



EV 3.0

A Design-driven Integrated Innovation on Rapid Charging Model BEV Mobility

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A collaborative research between

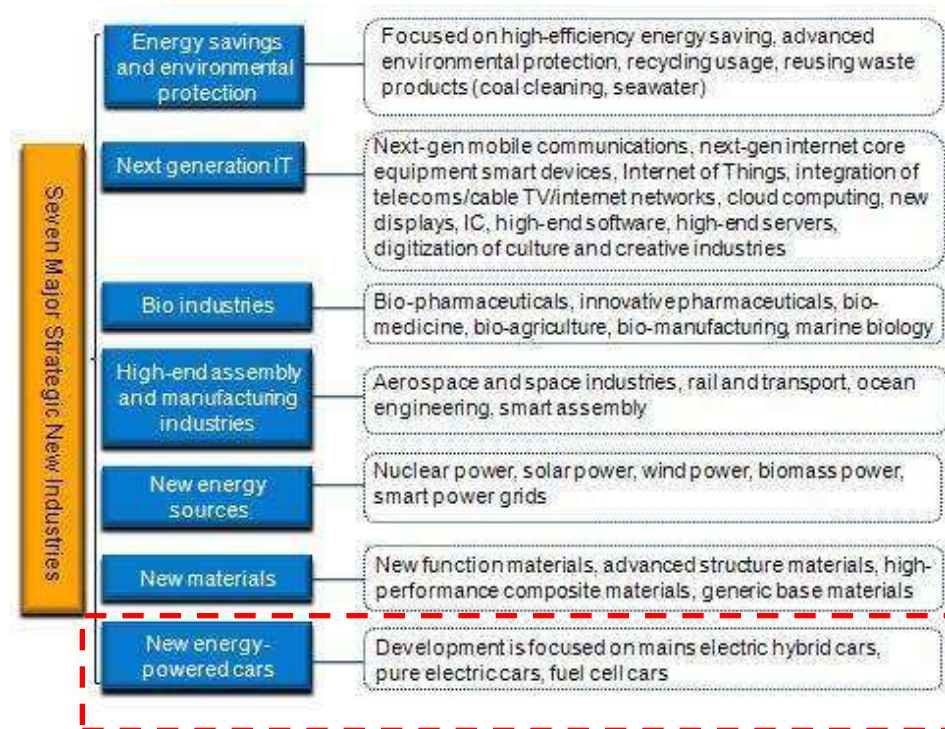
DESIS Lab
Jiangnan University

DESIS Lab, Jiangnan
University



Jiangsu Duke New Energy
Automobile Co., Ltd

Since 2012



Source: China State Council, compiled by Digitimes Research, January 2011

new energy vehicle was defined as one of seven strategic emerging industries (2010)

• Home / Business / Motoring

China mulls timetable to ban fossil fuel vehicles

Xinhua | Updated: 2017-09-11 17:32



http://www.chinadaily.com.cn/business/motoring/2017-09/11/content_31857842.htm

Xin Guobin, China's vice-minister of industry and information technology disclosed that the country had started research on a timetable to phase out production and sales of fossil fuel cars

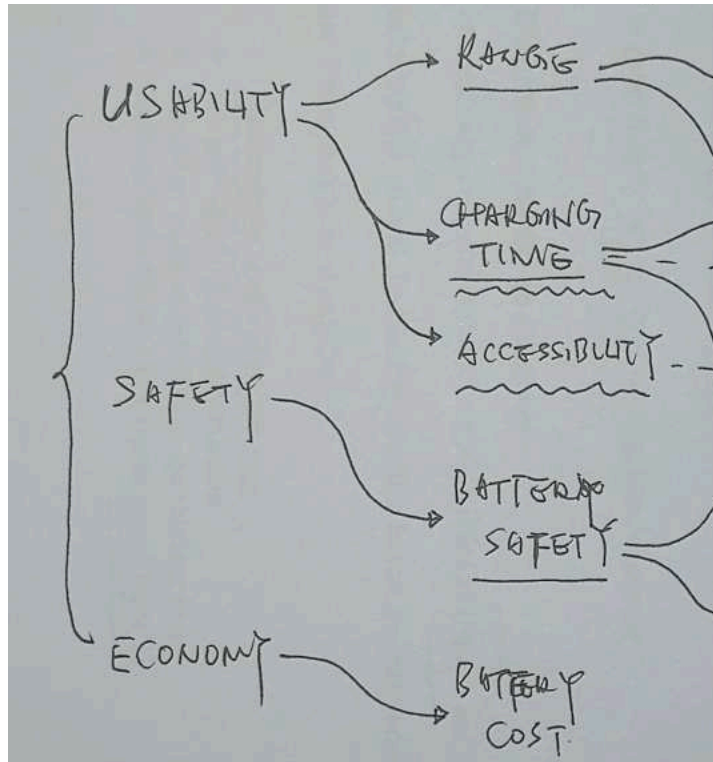
An observation: EV industry hasn't been prepared well for mass market without a completely valid solution.

