Structural transformation and economic stimulus: the role of renewable energy investment
结构转型与经济刺激：可再生能源投资的作用

Adair Turner, Chair of Energy Transitions Commission
Adair Turner,能源转型委员会主席

EFC Dialogue on Economic Stimulus and the Low Carbon Transition
能源基金会经济刺激与低碳转型对话
21 May 2020
2020年5月21日

❑ China's Macro Challenge and Stimulus Policy Options

- Energy Transition: Ceasing new coal investment
- Renewable Energy Investment and Macro-stimulus: the need for a strategic approach

❑中国面临的宏观挑战和经济刺激政策选择

- 能源转型：停止新增煤炭产能投资
- 可再生能源投资和宏观经济刺激：需要采用战略方法

- Health crisis contained
  遏制健康危机
- Supply side capacity rapidly restored
  快速恢复供给侧产能

but但是

- Outlook for exports to US and Europe severely depressed
  对欧美的出口贸易前景严重低迷

How to stimulate domestic demand
如何刺激国内需求

- Consumption (but potentially constrained?)消费（但可能受限？）
- Investment, which might also build more future economy投资，也可能是建设未来的经济

Default policy option默认政策选择：

- Repeat the 2009 post GFC policy重复**2009**年全球金融危机后的经济刺激政策
- Massive infrastructure and real estate investment大规模的基础设施和房地产投资

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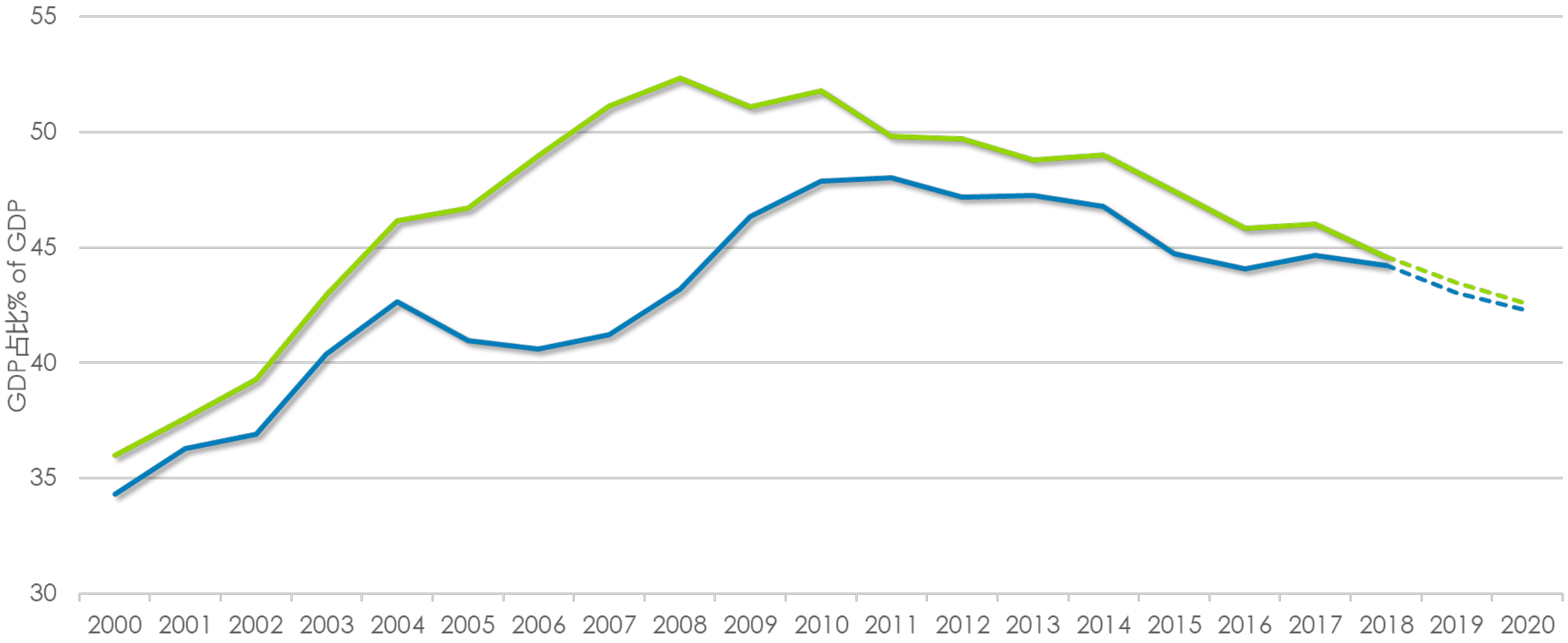
China: National Savings and Investment 2000-2020
中国：国民储蓄和投资，2000-2020年



