商用车节油技术评估及中国市场零排放技术概况
Fuel efficiency and zero emission technologies for heavy-duty vehicles in China

国际清洁交通委员会 / International Council on Clean Transportation
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新能源商用车政策系列研讨会 / NE-HDV policy webinar series
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回顾过去：一、二阶段油耗标准带来的技术进步
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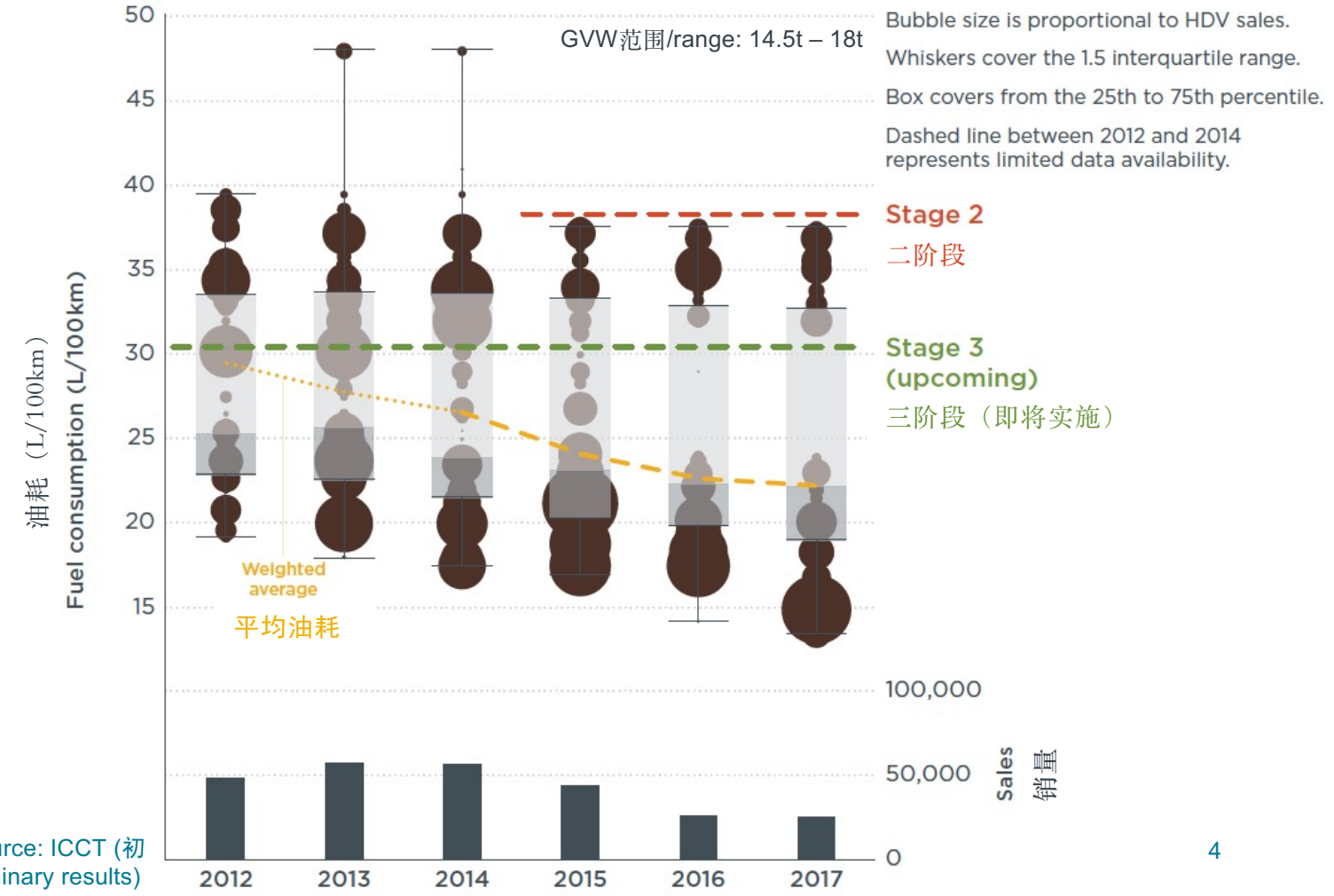
历史HDV油耗表现回顾——城市客车
Historical HDV fuel consumption: city bus

1. 2012-2017年，城市客车整体平均油耗下降明显，约27% *Avg. fuel consumption of city buses dropped by 27% during 2012-2017.*
2. 2017 年34.6%的车型已经达到三阶段油耗标准 *34.6% of available models sold in 2017 complied with Stage 3 fuel consumption prior to fully implemented.*
3. 三阶段油耗标准对城市客车的约束作用需进一步评估 *It may need further evaluation on potentials that Stage 3 could bring.*



