EXIST
ENERGY EXCHANGE ISTANBUL

Conditions That Led Towards Liberalization

Hasan SİLAHTAROĞLU, PMP

Strategy and Business Development Unit Manager

Why Market Liberalization?

All in one …

- Security of supply
- Climate change mitigation

Benefits …

- Competition
- Consumer choice
- More efficiency
- Better service quality
- FDI, etc.

… because it is nice?

Main Motivations and Key Elements

PSP model was applied to attract private investment since the early 1980s, but model required take-or-pay guarantees and created contingent liabilities over the public institutions while leaving almost all of the market risks to the buyer.

The problems encountered in the previous period showed the need for a different model to attract private investment.

Main objective was to create a competitive market structure

- Attracting Investment
- Increasing Efficiency
- Enhancing the Security of Supply

The 2000 - 01 Crisis

As is often the case with fundamental reforms, a crisis provided the impetus for implementing the planned energy reforms.

In the 1990s, GDP growth varied from a high of 9.3% to a low (contraction) of -5.5%. A slowdown began in the late 1990s, with growth declining from 7.5% in 1997 to 2.5% in 1998.

Slowing growth in Turkey, combined with financial crises in East Asia and Russia, reduced foreign investors' confidence in Turkey and capital inflows declined.

The banking sector that emerged from the restructuring after the 2000–01 crisis provided most of the debt financing to the investors that responded to the energy sector liberalization launched as part of the government's response to the crisis.

Major Challenges in Reform

PROBLEM

- Differences between regions and consumer groups
- High technical & non-technical losses
- Fast increasing demand & high investment requirement
- Lack of competition in market activities
- Reliance on imported fuels in the fuel-mix

REMEDY

- Price equalization mechanism for a smooth transition
- Loss targets and incentive-based regulation
- Enhanced trade opportunities for generators, long-term tariff setting with satisfactory returns for network operators
- Unbundled market activities, privatization & enabling supplier switching
- Encouraging diversity via incentives, increasing utilization of renewables and distributed generation

Challenges

- High rates Theft and Loss
- Stranded Costs
- Privatization
- Lack of Competition in wholesale
- Tariff content
- Wholesale prices
- Retail prices

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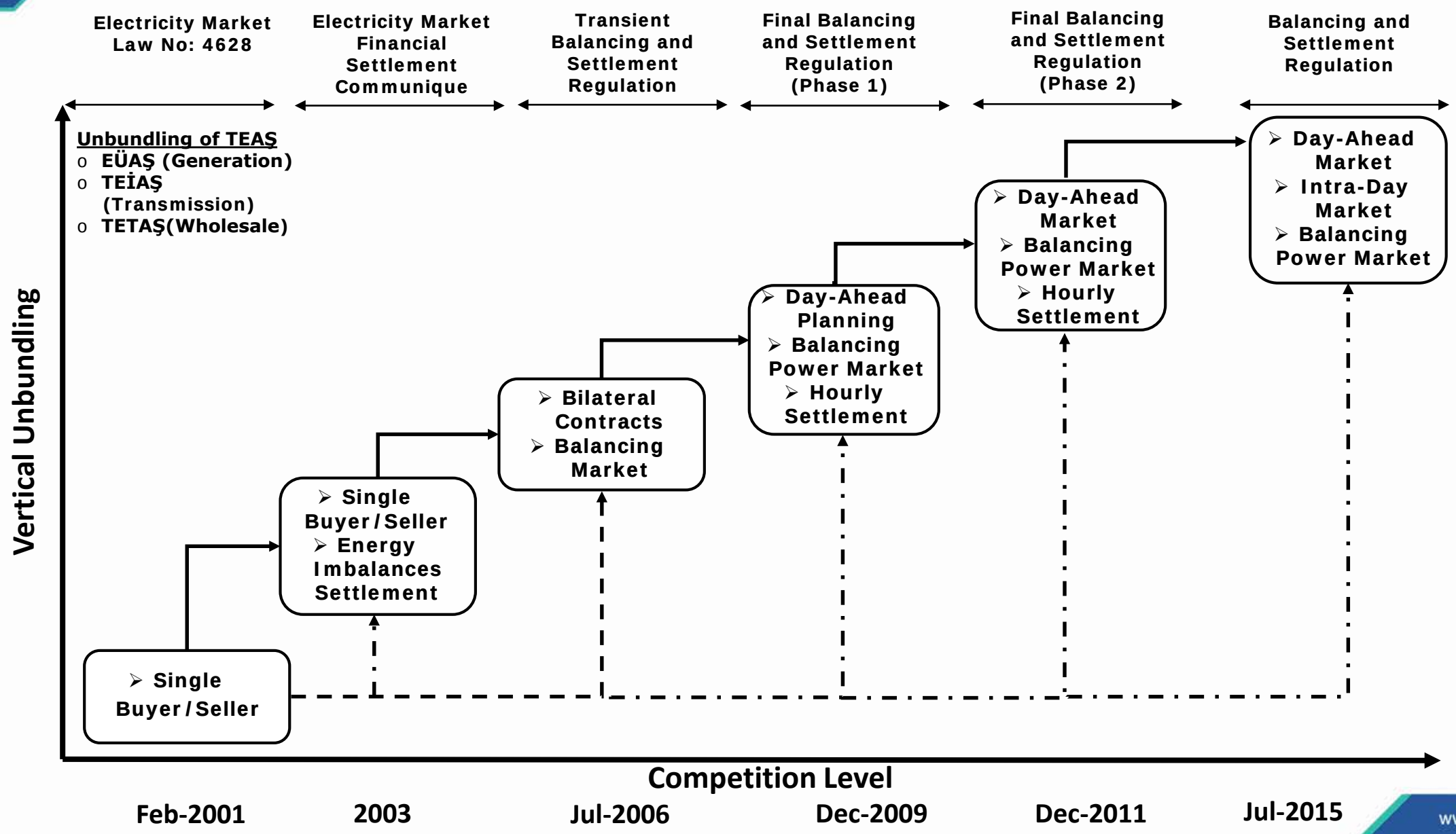
Transition of the Turkish Market

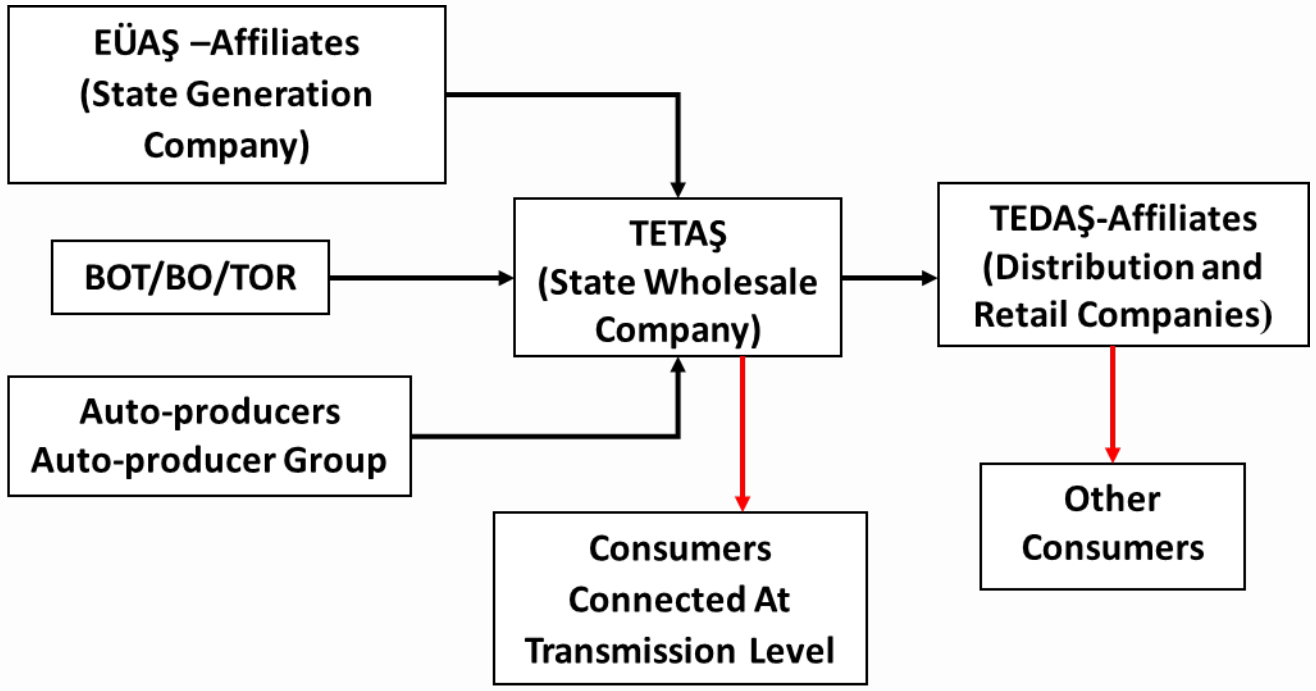
Hasan SİLAHTAROĞLU, PMP

Strategy and Business Development Unit Manager

Transition to Spot Market (2003-2017)

