2024 年度晶科能源气候转型年度行动实践

2024 Annual Climate Transition Action Practices of Jinko Solar

气候变化相关财务风险说明

Explanation of financial risks related to climate change

转型风险：若企业管控不当，未达成现行政策要求，可能面临罚款、生产限制等风险；另外，各国为应对气候变化，可能会制定更严格的碳排放法规和碳定价机制。企业需投入更多资源开展节能减排行动、降低温室气体排放，进而减少企业的运营成本。

Transition Risk: Inadequate corporate governance or failure to meet existing regulatory requirements may expose the Company to risks such as fines, production restrictions, and other penalties. In addition, as countries continue to strengthen climate actions, stricter carbon emission regulations and carbon pricing mechanisms may be introduced. This trend would necessitate greater corporate investment in energy conservation and emission reduction efforts, driving up operational costs associated with reducing greenhouse gas emissions.

1、财务影响评估：晶科能源通过 IEA 不同气候转型情景评估晶科能源转型路径下潜在面临的转型风险。在 IEA-2050 年净零排放情景下，长期时间范围为 2030 年至 2050 年。分析结果表明，晶科能源在落实公司自身减排目标的基础上，在 3 个气候转型情景下均仍需要一定的额外碳减排量，可能为此付出额外碳减排成本。不过，公司每年所需达成的碳减排量逐年下降，相应的额外减排成本和在险价值亦呈现逐年下降趋势。从长期来看，随着碳目标的达成落实，公司潜在的额外减排成本趋近于 0，对企业价值几乎无负面影响；在短期至中期时间范围内，公司需要积极推进减排行动，增加设备更新、技术创新、管理优化、能力建设等相关投入，可能存在较高的额外减排成本，但相关的财务影响处于可接受范围内。

在 NZE 2050 低排放情景下，公司为应对转型风险、满足减排合规要求所需的额外减排量、碳减排成本最高，但 2050 年对企业价值的影响仅为 0.0044%，未触发财务规划决策的重大性风险阈值。根据外部财经网站，晶科能源 2024 年末的企业价值约 15,330.5 亿元，加权资产成本约 6.62%；根据 IEA 对未来情景的排放量和碳价预测，晶科能源在 2050 年的潜在额外减排成本现值约 6,719 万元。此外，在既定政策情景下，2043 年之后存在盈余的碳预算，公司将无需承担额外的减排成本。据公司内部测算，每年度节能减排支出约占节能环保支出的 1%，参考 2024 年度 ESG 报告中披露的节能环保支出费用约为 2.569 亿，则每年节能减排支出约为 256.9 万元。

1、 Financial impact assessment: Jinko Solar assesses the potential transition risks under Jinko Solar's transition path through different IEA climate transition scenarios. Under the IEA's Net Zero Emissions by 2050 Scenario (NZE 2050), the long-term is from 2030 to 2050. The analysis results show that based on the Company's reduction targets, Jinko Solar is supposed to achieve a certain amount of additional carbon reductions under all three climate transition scenarios, and may incur additional carbon reduction costs. However, the Company's annual carbon reduction targets and associated additional carbon reduction costs decline progressively, with the CVaR showing a similar downward trend. In the long term, as the carbon targets are achieved, the Company's potential additional carbon reduction costs approach zero, with almost no negative impact on corporate value. In the short to medium term, the Company needs to actively promote reduction actions, increase related investments in equipment updates, technological innovation, management optimization, and capacity building, which may result in high additional carbon reduction costs, but the financial impact is within an acceptable range. Under the NZE 2050 low-emission scenario, the Company needs the highest additional carbon reductions and carbon reduction costs to cope with transition risks and meet reduction compliance requirements. Yet the impact on the corporate value in 2050 will be only 0.0044%, not triggering the material risk threshold for financial planning decisions. According to external financial websites, Jinko Solar's enterprise value as of the end of 2024 is approximately

1,533.05 billion CNY, with a weighted average cost of capital of approximately 6.62%. Based on the IEA's projections on future emissions scenarios and carbon price forecasts, the present value of Jinko Solar's potential additional abatement costs by 2050 is estimated to be approximately 67.19 million CNY. Additionally, under the Stated Policies Scenario (STEPS), there will emerge a surplus carbon budget after 2043, and the Company will not incur additional carbon reduction costs. According to the Company's internal estimation, the annual expenditure on energy conservation and emission reduction accounts for approximately 1% of the total energy conservation and environmental protection expenditure. Referring to the total investment in energy conservation and environmental protection disclosed in the 2024 ESG report, which is about 256.9 million CNY, the annual expenditure on energy conservation and emission reduction is approximately 2.569 million CNY.

