

# Regulations and standards for Clean trucks and buses

On the right track?

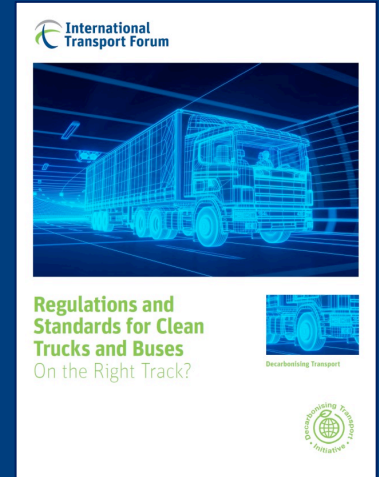
清洁卡车和公交车的管理标准  
我们走对路了吗?

*ICCT-CATARC webinar*

*"Regulations and Supportive Policies to Electrify the Truck Sector"*

17 June 2021

2021年6月17日



# The ITF

- **Intergovernmental organisation**
  - OECD framework, but 63 member countries
- Only global body covering **all transport modes**
- **Think tank** for transport policy
  - **Data and statistics**
  - **Analysis, identification of best practices**
  - **Knowledge sharing**
- Organising global dialogue for better transport
  - **Annual Summit**, largest gathering of transport ministers
  - **Corporate Partnership Board**
  - “Platform for **discussion and pre-negotiation**”
- Current **focal areas**
  - Digitalisation, connectivity, safety & security, universal access, **decarbonisation**

## 关于国际交通论坛(ITF)

- 政府间组织
  - 隶属于经济合作与发展组织框架下，共有63个成员国
- 是唯一涉及所有交通领域的全球化机构
- 交通政策领域智库
  - 数据与统计
  - 分析并找出最佳实践方案
  - 知识共享
- 组织开展全球对话，推动交通领域向更好的方向发展
  - 我们的年度峰会是规模最大的交通领域部长级会议
  - 合作委员会
  - “探讨与预沟通的平台”
- 目前重点关注的领域
  - 数字化、互联、安全性、通用接入、低碳化



# Decarbonising transport initiative 低碳交通行动



## Key activities 主要活动

### Progress tracking 进展跟进

- Evaluate how current mitigation measures contribute to reducing transport CO<sub>2</sub> 评估现有措施对交通领域CO<sub>2</sub>减排的贡献  
→ **NDC analysis** 国家自主减碳 (NDC) 分析

### In-depth sectoral reports 各个领域的深入研究报告

- Identify effective policies for decarbonising transport sub-sectors 为交通领域的各个子领域确定行政有效的低碳化政策  
→ **urban passenger, road freight, maritime transport, aviation...** 市区乘用车、道路货运、船舶、航空……

### Focus studies 重点研究

- **Analyse specific decarbonisation issues** 低碳化专项问题分析  
→ e.g. Impact of decarbonising road transport on tax revenues, Vehicle technology choice in the case of France, 例如低碳化对交通税收的影响, 法国的车辆技术选择  
**Regulations and standards for clean trucks and buses** 清洁卡车和公交车管理标准

### National pathways 国家层面的方针路线

- **Help countries define pathways to meet their transport CO<sub>2</sub> reduction ambitions** 帮助各国确定实现CO<sub>2</sub>减排目标的方针路线

### Policy dialogue 政策对话

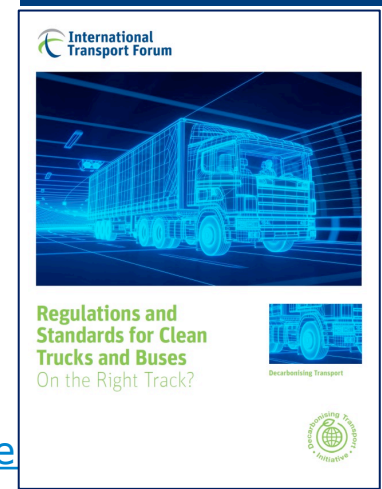
- Organise global dialogue on transport and climate change → **ITF Summit**, roundtables, briefings, workshops 组织开展交通和气候变化领域的全球性对话→ITF峰会、圆桌会、简报、研讨会
- Act as a conduit for transport sector input to climate change negotiations → **Involvement in UNFCCC & COP** 作为交通领域参与气候变化对话的桥梁→参与联合国气候变化框架公约 (UNFCCC) 和联合国气候变化大会 (COP)
- **Transport Climate Action Directory** 交通气候行动指南