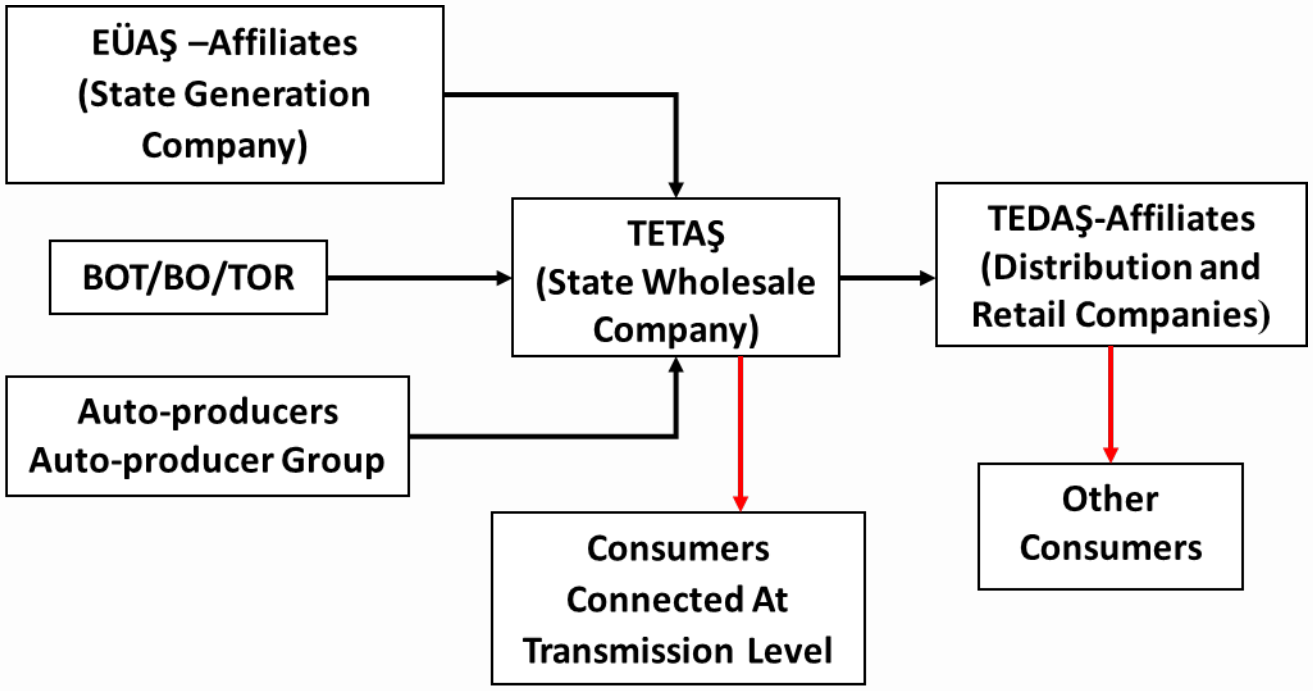


Partially Open Market (2003-2006)



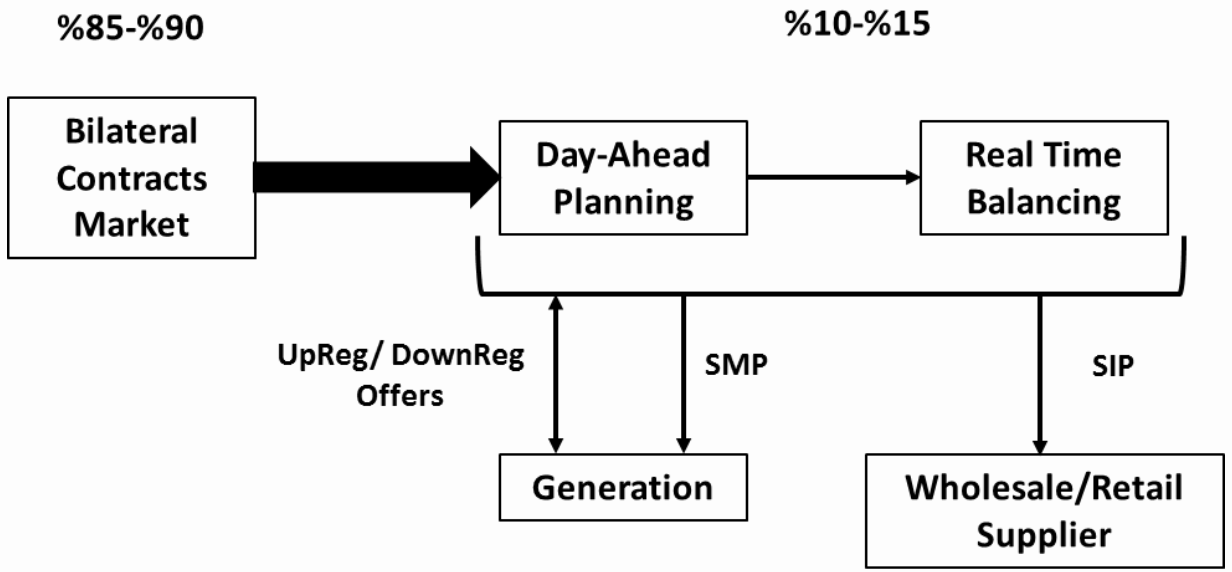
- ✓ Main document; Electricity Market Financial Settlement Communique (2003)
- ✓ Transition from single buyer-seller market to partially open market with energy imbalance settlement.
- ✓ Single buyer/seller market; **regulated bilateral contracts** between two state companies
- ✓ Free market; energy imbalances of auto-producers were subject to financial settlement
- ✓ System balancing was achieved via generation facilities at EÜAŞ portfolio

Partially Open Market (2003-2006)



- ✓ Financial Settlement; PMUM (Center for Market Financial Settlement) under TEİAŞ on behalf of TETAŞ
- ✓ Monthly based calculations reported to TETAŞ and respective participants by PMUM
- ✓ Energy imbalances were settled at 3 periods on monthly basis
  - Night (22:00-06:00)
  - Day (06:00-17:00)
  - Peak (17:00-22:00)
- ✓ Energy imbalances average prices; determined by TETAŞ approved by EMRA.
- ➢ Energy Surplus; 35 TL/MWh
- ➢ Energy Deficit; 106 TL/MWh (Day), 160 TL/MWh (Peak), 56 TL/MWh (Night)

Transition Period (2006-2009)



- ✓ Main document; Balancing and Settlement Regulation (2004)
- ✓ Bilateral contract market complemented by balancing mechanism
- ✓ Transition from real time central dispatch to a balancing market for dispatch based on generation plan and forecasted consumption
- ✓ State and private generators submit UpReg and DownReg offers based on their costs.
- ❖ System Marginal Price (SMP); based on accepted UpReg and DownReg offers
- ❖ System Imbalance Price (SIP); single energy imbalance price for settlement
- ✓ 3 settlement periods on monthly basis
- ✓ Introduction of eligible customer; Annual consumption of 9 GWh

Transition Period (2006-2009)

✓Generators submit The National Load Dispatch Center-NLDC;

a) UpReg and DownReg offer prices on monthly basis
b) Daily generation schedule (DGS) to NLDC
c) Submit technical parameters to on daily basis

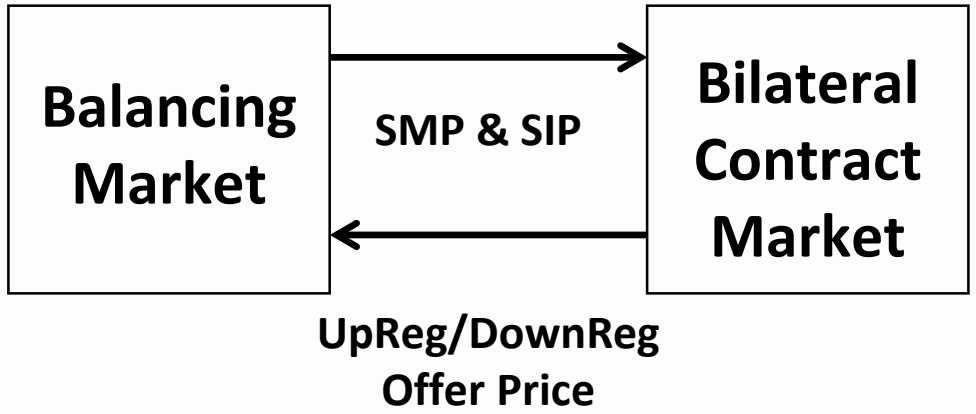
✓Volumes for UpReg and DownReg offers consist of 2 levels; based on DGS, Available Capacity and Minimum Stable Generation Level
✓NLDC accepts UpReg and DownReg offers to maintain system balance
✓DownReg /UpReg volumes are considered at calculation of energy imbalance

✓3 venues for participants to trade;

➢Sales/purchase via bilateral contracts
➢Sales/purchase via UpReg and DownReg offers (for balancing generators)
➢Sales to/purchase from system as imbalance energy

Transition Period (2006-2009)

