

2022年8月19日，由国家能源局石油天然气司、国务院发展研究中心资源与环境政策研究所、自然资源部油气资源战略研究中心编写的《中国天然气发展报告（2022）》（以下简称《报告》）在京发布。《报告》提出了2022年我国天然气产供储销体系建设的四个重点方向：加大释放国内供应潜力，提升自主保障能力；统筹谋划适度先行，推动天然气基础设施投资建设；有为政府和有效市场相结合，积极应对国内外能源格局深刻调整；坚持创新发展，塑造行业发展新优势。

针对2021年我国天然气发展情况，《报告》指出，天然气消费快速增长，在一次能源结构中占比稳步提升。2021年全国天然气消费量3690亿立方米，增量410亿立方米，同比增长12.5%。天然气占一次能源消费总量的比例升至8.9%，较上年提升0.5个百分点。勘探开发持续发力，新增储量产量再创新高。2021年，全国天然气新增探明地质储量16284亿立方米；天然气产量2076亿立方米，同比增长7.8%，连续五年增产超100亿立方米。天然气进口稳步增长，管道气进口增速超过LNG。2021年进口天然气1680亿立方米，同比增长19.9%；管道气进口量591亿立方米，同比增长22.9%；LNG进口量1089亿立方米，同比增长18.3%。天然气基础设施建设加快推进，储气能力快速提升。2021年全国主干天然气管道总里程达到11.6万千米。全国已建成储气能力同比增长15.8%，三年多时间实现翻番。此外，我国天然气保供稳价取得积极成效，技术攻关成果显著，自主创新能力进一步提升。

《报告》显示，今年上半年，国内天然气产量1120亿立方米，同比增长7.9%。天然气进口量741亿立方米，同比下降8.9%。其中，管道气进口312亿立方米，同比增长10%；LNG进口428亿立方米，同比下降19%。天然气消费量与上年同期基本持平。分行业看，城市燃气用气稳步增长，化工化肥用气小幅增长，商服用气受新冠疫情影响下降，工业和发电用气增速明显回落。

《报告》对我国天然气市场进行了展望。预计2022年全国天然气产量2200亿立方米左右，力争全年增产100亿立方米。天然气表观消费量3750亿~3800亿立方米，增长率1%~3%，下半年需求将受到今冬明春气候不确定性、国际能源市场价格大幅波动不确定性双重影响。

以下为报告全文：



中国天然气发展报告

2022

国家能源局石油天然气司
国务院发展研究中心资源与环境政策研究所
自然资源部油气资源战略研究中心

石油工业出版社

中国天然气发展报告

(2022)

国家能源局石油天然气司

国务院发展研究中心资源与环境政策研究所

自然资源部油气资源战略研究中心

石油工业出版社

《中国天然气发展报告（2022）》编委会

（以下按姓氏笔画排序）

主任：

任京东 凌月明 隆国强

副主任：

刘红 余国 吴裕根 高世楫

委员：

王晶 王晓伟 刘潇潇 陆家亮 杨雷

杨上明 杨丽丽 陈进殿 李莉 李政

李继峰 姜学峰 段兆芳 郭焦锋 潘继平

支持单位：

中国石油经济技术研究院

中国石油勘探开发研究院

中国石油规划总院

中国石化经济技术研究院

中国海油能源经济研究院

国家管网集团研究总院

中国国际工程咨询有限公司

北京大学能源研究院

清华大学气候变化与可持续发展研究院

前 言

2021年，全球新型冠状病毒肺炎疫情（简称新冠疫情）持续蔓延，世界经济缓慢复苏。能源消费恢复增长，区域供需矛盾突出，加之全球地缘政治与金融风险交织，全球能源价格大幅上升且剧烈波动。统筹能源低碳转型和能源供应安全，成为世界各国能源发展的共同挑战。

2021年，中国面对复杂严峻的国内外形势和风险挑战，统筹疫情防控和经济社会发展，实现“十四五”良好开局，取得显著成效。中国天然气行业深入贯彻落实习近平总书记重要指示批示精神，产供储销体系建设取得阶段性明显成效。天然气行业发展总体实现量增价稳，采暖季民生用气得到有力保障，天然气在一次能源消费结构中占比稳步提升。

面对更趋复杂的外部环境和能源发展改革的新形势、新要求，天然气行业将以产供储销体系建设为工作指引，统筹发展和安全，立足行业保供稳价，系统谋划、综合施策，不断夯实国内资源基础，加快设施投资建设，提升科技创新能力，深化体制机制改革，完善市场体系设计，努力推动行业高质量发展，为保障国家能源安全、加快建设能源强国贡献行业力量。

目 录

一、2021年国内外天然气发展形势	1
(一)世界天然气发展	1
(二)中国天然气发展	3
二、2022年中国天然气发展面临的新形势、新要求	6
(一)外部环境不确定性增加,能源安全面临新挑战	6
(二)能源强国对天然气行业高质量发展提出新要求	6
(三)全国统一能源市场建设提出天然气行业发展新任务	7
三、2022年天然气产供储销体系建设重点方向	8
(一)立足国内加大释放国内供应潜力,提升自主保障能力	8
(二)统筹谋划适度先行,推动天然气基础设施投资建设	8
(三)有为政府和有效市场相结合,积极应对国内外能源 格局深刻调整	9
(四)坚持创新发展,塑造行业发展新优势	10
四、2022年中国天然气市场展望	11
结束语	13
2021—2022年中国天然气发展大事记	14

一、2021年国内外天然气发展形势^①

(一) 世界天然气发展

1. 天然气消费快速反弹并超过新冠疫情前水平

2021年,世界天然气消费量4.0万亿立方米,同比增速由上年的-1.6%回升至5.3%,较2019年增长3.4%。北美地区全年天然气消费量1.03万亿立方米,与上年持稳。其中,美国消费量8267亿立方米,同比下降0.4%,主要是由于发电用气下降、工业用气疲软。欧洲消费量5711亿立方米,同比增长5.7%,较2019年增长3.0%,居民商业和发电用气恢复性增长是主要动因。亚太地区全年消费量9183亿立方米,同比增长6.2%,贡献全球天然气消费增长的26.8%。其中,中国、韩国、印度、新兴市场同比分别增长12.5%、9.0%、3.1%和2.6%;日本用气需求较为低迷,同比下降0.2%。

2. 天然气勘探开发投资回升,但仍低于近十年平均水平

2021年,受需求增长和价格上涨双重驱动,世界天然气产量4.0万亿立方米,同比增长1754亿立方米,增幅达4.8%。其中,北美、俄罗斯-中亚、中东地区产量位居前三,分别为11358亿立方米、8960亿立方米和7149亿立方米,增速

^① 本部分世界天然气储量、生产、消费和贸易的数据主要来源于《BP世界能源统计》,天然气液化能力和项目、勘探开发投资数据来源于埃信华迈(IHS);中国天然气储量数据来源于自然资源部《全国油气矿产储量通报(2021)》,中国天然气产量数据来源于国家统计局,消费数据来源于行业统计,进出口数据来源于国家海关总署。



分别为 2.4%、10.9% 和 4.2%。2021 年全球新增储量 1.04 万亿立方米，世界天然气剩余可采储量 192 万亿立方米。据 IHS 统计，2021 年全球油气勘探开发投资支出 3470 亿美元，较 2020 年增长 450 亿美元，增幅达 15%，但远低于近十年平均水平（4800 亿美元）。

3. 世界天然气贸易量出现下降，全球新投产液化产能低速增长

2021 年，世界天然气贸易量 12206 亿立方米，同比减少 2.3%。管道气贸易量 7044 亿立方米，同比减少 6.8%，占天然气贸易总量的 57.7%。液化天然气（LNG）贸易量 5162 亿立方米，同比增长 5.6%。LNG 贸易中现货和 3 年内短期合约贸易量 1693 亿立方米，占 LNG 总贸易量的 32.8%。2021 年，全球已投产液化设施产能 4.65 亿吨 / 年，新增产能 754 万吨 / 年，同比增速由上年的 5.8% 降至 1.6%，液化设施负荷率达到 80%，同比上升 2 个百分点。

4. 天然气价格大幅攀升且全球联动性增强

欧洲天然气需求快速恢复，区内气田明显减产，管道气和 LNG 进口量下降，全年供需紧张。尤其是下半年，新能源出力不足，碳价高企，地下储气库库存低于过去五年平均水平，荷兰产权转让设施（TTF）天然气现货价格一度达到 60.28 美元 / 百万英热单位的历史高点，年均价格 15.9 美元 / 百万英热单位，同比上涨 398%。受欧洲高气价驱动，亚洲至欧洲 LNG 跨区套利贸易大幅增长，亚洲与欧洲现货价格联动明显