2、风险管理方法：晶科能源不断建立并完善气候风险与机遇管理流程，对气候风险与机遇开展重要性分析及财务影响评估，制定并升级关键应对策略。风险合规与 ESG 管理委员会定期向战略与可持续发展委员会汇报气候风险与机遇管理工作进展，并由战略与可持续发展委员会定期向董事会汇报管理结果，推动气候风险与机遇管理和公司商业战略深度融合。此外，晶科能源探索将气候风险防范纳入风险管理体系的有效方法，持续推动风险管理体系升级创新。2024 年，公司持续完善自然风险管理制度建设，明确公司各项风险管理政策、识别和评估制度、监测和控制制度、业务风险管理制度、风险报告和沟通制度。公司积极构建风险因子库，分类管理包含气候风险在内的各项已被识别到的风险，并通过定期报告、独立内部审计、内控评价等方式开展风险因子调整以及管理方法调整，从而简化机遇的识别、评估和管理流程整合至全公司风险管理流程。

2、Risk management method: Jinko Solar has continuously established and improved the management process for climate-related risks and opportunities. It conducts materiality analysis and financial impact assessment on climate risks and opportunities, and formulates and upgrades key response strategies. The Risk Compliance and ESG Management Committee regularly reports the progress of climate risk and opportunity management to the Strategy and Sustainable

Development Committee, which in turn regularly reports the management results to the Board of Directors. This promotes the in-depth integration of climate risk and opportunity management with the Company's business strategy. In addition, Jinko Solar explores effective ways to incorporate climate risk prevention into its risk management system, and continuously promotes the upgrading and innovation of the risk management system. In 2024, the Company continued to improve the construction of natural risk management systems, clarifying various risk management policies, identification and assessment systems, monitoring and control systems, business risk management systems, as well as risk reporting and communication systems. The Company actively builds a risk factor database to manage various identified risks, including climate risks, in a classified manner. Through regular reporting, independent internal audits, and internal control evaluations, it adjusts risk factors and management methods, thereby simplifying the processes of identifying, assessing, and managing opportunities and integrating them into the company-wide risk management process.

3、风险应对策略：公司在全球各运营区域配备专业法务团队，持续关注碳权交易、征收碳费及碳边境税等相关的法律法规最新进展，避免因不满足相关规定造成的财务损失；定期组织内部相关人员开展专题培训，不断提升自身对相关讯息的掌握程度。此外，公司引入碳定价机制，探索以影子碳价的方式，在设备和能源采购等决策中纳入对气候变化应对的考量。

3、Risk response strategy: The Company will equip professional legal teams in all operational regions globally to continuously monitor the latest developments in laws and regulations related to carbon trading, carbon fees, and carbon border taxes, avoiding financial losses due to non-compliance; regularly organize specialized training sessions for relevant internal personnel to continuously improve their understanding of relevant information; explore the use of shadow carbon pricing to incorporate considerations for climate change response into decisions on equipment and energy procurement.

物理风险：晶科能源通过 IPCC 两种气候情景分析了公司在短期、中期和长期面临的物理风险。在 RCP8.5 情景下，长期时间范围为 2030 年至 2050 年。分析结果显示，晶科能源在基线情景下，面临的主要物理风险为极端降水、湿润趋势、气旋，且在 RCP8.5 情景下仍有一定比例的资产处于上述风险的高风险地区。通过在运营地点层面的逐个分析，受到此三项气候风险的子公司集中位于中国江西省、浙江省，以及东南亚地区。目前，晶科能源已在全部运营点全面建立物理风险应急响应机制，提高气候风险的适应力，针对位于高风险运营点制定部署洪涝灾害、台风飓风等极端天气的应急预案，2024 年未有生产制造基地因上述物理风险遭受重大财务损失。