- ✓ SMP; accepted UpReg offer with highest price/DownReg offer with lowest price in an hour
- ✓ SIP; weighted average of SMP's at hours belonging to day, night or peak period (i.e. 3 prices for month)

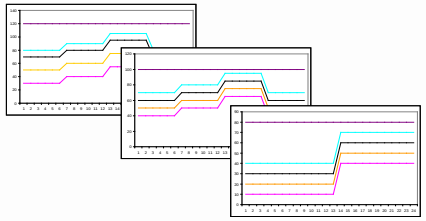


- ✓ Interactions between two markets;
- ❖ Determination of UpReg/DownReg prices based on
  a) Volume/Price committed to bilateral contracts
  b) Generation cost
  c) Uncomitted volume

- ❖ SIP is calculated using SMP's of relevant hours (determined by UpReg/DownReg offer prices)

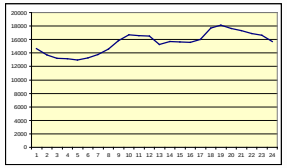
Transition Period (2006-2009)

✓Balancing Mechanism;



- Monthly; UpReg and DownReg Price Offers
- Daily; Daily Generation Schedule Other Technical Parameters

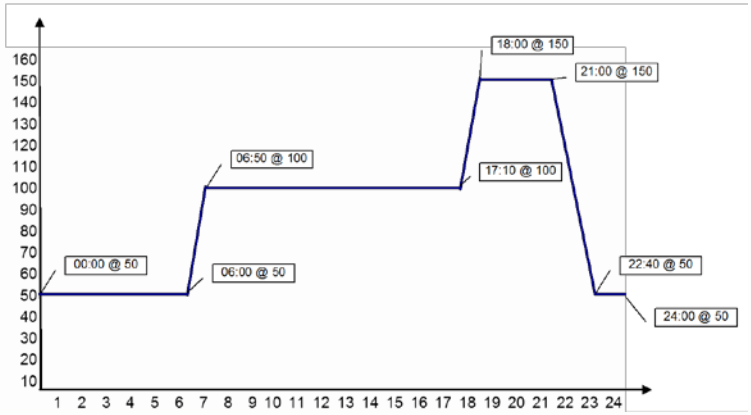
Congestion Management



Transition Period (2006-2009)

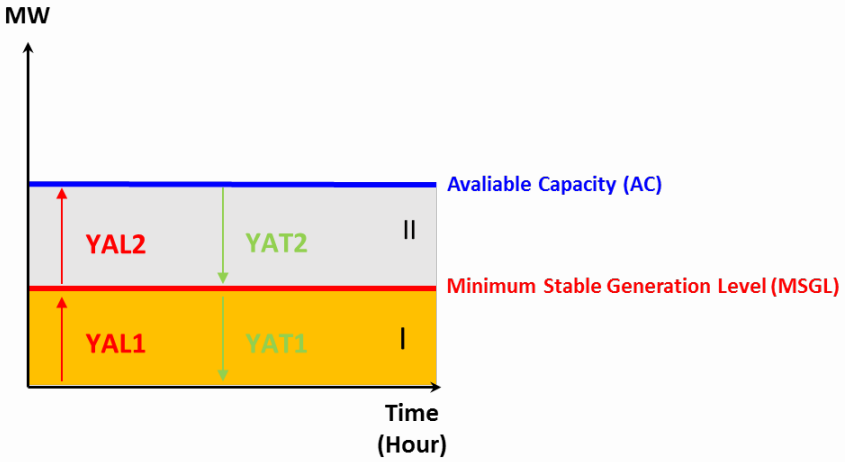
✓ Daily Generation Schedule

Starting Time	Starting Level (MW)	Ending Time	Ending Level (MW)
00:00	50	06:00	50
06:00	50	06:50	100
06:50	100	17:10	100
17:10	100	18:00	150
18:00	150	21:00	150
21:00	150	22:40	50
22:40	50	24:00	50



✓ Forms basis for UpReg and DownReg Offer amounts for balancing units

✓ UpReg and DownReg Price Offers;



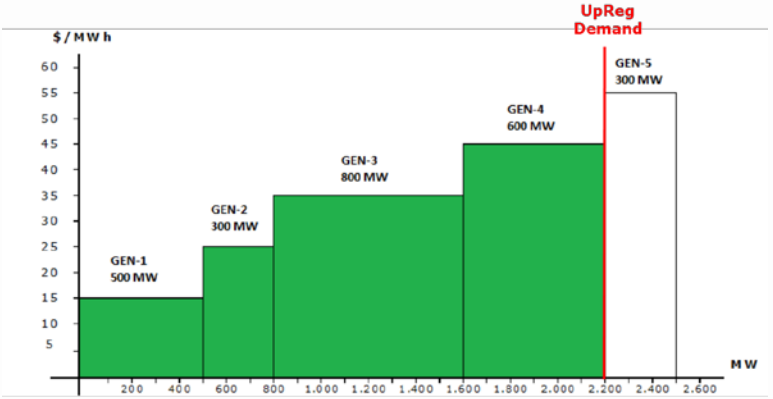
✓ Offer can be at most 2 price levels;

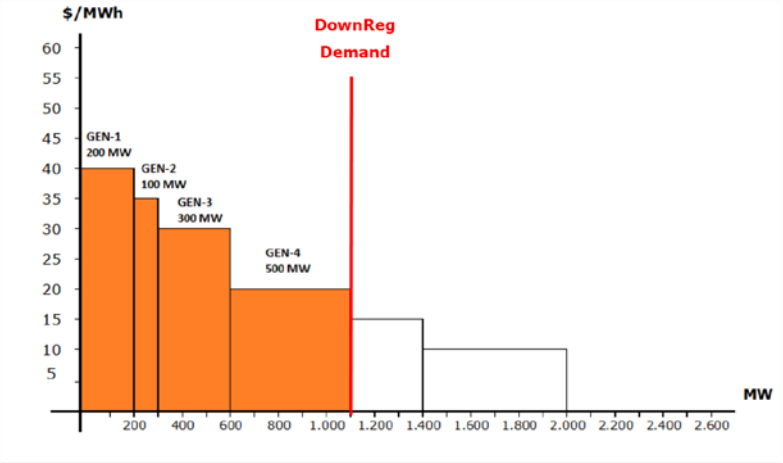
- ❖ UpReg Price Offer 1 (YAL1): price demanded for increasing generation up to MSGL
- ❖ UpReg Price Offer 2 (YAL2): price demanded for increasing generation up to AC
- ❖ DownReg Price Offer 1 (YAT1): price demanded for decreasing generation below MSGL
- ❖ DownReg Price Offer 2 (YAT2): price demanded for decreasing generation below AC

Transition Period (2006-2009)

✓ System Marginal Price;

✓ Represents marginal cost of additional generation: highest offer price of currently running generator





✓ Respective UpReg (merit order being lowest price) and DownReg (merit order being highest price) offers are placed at merit order

- ❖ If system is energy deficient; accepted UpReg offer with highest price sets SMP
- ❖ If system is energy surplus; accepted DownReg offer with lowest price sets SMP

✓ **Marginal pricing** for offers accepted for balancing purpose

✓ UpReg/DownReg offers accepted outside merit order list for purposes other than balancing (transmission constraints, emergency situation, system security) are evaluated via **pay-as-bid**

Transition Period (2006-2009)

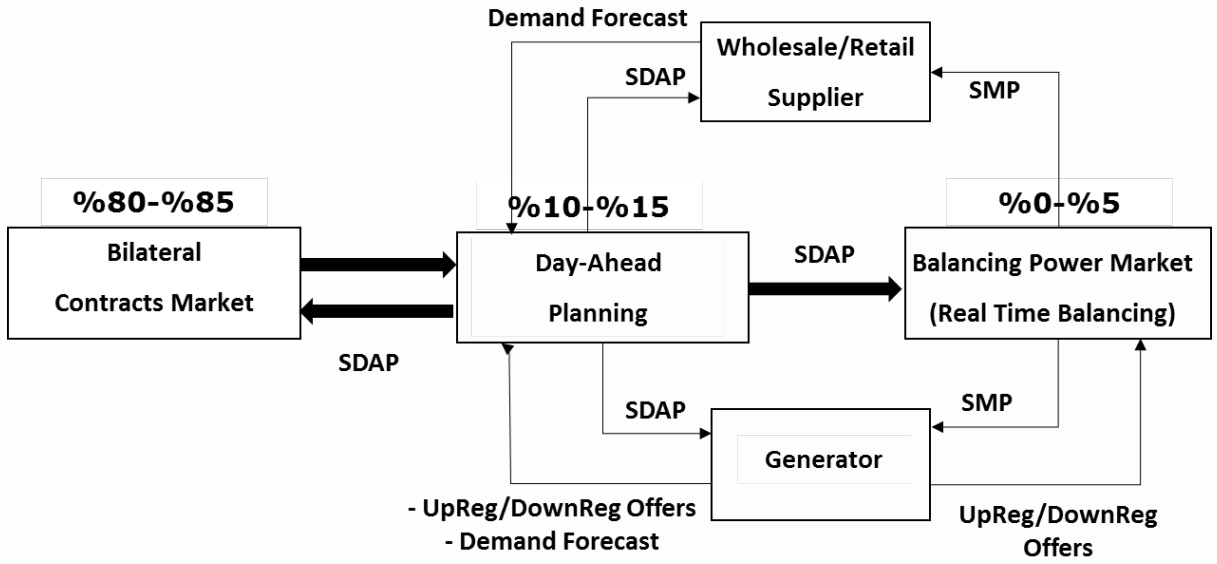
- ✓ <u>System Imbalance Price-Calculation Example</u>
- ✓ Energy imbalances and accepted UpReg/DownReg offers could not be settled hourly due to insufficient metering structure
- ✓ Settlements based on 3 settlement period (day, night, peak) via calculating separate SIP's on monthly basis.