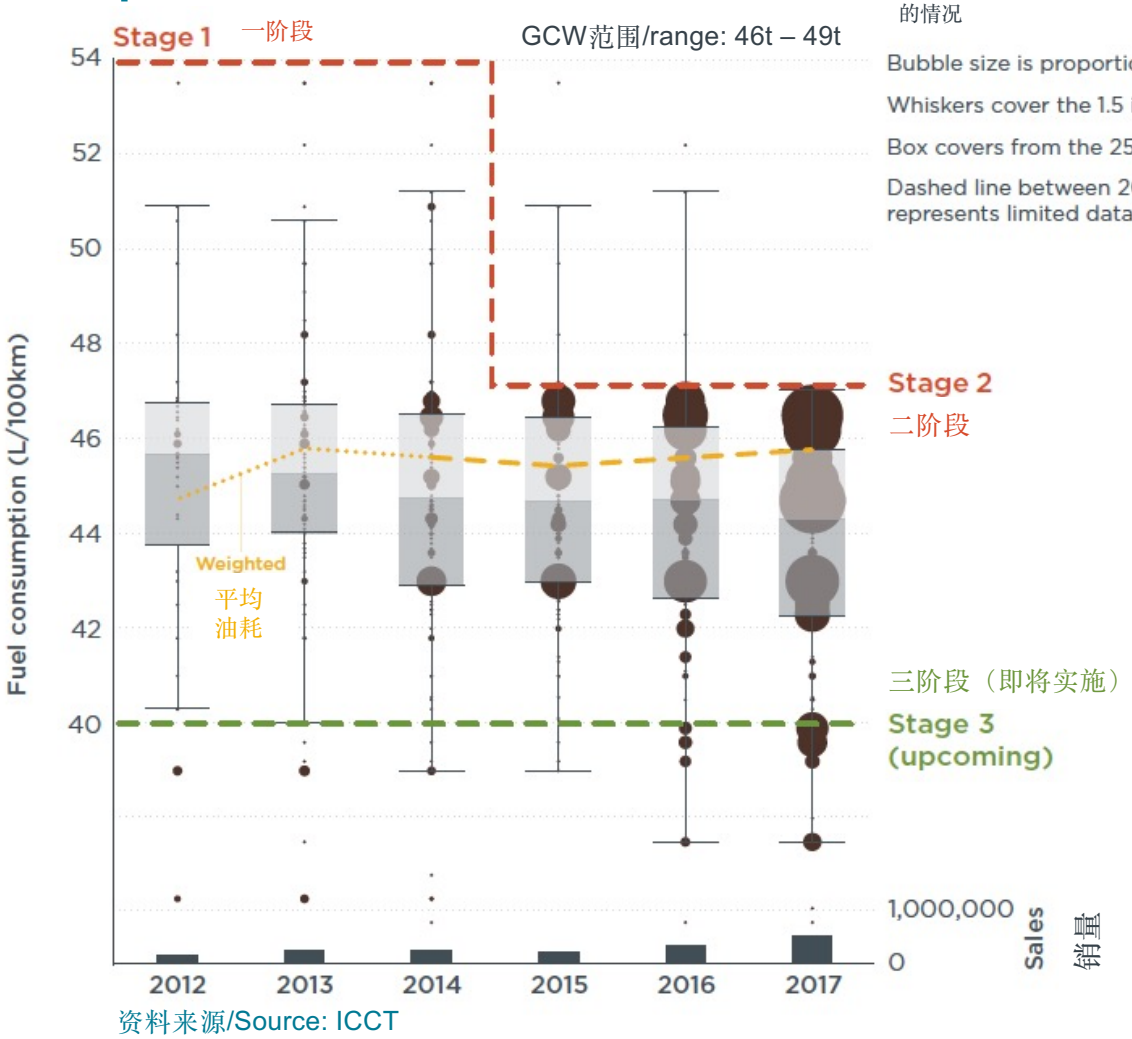
- 气泡大小代表销量
- 箱型图上下限区间代表 1.5倍四分位距（IQR）
- 箱体面积覆盖25%-75%数据范围
- 黄色2012-2014 年间的虚线代表存在数据质量不佳的情况

Bubble size is proportional to HDV sales.
Whiskers cover the 1.5 interquartile range.
Box covers from the 25th to 75th percentile.
Dashed line between 2012 and 2014 represents limited data availability.

数据来源/Source: ICCT (初步结论/preliminary results)

历史HDV油耗表现回顾——半挂牵引车
Historical HDV fuel consumption: tractor-trailer

1. 2012-2017年，半挂牵引车整体平均油耗呈现缓慢上升趋势 *Avg. tractor-trailer fuel consumption kept stable with slightly increase during 2012-2017*
2. 2017 年 8.5%的车型已经达到三阶段油耗标准 *8.5% of models sold in 2017 complied with Stage 3 HDV fuel consumption standard*
3. 根据 2017 年数据，三阶段油耗标准的实施将会带来至少 13%的整体油耗提升 *Stage 3 will improve the certified fuel consumption at least 13%*



