

Inter-Discom P2P Energy Trading in India

Disclaimer: This is a working version and subject to change. For the latest information, please refer to India Energy Stack GitHub.

References

Full specification for P2P trading: DEG - P2P Trading (implementation guide - draft)

Specification for inter-discom P2P trading: DEG - Inter Distributor P2P Trading (draft)

Context

This document provides contextualization for inter-discom P2P energy trading.

In India, the Discom (Distribution Company) combines both roles defined in the main specification:

Main Spec Actor	India Equivalent
Energy retailer (consumer-facing)	Discom
Energy distribution company (wire/infra)	Discom

Therefore, the actor set simplifies to:

#	Actor	Examples
1	Discom(s)	BSES, Tata Power, MSEDCL, BESCO, etc.
2	Buyer	Prosumer consuming P2P energy
3	Seller	Prosumer producing P2P energy
4	Trade platform(s)	Consumer-facing apps
5	Trade exchange(s)	Permissioned ledger / permissioned ledger operator

Overall Flow (India)

Mermaid sequence diagram (shown as source):

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sequenceDiagram
    participant S as Seller
    participant TPA as Trade Platform A
    participant B as Buyer
    participant TPB as Trade Platform B
    participant TE as Trade Exchange/Ledger
    participant DA as Discom A
    participant DB as Discom B
  
```

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rect rgb(230, 245, 255)
note over S,TE: Phase 1: Trade Placement
S->>TPA: Initiate trade
B->>TPB: Accept trade
TPA->>TE: Submit signed contract
TPB->>TE: Submit signed contract
TE->>TE: Record on ledger
Note right of TE: Ledger: Discom A, Discom B, seller, buyer,
  Trade Timestamp, Delivery Date & Time Window,
  Trade Qty, Actual pushed/pulled Qty
DA-->>TE: Visibility into upcoming trades (optional)
DB-->>TE: Visibility into upcoming trades (optional)
end

rect rgb(230, 255, 230)
note over S,DB: Phase 2: Trade Delivery
S->>DA: Inject energy at scheduled time
DA->>DA: Grid security check
DB->>DB: Grid security check
DB->>B: Consume energy
end

rect rgb(255, 245, 230)
note over TE,DB: Phase 3: Data Updation (from meter reading)
DA->>TE: Add actual pushed signed meter data (P1)
DB->>TE: Add actual pulled signed meter data (P7)
end

rect rgb(255, 230, 230)
note over S,B: Phase 4: Financial Settlement
Note right of TE: Settlement via chosen
  mechanism (prepaid/postpaid)
B->>S: Payment (via settlement mechanism)
end

rect rgb(245, 230, 255)
note over DA,DB: Phase 5: Billing & Wheeling
DA-->>TE: Look up P2P trades for seller
DB-->>TE: Look up P2P trades for buyer
DA->>S: Bill (incl. wheeling charges)
DB->>B: Bill (incl. wheeling charges)
S->>DA: Pay bill
B->>DB: Pay bill
end

```

Ledger Data Structure

The trade exchange/ledger records the following for each trade:

Field	Description	Updated by
Seller Discom ID	Discom of the seller (e.g., D1)	Trade Platform
Seller ID	Prosumer ID of the seller (e.g., P1)	Trade Platform
Buyer Discom ID	Discom of the buyer (e.g., D2)	Trade Platform
Buyer ID	Consumer ID of the buyer (e.g., C1)	Trade Platform

Trade Timestamp	When the trade was placed	Trade Platform
Delivery Time, Date Window	Scheduled delivery date and time window	Trade Platform
Units	Contracted quantity	Trade Platform
Actual Pushed	Actual units pushed by seller (from meter data)	Discom
Actual Consumed	Actual units consumed by buyer (from meter data)	Discom

Financial Settlement

The financial settlement of the trade between the buyer and seller is facilitated through trade platforms. Platforms can explore various models depending on the nature of trade, reputation of users, and business case:

- Prepaid models: clearing house, escrow model
- Postpaid models: invoice generation and collection based on actual delivered quantities

This settlement is independent of the discom's billing process.

Enforcement (if default)

Enforcement is handled outside the main trading and fulfillment flow. Mechanisms include:

- Trade Platform Level: Platforms can implement penalties, reputation downgrades, escrow forfeiture, or suspension for users who default on payments or fail to deliver contracted energy. This architecture does not prevent discoms from implementing enforcement mechanisms at a later date.
- Ledger Visibility: The trade exchange provides transparency into defaults, enabling platforms and discoms to take informed action.

Resources

Sample spreadsheet with bill calculations