  Weighted average of SMP's at hours belonging to day, night or peak period

  (Total Payment Required For Instructions)/(Total Amount of Instructions Given)

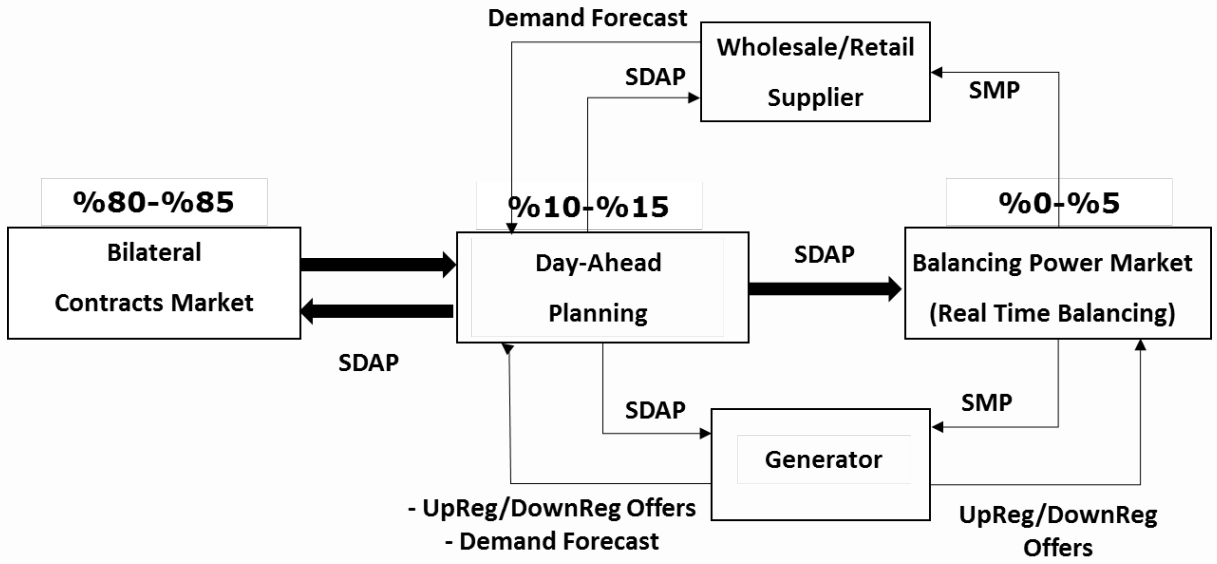
Settlement Period	Hour	UpReg Amount (MWh)					SMP (TL/MWh)	UpReg Payment (TL)					SIP (TL/MWh)
		G1	G2	G3	Total			G1	G2	G3	Total		
Night	23	210	260	100	570	2.960	65	13.650	16.900	6.500	37.050	156.000	53
	24	210	260	100	570		65	13.650	16.900	6.500	37.050		
	1	210	150		360		45	9.450	6.750		16.200		
	2	210	100		310		45	9.450	4.500		13.950		
	3	210	50		260		45	9.450	2.250		11.700		
	4	210	50		260		45	9.450	2.250		11.700		
	5	210	50		260		45	9.450	2.250		11.700		
	6	210	160		370		45	9.450	7.200		16.650		

Day-Ahead Planning Period (2009-2011)



- ✓ Main document; Balancing and Settlement Regulation (2009)
- ✓ Bilateral contract market and Day-Ahead Planning; day-ahead balancing and complementing balancing power market
- ✓ Employment of non-regulated bilateral contracts
- ✓ Enhanced metering infrastructure; allowing hourly settlement of energy imbalances
- ✓ System Marginal Price; hourly energy imbalance price
- ✓ System Day-Ahead Price (SDAP); reference price for bilateral contracts
- ✓ Day-Ahead Planning; spun off from Balancing Market and allows day-ahead balancing of system based on forecasted demand
- ✓ Balancing Power Market; procurement of ancillary services, mitigation of transmission congestion and formation of reserve capacity for real time balancing

Day-Ahead Planning Period (2009-2011)



- ✓ Participation is mandatory to Day-Ahead Planning
- ❖ Wholesale/retailer supplier submit **daily load forecast** associated with their consumers
- ❖ Generators (balancing units) submit their **daily generation schedule (DGS)** and **daily load forecast** associated with their consumers
- ❖ Additionally balancing units submit their **UpReg (Sales) and DownReg (Purchase) price and volume offers daily**
- ✓ Daily offers presented to Day-Ahead Planning on hourly basis
- ✓ Daily Generation Schedule; planned hourly total generation of a generation unit
- ✓ UpReg (Sales) Offers; amount of increase in generation above DGP at a particular hour
- ✓ DownReg (Purchase) Offers; amount of decrease in generation below DGP at a particular hour
- ✓ Finalized Daily Generation Plan is formed for each generator after Day-Ahead Planning

Day-Ahead Planning Period (2009-2011)

- ✓ Formation of System Day-Ahead Price (SDAP);
- ✓ Dispatch Tool is used for calculating SDAP for each hour basis on unconstrained marginal system marginal price
- ✓ Aggregated daily generation plan, forecasted total demand and offers of participants are considered

Hour	Aggregated Generation Plan (MWh)	Forecasted Total Demand (MWh)	Balance (MWh)	System Direction	Dominant Direction of Accepted Offers
08:00	16.000	17.000	-1.000	Energy Deficit	Sales
09:00	10.000	10.000	0	Balance	Balance
10:00	12.000	11.500	500	Energy Surplus	Purchase
11:00	17.000	17.700	-700	Energy Deficit	Sales

- ✓ In case system is **energy deficit**, dominant direction of accepted offers is at **sales direction (from participant point of view)** (i.e. most volume accepted belongs to sale offers but to adjust balance some volume belongs to purchase direction offers can also be accepted)

- ✓ In case system is **energy surplus**, dominant direction of accepted offers is at **purchase directions (from participant point of view)**

Day-Ahead Planning Period (2009-2011)

- ✓System sales offers are put to in merit order at increasing price order
- ✓System purchase offers are put in merit order at decreasing price order
- ✓Depending on system direction sales or purchase offer merit order is chosen

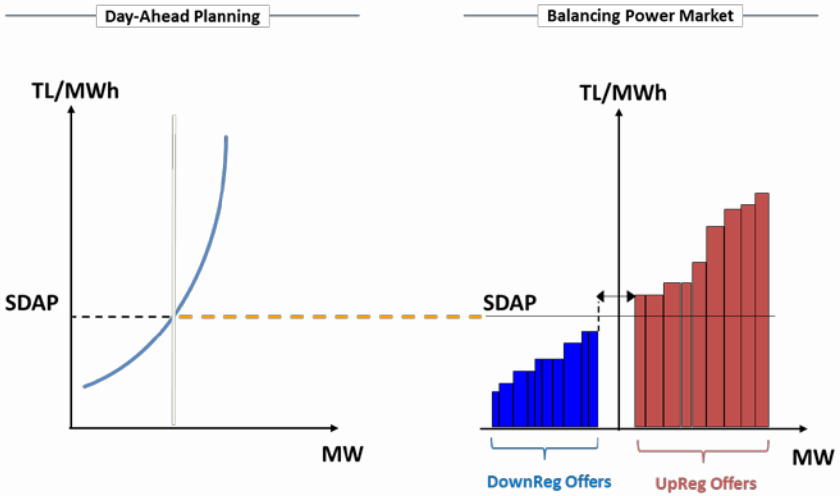
Merit Order for Sales Offers For Hour 08:00		
Amount of Offer (MWh)	Price of Offer (TL/MWh)	Partial Acceptance
100.00	70.00	YES
100.00	70.00	YES
100.00	71.00	NO
100.00	74.00	YES
100.00	79.00	NO
100.00	80.00	YES
100.00	83.00	NO
100.00	87.00	YES
100.00	96.00	NO
180.00	97.00	NO
150.00	99.00	YES
200.00	100.00	YES

Total Accepted Amount of Offer 1.000 MWh

- ✓ For Hour 08:00, there is 1.000 MWh of energy deficiency;
- ❖ Offers are accepted at merit order to cover required amount of energy
- ❖ Last Accepted Offer of 180 MWh at 97 TL/MWh is enough to satisfy 1.000 MWh deficit.
- ❖ This is the marginal offer and price of 97 TL sets System Day-Ahead Price