Note: The dotted line represents forecasting data
Source: IMF, World Economic Outlook Database, April 2019

注：虚线表示预测数据
来源：国际货币基金组织、世界经济展望数据库，2019年4月

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Three downsides of the post-GFC stimulus
全球金融危机后经济刺激政策的三个弊端

- Over investment / wasted investment
  - 15% of apartments unoccupied: real estate as investment speculation
  - Overcapacity in urban infrastructure in 2nd /3rd /4th tier cities
  - Rapidly increasing capital/output ratio (YU Yongding 2016*)
  - Overcapacity in heavy industry
- Increasing leverage in banking and shadow banking system: credit to non-financial sector from 150% to 250% of GDP
- Highly carbon intensive: total CO2 emissions from 7.5Gt to 10GT

- 过度/浪费性投资
  - 15%的公寓空置：房地产作为投资投机
  - 二、三、四线城市的城市基础设施产能过剩
  - 资本/产出比迅速提高（YU Yongding，2016年*）
  - 重工业产能过剩
- 银行和影子银行系统的杠杆率不断提高：非金融部门信贷的GDP占比从150%增至250%
- 高碳密集型：CO2总排放量从7.5Gt增加到10GT

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* Yongding YU, *China's Non-financial Corporate Debt Dynamics,* China & World Economy (1-17, Vol. 24, No. 1,2016)
Yongding YU，中国非金融企业债务动态，《中国与世界经济》（2016年第1期第24卷，第1-17页）

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China 2050: a Fully Developed Rich Zero-carbon Economy
中国2050年：全面发展的富裕零碳经济体

Feasible 2050 vision for China's power system
中国电力系统的2050年可行愿景

- 15000 twh of zero carbon electricity delivered from:
  15000 twh 的零碳电力组成：
  - 2400 GW wind 风电
  - 2500 GW solar 光伏发电
  - 230GW nuclear 核电
  - 550 GW hydro 水电
- Total eventual cost to GDP: ~ 0%
  最终总成本GDP占比： ~ 0%
- Investment needs in transition: ~ 1% of GDP
  转型投资需求： ~ 占GDP的1%

