Introduction of China electric vehicle standardization work

National Technical Committee of Auto Standardization
Automotive Standardization Research Institute, China Automotive Technology and Research Center

Zhou Rong
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1. Status of China’s electric vehicle standards
2. Comparison and interface with international standards
3. Work plan for the future
1. Standardization committees of electric vehicle

TC114 National technical committee of auto standardization
CEC China electricity council
TC26 Rotary machine
TC67 Electrical accessories
TC69 Lead-acid battery
TC77 Alkaline battery
TC243 Nonferrous metals
TC247 Auto repair
TC309 Hydrogen
TC342 Fuel cell
TC457 Battery materials

Traction battery system
TC114 TC67
TC77 TC242
TC343 TC309
TC342 TC457

Electric machine system
TC114 TC26

Control system
TC114 TC26

Infrastructure
TC114 CEC
TC67 TC309
TC342
2. Standard system of China electric vehicle

- 2.1 Whole vehicle standards
  - 2.1.1 Electric vehicle standards
  - 2.1.2 Hybrid vehicle standards
  - 2.1.3 Fuel cell vehicle standards

- 2.2 Key systems and components standards
  - 2.2.1 Rechargeable energy storage system standards
  - 2.2.2 Electric machine system standards
  - 2.2.3 Hybrid powertrain standards
  - 2.2.4 Electric assist device standards
  - 2.2.6 Fuel cell vehicle-specific components standards

- 2.3 Infrastructure standards
  - 2.3.1 Charging infrastructure standards
  - 2.3.2 Hydrogenation facility standards

- 2.4 Basic and general standards
  - 2.4.1 Terminology standards
  - 2.4.2 Identity Standards
  - 2.4.3 Interchangeability Standards
  - 2.4.4 Electric vehicle classification and characteristics standards
  - 2.4.5 Electric vehicle driving cycle standards
3. Released standards of electric vehicle in China

Since “Ninth Five Years Plan”, national technical committee of auto standardization (NTCAS) have organized and drafted 46 electric vehicle standards (33 national standards and 13 automotive industry standards) which have been approved and released by standardization authorities.

There are 4 standards which are equivalent to international standards; 16 standards were developed by referring the international standards; 26 standards were self-developed.
4. Under developing electric vehicle standards

- 15 standards are waiting approval (Including 2 revision standards);
- 17 standards are planning to develop and revise (Including 4 revision standards);
- 35 standards under preliminary study even without standards development plan;
- After research and discussion, 200 standards will be developed and revised to meet the electric vehicle research, industrialization, demonstration operation and government management in the next four years.

This electric vehicle standard system is the world's most extensive coverage, the largest number of electric vehicle standards.
5. Application of electric vehicle standards

- Since the first standards of electric vehicle had been released at 2001, it become the basis and technical support for the project application and evaluation, such as state 863 program, and it also technically support the electric vehicle technology innovation, demonstration operation, such as Shanghai Expo;

- The released “Renewable energy automotive manufacture and product access management” by Ministry of Industry and Information Technology (MIIT) at June, 2009 describe that electric vehicle must meet existing conventional test items and specific standards;

- 26 electric vehicle testing standards including national and industry standards were drafted by electric vehicle technical subcommittee of NTCAS, more than 350 varieties of electric vehicle on the announcement;

- Electric vehicle standards take an import role in electric vehicle industry, manufacture and product access, allowance of private purchase, etc.
6. Introduction of electric vehicle subcommittee

- Founded by NTCAS at 1998, secretariat is located at CATARC;
- Guided by SAC and MIIT;
- Interface with ISO/TC22/SC21 and IEC/TC69;
- Responsible for national electric vehicle standardization.
6. Introduction of electric vehicle subcommittee

37 committee members and 6 observers from electric vehicle manufacture, traction battery company, electric machine company, electric motorcycle company, inspection institute, university and research institute, etc.
Outline

1. Status of China’s electric vehicle standards
2. Comparison and interface with international standards
3. Work plan for the future
## 1. Comparison with international standard

<table>
<thead>
<tr>
<th>Type</th>
<th>China (46)</th>
<th>ISO (13)</th>
<th>IEC (9)</th>
<th>SAE (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Whole vehicle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric vehicle</td>
<td>12</td>
<td>5</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Hybrid vehicle</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fuel cell vehicle</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Electric motorcycle</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>General standard</strong></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Key components standard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traction battery</td>
<td>7</td>
<td>0</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Electric machine and controller</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>
2. Status of international standards

IEC

TC23/SC23H
TC21

TC69 (WG2 WG4)

ISO

TC22/SC21 (WG 1 WG 2)

ISO TC22/SC3

JWG (ISO TC22/SC3, IEC/TC69) V2G

Electric vehicle
2. Status of international standards

ISO/TC22/SC21
- 13 standards released
- 4 standards under development

IEC/TC69
- 9 standards released
- 11 standards under development
- 6 standards plan to revise
2. Status of international standards

- Hybrid vehicle standard committee
- Battery standard committee
- Fuel cell vehicle standard committee
- Light duty vehicle performance and economy measurement committee
- Hybrid truck and electric vehicle committee
- Pedestrian traffic noise committee
3. Standards with international influence-example

GB/T Connection set of conductive charging for electric vehicle
Part 1 General requirements—corresponding to IEC 62196-1
Part 2 AC charge coupler—corresponding to IEC 62196-2
Part 3 DC charge coupler—corresponding to IEC 62196-3

Note:
● The charge coupler standard system of GB and IEC is same;
● It is nearly the same time for GB and IEC to carry out the research work of charge coupler, however, GB is more faster than IEC. 3 standards of charge coupler already have been reported to authority for approval in China.
Part 1 The general requirements of GB/T and IEC is basically same.