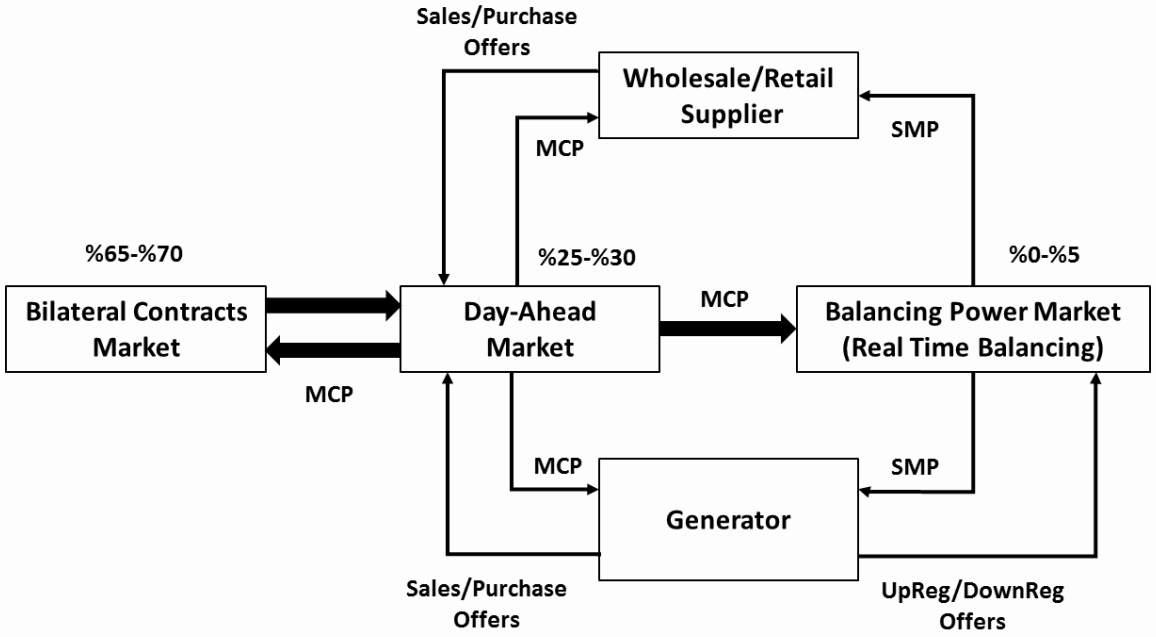
Day-Ahead Planning Period (2009-2011)

- ✓ <u>Balancing and Power Market;</u>
- ✓ Daily offers presented to Balancing Power Market on hourly basis
- ✓ Balancing units offer generation output changes (increase or decrease from a level) within 15 minutes as reserve capacity
- ✓ Balancing units submit their Finalized Daily Generation Program, UpReg and DownReg offers (price-quantity) on daily basis
- ✓ UpReg and DownReg offers; 15 price-quantity levels are allowed and each quantity level represents increment or decrement from previous quantity level



- ✓ System Day-Ahead Price sets reference price for DownReg and UpReg offers;
- ❖ UpReg offer prices starting from SDAP and continues with an **increasing fashion**
- ❖ DownReg offer prices starting from SDAP and continues with an **decreasing fashion**

Day-Ahead Market Period (2011-2015)



✓ Main documents;

- Balancing and Settlement Regulation (2009)
- Electricity Market Law No: 6446 (2013)

✓ Transition from Day-Ahead Planning to Day-Ahead Market

- Participation becomes voluntary
- Shift from generation balancing unit basis to portfolio (generation and consumption units) basis
- Portfolio balance responsibility
- Demand side can submit sales/purchase offers

✓ Participants have various options for generation and consumption plans to balance their portfolio.

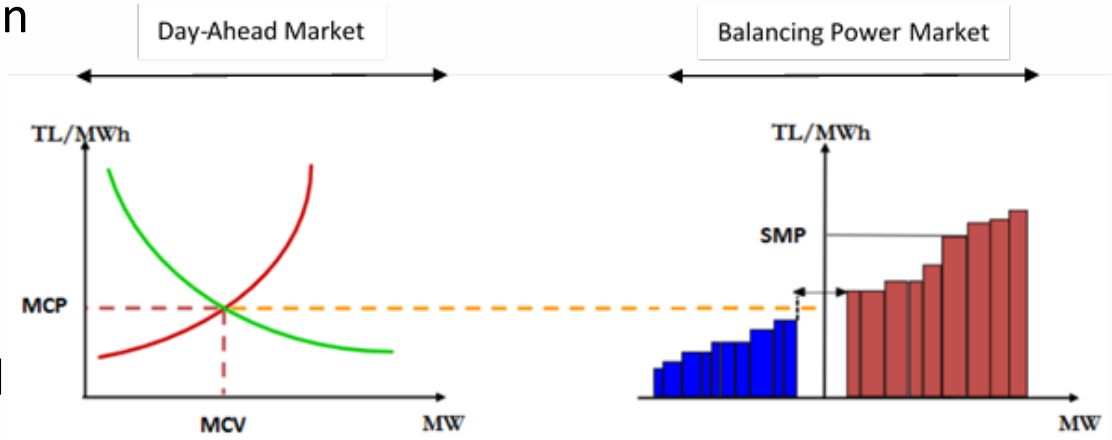
- Generating for their consumption
- Purchasing from the market for their consumption
- Selling extra generation to the market

✓ Market Clearing Price (MCP);

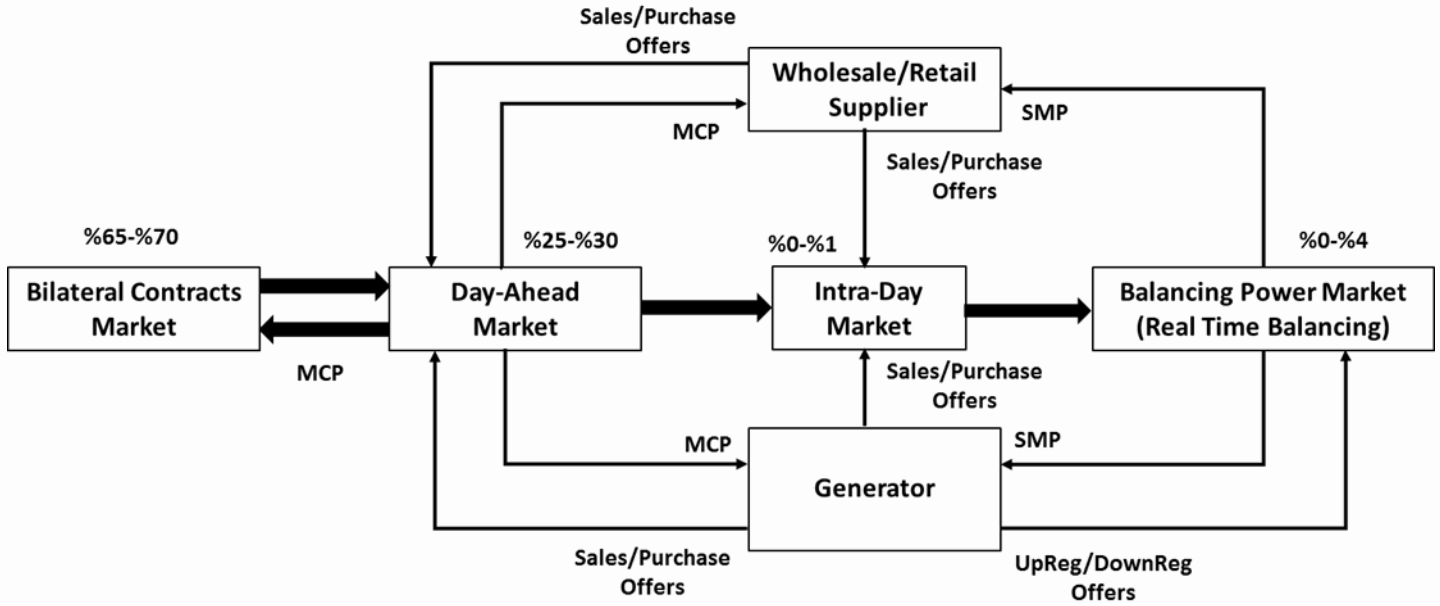
- Reference price for bilateral contracts.
- Signal for balancing portfolio

Day-Ahead Market Period (2011-2015)

- ✓ Supply and demand sides reflect their cost structures to the same platform;
- Formation of spot market in real sense
- Formation of true reference price as MCP
- ✓ Aggregated supply and demand curves are formed based on sales/purchase offers for each hour
- ✓ Intersection of supply and demand curves indicate
- Market Clearing Price (MCP)
- Market Clearing Volume (MCV)
- ✓ MCP and MCV are calculated via complex optimization tool
- ✓ <u>Introduction of collateral and advance payment mechanims;</u>
- Collateral required for engaging market operations
- Advance payment based on daily transactions at the Day-Ahead market
- ✓ **Ensuring continuation of cash-flow for healthy market operations**