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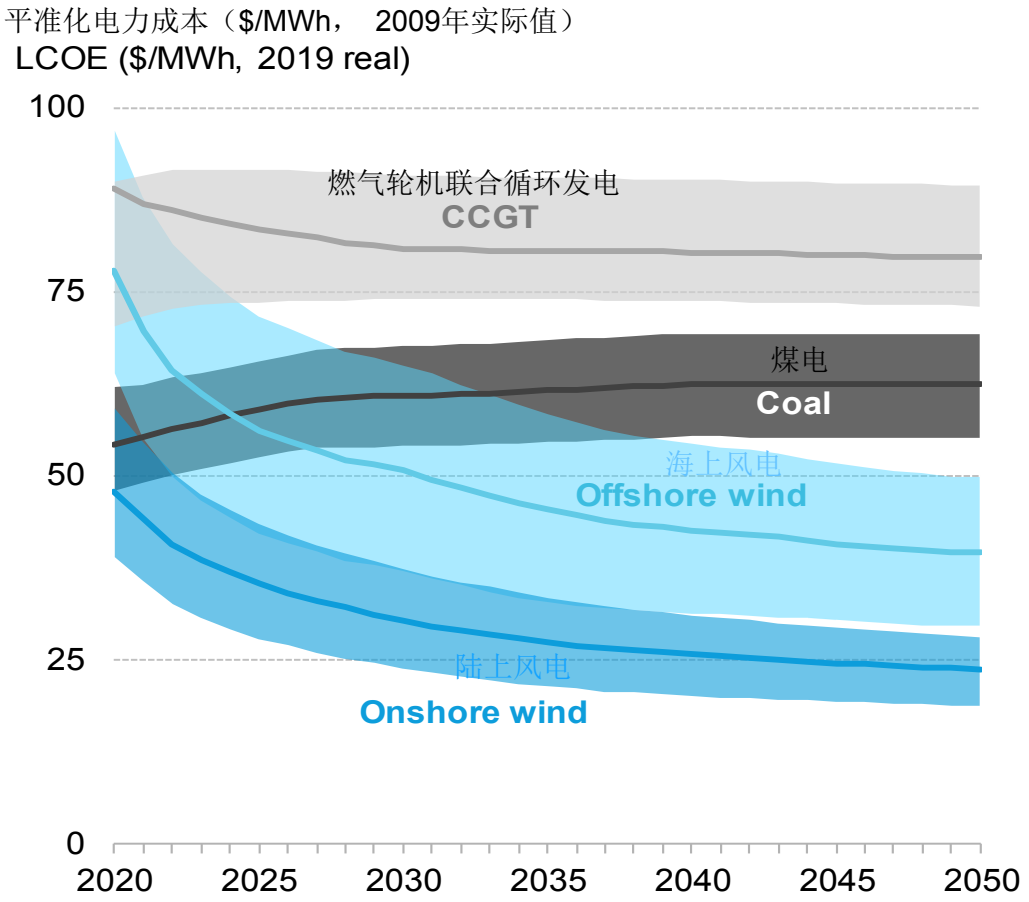
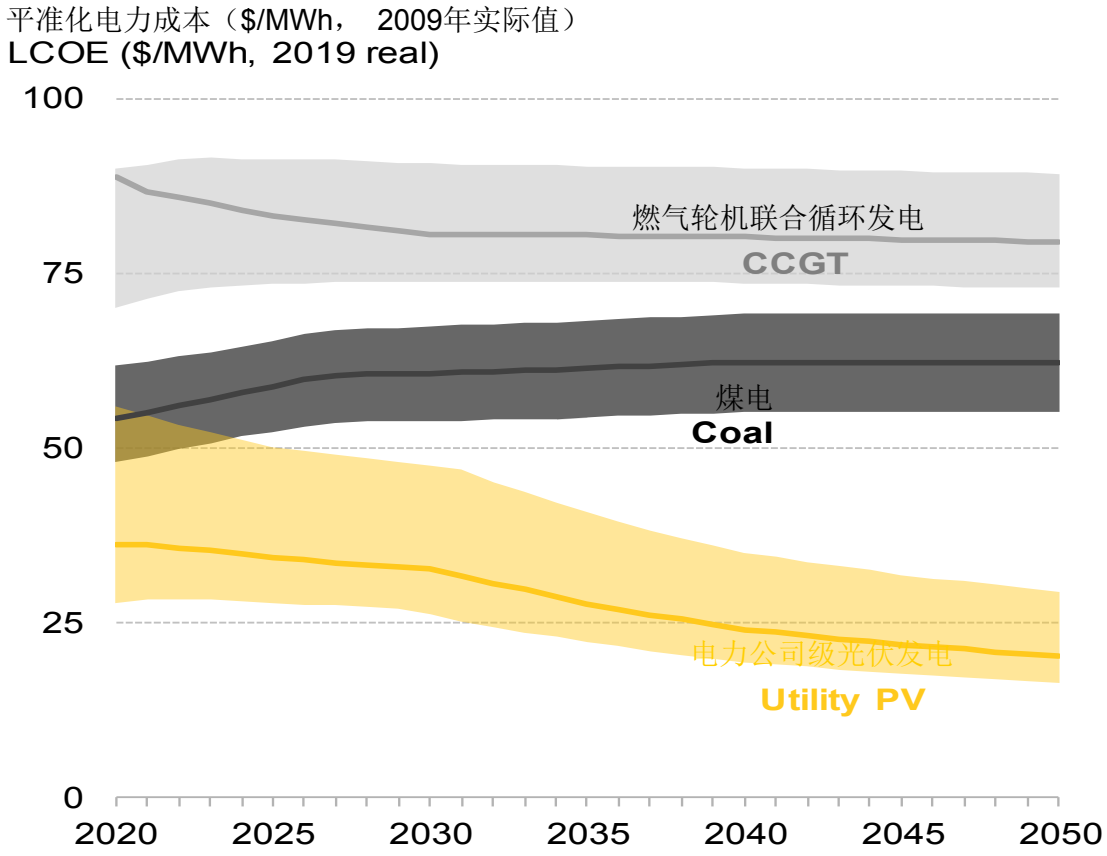
BNEF Forecast – new build RE versus new build coal and gas
彭博新能源财经预测-新增可再生能源发电产能与新增煤电和燃气发电产能