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资料来源/Source: ICCT

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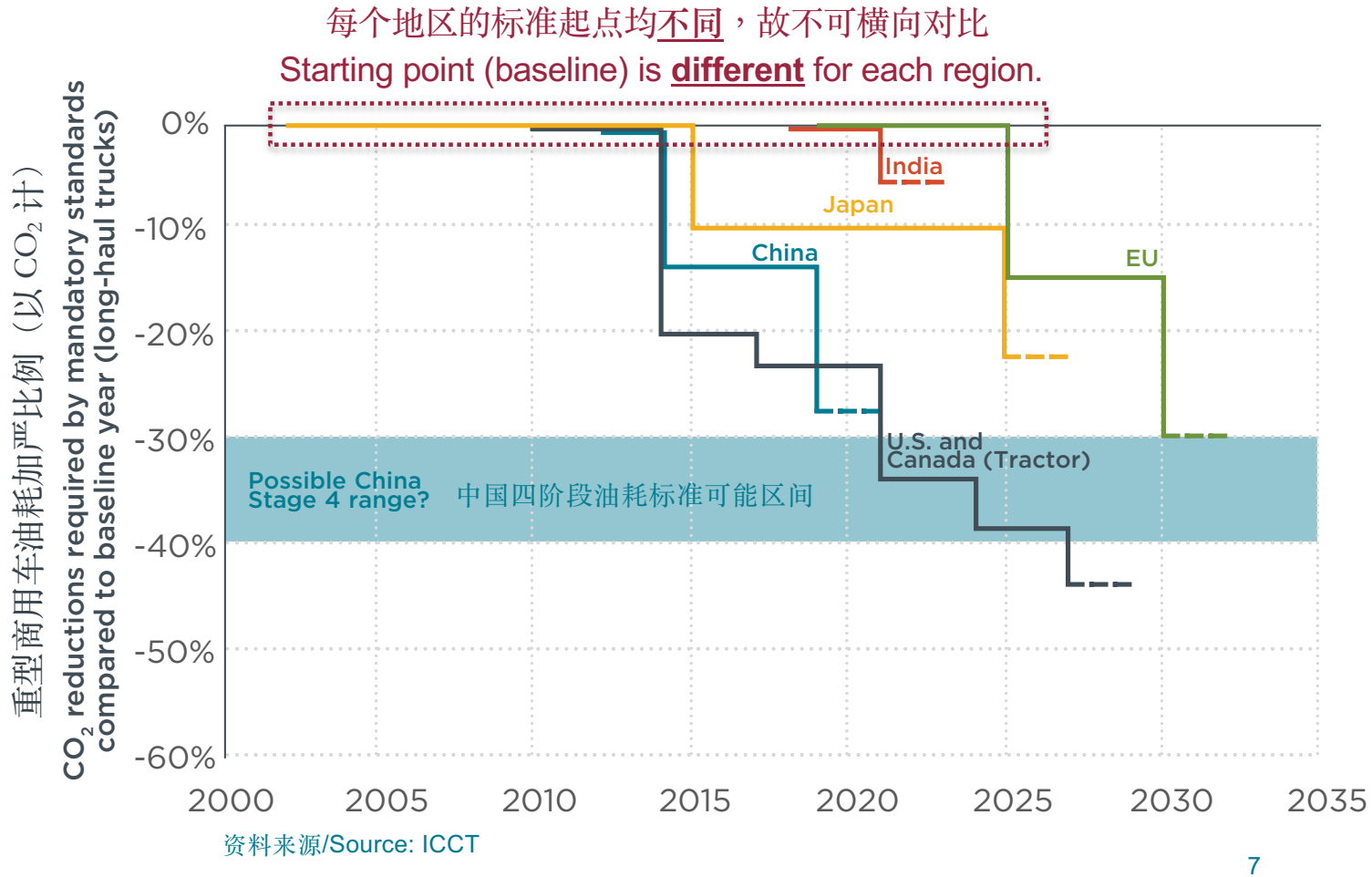
传统商用车国际标准比较
International comparison over HDV fuel consumption standards