Intra-Day Market Period (2015-……)



✓ <u>Establishment of Intra-Day Market</u>

- Synchronously operating with Day-Ahead Market and Balancing Power Market
- Physical Delivery Obligation

✓ <u>Main motivation;</u> participants to decrease amount of their imbalances, due to unforeseeable reasons, closer to real time

- Generation/transmission outages
- Variability of renewable generation facilities

✓ Establishment of EXIST-March 2015

✓ EXIST was granted as market operator-September 2015

✓ Deployment of Transparency Platform-March 2016

✓ Activation of Local Day-Ahead Market Optimization and Software-June 2016

Intra-Day Market Period (2015-……)

11:00-12:00 Offer Book					
Hour	Sales Price (TL/MWh)	Sales Amount (LOT)	Hour	Purchase Price (TL/MWh)	Purchase Amount (LOT)
10:10:25	140	50	10:05:25	110	30
09:45:00	145	5	09:41:00	105	20
10:05:30	145	10	09:43:30	105	45
10:15:15	150	30	09:50:15	105	15
09:30:45	155	20	09:30:45	100	200
10:05:05	160	500	10:15:05	90	400
10:08:35	170	200	09:35:35	80	250

Hour	Purchase Price (TL/MWh)	Purchase Amount (LOT)
10:15:25	140	50

11:00-12:00 Offer Book					
Hour	Sales Price (TL/MWh)	Sales Amount (LOT)	Hour	Purchase Price (TL/MWh)	Purchase Amount (LOT)
10:10:25	140	50	10:15:25	140	50
09:45:00	145	5	10:05:25	110	30
10:05:30	145	10	09:41:00	105	20
10:15:15	150	30	09:43:30	105	45
09:30:45	155	20	09:50:15	105	15
10:05:05	160	500	09:30:45	100	200
10:08:35	170	200	10:15:05	90	400
			09:35:35	80	250

✓ Intra-Day Trading Platform

- Continuous trading platform
- Amounts can wholly or partially match
- Gate closure time; 1.5 hours before physical delivery (Initially 2 hours)

✓ Purchase offers; put in merit order at decreasing price order

✓ Sales offers; put in merit order at increasing price order

✓ Intra-Day Matching Example

- Until 10:15:25 no matching occurred since best offers available are not matching on price
- At 10:15:25 purchase offer of 140 TL/MWh and 50 Lot was given, this is the best purchase offer so it is put at first place at merit order.
- Given purchase offer has a suitable counter-offer at sales direction thus matching occured.

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Benefits from Liberalization

Hasan SİLAHTAROĞLU, PMP

Strategy and Business Development Unit Manager

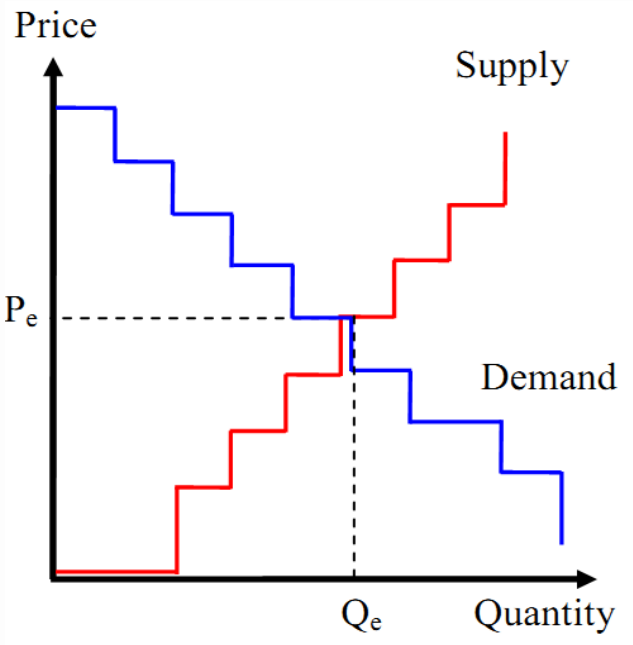
Milestone: Privatization

FRIEDMAN MATRIX(4 WAYS TO SPEND MONEY)				
	For yourself		For somebody else	
	Cost	Quality	Cost	Quality
Your money	YES	YES	YES	NO
Somebody else's money	NO	YES	NO	NO

	PRIVATE
	PUBLIC

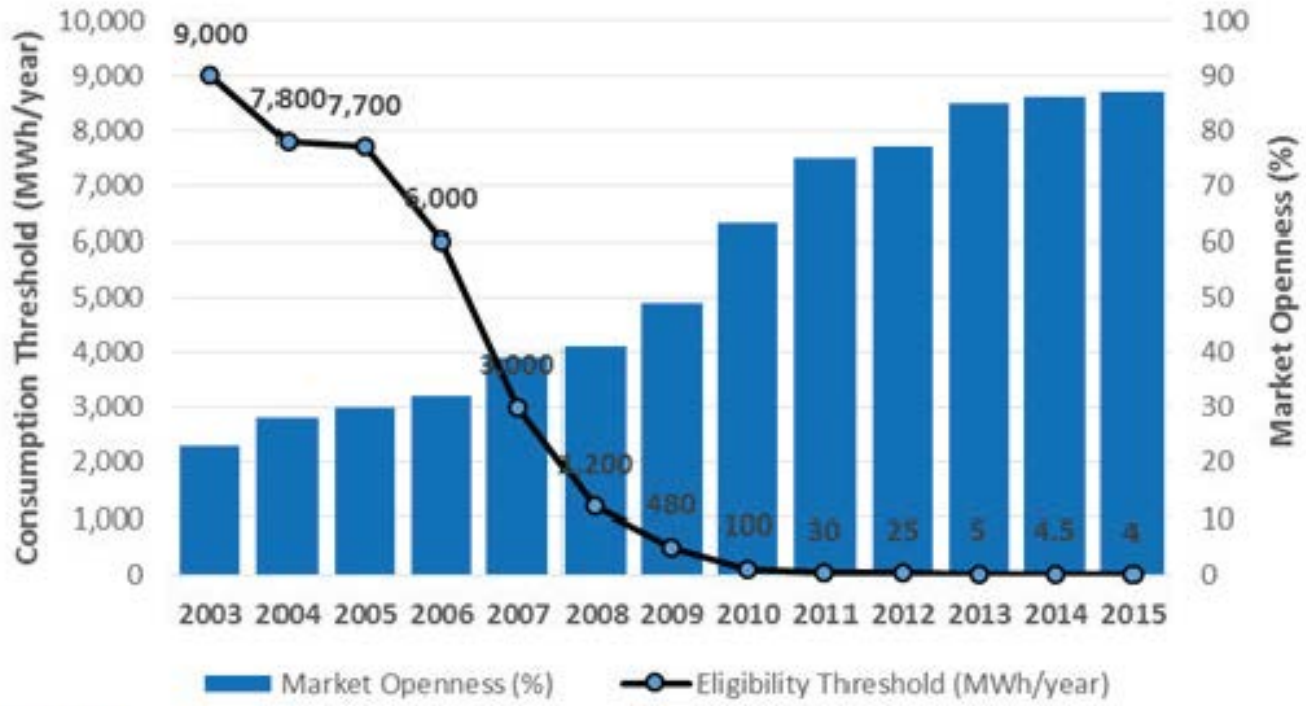
Making Competition Work

- **Investment perspective**
  - Economic and political stability
  - Long-term view on policy priority
  - Predictability and investment comfort
  - Appropriate market mechanisms for trade
- **Regulatory perspective**
  - Security of supply, social & environmental goals
  - Unbundling
  - Non-discriminatory network access
  - Consumer choice



Eligibility: Theoretical and Actual Market Openness

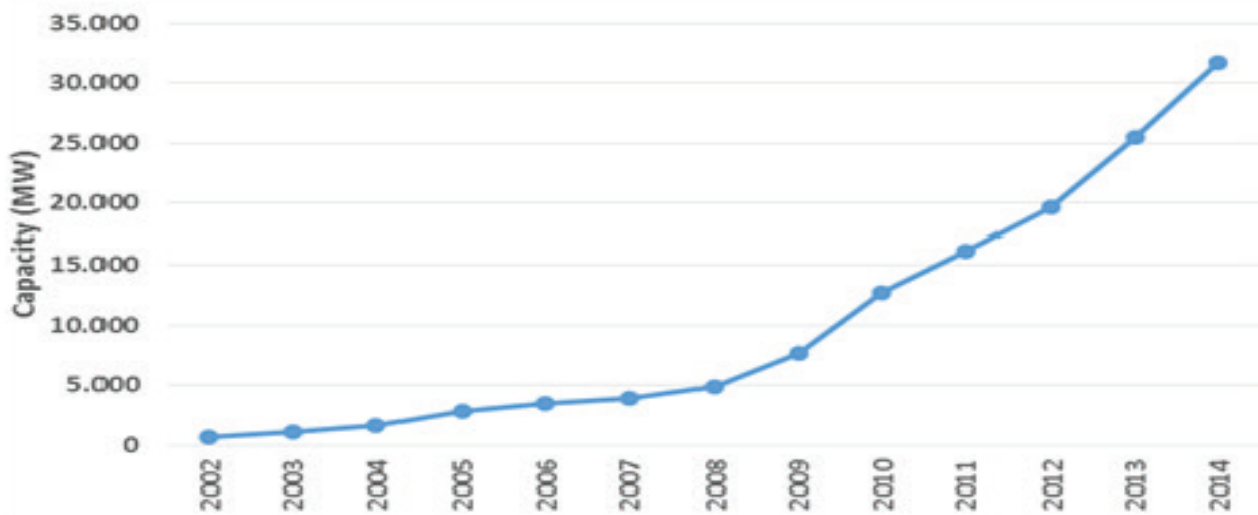
Figure 44. Development of Eligibility Limits and Market Openness, 2003–15



Source: TEİAŞ/PMUM.

