VIPV as Energy Sources in Disaster Zones

灾区能源来源：车载集成光伏（VIPV）

IEA PVPS Task 17 has published a new report examining how Vehicle-Integrated Photovoltaics (VIPV) and Solar Electric Vehicles (SEVs) can strengthen disaster resilience by providing decentralized and flexible emergency power during natural disasters and prolonged outages.

国际能源署 IEA PVPS TASK17 工作组发布了一份新报告，探讨车载集成光伏（Vehicle-Integrated Photovoltaics，VIPV）和太阳能电动汽车（Solar Electric Vehicles，SEVs）如何在自然灾害及长时间断电期间，凭借分布式、灵活化的应急供电能力提升灾害抗灾韧性。

Titled "VIPV as Energy Sources in Disaster Zones", the report explores how PV-equipped vehicles can support evacuation centres, communication systems and other critical services when conventional infrastructure is disrupted. Unlike stationary systems, SEVs can autonomously generate electricity, relocate to areas with higher solar irradiance and transport energy directly to affected communities.

报告分析指出，当常规基础设施受损瘫痪时，搭载光伏设备的车辆可为疏散安置点、通信系统及其他关键设施提供电力保障。相较于固定式供电设备，太阳能电动汽车可自主发电，能够驶往太阳辐照强度更高的区域，并将电力直接输送至受灾区域。

Using Monte Carlo–based modelling, the report assesses resilience under uncertain conditions, including weather variability, infrastructure damage and human behaviour. The analysis demonstrates that voluntary energy sharing from SEV owners can significantly improve the ability of communities to maintain essential services during extended outages.

报告采用蒙特卡洛模型开展模拟分析，评估天气波动、基础设施损毁、人员行为等不确定因素下的防灾供电韧性。分析结果表明，车主主动共享车载电能，可大幅提升社区在长期断电期间维持基础公共服务运转的能力。

"VIPV and SEVs combine mobility, energy generation and storage in a single system, offering a new approach to distributed disaster resilience." (Kenji Araki, lead author of the report)

"车载集成光伏系统与太阳能电动汽车集移动性、发电与储能功能于一体，为分布式防灾抗

灾供电提供了全新思路。”报告主要作者 Kenji Araki 表示。

Key findings
关键要点

- SEVs can enhance disaster energy resilience by providing decentralized, flexible power support.
太阳能电动汽车可依托分布式灵活供电模式，提升灾害场景下的能源抗灾韧性。

- Voluntary energy sharing can help sustain essential services during prolonged outages.
车主自愿共享电能，能够保障长期断电期间基础服务持续运行。

- Monte Carlo–based modelling helps policymakers assess resilience under uncertainty by capturing variability in weather, infrastructure damage and human behaviour, rather than relying on average-case assumptions.
蒙特卡洛模型可纳入天气变化、设施损毁、人员行为等变量，助力政策制定者评估不确定环境下的供电韧性，规避单一平均工况假设带来的评估偏差。

Supporting resilient energy systems
助力韧性能源体系建设

The report highlights the role of VIPV and SEVs as complementary technologies within broader resilience strategies alongside stationary PV systems, portable solar generators and conventional backup solutions. By combining electricity generation, storage and transportation in a single asset, SEVs can provide adaptable emergency energy support in regions vulnerable to earthquakes, typhoons and grid disruptions.
报告提出，车载集成光伏系统与太阳能电动汽车可与固定式光伏设备、便携式太阳能发电机、传统应急供电设备协同配合，共同构筑综合防灾韧性体系。这类车辆兼具发电、储能与电力转运能力，能够为地震、台风、电网故障高发区域提供灵活适配的应急电力保障。