- The requirements of charge coupler at structure, safety, environment and ingress protection are described in detailed;
- GB/T filled the emptiness for DC charge coupler at breaking capacity test;
- It is more clear for the requirements of GB/T at operation life and force, etc. The test method is more feasible.
### 3. Standards with international influence-example

#### Part 2 AC charge coupler

<table>
<thead>
<tr>
<th>Phase</th>
<th>Circuit</th>
<th>Voltage</th>
<th>PIN and lock</th>
<th>Interface type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>16/32A</td>
<td>220V</td>
<td>Mechanical + electronic lock</td>
<td><img src="image1" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>32A/80A</td>
<td>≤250V</td>
<td>5</td>
<td><img src="image2" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>70A</td>
<td>≤480V</td>
<td>7</td>
<td><img src="image3" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>63A</td>
<td></td>
<td>7</td>
<td><img src="image4" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>16A</td>
<td>250V</td>
<td>4</td>
<td><img src="image5" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>32A</td>
<td>250V</td>
<td>5</td>
<td><img src="image6" alt="Interface type" /></td>
</tr>
<tr>
<td>Single</td>
<td>32A</td>
<td>500V</td>
<td>4</td>
<td><img src="image7" alt="Interface type" /></td>
</tr>
</tbody>
</table>

#### IEC 62196-2

<table>
<thead>
<tr>
<th>Type1 (Japan, US)</th>
<th>Type2 (Germany)</th>
<th>Type3 (Italy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-control guide</td>
<td>Double-control guide</td>
<td>Single-two</td>
</tr>
</tbody>
</table>

#### The characteristics of China AC charge coupler:
- Similar with type 2 of IEC, but with double lock protection;
- The standard progress and practical application are faster than IEC.
3. Standards with international influence-example

Part 3 DC charge coupler

<table>
<thead>
<tr>
<th>Parameter</th>
<th>China proposal</th>
<th>US proposal</th>
<th>Japan proposal</th>
<th>EU proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>PIN 9 7 10 (1 spare)</td>
<td>9 7</td>
<td>10 (1 spare) 9</td>
<td>9</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>750V/250A</td>
<td>600V/200A</td>
<td>600V/150A</td>
<td>850V/200A</td>
</tr>
<tr>
<td>Communication</td>
<td>CAN</td>
<td>PLC</td>
<td>CAN</td>
<td>PLC</td>
</tr>
<tr>
<td>Status</td>
<td>National standard for approval</td>
<td>Conceptual design</td>
<td>ChadeMo association Standard</td>
<td>Conceptual design</td>
</tr>
</tbody>
</table>

The characteristics of China DC charge coupler:
- Already submitted to IEC and under consideration;
- The range of rated value is more reasonable;
- DC special;
- CAN is popular in vehicle;
- Already became auto industry standard and will become national standard.
3. Standards with international influence-example

GB/T 24549-2009 Fuel cell vehicle safety requirements

- Safety of gaseous hydrogen, electricity, hydrogen, pressure vessel;
- Developed by China’s own technical innovation and experience;
- Benefit for China to develop fuel cell vehicle global technical regulation with UN;
- Provide support for fuel cell vehicle research and demonstration operation in China.
### 3. Standards with international influence-example

**QC/ T816-2009 hydrogen fueled vehicle technical specification**

- It is very important that hydrogen fueled vehicle ensure fuel cell vehicle operating conveniently before the infrastructure is ready;
- The first standard related hydrogen fueled vehicle in the world;
- Support from Tongji university.
3. Standards with international influence-example

GB/T Hydrogen fuel cell vehicle demonstration operation specification
GB/T Fuel cell vehicle demonstration operation facilities specification

- Safety, operation and management of vehicle and infrastructure
- This two standards are developed by China and could be a sample for other countries;
- Developed for Beijing Olympic games and Shanghai Expo
4. Interface with international standard

- Interface with WP29

- The revised version of ECE R100 “Technical requirement, test method and relevant provision for Electric vehicle” was approved by vote. The scope of this standard was extended from electric vehicle to other kinds of electric vehicle model.

  Some requirements of this standard is applied in GB/T 18388 and GB/T 19750.

