





从行动开始

COP28 特別版

在华企业低碳转型实践观察报告2023

START FROM ACTION

OBSERVATION REPORT ON LOW-CARBON TRANSITION OF ENTERPRISES IN CHINA 2023

碳中和不是一个简单的外部性问题,

也不是简单的化石能源替代和技术进步问题,而是对工业革命以来传统发展范式的颠覆性变革。 碳中和意味着发展底层逻辑的变化,意味着整个社会经济体系的深刻变革。 企业身处变革之中,唯有不断适应零碳潮流,才能不被时代所抛弃。 本研究是《可持续发展经济导刊》开展的关于"金钥匙塑造中国企业低碳行动领导力"系列研究的第二期报告。第一期报告《行动向未来:金钥匙行动塑造中国企业低碳领导力报告》已于2021年在COP26中国角发布。本报告基于2020—2023年"金钥匙"活动中涌现的企业优秀低碳实践,进行了在华企业碳减排行动特点洞察与分析。报告还提供了典型案例,并针对企业未来加速低碳转型提供了建议。报告的"特别关注"部分重点呈现了中国企业在海外应对气候危机的参与和贡献。

本报告旨在展示和分析在华企业自"30·60"双碳目标提出以来应对气候变化的行动进展及特点,分享在华企业低碳转型的实践与经验,增进国际社会对中国企业界低碳发展的了解。

本报告研究对象均来自 2020—2023 年期间参与"金钥匙"活动的在华企业减碳实践。鉴于"金钥匙"活动本身所覆盖的企业数量、区域范围以及行业类别的有限性以及其他限制条件,报告内容可能并不完整,如有问题或建议,请联系 huwenjuan@sdg-china.net.

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在华企业低碳转型实践观察报告 2023

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关于"金钥匙——面向 SDG 的中国行动"

为落实中国国家主席习近平关于 "可持续发展是破解当前全球性问 题的'金钥匙'"论断,响应联合国可持续发展目标"行动十年"计划, 《可持续发展经济导刊》于2020年发起"金钥匙"(全称"金钥匙—— 面向 SDG 的中国行动")活动,通过设置推荐、展示、路演、评审 等流程,寻找并塑造面向 SDG 的中国行动标杆,讲述和分享在华企 业可持续发展行动的故事和经验,为推动中国和全球可持续发展贡 献力量。2021年,"金钥匙"活动荣获联合国可持续发展目标优秀 实践(UN SDG Good Practices),成为中国最具影响力和国际化 的企业可持续发展交流与评选活动。





2023年"金钥匙"活动颁奖典礼现场



2021年,"金钥匙——面 向 SDG 的中国行动"入 选第二届联合国可持续 发展优秀实践(UN SDG Good Practices),同年 "金钥匙"活动中的6个 案例也同时入选, 在国际 平台展示了中国可持续 发展的智慧和行动



《行动向未来: 金钥匙行动 塑造中国企业低碳领导力报 告》汇集金钥匙平台上的中 国企业低碳行动,在2021 年《联合国气候变化框架 公约》第26次缔约方大会 (COP26) 中发布,展现中 国企业贡献"双碳"目标的 领先行动

"金钥匙"活动目前已举办四届,共计389家企业的449项行动参加(未含金钥匙·国家电网主题赛127项行动), 其中关注气候议题的企业行动占比将近50%,涉及企业包括不同规模、不同行业的央企、在华外企以及民营企业等, 这些行动分别从能源转型、低碳生产与运营、数字化赋能、金融支持、低碳消费与生活等方面积极参与全球气候治理, 贡献中国碳中和目标。

2021年,《可持续发展经济导刊》携手山东财经大学中国国际低碳学院成立"金钥匙低碳行动中心",共同搭建 以企业为主体的低碳行动网络,提供企业在低碳战略、低碳管理、低碳实践、绿色金融、应对气候变化风险管控 等各方面的能力建设,搭建先锋行动的交流空间。





金钥匙落地高校和企业,分别和山东财经大学中国国际低碳学院、西交利物浦大学国际商学院合作成立 "金钥匙低碳行动中心" "金钥匙工作室"

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关于《可持续发展经济导刊》

《可持续发展经济导刊》(期刊号: CN10-1603/F, ISSN 2096-6520)是由中华人民共和国商务部主管的一份聚焦企业社会责任和可持续发展的商业管理类期刊,于 2019 年 1 月正式创刊,由 2002年创刊的《WTO 经济导刊》更名而来,是中国在企业社会责任和可持续发展领域的一面旗帜。

《可持续发展经济导刊》以"全球视野,合作共赢"为宗旨,定位于"面向未来的思想和行动",致力于建设可持续发展的思想智库和共享网络,汇聚并传递可持续发展信息和思想,发现并提升以可持续发展为目标的实践行动价值,推动可持续发展成为商业核心理念和行动,成为社会共同意识和选择。













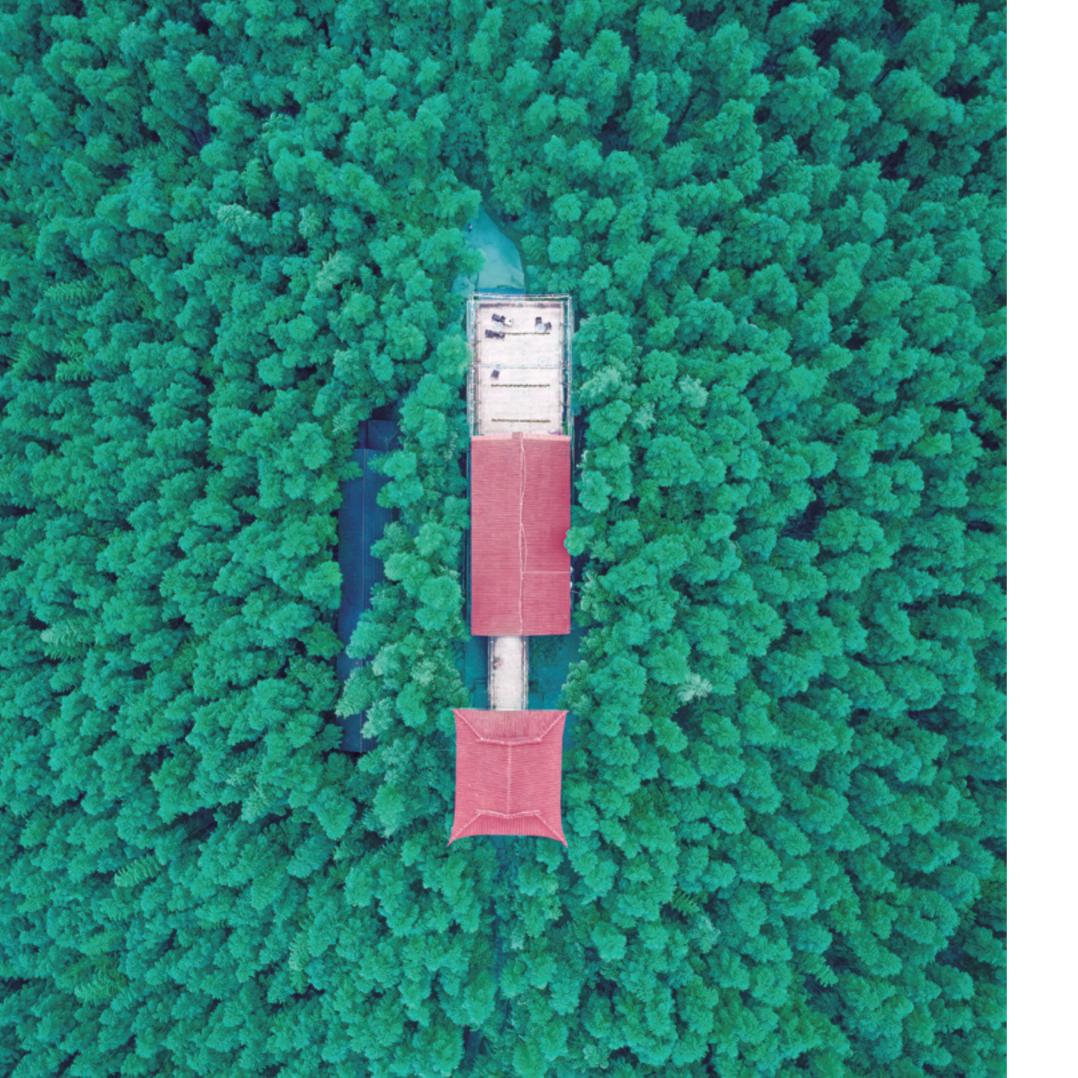
《可持续发展经济导刊》长期关注气候变化议题,在中国"双碳"目标制定后多次举办"碳中和高峰论坛""碳中和愿景与企业绿色发展专题研讨会"等交流活动,邀请来自清华大学、中国社会科学研究院、中华人民共和国科学技术部、中华人民共和国国家发展和改革委员会等机构的专家学者分别从国内外宏观政策、低碳科技创新、气候投融资、碳市场、企业减排路径、碳信息披露、绿色低碳品牌以及碳中和对国际贸易和供应链影响等角度开展对话和讨论,通过组织政界、学界和商界的多方交流,帮助企业全面系统了解碳中和带来的挑战和机遇,提高新认知、启迪新思维、发现新机遇,并且赋能企业将应对气候变化纳入企业治理的方法与路径。







连续举办碳中和高峰论坛,推动企业低碳转型,贡献高质量发展



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从责任到生存:

减碳逻辑正在改变

碳中和不是一个简单的外部性问题,也不是简单的化石能源替代和技术进步问题,而是对工业革命以来传统发展范式的颠覆性变革。碳中和意味着发展底层逻辑的变化,意味着整个社会经济体系的深刻变革¹。企业身处变革之中,唯有不断适应零碳潮流,才能不被时代所抛弃。

短短几年前,大部分人可能并没有意识到气候变化的存在,更不知道"碳达峰""碳中和"为何物。对于当时的人们而言,那些率先采取气候行动的大企业,可能更多的是出于"公益""情怀""公关",是企业在壮大之后履行社会责任的表现;而对于企业来说,节能减排可能除了省电费、节约成本,并无更多其他实质性益处。而且,当时企业即使不做"减碳",也不会有什么"坏处",企业并不会感受到来自政府、供应链、客户、消费者甚至资本市场的压力。

然而今天,气候变化已经成为全球共识。截至目前,已有占全球二氧化碳排放量约 90% 的 150 个国家和地区制定了碳中和目标²。2020 年 9 月,中国承诺二氧化碳排放力争于 2030 年前达到峰值,努力争取 2060 年前实现碳中和。在中国,绝大部分(96.3%)人相信气候变化的发生,尤其是近三年来诸如暖冬、高温等异常天气促进人们开始严肃思考气候变暖³。在社会舆论的引导下,公众的绿色消费意识逐渐增强,消费者也愈发关注企业及品牌的低碳表现⁴。与此同



时,敏锐的投资人和金融机构也看到了这个变化,开 始将企业低碳表现纳入投资决策。

在国际社会和国家的"指挥棒效应"下,一场席卷全球的零碳变革正在进行。在国家政策指导和监管下;在绿色供应链、绿色国际贸易新规的压力下;在资本市场以及消费市场的"用脚投票"下,越来越多的企业开始认识到,低碳转型不再是"锦上添花",而成为了一道必选题,关系每个企业的生死存亡。

我们观察到,企业做减碳的逻辑正在发生巨变——不只是责任、品牌形象,更是要抓住机遇积极进行战略调整和低碳价值创造。在"金钥匙"活动中,我们看到:

越来越多企业从战略高度布局低碳转型。例如,在中国"双碳"目标提出后,国家电网率先发布"碳达峰、碳中和"行动方案,并在清洁能源和智能电网方面积极谋划; 昕诺飞启动"低碳照明转型"计划,希望推动照明在城乡建设、清洁能源、绿色出行、循环经济、绿色农业五大重点领域发挥作用,助力中国"双碳"目标。

越来越多企业或品牌在加强绿色供应链管理,要求供应 商采用可再生能源,或者提供产品碳足迹报告。例如欧 莱雅中国将可持续发展绩效作为供应商准入与评价的 重要维度。安踏集团联动其他企业推动供应链绿色转 型,使用环保的纺织品面料并实现包装减塑。

越来越多企业以"绿色"价值为目标创新产品与业务, 甚至开创了新的商业模式。例如,第二树循环家具以 低碳环保的循环家具服务体系,成功实现循环经济商 业模式可持续转型。致力于让所有人绿色出行的哈啰 用共享单车放大了城市经济的边际价值,带动着城市 绿色发展活力。

越来越多企业积极顺应、拥抱绿色消费浪潮,支持并引导消费者低碳消费。例如,星巴克中国通过"绿色门店"建设,增强了消费环境的低碳空间概念;抱朴再生通过零废弃全流程解决方案,带动品牌和个人提升可持续价值和绿色消费理念。

可以发现,这些敏锐的、有志于在未来市场竞争中拔得头筹的企业将追求绿色低碳视为了一种可以让企业

获益更多、更持久的商业模式。他们这些优秀的低碳 行动背后隐藏着未来商业世界的模样。

为此,我们想要通过对这些行动进行归纳分析,尝试 去呈现当前在华企业低碳转型的特点与行动路径,并 且展示企业界在进入零碳时代所进行的勇敢自我革 新。这些行动是中国滚滚低碳浪潮中的小小的缩影, 也是未来零碳世界里发展的"主角"。期待通过这份 报告将这些优秀的低碳行动分享给世界,并影响和鼓 舞更多企业行动起来,行动起来,行动起来!

- 1 朱民等,世界经济(2023.03),《拥抱绿色发展新范式——中国碳中和政策框架研究》,http://ejournaliwep.cssn.cn/qkjj/sjjj/sj233/202303/P020230328550622286475.pdf
- 2 https://zerotracker.net/#data-explorer
- 3 澎拜新闻,《2022 年中国公众气候变化认知及行动调查报告》, https://projects.thepaper.cn/thepaper-cases/839studio/ report/Chinese_Public_Climate_Change_Awareness_and_ Actions_Report.pdf
- 4 商道纵横、界面新闻,《2022 中国可持续消费报告》, https://mp.weixin.qq.com/s/Zbnl-ISZIdLu71pc4ww7LA



第一章

势在必行:

减碳,"破圈"而来的发展主角



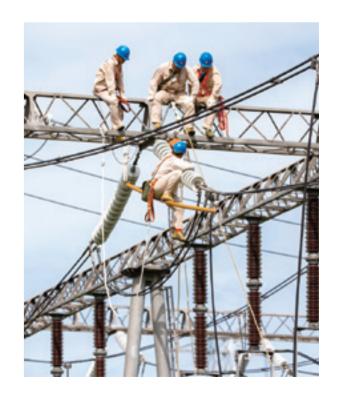
新事物的发展总要经历一个由小到大,由不完善到比较完善的过程。而且,由于人们认知改变 也要有一个过程,在这期间旧事物往往会顽强抵抗。但是,凭借着强大的生命力,新事物最终 必然战胜旧事物。

1.1 2020 年: 迎来爆发点

发生在岁末年初的新冠肺炎疫情,以其汹汹袭来之势,深刻改变了 2020 年的春天以及后来很长一段时间内人们的生产、生活,同时也改变了很多人的价值观,驱使人们重新思考人与自然的关系,也开始关注人类社会在更大危机——气候变化面前的应对能力与韧性发展。疫情促进民众开始更加关注绿色,大家希望通过自己的消费行为给世界带来积极改变。根据埃森哲2020 年 4 月的调查,50% 的消费者在购物时更注重健康,45% 的消费者会做出更可持续的选择,并很可能保持这样做5。

在新冠疫情给人类带来警醒之际,2020年9月,中国向世界宣布力争2030年前实现碳达峰、2060年前实现碳中和,再次加速了世界应对气候变化的进程。中国的这一承诺不仅提振了全世界应对气候变化的信心,同时也"点爆"中国各行各业对于低碳转型的关注。一时间,关于应对气候变化、深度脱碳转型的讨论陡增。碳中和成功从环保界"破圈",成为企业界言必提及的话题。

面对来自最高层的明确政策信号,一批领先型企业率 先响应,或积极表态,或抓紧时间着手研究方案,亦 有先行者甚至率先承诺,提出碳达峰碳中和的时间表。 其中,首当其冲的就是中央企业。例如,三大石油公 司(中国石油天然气集团公司、中国石油化工集团公 司、中国海洋石油总公司)迅速启动碳中和路径研究, 国家电投(2023 年)、大唐集团(2025 年)、华电集团(2025 年)、三峡集团(2023 年)等电力央企以及中国宝武等也相继宣布了实现碳达峰的时间表。2021年3月1日,国家电网正式对外发布"碳达峰、碳中和"行动方案,成为首个发布有关"双碳"目标"施工图"的央企。伴随着众多能源央企率先反应,市场敏锐度较高的金融领域也布局谋划,推动实质性措施出台。2021年2月8日,全国首批6只"碳中和债"在银行间债券市场成功发行,合计发行规模人民币64亿元,发行人包括华能国际、国家电投、南方电网、三峡集团、雅砻江水电和四川机场集团。2021年3



月中下旬,高瓴资本、红杉中国相继推出绿色基金和碳中和技术基金。同时,互联网巨头也踊跃加入碳中和竞赛,其中,腾讯于2021年1月12日,宣布启动碳中和规划;2021年3月,蚂蚁集团承诺在2030年实现净零排放⁶。

