



# TCS experience in Vehicle Electrification & Contribution to CHAdEMO technologies

DATE: 8-Feb-2019

**01** TATA Introduction and TCS-Auto overview

**02** TCS experience in Vehicle Electrification

**03** Contribution to CHAdeMO technologies

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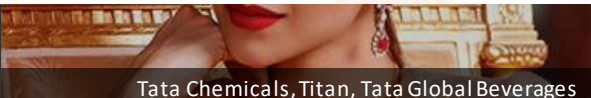

## One of the World's Largest Business Conglomerates






- ✓ Established 150 years ago (1868)
- ✓ 30 major companies across 10 verticals
- ✓ 700,000+ employees

- ✓ Revenues : USD110.7BN (FY2018\*)  
\*year ending March 31, 2018
- ✓ Operating in 100+ countries
- ✓ TCS is the group's largest member



### Major Group Companies

IT	 TCS
Steel	 Tata Steel
Automotive	 Tata Motors, Jaguar Land Rover
Consumer & Retail	 Tata Chemicals, Titan, Tata Global Beverages
Infra-structure	 Tata Power

Financial Services	 Tata Capital
Aerospace & Defense	 Tata Advanced Systems
Tourism & Travel	 Indian Hotels Company, The Taj
Telecom & Media	 Tata Communications
Trading & Investments	 Tata International