增强，年内均呈现前低后高走势，年内 LNG 现货报价最高达到 46.45 美元 / 百万英热单位，全年到岸均价 14.5 美元 / 百万英热单位，同比上涨 279%。长协价格主要受油价影响，全年东北亚地区 LNG 进口均价 10.7 美元 / 百万英热单位，同比上涨 51%。美国由于 LNG 出口强劲，原料气需求大幅增加，天然气供需基本面持续紧张。美国亨利中心（HH）天然气现货年均价格 3.9 美元 / 百万英热单位，同比上涨 93%。

（二）中国天然气发展

1. 天然气消费快速增长，在一次能源结构中占比稳步提升

2021 年，中国宏观经济实现“十四五”良好开局，全国天然气消费量 3690 亿立方米，增量 410 亿立方米，同比增长 12.5%。2021 年中国天然气占一次能源消费总量的比例升至 8.9%，较上年提升 0.5 个百分点。从消费结构看，工业用气同比增长 14.4%，占天然气消费总量的 40%；发电用气同比增长 13.4%，占比 18%；城市燃气同比增长 10.5%，占比 32%；化工化肥用气同比增长 5.8%，占比 10%。分省看，广东、江苏、四川、山东和河北消费量位居前五，广东和江苏消费量均超 300 亿立方米，增速分别为 25.5% 和 2.2%；四川、山东和河北消费量均超 200 亿立方米。

2. 勘探开发持续发力，新增储量产量再创新高

2021 年，全国天然气新增探明地质储量 16284 亿立方米。其中，常规气（含致密气）、页岩气、煤层气新增探明地质



储量分别达到 8051 亿立方米、7454 亿立方米和 779 亿立方米。2021 年，全国天然气产量 2076 亿立方米，同比增长 7.8%，连续五年增产超 100 亿立方米。

3. 天然气进口稳步增长，管道气进口增速超过 LNG

2021 年，进口天然气 1680 亿立方米，同比增长 19.9%。其中，澳大利亚、土库曼斯坦、俄罗斯、美国、卡塔尔及马来西亚六个国家的进口量合计 1290 亿立方米，占比 77%。管道气进口量 591 亿立方米，同比增长 22.9%。LNG 进口量 1089 亿立方米，同比增长 18.3%。澳大利亚是中国最大的 LNG 进口来源国，进口量 430 亿立方米，占比 39.4%，同比增长 7.7%；美国超越卡塔尔成为中国第二大 LNG 进口来源国，进口量 124 亿立方米，占比 11.4%，同比增长 191.1%。

4. 天然气基础设施建设加快推进，储气能力快速提升

2021 年，全国主干天然气管道总里程达到 11.6 万千米。长岭—永清管道、南北中通道郴州—韶关段、海南管网东环线、粤东 LNG 外输管线等建成投产，西气东输三线中段、永清—上海管道全面开工，西气东输四线完成核准，川气东送二线加快推进。储气设施开工建设全面提速，采暖季前地下储气库实现“应储尽储”。2021 年，全国已建成储气能力同比增长 15.8%，三年多时间实现翻番。

5. 天然气保供稳价取得积极成效

在国际油气价格高企、剧烈波动的不利形势下，国内天然气市场总体实现量增价稳。市场化、合同化保供机制深入

人心，合同内保供、合同内调节稳定行业发展和资源保供基本盘。国产气和进口长协气源发挥保供稳价压舱石作用，大企业特别是国有企业发挥天然气保供稳价主力军作用。主干管网运营企业加快管网投资建设速度，大力提升管网互联互通水平，全国基础设施尖峰供气能力进一步提升。各地扎实做好有序用气调节及应急预案，民生用气需求得到有力保障。出台《天然气管道运输价格管理办法（暂行）》和《天然气管道运输定价成本监审办法（暂行）》，加强自然垄断环节价格监管。

6. 技术攻关成果显著，自主创新能力进一步提升

创新发展深层页岩气钻井提速技术，实现长水平段高效快速钻进。截至2021年底，四川盆地深层页岩气最短钻井周期已低于30天，最深完钻井深已达7000米以上，最长水平段达3601米。深层超深层天然气实现了一批重大装备和关键工具的自主研发，多口超深井迈上8500米新台阶。海洋油气领域，“深海一号”大气田顺利投产，实现3项世界级创新，攻克12项关键装备国产化难题。地下储气库强化库（群）集约化建设新模式，创新形成复杂断块油气藏新老井协同排液与注采建库技术，完成国内首个复杂连通老腔改建盐穴储气库工程建设方案。天然气管道重大技术装备研发持续推进，首次提出管道金属损失及裂纹缺陷电磁控阵检测原理和方法，研制首台1016毫米口径油气管道电磁控阵内检测器等。



二、2022 年中国天然气发展面临的新形势、新要求

（一）外部环境不确定性增加，能源安全面临新挑战

近年来，全球能源格局加快调整，市场波动明显加剧。乌克兰危机等地缘政治角力影响能源市场平稳运行，国际能源市场秩序和运营规则面临新挑战，能源底线安全成为各国面临的共同课题。当前全球化石能源生产和基础设施投资强度仍不能完全适应能源安全发展需要，叠加新能源快速发展，中长期全球能源安全面临的不确定性增加。欧洲寻求减少对俄罗斯天然气的依赖，进口 LNG 需求上升，欧美亚区域天然气市场联动增强，区域供需风险对全球天然气市场影响进一步放大。能源安全领域新旧风险交织，如何建立健全风险防范和应对机制，持续推动产业链供应链平稳运行等，是中国天然气发展面临的新挑战。

（二）能源强国对天然气行业高质量发展提出新要求

2021 年，中央经济工作会议提出加快建设能源强国。围绕天然气发展，明确国内生产自给的战略底线，发挥国有企业支撑托底作用，加快油气等资源先进开采技术推广应用，着力释放国产气特别是非常规天然气增储上产潜力。加强天然气储备能力建设，发挥其在季节调峰、应急保供和应对突发事件短供断供等方面的调节保障作用。进一步完善开放条

件下的保供责任划分与制度建设，发挥好各类市场主体在保供稳价中的积极作用。实现科技自立自强，进一步提升核心技术自主研发能力，推动在天然气上游勘探开发、基础设施建设、节能高效利用等领域的技术装备攻关和智能化应用。立足“双碳”发展目标，不断强化产业链发展的韧性和弹性，在稳定供应基础上，推动天然气高效利用，促进油气与新能源融合发展，在促进减污降碳协同方面发挥更大作用。夯实高水平对外开放合作，充分发挥中国在推动全球天然气贸易和投资稳健发展、构建互利共赢的国际合作格局中的积极作用，深度融入全球天然气产业链。

（三）全国统一能源市场建设提出天然气行业发展新任务

加快建设全国统一大市场强调立破并举，深化发展要素市场化配置改革。强化天然气市场建设，一方面要求不断健全自身市场体系，建立完善市场规则、标准，另一方面要着力推动天然气与新能源融合发展。要坚持基础设施“全国一张网”统筹规划、适度先行，发挥基础设施促投资、稳增长作用，发挥基础设施对天然气市场培育和完善引导作用。要打破行政性、区域性垄断，立足全国加快天然气产供储销体系建设，持续推动天然气管网设施互联互通并向各类市场主体高质量开放；加快推动省级管网市场化融入国家管网，促进天然气在市场的自由流动和灵活调配。加快推动构建天然气能量计量计价体系。



三、2022 年天然气产供储销体系建设重点方向

2022 年是第二个百年目标的开局之年，是“十四五”规划的关键之年。油气行业深刻认识和把握“三新一高”要求，以落实“十四五”规划目标和重大任务为抓手，不断推进产供储销体系建设走深走实，努力实现高质量发展。

（一）立足国内加大释放国内供应潜力，提升自主保障能力

牢记习近平总书记“能源的饭碗必须端在自己的手里”的嘱托，大力提升勘探开发力度，保障能源安全。强化国有企业的责任考核和使命担当，不断增强国内天然气生产保障能力，持续增储上产。强化勘探特别是风险勘探投资，加快资源探明，夯实资源基础，强化储量接续。加快科技创新和工程示范，推动油气等资源先进开采技术开发应用。围绕深层深水常规气、深层页岩气、煤层气等难动用储量资源，强化勘探评价和科技攻关，推动效益建产、高效上产。

（二）统筹谋划适度先行，推动天然气基础设施投资建设

落实国务院稳住经济大盘工作部署要求，适度超前加快天然气基础设施投资建设，更好地满足天然气行业持续稳定发展的形势要求。加快推进永清—上海管道、西气东输三线中段、西气东输四线、川气东送二线等一批重大、标志性工

程，强化“十四五”规划落地实施。加快完善区域及省内管道，强化供需衔接。支持实施天然气长输老旧管道更新改造，保障产业链平稳运行。督促和指导相关企业切实简化优化管道、地下储气库等重大工程内部决策程序，强化落实国家战略相关考核，加快投资批复，加大投资力度，加快建设进度。依托产供储销体系建设专班工作机制，央地企联动，不断强化重大工程实施的资源要素保障。