Generation Investments

Figure 48. New Power Plant Capacity Realized by Private Companies, 2002–14 (MW)

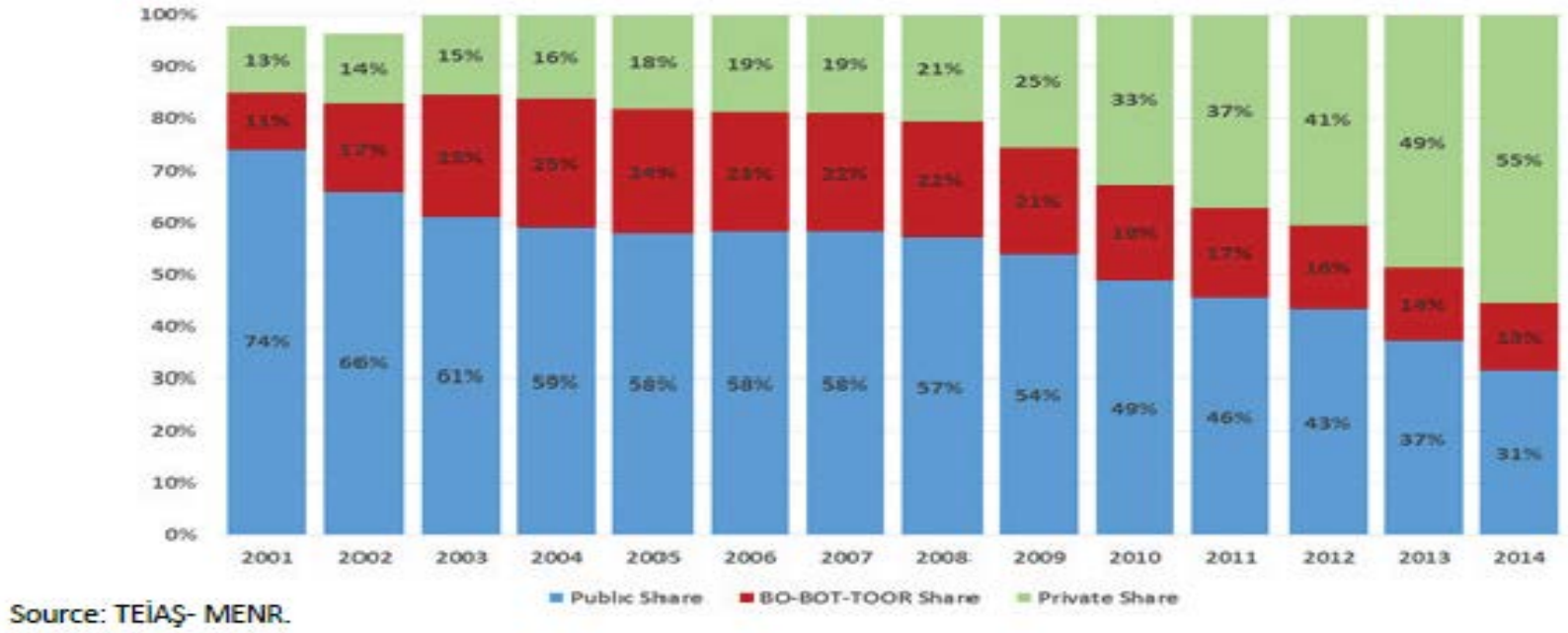


Source: MENR and TEİAŞ.

- As shown in Figure 48, private investment gained pace after 2007 and 88% of this capacity was realized in 2007–14. The reform process has attracted large generation investments by many private companies, with an annual average investment of roughly $4 billion in 2008–14

Generation Investments

Figure 50. Shares of Generation Companies in Total Installed Power, 2001–14

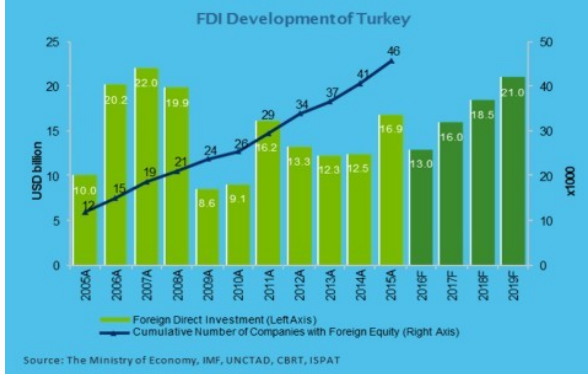


Source: TEİAŞ- MENR.

- As shown in Figure 50, the share of market-based private sector capacity in the total installed power had reached 55% – meaning that market-based power accounted for the majority of Turkey's power supply less than 14 years after the enactment of the EML in 2001.

Foreign Direct Investment

Foreign Direct Investments



Source: The Ministry of Economy, IMF, UNCTAD, CBRT, ISPAT

With respect to 2003 volumes, annual Inward Direct Investment values have increased about 10 times with recent reforms and regulations.

Owing to the prominent economic performance, Turkey attracted around USD 160 billion of foreign direct investment between 2003 and 2015 and Turkish economy is expected to attract USD 70 billion of FDI within the next 4 years.

Energy, Manufacturing, Financial & Insurance Activities and Retailer Trade sectors are the leading ones which constitute 80% of the total FDI inflow of Turkey.

Souce: dektmk.org.tr

Foreign Direct Investments

Source: The Ministry of Economy
* Real estate investments are excluded on FDI shares.

In the last decade, Turkey has enhanced its regulations for foreign investors and become an attractive investment market. In 2016, more than 50,000 companies with foreign equity have operations in Turkey.

Souce: dektmk.org.tr

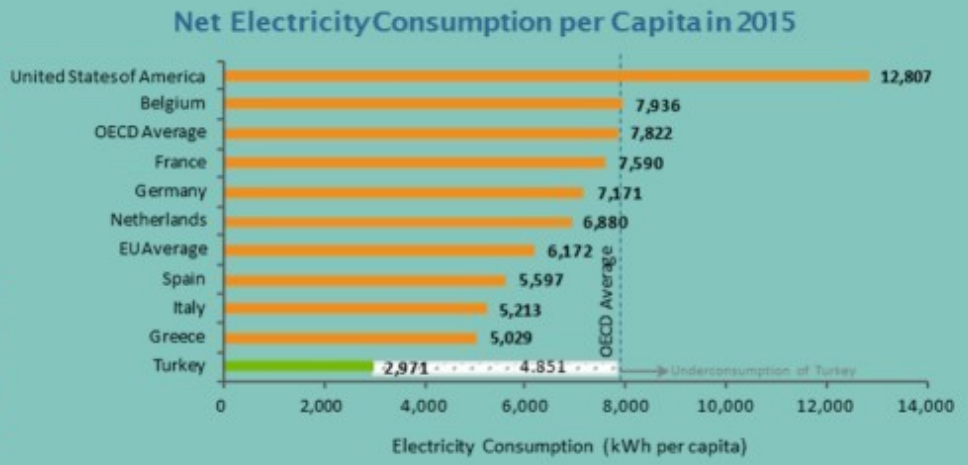
Consumption per Capita

Net Electricity Consumption per Capita

As of MENR base scenario demand projection, electricity consumption will be more than doubled in 15 years by reaching 581 TWh from current level of 266 TWh.

Turkey is one of the fastest growing countries among OECD members in terms of electricity consumption. However, on average, per capita electricity consumption is still much less compared to OECD average.

In 2015, average per capita consumption for OECD member countries is ca. 7.8 MWh, while it is around 3.0 MWh in Turkey. This is another viewpoint showing growth potential of Turkey's electricity consumption.



Source: World Development Indicators

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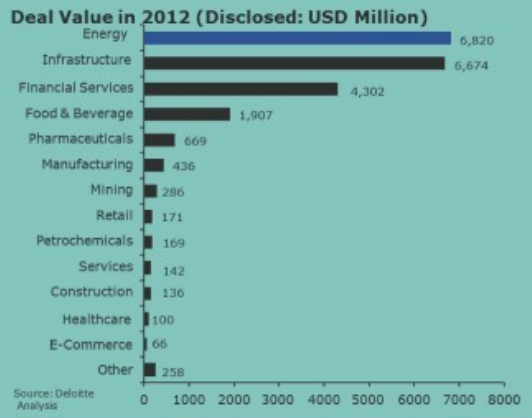
Entry of Major International Players

Entry of major international players

Energy along with infrastructure and financial services received the highest sectoral share, with an approx. 74% share in total M&A volume (including estimates for undisclosed values). In terms of number of deals, manufacturing and energy took the lead with 38 and 36 deals, respectively.