User-Centered Perspective

Usability

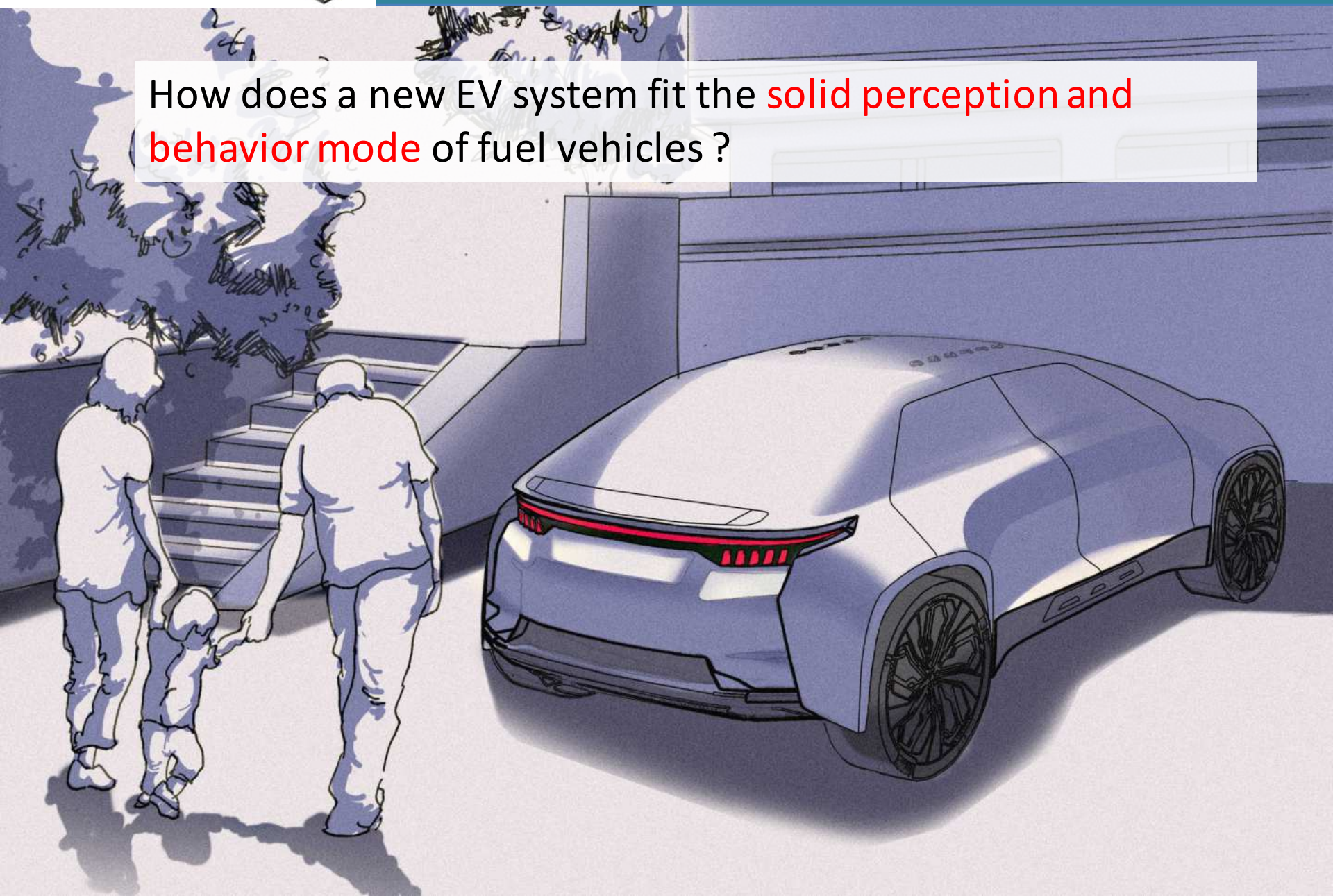
Safety

Economy



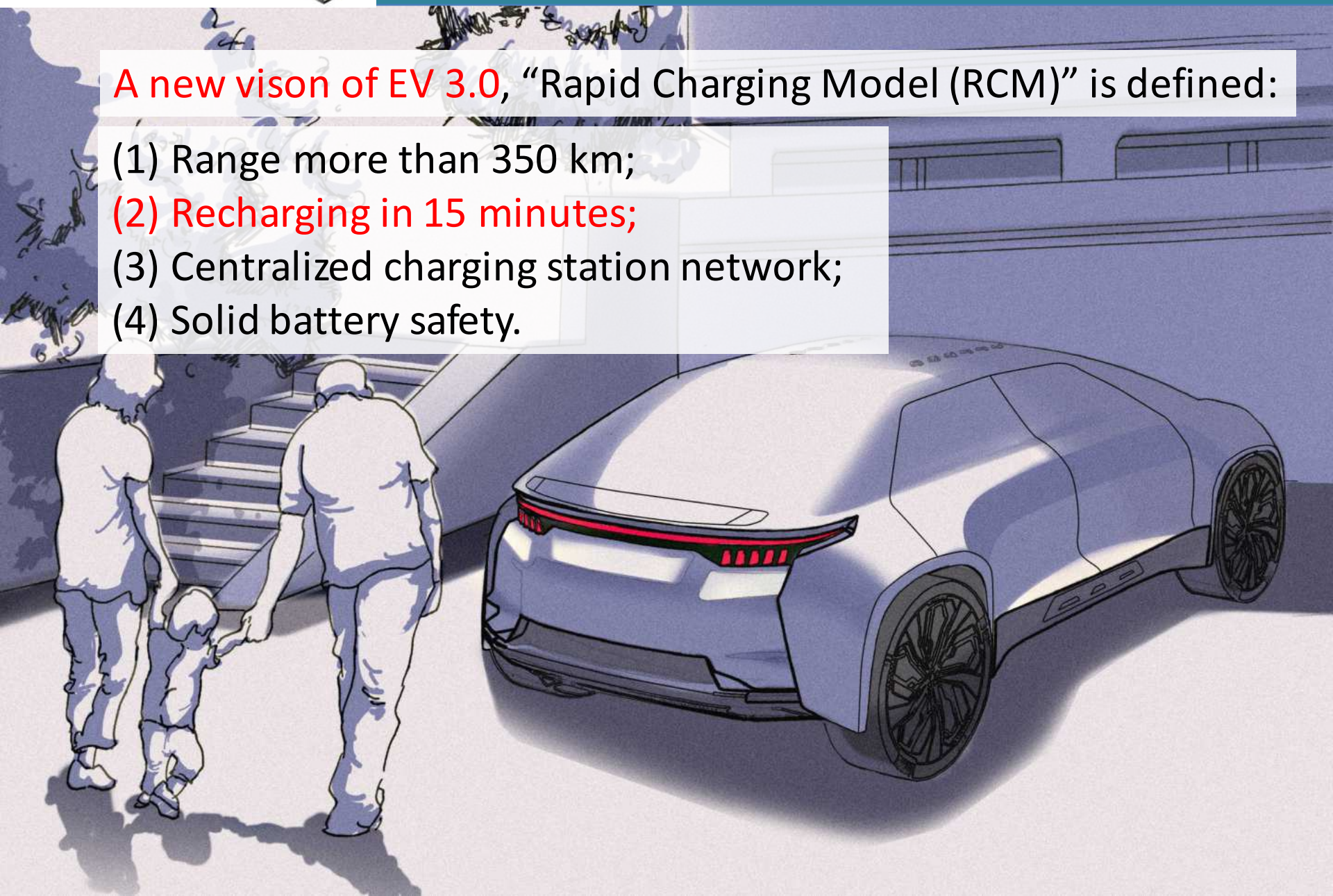
User-Centered Perspective

How does a new EV system fit the **solid perception and behavior mode** of fuel vehicles ?



A new vision of EV 3.0, “Rapid Charging Model (RCM)” is defined:

- (1) Range more than 350 km;
- (2) Recharging in 15 minutes;
- (3) Centralized charging station network;
- (4) Solid battery safety.



Scenario of multiple charging system



super-charging station



Mobile-charging station



Normal plug-in stand



快速充电站设计 Q-Charge

BACKGROUND

在电动汽车被大力推广的情况下，现有充电过程耗时太长，充电基础设施不完善。
At present, the charging car was vigorously promoted, but the existing charging process costs too much time and charging infrastructure is imperfect.

PROBLEM STATEMENT

目前，充电站的规模、分布、布局与用户的需求不匹配。并且，司机也不能高效地找到充电站。