Wind versus coal and CCGT
风电与煤电和燃气轮机联合循环发电



Utility-scale PV versus coal and CCGT
电力公司规模的光伏发电与煤电和燃气轮机联合循环发电



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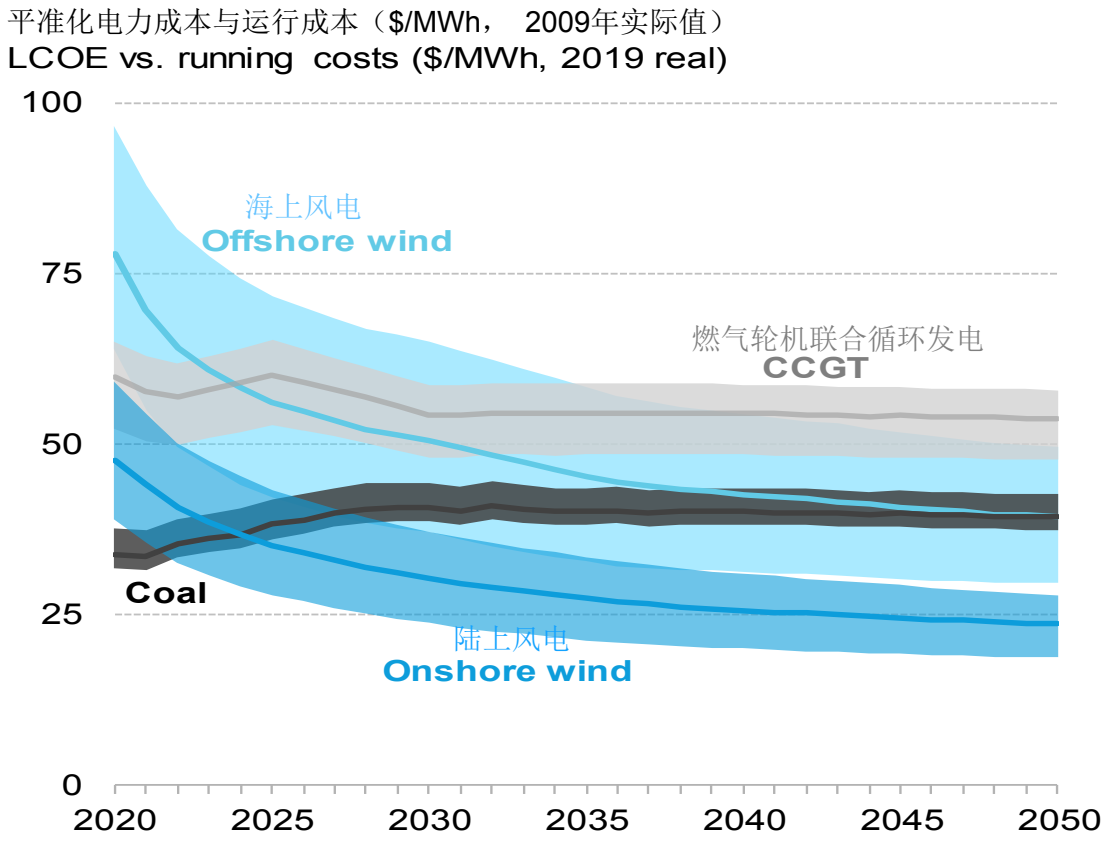
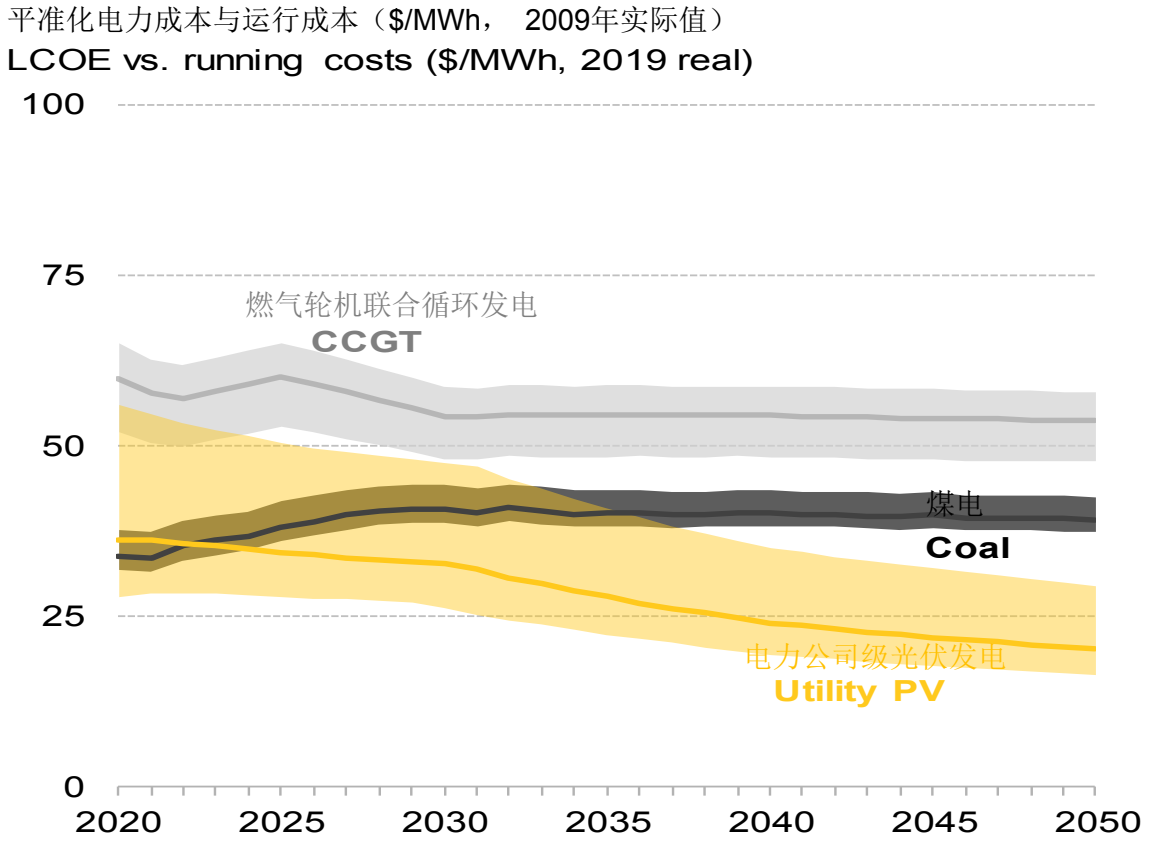
来源：彭博新能源财经。注：所有平准化电力成本计算没有考虑补贴。平准化电力成本的范围表示产能系数的范围。我们的海上风电平准化电力成本预测为全球预测结果。对于热电厂，上限反映我们NEO调度分析得出的实际产能系数，下限反映市场新电厂的标准产能系数假设。