1.2 2021 - 2022 年: 从含混走向清晰

2021 年是中国宣布碳中和目标后的第一年,也是 "十四五"规划的开局之年。自 "双碳"目标首次被 写入 2021 年 "两会"的政府工作报告以来,这一年 的相关政策层出不穷,市场反应千变万化。一些经验 不足的企业很快在如何开展低碳行动上陷入迷茫,变 革本身的复杂性也让很多企业望而却步、甚至"跑偏"。 例如,有些企业口号大于行动;有些企业提出的碳达峰、碳中和目标缺少科学论证;还有些企业避重就轻,绕开与业务相关的核心减碳,在 "碳补偿"方面大做 特做文章; 也有企业错把 "碳达峰" 理解为 "碳冲锋"。

2021年7月30日,中共中央政治局会议明确指出,要统筹有序做好碳达峰、碳中和工作,尽快出台

2030年前碳达峰行动方案,坚持全国一盘棋,纠正"运动式"减碳,先立后破,坚决遏制"两高"项目盲目发展。伴随着中央点名"运动式"减碳,在政策指引下和能力认识提升的基础上,企业的减碳行动逐步趋于科学、理性,很多企业开始寻求科学的碳核查以及减排目标,并且根据实际发展现状合理规划减碳路径与行动。2021年11月18日,中国宝武正式发布《中国宝武碳中和行动方案》;2021年12月29日,鞍钢集团正式发布低碳冶金路线图,提出了低碳发展愿景、"三个使命"和"五大路径",两大钢铁领军企业从不同角度提出了中国钢铁实现"双碳"目标的方向和路径,为我国全面建设钢铁强国、全面引领世界钢铁明确了方向⁷。

2021年11月,《中共中央国务院关于完整准确全面贯彻新发展理念做好碳达峰碳中和工作的意见》以及《2030年前碳达峰行动方案》印发,贯穿碳达峰碳中和两个阶段的顶层设计正式出台。2022年,中国碳达峰碳中和"1+N"政策体系从顶层设计到各领域不断完善,钢铁、建材、有色、化工、石化、电力、煤炭等重点行业陆续提出明确的达峰目标并制定达峰



2019 年澳大利亚森林大火

行动方案,配套措施等;研究机构和国际组织也陆续 发布各种有关企业碳中和路径的文件和指导文件,为 企业如何实现碳中和提供路径指导。

2021 年郑州 "7·20" 暴雨让更多的中国人认识到气候变化的真实存在,实现碳中和社会的愿望更加迫切; 也是在这一年"运动式"减碳人为拉闸限电让关于能源绿色与能源安全的平衡问题成为焦点。2022 年,北京冬奥会成为迄今为止第一个"碳中和"冬奥会,为中国企业和其他重大活动提供了低碳样本; 2022年,一些第三方核查机构碳排放报告数据弄虚作假也让舆论一时哗然。2021-2022年,在碳中和的持续热议背后,不少人开始认识到了"碳中和"确实是一条又长又难的赛道,碳中和将给众多产业带来巨变,但这其中亦有很多挑战。

1.3 2023年: 求变求胜

碳中和绝不会一蹴而就,实现过程必定挑战重重,但是碳中和的目标不会动摇。中国牢牢保持绿色低碳发展的战略定力,在华企业扎实、系统、科学推进相关工作的局面也在不断展开。在一系列国家政策的指导以及社会各界对碳中和及其背后影响不断深化认识后,在2023年我们看到企业的减碳逻辑发生改变,低碳价值也更加坚定了企业变革的决心与信心。

企业界开始意识到,碳中和不只是"碳核查""碳管理",在转型压力和减排成本之外,碳中和更是经济的新增长故事。例如,隆基股份利用云南当地水电制造单晶硅棒、硅片、电池和组件等光伏产品,不仅使得光伏发电成本下降,还推动云南水电产业持续发展。截至2020年,隆基股份位于云南的5个工厂实现生产用电100%使用可再生能源电力,累计消纳水电25亿度,相当于减少135万吨的温室气体排放。2020年12月,隆基股份受到了高瓴资本158亿元投资。与此同时,伴随着消费者越来越愿意接受企业产品或服务中的"低碳价值"并买单,消费产业也刮起



建筑减碳

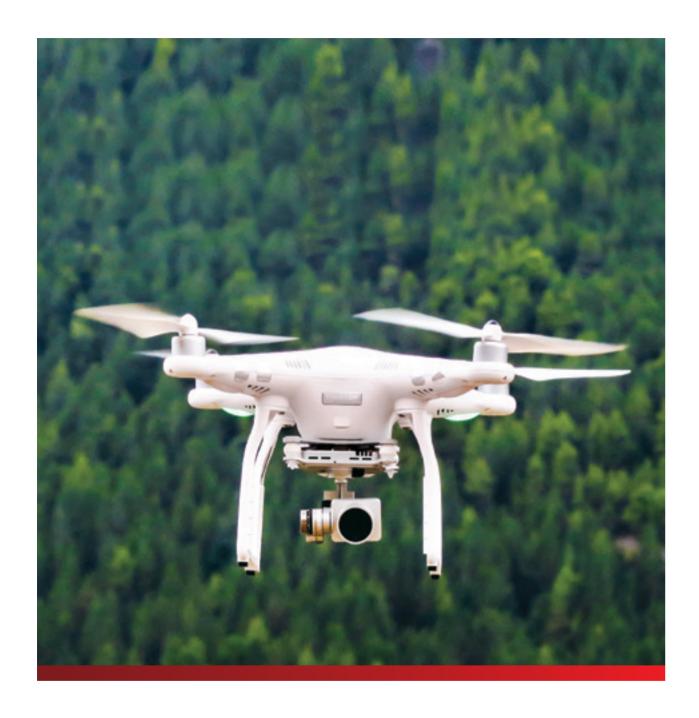
了低碳风,低碳产品、零碳产品不断涌现,低碳环保 也逐渐成为增强品牌市场竞争力的重要元素 ⁸。

在 2023 年首届上海国际碳中和技术、产品与成果博览会上,围绕能源转型、节能增效、循环经济、实践探索、低碳服务、低碳交通六大板块所展示的绿色技术、绿色产业、绿色产品让人们看到了绿色新经济的鲜活案例。"30·60"双碳目标之下,各类绿色产业应运而生,低碳转型正在成为经济发展的新动能。

碳中和即将改变商业规则,重塑商业新格局,但是实 现碳中和具有长期性、复杂性、艰巨性。伴随着认知 越清晰,企业低碳转型的行动也在愈发坚定。

- 5 埃森哲(2020),"COVID-19 如何永远改变消费者的行为"报告。https://www.accenture.com/gb-en/insights/consumergoods-services/coronavirus-consumerbehavior-research
- 6-8 于志宏等, 《中国企业落实"双碳"目标行动进展分析》

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第二章

主动变革:

在华企业减碳行动观察



如今,在商业规则和国家政策的推动下,大部分企业已经认识到低碳转型的重要价值,并将其视为在新一轮变革中获取融资、创新业务、提升品牌影响力和市场竞争力的关键砝码。这些转变是对零碳变革的深刻领悟,也源于身边低碳转型的蓬勃之势。越来越多的中国企业投身低碳潮流,求变求新,他们不仅展示了应对气候变化的决心和行动力,而且也发挥着"他山之石可以攻玉"的作用。

2.1 在华企业低碳实践特点

中国减碳进程起步较晚,对于大部分企业而言,如何 将低碳发展理念融入企业业务,实现环境价值和经济 价值的双赢,依然是一道较为棘手的难题。通过分析 "金钥匙"活动中涌现出的企业优秀的减碳行动,以 及与企业深入交流,本研究发现在华企业在低碳转型 方面形成了以下5个方面的特点。这5个方面,分别 对应企业低碳战略与治理,企业减碳举措、价值链合 作、数字化赋能减碳以及适应气候行动等。

▶ 1. 战略引领,内生动力不断迸发

企业要想在低碳转型中赢得先机,必须要全面审视自身定位和发展战略。企业必须要提升现有生产和运营的低碳水平,包括基础设施、供应链以及产品等;要设计和开发能够助力其他行业减少碳排放的产品、服务以及新型解决方案,这可能打破原有的市场格局,带来蓬勃发展的新业务和新市场。

将低碳发展理念上升到企业战略层面进行考量,并制定科学、完善的低碳转型战略,对于企业开展减碳工作意义重大。首先,明确目标,有利于企业各部门统一思想,形成合力。其次,提前谋划,科学部署,为碳减排工作描绘"施工图"。第三,有助于企业优化资源配置,提高碳减排工作效率。第四,有助于规避风险,提前布局低碳经济,提升核心竞争力。最后,

低碳战略有助于提升企业在各利益相关方包括投资人和消费者心目中的形象。

尽管目前大部分企业尚未制定清晰的减碳战略或碳达 峰碳中和行动方案,且有不少企业在设定目标以及碳 核查方面存在挑战,但通过对"金钥匙"活动中的企 业低碳实践分析,本研究发现:

第一,在国务院国有资产监督管理委员会领导下,中央企业领先其他企业制定碳达峰碳中和行动方案。尽管编制工作依然存在一些问题,但是央企发挥了很好的引领示范作用。第二,大部分企业认识到了减碳战略的价值,其驱动力除了政策引导,更多来自市场供应链、资本市场以及消费者等市场因素,企业减碳动力不断内化。第三,为推动低碳战略有效执行,优秀企业建立了完善的低碳治理架构,通过企业内部考核奖惩体系落实相关举措。第四,优秀企业将低碳战略融入业务发展,在低碳产品设计、低碳服务创新和低碳解决方案方面积极行动,追求实现商业价值和环境价值协同增长。

▶ 2. 中国并联式协同推进绿色发展

中国仍然是一个发展中国家,中国经济有潜力继续保持比较快的增速。为此,不同于已经完成工业化的发达国家的减碳,中国的减碳必须立足现在所处的发展 阶段,强调边发展边保护、将绿色低碳理念纳入发展, 16 从行动开始: 在华企业低碳转型实践观察报告 2023

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第一,降碳。提高传统能源使用效率,加快清洁能源 替代是大部分企业在降碳方面采取的常见举措,其中 创新发展和应用 CCUS 等负碳排放技术是大型能源和 工业企业发力脱碳的重要领域。第二,减污。在污水 治理、废气余热回收、固体废弃物循环利用以及塑料 污染治理方面, 无论是大企业还是小企业均采取了积 极行动。不少领先企业将循环理念前置产品设计阶段, 从源头提升资源利用效率。第三,扩绿。植树造林, 红树林、湿地生态修复,海洋保护等是企业经常采取 的天然碳汇手段。此外,生物多样性保护与碳减排的 协同效应不断被强化认识。第四,增长。对于企业而 言减碳不仅是践行公益, 也是在谋求增长。碳交易、 绿色投融资、低碳产品及创新解决方案等市场机制的 建立与作用发挥使得企业在推动绿色转型方面获得持 久内生动力。此外,由资源循环和共享理念衍生的新 商业模式,例如共享出行,二手经济等日益受到消费 者喜爱并带来新的增长点。

既顺应全球减碳的时代趋势,又结合中国式减碳进程 时间压缩、任务叠加、发展与环保要协调等特点,中 国企业多元减碳举措并行,在循环经济、可再生能源、 能效提升、生态修复等方面进行了诸多探索。

▶ 3. 建立伙伴关系,推动全价值链减碳

企业实现净零,很大程度上是解决范围三排放(来自企业运营上游和下游的间接排放)的问题。据世界经济论坛相关研究显示,"食品、快消品、时尚、电子、汽车、货运六大与消费相关的价值链占全球排放量约40%"⁹。其次,推进全价值链减排,品牌企业对消费者及供应商的引导不可或缺。据相关研究发现,"消

费品行业约有80%-90%的碳排在品牌自身运营之外,主要来源于品牌端到端价值链中的上游供应商和下游消费者。"¹⁰因此,除了降低企业内部运营的碳排放,推动价值链上下游协同减碳,合力打造绿色发展生态圈正在成为比较有雄心的大型企业的努力方向。2018年12月,全球时尚界在波兰卡托维兹联合国气候变化大会(COP24)期间发布了《时尚业气候行动宪章》(Fashion Industry Charter for Climate Action)。43个主要品牌、零售商、供应商组织和其他公司已同意共同解决时尚行业在整个价值链中对气候的影响。

而且,推动价值链减碳对于品牌也至关重要。据埃森哲 2021 年消费者研究报告,"77%的中国消费者认为低碳议题在消费中日益重要,83%的中国消费者认为商家应为低碳购买和消费提供便利。"¹¹ 其次,减碳还可以创造新需求,实现营收增长、成本节降、企业品牌力提升和风险防范。尽管目前大多数企业碳中和行动仍集中在自身运营,全供应链的"碳中和"行动仍然滞后,但是"金钥匙"中的许多减碳行动让我们看到了优秀企业在这一方面所进行的努力与尝试。

第一,在华跨国企业注重全价值链减碳,例如雀巢中 国、戴尔科技集团等,他们从原料产地采购到工厂研 发设计、生产制造再到仓储物流和后期产品使用及回 收整个完整的供应链已形成一定的减碳实践。在推动 上游供应商进行能源及产业结构转型, 引导下游消费 者形成低碳消费意识和行为方面, 跨国品牌均发挥了 较大影响力。第二,瞄准市场机遇,科技公司、金融 机构以及制造业企业等,通过创新数字化解决方案和 可持续产品,助力其他行业和消费者积极减碳,实现 环境效益和经济效益共赢(详见下文"4数字化赋能, 加速低碳转型")。第三,众多企业和组织打造伙伴 关系,例如中国纺织工业联合会启动"中国时尚品牌 气候创新碳中和加速计划";《可持续发展经济导刊》 联合企业界发起 "全球可持续消费倡议"等,这些行 动倡议有助于营造绿色可持续发展社会舆论,促进交 流、凝聚共识,号召更多企业行动。

▶ 4. 数字化赋能,加速低碳转型

当前,全球正在进行绿色化与数字化的双转型过程,加快数字化与绿色化协同转型有助于推动经济社会实现可持续发展。一方面,以数字化赋能绿色化。数字化具有放大、叠加和倍增的作用,大数据、云计算、物联网、区块链、人工智能等前沿技术的推进,为企业开展高效低碳管理和治理提供了强有力的支撑。比如,数字化可以提高能源使用效率。根据中国信通院《数字碳中和白皮书》预测,到2030年,数字技术将赋能不同行业减排约10%到40%不等¹²。另一方面,以绿色化牵引数字化。伴随着数字经济发展,数字产业的碳排放和电子废弃物将成为制约其健康发展的重要障碍。为此,绿色化为数字化发展指明了方向,推动绿色低碳发展是数字产业健康可持续发展的必然要求。

在金钥匙行动中,企业积极探索数字化绿色化融合发展,并取得初步成效。

第一,数字化助力气候行动。通过智慧工厂、智慧农业、智慧共享出行以及电力大数据的开发应用等,数字化技术帮助中国企业提质增效,优化资源配置,提升企业低碳发展水平。另外,5G、云、AI等技术在预警和监测方面的应用,大大提升了企业以及全社会的气候风险管理水平。第二,数字化助力碳数据管理。利用数字化技术提高企业碳数据搜集、分析的准确性和效率。数字化还帮助企业进行碳数据的实时监测和分析,有助于企业随时采取对策;帮助企业开展碳排放数据的公开透明化工作。数字化有助于企业开展较为复杂的绿色供应链管理。第三,数字化助力企业开拓绿色业务。在市场需求的指引下,科技公司以及第三方咨询机构等创新开发碳数据管理系统,能效管理软件等其他产品与服务,赋能各行各业以及全社会低碳发展。

▶ 5. 适应气候行动初见起色

除了尽可能减少人为排放、减缓气候变暖速度,人类 还必须采取适应行动,降低气候变化带来的灾难性后 果和影响。然而,作为应对气候变化的重要手段之一, 气候适应却一直被忽视。《联合国气候变化框架公约》 第 27 次缔约方大会(COP27)启动了全球计划《沙姆沙伊赫适应气候变化议程》,提出了到 2030 年要实现的 30 个目标,以改善 40 亿人的生活。该计划希望通过制定粮食与农业、水与自然、海岸线与海洋等主题的目标,让公共和私营部门为共同目标而努力,加速适应气候变化。

面对气候危机,企业的认知水平、适应水平决定了其 韧性发展的能力。但是,目前中国企业适应气候变化 的管理仍处于起步阶段,普遍存在风险识别率偏低; 风险管理停留在定性层面(并没有评估气候风险对财 务的影响,也没有将气候风险纳入企业日常经营风控 体系);未和财务数据建立关联等特点¹³。在"金钥匙" 的企业行动中,聚焦适应气候变化的数量并不多,但 仍可窥探在华企业在此方面的几个特点。

第一,从预警防治自然灾害角度出发,金融企业、互联网公司、通信运营商等均推出了风险管理平台,灾后应急通信系统等。气象服务对产业、基础设施等经济社会基础服务的支撑能力也被进一步地认识和发挥。第二,农业领域里现有的适应措施的规模仍不足以实现可持续发展目标。第三,企业以及企业所在行业缺乏自身对于气候变化脆弱性和暴露度的评估,在制定适应规划和方案并采取行动降低不利影响方面,明显不足。

- 9 世界经济论坛 (WEF),《净零挑战,供应链机会》,https://www.weforum.org/publications/net-zero-challengethe-supply-chain-opportunity/
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2.2 企业减碳行动典型案例

中国石化:践行"双碳"目标,持之以恒投身美丽中国建设



企业简介

中国石油化工集团有限公司(简称中国石化,英 文缩写 Sinopec Group) 坚持"为美好生活加油" 的企业使命,践行"能源至净生活至美"的品牌 承诺,加快完善"一基两翼三新"产业格局,积 极履行"三大核心职责",加快打造具有强大战 略支撑力、强大民生保障力、强大精神感召力的 中国石化,全力推进高质量发展,努力建设"世 界领先洁净能源化工公司"。