（三）有为政府和有效市场相结合，积极应对国内外能源格局深刻调整

当前国际油气价格高企，国内天然气行业发展不平衡不协调新问题有所显现。多措并举，积极化解产业链各环节矛盾，疏导痛点难点。督促和引导国有企业天然气增储上产，并进一步激发基层企业干劲和活力。压实地方政府民生保供主体责任和城镇燃气企业民生保供“最后一公里”主体责任。强化合同签订、规范合同执行、加强履约监管。在保供稳价的同时，积极发挥价格在合理区间波动等市场信号对资源配置的决定性作用，不断强化合同内保供、合同内调节，谁欠供谁赔付，谁超用谁补偿；更好地发挥政府作用，围绕居民用气供应保障，合理核定居民用气等民生用气量，聚焦重点矛盾、因地制宜、精准施策，不断探索完善区域性、差异化、可落地的保障措施。坚持市场化改革方向，稳步推进管网运营体制机制改革，完善管网运行调度规则，加强管网设施公平开放监管，提升管网设施利用效率，推动建立管网气量平



衡辅助服务市场机制；明确和规范各类市场主体保供责任，推进设施高质量开放。

（四）坚持创新发展，塑造行业发展新优势

加强科技装备攻关。加快油气等资源先进开采技术、装备开发应用，加快管网数字化、智能化、标准化体系建设等。加强模式探索创新。因地制宜、因省施策，积极推动省级管网以市场化方式融入国家管网公司；压缩供气层级，简化收费模式，结合省网融入鼓励探索开展管输费“一票制”结算等模式创新，提高用户改革获得感。加强新业态探索。立足“双碳”发展目标，推动油气行业低碳转型，推进天然气与新能源融合发展；立足行业发展优势，开展二氧化碳捕集、利用与封存（CCUS）、管道掺氢输氢、二氧化碳管道关键技术装备攻关和试点示范。加强国际合作。加强在非常规天然气生产、碳减排、CCUS、制氢等领域的技术交流、引进、合作与共同研发。加强与国际燃气联盟（IGU）、国际能源机构（IEA）等主要国际能源组织的交流合作，持续推动完善国际天然气公平交易、投资安全和商务合作的合理规则。

四、2022 年中国天然气市场展望

2022 年以来，中国经济稳步增长，能源转型和发展持续推进。面对极端复杂的外部环境，中国天然气行业产供储销协同发力，“强国产、强设施、强市场”“稳进口、稳价格、稳预期”“保合同、保民生、保存量”“三强三稳三保”多措并举，天然气购销衔接更为稳健，市场规则和合同机制运行稳健，行业发展总体平稳。同时，中国天然气发展主动融入全球市场，成为促进区域间资源再平衡的有效力量，行业发展显示出更高灵活性和更大弹性。

上半年国内天然气产量 1120 亿立方米，同比增长 7.9%。天然气进口量 741 亿立方米，同比下降 8.9%。其中，管道气进口 312 亿立方米，同比增长 10%；LNG 进口 428 亿立方米，同比下降 19%。1—6 月，中国天然气消费量与上年同期基本持平。分行业看，城市燃气用气稳步增长，化工化肥用气小幅增长，商服用气受新冠疫情影响下降，工业和发电用气增速明显回落。

预计 2022 年全国天然气产量 2200 亿立方米左右，力争全年增产超过 100 亿立方米。天然气进口量稳中有降，LNG 进口可能出现近年来首次负增长。预计 2022 年中国天然气表观消费量 3750 亿 ~ 3800 亿立方米，增长率 1% ~ 3%，下半年需求将受到今冬明春气候不确定性、国际能源市场价格大



幅波动不确定性双重影响。分行业看，城市燃气用气需求稳健增长，居民生活、采暖用气是主要增长动力。气电增速放缓，主要是全社会用电量增速有所放缓、去年同期基数较高、水电及风电光伏等可再生能源发电量较快增长。工业用气增速放缓，主要是国际进口现货 LNG 价格高企提高资源增供的边际成本，高气价挤出部分高耗能及低端产业用气需求。化工化肥用气保持平稳。

结束语

2022年是进入全面建设社会主义现代化国家、向第二个百年奋斗目标进军新征程的重要一年。百年未有之大变局下，多重因素加剧世界能源市场不确定性。天然气行业要坚决贯彻落实党中央、国务院对天然气产供储销体系建设的各项决策部署和保供稳价工作要求，扎实推进“十四五”规划落地实施，为中国经济发展和能源低碳转型发挥更大作用。

《中国天然气发展报告》已连续发布七年，期待《中国天然气发展报告(2022)》的发布进一步激发社会各界为天然气未来发展出谋划策的积极性。诚挚感谢各相关部门、研究机构、行业学会、企业、国际机构及众多专家的大力支持和帮助。

感谢申姝琦、单卫国、樊慧、孙文字、张晓宇、王立敏、祝婧祎、孙慧、张继龙、李易隆、沈鑫、石云、李秋扬、王丹旭、刘秉谦等对报告成稿的积极贡献，感谢行业专家学者和企业代表对报告提出的修改建议。感谢北京太科石油信息咨询服务有限公司、石油工业出版社等对报告校核、英文翻译、印刷出版等工作的大力支持。



2021—2022 年中国天然气发展大事记

2021 年 1 月

1月6日，永清—上海管道江苏段第七标段正式点火开焊，标志着永清—上海管道在河北、山东、江苏等地全面开工建设。

1月7日，生态环境部公布《碳排放权交易管理办法（试行）》，并印发配套的配额分配方案和重点排放单位名单。

2021 年 3 月

3月13日，《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》发布。首次提出油气核心需求依靠自保，部署加快深海、深层和非常规油气资源利用，夯实国内产量基础，保持原油和天然气稳产增产，拓展油气进口来源，维护战略通道和关键节点安全等重点任务。

3月15日，习近平总书记主持召开中央财经委员会第九次会议，研究促进平台经济健康发展问题和实现碳达峰、碳中和的基本思路和主要举措，强调要把碳达峰、碳中和纳入生态文明建设整体布局，如期实现2030年前碳达峰、2060年前碳中和的目标。

3月31日，国家石油天然气管网集团有限公司于24时正式接管原中国石油昆仑能源下属北京管道公司和大连LNG公司股权，标志着中国油气主干管网资产整合全面完成，实现

了国内全部油气主干管网并网运行。

2021年4月

4月22日，国家主席习近平在北京以视频方式出席领导人气候峰会，并发表题为《共同构建人与自然生命共同体》的重要讲话。

4月22日，国家能源局发布《2021年能源工作指导意见》。提出推动油气增储上产，推进天然气主干管网建设和互联互通，加强储气能力建设等。

4月29日，我国首个海上智能气田群——东方气田群全面建成，海上油气生产运营迈入智能化和数字化时代。

2021年5月

5月6日，国家财政部、海关总署、税务总局联合印发《关于“十四五”期间能源资源勘探开发利用进口税收政策的通知》，出台石油（天然气）、煤层气勘探开发作业项目和海上油气管道应急救援项目免税规定与天然气进口增值税先征后退规定等。

5月18日，中国油气企业甲烷控排联盟成立。该联盟由中国石油、中国石化、中国海油、国家管网、北京燃气、华润燃气、新奥能源7家联盟成员单位共同组成，力争在2025年实现将天然气生产过程甲烷平均排放强度降到0.25%以下。

5月25日，国家发展和改革委员会印发《关于“十四五”时期深化价格机制改革行动方案的通知》（发改价格〔2021〕689号），要求深入推进能源价格改革。



2021 年 6 月

6月9日，国家发展和改革委员会正式印发《天然气管道运输价格管理办法（暂行）》和《天然气管道运输定价成本监审办法（暂行）》（发改价格规〔2021〕818号），进一步完善天然气管道运输价格管理体系。

6月10日，国家能源局印发《天然气管网和LNG接收站公平开放专项监管工作方案》，推动天然气管网设施公平开放，促进管网设施高效利用，规范管网设施运营企业开放服务行为。

6月25日，中国首个自营勘探开发的1500米深水大气田“深海一号”在海南陵水海域正式投产，标志着中国海洋油气勘探开发迈向“超深水”。

2021 年 7 月

7月15日，国家能源局在北京组织召开2021年大力提升油气勘探开发力度工作推进会，深入贯彻落实习近平总书记关于油气勘探开发系列重要指示批示精神，总结前期工作经验，分析当前面临的形势，研究部署下步工作，对大力提升油气勘探开发力度进行再学习再动员，推动油气产业高质量发展再上新台阶。