# Regulations and standards for clean trucks and buses – On the right track? 清洁卡车和公交车的管理标准—我们走对路了吗？

## Project milestones 项目重点成果

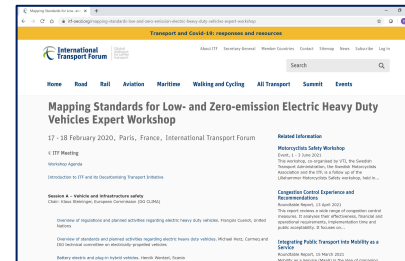
- **Workshop:** 17-18 February 2020
- 2020年2月17-18日召开研讨会

Link链接: <https://www.itf-oecd.org/mapping-standards-low-and-zero-emission-electric-heavy-duty-vehicles-expert-workshop>



- **Publication:** September 2020
- 2020年9月发布研究报告

Link链接: <https://www.itf-oecd.org/regulations-and-standards-clean-trucks-and-buses>



## Report purpose

- Review progress on truck regulations and standards
- Focus on technologies that enable low- or near-zero emissions: battery, plug-in hybrids and fuel cell electric vehicles
- Look at core regulatory aspects such as vehicle safety, charging/refueling infrastructure, environmental performance, energy use

### Background:

Developments in the transport sector: electrification, hydrogen

Different pathways for decarbonising trucks are still possible: hybrids, direct electrification with batteries, plug-in hybrids, e-roads, hydrogen fuel cells, biofuels, e-fuels...

Regulations & standards are major pre-requisites for large-scale deployment of new technologies

## 研究报告的目的

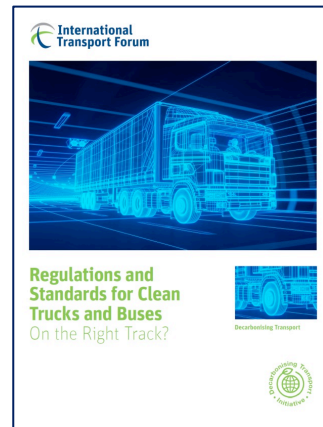
- 回顾卡车的管理发展进程和管理标准
- 重点关注低排放或近零排放技术：电动、插电式混合动力和燃料电池
- 关注管理核心要点，例如车辆安全性、充电/燃料补给基础设施、环境性能、能源使用等

### 背景:

交通领域的发展：电动化、氢能

卡车低碳化依然有不同的可行性路线：混合动力、纯电动、插电式混合动力、e-道路、氢燃料电池、生物燃料、e-燃料等

管理法规和标准是大范围推广应用新技术的重要前提



## Vehicle safety

- Significant work done at the United Nations (WP.29)
- International safety R&S tend to cover cars, light commercial vehicles and heavy vehicles together - but focus is more on light vehicles (larger market size)
- Provisions for heavy vehicles have gaps - in particular for fuel cell electric vehicles
- Different technical requirements and duty cycles between light and heavy vehicles - require more specialized regulations and standards

## 车辆安全

- 联合国（WP.29）做出了重要工作
- 国际安全管理法规与标准同时涵盖轿车、轻型商用车和重型车—但更偏重于关注轻型车（市场保有量更大）
- 目前重型车管理法规尚处于空缺状态—特别是对于燃料电池汽车
- 鉴于轻型车和重型车之间存在的技术要求和工况差异——需要出台更有针对性的管理法规和标准



## Hydrogen refuelling

- International standards developed at ISO and SAE
- Existing regulations mainly on compressed gaseous on-board storage
- Most fuel cell busses now use 35 Mpa tanks
- Manufacturers look at 70 MPa tanks already used in cars – better suited for trucks
- Regulatory framework is not ready - no refuelling protocol, nozzle for high flow
- Alternative hydrogen storage solutions (e.g. liquid hydrogen, chemical bonding or swapping) unlikely to be commercially viable within next decade
- High purity requirements in PEM fuel cells could make transition toward hydrogen-propelled trucks using internal combustion engines an option