At present, the scale, distribution and space layout of charging stations aren't uniformed with users' needs, and drivers can't find charging station efficiently.

DESIGN OPPORTUNITY

如何给公众提供有效的充电服务，让充电像加油一样方便、快捷？

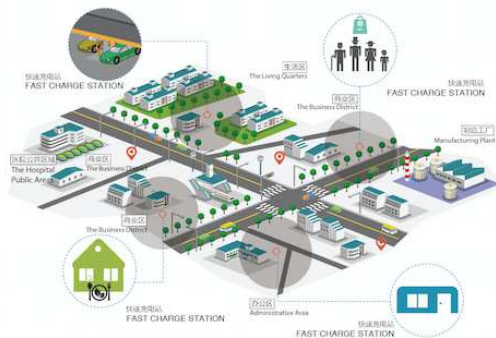
How to provide effective charging service for the public to make charging as convenient as fuel?

SERVICE IDEA

基于EV3.0快充技术，通过集中式超级充电站提供智能化、安全、高效的充电服务。

Based on EV3.0 fast charging technology, to provide intelligent charging, safe and efficient service through the centralized super charging stations.

SITE SELECTION



充电站选址：
SITE SELECTION:

- 1.生活区：结合现在已存在的慢充，充电站的数量适当减少。
1. We should be appropriate to reduce the number of charging stations because the slow charges exist in living area and workspace.
- 2.商业区：快速充电站吸引用户充电，带动周边消费，为投资商提供机会，形成产业链。
2. Commercial fast-charge stations attract EV owners to retail locations and provide advertising opportunities and other value chains to station operators.
- 3.充电站的分布与电动车的交通密度和充电需求的分布尽可能一致。
3. The distribution of the charging station should be the same as the local traffic density and charge needs.
- 4.充电站分布在城市道路两旁，但要避开主要道路，靠近主路。
4. The charging station located in the city roads, but to avoid the main roads.

SCENARIO



ELEX



问题陈述：建造充电桩技术的局限性与信息传播的不流通导致了难以让人满意的实际体验，用户已习惯开汽油车以及他们在充电站缺乏更好情感体验使人们不能轻易接受驾驶电动车。

挑战：充电设施完善前，如何匹配行车范围与充电范围？

背景：充电基础设施的建设和用户的购车相互牵制，导致电动车充电系统不完善，给用户的出行带来了不便。

服务理念：基于EV3.0快充技术，以移动充电车为载体，为用户主提供实时定点和不定时的快充服务，来满足用户充电的基本需求。

ELETRICITY+EXPRESS

Problem statement: the limited technology of building charging point and the obstruction of information flow can cause disatisfied intellectual and practical experiences, the habit of driving gas cars and negative emotional experiences in charging station, cause people cannot receive driving EV easily.