## 1.2 TCS at a Glance

**1968** Established (as a division of Tata Sons Limited)

**USD19.1B** Revenues in FY2018 \*1

**417,929** Head-count \*2

**151** Nationalities of employees \*2

**46** Countries \*2

**USD112.2B** Market Capitalization \*3

\*1 Year ended March, 2018

\*2 As of end December, 2018

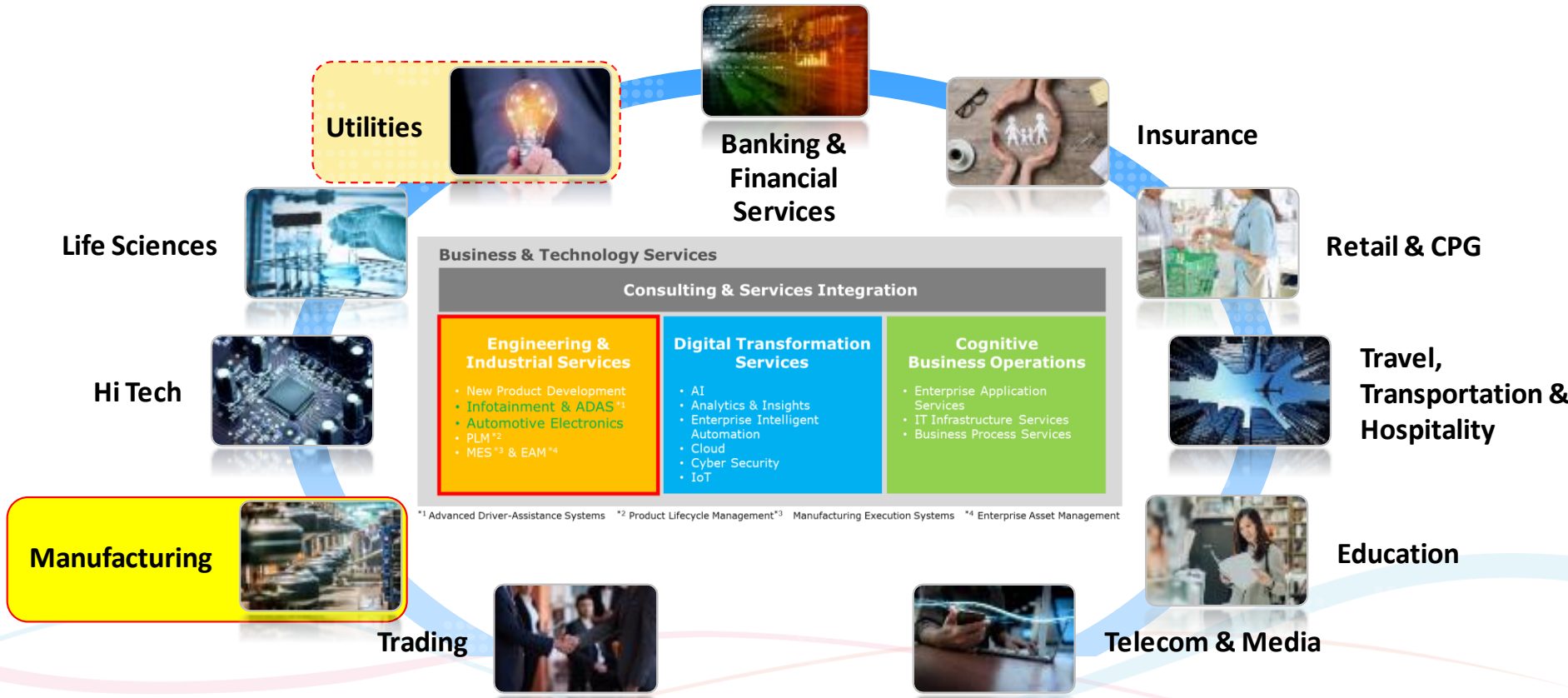
\*3 As of end August, 2018

**tcs 50**  
Experience energy



**BIG THREE**  
**in Brand Value**

# 1.3 Contextual Knowledge across Industries





# 1.5 車両エンジニアリング実績概要

## 各種車両アーキテクチャ実績



## 全システム及びサブシステムに対応



## 種類が異なる各プロジェクト

<ul style="list-style-type: none"> <li>車両プログラム開発支援：設計と開発</li> </ul>	<ul style="list-style-type: none"> <li>製品のローライゼーション</li> <li>最適化：費用、重量 &amp; 仕様</li> </ul>	<ul style="list-style-type: none"> <li>車両のライフサイクル管理（SOP後作業）</li> </ul>	<ul style="list-style-type: none"> <li>アドバンストエンジニアリング：新機能、軽量構造開発支援</li> </ul>	<ul style="list-style-type: none"> <li>車両の完全CAE</li> <li>安全性（衝突）</li> <li>NVH</li> <li>耐久性</li> <li>空気力学</li> </ul>	<ul style="list-style-type: none"> <li>パワートレイ CAE/CFD</li> <li>安全性（衝突）</li> <li>NVH</li> <li>耐久性</li> </ul>
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## 開始からSOPまでの作業実績

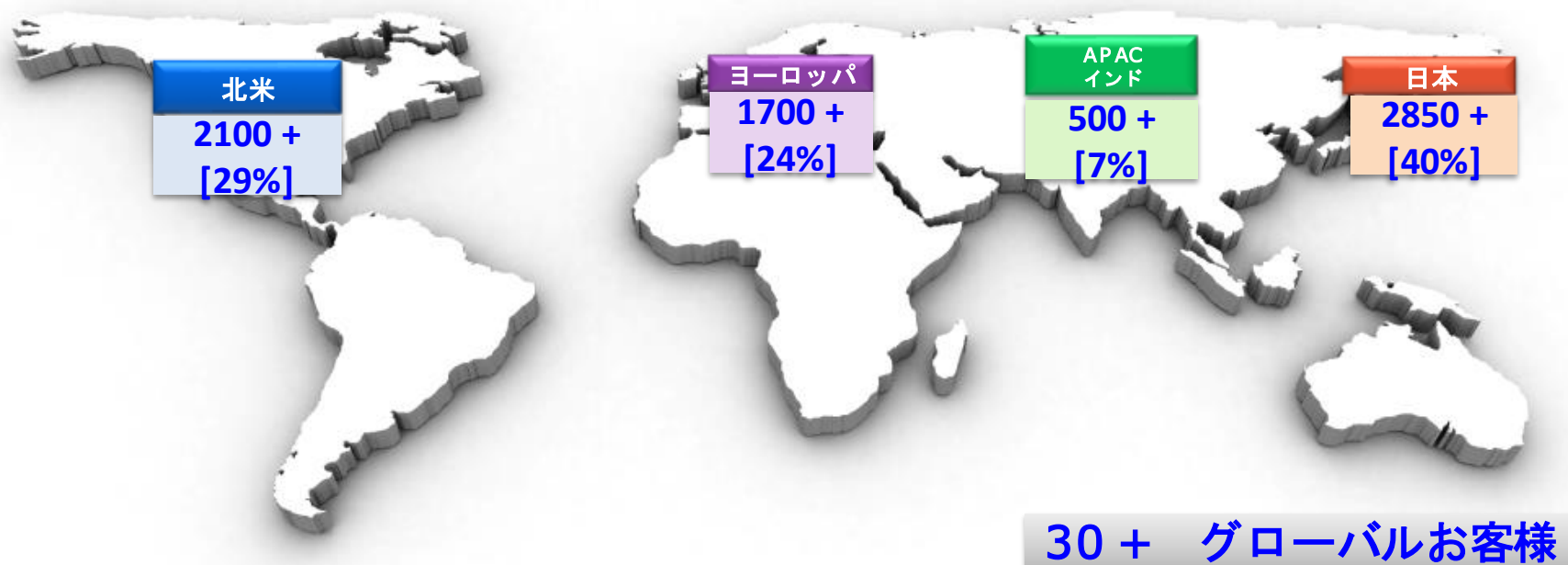
ベンチマー ク化	スタイリ ング調査と フィード バック	レイアウト & パッケージ 調査	設計構想の 提案	企画図面作 成	設計検証	設計 リリース	課題解決	サプライヤ 調整	MRDフォ ロー
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## 1.6 自動車関連人員数分布