BNEF Forecast – new build RE versus existing coal and gas
彭博新能源财经预测-新增可再生能源发电产能与现有的煤电和燃气发电产能

New wind versus existing coal and CCGT
新增风电与现有煤电和燃气轮机联合循环发电



New utility-scale PV versus existing coal and CCGT
新增电力公司级光伏发电与现有煤电和燃气轮机联合循环发电



Note: All LCOE calculations are unsubsidized, and exclude curtailment. The range of the LCOE represents a range of capacity factors, it excludes curtailment. Our offshore wind LCOE forecast is global. For thermal plants, the short-run marginal cost range represents a diversity of plant efficiencies in the fleet. The running cost includes a carbon price, see the carbon prices section in the Appendix.注：所有平准化电力成本计算没有考虑补贴和弃风弃光现象。平准化电力成本的范围表示产能系数的范围，不考虑弃风弃光现象。我们的海上风电平准化电力成本预测为全球预测结果。对于热电厂，短期边际成本范围反映电厂效率的多样性。运行成本包括碳价，详见附件中的碳价部分。

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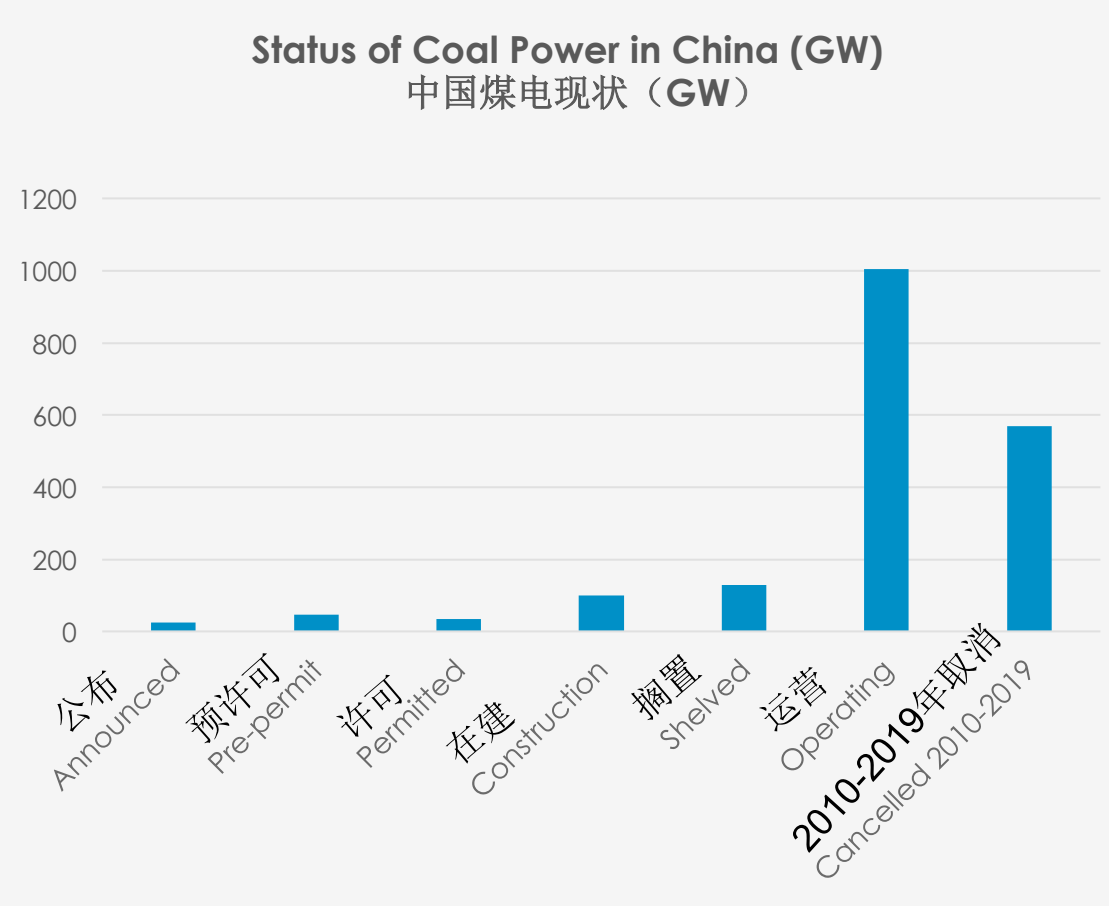
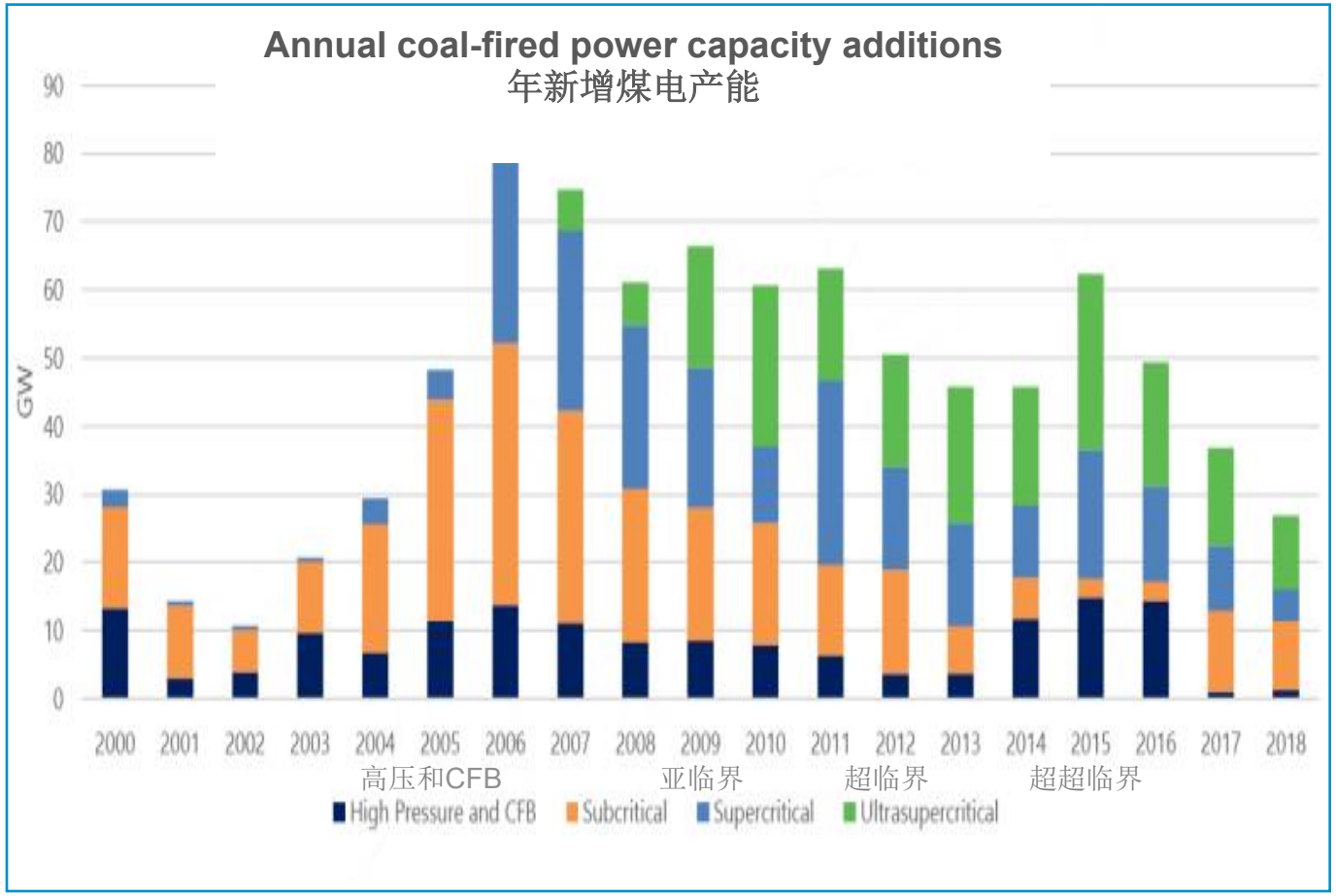
Coal power has 1000 GW in operation and about 40 GW added per annum, still playing a big role in China's power sector
现有煤电产能为1000GW，每年新增约40GW，在中国电力行业中仍发挥着重要作用