Background: the establishment of charging facilities is disadvanced which leads to the defect of charging system. It leads to various kinds of inconvenience when traveling. Before the fixed charging system establishes completely, how to make the charging service fit for people's travel? Based on the EV3.0 quick charging tech, our mobility charging system is realized by mobile charging cars. The system provides real-time charging with fitted charging point service and the any-time charging sevice with charging cars to satisfy the requirement of EV charging.



住在同一个小区，或是在相同停车场停车的上班族，可以选择团购充电服务，在APP上找到最符合自己停车习惯的停车场并选择团购下单，充电车将会在您停车在该停车场且电量低于50%时充电。

People who live in the same community or work in the same business hall which can park their cars in same place can choose the group buying charging service. Choose a parking place where you are used to park and make the group buying order. Mobile charging car will charge for your car when its electricity below 50% and it is in the parking place you choose.



如果剩余的电量无法让你到达最近的充电站，你可以选择呼叫附近的充电车。后台将会自动匹配离你最近的充电车并提供司机的电话号码以便联系。

If the electricity can't ensure you to go to the nearest charging station, you can find a mobile charging car nearby. The background will find the nearest charging car for you and provide you the driver's number to make you keep in touch.



当电动车电量低于30%时app会发出提醒，应用会自动显示出离你最近的几个移动充电车站点的位置，并根据充电站的车数与充电车数为你推荐最优。去充电吧。

The app will remind you to charge if the electricity under 30%. The app will show you the charging station nearby. Background will choose the best station because every station has different number of charging cars and users. Then go to charge.