- ECE R83, ECE R101, CAFÉ

  Some clauses are adopted by consumption and emission related standards, such as GB/T 18386, GB/T19753, GB/T19754, GB/T19755.
4. Interface with international standard

- Interface with IEC and ISO
  - Some clauses of IEC61254-1~4 and IEC61892-1~3 are quoted by battery related standards, such as QC/T 741 ~QC/T 744.
  - Some clauses of IEC62196-1 ~2 are cited by GB/T –xxxxx (electric vehicle charge coupler) which are under development, such as general requirements, AC charge coupler.
  - ISO 6469-1 ~ 3 are quoted by GB/T 18384.1 ~ 3 “Electric vehicle safety requirements”

Overall, China’s electric vehicle safety, consumption, emission, battery, charger and charger coupler related standards more or less referred to the standards of WP29, IEC and ISO.
Outline

1. Status of China’s electric vehicle standards
2. Comparison and interface with international standards
3. Work plan for the future
1. Strategy

1) **Goal**: Establish a scientific, systematic, open, orderly and adjustable renewable energy vehicle standard system; Fully meet the research, industrialization, commercialization and management and to become an important technical support for electric vehicle industry; Transform the large number of the latest achievements and advanced experience into the standards and show it to the world, get advantages at international standard activities.

2) **Measurements**:

- The strategy of standards development will be transformed from follower to leader;
- The technical route of standards development will be transformed from research to the joint of research and industrialization;
- The work emphasis of standards development will be on the coordination of enterprise, industry and national standard.
2. Work plan of standardization during twelfth five years plan

- First phase: Set up standard system scheme and develop urgent needed standards (Sep, 2010-Dec, 2011)

Key tasks: Set up standards system scheme by concentrating all the forces and develop some urgent needed standards (32 important standards) in order to cooperate with research project, industrialization, demonstration operation, subsidies of energy saving and private purchase.
2. Work plan of standardization during twelfth five years plan

- Second phase: implement the standard developing plan (Jan, 2012-Dec, 2013)

Key tasks: fully implement the standard developing plan and develop standards rapidly (26 important standards), basically change the asynchronous situation between standards and industrialization.

- Develop standards for some technical areas where without related standards;
- Coordinate the number of standard and requirement;
- Coordinate the standard with research, industrialization, demonstration operation.
2. Work plan of standardization during twelfth five years plan


  Key tasks: Optimize the standards plan for renewable energy vehicle and complete the planned standards (20~30 standards); to meet the requirements of research, industrialization, commercialization and management.
3. Work plan of electric vehicle committee this year

- Complete 11 standards: 3 standards have been submitted for review at June; 8 standards will be reviewed end of this year;

- Organize technical experts from China and Germany to discuss the passive safety of electric vehicle at the Frankfurt motor show and visit VW company (based on the cooperation framework between SAC and German ministry of economic);

- Oct 10~12, international symposium of electric vehicle standard at Xi’an;

- The standards review meeting will be hold end this year.
4. Cooperation and coordination with international standards this year

1) WP29

a) Actively involved in the activities of WP29/GRSP/ELSA and submit the proposal of electric vehicle crash;

b) Actively involved in the activities of fuel cell vehicle GTR drafting group;

c) Achieve active results at safety requirements of UN HFCV-GTR and complete the first phase draft.
set up work group and develop the standards of “Electric motorcycle terminology” and “Safety requirements of lithium-ion battery pack for electric motorcycle”;

Start the procedure of ISO standard application for “Safety requirements of frontal crash for electric vehicle” which is developed by China;

Involve in ISO standard development of “Lithium-ion battery size and safety requirements for electric vehicle” and put forward China’s proposal.
4. Cooperation and coordination with international standards this year

3) IEC

- Actively participate IEC62196-3 standard development and try to make China’s DC charge coupler standard become the part of IEC62196-3;

- Actively participate IEC “Traction battery size” standard development and put forward China’s proposal.
4. Cooperation and coordination with international standards this year

4) Recommend experts for IEC/ISO and strengthen the working relationship

IEC/TC69: Charge system (charge station, charger, protocol), e-machines, electric components

IEC/TC21/SC21A: Battery general specification

IEC/TC23/SC23H: Charge coupler

ISO/TC22/SC3: V2G protocol

ISO/TC22/SC2: EV performance, battery pack performance and safety

IEC/TC105: Fuel cell and hydrogen

TC or SC

WG

standard

PT 61851-23: DC charge station
PT 61851-24: DC protocol

IEC/WG4: IEC61851-21: Connection requirements
IEC61851-22: AC charge station

JWG Li: PNX21-735 Lithium ion battery size

JWG 69Li: IEC 62196-1: General requirements
IEC62196-2: AC charge coupler

JWG 69Pb-Ni

JWG1: ISO 15118 V2G

MT8: ISO 6469-3: Electric shock protection
ISO 8713: Terminals

WG2

WG4

JWG 69Li

JWG 69Pb-Ni

JWG1

MT8

WG1

WG2

WG3

PT 62196-3: DC charge coupler

ISO/WG1: ISO 6469-3: Safety requirements
NP PAS 16898: Dimensions

ISO/WG3: ISO 12405-3: Safety requirements
Thank you for listening!