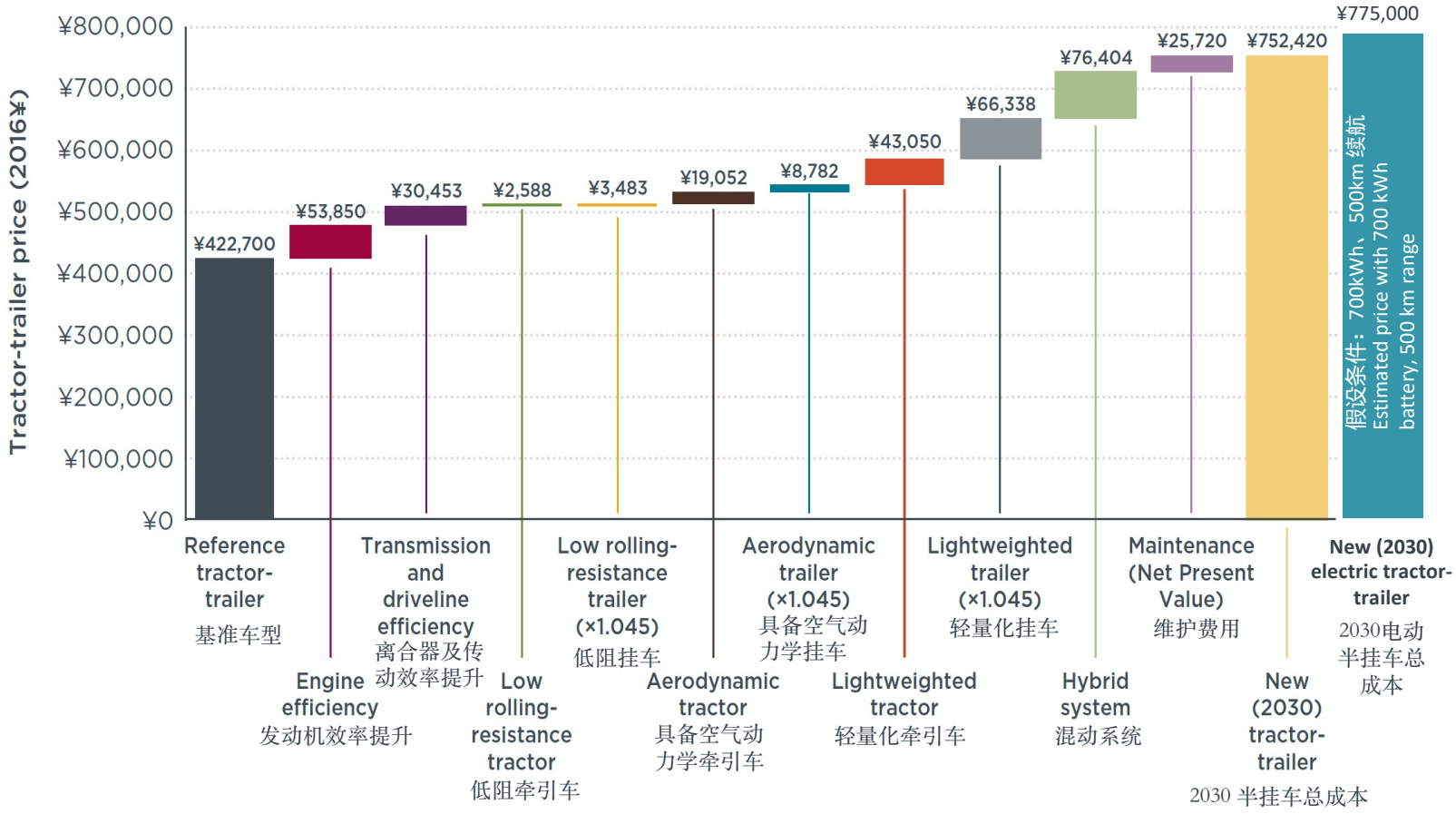
1. 右图仅反映加严比例，由于各经济体油耗标准起始点和测试方法均不完全相同，故彼此间不可横向比较
   The diagram for stringency improvement only, incomparable between each region due to differing baseline and methodology
2. 中国商用车四阶段油耗标准加严比例尚未确定，初步信息为整体加严15%左右 *China Stage 4 stringency not determined yet, preliminarily could improve by 15% overall*



资料来源/Source: ICCT

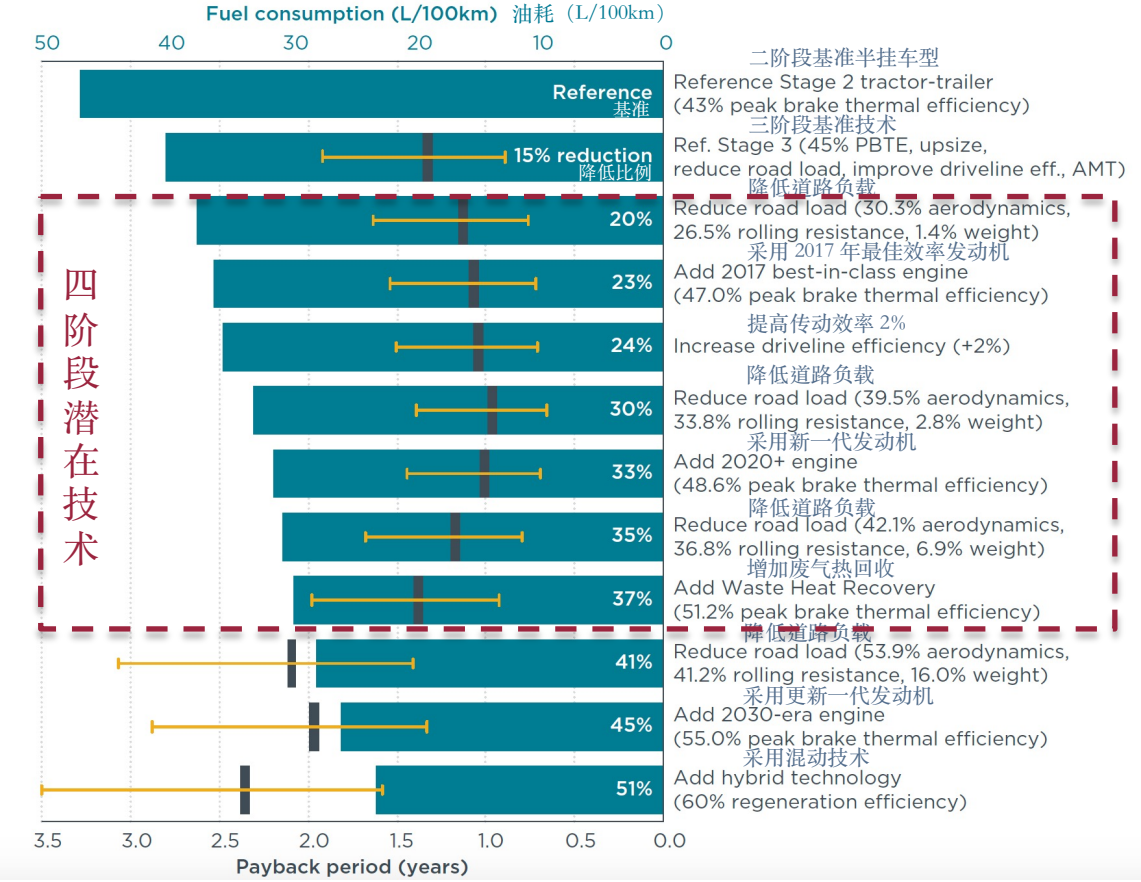
清洁技术成本分析：零排放半挂车总成本快速接近，即将初步具备实用性
Clean technology cost analysis: ZE tractor-trailer ready for use with approaching total cost