Source: Coalswarm
来源： Coalswarm

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Why is new coal investment still occurring?
为什么仍有新增煤电投资？

- Conservative belief that more renewables will create system balance problems…
  保守观念认为，更多的可再生能源将造成系统平衡问题

  despite evidence that challenges minimal till RE>50% and manageable up to 85%
  尽管有证据表明，可再生能源占比超过 50%时挑战极小，可控范围可达到85%

- Grid optimisation at regional rather than national level…应该在区域而非国家层面去优化电网

  and insufficient UHV transmission capacity特高压输电能力不足

- Provincial incentives to maximise local production even if power imports cheaper
  即使外购电价格便宜，省级激励也可以最大限度地提高本地产能

- Vested interests 既得利益

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支持风能和光伏发电投资：投资放缓风险
Supporting wind and solar investment: risk of investment slowdown

Past renewables support regime
过去的可再生能源支持机制

- Fixed FITs giving subsidy above coal benchmark prices 固定上网电价为超出煤电基准电价的部分提供补贴
- Paid for out of renewable surcharge of RMB 0.019per kwh支付每千瓦时0.019元的可再生能源附加费
- Total subsidy surcharge in 2018 RMB 84bn (< 0.1% of GDP) 2018年补贴总附加费为840亿元（不到GDP的0.1%）

Need for subsidy declining
需要减少补贴

Moving to "unsubsidised" auction based system
转向"无补贴"拍卖制度
… following evolution seen in other countries
…跟随其他国家的演变

But lack of clear medium / long term targets to drive the quantity of RE purchased
但是缺乏明确的中长期目标来驱动可再生能源的购买量
…. which would then drive even further cost reductions
….然后将进一步降低成本

Need for strategic vision of scale of RE needed
要为所需的可再生能源规模制定战略愿景

— reflected in ambitious 14th FYP targets
反映在雄心勃勃的"十四五"规划目标中

— and in auctions with maximum price to ensure nil/ minimal subsidy
并以最高价格进行拍卖，以确保零/最低补贴

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The macro figures: GDP and Investment – 2019
宏观数据：2019年GDP与投资

	RMB人民币	US$美元
GDP	~100tr万亿	~14tr 万亿
Total fixed asset investment 固定资产投资总额	~43tr 万亿	~6tr 万亿
Of which “ Infrastructure” and Real Estate 其中，基础设施和房地产投资	> 20tr 万亿	> 3tr 万亿

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“Traditional” or “new” infrastructure
“传统”与“新型”基础设施

“Traditional”
”传统“

- Road, water and sewage systems to support real estate development道路、水和污水处理系统，支持房地产开发
- Highways, airports, convention centres, sports centres, industrial parks and other to support city economic development公路、机场、会议中心、体育中心、工业园区等支持城市经济发展

Intermediate / unclear
中间/不清晰

- High speed rail 高铁
- Subway systems 地铁系统

“New”
”新型“

- 5G
- AI / IoT 人工智能/物联网
- Charging infrastructure充电基础设施
- Data centres and fibre optics数据中心和光纤
- UHV transmission lines 特高压输电线路

