Residential Electricity Pricing Offer
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Goals

Understand how an energy supplier builds and prices a residential electricity offer.

Building and pricing two competitive offers:
- one with energy directly bought to the producer
- one with energy bought on the market with a Guarantee of Origin (GO)

Try to find out if you energy supplier is really the one you want to.
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Summary

1. Components of the energy part
2. Pricing the energy part components
   1. Energy part from market
   2. Energy part directly to the producer
   3. Balancing fees
   4. Guarantee of Origin (GO)
   5. Capacity
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3. Components of the energy part

Producer ➔ TSO ➔ DSO ➔ Residential Consumer
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3. Components of the energy part

Energy part:
- energy
- balancing fees
- Guarantee of Origin (GO)
- capacity

Markets: EEX, EPEXSPOT
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4. Pricing the energy part components: the energy

Energy part:
- **energy**
- balancing fees
- Guarantee of Origin (GO)
- capacity

Markets: EEX, EPEXSPOT

EEX:
- Calendars
- Quarters
- Months
- Weeks
- Days

EPEXSPOT:
- Spot
- Intraday

Producer

Energy supplier

Fixed price
Indexed price
Fixed within a threshold then indexed outside
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4. Pricing the energy part components: buying to the market

Minimizing the risk aversion by buying futures products on different horizons:
- Calendar: Y+1/Y+2/Y+3 -> to buy 3 years in advance
- Quarter: Q+1/Q+2/Q+3/Q+4 -> to buy 12 - 6 months in advance
- Months: M+1/M+2…/M+12 -> to buy 3 - 1 months in advance
- Weeks: W+1/W+2…
- Days:D+1/D+2 …

\[ \text{Price} = P_{\text{cal}} + P_{Q} + P_{M} + P_{W} + P_{D} + P_{\text{Spot}} \]
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4. Pricing the energy part components: buying to the market

\[
\text{Price} = P_{\text{cal}} + P_Q + P_M + P_W + P_D + P_{\text{Spot}}
\]
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4. Pricing the energy part components: buying to the market

Residential Profiles

Ps <= 6 kVA
9kVA <= Ps <= 36 kVA
HP
HC
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4. Pricing the energy part components: buying to the market

\[ P_{\text{cal}} = \text{Average[profile]} \times \text{cal} \]
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4. Pricing the energy part components: buying to the market

\[ P_{Q_i} = \text{Average} [\text{profile} - \text{Average} [\text{Profile}]]_i * Q_i \]
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4. Pricing the energy part components: buying to the market

\[ P_{\text{Spot}} = \int \text{Solde}(t) \ast \text{Spot}(t) \, dt \]
4. Pricing the energy part components: buying to the market
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4. Pricing the energy part components: buying to the market

<table>
<thead>
<tr>
<th></th>
<th>EEX Settl</th>
<th>RES1-P1</th>
<th>RES11-P1</th>
<th>RES2-P1 (HP)</th>
<th>RES2-P2 (HC)</th>
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<tr>
<td>Q1 2019</td>
<td>68.95 €</td>
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<td>Q2 2019</td>
<td>45.47 €</td>
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<td>Q3 2018</td>
<td>46.43 €</td>
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<td>Q4 2018</td>
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<td>Cal19</td>
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<td>Spot recalé en cal &amp; Q</td>
<td>54.93 €</td>
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<td>Achat Cal</td>
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<td>Achat Quarter</td>
<td>1.07 €</td>
<td>1.71 €</td>
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<td>Frais Spot</td>
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<td>Prix Achat (euros/MWh)</td>
<td>59.19 €</td>
<td>59.63 €</td>
<td>65.86 €</td>
<td>53.06 €</td>
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<th>(euros/MWh)</th>
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<td>Frais</td>
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<td>Frais blocs au settlement NEB</td>
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<td>Frais blocs au settlement RE</td>
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<tr>
<td>Frais d’équilibrage +/-</td>
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4. Pricing the energy part components: buying to the producer

\[
Price = \int P(t) \cdot Spot(t) \, dt \quad \text{48 euros / MWh with Spot 2017 on this production}
\]

\[
Price(t) = Spot(t) - X \quad X = 0.5 \text{ euros / MWh}
\]

Price = 48 if 40 < Spot < 48
Else Price = Spot - X
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4. Pricing the energy part components: the balancing fees

Energy part:
- energy
- **balancing fees**
- Guarantee of Origin (GO)
- capacity

Main grid balancing responsible: TSO

Producer -> Energy supplier

CP: forecast errors for production

CC: forecast errors for consumption

CR: production profile is not equal to consumption profile
4. Pricing the energy part components: balancing fees CR

\[ C_R = \int [RES1(t) - Eolien(t)] \times Spot(t) dt \]

\[ C_R \text{ 2017} = 0.24 \text{ euros / MWh} \]
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4. Pricing the energy part components: balancing fees CP

The better the forecast is the smaller are Cc & Cp

\[ C_P = \int [P(t) - P_(p(t))] \times [Spot(t) - Ecart(t)] dt \]

- \( P(t) : production(t) \) \( [P(t) - P_(p(t))] > 0 \rightarrow selling at Ecart_{>0} \)
- \( P_p(t) : forecast(t) \) \( [P(t) - P_(p(t))] < 0 \rightarrow buying at Ecart_{<0} \)

if \( [Ecart_{>0} > Spot(t)] \rightarrow P_p(t) = 0 \) leads to greater profit than \( P_p(t) = P(t) \)

Wind power: \( 0, 7 < C_P < 2 \text{ euros / MWh} \)
Hydraulic power: \( 0, 2 < C_P < 1 \text{ euros / MWh} \)
Solar power: \( 0, 5 < C_P < 1.5 \text{ euros / MWh} \)
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4. Pricing the energy part components: balancing fees CC

The better the forecast is the smaller are Cc & Cp

\[ C_c = \int [C(t) - C_p(t)] * [Ecart(t) - Spot(t)]dt \]

\( C(t) : consumption(t)[C(t) - C_p(t)] > 0 \rightarrow buying \ at \ Ecart_{<0} \)
\( C_p(t) : forecast(t) \quad [C(t) - C_p(t)] < 0 \rightarrow selling \ at \ Ecart_{>0} \)

if \( [Ecart_{<0} < Spot(t)] \rightarrow C_p(t) = 0 \) leads to greater profit than \( C_p(t) = C(t) \)

Residential: \( C_C \leq 0.7 \text{ euros / MWh} \)
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4. Pricing the energy part components: green certificates

Energy part:
- energy
- balancing fees
- Guarantee of Origin (GO)
- capacity

0.5 < Prices < 2 euros / MWh

1 GO = 1 MWh produced
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5. Pricing the energy part components: capacity

Energy part:
- energy
- balancing fees
- green certificates
- capacity

Producer

Given the generation curve (peaks) the TSO estimate the capacity potential (kW per kW installed) <1 that can sold on the market.

Residential Consumer

Given the consumption curve (peaks) the TSO estimate the capacity needed for a given portfolio.

Energy supplier

Buy the capacities required for its portfolio.
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5. Pricing the energy part components: capacity

Energy part:
- energy
- balancing fees
- green certificates
- capacity

Capacity Price = 10 000 euros / MW
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Conclusion

Energy part (1/3 of the total electricity bill):
- energy
- balancing fees
- Guarantee of Origin (GO)
- capacity

Markets: EEX, EPEXSPOT

Producer

Energy supplier

Residential Consumer