Physical Risk: Jinko Solar analyzes the physical risks faced by the Company in the short, medium and long term through two IPCC climate scenarios. Under the RCP8.5 scenario, the long-term is from 2030 to 2050. The analysis reveals that Jinko Solar's primary physical risks under baseline scenarios are extreme precipitation, humid trends, and cyclones, with a notable portion of its assets remaining exposed to high-risk areas for these hazards under the RCP8.5 scenario. Site level assessment shows subsidiaries exposed to these three climate risks are predominantly located in China's Jiangxi and Zhejiang provinces, as well as Southeast Asia. Currently, Jinko Solar has established comprehensive physical risk emergency response mechanisms across all operational sites to enhance climate resilience. Specific contingency plans for extreme weather events such as floods, typhoons, and hurricanes have been implemented in high-risk locations. In 2024, no manufacturing base suffered significant financial losses due to such physical risks.

1、财务影响评估：以洪水风险为例，我们假设，在中期的时间范围内（5 年），洪水将造成资产价值损失金额最多出现 5%，最少出现 1%。在长期的时间范围内（20 年），洪水将造成年度资产价值损失金额最多出现 15%，最少出现 5%。已知公司基于生产制造型子公司进行情景分析，资产价值总计：204,048,143,451.26 元。由此：中期预期财务影响最大：204,048,143,451.26*5%*5=51,012,035,862.82 元，中期预期财务影响最小：204,048,143,451.26*1%*5=10,202,407,172.56 元；长期预期财务影响最大：204,048,143,451.26*15%*20=612,144,430,353.78 元，长期预期财务影响最小：204,048,143,451.26*5%*20=204,048,143,451.26 元。

1、Financial impact assessment: Taking flood risk as an example, we assume that within the medium-term time horizon (5 years), floods will cause the amount paid for the asset value in the current year to increase by a maximum of 5% and a minimum of 1%. Within the long-term time horizon (20 years), floods will lead to an increase in the said payment amount for the current year by a maximum of 15% and a minimum of 5%. It is known that the Company conducts scenario analysis based on its manufacturing subsidiaries, with a total asset value of 204,048,143,451.26 CNY. Therefore: The maximum expected financial impact in the medium term: 204,048,143,451.26 * 5% * 5 = 51,012,035,862.82 CNY; The minimum expected financial impact in the medium term: 204,048,143,451.26 * 1% * 5 = 10,202,407,172.56 CNY; The maximum expected financial impact in the long term: 204,048,143,451.26 * 15% * 20 = 612,144,430,353.78 CNY; The minimum expected financial impact in the long term: 204,048,143,451.26 * 5% * 20 = 204,048,143,451.26 CNY.

我们预计采用将洪水风险防范融入建设阶段、洪水风险应急预案制定、应急物资配备等方式应对洪水风险，洪水风险防范融入建设阶段与洪水风险应急预案制定可融入公司正常厂房建设及 EHS 应急预案制定，成本可忽略不计，预计应对成本主要用于采购防洪设施及应急事件物资的支出，依据往年实际支出情况，预计每年该支出可达 116,746,200.00 元。

We plan to address flood risks through measures such as integrating flood risk prevention into the construction phase, formulating flood risk emergency response plans, and equipping emergency supplies. Integrating flood risk prevention into the construction phase and formulating flood risk emergency response plans can be incorporated into the Company's regular factory construction and EHS emergency plan formulation, with negligible costs. The projected response costs will mainly be used for purchasing flood control facilities and emergency supplies. Based on the actual expenditure in previous years, the annual expenditure is expected to reach 116,746,200.00 CNY.

2、风险管理方法：晶科能源不断建立并完善气候风险与机遇管理流程，对气候风险与机遇开展重要性分析及财务影响评估，制定并升级关键应对策略。风险合规与 ESG 管理委员会定期向战略与可持续发展委员会汇报气候风险与机遇管理工作进展，并由战略与可持续发展委员会定期向董事会汇报管理结果，推动气候风险与机遇管理和公司商业战略深度融合。此外，晶科能源探索将气候风险防范纳入风险管理体系的有效方法，持续推动风险管理体系升级创新。2024 年，公司持续完善自然风险管理制度建设，明确公司各项风险管理政策、识别和评估制度、监测和控制制度、业务风险管理制度、风险报告和沟通制度。公司积极构建风险因子库，分类管理包含气候风险在内的各项已被识别到的风险，并通过定期报告、独立内部审计、内控评价等方式开展风险因子调整以及管理方法调整，从而简化机遇的识别、评估和管理流程整合至全公司风险管理流程。

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thereby simplifying the processes of identifying, assessing, and managing opportunities and integrating them into the company-wide risk management process.