1. 随着清洁技术的应用，2030 年传统车辆总成本增长约 80%（以 2016 年半挂车作为基准）*Total cost of diesel tractor-trailer is expected to increase by 80% to exploit all tech. potential.*
2. 2030 年零排放半挂车（以700kWh 电池，500 公里续航估计）总成本快速接近柴油车，两者总成本几乎持平 *ZE-HDVs with battery of 700 kWh and range of 500 km are almost the same to diesel HDVs in terms of total cost.*



资料来源/Source: ICCT

各清洁技术节油潜力评估
Potential of clean technologies



资料来源/Source: ICCT

四阶段具备在三阶段的基础上提升26%油耗水平的技术潜力
Compared to Stage 3, Stage 4 can require an additional 26% improvement.

据预测，柴油机尚可在三阶段油耗标准的基础上提升约 40%，为此则需要更长的成本回收周期
The maximum potential of diesel powertrains is estimated at around 40% lower than Stage 3 requirements. This would require longer payback periods.

为实现全面碳中和的目标，零排放商用车势在必行。零排放商用车可以提供一种比提升柴油机燃油效率更为经济和更有效率的技术路线
Zero emission HDVs are necessary for the long term decarbonization goals. Switching to zero emission HDVs can represent a more cost-effective technology pathway than improving diesel to its maximum

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展望未来：零排放商用车方兴未艾，即将迎来新增长

Looking forward: zero-emission HDV (ZE-HDV) are primed to achieve rapid growth

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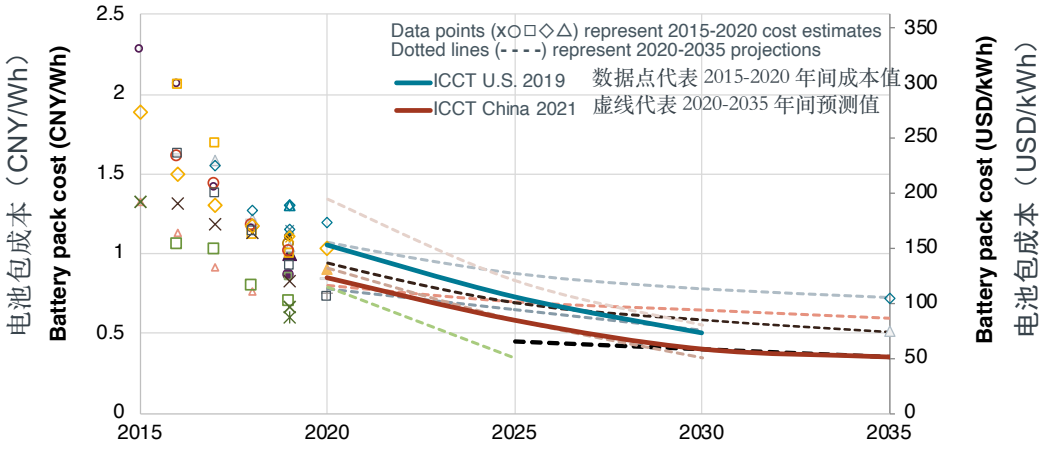
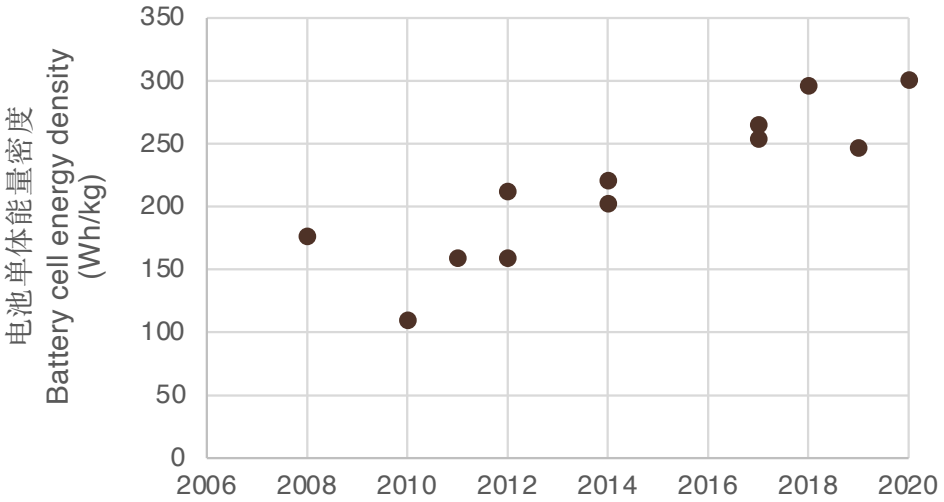
零排放商用车技术日益成熟：更低的价格，更高的能量密度
Zero emission technologies are maturing with higher energy density and lower price