行动亮点

推动 CCUS 产业发展,助力"双碳"目标

2022年1月,中国石化正式建成中国首个全流 程百万吨级 CCUS 项目——"齐鲁石化-胜利油 田",投产后每年可减排二氧化碳100万吨,相



"齐鲁石化-胜利油田百万吨级 CCUS 项目" 二氧化碳输送管道——齐鲁石化首站

当于植树近900万棵、近60万辆经济型轿车停 开一年, 预计未来 15年可实现增产原油 296.5 万吨。2022年8月25日,"齐鲁石化-胜利油田" 投产,标志着中国 CCUS 产业开始进入商业化运 营阶段。

中国石化 CCUS 重点实验室等高能级科研平台, 突破国内外低渗透油藏开发常规认识,创新提出 CO。高压混相驱油与封存技术,建立"压驱+水 气交替驱"注入模式,配套低浓度 CO₂ 捕集、全 密闭高效注采等技术,整体达到国际领先水平, 为我国上百亿吨低渗透油藏高效开发创新了技术 路径。成功研发具有完全自主知识产权的 CO。高 效外输泵、低温密闭液相注入和高压密相注入装 备,破解CO。大排量长距离输送、多相态高压注 入等难题,填补了我国在该领域装备制造及应用 上的空白。

中国石化坚持标准领跑,努力打造国际 CCUS 标 准高地,带动上中下游企业质量进步、标准提升, 推动形成优质企业集群,共同提升绿色低碳产业 发展潜力和核心竞争力。

加快培育壮大氢产业链

在氢能交通领域,中国石化围绕"3+2"氢燃料电 池汽车示范城市群(北京、上海、广东、河南、 河北五大城市群)及山东、成渝等重点地区,布 局后冬奥时代的氢能重卡、氢能大客车、氢能物 流走廊等应用场景, 先后建成 9 个氢燃料电池供 氢中心,累计建成加氢站 101 座、建设和运营加 氢站数量居全球首位。



氢能交通率先发力,规模效应明显

在绿氢炼化领域,中国石化启动全球最大绿氢耦 合煤化工项目——内蒙古鄂尔多斯市风光融合绿 氢示范项目,年可制绿氢 3 万吨、绿氧 24 万吨; 负责实施的新疆库车 2 万吨 / 年绿氡示范项目干 2023年顺利产氢,标志着我国绿氢工业化规模应

用实现零的突破;首条"西氢东送"管道纳入国 家规划,是我国首条跨省区、大规模、长距离的 纯氢输送管道,建成后将大力缓解我国绿氢供需 错配的问题, 对今后我国跨区域氢气输送管网建 设具有战略性的示范引领作用。



中国石化主动拥抱绿色变革,以碳的"净零"排 放为终极目标,打造低碳竞争力。聚焦"双碳" 目标,统筹发展与减排的关系,扎实推进化石能 源洁净化、洁净能源规模化、生产过程低碳化, 走出一条统筹能源安全、产业安全、绿色低碳发 展之路,为能源化工行业绿色低碳转型、实现"双 碳"目标提供新思路。

京东物流:推动上下游协同脱碳,打造气候韧性供应链



企业简介

京东物流于 2007 年作为京东集团内部的物流部门 成立,于2017年4月作为京东集团的独立业务分 部运营。2021年5月于香港联交所主板上市,进 入崭新的发展阶段。作为中国领先的技术驱动的 供应链解决方案及物流服务商和国内首家设立科 学碳目标(SBTi)的物流企业,京东物流从"环境 (Planet) " "人文社会 (People) " "经济 (Profits) " 三方面,携同利益相关方关注人类的可持续发展, 着力推行战略级项目"青流计划"。使用更多清洁 能源,推广和使用更多可再生能源和环保材料,践

行绿色可持续发展理念。以"体验为本、技术驱动、 效率制胜"的发展战略,将自身长期积累的新型实 体企业发展经验和长期技术投入所带来的数智化能 力持续服务实体经济,持续创造社会价值。



行动亮点

京东物流在推动自身减碳行动的同时,积极带动 产业链绿色低碳发展,持续推进供应链上下游生 态伙伴积极融入产业脱碳大循环,构建绿色价值 链。以共同的碳目标为指引,鼓励供应链上下游

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企业将"去碳化"作为合作基础,减缓并最终扭 转全球气候变暖,实现"生态环境累积效应"。

绿色仓储: 致力于至 2030 年打造供应链领域全 球屋顶光伏装机容量最大的生态体系, 为智能产 业园提供绿色能源。2022年,京东物流西安"亚 洲一号"智能产业园获得由北京绿色交易所和华 测认证(CTI)颁发的碳中和认证双证书,是我国 首个"碳中和"物流园区。该园区内屋顶配备了 光伏发电设备, 总装机容量为 9 兆瓦, 总计 10 万 平方米的光伏屋顶占据了园区总面积的三分之一 以上,所产生的绿色电力白天可供园区办公照明 使用, 夜间可通过"汽车+车棚+充电桩+光伏" 的项目试点,为电动新能源车充电。该园区建设 中的分布式锂电池储能系统将有助于电力平滑和 调节,缓解用电高峰时段对电网系统的冲击,同时, 园区建立有完善的节能管理制度, 在生产作业过 程中持续优化分拣、运输流程,实现高效分拣与 立库黑灯作业, 在效率提升的同时减少碳排放; 园区内根据光照条件,优先使用太阳能路灯进行 照明。此外,园区还充分利用自身可再生电力优势, 采用分布式空调取代锅炉房,最大限度避免化石 能源消耗。

绿色运输: 多式联运规模不断扩大, 严格依据碳 目标导向,基于仓网运筹规划技术,选取碳排放 较低的交通工具、积极推动新能源车辆使用、推 进不同货物组合运输, 提升运输效率的同时降低 能耗、减少碳排放。2022年8月,京东物流首 批换电新能源车投入实际运行。通过新能源车整 体换电解决方案,京东物流预计可提升所在物流 园区储能电量消纳比超25%,减少投放车辆超 20%, 单车碳减排量可进一步提升超 15%, 综 合碳减排提升率超35%。截至2022年底,京东 物流已在全国范围投放约 120 台换电新能源车。 2022年10月17日,首批京东物流氢能源物流卡 车投入运营。作为京东物流"零碳运输"解决方 案的重要环节之一, 京东物流氢能源物流卡车为 客户实现了部分供应链运输的"净零"排放,相 较传统柴油卡车,每月可减少碳排放约7.53吨, 并大幅节约燃料成本。

绿色配送: "最后一公里"配送持续引入机械化 与智能化设备降低能源消耗,推广环保材质使用, 让绿色基因延伸至全链路的每一公里。2022年, 京东物流拣运仓库新引入货物感应设备1,056套, 当拣运设备处于无货状态时会自动停机以节约电 量,根据估算全年将节约电费3%。同时,使用 聚氯乙烯 (PVC) 材料制成的卡板替换木制卡板, 使用循环编织袋替换一次性编织袋。与 2021 年 相比,循环包装袋投入环比增长25%,全年循环2.4 亿次,节约一次性编织袋 8.247 万个。

绿色包装: 从减量包装、循环包装等多渠道实现推 进绿色包装,常态化投入使用循环包装箱,推出行 业首个"原发包装认证标准"。通过优惠政策激励 品牌商企业推行原厂直发包装。采用可重复使用的 循环快递箱"青流箱"、循环保温箱、循环中转袋 等减少一次性包装材料的使用。开放京东物流材料 实验室,作为高校可再生材料创新项目孵化器,推 动行业环保材料的使用和技术革新。



自主研发供应链碳管理平台 SCEMP 并经核证: 吸 纳中国超过140种道路运输载具碳排放因子,并 基于运输工具的真实轨迹, 以最小颗粒度计算的物 流运输碳足迹管理平台,是目前全球供应链物流领 域首款囊括上述功能的供应链碳管理平台,填补了 当前该领域碳足迹精细化管理空白, 有效地解决了 移动排放源监测难题。京东物流积极为客户解决碳 排放管理的痛点。为迪卡侬建立碳账户,针对性的 解决迪卡侬电商 B2B 场景下温室气体碳足迹的计 算以及脱碳路径。平台在上线的一个月内完成了客 户单个场景超过20万张运单的计算量。精准计算 了每一张订单的碳足迹和可核证温室气体减排量, 满足客户要求的碳足迹计算准确度、颗粒度及可视 化要求。2023年4月,在绿色供应链创新发展论 坛上, 京东物流等 11 家企业共同签署发布"供应 链脱碳倡议"。共同承诺强化绿色管理主体责任, 探索绿色供应链发展路径模式,推动供应链端到端 的低碳化、绿色化、可循环化。





京东物流作为紧密链接生产和消费两端的供应 链物流企业, 在企业自身绿色发展的同时, 倡 导供应链上的所有参与企业一致行动,从单一 企业的减碳自循环上升为联动上下游共同融入 产业脱碳大循环。在此背景下, 京东物流在行 业内首次提出供应链"共享碳足迹"的理念, 发起供应链脱碳行动,成为破解物流行业长期 可持续发展的有效解决方案,并推动行业、产业、 供应链生态可持续发展, 共同抵御全球变暖的 切实可行路径。

- 1. 作为国内首家提出供应链脱碳行动的供应链物 流企业,努力提升自身基础设施能力和数字技术 能力,最大化降低自身碳排放。
- 2. 积极带动产业绿色低碳发展,持续推进供应链 上下游生态伙伴积极融入产业脱碳大循环,构建 绿色价值链。基于绿色价值链下的共享碳足迹和 分担脱碳成本实现联合脱碳,将从温室气体排放 范围一、二、三、系统性提出供应链减碳技术以 及实现路径。
- 3. 作为供应链脱碳行动的重要内容和抓手, 京东 物流推出了适用于多种不同场景下的供应链碳管 理平台 SCEMP,以推动更多企业高效、低成本减 碳, 最终实现"净零排放"目标。
- 4. "供应链脱碳行动"不仅能让碳足迹相对较小 的企业在全球范围同样产生重大影响,还可以通 过分散价值链的脱碳成本,缓解企业减碳路径的 成本投入,为消费者提供减碳参与途径,让实现 供应链脱碳的路径更加深刻且彻底。

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光大银行: 打好绿色金融"组合拳","贷"动经济低碳发展



企业简介

中国光大银行(简称光大银行)成立于1992年 8月,是经国务院批复并经人民银行批准设立的 全国性股份制商业银行。光大银行聚焦"打造一 流财富管理银行"战略愿景,加快产品、渠道和 服务模式的创新,在财富管理、金融科技和综合 金融等领域培育了较强的市场竞争优势。在社会 责任和可持续发展方面,光大银行持续关注社会 需求,在教育、环保、精准帮扶、爱老敬老、公 益慈善等领域开展多种形式的公益活动; 光大云 缴费聚焦便民服务和金融场景搭建,发挥线上化、 便捷化优势服务亿万民众; 入选福布斯中国发布 的"中国 ESG50"榜单,恒生 A 股可持续发展企 业指数, 在 2023 年 "全球银行 1000 强排行榜"中, 位列第 28 名。



行动亮点

在战略目标层面,光大银行制定了《2021-2025 年滚动战略计划》,要求全行"大力发展绿色金 融,支持绿色、低碳、循环经济发展,以市场化 方式为'碳达峰、碳中和'目标提供投融资支持, 确保绿色融资增速不低于全行平均增速",将建 设"绿色光大"融入全行发展战略。在《中长期 发展战略(2018-2027)》中明确绿色金融战略, 要求本行应开展绿色金融,与各利益相关方携手, 持续提升经济、环境和社会责任的绩效表现和社 会责任管理水平。

在管理机制方面,光大银行从完善管理架构、细 化政策制度、明确风险管理流程、提升信息披露 专业性等方面构建了全面的管理机制。在总行层



面,进一步明确了融资活动中的 ESG 风险管理范 围,把 ESG 风险纳入全面风险管理体系,并作为 风险管理框架的有机组成部分; 在分行实践方面, 以深圳分行为代表的部分分支机构还发布了《环 境信息披露报告》,探索自身经营和投融资活动 环境数据的收集、管理和披露工作,识别和评估 投融资环境影响、投融资活动碳足迹等要素。

在绿色信贷领域,光大银行坚持协同推进降碳、 减污、扩绿、增长,有计划、有步骤地支持"双 碳"目标,应对气候变化、支持生物多样性保护, 持续优化环境相关信贷管理政策,制定了涵盖农 林牧渔、电力、钢铁、煤炭等重点行业信贷政策, 促进信贷结构向"绿色"调整,大力支持绿色产 业发展,助力传统行业转型升级。截至2023年 9月末,光大银行绿色贷款余额 2888 亿元,较 上年末增长 45%; 清洁能源产业贷款余额 545 亿 元,较上年末增长75%;绿色债券投资也较上年 末增长 38%。

以光大银行助力"物流运输"领域绿色转型发展 **为例**。近年来,光大银行作为满帮集团最主要的 物流数字金融合作伙伴,与企业携手共建了物流 数字化结算体系,为数百万司机和货主完成数千 亿元的线上化运费支付,极大提升了货运数字化 水平。同时,光大银行积极响应满帮集团发起的 中国公路货运可持续发展绿色行动,参与建设"绿 色物流+"服务体系。目前,联合满帮集团推出 的"绿色物流+金融"服务已正式上线,双方基 于司机碳账户建立起互认互信的绿色信誉体系。 此举将进一步提升货车司机在金融服务领域的体 验感、获得感, 鼓励更多的货车司机提升节能减 碳意识,成为物流运输领域"碳达峰、碳中和" 道路上的主力军。



在绿色金融产品方面,光大银行在业内率先推出 了"碳易通场景金融"模式,以全国碳交易所为 依托, 为参与碳配额交易的电力企业提供碳排放 权质押融资、绿色债券、支付结算、账户管理等 一揽子金融服务,为企业绿色发展助力,也给银 行业绿色金融创新提供了更多思路。

在自身节能减排方面,连续两年开展全行碳排放 盘查工作,统计收集境内 1000 余家总分支机构 碳排放数据,建立科学有效的数据测算模型,完 成碳足迹管理的初步摸底工作, 积极探索能源托 管模式,明确碳排放重点节能技改目标。



布局绿色金融,不仅是商业银行转型发展的重要 方向,也是银行机构广阔的发展机遇。作为绿色 金融的积极践行者,光大银行多措并举,有重点 倾斜,也有创新突破,将绿色金融作为践行 ESG 的重要抓手,以把握能源和产业变革带来的发展 契机,协同推进降碳、减污、扩绿、增长;同时 防范 ESG 风险,提升自身 ESG 表现,促进经济 社会发展全面绿色转型。

国网无锡供电公司:用创新解决方案推进能源低碳转型



企业简介

国网江苏省电力有限公司无锡供电分公司(以下简称国网无锡供电公司)起步于1909年,至今已走过了百年发展历程。截至2022年12月底,国网无锡供电公司营业客户总数达410.42万户。35千伏及以上变电所347座,变电容量6800.8万千伏安,35千伏及以上线路长度7955.2千米。在"双碳"目标下,国网无锡供电公司积极行动,结合自身实际,牢牢抓住绿色低碳发展有利机遇,多措并举,全面探索能源低碳转型的多元化路径,开展了丰富而卓有成效的实践,在助力低碳发展方面先行先试,为构建韧性、安全、绿色、低碳电网做出贡献。



行动亮点

打造零碳灯塔工厂,引领绿色智能之路

国网无锡供电公司联合无锡综合能源服务公司和普洛菲斯,在"灯塔工厂"的基础上,紧扣绿色智能制造和绿色能源管理两大抓手,围绕供电可靠性提升、清洁能源建设、工厂能效运营管理、绿色电力服务等方面展开合作,从节费和绿色两方面,打造首个零碳"制造业灯塔工厂",促进



精益生产、能效提升、清洁能源替代、用能成本 优化、可持续发展,推动能源转型与脱碳,为更 多制造型企业探索出一条将绿色能源管理和绿色 智能制造融会贯通的发展之道。

推进内河船舶靠港使用岸电,保护绿水青山

为了推广绿色岸电,国网无锡供电公司加快内河港口码头岸电设施建设,推进船舶靠港使用岸电,并以岸电的智能化赋能绿色码头,助力生态港口建设。针对企业不想建、船只不好用、平台不会管三大痛点问题,国网无锡供电公司建立了"一基一降三创新"推广模式,实现了内河岸电从能用、好用再到享用的蜕变。内河岸电的使用,满足了船舶靠泊期间的生活用电需求,减少了噪声和空气污染,降低了船舶靠港成本和维护费用,实现了有害气体的零排放,助力了低碳生态发展,为绿色岸电在全国内河港口码头推广提供了示范样本。

打造绿色智慧仓储,推动供应链低碳发展

在国家电网系统中,物资仓储链接着供应商、项目单位和其他兄弟单位,存储着数目庞大、种类繁杂的货物,在构建绿色供应链管理中发挥着至关重要的作用。国网无锡供电公司以数字孪生云平台、3D建模多种新技术,打造"五星"供应链平台智慧仓库,实现业务办理自动化、仓库全息可视化、资源调度智能化、运营管理低碳化,极大地提升了效率和质量,盘活了仓储物资,在打造高效低碳供应链、推动供应链绿色发展方面做出了有益尝试。

加强绿色电力供应,助力绿色农业发展

作为电力能源的配送方,国网无锡供电公司从自身服务端推动绿色电力的供给和消费、协助优化



国网无锡供电公司仓库屋顶光伏

服务地区的能源结构。国网无锡供电公司抓住农业污染严重的痛点,利用风能、光伏、储能、地源热泵等多种绿色可再生能源,实现青禾农场生产装置电力化改造,最大程度地减少传统化石能源造成的碳排放及二氧化硫、氮氧化合物等多种有害物质的排放,减少相应的冲灰废水等对水环境的污染,助力绿色农业发展。