3、风险应对策略：

3、Risk response strategy:

（1）洪水风险防范：工厂建设阶段考虑洪水风险防范，如对仓库进行防渗、防雨、防腐处理。 Flood risk prevention: Consider flood risk prevention during the factory construction phase, such as implementing anti-seepage, rainproof, and anti-corrosion treatments for warehouses.

（2）洪水风险应急预案制定：制定《突发环境事件应急预案》，组建应急小组，定期开展应急演练，及时预警、处置风险。 Formulation of flood risk emergency plans: Develop an Emergency Plan for Sudden Environmental Incidents, establish an emergency response team, conduct regular emergency drills, and provide timely early warning and risk disposal.

（3）提升安全保障：增加员工健康安全保障措施。 Enhancing safety guarantees: Strengthen health and safety protection measures for employees.

（4）应急物资配备：增加水资源应急物资。 Equipping emergency supplies: Increase emergency supplies for water resources.

（5）产品防水性能提升：将防水要素融入产品设计阶段考量。 Improving product waterproof performance: Incorporate waterproofing elements into the product design phase.

气候变化相关财务机遇说明

Explanation of financial opportunities related to climate change

在晶科能源的转型机遇分析中，长期时间范围为 2030 年至 2050 年。晶科能源根据自身主营业务，重点关注应对气候变化所带来的光伏市场增长机遇。

In Jinko Solar's transition opportunity analysis, the long-term is from 2030 to 2050. Aligned with our core business, we focus on leveraging climate change-driven growth opportunities in the photovoltaic market.

我们同样采用转型风险分析中的 IEA 转型情景，基于 3 个情景下的光伏组件未来需求增长数据进行预测，模拟公司光伏业务在不同能源转型路径下可能的增长潜力。根据 IEA 的分析预测，在短中期的时间范围内，光伏市场呈现较快增长趋势。2030 年前，IEA 的 3 种气候情景下光伏装机量的复合年均增长率高于 20%，组件产品具有较高的销售潜力。至 2030 年，光伏市场机遇增长最为显著，预计市场需求量的增长可进一步超出预测周期平均水平。2030 年潜在市场份额达 290GW，每年增加（290GW-90GW）/6=33.3GW，按照市场价格可以估算每年的营收潜在增量约为 33.3GW*7 亿元/GW=233.1 亿元。参考 2024 年的研发投入，预计目前与开发该机遇相关的年度成本为 44.07 亿元。在长期时间尺度下，光伏市场需求增速放缓，但光伏组件销售总量仍保持较高水平，其中在 NZE 2050 和 APS 情景下，2038 年-2050 年潜在的光伏组件销售量相对较高。

Using the same IEA transition scenarios from our transition risk analysis, we project future PV module demand growth across three scenarios to model business expansion potential under different energy transition pathways. IEA's analysis and projections show that in the short to medium term, the PV market is experiencing a rapid growth trend. Before 2030, the compound annual growth rate of PV installations under the three IEA climate scenarios is higher than 20%, indicating that the sales potential of PV modules is relatively large. By 2030, the PV market opportunity is expected to grow the most significantly, with market demand potentially exceeding the average level of baseline forecasts.

The potential market share is expected to reach 290GW by 2030, with an annual increase of (290GW - 90GW)/6 = 33.3GW. Based on the market price, the potential annual revenue increment can be estimated at approximately 33.3GW × 700 million CNY/GW = 23.31 billion CNY. Referring to the R&D investment in 2024, the current annual cost related to developing this opportunity is projected to be 4.407 billion CNY. In the long term, although the growth rate of PV market demand slows down, the total sales volume of PV modules remains elevated. Notably, under both NZE 2050 and APS, the potential sales volume of PV modules from 2038 to 2050 is still relatively high.