SYSTEM MAP

STORY BOARD + SCENARIO





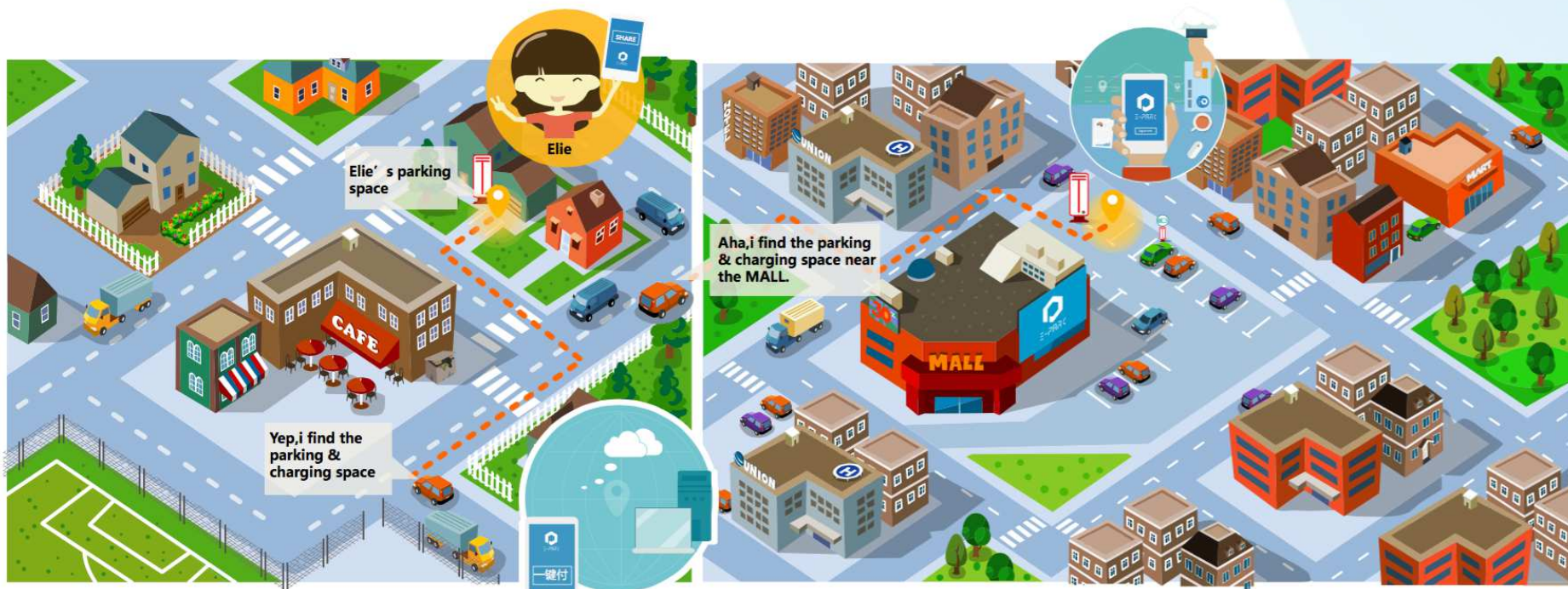
易趴，享趴就趴

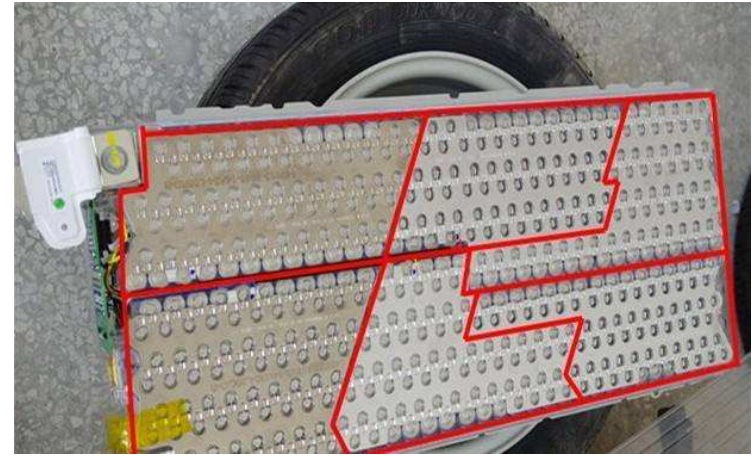
E-Park, share wider, park easier

目前，城市停充系统不完善，导致车主的停充体验不佳；并且公私停充资源利用率低。我们利用车联网技术与EV3.0，考虑时间、电量与位置三大变量，整合公私停充系统，致力于为车主提供最优的停充服务。At present, the city parking system is imperfect, leading to the bad experience of parking and charging (PC) as

well as the low usage of public and private parking and charging resources. We devoted to offer optimal PC service based on the technique of the IOV and EV3.0, considering parking time, electricity, and location factors, and integrating private and public PC system.