## 氢燃料补给

- 由ISO和SAE起草制订了国际标准
- 现有管理法规主要针对的是压缩氢在车辆上的存储
- 大部分燃料电池公交车使用的是35Mpa的燃料罐
- 生产企业认为目前已经在轿车上使用的70Mpa燃料罐会更适合卡车
- 管理架构尚未搭建——缺少燃料补给规程以及高流量喷嘴
- 替代型储氢方案（例如：液氢、化学绑定或交换），不过在未来十年内不太可能商业化应用
- 鉴于氢燃料电池对质子交换膜的高纯度要求，在卡车上应用氢燃料内燃机也是一种选择方案



## Electric vehicle charging

- International standards developed at IEC, ISO and SAE
- CHAdeMO (rooted in the electricity industry) and CharIn (roots in European automotive industry) associations are key players
- EV charging standards can apply to different vehicle categories - but they were first developed for cars
- Existing framework suitable for buses and delivery vehicles, not yet for trucks
- DC charging is now looking beyond electric car charging (<450 kW) to 1 MW or more
- Progress made in new standards for electric road systems (ERS) with overhead contact lines for use by heavy vehicles on motorways, less so for other systems

## 电动汽车充电

- 由IEC、ISO和SAE起草制订了国际标准
- CHAdeMO (起源于电力行业) 和CharIn (起源于欧洲汽车行业) 两家协会是充电器主要供应商
- 电动汽车充电标准适用于不同类型的车辆——但最初是针对轿车开发制定的
- 现有的管理框架可以适用于公交车和物流运输车，但不适用于卡车
- 直流充电正在从<450 kW的轿车充电发展至1MW以上的大功率充电
- 在电动道路系统（ERS）新标准方面取得了一些进展，主要关注于重型车在高速公路上使用的顶部接触式线缆，其他系统在标准方面的进展则较为滞后





## Environmental performance (1) 环境表现 (1)

### Vehicle focus (tailpipe)

- Significant work done at the United Nations (WP.29), national and EU framework
- Regulations primarily focused on tailpipe energy use and emissions (pollutants, GHG)
- Technical regulations of air pollutant emissions from heavy vehicles typically apply to engines, complemented with PEMS on-road tests
- Tailpipe GHG emissions and final energy use relate to the entire vehicle: greater regulatory complexity (VECTO, GEM, HILS...)
- International harmonisation far more developed for air pollutants than GHG emissions
- Further work needed to align tailpipe GHG emission regulations and to integrate LZEVs

### 对车辆本身的关注 (尾气)

- 在联合国 (WP.29)、世界各国和欧盟框架体系下已经做了大量有价值的工作
- 管理主要针对车辆能耗和尾气排放 (污染物、温室气体)
- 重型车污染物排放技术管理法规的适用对象是发动机, 另外采用 PEMS道路测试作为补充
- 尾气温室气体排放和能耗管理则针对的是整车: 管理复杂性更高 (VECTO、GEM、HILS...)
- 在国际协同管理方面, 污染物排放法规远远领先于温室气体排放法规
- 需要进一步开展温室气体排放管理法规协同方面的工作, 并将低排放和零排放车辆纳入整体管理框架



## Environmental performance (2) 环境表现 (2)

### Vehicle manufacturing & fuel production

- Need to account for the full environmental impacts over vehicle life cycle
- Batteries a core feature of LZEVs and an important contributor to carbon emissions
- Important to manage impacts of battery production and end-of-life treatment - several governments are active on this, with EU at the forefront
- Governments also working on regulating the carbon intensity of fuels/energy vectors (“well-to tank”, not only “tank-to-wheel”)
- Important requirement for an effective transition towards lower carbon intensity overall
- Need to properly integrate electricity and hydrogen used in LZEVs (incl. trucks)

### 车辆生产 & 燃油生产



- 需要考虑车辆全生命周期的整体环境影响
- 电池是低排放和零排放车辆的核心部件，也是碳排放的重要贡献源
- 加强电池生产端和报废处理端的管理是非常重要的，一些政府部门已经开始在这方面采取行动，欧盟在这方面也有比较积极的进展
- 政府部门也开始对燃油/能源领域的碳强度进行管理（即从“油井到油箱”阶段的碳排放，而不再仅关注“从油箱到车轮”阶段）
- 需要提出行之有效的转型方案，实现碳强度的整体下降
- 需要在低排放和零排放车辆领域（包括卡车在内）合理应用电能和氢能