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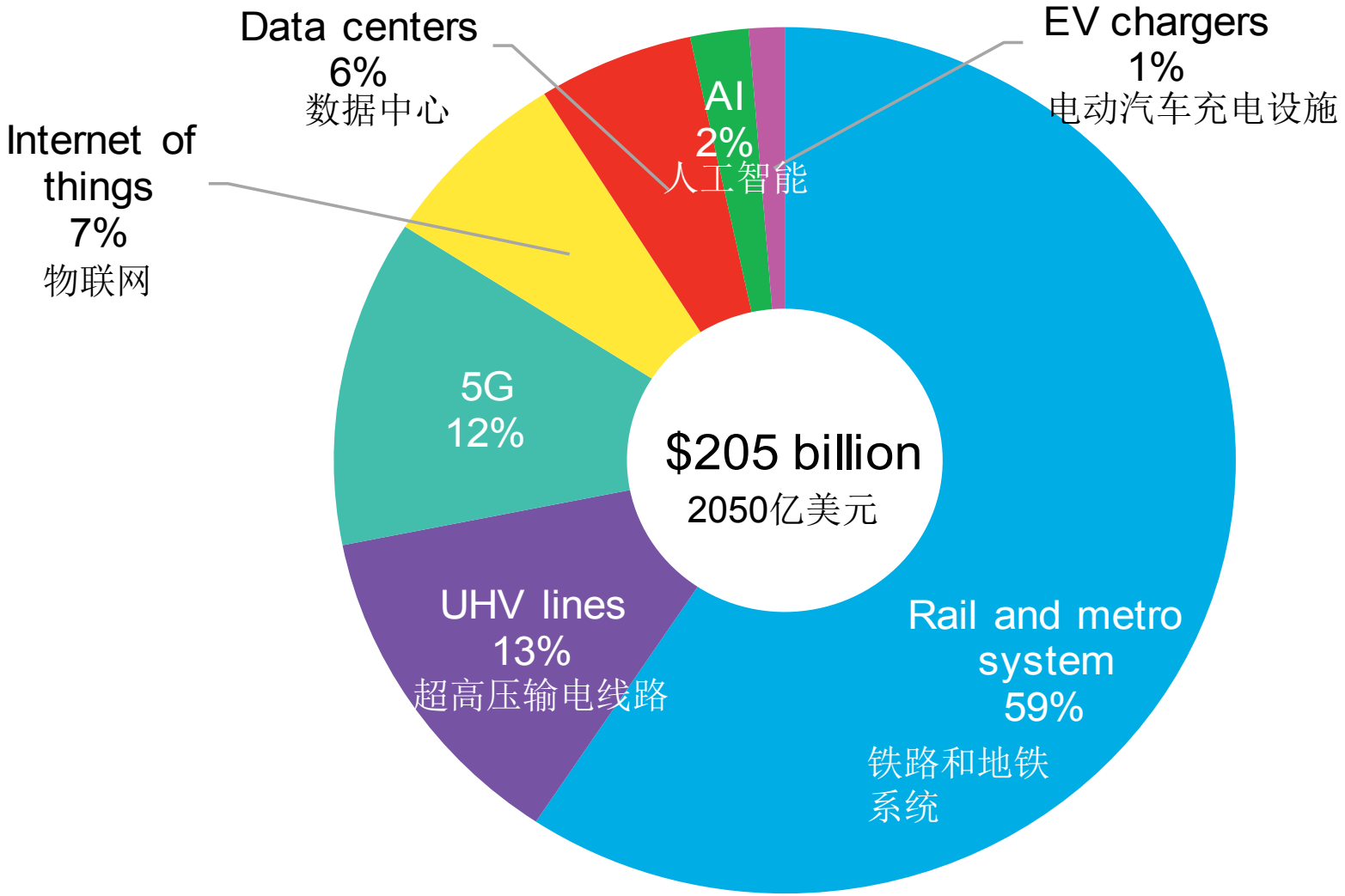
BNEF Estimated investment in the seven “new” infrastructure sectors in 2020
彭博新能源财经对2020年七大“新型” 基础设施领域的投资估算



Source: Bank of China, National Development and Reform Commission, State Grid, BloombergNEF Note: AI = Artificial Intelligence, EV = Electric vehicle, UHV = Ultra High Voltage. Investment estimate is based on historical trends, market price, government targets and announced deals.
来源：中国银行、国家发改委、国家电网，彭博新能源财经。注：AI =人工智能、EV =电动汽车、UHV =超高压。投资估算基于历史趋势、市场价格、政府目标和已公布的交易。

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Order of magnitude investment needs / opportunity
数量级投资需求/机会

Traditional infrastucture and real estate 传统基础设施和房地产	~ RMB 20Tr ... so +10% = 2Tr = 2% of GDP ~ 20万亿元 ... 因此+10% = 2万亿 =占GDP的 2%	Vital to ensure that traditional infrastructure done in green energy efficient fashion 重要的是要确保以绿色能效的方式建设传统基础设施
50GW of wind + 50 GW of solar, UHV, grid reinforcement, storage, charging infrastructure 50GW风电+ 50GW光电、超高压、电网加固、储能、充电基础设施	~ RMB 1.0-1.3Tr = 1.0-1.3% of GDP ~ 1-1.3万亿元 = 占GDP的1.0-1.3%	Green electrification should be strategic objective driven by clear 14th FYP targets 在明确的“十四五”规划目标的驱动下，绿色电气化应成为战略目标
5G, IoT, Data centres, optical fibre, AI 5G、物联网、数据中心、光纤、人工智能	~ RMB 0.4tr = 0.4% of GDP ~ 0.4万亿元 =占GDP的0.4%	Helps build hi tech high value added economy … but total investment needs and short term stimulus potential small 帮助建立高技术高附加值经济 …但是总投资需求和短期经济刺激潜力很小

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The Energy Transitions Commission is hosted by SYSTEMIQ Ltd.

能源转型委员会挂靠在SYSTEMIQ Ltd.