电池价格/price of battery



数据来源/Source: ICCT, forthcoming China EV cost parity study, April 2021

电池单体能量密度/battery cell energy density



数据来源/Source: Bloomberg NEF

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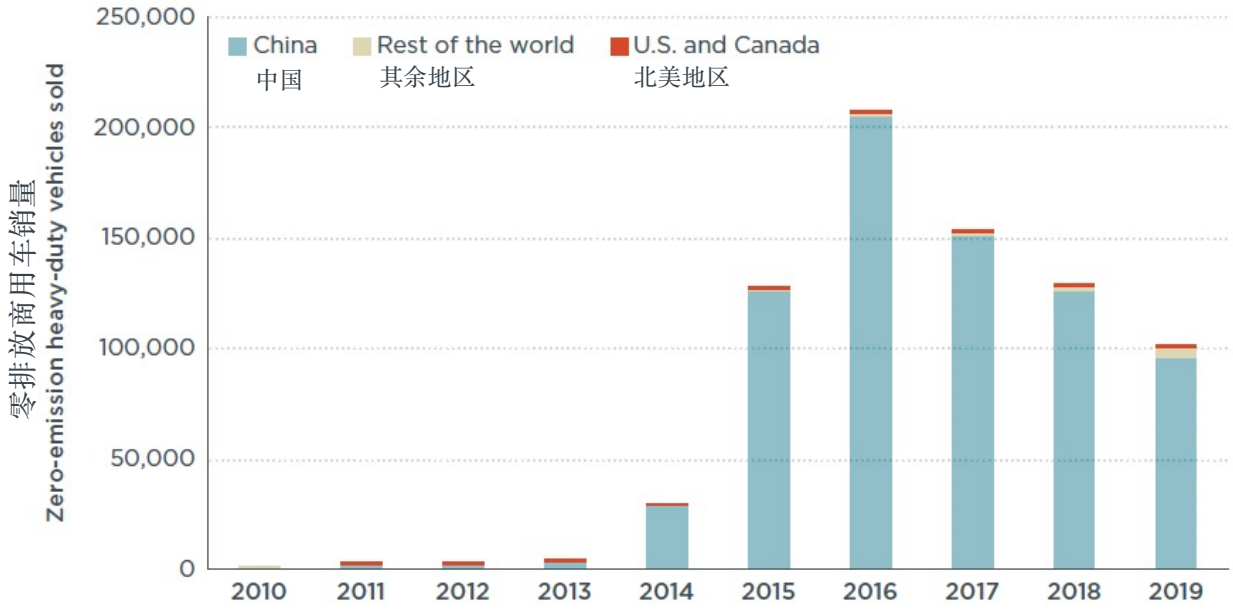
中国零排放商用车市场：快速增长后的冷静期，静待重新出发
China ZE-HDV market: cooling down after rapid growth from incentives

1. 中国零排放商用车市场起步较早，发展迅速 *China ZE-HDV market develops with incredibly fast pace*
2. 目前中国零排放商用车产销量一骑绝尘，全球市占率始终高于 95% *China's ZE-HDVs dominated global markets with overwhelming penetration rate of >95%*
3. 市场前期依赖政府补贴，随着补贴退坡零排放商用车市场萎缩 *ZE-HDV market was incentivized by government subsidy in early years. China's ZE-HDV market almost halved by 2019 due to phase-out of subsidies.*
4. 当前市场处于第一次快速增长后的冷静期，即将迎来重新增长的拐点 *ZE-HDV market is cooling down from the first growth wave and waiting to re-bounce again*