# What we recommend on vehicle safety

## 我们关于车辆安全性的一些建议



- Ensure that vehicle safety regulations & standards cover all classes of for electric and hydrogen road vehicles and better differentiate between light and heavy vehicles
- Leverage the experience of international regulatory fora to extend the coverage of safety-related requirements to heavy electric vehicles
  - Larger size of batteries, relevance for thermal runaway and propagation
- Ensure safety regulations for hydrogen-powered trucks address aspects that are currently not adequately considered
  - Higher lifetime travel of heavy vehicles
  - Need for periodic inspections for high-pressure vessels
  - Crash-related safety provisions (rollover)
- 确保车辆安全管理法规能够涵盖所有级别的电动和氢能道路车辆，并且对轻型车和重型车的管理要求要有所区别
- 利用国际法规论坛的经验，将安全管理要求扩展至重型电动车领域
  - 更大的电池带来的热控制和热扩散问题
- 确保对氢能卡车实施安全管理，强化解决目前尚未充分纳入管理考量的问题：
  - 重型卡车的使用寿命周期总行驶里程较长
  - 高压罐体需要定期检查
  - 碰撞、倾翻相关的安全管理法规



# What we recommend on EV charging

## 我们关于电动汽车充电的一些建议



- Involve diverse transport and energy stakeholders in the development of charging standards for electric heavy vehicles
  - High power and “mission critical” nature of heavy vehicle charging comes with important implications for the electricity system. Need for cooperation between truck manufacturers, components producers, road infrastructure providers and the electricity industry
- Address missing elements in regulations and standards related to e-roads
  - Need to ensure interoperability, technology shall be developed by more than a single manufacturer; metering of electricity consumption; safety specifications
  - Catenary-based solutions can build on experiences and standards with railway and trolleybus services, have less impact on road maintenance and are therefore closer to commercial deployment
  - Competition with charging stations with high power
- 在制定重型电动车充电标准的过程中，应邀请交通部门、能源部门等多方的参与
  - 重型车从本质上需要较大的功率且需要以“完成工作目标”为重，这些特征对于电力系统建设具有重要的参考意义，需要在卡车生产企业、零部件生产企业、道路基础设施运营部门和电力行业之间建立起良好的协作
- 解决“e-道路”管理法规和标准中的缺失环节
  - 技术设施开发企业不止一家，需要确保互通操作性；耗电计量；安全规范
  - 接触网解决方案可以以铁路和无轨电车领域的经验和标准为基础，接触网对于道路维护的影响较小，更接近于商业发展部署
  - 建设高功率充电站点

# What we recommend on hydrogen refueling

## 我们关于加氢的一些建议



- Develop refuelling protocols for trucks with gaseous hydrogen storage at 70 Mpa
- Develop new high-flow nozzles - necessary for efficiently refuelling long-haul trucks
- Ensure compliance with stringent fuel quality requirements
- Focus pre-normative research on the safe use of low- and zero emission vehicles with existing vehicle infrastructure
  - Especially relevant for hydrogen-powered options – use in constrained spaces like tunnels, garages, etc.
  - Fire code also relevant, along with safety requirements for depots (buses)
- Questions remain on economic competitiveness of hydrogen vs. EVs
  - Higher thermodynamic losses, much higher low carbon electricity production requirements with green hydrogen, need for CCS for blue hydrogen to limit GHG emissions, path dependency of distribution infrastructure investments (and higher risk profile), all with cost implications
- 开发卡车气态氢加氢规程，气态氢储存压力 70 Mpa
- 有必要开发新的高流量喷嘴—提高长途货运卡车燃料补给效率
- 确保燃料质量达标
- 就现有车辆设施基础上安全使用低排放和零排放车辆的管理规范问题进行前期研究
  - 特别是氢燃料应用方面 - 在隧道、车库等狭窄空间的使用
  - 连同场站（公交车）安全管理要求，还需出台消防防火规范
- 关于氢燃料与电动汽车经济竞争力的讨论依然存在
  - 热动力损耗较高、绿氢更高的低碳发电要求、蓝氢需要通过碳捕捉和储存（CCS）来限制温室气体排放、储运基础设施依赖度（风险较高）等方面的问题都会对成本造成影响

