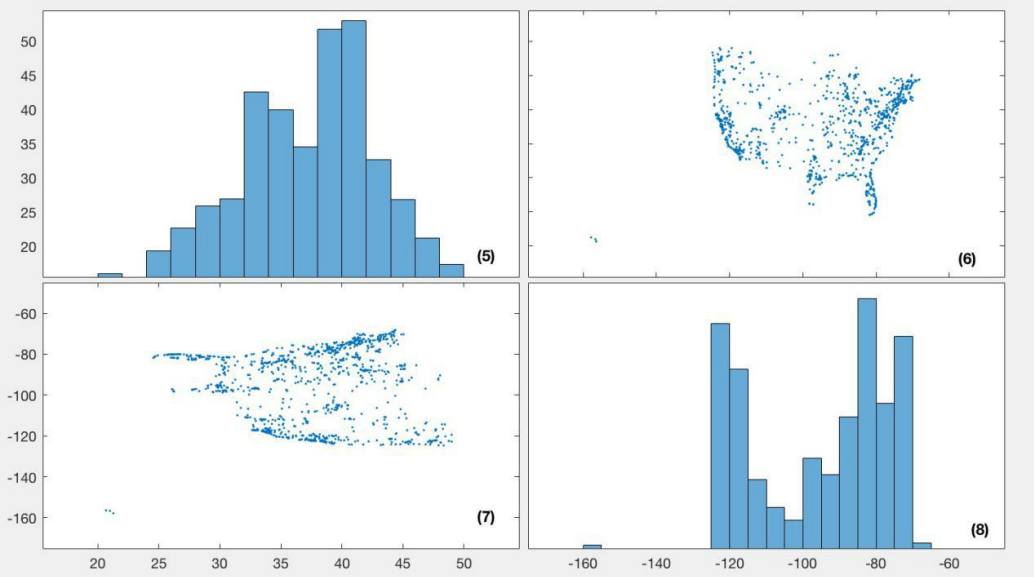

Figure 4

Combination of urban and rural areas in the United States map:

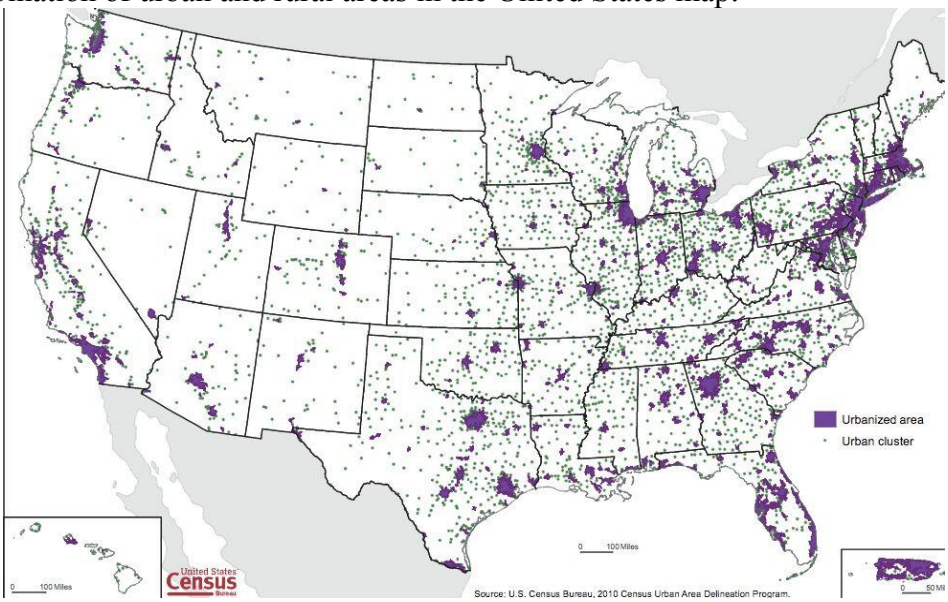

Figure 5

Obtain the percentage of these two types of charging posts in urban, suburban and rural areas, respectively:

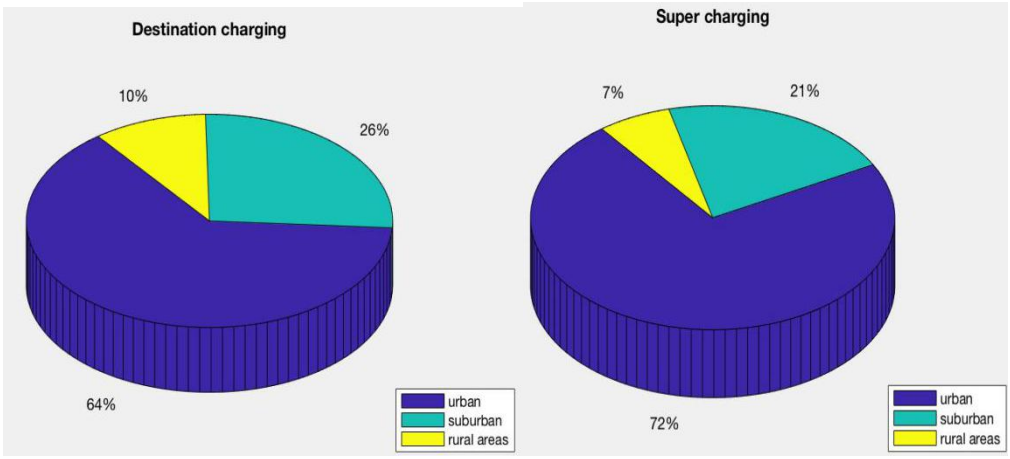

Figure 6

5 Irish'sfull electric conversion to achieve

5.1 The number of charging stations

Different countries have different numbers of EV charging stations, and the total demand for EV charging stations should meet the total demand of EVs in the region.The United States and Ireland are different in geographic area, population density distribution and wealth distribution, so the number of charging stations required for the popularization of all-electric vehicles is different.

The analysis of Ireland is as follows:

➢ Traffic conditions

Irish countries are too small to travel by plane. In addition, the Irish railway system is far from the rest of Europe due to its under-developed status, but at the same time, Ireland has a very developed road network and is therefore very good for the automotive industry.

➢ Economic status

Ireland's economy is small but well-developed.

➢ Urban-rural ratio

Ireland In addition to Dublin, Cork, Limerick, Waterford several major cities, the rest of the rest of the country can be regarded as rural.

The Irish data into the charging station demand total measurement model solution is as follows:The best number of charging piles in Ireland is about: 690,000.

Ireland's charging station distribution as shown:

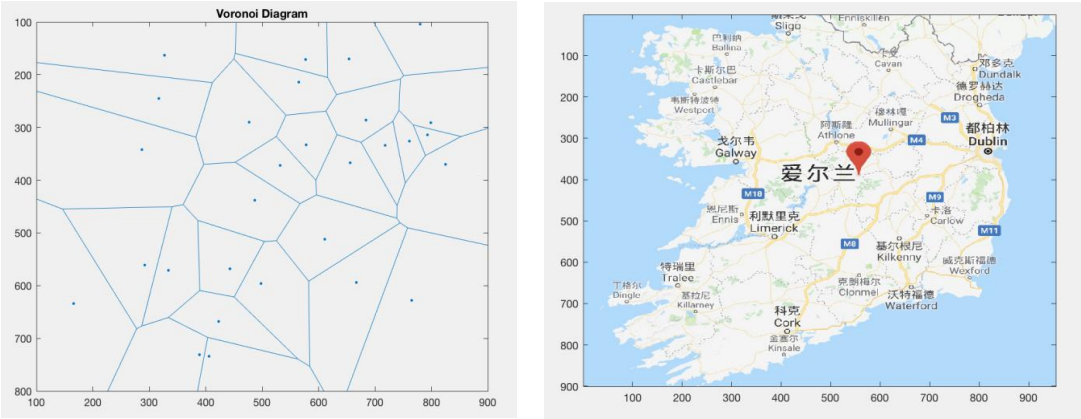

Figure 7

5.2 Distribution of the charging station

Use the coordinates of the charging station to mark on the map of Ireland and make a Voronoi diagram,Due to the point density, Voronoi plots only make charging stations with a high weight rating. There are also charging stations with low weight ratings around each charging station.The map is reduced to the size of the city is, the same reason can get the location of the charging station and do Voronoi map.