### グローバルOEMとティア1お客様



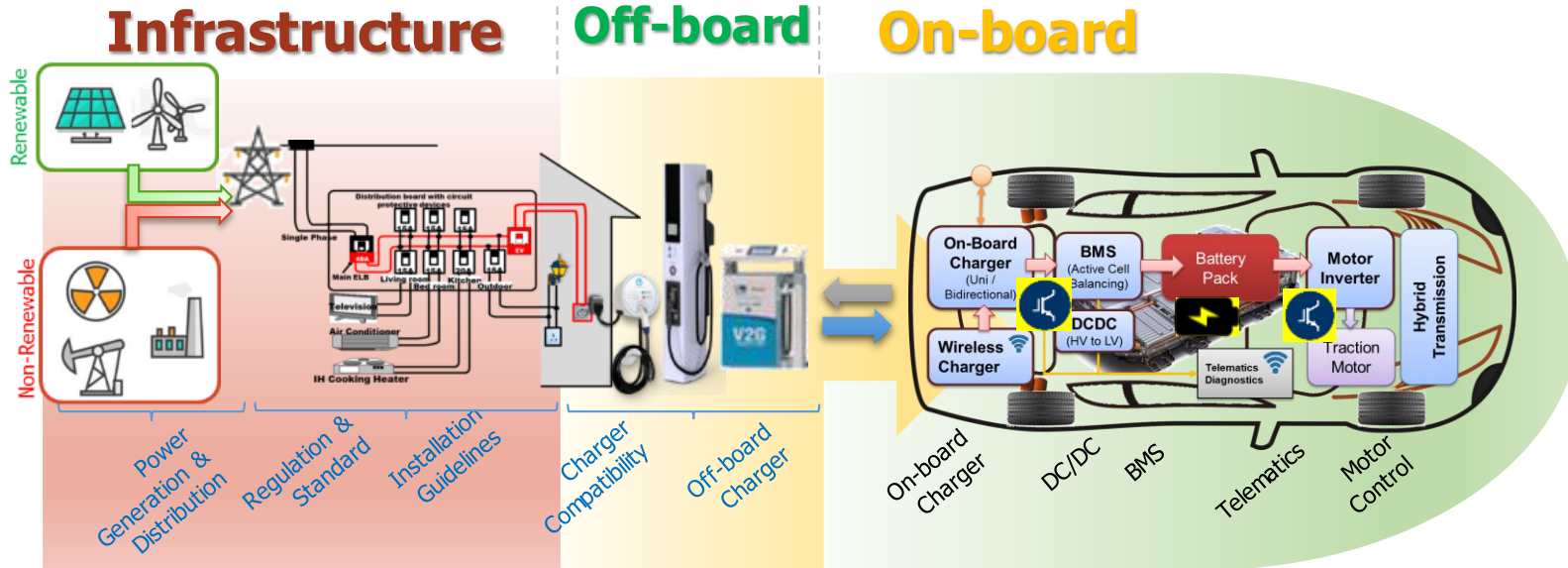
自動車全体のバリューチェーンを提供するエンジニア数 7150+

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# 2.1 Vehicle Electrification – Scope & Challenges



**Challenges**

Fossil Fuel	Quality	Compliance	Precautions	Compatibility	Power Electronics	Battery
					High Cost Low efficiency	Capacity limitation Driving Range

