# Power Sector Flexibilization and Energy Storage—German Experiences 电力灵活性与储能——德国经验分享

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## 欧盟应对气候变化相关政策 EU Climate Change Policies



欧盟可再生能源新目标: 2030年可再生能源占比提高至

40%

目前可再生能源占比: 19.7% 当前欧盟2030可再生能源目标: 32%

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China vs. Germany Common Objectives	中德 气候目标对比	
Achieve GHG neutrality by 2045	Reach CO <sub>2</sub> peak before 2030, neutrality by 2060	
Coal phasing out in the power system by 2038	Reduce CO <sub>2</sub> -intensity by 60-65% until 2030	
65% <b>RE target</b> by 2030, and GHG neutral power system by 2050	RE share in primary energy consumption to 25% by 2030	

# 德国电力行业可再生能源发展

Renewable Energy Development in German Power Sector



### Electricity Generation in 2020 2020年发电情况

#### Development of Renewable Energy 可再生能源发电



AG Energiebilanzen (2019), \*preliminary results



### 提升电力市场灵活性方案 Program to Enhance Electricity Market Flexibility

灵活性方案	操作		
可再生能源发电管理	让可再生能源适应电力需求和电网运行		
可再生能源技术组合	综合利用互补的可再生能源技术		
发电侧控制	在可再生能源上网比例低和波动时供电		
电网互联	改善地区间电网互联状况,改善电力系统平衡,实 现可再生能源空间整合		
储能	可再生能源并网多时储能系统充电,反之放电		
能效和需求侧管理	降低用电需求		
部门耦合	电转热, 电制氢或甲醇等碳基能源		

### 德国电力系统灵活性资源介绍 Introduction to German Power System Flexibility



#### 不同储能技术及其特征和应用 Characteristics and Applications of Different Energy Storage Technologies



#### 德国储能灵活性资源 Energy Storage Flexibility Resources in Germany

	总量	抽水蓄能	商用储能 电池	户用储能 电池	空气压缩 储能	电制 X
装机(MW)	7,897	6,800	370	380	321	26
占比	-	86.10%	4.70%	4.80%	4.10%	0.30%

#### 2018年德国各类储能设施的装机和占比

### 德国抽水蓄能资源 Pumped Storage Resources in Germany

◆二十世纪五十年代末开始建设 Construction began in the late 1950s

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◆2018年共有 680万千瓦 Generated 6.8 million kW of electricity in 2018

◆分布于中部和南部 Distributed in the centre and southern Germany

# 德国的电池储能资源 Battery storage in Germany

◆2018年德国电池储能装机容量70万千万

Battery storage capacity was 700MW by 2018 in Germany

◆ 商用项目占52.9%, 户用项目占47.1%

52.9% was commercial battery project, and 47.1% was household battery storage

## ◆ 以锂电池为主

Mainly Lithium battery

### 德国户用储能电池发展趋势 Development in Household Energy Storage Batteries in Germany



#### 德国的PtX项目 PtX Project in Germany

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