7月16日，全国统一的碳排放权交易市场正式启动。

2021 年 8 月

8月28日，中国首个海上二氧化碳封存示范工程在南海珠江口盆地正式启动，将把海上恩平15-1油田群开发伴生的

二氧化碳永久封存于 800 米深海底储层，每年封存约 30 万吨，总计超 146 万吨。

2021 年 9 月

9 月 11 日，国家发展和改革委员会印发《完善能源消费强度和总量双控制度方案》（发改环资〔2021〕1310 号）。

9 月 15 日，国家能源局制定实施全国储气能力建设实施方案。

9 月 23 日，西气东输三线中段工程（中卫—吉安）开工建设。

2021 年 10 月

10 月 8 日，中国首个商业开发大型页岩气田——江汉油田涪陵页岩气田累计生产页岩气 400 亿立方米，创造中国页岩气田累计产量新纪录。

10 月 21 日，习近平总书记来到胜利油田勘探开发研究院、胜利油田莱 113 区块考察调研。习近平总书记指出：“石油能源建设对我们国家意义重大，中国作为制造业大国，要发展实体经济，能源的饭碗必须端在自己手里。”

10 月 24 日，中共中央、国务院印发《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》（中发〔2021〕36 号），提出了碳达峰、碳中和工作的 10 方面 31 项重点任务。

10 月 26 日，国务院印发《2030 年前碳达峰行动方案》（国发〔2021〕23 号），提出重点实施能源绿色低碳转型行动、



节能降碳增效行动等“碳达峰十大行动”。

2021年11月

11月20日，中国首座沿海LNG船舶加注站在海南省澄迈县马村港码头正式投运。

2021年12月

12月2日，国务院安全生产委员会印发《全国城镇燃气安全排查整治工作方案》，部署全国范围内为期一年的城镇燃气安全排查整治工作。

12月8—10日，中央经济工作会议在北京举行。会议要求，明年经济工作要稳字当头、稳中求进，深入推动能源革命，加快建设能源强国。

12月15日，中国科学院广州能源研究所自主研发出国际首套有效体积2585升、最大模拟海深3000米的大尺度全尺寸开采井天然气水合物三维综合试验开采系统。这是当前国际规模最大、模拟海深最深、技术水平国际领先的天然气水合物开采试验装备。

12月20日，全国长江内河首座岸基式LNG加注站在芜湖段建成并投入试运营，该加注站年设计加注能力3.02万吨，最大可停靠5000吨级船舶。

截至12月31日，自然资源部2021年分四批依次挂牌出让煤层气（黔西向斜西翼区块）探矿权、新疆准噶尔盆地大有1勘查等4个石油天然气探矿权、新疆塔里木盆地疏勒—岳普湖勘查等7个石油天然气探矿权、新疆塔里木盆地尉犁

西 2 勘查等 7 个石油天然气探矿权。

2022 年 1 月

1 月 24 日，中共中央政治局就努力实现碳达峰、碳中和目标进行第三十六次集体学习。习近平总书记强调，实现碳达峰、碳中和是贯彻新发展理念、构建新发展格局、推动高质量发展的内在要求，是党中央统筹国内国际两个大局作出的重大战略决策。

1 月 29 日，中国首个百万吨级 CCUS 项目——齐鲁石化—胜利油田 CCUS 项目全面建成。

2022 年 2 月

2 月 3 日，中国石油与俄罗斯天然气工业股份公司签署项目购销协议，约定自俄罗斯远东通过管道对华供应天然气，年合同量 100 亿立方米。

2 月 10 日，国家发展和改革委员会、国家能源局印发《关于完善能源绿色低碳转型体制机制和政策措施的意见》（发改能源〔2022〕206 号）。

2 月 28 日，中国中东部地区最大的储气库——文 23 储气库一期工程建成投产。

2022 年 3 月

3 月 22 日，国家发展和改革委员会、国家能源局印发《“十四五”现代能源体系规划》，提出“十四五”时期现代能源体系建设的主要目标。

3 月 29 日，国家能源局印发《2022 年能源工作指导意见》，



提出 2022 年主要目标为增强供应保障能力。

2022 年 4 月

4 月 13 日，习近平总书记在海南考察时强调，建设海洋强国是实现中华民族伟大复兴的重大战略任务。要推动海洋科技实现高水平自立自强，加强原创性、引领性科技攻关，把装备制造牢牢抓在自己手里，努力用我们自己的装备开发油气资源，提高能源自给率，保障国家能源安全。

4 月 21 日，国家能源局组织召开全国油气管道规划建设和保护工作会议，贯彻落实党中央、国务院决策部署，推动油气“十四五”规划落地实施，加快管道基础设施建设，统筹做好管道保护。

4 月 26 日，习近平总书记主持召开中央财经委员会第十一次会议，对全面加强基础设施建设作出新部署，为构建现代化基础设施体系指明方向。

2022 年 5 月

5 月 26 日，国家发展和改革委员会印发《关于完善进口液化天然气接收站气化服务定价机制的指导意见》（发改价格〔2022〕768 号）。

2022 年 6 月

6 月 10 日，国务院办公厅发布《城市燃气管道等老化更新改造实施方案（2022—2025 年）》（国办发〔2022〕22 号）。

6 月 27 日，住房和城乡建设部及国家发展和改革委员会联合发布《关于城市燃气管道老化评估工作指南的通知》（建

办城函〔2022〕225号)。

2022年至今,自然资源部分两批挂牌出让广西柳城北勘查等2个页岩气探矿权、黑龙江拜泉南勘查等4个石油天然气探矿权。

2022年7月

7月24日,国家能源局在北京组织召开2022年大力提升油气勘探开发力度工作推进会。会议指出,全国能源系统和油气行业坚定不移推动油气增储上产,实现勘探大突破、原油稳增长、天然气快上产。会议要求切实提高政治站位,牢牢守住油气战略安全底线,以国内油气增产保供的确定性,来应对外部环境的不确定性。

China Natural Gas Development Report (2022)

Oil and Gas Department, National Energy Administration

Institute for Resources and Environmental Policies, Development
Research Center of the State Council

Center for Oil and Gas Resource Strategies, Ministry of Natural
Resources

Petroleum Industry Press

China Natural Gas Development Report (2022)

Editorial Board

(in the order of surname by number of strokes)

Chairpersons:

REN Jingdong LING Yueming LONG Guoqiang

Deputy Chairpersons:

LIU Hong YU Guo WU Yugen GAO Shiji

Committee Members:

WANG Jing WANG Xiaowei LIU Xiaoxiao LU Jialiang

YANG Lei YANG Shangming YANG Lili CHEN Jindian

LI Li LI Zheng LI Jifeng JIANG Xuefeng

DUAN Zhaofang GUO Jiaofeng PAN Jiping

Supporting Institutions:

CNPC Economics & Technology Research Institute

Research Institute of Petroleum Exploration & Development

PetroChina Planning & Engineering Institute

Sinopec Economics & Development Research Institute

CNOOC Energy Economics Institute

PipeChina Research Institute of Science and Technology

China International Engineering Consulting Corporation

Institute of Energy, Peking University

Institute of Climate Change and Sustainable Development, Tsinghua

University

Preface

In 2021, amid the ongoing spread of COVID-19 epidemic, the world economy recovered slowly. With the resumption of energy consumption growth, the prominent contradiction between regional supply and demand, and the interweaving of global geopolitical and financial risks, global energy prices surged and fluctuated sharply. Pushing the low-carbon energy transition while ensuring the security of energy supply has become a worldwide challenge for energy development.

In 2021, facing tough situation, risks and challenges at home and abroad, China coordinated epidemic prevention and control and socio-economic development, and has achieved remarkable results, off to a good start to the 14th Five-year Plan period. Through thoroughly implementing important instructions of President Xi Jinping, China's natural gas industry witnessed considerable results in the construction of natural gas production, supply, storage and marketing system. An overall increase in natural gas supply and stability in prices was accomplished. Gas consumption for people's livelihood in the heating season was well guaranteed. The proportion of natural gas in the primary energy consumption structure increased

constantly.

In the face of the more complex external environment, and the new situation and requirements of energy development and reform, China's natural gas industry should focus on the major work of building the natural gas production, supply, storage and marketing mechanism, coordinate energy development and security, ensure natural gas supply, maintain stable prices, consolidate the foundation of domestic resources, and accelerate the investment and construction of facilities through systematic planning and comprehensive strategies. Additional efforts will be made to enhance the ability of technological innovation, deepen the reform of institutional mechanisms, and improve the design of market system, so as to promote the high-quality development of the industry and contribute to ensuring national energy security and moving towards an energy powerhouse.