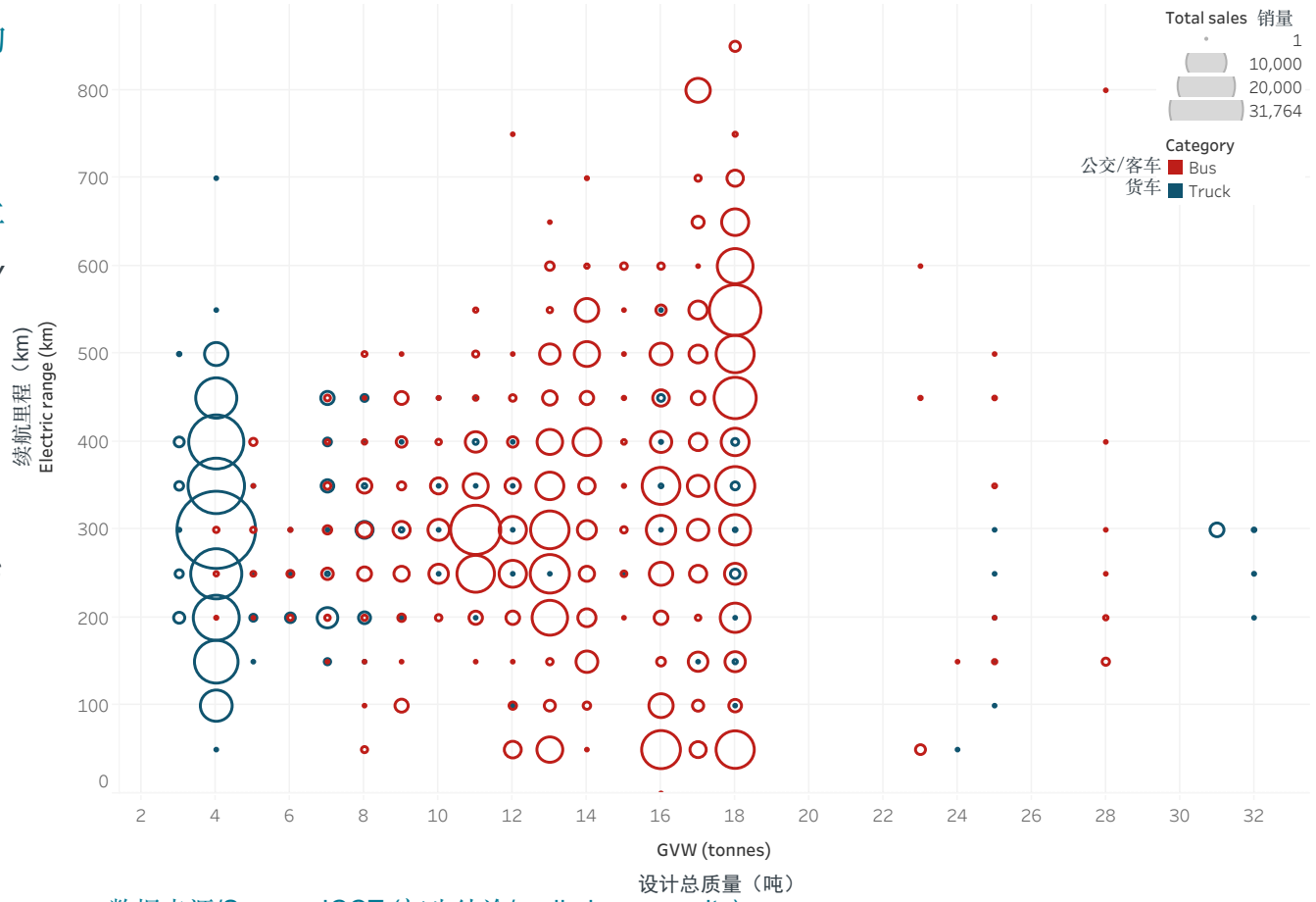


数据来源/Source: ICCT

零排放商用车车型及结构分布
Current ZE-HDV weight class distribution and market structure

1. 右图展示 2017-2019 年中国零排放商用车市场结构及分布 *The diagram illustrates ZE-HDV market structure during 2017-2019.*
2. 当前中国市场主要以电动公交/巴士为主，货车车型较少 *China's ZE-HDV market is dominated by electric buses/coaches with few trucks available.*
3. 零排放货车车型主要集中在轻型车质量段（3,500-4,000kg），中重型车型十分稀少