**Improved Battery capacity and Power Electronics is needed inside Vehicle...**  
*Good charging infrastructure can contribute to faster adoption of EVs...*

## Charging Infrastructure

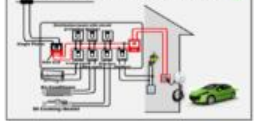
Electricity / Power Quality ✓



Charger Validation ✓



Electrical Installation ✓



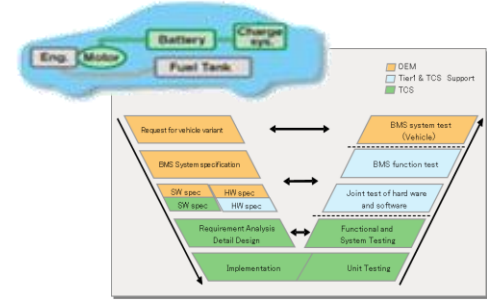
Regulation / Homologation compliance



## CHAdeMO Protocol Test-tool



## Battery Management Software



## Vehicle Diagnostics

Vehicle Diagnostics System

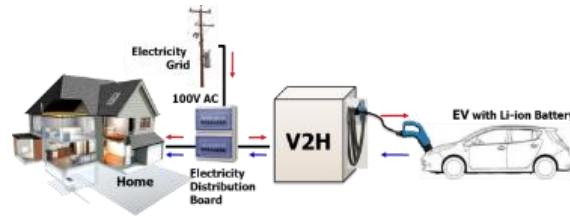


Data upload

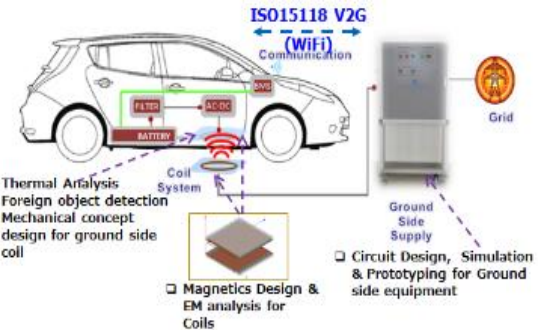
Data Collection & Analysis

Diagnostic Trouble Codes  
Vehicle Operating Conditions

## V2H Software Development



## Wireless Charger

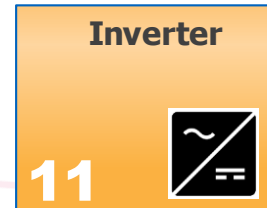
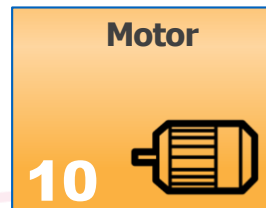
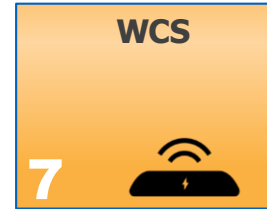
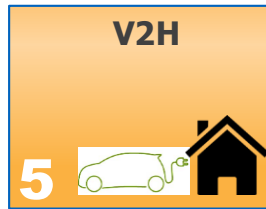
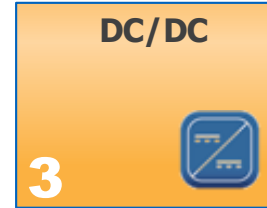
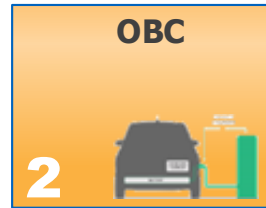
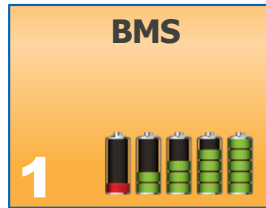