推动电能替代,助力"非遗"产业焕发新活力

江苏宜兴手工紫砂陶艺作为一种富有民族特征和 地域特色的非物质文化遗产, 其传统生产过程存



推广电窑炉,助力宜兴陶瓷业低碳发展

在资源消耗大、能耗高和污染严重问题,以及成品率低、品质控制等问题。国网无锡宜兴市供电公司以保护青山绿水、促进节能减排为宗旨,于2005年在宜兴丁蜀地区积极推广电窑炉替代,落实相关政策,开辟了一条电能替代的绿色通道,实现陶瓷业由资源消耗型、生态欠佳型向资源节约型、低碳发展型转变,并大幅提升了陶瓷品质,助力陶瓷产业焕发新活力。



启示

自我国"双碳"目标提出以来,国家电网系统各公司加快推进能源供给多元化清洁化低碳化、能源消费高效化减量化电气化。国网无锡供电公司从自身业务和技术优势出发,结合地方经济发展、产业特色等,由内而外,从自身打造绿色智慧仓储、推动传统产业电能替代、推广岸电使用,到发挥优势联合打造首个零碳"制造业灯塔工厂",用扎实行动为制造业、农业、陶瓷产业等众多行业企业用能清洁化、低碳化提供了有效的解决方案,充分展示了其在助力节能降碳上的不懈努力、突出成效及巨大潜能,在助力实现"双碳"目标上发挥着示范和引领作用。



第三章

特别关注:

以绿色发展破浪"出海"



近年来,中国企业走出去步伐不断加快,中企海外投资力度不断加强。数据表明,中国境内投资者在全球超过 80% 的国家和地区设立了境外企业 ¹⁴。通过项目建设等方式,中国企业改善了当地的基础设施,并创造了大量就业机会,促进了贸易、资金的流通,中国企业在全球经济社会发展中的影响力日益增强。同时,中国的制造业和出口企业的实力和竞争力持续增强,世界贸易组织(WTO)数据显示,2022 年中国出口国际市场份额为 14.4%,连续 14 年居全球首位 ¹⁵。进入碳中和时代,要保持对外投资和贸易的良好势头,除了要持续提高"走出去"的质量,低碳发展水平也将决定中国企业和中国制造的核心竞争力。

日益复杂的外部环境要求出海企业加快形成绿色竞争

力。以碳市场与碳边境调节机制(CBAM)为代表的碳定价政策,以生态设计、全生命周期管理与回收利用为代表的循环经济政策,以价值链碳管理与强制披露为代表的合规与报告政策,要求中国出海企业应具备量化核算企业组织与产品层面碳排放、构建循环经济体系、打造可持续价值链的能力,给企业出海带来了合规性挑战 ¹⁶。

中国始终将"绿色"作为走向世界的底色。在推动绿色低碳发展方面,中国坚持国内行动和国外行动的内在一致性。在共建"一带一路"倡议中,中国先后发布《关于推进共建"一带一路"绿色发展的意见》等文件,提出2030年共建"一带一路"绿色发展格局基本形成的宏伟目标。中国承诺不再新建境外煤电项目,积极构建绿色金融发展平台和国际合作机制,与共建国家开展生物多样性保护合作研究,共同维护海

上丝绸之路生态安全,建设"一带一路"生态环保大数据服务平台和"一带一路"环境技术交流与转移中心,实施绿色丝路使者计划。

在国际社会和中国政策要求下,中国企业在对外投资合作中不断提高环境风险管理水平,绿色、低碳理念逐步深入到生产和运营中。在"金钥匙"活动中,秉持"四海一家"原则的企业实践为外界了解中国企业海外绿色"破局"提供了窗口。

首先,作为"走出去"企业的主力军,中央企业通过开展公益活动,呵护动植物,保护环境,推广可再生能源和技术等等,担负起了中国企业海外绿色发展与形象建设的重任。第二,新兴经济体和发展中国家对传统能源依赖程度较高,绿色转型发展面临瓶颈,中企凭借自身经济和技术实力以多种形式参与共建国家在可再生能源领域、绿色基建、绿色交通等领域的合作,不仅为自身

"一带一路"十周年绿色低碳发展取得积极进展 17

中国与30多个国家及国际组织签署环保合作协议,与31个国家共同发起"一带一路"绿色发展伙伴关系倡议,与超过40个国家的150多个合作伙伴建立"一带一路"绿色发展国际联盟,与32个国家建立"一带一路"能源合作伙伴关系。中国与39个共建国家签署47份气候变化南南合作谅解备忘录,与30多个发展中国家开展70余个减缓和适应气候变化项目,培训了120多个国家3000多人次的环境管理人员和专家学者。

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赢得海外业务,同时也避免了所在国由于工业化、城镇 化发展带来的高排放,赋能投资所在国低碳发展。第三, 海外园区树立了中国经济发展模式的样板,也是向世界 展示中国推动绿色低碳发展成果的重要载体。尽管海外 园区绿色低碳水平还有较大提升空间,但在推动能源、 经济低碳转型,建设绿色基础设施,促进资源循环利用 以及绿色宣传等方面,均已有许多探索,提升了中国企 业走出去的影响力和软实力。

中国石化:清洁能源——助力"绿色中东"建设



企业简介

中国石油化工集团有限公司(简称中国石化,英文缩写 Sinopec Group)坚持"为美好生活加油"的企业使命,践行"能源至净生活至美"的品牌承诺,加快完善"一基两翼三新"产业格局,积极履行"三大核心职责",加快打造具有强大战略支撑力、强大民生保障力、强大精神感召力的中国石化,全力推进高质量发展,努力建设"世界领先洁净能源化工公司"。



行动亮点

中国石化积极响应"绿色中东"倡议和各国提出的绿色发展规划,持续提升绿色运营水平、开展环境保护行动,为推进"绿色中东"进程贡献力量。

积极响应倡议

中国石化在中东各国开展业务时,积极参考当地绿色发展倡议和战略,制定相应的可持续发展战略规划并严格执行,配合当地低碳发展,为构建



中国石化炼化工程集团承接的沙特IBB合成氨改造项目,改造工业设备,减少污染物排放

具有全球竞争力和影响力的能源企业持续努力。 中国石化在沙特公司和项目部积极落实"绿色沙特"倡议,从环境管理、低碳节能、人员培训、 环保实践等多个方面践行绿色理念,为配合"绿色沙特"倡议、推进沙特绿色发展贡献力量。中 国石化位于阿联酋的项目部积极响应倡议,提升 清洁能源使用范围,加快可再生能源项目的研发 应用,支持"2050年零排放战略倡议"。

开展绿色运营

中国石化在中东各国开展绿色建设,提升绿色运营水平,通过具体行动持续提升当地项目的绿色环保水平,推进绿色低碳建设,在工程规划设计、施工、运营等全生命周期中践行绿色低碳的生产理念,实现全过程环境影响管理,最大程度降低环境负面影响。

在沙特,中国石化推进化工生产的洁净化和低碳化,积极承接升级改造项目,引入绿色施工技术和管理模式,通过新技术、新工艺、新材料,及更有效率的管理流程,有效降低能源消耗水平和污染物排放;加强"三废"全生命周期管理,积极开展生产噪声治理、资源节约、废弃物管理、控制污染源排放。中国石化炼化工程集团承接的沙特 IBB 合成氨改造项目有效提高沙特国家化肥公司的生产稳定性和环保可靠性,减少装置污染物的排放,具有较高的经济效益和社会效益。

共建绿色家园

中东地区有大片沙漠,如何有效防止沙漠化,成 为当地政府和企业共同努力的目标。中国石化在 开展业务的同时,积极践行社会责任,组织当地 员工进行义务植树、绿化造林等环保工作,为广 阔的沙漠增添绿意。

在沙特,从 2008 年开始,国际石油工程公司沙特 分公司开展植树活动,每年种植一千棵树,累计 成活五千多棵,获得业主和当地政府的高度评价。



在沙特播种六百万颗树种



启示

绿色发展是各国共同追求的目标和全球治理的重要内容,也是共建"一带一路"高质量发展的鲜明底色。中国石化站在促进人与自然和谐共生的高度,坚持把绿色低碳理念贯穿共建"一带一路"全过程,通过绿色清洁生产、发展循环经济、保护生物多样性等措施,积极应对全球气候变化,共同守护绿色地球。

- 14 商务部、国家统计局和国家外汇管理局,《2022 年度中国对外直接投资统计公报》,http://images.mofcom.gov.cn/hzs/202310/20231027112320497.pdf
- 15 商务部研究院,《中国对外贸易形势报告: 2023 年春季》,https://caitec.org.cn/upfiles/file/2023/5/20230619164211237.pdf
- 16 赛迪研究院、西门子(中国)有限公司(2023),《企业绿色出海白皮书》
- 17 新华社,"一带一路"数据"说":中国与共建国家绿色低碳发展取得积极进展

30 / **从行动开始:** 在华企业低碳转型实践观察报告 2023 拾级而上: 于挑战中变革, 于逆境中求胜 / **31**



第四章

拾级而上:

于挑战中变革,于逆境中求胜



保持低碳发展战略定力源自:零碳时代是客观规律规定的社会意识和社会存在变化趋势。人类必须要接受从工业文明到生态文明的转变,否则生存和发展都要受到威胁,甚至终结¹⁸。为此,所有组织包括企业在未来必须克服一切困难,努力成为低碳、零碳甚至负碳,这是目前全球市场的普遍共识与未来可持续发展的基础。

4.1 困难与挑战

▶ 1. 驱动力不足

低碳变革是企业重塑核心竞争力的历史机遇,但是低碳转型也意味着企业需要付出额外的投入和成本。在难以看到短期利益的现实情况下,很多企业很难持续去做"碳中和"背后所蕴含的一系列正确但又艰难的事情。有时候企业不是没有"向绿而行"的意识,而是高昂的成本制约了企业转型的动力与积极性,或者说企业无法确定减碳给自己能带来哪些"好处"。

○ 2. 行动路径不清晰

低碳发展不是喊口号,而要是切实地将其融入企业业务,实现经济效益和绿色效益协同增长。目前,多数企业并没有认真思考如何将自身利益与减碳趋势进行有机融合,尚未形成全面、科学的低碳转型行动方案。有些企业甚至在最基础的"摸家底"以及目标设定方面都不够及时、清晰和准确。

▶ 3. 支撑体系不健全

首先,对于很多人和企业来说,碳达峰、碳中和仍是 新鲜事物,存在认知误差以及转型能力不足,亟需加 强学习,增强人才储备。其次,减碳技术/工艺、新 能源技术创新以及数字化应用方面根基薄弱、发展滞 后,严重制约了企业绿色转型的行动力。第三,标准 缺失以及低碳/零碳产品标识认证体系的不完善,易 于导致虚假减碳以及恶性竞争等。最后,应对气候变 化的舆论环境和生态体系尚未真正形成,社会各界对于减碳尚未形成共识,因而难以集结力量,形成有效合作。为此,企业虽然希望进行绿色转型升级,但缺少外部支撑,导致企业根本"转不动"。

4.2 未来的建议

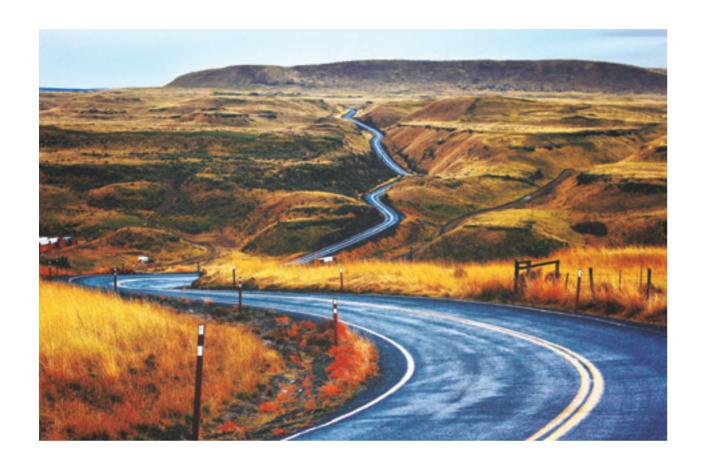
建议企业增强低碳转型的主动性:

▶ 1. 练好自身内功

尽管存在诸多挑战,但是碳中和带来的是一场关于企业生死存亡的变革,因此企业需要提高认知,加强主动性,积极适应变化。企业需要认真思考并寻找"碳中和"与自身发展相融合的减碳之路,通过制定并执行低碳行动计划,形成绿色低碳的核心竞争优势。其次,企业需要将"成本"思维为"投资"思维,秉持长期主义,通过加大技术创新、能力学习以及数字化转型等,先人一步布局未来市场。最后,企业要加强数字化建设,善于利用数字化技术在绿色低碳领域形成新的经济增长点和绿色发展新动力。

▶ 2. 增强外部协作

碳中和是一场系统性变革,涉及经济社会的方方面面。 同时,企业低碳转型也不是一家企业能够独自完成, 需要搭建起良好的低碳发展生态圈。为此,企业在做 好自己之余,还应该积极与政府、行业协会等合作, 推动相关政策以及标准的制定。其次,企业还需加强 **32** | **从行动开始:** 在华企业低碳转型实践观察报告 2023 | 附录 | **33**



同高校、科研院所的合作,发挥市场主导优势推进低 碳技术研究以及成果转化,积极引进先进的绿色技术。 最后,企业要强化宣传,利用"碳积分"等鼓励员工 和消费者在各自工作岗位和生活中低碳生产、生活。

建议企业以外的其他利益相关方优化企业低碳转型环境:

- 加大政策支持力度,完善支持绿色发展的财税、金融、投资、价格政策,加大对绿色低碳产品、绿色技术研发的支持,通过税费优惠、政府补贴等激励措施提高企业转型的积极性。
- 探索转型金融,将金融产品设计与项目碳减排量 或绿色评估挂钩,保障高能耗企业在绿色转型发 展过程中合理的融资需求,有序推动传统制造业 低碳转型。
- 建立和逐步完善碳市场机制,积极完善绿色交易, 绿证市场等。
- 完善相关标准认证体系建设,提升企业低碳转型执行力。
- 加强监管和激励机制建设,避免劣币驱逐良币。

附录



本报告的分析素材主要来自 2020-2023 年 "金钥匙——面向 SDG 的中国行动"活动中的企业行动,共计 389 家企业的 449 项行动参加,其中关注气候议题的企业行动占比将近50%,涉及企业包括不同规模、不同行业的央企、在华外企以及民营企业等。





Carbon neutrality is more than just an external issue, a shift from fossil fuels, or a technical advancement.

It marks a revolutionary shift from the traditional development models since the industrial revolution.

It indicates a change of the basic logic of development and the fundamental reform of socio-economic system.

Businesses, now in the heart of this transformation, must adapt to the increasingly carbon-conscious world and pursue zero carbon.

This report, the second in the "Report on Shaping the Low-carbon Leadership of Chinese Enterprises by GoldenKey" series by China Sustainability Tribune, analyzes and provides insights into the low-carbon practices of enterprises in China that participated in the GoldenKey-SDG Solutions Campaign from 2020 to 2023. The report features case studies and recommendations for accelerating low-carbon transitions in the future. The "Spotlight" section illustrates the contributions of Chinese enterprises overseas to addressing the climate crisis.

This report aims to showcase and analyze the progress and distinctive actions of enterprises in China since China put forward the 30·60 Decarbonization Goal (to peak carbon dioxide emission by 2030 and achieve carbon neutrality by 2060). It focuses on sharing corporate practices and experience of low-carbon transitions and aims to enhance global understanding of the commitment of China's business community to low-carbon development.

The research targets of this report are carbon reduction practices of enterprises in China that participated in the GoldenKey Campaign from 2020 to 2023. Given the limited scope of companies, regions, and industry categories in the GoldenKey Campaign, the report may not be exhaustive. For any inquiries or suggestions, please contact huwenjuan@sdg-china.net.

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START FROM ACTION

OBSERVATION REPORT ON LOW-CARBON TRANSITION OF ENTERPRISES IN CHINA

2023

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About "GoldenKey — SDG Solutions"



To implement the "golden key" spirit highlighted by Chinese President Xi Jinping, that is, sustainable development is the "golden key" to solving global problems, and respond to the Decade of Action, China Sustainability Tribune officially launched the GoldenKey-SDG Solutions in 2020. Through the recommendation, display, roadshow, review and other processes, this campaign aims to find and shape the SDG action models in China, spread the story of China's sustainable development action, and contribute to the sustainable development in China and even the world. In 2021, the GoldenKey Campaign was selected among the UN SDG Good Practices, which was highly recognized around the world, marking it one of the most influential and international event for exchange and selection of SDG solutions in China.

In the four sessions of the GoldenKey Campaign, 389 enterprises shared a total of 449 SDG solutions (excluding 127 from the Golden Key · State Grid Special). Nearly 50% of those solutions are about climate issues, and different sizes of enterprises in various industries, including state-owned enterprises, foreign enterprises in China and private enterprises, contributed their solutions to global climate governance and China's carbon neutrality goal from the aspects of energy transition, low-carbon production and operation, digital empowerment, financial support, low-carbon consumption and life.

In 2021, China Sustainability Tribune and China International Low-carbon College of Shandong University of Finance and Economics jointly established the GoldenKey Lowcarbon Action Center, aspiring to build a low-carbon action network with enterprises as the mainstay. It will provide enterprises with capacity building in low-carbon strategy, low-carbon management, low-carbon practice, green finance, risk management in addressing climate change, and create a space for exchanging pioneering actions.