场景 SCENARIO



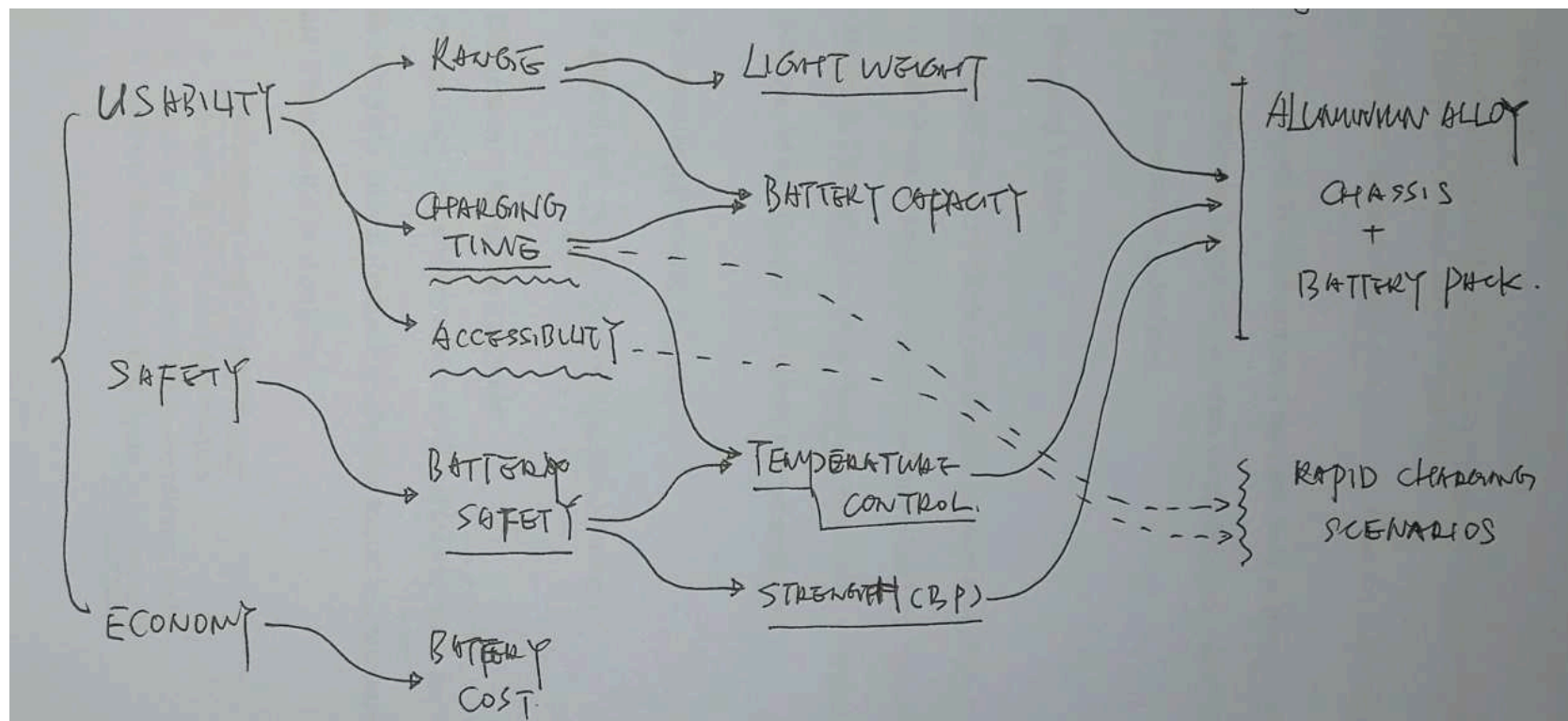


- Learning from the leading case
- 18650 battery
 - temperature control + BMS
 - aluminum alloy