**Infrastructure**

**Off-board**

**On-board**

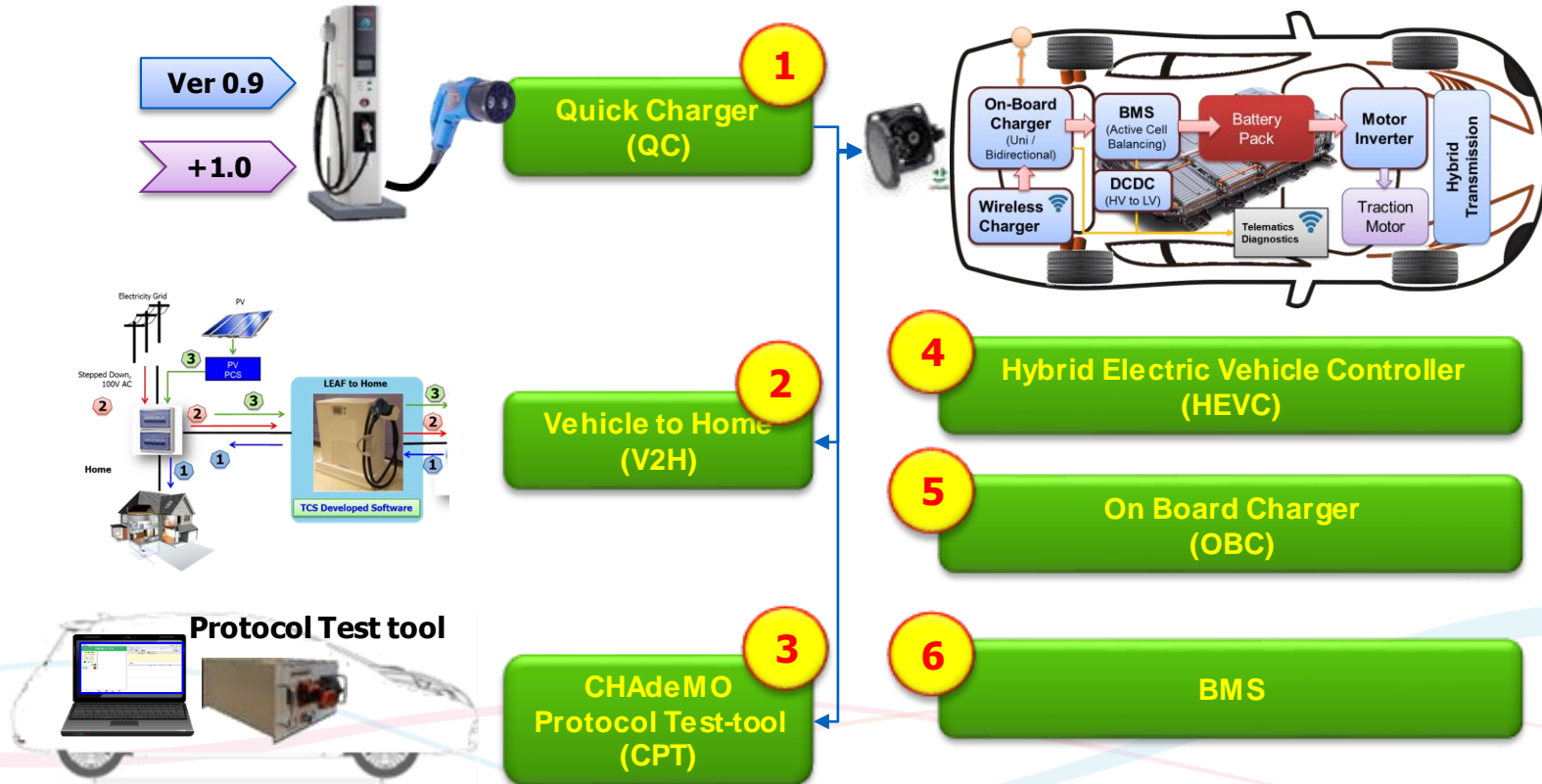
## 2.3 Case Study



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Phases Items	Software			Hardware			Testing		
	Requirement	Design	Coding	Requirement	Design	Prototype	Unit Testing	HILS / System bench	Vehicle Testing
① QC	O	O	O	Δ	Δ	Δ	O	O	O
② V2H	O	O	O	Δ	Δ	Δ	O	O	O
③ CPT	O	O	O	O	O	O	O	O	O
④ HEVC	O	O	O	O	O	Δ	O	O	Δ
⑤ OBC	O	O	O	Δ	Δ	Δ	O	O	Δ
⑥ BMS	O	O	O	O	O	O	O	O	Δ

## \* TCS Experience

O	Full
Δ	Partial
X	Not yet



## India EV trends

## QnA

Please contact us for any EV/HEV development and support activity.

Email: [Dhruv.anand@tcs.com](mailto:Dhruv.anand@tcs.com)



Thank You