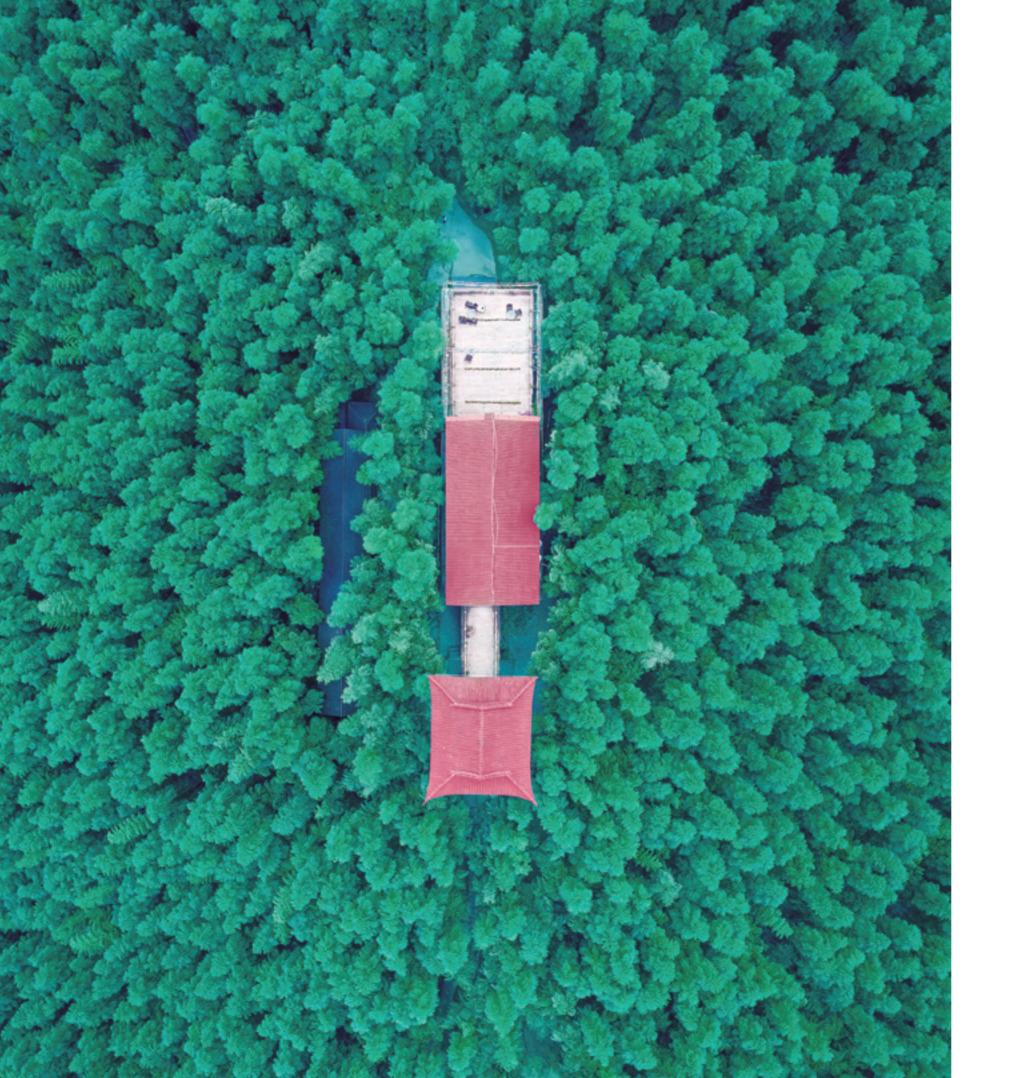
About China Sustainability Tribune



Founded in 2002, China Sustainability Tribune, (CST for short, formerly known as China WTO Tribune) is supervised by Ministry of Commerce of the People's Republic of China (MOFCOM), and hosted by China Center for International Economic Exchanges (CCIEE). It is an upgrade of China WTO Tribune in the field of social responsibility and sustainability.

As the only domestic media named after sustainable development, CST has been actively contributed to global sustainable development based on the motto of "Global Perspective, Competition and Win Together". It promotes various fields, industries and organizations, especially those who have a huge influence on economy, society and environment, to be sustainable, to take actions for sustainable development, and to support the achievement of UN Sustainable Development Goals (SDGs).

CST has consistently focused on climate change. Following China's 30.60 Decarbonization Goal, it hosted key events like the "Carbon Neutrality Summit Forum" and the "Symposium on Carbon Neutrality and Corporate Green Development." These events brought together experts and scholars from prestigious universities like Tsinghua University, the Chinese Academy of Social Sciences, and governmental bodies, such as the Ministry of Science and Technology and National Development and Reform Commission, to have discussions about various topics, including macro-policies at home and abroad, low-carbon science and technological innovation, climate investment and financing, carbon markets, corporate emission reduction pathways, carbon information disclosure, green low-carbon branding, the impact of carbon neutrality on international trade and supply chains. The multi-party exchanges between government, academia, and business sector equip enterprises with a comprehensive understanding of carbon neutrality's challenges and opportunities, fostering new perspectives, insights, and opportunities, and empowering companies to integrate climate change into their governance strategies.



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Preface

From Responsibility to Survival: The Evolving Logic Behind Carbon Reduction

Carbon neutrality is more than just an external issue, a shift from fossil fuels, or a technical advancement; it marks a revolutionary shift from the traditional development models since the industrial revolution. It indicates a change of the basic logic of development and the fundamental reform of socio-economic system. Businesses, now in the heart of this transformation, must adapt to the increasingly carbon-conscious world and pursue zero carbon.

A few years ago, climate change and concepts like "carbon peaking" and "carbon neutrality" were less understood, with corporate climate actions often seen as mere public welfare, public relations campaign, and social responsibility. Then, energy conservation and emission reduction were mostly about electricity and cost savings, without any other substantial benefits. Moreover, even if companies did not engage in "carbon reduction" at that time, there would be no "harm", and companies would not feel the pressure from the government, supply chain, customers, consumers and even the capital market.

However, today, the global consensus on climate change has been shaped. Approximately 150 countries and regions, responsible for about 90% of global carbon emissions, have set carbon neutrality goals². In September 2020, China pledged to peak carbon dioxide emissions. Public belief in climate change is prevalent in China, with 96.3% acknowledging its occurrence, further fueled by abnormal weather patterns, such as mild winter and high temperatures³. This public awareness has heightened demand for green consumption, with increasing attention on the low-carbon credentials of companies and brands⁴. At the same time, keen investors and financial institutions have recognized this and increasingly factoring corporate low-carbon performance into their investment decisions.

Amidst this global zero-carbon revolution, driven by international and national influences, companies face pressures from national policies and supervision, from green supply chains, new green trade regulations, capital markets, and consumer markets. Companies are increasingly aware that, low-carbon transition is no longer icing on the cake; it is a necessity and is crucial for corporate survival.

The corporate carbon reduction logic is evolving drastically from mere responsibility and brand image to strategic adjustment and low-carbon value creation. In the GoldenKey Campaign, this shift is evident.

More companies are strategically mapping out their journey towards low-carbon transition. For instance, in response to China's 30.60 Decarbonization Goal, State Grid launched an action plan on carbon peaking and neutrality, and has actively planned in clean energy and smart grids. Signify initiated the "low-carbon lighting transition" campaign to let lighting play a greater role in urban and rural development, clean energy, green travel, circular economy, and green agriculture, contributing to China's 30.60 Decarbonization Goal.



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Moreover, an increasing number of companies and brands are reinforcing green supply chain management, urging suppliers to adopt renewable energy sources and provide detailed carbon footprint reports for their products. For example, L'Oréal China has incorporated sustainability performance as an important dimension of supplier access and evaluation. Anta Group, in collaboration with a number of companies, is pushing for green transformation in supply chains, opting for eco-friendly textiles and reducing plastic in packaging.

This trend of "green" value-driven innovation in businesses and products is leading companies to even develop new business models. For example, Deartree Circular Furniture has successfully transformed its circular economy model in a sustainable manner with its low-carbon, eco-friendly circular furniture service. Hellobike promotes green urban travel through shared bicycles, enhancing the marginal value of urban economy and driving green growth of cities.

More and more companies are actively adapting to and embracing green consumption, supporting and guiding consumers to low-carbon consumption. Take Starbucks China as an example. The company is fostering low-carbon consumer spaces with "green stores". BOTTLOOP is dedicated to increasing the sustainable value of both the brand and individual consumers and fostering green consumption through full-lifecycle zero-waste solutions.

These agile, pioneering companies regard green, low-carbon strategies as long-term, beneficial, and sustainable business models. Their low-carbon actions signal the future of business.

Thus, this report aims to analyze these actions and showcase the characteristics and pathways for low-carbon transition of companies in China. It also seeks to showcase the courageous self-reform and innovation within the business sector on the cusp of a zero-carbon era. These efforts symbolize the essence of China's extensive low-carbon development and portray the leading figures of a future zero-carbon world. Our goal is to inspire more companies around the world with these exemplary low-carbon practices, encouraging them to take decisive and consistent steps towards a sustainable future.



Chapter I

Reform is Imperative: Carbon Reduction as the New Driver for Development



The evolution of new concepts often progresses from humble beginnings to maturity, encountering resistance from established norms and people's perception. Nevertheless, with resilience, new paradigms will inevitably prevail over the old.

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1.1 2020: A Flashpoint

The COVID-19 pandemic, straddling the end of 2019, significantly impacted lives and production in Spring 2020 and beyond. It reshaped values, urging to reconsider people's relationship with nature and highlighting the need for societal resilience against greater crises like climate change. This period has heightened environmental consciousness, with individuals seeking to make positive global contributions through their consumption choices. According to an April 2020 survey by Accenture, 50% of consumers prioritize health in their shopping decisions, while 45% opt for more sustainable choices, with a likelihood to persist in this trend⁵.

The wake-up call of the pandemic, coupled with China's commitment in September 2020 to peak carbon emissions by 2030 and achieve carbon neutrality by 2060 (China's 30.60 Decarbonization Goal), has intensified the global response to climate change. This pledge has not only catalyzed efforts worldwide but also sparked widespread attention on low-carbon transitions across various sectors in China. As a result, discussions surrounding climate change and deep decarbonization have surged. Carbon neutrality, once a niche environmental concern, has evolved into a crucial business topic.

In response to clear policy signals from higher authorities, a cohort of leading enterprises quickly took action, issuing positive statements or commencing studies on relevant plans. Some even pledged specific timetables for carbon peaking and neutrality. Central state-owned enterprises (SOEs), notably, were at the forefront of these efforts. Three major petroleum companies promptly initiated research into carbon-neutral pathways. Key power corporations, including State Power Investment Corporation Limited (2023), China Datang Corporation Limited (2025), China Huadian Corporation Ltd. (2025), China Three Gorges Corporation (2023), and China Baowu Steel Group Corporation, announced their timelines for peaking carbon emissions. On March 1, 2021, State Grid became the first central SOE to release a detailed action plan towards the 30.60 Decarbonization Goal. The energy sector's proactive stance inspired the financial sector, known for sharp market insights, to follow suit by releasing concrete measures. The inter-bank bond market saw the issuance of the first batch of "carbon neutral bonds" on February 8, 2021, totaling RMB 6.4 billion, with issuers including Huaneng Power International, State Power Investment Corporation Limited, China Southern Power Grid, China Three Gorges Corporation, Yalongjiang River Hydropower Development Co., Ltd., and Sichuan Province Airport Group Co., Ltd. In late March 2021, investment firms Hillhouse Capital and Sequoia China launched a green fund and a carbon neutrality technology fund, respectively. Meanwhile, internet giants were not left behind in

this race towards carbon neutrality. Tencent announced its carbon neutral plans on January 12, 2021, followed by Ant Group's commitment in March 2021 to net zero carbon emissions by 20306.

1.2 2021-2022: From Ambiguity to Clarity

2021 marked the first year following China's announcement of carbon neutrality goal and the initiation of the 14th Five-Year Plan. Since the 30.60 Decarbonization Goal was included in the government's work report released during the "Two Sessions", naming the National People's Congress (NPC) and the Chinese People's Political Consultative Conference (CPPCC) in 2021, relevant policies rapidly evolved. It triggered different market reactions, leaving some inexperienced enterprises confused about how to implement low-carbon actions. The complexity of this reform caused hesitation and misdirection among many businesses. Missteps included favoring promotional slogans over tangible actions, setting carbon targets without scientific justification, and incorrectly emphasizing "carbon compensation" instead of focusing on core business-related carbon reduction efforts. Some companies even mistakenly take "carbon peaking" as a mere hasty push for carbon emissions.

On July 30, 2021, the meeting of the Political Bureau of the Central Committee of the Party emphasized the need for systematic and orderly progress in promoting carbon peaking and neutrality. The action plan for carbon peaking before 2030 should be promptly introduced, ensuring cohesive efforts across the country. The "campaign-style" carbon reduction should be rectified. Developing comes after setting up the quidelines. The unchecked development of projects with high energy consumption and emissions shall be resolutely curbed. Policy shift and enhanced awareness and capabilities have led enterprises to adopt more scientific and rational carbon reduction approaches, seeking science-based carbon accounting methods and emission targets, and tailoring their carbon reduction roadmaps and actions in line with their actual development stages. Notably, on November 18, 2021, China Baowu Steel Group Corporation officially released China Baowu Carbon Neutralization Action Plan. On December 29, 2021, Ansteel Group issued its Declaration on Carbon Peak and Carbon Neutrality and Low-carbon Metallurgy Route, setting low-carbon development visions, as well as "three missions" and "five paths" of low-carbon development. The two leading iron and steel companies have proposed clear directions for China's iron and steel industry from different perspectives to meet the 30-60 Decarbonization Goal and to establish global leadership in this industry in an all-round manner⁷.

In November 2021, the Central Committee of the Communist Party of China and the State Council issued the Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy and the Action Plan for Carbon Dioxide Peaking Before 2030. These documents established a top-level framework encompassing both carbon peaking and neutrality stages. By 2022, China's "1+N" policy system for carbon peaking and neutrality had evolved, extending from overarching strategies to specific sectors. Key industries including steel, building materials, non-ferrous metals, chemicals, petrochemicals, electricity, and coal have set clear peaking targets and developed action plans and supportive measures. Additionally, research institutions and international organizations have provided various documents and guidelines around corporate carbon neutral pathways, offering businesses strategic direction towards carbon neutrality.

The "July 20" Zhengzhou flood in 2021 alarmed Chinese people to respond to climate change, intensifying the will and push for creating a carbon-neutral society. That year, "campaign-style" carbon reduction measures, including power cuts, brought the dilemma of balancing green energy with energy security into sharp focus. In 2022, the Beijing Winter Olympics set a precedent as the first carbonneutral Winter Games, offering a low-carbon model case for Chinese enterprises and future events. However, instances of third-party verification agencies falsifying carbon emission data also surfaced in 2022, causing public concern. During 2021-2022, behind heated discussions, it became increasingly evident that achieving carbon neutrality is a bumpy and long journey for many industries. Carbon neutrality will disruptively transform industries, bringing numerous challenges.

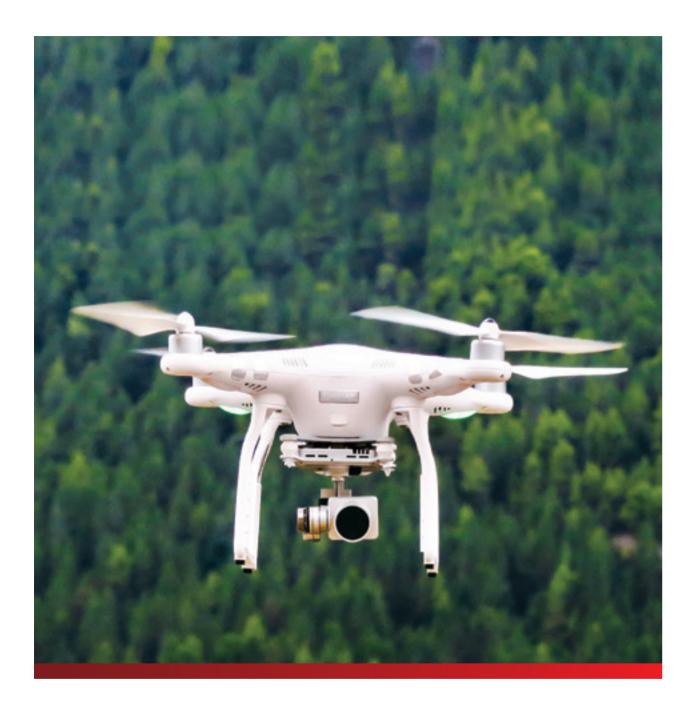
1.3 2023: Embracing Change for Victory

Carbon neutrality is a gradual process filled with challenges, yet the commitment remains steadfast. China continues to determinedly pursue its strategy for green, low-carbon development, with enterprises in China progressively advancing in a robust, systematic, and scientific manner. Guided by national policies and an evolving understanding of carbon neutrality's impact across various sectors, 2023 witnessed a shift in the corporate logic to carbon reduction. This evolution has been marked by an enhanced commitment to low-carbon values, bolstering the resolution and confidence of businesses to embrace transformative changes.

The business community begins to realize that carbon neutrality encompasses more than just "carbon accounting" and "carbon management". It is also about crafting new narratives in economic growth, beyond the pressures of transformation and the costs of emission reduction. Taking LONGi Group as an example, it utilizes local hydropower in Yunnan Province to produce photovoltaic products like silicon rods, silicon wafers, batteries, and other components. The company is not only reducing costs but also fostering the sustainable growth of the regional hydropower industry. By 2020, LONGi's five factories in Yunnan had shifted to 100% renewable energy. The factories have consumed 2.5 TWh of hydropower electricity, equivalent to reducing GHG emissions by 1.35 million tons. In December 2020, LONGi received an investment of RMB 15.8 billion from Hillhouse Capital. Concurrently, low-carbon and zerocarbon products emerge beacause of consumers' increasingly willingness to pay for such products and services. The shift towards eco-conscious choices is shaping brand competitiveness, with low-carbon and eco-friendly attributes becoming vital market differentiators⁸.