CONTENTS

1. Global and China's Natural Gas Development in 2021	1
(1) Global Natural Gas Development	1
(2) China's Natural Gas Development.....	5
2. New Situation and Requirements for China's Natural Gas Development in 2022	10
(1) Energy security faces new challenges as more uncertainties occurred	10
(2) The goal of becoming an energy powerhouse pushes the natural gas industry towards high-quality development	11
(3) The goal for building a national unified energy market asks new task for the development of natural gas industry.....	13
3. Key Directions for the Construction of Natural Gas Production, Supply, Storage and Marketing System in 2022	15
(1) Domestic supply potential shall be promoted, so as to enhance the ability of independent guarantee.....	15
(2) Investment and construction of natural gas infrastructure shall be promoted, with moderate priority on overall planning	16
(3) Improve macro adjustment mechanism, play a better role of the efficient market, and actively respond to profound adjustments in the energy landscape at home and abroad	18
(4) Adhere to innovative development and create new advantages of industry development	19

4. Prospects of China's Natural Gas Market in 2022.....	22
Conclusion	25
China Natural Gas Development Events (2021–2022)	27

1. Global and China's Natural Gas Development in 2021^①

(1) Global Natural Gas Development

① Natural gas consumption rebounded rapidly and exceeded the pre-epidemic level

In 2021, the world's natural gas consumption was 4.0 trillion cubic meters (tcm), with the year-on-year growth rate rebounded to 5.3% from -1.6% in the previous year, an increase of 3.4% over 2019. The annual natural gas consumption in North America was 1.03 tcm, flat with the previous year. Among them, U.S. consumption was 826.7 billion cubic meters (bcm), a year-on-year decrease of 0.4%, mainly due to the decline in gas consumption for electricity generation and weak gas consumption for industrial use. Consumption in Europe was 571.1 bcm, a year-on-year increase of 5.7% and an increase of 3.0% over 2019, for which the main driver was

① In this chapter, the data on world's natural gas reserves, production, consumption and trade is mainly sourced from *BP Statistical Review of World Energy*, data on natural gas liquefaction capacity and projects, and exploration & development investment from IHS. The data on China's natural gas reserves is sourced from the *National Oil and Gas Reserves Bulletin (2021)* of the Ministry of Natural Resources. The data on China's natural gas production is sourced from the National Bureau of Statistics, consumption from industry statistics, and import and export from the General Administration of Customs.



the recovery of gas consumption for residential, commercial and electricity generation uses. The annual consumption in the Asia-Pacific region was 918.3 bcm, a year-on-year increase of 6.2%, contributing 26.8% of the growth in global natural gas consumption. In particular, China, South Korea, India, and emerging markets increased by 12.5%, 9.0%, 3.1% and 2.6% year-on-year respectively; while Japan saw a year-on-year decline of 0.2% due to relatively sluggish gas demand.

② Investment in natural gas exploration and development picked up, but still lower than the average level in the past decade

In 2021, driven by both demand growth and price increases, the world's natural gas production reached 4.0 tcm, a year-on-year increase of 175.4 bcm or 4.8%. In particular, North America, Russia-Central Asia and the Middle East ranked the top three in terms of production, with 1,135.8 bcm, 896 bcm and 714.9 bcm respectively, and growth rates of 2.4%, 10.9% and 4.2% respectively. In 2021, the world's newly added natural gas reserves were 1.04 tcm, and remaining recoverable natural gas reserves were 192 tcm. According to IHS statistics, global investment in oil and natural gas exploration and development in 2021 was US\$347 billion, an increase of US\$45 billion or 15% over 2020, but far below the average of the past decade

(US\$480 billion).

③ The world's natural gas trade volume declined, and the global newly commissioned liquefaction capacity grew at a low rate

In 2021, the world's natural gas trade volume was 1.22 tcm, a year-on-year decrease of 2.3%. PNG trade volume was 704.4 bcm, a year-on-year decrease of 6.8%, accounting for 57.7% of the total natural gas trade. LNG trade volume was 516.2 bcm, a year-on-year increase of 5.6%. In the LNG trade, the volume of spot and short-term contracts within three years was 169.3 bcm, accounting for 32.8% of the total LNG trade volume. In 2021, the global existing liquefaction capacity was 465 million tons/year (t/y), and the newly added capacity was 7.54 million t/y. The year-on-year growth rate dropped to 1.6% from 5.8% in the previous year, and the utilization rate of liquefaction projects reached 80%, up 2 percentage points year-on-year.

④ Natural gas prices climbed sharply, and global linkages increased

In 2021, the demand for natural gas in Europe recovered rapidly. The production of gas fields in the region was significantly reduced. Imports of PNG and LNG declined. Supply was tight throughout the year. Especially in the second half of the year, the output of new energy was insufficient,



carbon prices were high, and the stock of underground gas storages was lower than the average level of the past five years. Title Transfer Facility (TTF) spot price once reached an all-time high of US\$60.28/MMBtu, with an annual average of US\$15.9/MMBtu, a year-on-year increase of 398%. Driven by high gas prices in Europe, cross-regional LNG arbitrage between Asia and Europe grew significantly, and the linkage of spot prices between Asia and Europe increased notably, showing a trend of first low then high during the year. The Asia spot LNG price reached a maximum of US\$46.45/MMBtu during the year, and the annual average was US\$14.5/MMBtu, a year-on-year increase of 279%. The long-term contract (LTC) prices were mainly affected by oil prices. In 2021, the average import price of LNG in Northeast Asia was US\$10.7/MMBtu, a year-on-year increase of 51%. In the United States, the fundamentals of natural gas supply continued to be tight due to strong LNG exports and a substantial increase of gas delivered to LNG export facilities. Henry Hub (HH) spot price averaged US\$3.9/MMBtu, up by 93% year-on-year.

(2) China's Natural Gas Development

① Natural gas consumption grew rapidly, with a proportion in the primary energy consumption structure increased constantly

In 2021, China's macro-economy made a good start to the 14th Five-Year Plan period, with the country's natural gas consumption of 369 bcm, a year-on-year increase of 41 bcm or 12.5%. In 2021, the proportion of natural gas consumption in China's total primary energy consumption rose to 8.9%, an increase of 0.5 percentage points over the previous year. In terms of consumption structure, gas consumption for industrial use increased by 14.4% year-on-year, accounting for 40% of the total natural gas consumption; gas consumption for electricity generation increased by 13.4% year-on-year, accounting for 18%; urban gas consumption increased by 10.5% year-on-year, accounting for 32%; and gas consumption for chemical and fertilizer uses increased by 5.8% year-on-year, accounting for 10%. In terms of consumption region, Guangdong, Jiangsu, Sichuan, Shandong, and Hebei were among the top five provinces. The consumption in Guangdong and Jiangsu both exceeded 30 bcm, with a growth rate of 25.5% and 2.2% respectively; and the consumption in Sichuan, Shandong and

Hebei all exceeded 20 bcm.

② Efforts stepped up in exploration and development, with new reserves and production reached new highs

In 2021, China's proved reserves of natural gas increased by 1.6284 tcm, of which proved reserves of conventional gas (including tight gas), shale gas and coalbed methane increased to 805.1 bcm, 745.4 bcm and 77.9 bcm respectively. In 2021, China's natural gas output was 207.6 bcm, a year-on-year increase of 7.8% and an increase of more than 10 bcm for five consecutive years.

③ Natural gas imports increased constantly, and PNG imports grew faster than LNG

In 2021, China imported 168 bcm of natural gas, a year-on-year increase of 19.9%. Among them, the import volume from Australia, Turkmenistan, Russia, the United States, Qatar and Malaysia totaled 129 bcm, accounting for 77%. The import volume of PNG was 59.1 bcm, a year-on-year increase of 22.9%. The import volume of LNG was 108.9 bcm, a year-on-year increase of 18.3%. Australia was China's largest source of LNG imports, with an import volume of 43 bcm, accounting for 39.4%, a year-on-year increase of 7.7%; the United States surpassed Qatar to become China's second largest source of LNG imports, with an import volume of 12.4 bcm, accounting

for 11.4%, a year-on-year increase of 191.1%.

④ Construction of natural gas infrastructure accelerated, resulting in a rapid increase in gas storage capacity

In 2021, the total mileage of China's main natural gas pipelines reached 116,000 kilometers. The Changling – Yongqing Pipeline, the Chenzhou - Shaoguan section of North-south Central Pipeline, the eastern ring line of Hainan Pipeline Network, and the LNG outbound pipeline in the east of Guangdong were completed and put into operation. The construction of the middle section of West-East Gas Pipeline 3 and the Yongqing - Shanghai Pipeline began in an all-round way. The construction of West-East Gas Pipeline 4 was approved, and the construction of Sichuan-East Gas Pipeline 2 was accelerated. The construction of gas storage facilities was speeded up, with underground gas storages achieving maximum capacity before heating season. In 2021, China's gas storage capacity has increased 15.8% year on year, doubled in just over three years.

⑤ Positive results achieved in ensuring natural gas supply and stabilizing prices

Under the unfavorable situation of abnormally high and volatile international oil and gas prices, the domestic natural gas market saw an increase in volume and a stability in prices.