For example: Dublin, Ireland, a city charging station distribution as shown:

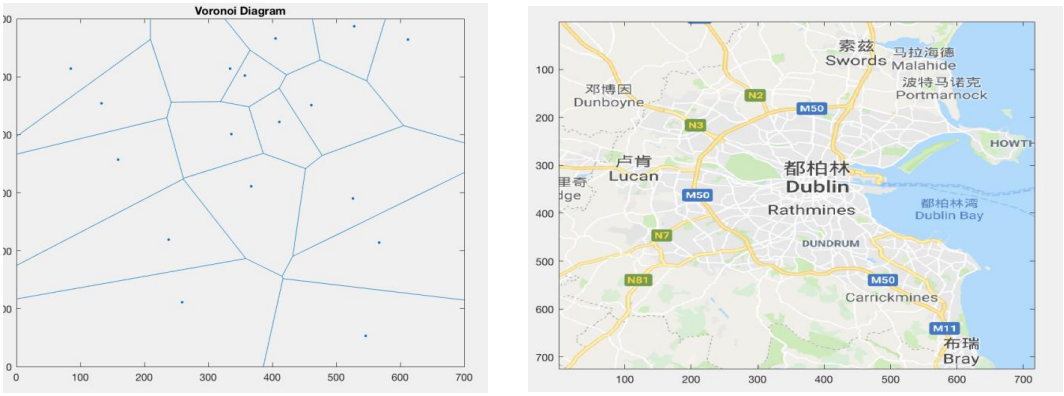

Figure 8

It can be seen that the charging stations are mainly distributed in the northeast of Ireland, and are concentrated in the capital and its urban circle of Ireland. However, cities with low density and low population density in the southwest of the northwest are rarely distributed.In addition, charging stations are mainly distributed along major traffic routes in Ireland, with more northeast and less southwest.

5.3 The key factors affecting the conversion

5.3.1 The establishment of comprehensive evaluation index system

Now according to the specific situation of electric vehicle charging station, consider the factors that affect the location and use it to establish the initial evaluation index system.,In this selection Delphi method.

It is assumed that there are M indicators at a certain level in this initial evaluation index system, and N experts select this index and divide the indicator into H levels according to the degree of importance.Expert opinion concentration and dispersion respectively expressed as $\bar{E}_i$, σ_i , respectively, using the weighted average method and standard deviation calculation:

$$\tilde{E} = \frac{1}{N}\sum_{i=1}^{H} n_{ij} \cdot E_j \qquad i = 1,2,...,M$$

$$\sigma_i = \sqrt{\frac{1}{N}\sum_{j=1}^{H} n_{ij}\left(\tilde{E}_i - E_j\right)^2} \qquad i = 1,2,...,M \tag{14}$$

Among them, ， E_j is the grade Jlevel of importance value; n_{ij} is the number of experts who rate the i-th indicator as tne j-th level.

5.3.2 determine the weight of evaluation index

In the above comprehensive evaluation index system, each index has different degrees of importance. When determining the weight of each index, it should be based on its corresponding contribution to the target size.Taking into account the characteristics of charging station site selection, use AHP method to determine the weight of each indicator.

After calculating the relative weight, we use AHP combined weight calculation method to get the combined weight of the lowest level element and the top level factor.

6 Suggestions on Ireland's development

The well-developed road network in Ireland is conducive to the development of the automotive industry; most of the required energy needs to be imported, so the trend of growth in the number of such vehicles tends to be flat when the all-electric vehicle is first introduced into the country, and over time , People will gradually find the advantages of all-electric vehicles and from the perspective of saving energy and protecting the environment, people will also encourage people to shift from fuel-

consuming cars to full-electric vehicles. During this period, the domestic all-electric vehicles The number will grow rapidly;When a certain period of time, the number of electric vehicles will grow very slowly or no longer continue to grow.

We assume that there will be no new green energy in the future. Based on the data of previous years and the model of total demand of charging stations, we predict the future conversion from Ireland to EV. The results are as follows:

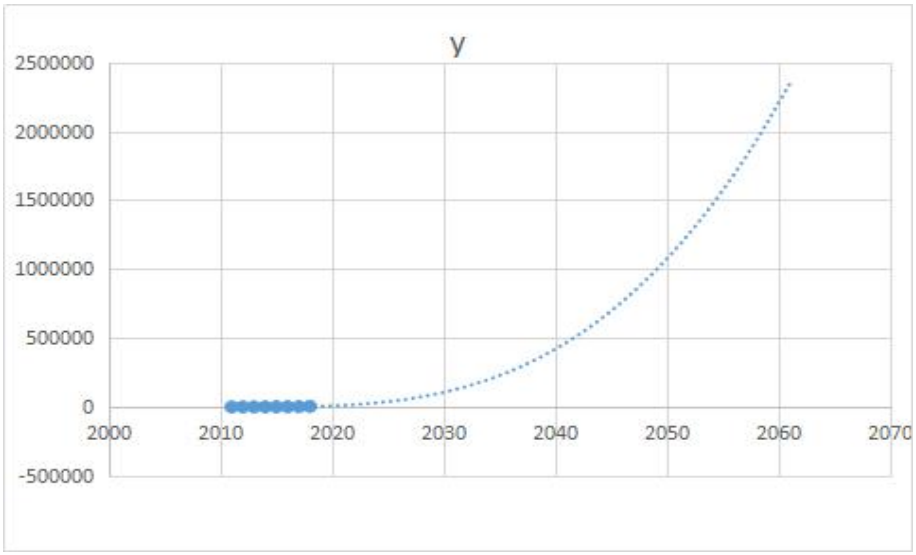

Figure 9

Access to information Ireland has a population of about 4.77 million, with a car ownership of 513 per thousand. According to our projected development plan, the timetable for the country's complete conversion to electric vehicles is as follows:

Proportion of EVs	10%	30%	50%	100%
Number of EVs	244701	734103	122350	2447010
Forecast time	2035	2045	2050	2060

Table 2

7 Development of different countries charging network

The following uses the (principal component) based (fuzzy) cluster analysis to classify Australia, China, Indonesia, Saudi Arabia and Singapore in order to provide a reference for the value of a in different countries.The same type of countries to establish a charging station, the value should be the same or similar.

Because the value of α is not only related to the regional traffic level but also related to the regional economic level,In the regional division of the value of the country α the index of per capita GDP, population, ownership of civilian vehicles and road area density are selected to reflect the regional socio-economic and transportation development level[7].

The statistics of evaluation indicators reflecting the level of socio-economic and traffic development in 2017 are shown in the following table:

Factor / Country	GDP percapital (USD)	Population (millions)	Civilian car ownership(10 million)	Road density
Australia	56135.42	24.764	1.67	0.11
China	8582.94	1390.85	20	0.36
Indonesia	3858.69	261.989	2	0.20
Saudi Arabia	20957.21	32.377	0.4	0.10
Singapore	53880.13	5.675	0.06	1.7168

Table 3

Note: Road density means km of road per 100 sq.km of land area

Using fuzzy clustering analysis method, ,The fuzzy similarity matrix is as follows：R=

1.0000	0.7030	0.8757	0.9252	0.8869
0.7030	1.0000	0.8093	0.7639	0.6294
0.8757	0.8093	1.0000	0.9365	0.7823
0.9252	0.7639	0.9365	1.0000	0.8334
0.8869	0.6294	0.7823	0.8334	1.0000

When the classification coefficient k = 0.8093， the final dendrogram of clustering process, as shown in Figure (10).

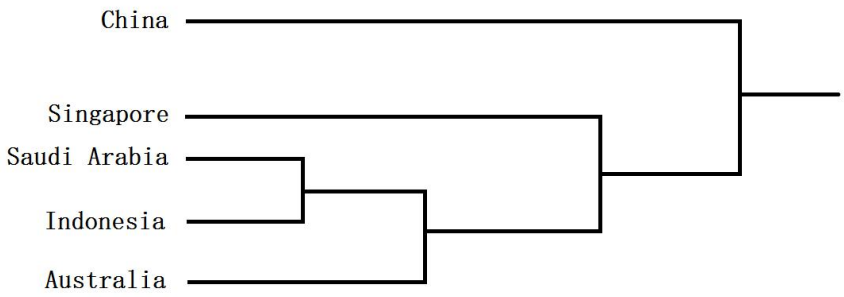

Figure 10

It can be seen from the dendrogram that the clustering result is divided into three categories, so a vertical bar is used to disconnect only 3 horizontal bars in the graph. After disconnection, it is still connected to a class, the clustering results shown in Table (4).

Classification	Category 1	Category 2	Category 3
Country	Singapore	China	Saudi Arabia Indonesia Australia
Features	Highway traffic economy developed (Mostly developed countries)	Highway traffic economy is medium developed (Mostly for developing countries)	Highway traffic economy developed (Special geographical environment)
α	Smaller	Moderate	Larger

Table 4

8. Analysis of the growing popularity of electric vehicles

As a typical high-tech product integrating machinery, electronics, energy, high-tech computers and automobiles, the electric car industry will eventually achieve its goals of intelligence, digitization and light weight. As the technology continues to evolve, it will be qualified leap.With the global energy crisis and environmental issues have become increasingly prominent, all countries in the world are currently developing electric vehicles as a new direction for future automobiles. The main obstacles to the development of electric vehicles are as follows:

1.battery technology

Power battery is the source of electric vehicle power is to restrict the

development of electric vehicle industry, one of the key factors,Its technological breakthrough has played a decisive role in the overall development of the electric vehicle industry.Battery energy density is too low, the battery pack is too small, too small capacity will affect the performance of electric vehicles, thereby affecting its development.