At the inaugural 2023 Shanghai International Carbon Neutrality Expo in Technologies, Products and Achievements, green technologies, industries, and products were showcased across six key areas: energy transformation, energy saving and efficiency, circular economy, practice and exploration, lowcarbon transportation and services. This event vividly highlighted the burgeoning green economy under the influence of the 30.60 Decarbonization Goal. Green industries are emerging as new drivers for economic growth, marking that low-carbon transition is becoming the new engine for economic growth.

Carbon neutrality is poised to revolutionize business norms and transform the commercial landscape. While achieving carbon neutrality is a long-term, complex, and challenging journey, a clearer understanding is reinforcing the dedication and efforts of businesses towards a low-carbon transition.



Chapter II

Proactive Transformation:

An Observation of Carbon Reduction Efforts by Enterprises in China



In the current business landscape shaped by evolving business rules and national policies, most enterprises have recognized the critical value of low-carbon transition. It's increasingly seen as vital for securing financing, spurring innovation, enhancing brand impact, and building market competitiveness in this new round of transformation. This shift reflects a deep understanding of the zero-carbon revolution, fueled by the global momentum towards low-carbon transition. More and more Chinese enterprises are increasingly embracing this trend, innovating and adapting to not just resolutely address climate change but also to leverage it as a catalyst for growth.

2.1 Characteristics of Low-carbon Practices by Enterprises in China

China's journey towards carbon reduction began relatively late. For most enterprises, blending the lowcarbon development philosophy into their businesses to gain environmental and economic values remains challenging. Through analyzing standout practices from the GoldenKey Campaign and engaging with enterprises, this research identifies five characteristics of the low-carbon transition of enterprises in China. These include low-carbon strategy and governance, carbon reduction measures, value chain collaboration, digital empowerment, and climate adaptation efforts.

1. Harnessing strategic guidance to boost internal momentum for development

For enterprises aiming to seize early advantages in low-carbon transition, a thorough review of their positioning and development strategies is essential. Enterprises need to strengthen the low-carbon production and operations by improving infrastructure, supply chains, and products. They need to design and develop products, services, and solutions that can help other industries reduce carbon emissions. This would potentially disrupt the existing market structures, fostering new business opportunities and a thriving new market.

It is crucial for enterprises to elevate low-carbon development to a strategic level and develop a scientific and sound strategy for low-carbon transition. First, a clear objective unifies all departments, creating cohesive efforts towards common goals. Second, planning in advance and in a scientific manner is essential to devise an effective blueprint for carbon emission reduction. Third, this move will enable enterprises to optimize resource allocation, thereby enhancing carbon reduction efficiency. Fourth, it is conducive to mitigating risks, planing the transition to low-carbon economy in advance, and bolstering their core competitiveness. Finally, the low-carbon strategy significantly improves a company's image among all stakeholders, including investors and consumers

Although most enterprises are yet to develop a clear carbon reduction strategy or an action plan for peaking carbon emissions and reaching carbon neutrality, and some face challenges in setting targets and conducting carbon accounting, the analysis in this report reveals several findings:

First, under the guidance of the State-owned Assets Supervision and Administration Commission of the State Council, central SOEs are pioneering in formulating action plans regarding carbon peaking and carbon neutrality. Despite some problems in the development of these plans, these enterprises are setting a strong example for others. Second, most enterprises have recognized the value of the carbon reduction strategy, driven not just by policy but also by market factors such as supply chains, capital markets, and consumers, leading to the internalization of these drivers. Third, top-performing enterprises have established robust low-carbon governance structures to effectively materialize their low-carbon strategy. They enforce low-carbon initiatives through internal assessments as well as incentive and punishment systems. Fourth, leading enterprises are integrating low-carbon strategies into their businesses. They are actively engaging in low-carbon product design, service innovation, and solution development, striving for the coordinated growth of both commercial and environmental values.

2. China's approach to green development through coordinated efforts

Recognizing its status as a developing country with potential for rapid economic growth, China has adopted an approach to carbon reduction unique from those of developed countries. Based on the current stage of its development, China emphasizes a "parallel" model that balances development with environmental protection, integrating green and low-carbon practices into the development process through full-lifecycle management. This green transition strategy goes beyond mere carbon reduction; it involves a holistic approach that coordinates efforts in reducing carbon emissions and pollution, while enhancing greening and growth. Thus, Chinese enterprises pioneer a distinctive approach to carbon reduction, and adopt a parallel model that underscores the importance of collaborative efforts. This model and its synergistic effect has been well reflected in the low-carbon actions of GoldenKey enterprises.

First, carbon reduction. Many enterprises are enhancing the efficiency of traditional energy and shifting towards clean energy to reduce carbon emissions. Notably, large energy and industrial enterprises are focusing on the innovation and application of carbon negative technologies, like carbon capture, utilization, and storage (CCUS). Second, pollution control. Enterprises, no matter large or small, are actively engaging in sewage treatment, waste heat recovery from exhaust gas, solid waste recycling, and plastic pollution control. Some leading enterprises are incorporating recycling concepts early in product design, enhancing resource utilization efficiency from the source. Third, greening initiatives. Enterprises are investing in afforestation, ecological restoration of mangroves and wetlands, and marine protection, contributing to natural carbon sinks. The awareness and recognition of the synergy between biodiversity protection and carbon emission reduction is raised. Fourth, growth. Carbon reduction is not just a public welfare campaign for enterprises; it's a growth strategy. Market mechanisms like carbon trading, green financing and investment, and low-carbon products and innovative solutions are providing businesses with enduring, endogenous incentives for green transition. Additionally, emerging business models based on resource recycling and sharing, such as shared mobility and the secondhand economy, are gaining popularity and opening new avenues for growth.

Aligning with the global carbon reduction trend and integrating the distinctive features of China's carbon reduction approach, such as tight schedule, multi-tasking, and coordinated development with environmental protection, Chinese enterprises have ventured into several areas to promote carbon reduction in an all-round manner. These include the circular economy, renewable energy, energy efficiency enhancement, and ecological restoration.

3. Building partnerships for carbon reduction across the value chain

Achieving net zero for enterprises largely involves addressing Scope 3 emissions, which are indirect emissions from the upstream and downstream of the enterprises' operational chain. According to the research of the World Economic Forum, six key value chains related to consumption, i.e., food, fastmoving consumer goods, fashion, electronics, automotive, and freight, account for about 40% of all global greenhouse gas emissions⁹. Besides, to promote carbon reduction across the whole value chain, it is indispensable for brand enterprises to educate consumers and suppliers. According to relevant research, about 80%-90% of carbon emissions in the consumer goods industry originate outside a brand's direct operations, mainly from upstream suppliers and downstream consumers in the end-toend value chain of the brand. 10 Thus, ambitious enterprises are not only focusing on reducing their own carbon emissions but also promoting carbon reduction along their entire value chain to foster a green development ecosystem. In December 2018, during COP24 in Katowice, Poland, the global fashion industry introduced the Fashion Industry Charter for Climate Action. 43 major brands, retailers, suppliers, and other companies were committed to collectively addressing the climate impact of the fashion industry across the entire value chain.

Moreover, promoting carbon reduction along the value chain is also vital for brand development. According to Accenture Chinese Consumer Insights 2021, 77% of Chinese consumers increasingly prioritize low-carbon issues in their consumption; 83% believe that organizations should provide more convenient options for sustainable consumption. 11 Besides, carbon reduction can stimulate new demand, drive revenue growth, cut costs, boost brand influence, and mitigate risks. While most enterprises currently focus carbon-neutral efforts on their own operations, and actions across the whole supply chain lag, the GoldenKey SDG solutions indicate the endeavors and explorations of leading enterprises in this area.

First, multinational corporations in China emphasize carbon reduction across their entire value chains. For example, Nestlé China and Dell Technologies are focusing on carbon reduction across their entire supply chains from sourcing raw materials from origin, factory R&D and design, production and manufacturing, to storage, logistics, product use, and recycling. Multinational brands significantly influence their upstream suppliers in energy and industrial transformation and guide consumers towards low-carbon consumption awareness and habits. Second, technology firms, financial institutions, and manufacturers are capitalizing on market opportunities by innovating in digital solutions and sustainable products to assist other industries and consumers in reducing carbon footprints, thus achieving environmental and economic gains (for more information, please refer to "4 Accelerating low-carbon transition through digital empowerment"). Third, partnerships are being formed between enterprises and organizations. For example, China National Textile and Apparel Council issued the China Climate Stewardship 30.60 Net Zero Accelerating Plan. China Sustainability Tribune, in collaboration with the business community, launched the Global Sustainable Consumption Initiative. These initiatives can foster public support for green and sustainable development, encouraging dialogue, building consensus, and inspiring more corporate actions.

4. Accelerating low-carbon transition through digital empowerment

Currently, the world is experiencing dual transformations: greening and digitalization. Accelerating this coordinated shift will foster sustainable development of the economy and society. On one hand, digitalization, with its amplifying, overlaying, and multiplying effects, can empower the greening process. Cutting-edge technologies such as big data, cloud computing, Internet of Things, blockchain, and artificial intelligence provide strong support for efficient low-carbon management and governance of enterprises. For example, digital solutions can improve energy efficiency. It is projected in the White Paper on Digital Carbon Neutrality issued by China Academy of Information and Communications Technology that, by 2030, digital technologies could enable industries to cut emissions by about 10% to 40%¹². On the other hand, digitalization is driven by greening. As the digital economy develops, carbon emissions and e-waste from the digital industry would challenge its healthy growth. Thus, greening directs digital development, making low-carbon, green development essential for the digital industry's healthy and sustainable development.

From the GoldenKey SDG Solutions, we can see that enterprises actively integrate digitalization with green transition and have achieved initial outcomes.

First, digitalization facilitates climate actions. Chinese enterprises, through developing and adopting digital technologies like smart factories, intelligent agriculture, shared travel, and development and application of big data, are enhancing their operational quality and efficiency, optimizing resource allocation, and improving low-carbon development. Besides, the integration of technologies like 5G, cloud, and AI in early warning and monitoring systems significantly uplifts climate risk management of enterprises and the whole society. Second, digitalization enhances carbon data management, Leveraging digital technologies. enterprises can gather and analyze carbon data accurately and efficiently. Also, they are able to monitor and analyze carbon emission data in real time and adopt countermeasures at any time. While helping enterprises disclosing carbon data in an open and transparent manner, it facilitates complex green supply chain management. Third, digitalization fosters green businesses. Responding to market demand, technology firms and third-party consulting agencies are developing innovative carbon data management systems, energy efficiency software, and other products and services, empowering various sectors and the whole society to achieve low-carbon development.

5. Achieving preliminary results in climate adaptation efforts

Beyond minimizing human-made emissions and slowing down climate change, it is crucial for mankind to undertake adaptive actions to mitigate the disastrous consequences and impact of climate change. However, climate adaptation, a key response strategy, has often been overlooked. At the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27), the Sharm-El-Sheikh Adaptation Agenda was framed, outlining 30 global adaptation outcome targets by 2030 to increase resilience of 4 billion people. This agenda aims to accelerate transformation across five impact systems, including food & agriculture, water &nature, and oceans &coastal, to engage both public and private sectors in a unified effort to accelerate climate adaptation.

In the face of the climate crisis, the awareness and adaptability of enterprises are crucial for their resilient development. However, Chinese enterprises are currently at the early stages of climate adaptation management, with a low rate of risk identification. Their risk management mostly remains qualitative and fails to fully assess the financial impact of climate risks or incorporate them into daily

operational risk control systems. Moreover, risk management is yet to be integrated with financial data¹³. In the GoldenKey SDG Solutions, only a few enterprises focus on climate adaptation, yet the characteristics of their adaptation practices can still be observed.

First, in the realm of natural disaster early warning, prevention, and treatment, financial firms, Internet companies, and communication operators have developed risk management platforms and postdisaster emergency communication systems. The role of meteorological services in supporting critical economic and social sectors like industry and infrastructure is increasingly recognized and leveraged. Second, the current scale of agricultural adaptation measures is insufficient to meet sustainable development goals. Third, enterprises and their respective industries lack their own assessments of vulnerability and exposure to climate change, and there is a significant gap in devising and implementing adaptation plans to mitigate adverse impacts.

2.2 Exemplary Cases of Corporate Carbon Reduction Actions

Sinopec Group: Advancing Progress Towards the 30.60 Decarbonization Goal and Contributing to the Vision of a Beautiful China



Company Profile

China Petrochemical Corporation (hereinafter referred to as "Sinopec Group"), with the mission of "better energy for better living," is committed to the brand promise of "Cleaner Energy, Better Life." Sinopec Group is accelerating the construction of "One Foundation, Two Wings and Three Growth Points" industry growth pattern, actively fulfilling the "three core responsibilities," and striving to become a company with strong strategic support, strong capability to guarantee a good livelihood and strong spiritual appeal. The company is dedicated to promoting high-quality development, and strives to become a "world-leading clean energy and chemical company."



Key Actions

Promoting the development of CCUS industry to contribute to the 30·60 Decarbonization Goal

In January 2022, Sinopec Group completed the construction of China's first megaton carbon capture, utilization, and storage (CCUS) project—the Qilu Petrochemical - Shengli Oilfield CCUS Project. Upon its operational commencement, the project is anticipated to reduce carbon dioxide emissions by one million tons annually. This reduction is equivalent to planting nearly nine million trees, and abstaining from using nearly 600,000 economy cars for one year.



The first station of CO₂ pipelines of Qilu Petrochemical - Shengli Oilfield Megaton CCUS Project

It is expected to increase crude oil output by 2.965 million tons over the next 15 years. On August 25, 2022, the "Qilu Petrochemical - Shengli Oilfield" started operations, marking the commencement of commercial operation of China's CCUS industry.

High-level research platforms, including the Sinopec CCUS Key Laboratory, have surpassed conventional understandings of low-permeability reservoir development both domestically and internationally. They introduced innovative CO₂ high-pressure miscible flooding and sealing technologies, establishing the "pressure-driven + water-alternating gas" injection model. Supported by technologies like low-concentration CO2 capture and fully enclosed and efficient injectionproduction, the overall capabilities of the key lab have reached an internationally leading level. This progress has paved the way for the efficient development of over billions of tons of low-permeability reservoirs in China. The key lab has successfully developed CO₂ efficient transportation pumps, lowtemperature closed liquid-phase injection, and high-pressure dense-phase injection equipment with complete independent intellectual property rights. These developments address challenges related to large-scale and long-distance CO2 transport, as well as multiphase high-pressure injection, filling a gap in China's equipment manufacturing and application in this field.

Sinopec Group is committed to setting standards and aims to establish a hub for international CCUS standards. The company strives to enhance quality and standards for enterprises in the upstream, midstream, and downstream sectors, promoting the creation of high-quality enterprise clusters. By collaborating with these clusters, Sinopec Group will collectively strengthen the potential and core competitiveness of the green and low-carbon industry development.

Accelerating the development of the hydrogen industry chain

In the realm of hydrogen-powered transportation, with a focus on the "3+2" fuel cell vehicle demonstration city clusters in Beijing, Shanghai, Guangdong, Henan, and Hebei, as well as key regions including Shandong, Chengdu, and Chongging, Sinopec Group has strategically ventured



Proactive Transformation: An Observation of Carbon Reduction Efforts by Enterprises in China | 55

The massive scale of pioneering hydrogen transportation

into application scenarios involving hydrogen-powered heavy-duty trucks, buses, and logistics corridors in the post-Winter Olympics era. The company has sequentially established nine hydrogen fuel cell supply centers and built 101 hydrogen refueling stations accumulatively. Its global standing in the construction and operation of refueling stations is unmatched, ranking first worldwide.

In terms of eco-friendly hydrogen refining, Sinopec Group has initiated the world's largest green hydrogen-coal chemical project—the Inner Mongolia Erdos Wind-Solar Green Hydrogen Project, which can produce 30,000 tons of green hydrogen and 240,000 tons of green oxygen annually. Boasting an annual capacity of 20,000 tons, the Sinopec Xinjiang Kuga Green Hydrogen Pilot Project, which was undertaken by Sinopec Group, has successfully commenced production in 2023. This marks a breakthrough in the large-scale industrial application of green hydrogen in China. Moreover, the first "west-to-east hydrogen transmission pipeline" has been incorporated into the national plan. It is China's first cross-provincial, large-scale, and long-distance pure hydrogen transport pipeline. Upon its completion, it is poised to substantially address the issue of imbalanced supply and demand for green hydrogen in China, while also serving as a strategic demonstration for the future development of cross-regional hydrogen transport networks.



Sinopec Group proactively embraces green transformation, takes "net zero" of carbon emissions as the ultimate goal, and strives to accelerate its low-carbon competitiveness. To achieve the 30.60 Decarbonization Goal, the company balances development with emission reduction, and steadfastly promotes the clean utilization of fossil energy, scaling-up of clean energy, and lowcarbon production process. It has charted a course that integrates energy security, industrial security, and green and low-carbon development, providing a new perspective for the green and low-carbon transformation of the energy and chemical industry and progress towards the 30.60 Decarbonization Goal.