The well-established gas supply guarantee mechanism based on market and contracts played a fundamental role in regulating and stabilizing the development of the industry. Domestic gas and imported LTC gas sources played a role of “ballast stone” and large companies, especially state-owned companies, played a major role in ensuring natural gas supply and stabilizing prices. The backbone pipeline operators accelerated the investment and construction of pipeline networks and vigorously improved the level of pipeline network interconnection, further increasing the peak gas supply capacity of infrastructure across the country. All localities made solid and orderly gas regulation and emergency plans, effectively ensuring the gas demand for people’s livelihood. “The Measures for the Administration of the Price of Natural Gas Pipeline Transportation (interim)” and “the Measures for the Supervision and Examination of the Pricing Cost of Natural Gas Pipeline Transportation (interim)” were issued to strengthen the price supervision to natural monopoly.

⑥ With remarkable achievements made in tackling key technological problems, the ability of independent innovation further improved

With innovative technology developed for accelerating deep shale gas drilling, China achieved efficient and fast drilling in long horizontal sections. By the end of 2021, the shortest

cycle for deep shale gas drilling in Sichuan Basin was less than 30 days, the deepest total depth was over 7,000 meters, and the longest horizontal section reached 3,601 meters. Independent research and development of a number of major equipment and key tools for deep and ultra-deep natural gas drilling was achieved, with the total depth of a number of ultra-deep wells hit a record of 8,500 meters. In the field of offshore oil and gas, “Deep Sea No. 1” gas field started operation, witnessing the realization of three world-class innovations and the successful tackling of 12 key problems in equipment localization. A new mode of intensive construction of underground gas storages (intensified storages/clusters) was introduced, cooperative fluid drainage and injection-production reservoir construction technology of new and old wells in complex fault block reservoirs was innovated, and the construction scheme of the first complex and connected old cavity reconstruction project of salt cavern gas storage in China was completed. The research and development of major technical equipment for natural gas pipelines advanced further. For the first time, the principle and method of electromagnetic array detection for pipeline metal loss and crack defects were proposed, and the first electromagnetic array detector for oil and gas pipelines of 1,016 mm in diameter was developed.



2. New Situation and Requirements for China's Natural Gas Development in 2022

(1) Energy security faces new challenges as more uncertainties occurred

In recent years, the adjustment of the global energy pattern has been accelerated, and market volatility has intensified significantly. Geopolitical events such as the Ukraine crisis have affected the smooth operation of the energy market. The order and operation rules of the international energy market are facing new challenges. Energy bottom line security has become a common issue for all countries. At present, the intensity of global fossil energy production and infrastructure investment still cannot fully meet the needs of energy security development. Considering the rapid development of new energy, the medium-and long-term uncertainty of global energy security is increasing. Europe seeks to reduce its dependence on Russian natural gas. The demand for imported LNG is rising. The linkage of natural gas markets in Europe, the United States and Asia is enhanced, and the impact of regional supply and demand risks on the global natural gas market is further magnified. The

new and old risks in the field of energy security are intertwined. How to establish and improve the risk prevention and response mechanism and continue to promote the smooth operation of the industrial chain and supply chain is a new challenge for the development of natural gas in China.

(2) The goal of becoming an energy powerhouse pushes the natural gas industry towards high-quality development

The 2021 Central Economic Work Conference proposed to accelerate the construction of an energy powerhouse. Centered on the development of natural gas, it is necessary to clarify the strategic bottom line of self-sufficiency in domestic production, give full play to the supporting role of state-owned enterprises, speed up the development and application of advanced exploitation technologies for oil and gas and other resources, and work to release the potential of reserve and production capacity increase of domestic gas, especially unconventional natural gas. Priorities will be given to strengthening the building of natural gas storage capacity, to adjust and safeguard gas supply in situations such as seasonal peak shaving, emergency management, short supply and short cuts. More efforts will be made to further improve the division of responsibility and



system construction of supply guarantee under open conditions, and maximize the positive role of all kinds of market entities in ensuring supply and stabilizing prices. Moreover, efforts will be increased to achieve self-reliance in technology, further enhance the capability of independent research and development of core technologies, and promote the research and intelligent application of technologies and equipment in the fields of upstream natural gas exploration and development, infrastructure construction, energy saving and efficient utilization. Additionally, to achieve the goal of “carbon peaking and carbon neutrality”, efforts will be stepped up to constantly strengthen the resilience and flexibility of the development of the industrial chain, increase the efficient use of natural gas on the basis of stable supply, promote the integrated development of oil, gas and new energy, and play a greater role in promoting synergy in pollution reduction and carbon reduction. Additional efforts will be made to consolidate a high level of opening up and cooperation, give full play to China’s positive role in promoting the steady development of global natural gas trade and investment, build a mutually beneficial and win-win pattern of international cooperation, and integrate deeply into the global natural gas industry chain.

(3) The goal for building a national unified energy market asks new task for the development of natural gas industry

The goal of speeding up the construction of a national unified energy market emphasizes deepening the reform of market-oriented allocation of development factors. In order to strengthen the construction of natural gas market, efforts will be made to constantly improve own market system, establish and improve market rules and standards, and work to promote the integrated development of natural gas and new energy. It is necessary to adhere to the overall planning of the “national network” of infrastructure, give full play to the role of infrastructure in promoting investment and stabilizing growth, as well as the guiding role of infrastructure in the cultivation and improvement of natural gas market. More efforts will be made to break administrative and regional monopolies, speed up the construction of the system of natural gas production, supply, storage and marketing, continue to promote the interconnection of natural gas pipeline networks and facilities, and open them to all kinds of market players with high quality. Additionally, efforts will be made to speed up the provincial pipeline integrating into the national pipeline through marketization,



and promote the free flow and flexible allocation of natural gas in the market. Moreover, efforts should be spent to accelerate the establishment of natural gas energy metering and pricing system.

3. Key Directions for the Construction of Natural Gas Production, Supply, Storage and Marketing System in 2022

The year 2022 is the first year of the second Centenary Goal and a crucial year for the 14th Five-Year Plan. The oil and gas industry should deeply understand and meet the requirements of “new development stage, new development concept, new development pattern, and high-quality development”, and continuously promote the construction of production, supply, storage and marketing system to achieve high-quality development by implementing the goals and major tasks of the 14th Five-Year Plan.

(1) Domestic supply potential shall be promoted, so as to enhance the ability of independent guarantee

Upholding the principle that “firmly holding the energy rice bowl in our own hands” stressed by President Xi Jinping, priorities will be given to enhancing exploration and development to ensure energy security. It is a must to strengthen the responsibility assessment and mission of state-owned enterprises, constantly enhance the capacity of domestic



natural gas reserve and production, increase investment in exploration, especially risk exploration, accelerate resources proving, consolidate resources foundation, and strengthen the replacement of reserves. It is also essential to speed up technological innovation and engineering demonstration, and promote the development and application of advanced exploitation technologies for oil and gas and other resources. For deep-water conventional gas, deep shale gas, coalbed methane and other difficult-to-produce reserves, efforts should be increased to strengthen exploration evaluation and tackle key technological problems, so as to promote cost-effective and efficient production.

(2) Investment and construction of natural gas infrastructure shall be promoted, with moderate priority on overall planning

Efforts will be made to implement the requirements of the State Council to stabilize the economy, moderately speed up the investment and construction of natural gas infrastructure to better meet the requirements of the sustained and stable development of the natural gas industry. Specifically, efforts will be made to promote a number of major and landmark projects such as Yongqing–Shanghai Pipeline, the middle

section of West-East Gas Pipeline 3, West-East Gas Pipeline 4, and Sichuan-East Gas Pipeline 2, as well as the facilities for the implementation of the 14th Five-year Plan. Additionally, efforts will be made to speed up the improvement of regional and provincial pipelines and strengthen the connection between supply and demand, as well as support the renovation of outdated natural gas pipelines to ensure smooth operation of the industrial chain. Besides, efforts will be stepped up to supervise and guide relevant enterprises to effectively simplify internal decision-making procedures for major projects such as optimization of pipelines and underground gas storages, strengthen the implementation of relevant assessments of national strategies, accelerate investment approvals, increase investment efforts, and speed up construction progress. Importantly, efforts should be increased to strengthen the guarantee of resource elements for the implementation of major projects, relying on the special working mechanism for the construction of natural gas production, supply, storage and marketing system, and the linkage between the central and local governments and enterprises.



(3) Improve macro adjustment mechanism, play a better role of the efficient market, and actively respond to profound adjustments in the energy landscape at home and abroad

At present, the international oil and gas prices are high, and the unbalanced and uncoordinated contradictions in the development of the domestic natural gas industry are emerging. Take various measures to resolve the contradictions in all links of the industrial chain, and ease the pain points and difficulties. Efforts will be made to urge and guide state-owned enterprises to improve the incentive mechanism for increasing natural gas reserves and production, and further stimulate the vitality of primary enterprises. The main responsibility of local governments and the “last kilometer” responsibility of urban gas enterprises to ensure people’s livelihood should be strictly assumed. Efforts will be intensified to strengthen contract signing, standardize contract execution, and enhance contract performance supervision. While ensuring supply and stabilizing prices, it is necessary to play the decisive role of market signals such as price fluctuations in a reasonable range in resources allocation, strengthen the guarantee and regulation in the contracts, and follow the principle that “whoever owes the supply shall pay, and whoever overspends will compensate”.