内部碳定价机制说明

Explanation of the internal carbon pricing mechanism

本公司已建立并实施内部影子碳价机制，用于覆盖范围一（直接排放）及范围二（间接排放）的二氧化碳（CO_2）排放管理。当前内部影子碳价为 9 元/吨二氧化碳当量，该价格基于严谨模型测算制定：结合 NZE2050 及 APS 情景分析，嵌套碳边境调节机制（CBAM）潜在影响，综合国内外短期及中期绿电、绿证、碳抵消等成本，并参考基准年碳成本及碳配额免除值进行动态优化，确保与公司碳管理合规性目标及气候战略相匹配。

The Company has established and implemented an internal shadow carbon pricing mechanism, which is applied to the management of carbon dioxide (CO_2) emissions under Scope 1 (direct emissions) and Scope 2 (indirect emissions). The current internal shadow carbon price is 9 CNY per ton of CO_2 equivalent. This price is formulated based on rigorous model calculations: it integrates scenario analyses of NZE2050 and APS, incorporates the potential impact of the Carbon Border Adjustment Mechanism (CBAM), synthesizes short-term and medium-term costs of green electricity, green certificates, and carbon offsets both domestically and internationally, and undergoes dynamic optimization with reference to the base-year carbon costs and carbon quota exemptions. This ensures alignment with the Company's carbon management compliance goals and climate strategy.

实施内部影子碳价的核心目标包括：

The core objectives of implementing the internal shadow carbon price include:

1. 支持资本项目及运营决策的成本效益分析，如在项目投资评估中核算碳成本以判断必要性，在设备选型中对比碳成本节省与投入差额； Supporting cost-benefit analysis for capital projects and operational decisions, such as accounting for carbon costs in project investment evaluations to determine necessity, and comparing the difference between carbon cost savings and investment in equipment selection;

2. 推动能源效率提升，通过淘汰高能耗设备、提高产线电气化水平等措施降低碳足迹； Promoting improvements in energy efficiency, reducing carbon footprints through measures such as phasing out energy-intensive equipment and increasing the electrification level of production lines;
3. 引导在业务决策及风险评估中系统纳入气候相关因素，如将碳管理风险纳入基地整体风险管理体系； Guiding the systematic integration of climate-related factors into business decisions and risk assessments, such as incorporating carbon management risks into the overall risk management system of bases;
4. 助力识别低碳发展机遇，促进绿电、绿证等低碳解决方案的应用； Helping identify low-carbon development opportunities and promoting the application of low-carbon solutions such as green electricity and green certificates;
5. 确保符合国内外碳监管要求，实现气候目标对标； Ensuring compliance with domestic and international carbon regulatory requirements and achieving alignment with climate goals;
6. 为设定碳补偿相关预算提供依据，通过年度评估内部碳费用对外部成本的覆盖情况，动态优化管理策略。 Providing a basis for setting budgets related to carbon offset, and dynamically optimizing management strategies by annually evaluating the coverage of internal carbon costs against external costs.

该影子碳价已应用于多项业务决策过程，包括资本支出项目的碳成本评估、生产设备的低碳选型，以及跨基地碳账户的风险管理等，由风险合规中心与能源管理专项组联合推进，按季度更新碳账户数据，每年评估并调整碳价，确保机制的科学性与有效性。

This shadow carbon price has been applied to multiple business decision-making processes, including the assessment of carbon costs for capital expenditure projects, low-carbon selection of production equipment, and risk management of cross-base carbon accounts. It is jointly promoted by the Risk Compliance Center and the Energy

Management Task Force. Carbon account data is updated quarterly, and the carbon price is evaluated and adjusted annually to ensure the scientificity and effectiveness of the mechanism.

低碳产品说明

Explanation of low carbon product

公司是一家以光伏产业技术为核心，以“改变能源结构，承担未来责任”为发展愿景的全球知名光伏产品制造商。公司主要业务范围包括单晶硅棒、硅片切割、电池制备、组件封装在内的光伏业务。公司建立了从硅片生产、电池片生产到光伏组件生产的垂直一体化产能，产品服务于全球范围内的光伏电站投资商、开发商、承包商以及分布式光伏系统终端客户，并以此为基础向全球客户提供高效率、高质量的太阳能光伏组件及储能产品，持续输送清洁能源。

Taking PV technology as its core competence, the Company is a globally recognized PV product manufacturer with the vision of "optimize the energy portfolio and take responsibility for enabling a sustainable future". The main business covers the entire PV value chain, including monocrystalline ingots, wafer slicing, cell fabrication, and module assembly. With vertically integrated capacity—from wafer and cell production to module assembly—the Company serves PV power-plant investors, developers, EPC contractors, and distributed-system end-users worldwide, delivering high-efficiency, high-quality solar modules and energy-storage solutions that continuously supply clean energy.