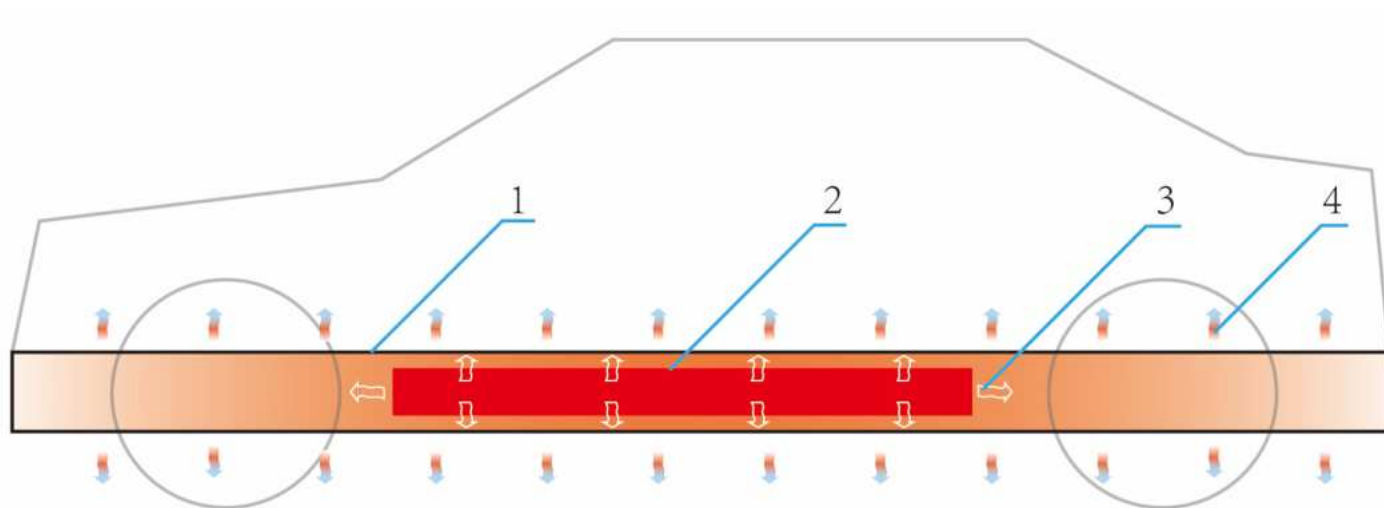
User Aspects

Key factors

Design Strategies

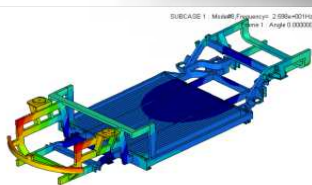
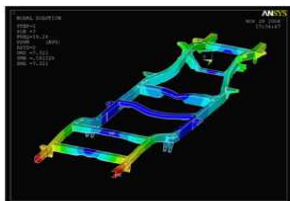


passive heat balance system of super chassis platform



1 Chassis ; 2 Battery Pack ; 3 heat conduction ; 4 heat emission

A super chassis platform with integrated battery pack



iteration of design and prototyping







tested in the National Center of Supervision and Inspection on New Energy Motor Vehicle Products Quality (www.smvic.com.cn) in Shanghai in 2014.

Report NO.: SW1500033N000

Test Report

Range and energy consumption of electric car

Sample Name: Pure electric carsSample Model: Gongjue EV 3.0Customer: Jiangsu Gongjue New Energy Car Co., LTD.Issued Date: 2015.4.10

Shanghai Motor Vehicle Inspection Center

National Center of Supervision and Inspection on New Energy Motor
Vehicle Product Quality**Test Report**

New Energy Motor Vehicle Product Quality

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1. Test instructions

According to the entrust between Jiangsu Gongjue New Energy Car Co., LTD. and SMVIC, the test is conducted as 80km/h speed method on the drum to provide the test data.

2. Test data

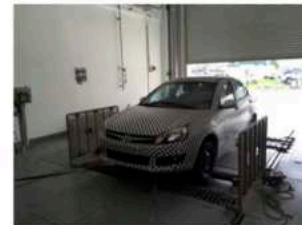
Test program	Test result	Remark
Driving distance(km)	431	80km/h speed method
Charging Quantity(kwh)	65.2	Charging time: 15min
Energy Consumption(Wh/km)	151.28	-

3. Test time and location

2015.4.9. In SMVIC

4. Sample data

Vehicle type	M1
Motor model and manufactory	JEEMC01002B Juyi Company
Curb weight (kg)	1750
Max weight (kg)	2010
Motor type	Permanent magnet synchronous
Motor position and arrangement	Front arrangement and front drive
Power rating and the corresponding rotational speed	13kw /3000rpm
Battery model and manufactory	18650/Gongjue
Battery type	The ternary lithium battery
Battery voltage/capacity (V/Ah)	370V /179.8Ah
Number of shaft	2
Tire model	175/65 R14

5. Test photo

the time of a full charge is reduced to **15** minutes, and it allows **430** km range of use in the speed of **80**km/h.

The research strongly depends on the **partnership and trust** between DESIS Lab and Duke as a jointed core team.

The Desis lab is mainly focus on **research and strategic design**, particularly on trend analysis, vision setting, integrating routine; Duke is mainly focus on **technical realizing and prototyping**.

Being a radical and open innovation, it is a long term investigation with high uncertainty and low control of objective.

EV is **discontinuation** of traditional vehicle, therefore, which calls for **new culture** and organization of design and innovation.

Although the entire outcome appears more like a technological innovation, while this radical innovation is leaded or driven by design research and strategy.

So it's a **design-driven integrated innovation**, in which design principles, approaches and strategic creativities is applied and play a key role in this technological innovation.

A Chinese vision of BEV

Leading Infrastructure (Ultra-high voltage power transmission technology)

Full industrial Chain of EV

Valid Product and user experience (e.g. **EV3.0**)

Large scale of Domestic Market



Thanks !

jointed R&D Team of EV 3.0 (DESIS lab + DUKE)

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