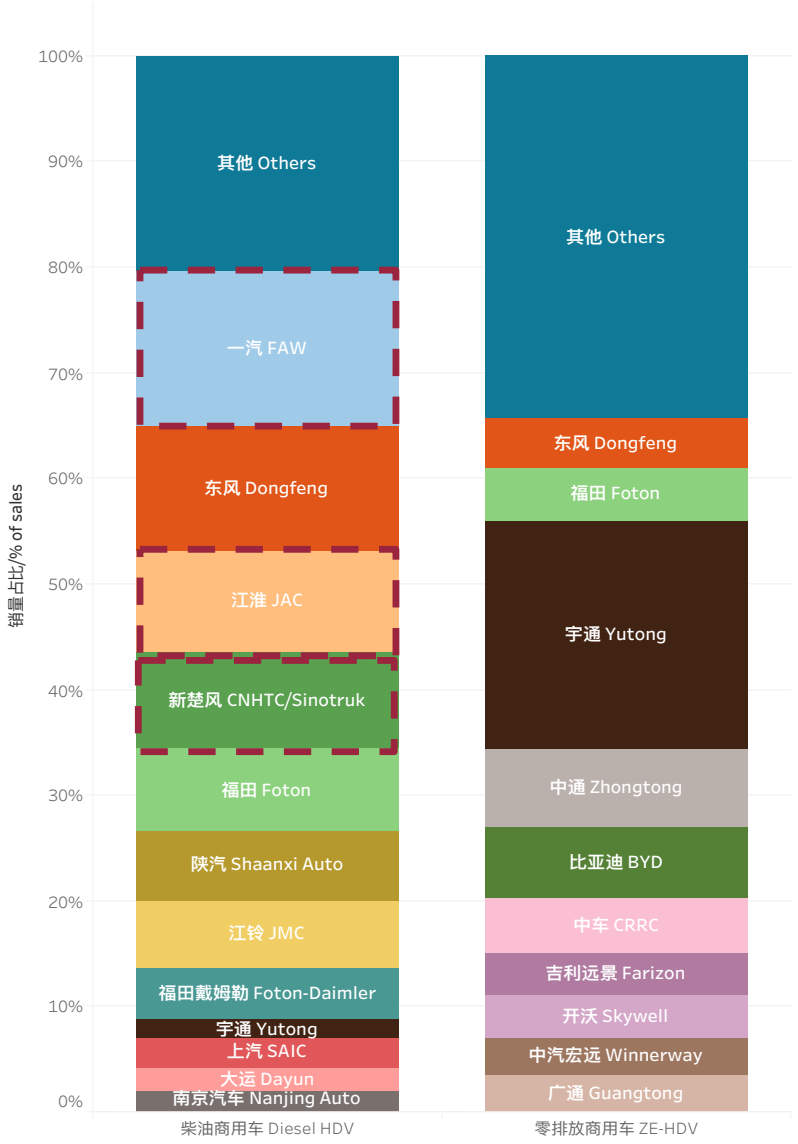
   ZE trucks are grouped between the weight class of 3,500-4,000kg. Few heavy-duty trucks are observed during the period.
4. 当前零排放货车续航里程集中在 300±100km，尚无法支撑中长途场景 *Range of ZE trucks mainly between 300±100km, unsupportive to medium and long-haul delivery.*



数据来源/Source: ICCT (初步结论/preliminary results)

零排放商用车市场尚未成熟，头部制造商尚未垄断
ZE-HDV market not fully matured, top 10 manufacturers take 2/3 of the cake

1. 相比于传统商用车市场，零排放商用车市场尚未成熟，给后发者留有足够空间 *ZE-HDV market is not fully matured, compared to conventional market, which left enough room for latecomer.*
2. 头部制造商占据 2/3 市场份额 *Top 10 notched up to 2/3 of shares on ZE-HDV market.*
3. 传统商用车头部制造商未完全出现在零排放商用车市场头部名单中，原腰部企业逆流而上 *Some of top manufactures in conventional market not show up in the new list; while some ordinarily-performed players go to surface.*



数据来源/Source: ICCT (初步结论/preliminary results)

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总结
Conclusions

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结论 Conclusions

1. 传统商用车仍然保有一定的油耗提升空间和技术潜力，然而随着零排放商用车技术的日益成熟和成本的日益下降，零排放商用车在未来不失为一种更好的技术路线

   Diesel trucks can still be improved with technology potential, but given the rapid pace of cost reduction in zero-emission technologies, it might become more cost-effective to switch to ZE-HDVs.

2. 零排放商用车目前已经处于再次爆发的前夜，由于国内生产商在制造零排放公交和客车方面积累了大量宝贵经验，相应技术的迁移和应用也将加快

   ZE-trucks are primed for rapid technology development, thanks to experience gained by Chinese OEMs on electric buses.

3. 零排放货车，尤其是重型货车领域需要相关政策的引导支持其快速发展。建议尽快出台油耗/温室气体排放标准和新能源商用车的积分政策

   The ZE-truck market, especially in the heavy segments, will need policy support to achieve rapid growth. An ambitious NEV regulation and fuel consumption/GHG policies would catalyze the market.

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Thanks for your attention !

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相关报告资源

- 零排放赛跑：中国零排放商用车市场评估（2021年4月，敬请期待）
- 中国2020-2035电动乘用车成本收益评估（2021年4月，敬请期待）
- Race to zero: How manufacturers are positioned for zero-emission commercial trucks and buses in North America
- Strategies for deploying zero-emission bus fleets: Development of real-world drive cycles to simulate zero-emission technologies along existing bus routes
- Transitioning to zero-emission heavy-duty freight vehicles
- Avoiding a gap between certified and real-world CO2 emissions: Technical considerations for on-board fuel consumption measurements in trucks
- Barriers and opportunities for improving long-haul freight efficiency in China
- The EU heavy-duty CO2 standards: Impact of the COVID-19 crisis and market dynamics on baseline emissions
- GHG reduction potential for heavy-duty vehicles in the EU
- Electrifying EU city logistics: An analysis of energy demand and charging cost

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