Additionally, efforts should be increased to give better play to the role of the government, focus on key contradictions and adjust measures to local conditions, reasonably assess and verify household gas consumption and other natural gas consumption for people's livelihood, implement pertinent policies to ensure gas supply for residents, as well as constantly explore and improve regional, differentiated and accessible safeguard measures. Besides, adhere to market-oriented reform, steadily advance the reform of the system and mechanism for pipeline network operation, improve the operation and dispatching rules of pipeline network, strengthen supervision of the fair and openness of pipeline network facilities, and improve efficiency of utilization, promote the establishment of a market mechanism for attached services for pipeline network gas balancing. And, efforts will be made to clarify and regulate the responsibility of various market entities for ensuring supply, and promote the high-quality opening of facilities.

(4) Adhere to innovative development and create new advantages of industry development

Firstly, to strengthen technology and equipment research.

Efforts will be made to accelerate the development and application of advanced exploitation technologies and

equipment for oil and gas and other resources, and speed up the construction of digital pipeline networks, intelligent and standardized systems, etc.

Secondly, to enhance mode exploration and innovation.

Efforts will be made to take measures in accordance with local conditions and provincial policies, actively promote the integration of provincial pipeline networks into national pipeline network companies in a market-oriented way, reduce the levels of gas supply and simplify the charging model, and encourage innovation in the mode of “one-vote” settlement of pipeline transmission fees to improve users’ sense of gain in reform.

Thirdly, to increase efforts to explore new business formats.

Under the goal of “carbon peaking and carbon neutrality” development, efforts will be made to promote the low-carbon transition of the oil and gas industry, and push forward the integrated development of natural gas and new energy. Based on the development advantages of the industry, efforts will be made to carry out researches and pilot demonstrations of key technical equipment for Carbon Capture, Utilization and Storage (CCUS), blending hydrogen into pipelines, hydrogen transportation by pipeline, and carbon dioxide pipelines.

Fourthly, to strengthen international cooperation.

Efforts will be made to strengthen technical exchanges,

technology introduction, cooperation and joint research and development in the fields of unconventional natural gas production, carbon emission reduction, CCUS and hydrogen production. More efforts will be made to strengthen exchanges and cooperation with major international energy organizations such as IGU and IEA, and promote the improvement of reasonable rules for fair international natural gas trade, investment security and business cooperation.



4. Prospects of China's Natural Gas Market in 2022

Since 2022, China's economy has grown steadily and energy transition and development has continued to drive forward. Amid extremely complicated external environment, concerted efforts have been made in the production, supply, storage and marketing system of China's gas industry. Multiple measures have been taken, such as to strengthen domestic production, infrastructure and market, stabilize import, price and expectation, guarantee contracts, livelihood and stock, and improve the steadiness of the purchase and sales of natural gas, as well as the operation of market rules and contract mechanism, in order to stabilize the overall development of the industry. At the same time, China's natural gas development has actively integrated into the global market, becoming an effective force to promote the rebalancing of inter-regional resources. The development of the industry has shown greater flexibility and resilience.

In the first half of 2022, domestic gas production was 112 bcm, up 7.9% year-on-year. Gas imports were 74.1 bcm, down 8.9% year-on-year, pipeline gas imports were 31.2 bcm, up

10% year-on-year, LNG imports were 42.8 bcm, down 19% year-on-year. From January to June, China's gas consumption was basically flat from a year earlier. By sector, urban gas consumption increased steadily, chemical and fertilizer gas consumption increased slightly, commercial and public service gas consumption declined due to the impact of the epidemic, and gas consumption for industry and power generation has seen an obvious fall in growth rate.

In 2022, it is estimated that the domestic production will be more than 220 bcm, aiming to increase by 10 bcm annually. Gas imports will slightly decline, and LNG imports probably will show the first decline in recent years. According to preliminary estimates, China's apparent gas consumption in 2022 will be 375-380 bcm, increasing 1%-3% year-on-year, and demand of the second half of the year will be effected by uncertainties of climate in this winter and next spring and the drastic price fluctuations in the global energy market. By sector, urban gas consumption will grow steadily, with residential and heating gas being the main driving force. The growth of gas power generation will slow down, mainly due to the slowdown in the growth of social electricity consumption in the whole society, the high base of last year and the relatively fast growth of power generation from hydro, wind, solar and other renewable power.



Growth of industrial gas consumption will slow down, mainly due to the high price of spot LNG imports which increases the marginal cost of resource supply, with an effect of squeezing out part of high energy consumption users and low-end industry users. Chemical and fertilizer gas consumption will remain stable.

Conclusion

2022 is a year of significance for China marching in confident strides toward the second centenary goal of building China into a modern socialist country in all respects. Undergoing changes unseen in a century, multiple factors have aggravated the uncertainty of the world energy market. China's natural gas industry will resolutely implement policies and arrangements made by the CPC Central Committee and the State Council with regard to the construction of the natural gas production, supply, storage and marketing system, meet requirements of ensuring supply and price stability, and solidly promote the implementation of the 14th Five-year Plan, so as to play a greater role in China's economic development and energy transition.

The *China Natural Gas Development Report* has been released for seven years in a row. We look forward to the release of the *China Natural Gas Development report (2022)*, which will hopefully stimulate discussion and exchange of ideas on the future development of natural gas industry. Here, we would like to express our sincere gratitude to all the relevant departments, research institutes, industry associations, enterprises,



international organizations and many experts for their strong support and help.

We would like to thank SHEN Shuqi, SHAN Weiguo, FAN Hui, SUN Wenyu, ZHANG Xiaoyu, WANG Limin, ZHU Jingyi, SUN Hui, ZHANG Jilong, LI Yilong, SHEN Xin, SHI Yun, LI Qiuyang, WANG Danxu, LIU Bingqian and others for their contributions to the drafting of this report. Our appreciation also goes to industry experts and scholars and enterprise representatives for their suggestions on the revision of the report. Last but not least, PetroTECH information Consulting Services Co., Ltd. and the Petroleum Industry Press, thank you for editing, proofreading, translating, printing and publishing the report.

China Natural Gas Development Events (2021–2022)

January 2021

On January 6, the seventh bid section of the Jiangsu Section of Yongqing-Shanghai Pipeline was officially ignited for welding, marking the full construction of the Yongqing-Shanghai Pipeline in Hebei, Shandong, Jiangsu and other places.

On January 7, the Ministry of Ecology and Environment announced the “Measures for the Administration of Carbon Emissions Trading (for trial implementation)”, and issued the supporting quota allocation plan and the list of key emission units.

March 2021

On March 13, “the 14th Five-Year Plan for National Economic and Social Development of the People’s Republic of China and the Outline of Vision 2035” was released. For the first time, it was proposed to rely on self-supply for core oil and gas demand, and deploy key tasks to accelerate the utilization of deep-sea, deep, and unconventional oil and gas resources, consolidate the foundation of domestic production, maintain



stable and increased production of crude oil and natural gas, expand sources of oil and gas imports, and maintain the safety of strategic channels and key nodes.

On March 15, President Xi Jinping presided over the ninth meeting of the Central Committee for Financial and Economic Affairs, which analyzed the healthy development of the country's platform economy as well as basic ideas and main measures to achieve carbon peak and carbon neutrality, stressing that carbon peak and carbon neutrality should be incorporated into the overall layout of ecological civilization construction, and the goals of carbon peak by 2030 and carbon neutrality by 2060 should be achieved as scheduled.

On March 31, PipeChina formally took over the equity interests of Beijing Gas Pipeline Company and Dalian LNG Company, formerly under PetroChina Kunlun Energy at 24:00, marking the full completion of asset integration of China's oil and gas trunk pipeline networks and realizing the grid-connected operation of all domestic oil and gas trunk pipeline networks.

April 2021

On April 22, Chinese President Xi Jinping attended the Leaders Summit on Climate via video link and delivered an

important speech titled “For Man and Nature: Building a Community of Life Together” in Beijing.

On April 22, the National Energy Administration issued the “Guiding Opinions on Energy Work in 2021”, proposing to increase oil and gas reserves and production, promote the construction and interconnection of the main natural gas pipeline networks, strengthen the construction of gas storage capacity, etc.

On April 29, the Dongfang Gas Field Group, China’s first offshore intelligent gas field group, was completed, marking the beginning of an intelligent and digital era for China’s offshore oil and gas production and operation.

May 2021

On May 6, the Ministry of Finance, the General Administration of Customs, and the State Taxation Administration jointly issued the “Notice on Import Tax Policies for the Exploration, Development and Utilization of Energy Resources during the 14th Five-Year Plan Period”, and released regulations on tax exemption for oil (natural gas) and coalbed methane exploration and development projects and emergency rescue projects for offshore oil and gas pipelines, and regulations on the collection and return of value-added tax on natural gas imports, etc.