Energy Sector Deals 2012 , Foreign

Acquirer	Origin	Target	Stake (%)
Goldman Sachs	USA	Aksa Enerji	13.3
Aquila Capital	Germany	Karasular Enerji	40 (*)
Tiway Oil	Norway	Petrol Ofisi Exploration	100
E.ON	Germany	Enerjisa	50
Inter RAO	Russia	AEI Enerji Holding	100
Oteko Group	Russia	BP Turkey: LPG Bottle & Tank Filling; Wholesale and Autogas Businesses	100
Samsung	Korea	ACWA Elektrik	N/D
BR Energy	UK	Hayat Enerji	25
SOCAR	Azerbaijan	Petkim	100

Source: Deloitte Analysis
(*) Updated as 100 recently

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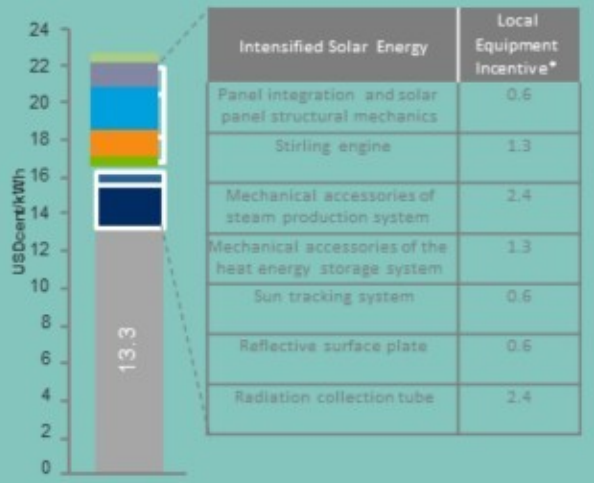
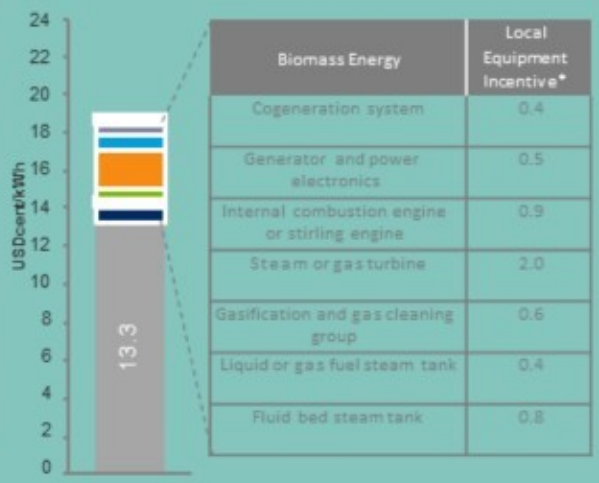
Local Equipment Incentives

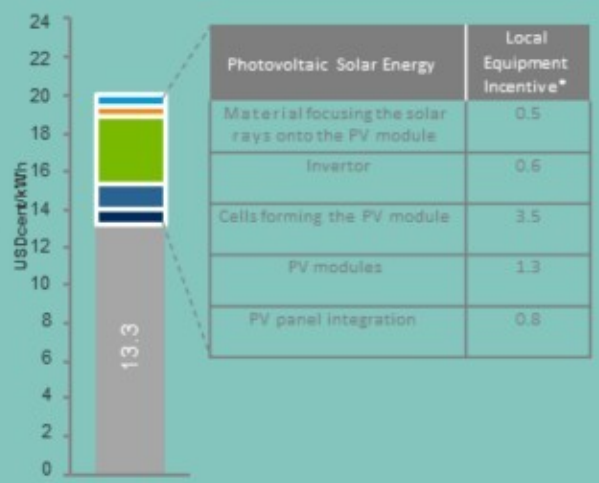
Local Equipment Incentives



Intensified Solar Energy	Local Equipment Incentive*
Panel integration and solar panel structural mechanics	0.6
Stirling engine	1.3
Mechanical accessories of steam production system	2.4
Mechanical accessories of the heat energy storage system	1.3
Sun tracking system	0.6
Reflective surface plate	0.6
Radiation collection tube	2.4



Biomass Energy	Local Equipment Incentive*
Cogeneration system	0.4
Generator and power electronics	0.5
Internal combustion engine or stirling engine	0.9
Steam or gas turbine	2.0
Gasification and gas cleaning group	0.6
Liquid or gas fuel steam tank	0.4
Fluid bed steam tank	0.8



Photovoltaic Solar Energy	Local Equipment Incentive*
Material focusing the solar rays onto the PV module	0.5
Invertor	0.6
Cells forming the PV module	3.5
PV modules	1.3
PV panel integration	0.8

Local equipment manufacturing and localization strategy of the Government constitutes strategic importance in conjunction with its direct positive effects on job creation, enterprise development and consequently GDP and current deficit.

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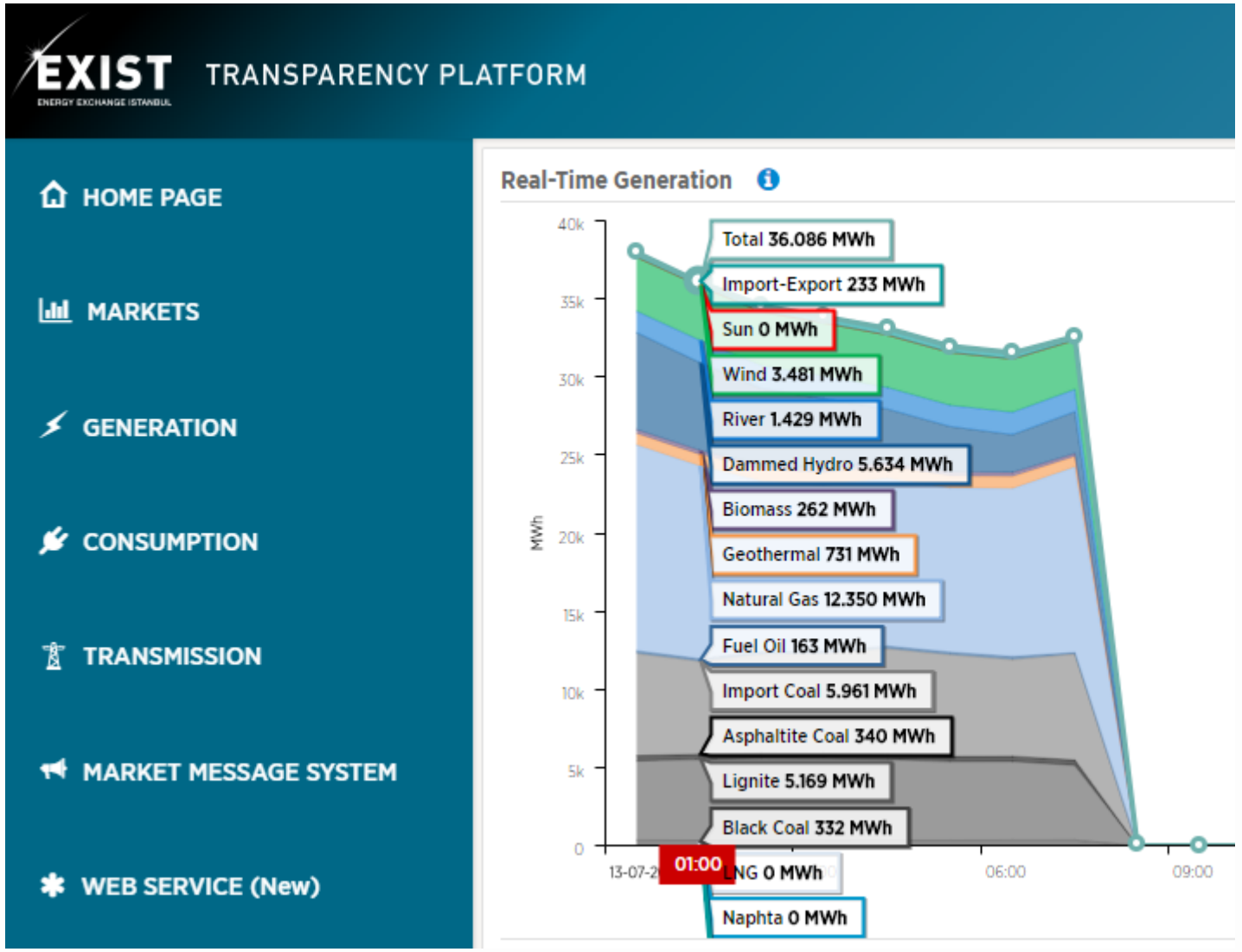
Competition

Transparency



THANK YOU