太阳能光伏组件是公司生产环节的终端产品，也是公司面向市场的主要产品，客户群体为全球范围内光伏电站投资商、开发商、承包商以及分布式光伏系统的经销商。公司光伏组件产品目前以单晶组件为主，结合全球范围内多样化的市场需求，公司应用了 TOPCon、双面（含双玻和透明背板技术）、半片、叠焊、多主栅、大尺寸等电池及组件工艺技术，结合当下市场需求，差异化地开发并推出了多个系列的高功率光伏组件产品。当前公司组件出货的主力产品为应用 N 型 TOPCon 电池技术的 Tiger Neo 系列高端组件。自 2021 年底推向市场以来，经过不断进行技术和工艺升级，公司在 2024 年推出了 Tiger Neo 第三代光伏组件产品，兼具更低的衰减，更优的温度系数，更高的双面率，更优的可靠性等特点，可为终端客户带来更好的发电收益。

PV modules are the final output of and the primary products of the Company and the customers include global PV power-plant investors,

developers, EPC contractors, and distributors of distributed solar systems. The Company currently focuses on monocrystalline modules. To address diverse global demand, the Company integrates a range of cell and module technologies — TOPCon, bifacial (both dual-glass and transparent backsheet), half-cut cells, ribbon overlay, multi-busbar, and large-format wafers—and have launched multiple high-power module products tailored to specific market needs. The flagship product line is the Tiger Neo series, powered by N-type TOPCon cells. Introduced at the end of 2021 and continuously refined, the third-generation Tiger Neo modules launched in 2024 deliver lower degradation, superior temperature coefficients, higher bifaciality, and enhanced reliability, providing end users with greater energy yield and improved financial returns.

通过向全球客户提供优质的光伏组件产品，公司持续助力下游客户避免温室气体排放，从而创造正向环境价值。公司基本使用光伏电力不产生碳排放（运营期间的排放量可以忽略不计）的假设，使用归因估算方法计算避免使用光伏电力可避免的排放量，计算方法如下：

- 假设年峰值小时数：1,400h。
- 参数：2024 年晶科能源股份有限公司销售的光伏产品的总数；国际电网平均排放因子来自国际能源署 IEA 2024 排放系数集；光伏电站系统效率。
- 避免的排放计算公式：2024 年公司售出光伏组件为 92,873MW，使用 2024 年公司售出组件的年发电量光伏电站装机容量*年峰值小时数*光伏电站系统效率（一般取值在 75%-85%之间，这里我们取 80%），得出 2024 年售出组件的年发电量 92,873MW*1,400h*80%=104,017,760MWh，使用总发电量（MWh）*国际平均电网排放因子 0.4604tCO_2/MWh，得出避免的排放量（tCO_2e），即 104,017,760*0.4604=47,889,776.70 吨二氧化碳当量。

By supplying high-quality PV modules to customers worldwide, the Company continuously helps downstream clients avoid greenhouse-gas (GHG) emissions, thereby creating positive environmental value. The Company adopts the attributional approach to calculate emission avoidance based on the assumption that electricity produced by PV

modules is effectively carbon-free (operational emissions are negligible). The calculation method is as follows:

- Assumed annual peak-sun hours: 1,400 h
- Parameters: Total PV module sales of Jinko Solar Co., Ltd. in 2024, international grid-average emission factor from IEA Emission Factors 2024, PV plant system efficiency
- Avoided emissions calculation: In 2024, the Company sold 92,873MW of PV modules. The annual electricity generated by these modules is calculated as installed capacity × annual peak-sun hours × PV plant system efficiency (typically 75–85 %; 80 % is applied here). Thus, 92,873 MW × 1,400 h × 80 % = 104,017,760 MWh. Multiplying this total generation by the international average grid emission factor of 0.4604 tCO_2e per MWh yields avoided emissions of 104,017,760 × 0.4604 = 47,889,776.70 tCO_2e.