Annex 1: DISC model documentation

The Dispatch and Contracts (DISC) model combines a stylised representation of the electricity system dispatch with the financial layer of electricity markets. By combining these essential features of the techno-economic electricity market system, DISC seeks to provide insights about the relationship between the physical electricity system and the associated financial flows through electricity markets. The framework was initially developed to deliver a scenario analysis in a report for the Industry, Research and Energy (ITRE) committee of the European Parliament (Zachmann et al, 2023). DISC is implemented in Python.

Figure 11 is a schematic overview of DISC, covering the modelling process from scenario design, model inputs, modelling steps, to model outputs. The framework can re4 TpCgnesingleiggratedes istomIn every hour, the DISC f cheapest available resources to meet demand. This is equivalent to assuming that the short-term wholesale electricity market operates as a perfectly competitive hourly auction in which different generation types compete based on variable costs.

2. **Dispatch is independent of contracts.** DISC first optimises the dispatch of electricity generation to meet demand, then calculates the associated financial flows between generators and consumers. The holding of contracts by different parties does not affect their dispatch outcomes.

The second assumption is critically important, as much of the policy discussion related to long-term contracts focuses on their incentives for short-term operational decisions. The DISC framework abstracts from such considerations and focuses on the relationship between the physical system, the holdings of contracts and financial flows between market participants.

Figure 11: Dispatch and Contracts (DISC) model structure

Source: Bruegel

DISC requires a set of data inputs, categorised by dispatch and contract. On the supply side, the inputs include:

- Capacity by generation type (Solar PV, Gas CCGT, etc);
- Cost by generation type, determined by:
  - Technical assumptions (efficiency, emissions factor, etc);
  - Commodity prices: gas, coal, oil, and carbon;
- Capacity by storage type (Battery and Pumped Hydro);
- Hourly renewable output (Solar, Wind, and Hydro).

generator needed to add one more unit of supply in every hour determines the hourly wholesale prices, based on the principle of marginal pricing.

The contract inputs are determined by assumptions regarding the contract stack in electricity markets. For different contract types (eg CfD, PPA, Futures), the model takes inputs on:

x Contract type (physical or financial);
x Contract price;
x Contract holder (generation type on supply side and consumer type on demand side);
x Contract volume.

The contracts module then arithmetically calculates the financial flows between generators and consumers, based on the outputs from the dispatch module and the contracts inputs. The final outputs are the revenue of different generation types by contract (wholesale market, CfD, etc) and the cost paid by consumers by contract type.

Annex 2: Scenario design

Three distinct scenarios are used in the analysis for this policy brief: Baseline, 20% Less Demand, and Fossil Fuel Shock. The essential differences between each scenario are provided in Table 1. To summarise, the 20% Less Demand is the same as the Baseline scenario, expect with a 20% demand

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Hydro – Run of River	3.9	13.6	7	3.4	0.4
Hydro – Reservoir	0.8	9.8	8.8	11.4	0.4

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Table 5: 2030 Contract Strike Prices

Contract	DE	FR	IT	ES	PL
Solar CfD [€/MWh]	65	65	60		