On May 18, the Methane Emission Control Alliance of Chinese Oil and Gas Companies was established. Composed of seven members including PetroChina, Sinopec, CNOOC, PipeChina, Beijing Gas, CR Gas, and ENN Energy, the alliance aims to reduce the average emission intensity of methane during natural gas production to less than 0.25% by 2025.

On May 25, the National Development and Reform Commission issued the “Notice on the Action Plan for Deepening Reform on Pricing Mechanisms in the 14th Five-Year Plan Period”, requiring further reform of energy prices.

June 2021

On June 9, the National Development and Reform Commission officially released the “Measures for the Price Administration of Natural Gas Pipeline Transportation (interim)” and the “Measures for the Supervision and Examination of the Pricing Cost of Natural Gas Pipeline Transportation (interim)” to further improve the price management system of natural gas pipeline transportation.

On June 10, the National Energy Administration issued the “Work Plan for the Special Supervision of Natural Gas Networks and LNG Terminals” to foster the fair opening of natural gas pipeline network facilities, promote efficient

utilization of pipeline network facilities, and regulate the open services of pipeline network facility operators.

On June 25, Deep Sea No.1, China's first self-operated 1,500-meter deep-water gas field, was officially put into production in Lingshui, Hainan, marking the country's capability of ultra deep-water drilling for oil and gas.

July 2021

On July 15, National Energy Administration convened a meeting in Beijing in 2021 to promote the oil and gas exploration and development, implemented a series of important instruction from President Xi Jinping of oil and gas exploration and development in-depth, summarized previous work experience, analyzed the current situation, deployed the next step work, learnt and mobilized to vigorously promote the oil and gas exploration and development, and to push the high-quality development of the oil and gas industry to a new level.

On July 16, China's national carbon emissions trading market was officially launched.

August 2021

On August 28, China's first offshore carbon dioxide storage demonstration project was officially launched in the Pearl River Mouth Basin of the South China Sea. It will permanently



store the carbon dioxide associated with the development of the offshore Enping 15-1 oilfield group in an 800-meter deep seabed reservoir, storing about 300000 tons per year, with a total of over 1.46 million tons.

September 2021

On September 11, the National Development and Reform Commission issued the “Plan for Improving the Dual Control System of Energy Consumption Intensity and Total Volume”.

On September 15, National Energy Administration formulated and implemented the plan of national gas storage capacity construction.

On September 23, the construction of the middle section of the West-East Gas Pipeline 3 (Zhongwei-Ji’an) started.

October 2021

On October 8, the Fuling Shale Gas Field in Jiangnan Oilfield, the first commercially developed large-scale shale gas field in China, produced 40 billion cubic meters of shale gas, setting a new record for the cumulative production of shale gas in the country.

On October 21, Chinese President Xi Jinping visited Shengli Oilfield Exploration and Development Research Institute and Lai 113 Block in Shengli Oilfield, and pointed out:

“Petroleum energy construction is of great significance to our country. As a major manufacturer, to develop the real economy, China must firmly hold the energy rice bowl in its own hands.”

On October 24, the CPC Central Committee and the State Council issued the “Opinions on Completely, Accurately and Comprehensively Implementing the New Development Concept and Doing a Good Job of Carbon Peak and Carbon Neutrality”, which put forward 31 key tasks in 10 aspects of carbon peak and carbon neutrality.

On October 26, the State Council issued the “Action Plan for Carbon Dioxide Peaking before 2030”, proposing to focus on the implementation of green and low-carbon transition of energy, energy conservation, carbon reduction and efficiency improvement and other ten actions to achieve carbon peaking.

November 2021

On November 20, China’s first coastal LNG ship bunkering station was officially put into operation at Macun Port Terminal, Chengmai County, Hainan Province.

December 2021

On December 2, the Work Safety Committee of the State Council issued the “National Urban Gas Safety Inspection and Remediation Work Plan”, deploying a nationwide one-year



urban gas safety inspection and remediation work.

From December 8 to 10, the annual Central Economic Work Conference was held in Beijing, stressing that China must make economic stability its top priority and pursue progress while ensuring stability, promote the energy revolution, and accelerate the construction of an energy powerhouse.

On December 15, the Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences independently developed the world's first set of three-dimensional comprehensive test production system for large-scale full-scale production wells with an effective volume of 2,585 liters and a maximum simulated sea depth of 3,000 meters. This is currently the largest gas hydrate production test equipment in the world, with the deepest simulated sea depth and the world's leading technology.

On December 20, the first shore-based LNG bunkering station in the inland rivers of the Yangtze River in China was completed and put into trial operation in the Wuhu section. The bunkering station is designed to have an annual bunkering capacity of 30,200 tons and can dock ships up to 5,000-tonnage.

Up to December 31, Department of natural resources has listed coalbed methane exploration rights (Syncline west wing block, Qianxi), Junggar basin Dayou 1 exploration in Xinjiang and

other three oil and gas exploration right, Tarim basin Shule-Yuepu lake exploration in Xinjiang and other six oil and gas exploration right, Tarim basin Weilixi 2 exploration in Xinjiang and other six oil and gas exploration right for sale in four times in 2021.

January 2022

On January 24, the Political Bureau of the CPC Central Committee held its 36th collective learning to strive to achieve the goal of carbon peak and carbon neutrality. President Xi Jinping emphasized that achieving carbon peak and carbon neutrality is an inherent requirement for implementing new development concepts, building a new development pattern and promoting high-quality development, and is a major strategic decision made by the CPC Central Committee in coordinating domestic and international situations.

On January 29, the construction of China's first million-metric-ton level carbon capture, utilization and storage (CCUS) project, built by Sinopec Qilu Petrochemical Company and Sinopec Shengli Oilfield, was completed.

February 2022

On February 3, CNPC and Gazprom signed a purchase and sale agreement, agreeing to supply gas from Russia's Far East to China through pipelines with an annual contract volume of 10 bcm.



On February 10, the National Development and Reform Commission and the National Energy Administration issued the “Opinions on Improving Institutional Mechanisms and Policy Measures for Green and Low-Carbon Energy Transition”.

On February 28, the first phase of the Wen 23 gas storage project, the largest gas storage in central and eastern China was completed and put into operation.

March 2022

On March 22, the National Development and Reform Commission and the National Energy Administration issued the “14th Five-Year Plan for a Modern Energy System”, proposing the main goals for the construction of a modern energy system during the 14th Five-Year Plan period.

On March 29, the National Energy Administration issued the “Guiding Opinions on Energy Work in 2022”, proposing that the main goal in 2022 is to enhance supply security capacity.

April 2022

On April 13, President Xi Jinping inspected Hainan. Building a maritime power is a major strategic task for realizing the great rejuvenation of the Chinese nation. It is necessary to promote high-level self-reliance and self-improvement in marine technology, strengthen original and leading technological

researches, keep the independence of equipment manufacturing, strive to use own equipment to develop oil and gas resources, increase energy self-sufficiency, and ensure national energy security.

On April 21, the National Energy Administration organized and held national conference of the planning construction and protection of the oil and gas pipelines, implemented the decisions and arrangements of the CPC Central Committee and the State Council, promoted the implementation of the 14th Five-year Plan for oil and gas, accelerated the construction of pipeline infrastructure, and coordinated pipeline protection.

On April 26, President Xi Jinping host the 11th meeting of the central financial and Economic Commission, made new arrangements for comprehensively strengthening infrastructure construction, and pointed out the direction for building a modern infrastructure system.

May 2022

On May 26, the National Development and Reform Commission issued the “Guiding Opinions on Improving the Pricing Mechanism for Regasification Services at LNG Import Terminals”.

June 2022

On June 10, the General Office of the State Council issued



the “Implementation Plan for Aging and Renovation of Urban Gas Pipelines (2022–2025)”.

On June 27, the Ministry of Housing and Urban-Rural Development and the National Development and Reform Commission jointly issued the “Notice on The Guidelines for The Assessment of Aging of Urban Gas Pipelines”.

Since 2022, the Ministry of Natural Resources has listed two batches of the transfer of two shale gas exploration rights such as Liucheng North Block, Guangxi, and four oil and natural gas exploration rights such as South Block in Heilongjiang.

July 2022

On July 24, the National Energy Administration held a meeting in Beijing to promote oil and gas exploration and development in 2022. The conference pointed out that the national energy system and oil and gas industry shall promote oil and gas reserve and capacity, to achieve a major breakthrough in exploration, a steady growth of crude oil capacity, and a quick growth of natural gas capacity. The meeting called for raising political positions, firmly holding the bottom line of oil and gas strategic security, and using the certainty of capacity increase and supply guarantee of domestic oil and gas to cope with the uncertainty of the external environment.