JD Logistics: Promoting Collaborative Decarbonization Throughout the Upstream and Downstream Processes to Foster a Climate-Resilient Supply Chain



Company Profile

Established in 2007 as the internal logistics department of JD.com, Inc., JD Logistics transitioned into an independent business division in April 2017. The company reached a milestone in May 2021 by going public on the main board of the Stock Exchange of Hong Kong Ltd. (SEHK), ushering in a new development phase. As a leading technology-driven provider of supply chain solutions and logistics services in China, JD Logistics is China's first logistics company to carry out the Science Based Targets initiative (SBTi). It centers on three pillars of "Planet, People, Profit," collaborating with stakeholders to address sustainable human development. An integral part of this commitment is the active promotion of its strategic "Green Stream Initiative." Upholding the principles of green and sustainable development, JD Logistics pledges to increase its use of clean energy, promote the adoption of renewable energy sources, and embrace environmentally friendly materials. Guided by its development strategy characterized as "experience-oriented, technology-driven, and efficiency-winning," the company capitalizes on its accumulated experience and ongoing technological investments to deliver intelligent services to the real economy, thereby creating enduring social value.



Key Actions

Amidst its own decarbonization journey, JD Logistics actively propels the green and low-carbon development of the entire industry chain. The company consistently involve partners along the upstream and downstream of the supply chain into the industry's decarbonization cycle, thereby constructing a green value chain. Guided by shared carbon reduction objectives, JD

Logistics encourages enterprises throughout the supply chain to establish "decarbonization" as the cornerstone of their collaboration. It is poised to mitigate and ultimately reverse global climate change, leading to a "cumulative effect of ecological environment."

Green warehousing: JD Logistics is dedicated to creating the world's largest ecosystem of



rooftop photovoltaic power generation in the supply chain by 2030, aiming to provide green energy for its intelligent logistics park. In 2022, JD Logistics' Asia No.1 logistics park in Xi'an received carbon neutrality certifications from the China Beijing Green Exchange and Centre Testing International (CTI), marking it as China's first "carbon neutral" logistics park. The park's rooftops feature photovoltaic power generation equipment with a total installed capacity of 9MW. Covering more than one-third of the park's total area at 100,000 square meters, these photovoltaic roofs generate electricity during the day to power the park's office lighting. At night, they power electric vehicles through a pilot project involving "cars + carports + charging stations + photovoltaics." The ongoing installation of a distributed lithium battery energy storage system in the park will enhance power regulation, contributing to the smooth operation of the grid system during peak electricity consumption periods. Simultaneously, the park has implemented a sound energy-saving management system, which consistently optimizes sorting and transportation processes. This ensures efficient sorting and lights-out operation in the warehouse, effectively reducing carbon emissions while enhancing overall efficiency. Considering sunlight conditions, the park prioritizes the use of solar street lights for illumination. Furthermore, the park capitalizes on its renewable energy advantage by employing distributed air conditioning instead of boiler rooms to minimize the consumption of fossil fuels.

Green transportation: As the scale of multimodal transportation continues to expand, JD Logistics remains steadfast in its commitment to carbon reduction goals. The company utilizes warehouse network planning technology to select transportation modes with lower carbon emissions, actively promotes the use of new energy vehicles (NEVs), and advances the combined transportation for different types of goods. These measures help improve the transportation efficiency while simultaneously reducing energy consumption and carbon emissions. In August 2022, JD Logistics introduced its first fleet of NEVs with battery-swapping capabilities. Through a comprehensive battery-swapping solution, JD Logistics aims to enhance the absorption rate of energy storage in logistics parks by over 25%. This initiative is projected to decrease the number of vehicles in operation by over 20%, raise the carbon emission reduction per vehicle by over 15%, and achieve a comprehensive improvement rate in carbon reduction exceeding 35%. As of the end of 2022, JD Logistics has rolled out around 120 battery-swapping NEVs across the country. On October 17, 2022, the initial fleet of hydrogen-powered logistics trucks were put into operation. Integral to its "zero carbon transportation" initiative, JD Logistics' hydrogen-powered trucks empower customers to attain "net-zero" emissions for specific segments of the supply chain transportation. Compared to conventional diesel trucks, they can curtail carbon emissions by roughly 7.53 tons per month and achieve substantial fuel cost savings.

Green delivery: JD Logistics has consistently incorporated mechanized and intelligent equipment for "last-mile" delivery to reduce energy consumption, while actively promoting the adoption of environmentally friendly materials. In 2022, the company introduced 1,056 sets of goods sensing devices to its picking and sorting warehouses. These devices automatically shut down when not in use, resulting in an estimated annual savings of 3% in electricity costs. Moreover, the company

replaced wooden pallets with PVC pallets and transitioned from disposable woven bags to reusable woven bags. Compared to 2021, the use of reusable bags increased by 25%, reaching a total of 240 million recycling times per year and preventing the consumption of 82.47 million disposable woven bags.

Green packaging: JD Logistics actively promotes environmentally friendly packaging, incorporating measures such as reducing packaging and utilizing recyclable materials. The company routinely employs reusable packaging boxes, and has pioneered the industry's first Delivered with Original Package (DWOP) certification. Through incentive programs, JD Logistics motivates brand manufacturers to ship products with their original packaging. The company



also utilizes reusable delivery boxes known as "Green Steam Delivery Boxes," along with reusable insulation boxes and recycling transit bags, thereby reducing reliance on disposable packaging materials. Moreover, to encourage the use of eco-friendly materials and encourage technological advancements in the industry, JD Logistics Material Laboratory is open as an incubator for innovation projects of universities focusing on renewable materials.

The independently developed Supply Chain Emission Management Platform (SCEMP) has been verified. Based on the actual routes of transportation vehicles and calculated at the smallest granularity, SCEMP is the world's first supply chain carbon management platform that encompasses over 140 types of carbon emission factors for road transportation in China. It is the first of its kind that enables refined carbon footprint management in the logistics industry, effectively addressing the challenge of monitoring mobile emission sources. JD Logistics



proactively offers solutions to carbon emission management for its customers. For instance, it has set up a carbon account for Decathlon, offering tailored solutions for computing the GHG carbon footprint and decarbonization paths in Decathlon's B2B e-commerce scenarios. Within the first month following its launch, SCEMP completed over 200,000 waybills of a single customer's scenario. It accurately computed the carbon footprint and verifiable GHG emission reduction for each order, aligning with the customer's specifications for precision, granularity, and visualization in carbon footprint calculations. In April 2023, at the Green Supply Chain Innovation and Development Forum, 11 companies, including JD Logistics, collaboratively signed and launched the Supply Chain Decarbonization Initiative. They are committed to enhancing their primary responsibility for green management, exploring models for the development of a green supply chain, and advancing end-to-end decarbonization, greening, and recyclability within the supply chain.



Closely connecting production and consumption, JD Logistics, in its pursuit of green development, advocates for collective action among all enterprises in the supply chain. The goal is to transition from individual companies reducing carbon emissions to an integrated industry-wide decarbonization cycle that involves all upstream and downstream enterprises. In this context, JD Logistics has introduced the groundbreaking concept of a "shared carbon footprint" in supply chain. It has launched the Supply Chain Decarbonization Initiative, a pioneering effort that proves to be an effective solution, propelling the long-term sustainable development of the logistics industry and the entire supply chain. This initiative presents a tangible and practical pathway for collective resilience against global warming.

- 1. As the pioneer among supply chain logistics companies in China to introduce the Supply Chain Decarbonization Initiative, JD Logistics has actively strengthened its infrastructure and digital technology capabilities to minimize its own carbon emissions.
- 2. JD Logistics has been promoting the green and low-carbon development of the industry, and has consistently motivated upstream and downstream partners to actively engage in the industry-wide decarbonization cycle, thereby nurturing a green value chain. Supply chain enterprises can collaboratively achieve decarbonization by leveraging the shared carbon footprint and cost-sharing within the green value chain. With a focus on Scope 1, 2, and 3 GHG emissions, JD Logistics has systematically introduced technologies and pathways for carbon reduction in the supply chain.
- 3. As a vital component and tool within the framework of the Supply Chain Decarbonization Initiative, the Supply Chain Emission Management Platform (SCEMP), designed for various scenarios, seeks to motivate enterprises to efficiently and cost-effectively reduce carbon emissions, ultimately working towards the goal of "net-zero emissions."
- 4. The Supply Chain Decarbonization Initiative not only enables enterprises with relatively small carbon footprints to have a significant global impact but also, by dispersing the carbon reduction costs along the value chain, helps mitigate the cost investment in the decarbonization paths of enterprises. Furthermore, it offers consumers avenues to participate in carbon reduction, making the journey towards achieving supply chain decarbonization more profound and comprehensive.

China Everbright Bank: Landing a Portfolio of Green Finance Measures to Drive Low-carbon Economic Development Through Green Credit



Company Profile

China Everbright Bank (CEB or the Bank), established in August 1992, is a national jointstock commercial bank approved by the State Council of China and the People's Bank of China. Following the strategic vision of "building a first-class wealth management bank", CEB accelerates continuous innovation in optimizing its product design, channel development and service models, and has forged a strong market competitive edge in its major product and business lines such as asset management, financial technology, and comprehensive finance. In its commitment to social responsibility and sustainable development, CEB focuses on societal needs, conducting various public welfare campaigns in education, environmental protection, targeted assistance, elderly care, and charity. CEB's Everbright Cloud Fee Payment, an online convenient service with a focus on people's livelihood services and financial scenarios, has served hundreds of millions of people. CEB was listed in the "China ESG 50" released by Forbes China, selected into the Hang Seng (China A) Corporate Sustainability Index, and was ranked 28th among the 2023 "Top 1,000 World Banks" according to The Banker.



In terms of the overall strategy, CEB formulated the Rolling Strategic Plan for 2021-2025, which requires the Bank to "vigorously develop green finance, support the development of green, low-carbon and circular economy, and provide investment and financing support for the goal of carbon peaking and carbon neutrality in a market-oriented manner, so as to ensure that the growth rate of green financing is not lower than the average financing growth rate of the Bank". This means to integrate the construction of "Green Everbright" into the development strategy of the Bank. The Medium- and Long-Term Development Strategy (2018-2027) of the Bank clearly defined the green finance strategy, which requires the Bank to work on green finance and cooperate with various stakeholders to continuously improve its economic, environmental and social responsibility performance and social responsibility management.

In terms of management mechanism, CEB has established a comprehensive management mechanism that focuses on optimizing management structure, refining management policies and regulations, clarifying risk management processes, and improving professional



information disclosure. At the headquarters level, the Bank has expanded the scope of ESG risk management in financing, incorporated ESG risks into its comprehensive risk management system and made it an integral part of the risk management framework. In terms of practices at branch level, CEB Shenzhen Branch published the Environmental Information Disclosure Report, which explored the collection, management and disclosure of environmental data in its own operation as well as in investment and financing activities, identified and assessed factors such as the environmental impact and carbon footprint of their investment and financing activities.

In terms of green credit, CEB is committed to promoting concerted efforts to cut carbon emissions, reduce pollution, promote green development, and pursue economic growth to support the 30.60 Decarbonization Goal with strategic plans and tangible actions. Focusing on climate change and biodiversity protection, the Bank continuously optimizes its environmentrelated credit management regulations. Its industry credit policies have covered key industries including agriculture, forestry, animal husbandry and fishery, electricity, steel, iron, and coal, thus shaping a greener credit portfolio to facilitate the development of green industries, and the transformation and upgrading of traditional industries. As at the end of September 2023, CEB's



green loan balance reached RMB 288.8 billion, an increase of 45% from the previous year-end; the loan balance of the clean energy sector reached RMB 54.5 billion, an increase of 75% over the previous year-end; green bond investment also grew by 38% compared with the end of previous year.

CEB is also playing a significant role in the green transition of the logistics and transportation sector. In recent years, as Full Truck Alliance Co., Ltd.(a leading digital freight platform)'s key financial partner for digital logistics, CEB has co-developed a digital logistics settlement system with the company, facilitating hundreds of billions in RMB online payments for millions of drivers and freight owners, thereby greatly elevating digital freight efficiency. In the meantime, in active response to the China Road Freight Sustainable Green Development Campaign launched by Full Truck Alliance, CEB actively participated in the development of a "Green Logistics+" service system. Now, the "green logistics + finance" service has been jointly launched by CEB and Full Truck Alliance, which have established a green reputation system based on mutual recognition and trust using drivers' carbon accounts. This move aims to improve the financial experiences and sense of content of truck drivers, foster their energy conservation and low-carbon awareness, and elevate the sector's contribution to carbon peaking and carbon neutrality.

In green financial products, CEB pioneered the "Carbon Exchange Scenario Finance" pattern, which, leveraging on the national carbon emissions trading market, provides a package of financial services like pledge financing of carbon emission rights, green bonds, payment and settlement, and account management. The pattern fuels green corporate growth and inspires green financial innovation in banking sector.

As for its own energy conservation and emission reduction, CEB has conducted Bank-wide carbon emission inventories for two consecutive years, gathering data from the headquarters and over 1,000 domestic branches. The Bank has established a scientific and effective data model, laying the groundwork for carbon footprint management. Additionally, CEB is also actively exploring an energy custody pattern and has set upgrade targets for major energysaving technologies to cut carbon emissions.



Promoting green finance not only signifies a strategic pivot for commercial banks, but also unveils extensive opportunities for banking institutions. As a proactive practitioner in green finance, CEB employs diverse measures with priorities on key tasks and innovative breakthroughs to underscore green finance as an important driver for its ESG initiatives. It capitalizes on development potential and opportunities brought by energy and industrial transformation, and makes concerted efforts to cut carbon emissions, reduce pollution, promote green development, and pursue economic growth. Meanwhile, CEB is also dedicated to preventing ESG risks, boosting its ESG performance and contributing to comprehensive green transition in both economic and social development.

State Grid Wuxi Power Supply Company: Advancing Low-Carbon Energy **Transition with Innovative Solutions**



Company Profile

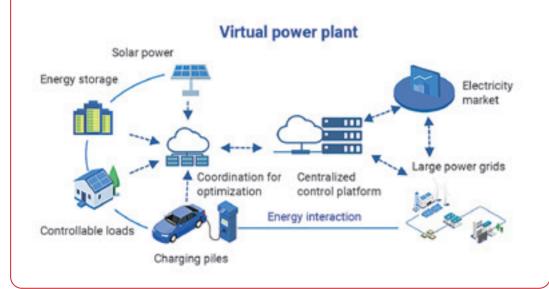
Wuxi Power Supply Company of State Grid Jiangsu Electric Power Co., Ltd. (hereinafter referred to as State Grid Wuxi Power Supply Company) was established in 1909 and has since traversed a century of development. As of the end of December 2022, the company's total customer base reached 4.1042 million users, boasting 347 substations of 35 kV and above, with a cumulative substation capacity of 68.008 MVA and a combined length of 7,955.2 kilometers for 35 kV and above lines. In response to China's carbon peaking and carbon neutrality goal, State Grid Wuxi Power Supply Company has proactively initiated various measures. In line with its own characteristics, the company seizes opportunities arising from green and low-carbon development. It has explored diverse pathways to facilitate the low-carbon transition of energy. Undertaking a range of effective practices, it has taken the lead in promoting low-carbon development and is dedicated to contributing to the establishment of a resilient, safe, green, and low-carbon power grid.



Kev Actions

Building a zero-carbon lighthouse factory and paving the path to green intelligence

While constructing the "lighthouse factory," State Grid Wuxi Power Supply Company, in partnership with State Grid Wuxi Integrated Energy Service Co., Ltd. and Pro-face, emphasizes green intelligent manufacturing and green energy management. The collaboration centers around



enhancing power supply reliability, developing clean energy, managing factory energy efficiency operations, and providing green power services. With a focus on cost savings and environmental protection, they have established the first zero-carbon "lighthouse factory in the manufacturing industry." It aims to promote lean production, energy efficiency enhancement, clean energy substitution, energy cost optimization, and sustainable development. It propels energy transition and decarbonization, blazing a trail for more manufacturing enterprises to explore a development path integrating green energy management and green intelligent manufacturing.

Facilitating the use of shore power for anchored inland vessels to protect lucid waters and lush mountains

To advance the adoption of eco-friendly shore power, State Grid Wuxi Power Supply Company has expedited to construct shore power facilities at inland river ports, encouraging vessels to utilize shore power during berthing. The company has empowered the green development of ports by using intelligent shore power technology for developing ecological port infrastructure. Addressing key challenges such as reluctance among enterprises to build shore power facilities, inconvenience during vessel usage, and platform inefficiency in facility management, State Grid Wuxi Power Supply Company has pioneered a model known as "one foundation, one reduction, and three innovations." This initiative has led to the transformation of inland shore power from mere usability to user-friendliness and, ultimately, to enhanced convenience. The adoption of shore power caters to the power requirements of anchored inland vessels, resulting in reduced noise and air pollution. It also lowers berthing costs and maintenance expenses for vessels, achieving zero emissions of harmful gases. This initiative aligns with low-carbon ecological development objectives, providing a model for the nationwide promotion of green shore power at inland river ports.

Building a green and intelligent storage system to promote low-carbon development of the supply chain

Material storage within the State Grid system is intricately linked to suppliers, project units, and other peer entities. Serving as the repository for a diverse array of goods, material storage plays a pivotal role in constructing green supply chain management. State Grid Wuxi Power Supply Company, harnessing various cutting-edge technologies such as digital twin cloud platforms and 3D modeling, has established a "five-star" intelligent warehouse on the supply chain platform. This accomplishment has automated business transactions, facilitated holographic visualization of warehouses, improved intelligence in resource scheduling, and promoted lowcarbon operations in management. It has significantly elevated efficiency and quality, making full use of storage materials and contributing to the establishment of an efficient, low-carbon supply chain, thus fostering its green development.