## What we recommend on environmental performance

### 我们关于车辆环境表现的建议



- Harmonise regulations on tailpipe GHG emissions and energy consumption of heavy vehicles + integrate measurement of LZEV's energy use
  - Fully integrate electricity and hydrogen into regulatory policies on low-carbon fuels
  - Make sure that sustainability criteria are clearly defined, including in cases when they do not exist yet – e.g., for hydrogen (Guarantees of Origin) or for e-fuels
  - Address non-regulated pollutants and integrate hydrogen-powered vehicles using internal combustion engines in regulations on tailpipe pollutant emissions
  - Address the environmental performance of vehicle batteries through innovative regulation that targets their durability, carbon footprint and the sustainability of associated supply chains
  - Integrate developments enabling the application of road charges and policies requiring geofencing in regulations on connected vehicles
- 对重型车的温室气体排放和能耗实施协同化管理，另外将低排放和零排放车辆的能耗测量也纳入管理范畴
  - 将电力和氢能全面纳入低碳燃料管理政策的框架内
  - 对“可持续性”进行明确的标准定义，例如氢能（生产方式）或生物燃料
  - 重点关注尚未纳入管理范畴的污染物，将使用氢燃料内燃机的车辆所产生的尾气污染物排放纳入管理范畴
  - 加强对车辆电池环境表现的关注，通过管理法规加强耐久性、碳足迹以及供应链可持续性方面的要求
  - 实现整合式发展，将道路收费和地域性限制政策整合到车联网管理当中



## What we recommend on international harmonization

### 我们关于国际协同的一些建议



- International harmonization can make product development cheaper by reducing administrative burdens and thanks to economies of scale, accelerating the transition to clean and connected vehicles and helping ensure that it is orderly and fair
  - International harmonisation is crucial to guarantee a levelled playing field for international competition, not only on clean vehicle and clean energy technology, but also on digital technologies needed for connected and autonomous vehicles
  - International harmonization also offers greater opportunities to scale up the application of high standards, in all fields of application
- International cooperation is essential to ensure greater international harmonization of regulations and standards
- 协同统一的国际化管理要求能够降低车辆的达标负担，实现规模化经济效应，从而降低产品的价格，加速向清洁汽车和车联网的转型，确保有序和公平的发展
  - 协同统一的国际化管理要求能够确保提供一个公平的国际竞争平台，不仅仅是对清洁车辆和清洁技术，对于车联网所需的数字化技术和车辆自动化技术也是如此
  - 协同统一的国际化管理要求还能够扩大高标准的应用对象范围
- 国际间的协作是确保更好地实施国际协同管理和标准的关键

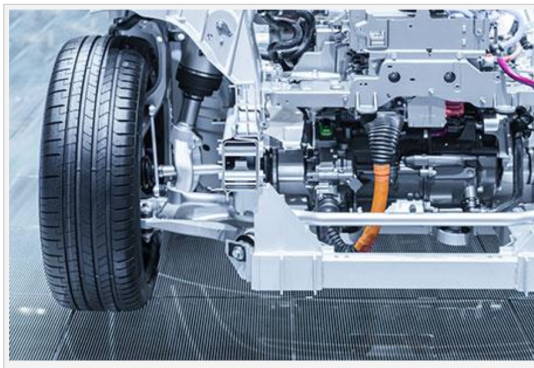
# Coming up next from ITF on clean vehicles...

## 国际交通论坛下一步将在清洁车辆领域开展的工作…

### Cleaner Vehicles

#### Achieving a Resilient Technology Transition

This report evaluates policies for transitioning to clean vehicles and clean energy for road transport. The review including measures that can help to scale up the transition quickly and instruments to manage it. It analyses technologies for clean passenger cars, light commercial vehicles, buses and trucks, and identifies solutions that deliver the greatest benefits. It reviews the policies for the promotion of clean vehicles currently in place and assesses the response of private sector stakeholders. The study specifically takes account of increasing digital connectivity and automation.



**Stay tuned!**

敬请期待!

Link to project page 项目页面

[https://www.itf-oecd.org/  
cleaner-vehicles](https://www.itf-oecd.org/cleaner-vehicles)

<b>Date of Publication</b>	14 July 2021
<b>Publication Type</b>	Case-Specific Policy Analysis
<b>Publisher</b>	OECD/ITF





# Thank you! 谢谢!

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咨询顾问—国际交通论坛，能源、技术与环境可持续部门

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