2.motor drive and control technology

Electric vehicle drive motor is one of the key components of electric vehicles, only the electric vehicle can provide a good drive system to make electric vehicles have good performance.

3.electric vehicle technology and energy management technology

In addition to batteries and engines, electric car bodies and energy management systems can also affect their performance.

The development of an industry will show a certain amount of laws and trends, the laws and trends that can well guide the industry's existing development models and methods.The following will be from the electric car industry's key technologies, economy, development environment and the technical foresight of its supporting industries to analyze the popularity of electric vehicles.

Currently, the technology world is constantly changing and car sharing and sharing services are affected. Traffic modes such as autonomous vehicles, EVs, flying cars and super loops are starting to emerge. The development of these technologies means that the electric.

9 Analysis

9.1Strengths

1. Voronoi diagram and charging station layout has a similar mathematical characteristics,can be used to divide the charging station service area.
2. The establishment of a comprehensive evaluation index system to analyze the factors that affect the promotion of electric vehicles.
3. Floyd algorithm to determine the shortest distance between the two charging stations to establish the optimal distribution model charging station

9.2Weaknesses

1. The voronoi diagram is a local optimality of the region divided by a given growth point, lacking the ability of global optimization[9];
2. Floyd algorithm complexity is high, not suitable for computing large amounts of data;
3. When the sample size is large, it is difficult to get clustering conclusions by fuzzy clustering analysis.

10 Conclusion

1. America's existing charging network allow a complete switch to all-electric .
2. If everyone switched to all-electric personal passenger vehicles in the US, the best number of charging pile will reach more than 30 million;

3. If everyone switched to all-electric personal passenger vehicles in the US, the number of charging stations in urban, rural, suburban distribution ratio is about 7: 2: 1;
4. If everyone in Ireland converted to electric personal car,4. The best charging pile number will reach 690,000;
5. It is estimated that the share of all electric vehicles will reach 10% by 2035, that of all-electric vehicles will reach 30% by 2045, that of all-electric vehicles will reach 50% by 2050, and that of 2060 all-electric vehicles will approach 100%;

11 References

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Handout

The energy market is reminding us to think about the future of energy supply as soon as possible. So, every economy in the world has some responsibility. However, each economy needs to have a valid and effective program that meets its own national conditions. In this regard, we put forward the following suggestions on the transition plan from the oil time to the electric time:

1. Locate the country

First of all, the implementation of electric vehicles will require the construction of a charging station that meets the needs of the owners of electric vehicles. According to their national conditions, the average total cost of building charging stations in each region is predicted

2 .regional positioning classification

According to the same method of positioning the above classification to determine the details of each region within the country charging station construction program.

3. Construction of charging stations need to consider the key factors:

- charging time and charging capacity

The charging electric vehicles should be based on different car charging needs, reasonable arrangements for charging stations, reduce the delay of electric vehicles charging queuing, improve social and economic benefits.

- set the spacing

Charging stations should be installed near large public parking lots;In the planning of urban construction land, the main entrances and exits of cities and the traffic along the road with a particularly large traffic flow, the charging stations shall be arranged at a relatively close spacing and conform to the charging requirements of electric vehicles inside the city;Along the road between urban and rural areas, the spacing between charging stations should be relatively sparse, in line with the requirements of the electric car charging at the junction of urban and rural areas.

4. Analysis of the specific circumstances of the existing electric car charging station

According to the specific circumstances of the existing electric vehicle charging station, need to consider the factors that affect the location and use it to establish the initial evaluation index system.

5.Analysis of the trend of the number of electric vehicles

Analyzing trends in the number of EVs in recent years and forecasting the number of EVs in the future, the point at which the quantity in the trend chart begins to flatten can be set as the Gas Vehicle Ban Date. Because at this time the car has basically reached the maximum number and the basic no longer increase, but also shows that the number of people using gas vehicles has dropped to the minimum can not be the basic decline in the past.