Strengthening green power supply to facilitate the growth of sustainable agriculture

As an electricity distributor, State Grid Wuxi Power Supply Company, starting from its own



Rooftop photovoltaic of the State Grid Wuxi Power Supply Company's warehouses

service end, promotes the supply and consumption of green power to assist in optimizing the local energy structure. Focusing on addressing agricultural pollution, the company utilizes various green renewable energy sources such as wind, photovoltaic, energy storage, and ground-source heat pumps. It has completed the electrification of Qinghe Farm's production facilities, minimizing carbon emissions and the release of various harmful substances such as SO₂ and NO₃ caused by traditional fossil fuels. It has also reduced the pollution of ashcontaining wastewater from farms, contributing to the development of green agriculture.

Advancing electric power substitution to revitalize an intangible cultural heritage industry

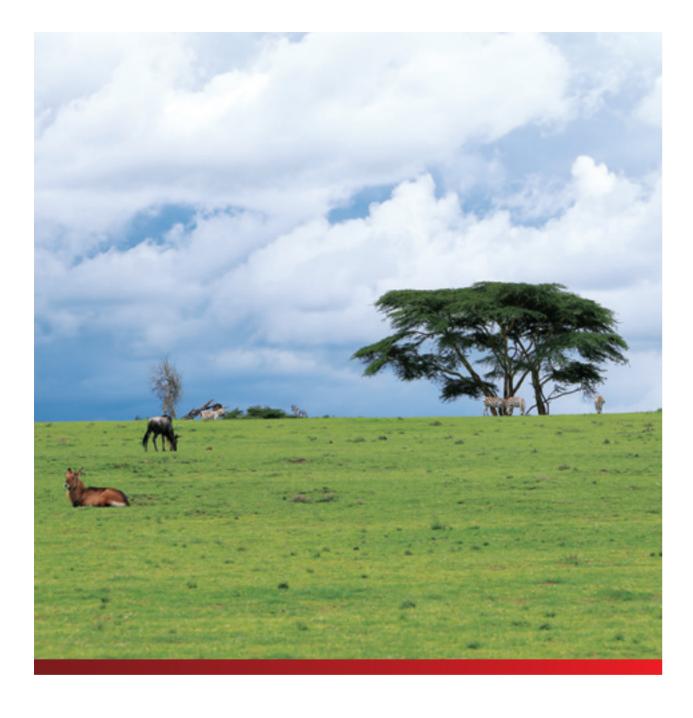
Handcrafted purple clay pottery in Yixing, Jiangsu, represents an intangible cultural heritage with distinctive national and regional characteristics. The traditional production process faced challenges such as significant resource consumption, high energy consumption, and serious pollution. It was also troubled by issues like low yield and challenging quality control. With the aim of preserving the natural environment and promoting energy conservation and emission reduction, the Yixing Branch of State Grid Wuxi Power Supply Company promoted the replacement of traditional kilns with electric kilns in the Dingshu area of Yixing in 2005. This initiative has paved the way for electric power substitution, transforming the ceramic industry from a resource-consuming and ecologically sensitive model to a resource-efficient and low-carbon development model. It has significantly improved the quality of ceramics, reviving the ceramic industry.



Promoting electric kiln to facilitate the low-carbon development of Yixing ceramic industry



Since the initiation of China's 30.60 Decarbonization Goal, various subsidiaries under State Grid have expedited the diversification, cleanliness, and low-carbon transformation of energy supply, along with the efficiency, reduction, and electrification of energy consumption. Capitalizing on its business and technological strengths, State Grid Wuxi Power Supply Company, in collaboration with local economic development and industrial characteristics, has undertaken tangible actions. It has established green and intelligent warehouses, promoted electric power substitution and shore power usage, and collaborated with strategic partners to create the first zero-carbon "lighthouse factory in the manufacturing industry." The company offered effective solutions for the clean and low-carbon energy utilization of enterprises across various industries, including manufacturing, agriculture, and ceramics. These endeavors underscore its unwavering commitment, notable achievements, and substantial potential in advancing energy efficiency and carbon reduction. In the pursuit of realizing China's 30.60 Decarbonization Goal, it plays a demonstrative and leading role.



Chapter III

Spotlight: "Going Global" with Green **Development**



In recent years, Chinese companies have rapidly expanded into global markets, with a continuous strengthening of overseas investments. Data indicates that Chinese investors have established enterprises in over 80% of countries and regions worldwide¹⁴. Through projects and constructions etc, Chinese companies have enhanced local infrastructure, generated numerous job opportunities, and facilitated the flow of trade and funds. The influence of Chinese enterprises in global economic and social development is steadily increasing. Concurrently, Chinese manufacturing is swiftly establishing a global presence, as China's total exports maintain a stable increase at an average annual growth rate of 9.77% from 2017 to 2022¹⁵. As we enter the era of carbon neutrality, sustaining a positive trajectory in foreign investment and trade requires not only a continuous enhancement in the quality of "going global" but also a commitment to elevating the level of low-carbon development, which will ultimately determine the core competitiveness of Chinese enterprises and manufacturing.

The increasingly complicated external contexts necessitates that enterprises expanding overseas **expedite the cultivation of green competitiveness.** Carbon pricing policies, represented by the carbon market and Carbon Border Adjustment Mechanism (CBAM), circular economy practices represented by ecological design, LCA management, and recycling, along with compliance and reporting measures highlighted by value chain carbon management and mandatory disclosure, collectively underscore the imperative for Chinese companies venturing abroad to possess the ability to quantify the accounting of carbon emissions at both organizational and product levels, build a circular economy system, and create a sustainable value chain, posing notable compliance challenges for them¹⁶.

Remarkable Progress in Green and Low-Carbon Development on the 10th Anniversary of the Belt and Road Initiative (BRI)¹⁷

China has entered into environmental cooperation agreements with more than 30 countries and international organizations. It has jointly launched the Initiative for B&R Partnership on Green Development with 31 countries and established the BRI International Green Development Coalition, boasting participation from over 40 countries and engaging more than 150 partners. China has established the Belt and Road Energy Partnership with 32 countries. The country has signed 47 South-South MoUs on climate change with 39 partner countries, and engaged in over 70 climate change mitigation and adaptation projects with over 30 developing countries. Moreover, China has provided training for over 3,000 environmental management professionals and experts from more than 120 countries.

China consistently places a "green" emphasis at the core of its global initiatives. In championing green and low-carbon development, China underscores the intrinsic coherence between its domestic and international actions. As part of the collective progress of the Belt and Road Initiative (BRI), China has released documents such as the Opinions on Jointly Promoting Green Development of the Belt and Road, setting an ambitious goal to establish a pattern of green development for the Belt and Road by 2030. China has pledged to stop building new coal-fired power projects abroad. It actively develops platforms for green finance and international cooperation, collaborates with countries along the Belt and Road on biodiversity conservation research, and collectively safeguards the ecological security of the Maritime Silk Road. Furthermore, China has developed the BRI Environmental Big Data Platform, established the Belt and Road Environmental Technology Exchange and Transfer Center (B&RETTC), and launched the Green Silk Road Envoys Program.

In alignment with international expectations and Chinese policy directives, Chinese enterprises are steadily improving their environmental risk management capabilities in foreign investment and cooperation. The green and low-carbon principles proceed to be integrated into their production and operations. During the "GoldenKey Campaign," actions guided by the principle of "We Are the World" offered an insightful view for the outside world to understand how Chinese enterprises are advancing green development overseas.

Firstly, as a leading force among Chinese enterprises going globally, central SOEs have undertaken the crucial responsibility of shaping the image of Chinese companies committed to green development abroad. They accomplish this through involvement in philanthropic activities, conservation efforts for flora and fauna, promotion of renewable energy, and advancement of green technologies, among other efforts. Secondly, emerging economies and developing nations, heavily reliant on traditional energy sources, encounter challenges in their transition toward sustainability. Chinese enterprises, capitalizing on their economic and technological strengths, engage in diverse collaborations with partner countries across renewable energy, green infrastructure, green transportation, and other domains. In doing so, they not only secure international business opportunities but also curb high emissions caused by the industrialization and urbanization in the countries where they operate, thereby contributing to local low-carbon development. Thirdly, overseas industrial parks serve as examples of China's economic development model and play a crucial role in showcasing the achievements of China's efforts to promote green and low-carbon development globally. While there is still significant room for improvement in the green and low-carbon levels of these overseas industrial parks, they have made considerable progress in steering energy and economic transitions towards low-carbon practices. They are actively involved in constructing green infrastructure, promoting resource recycling, and advocating for green initiatives. These efforts contribute to bolstering the global influence and soft power of Chinese enterprises expanding abroad.

Sinopec Group: Clean Energy Powers the "Green Middle East"



Company Profile

China Petrochemical Corporation (hereinafter referred to as "Sinopec Group"), with the mission of "better energy for better living," is committed to the brand promise of "Cleaner Energy, Better Life." Sinopec Group is accelerating the construction of "One Foundation, Two Wings and Three Growth Points" industry growth pattern, actively fulfilling the "three core responsibilities," and striving to become a company with strong strategic support, strong capability to guarantee a good livelihood and strong spiritual appeal. The company is dedicated to promoting high-quality development, and strives to become a "world-leading clean energy and chemical company."



Key Actions

Sinopec Group actively aligns with the Green Middle East Initiative and the green development plans proposed by different countries. It consistently enhances its environmentally friendly operational practices and takes environmental actions, contributing to the advancement of the "Green Middle East."



Sinopec Engineering (Group) Co., Ltd. undertakes the IBB synthesis ammonia renovation project, renovating industrial equipment and reducing discharge of pollutants

Proactively responding to local initiatives

When conducting business in Middle Eastern countries, Sinopec Group actively considers and aligns with local green development initiatives. The company has formulated corresponding sustainability strategies and rigorously implements them, demonstrating its commitment to promoting low-carbon development in the Middle East. Sinopec Group continuously strives to become an energy enterprise with global competitiveness and influence. In its Saudi branch and project departments, Sinopec Group has proactively implemented the "Saudi Green Initiative," incorporating green principles into various aspects such as environmental management, lowcarbon energy conservation, personnel training, and environmental practices. This endeavor contributes to the progress of the "Saudi Green Initiative" and supports the advancement of green development in Saudi Arabia. In its project department in the United Arab Emirates, Sinopec Group strongly responds to the "UAE Net Zero by 2050 strategic initiative," aiming to expand the use of clean energy and accelerate the research and application of renewable energy projects.

Conducting green operations

Sinopec Group is actively involved in promoting green development in the Middle East, striving to improve its green operational standards. The company actively enhances environmental protection in its local projects through tangible actions and integrates green and low-carbon production principles throughout the entire lifecycle, encompassing project planning, design, construction, and operation. Sinopec Group has successfully implemented whole-process environmental impact management, minimizing the adverse impacts of its operations on the environment.

For instance, in Saudi Arabia, Sinopec Group is driving the transformation towards cleaner and low-carbon chemical production. The company actively engages in upgrading and renovating projects, introducing green construction technologies, and adopting sustainable management practices. Leveraging new technologies, processes, materials, and more efficient management procedures, Sinopec Group has successfully decreased energy consumption and pollutant emissions. Simultaneously, the company has enhanced the full lifecycle management of wastewater, exhaust gases, and solid waste. It has taken proactive measures in production noise control, resource conservation, waste management, and pollution source control. Notably, the Saudi IBB Ammonia Revamp Project, undertaken by Sinopec Engineering (Group) Co., Ltd., has substantially enhanced the production stability and environmental reliability of SABIC Agri-Nutrients Company. This initiative has resulted in a significant reduction in pollutant emissions, leading to notable economic and social benefits.

Building a green home together

In the Middle East, combating desertification is a shared objective for local governments and businesses. While conducting business, Sinopec Group actively fulfills social responsibility. The company organizes local employees to participate voluntarily in tree planting, greening, and afforestation activities, contributing to the expansion of greenery in extensive desert areas.

Since 2008, the Saudi Branch of Sinopec International Petroleum Service Corporation has been actively involved in tree-planting initiatives. The company plants a thousand trees annually, and five thousand trees planted have survived in total, which earns commendation from property owners and local authorities.



Sinopec employees sow 6 million tree seeds in Saudi Arabia



Green development is a collective aspiration for nations and a pivotal element in global governance. It emerges as a distinct theme of the joint efforts to promote the high-quality development of the Belt and Road. Sinopec Group, driven by the philosophy of fostering harmonious coexistence between humanity and nature, systematically incorporates green and low-carbon principles into the entire spectrum of the BRI. By implementing initiatives like green and clean production, fostering a circular economy, and safeguarding biodiversity, the company proactively addresses global climate change, working in tandem with diverse stakeholders to protect the green planet.



Chapter IV

Step by Step:

Transforming in Challenges, Thriving in Adversity



The foundation for sustaining the strategic commitment to low-carbon development lies in the objective law that the zero-carbon era dictates changes in social awareness and societal existence trends. Humanity must embrace the shift from industrial to ecological civilization; otherwise, its survival and development will be at risk, even facing extinction 18. Therefore, all organizations, including businesses, must overcome all challenges in the future and strive to become low-carbon, zero-carbon, or even carbon-negative. This is a shared consensus in the current global market and the cornerstone for future sustainable development.

4.1 Difficulties and Challenges

- 1. Inadequate impetus. Low-carbon transformation presents a historical opportunity for businesses to redefine their core competitiveness. However, it also entails additional investments and increased costs. Faced with the harsh reality of limited short-term benefits, many businesses struggle to sustain the pursuit of the correct yet challenging tasks involved in achieving "carbon neutrality." At times, it's not a lack of awareness on the part of businesses in pursuing low-carbon transformation, but rather the daunting costs that hinder their drive and eagerness for the transformation. Additionally, businesses may struggle to identify the specific "benefits" that carbon reduction could yield for them.
- 2. Unclear pathways for action. Low-carbon development goes beyond mere rhetoric. It demands authentic integration into company operations for the simultaneous growth of economic and green benefits. Presently, many businesses haven't deeply contemplated the organic fusion of their interests with the carbon reduction trend. They fail to develop a comprehensive and scientific action plans for low-carbon transformation. In some cases, businesses lack timely, clear, and accurate insights into their real situation and goal setting.
- 3. Inadequate supporting systems. Firstly, carbon peaking and carbon neutrality are still novel concepts for many individuals and businesses. There are cognitive errors and insufficient transformation capabilities, necessitating an urgent need to strengthen learning and enhance talent reserves. Secondly, the foundation is weak, and development lags in areas such as carbon reduction technologies and processes, innovation in new energy technologies, and digital applications. Businesses' motivation to green transformation is severely hampered. Thirdly, the absence of standards and an imperfect certification system for low-carbon or zero-carbon products can easily lead to false claims of carbon reduction and foster malicious competition. Finally, the public opinion environment and ecosystem for addressing climate change are yet to be fully developed. There is still no consensus among various sectors of society on carbon reduction, making it difficult to gather forces and form effective cooperation. Consequently, while businesses aspire to undergo green transformation and upgrade, they often face a lack of external support, making it difficult for them to move forward.

4.2 Recommendations for the Future

It is recommended that businesses increase their proactive efforts in pursuing low-carbon transformation:

- 1. Enhance capabilities. Despite numerous challenges, achieving carbon neutrality marks a transformative juncture for businesses, a pivot between survival and demise. Consequently, businesses must heighten awareness, proactively engage, and adapt dynamically to changes. Businesses should meticulously contemplate and chart a decarbonization course that seamlessly integrates "carbon neutrality" with their own development trajectory. By rolling out and implementing low-carbon action plans, enterprises can establish a core competitive advantage in green and low-carbon practices. Furthermore, they need to shift mindset from cost to investment with long-term vision. This entails a heightened focus on technological innovation, augmented learning capabilities, and a strategic embrace of digital transformation to position themselves ahead in future markets. Lastly, businesses should invest in digital infrastructure, leveraging digital technologies to cultivate new economic growth avenues and propel green development.
- 2. Strengthen external collaboration. Achieving carbon neutrality is a systemic transformation that permeates all facets of the economy and society. Moreover, low-carbon transformation extends beyond individual companies. It demands the establishment of a sound ecosystem for low-carbon development. Therefore, while businesses concentrate on their internal endeavors, they should actively collaborate with the government, industry associations, and other stakeholders to promote the development of pertinent policies and standards. Businesses should also fortify partnerships with universities and research institutions, leveraging their influential position in the market to propel research on low-carbon technologies and the application of research outcomes. The proactive adoption of cutting-edge green technologies is also imperative. Lastly, businesses should intensify communication initiatives, utilizing incentives like "carbon credits" to motivate employees and consumers to embrace low-carbon practices in both professional and daily spheres.

Other stakeholders, beyond businesses, are recommended to enhance the environment for corporate low-carbon transformation:

- · Enhance policy support by refining financial, tax, investment, and pricing policies that promote green development; amplify backing for the research and development of green and low-carbon products and technologies; leverage incentives like tax benefits and government subsidies to elevate businesses' motivation for pursuing transformation.
- Explore transition finance and align the design of financial products with project carbon reduction or green assessments, thereby meeting the reasonable funding needs of high-energy-consuming enterprises during the green transformation process and systematically advancing the low-carbon transformation of traditional manufacturing industries.
- · Establish and continually enhance carbon market mechanisms, and actively improve green trading and green certificate markets, etc.
- Promote the development of relevant standard certification systems to boost the operational capabilities of enterprises in low-carbon transformation.
- · Strengthen regulatory and institutional construction to prevent the substitution of good practices by inferior ones.

Appendix



The analysis targets of this report are mainly from the corporate actions in the "GoldenKey - SDG Solutions" in 2020-2023, in which 389 enterprises shared a total of 449 SDG solutions. Nearly 50% of those solutions are about climate issues, and different sizes of enterprises in various industries, including state-owned enterprises, foreign enterprises in China and private enterprises.

Please scan the QR code to know more about the GoldenKey-SDG Solutions.



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