



EDAMS
Technology

EDAMS - Energy Market Operations System (EMOS)



Energy Trading

Cost Optimal Energy trading operations balancing supply and demand.

EDAMS Energy Trading covers all requirements related to the continuous optimal trading operation of an Energy producer and retailer in the Electricity Market. The module allows for (a) Regulations & Tariffs, (b) Registration of all production units as well as all market participants, and (c) Flexible PPA (Power Purchase Agreements) between all related internal and external parties.

Demand forecasting is performed in several ways, considering consumption patterns per individual connection. Production forecasting considers both environmental variables and specific park condition and behavior as well as pending production restrictions. The system communicates directly with the (MDMS) Meter Data management system to receive real time consumptions and productions,

EDAMS Energy Trading comes in two versions, depending on the type of electricity market as follows:

- a) EDAMS-ETMS (Energy Transitional Market System). This model applies in markets where trading is carried out monthly, usually being transitional markets prior to opening up of the proper market.

Figure 1: EDAMS-ETMS (Energy Transitional Market System) functional diagram.



- b) EDAMS-EMOS (Energy Management Operations System). This is the normal Energy Trading model applicable (at this stage) for The Forward Market and Day ahead market trading.

Figure 2: EDAMS-EMOS (Energy Management Operations System) functional diagram.



The Balancing module calculates in a cost optimal manner Over the Counter Contract requirements as well as DAM (Day Ahead Market) trading quantities. All submissions in the relevant markets are taken care of by the system.

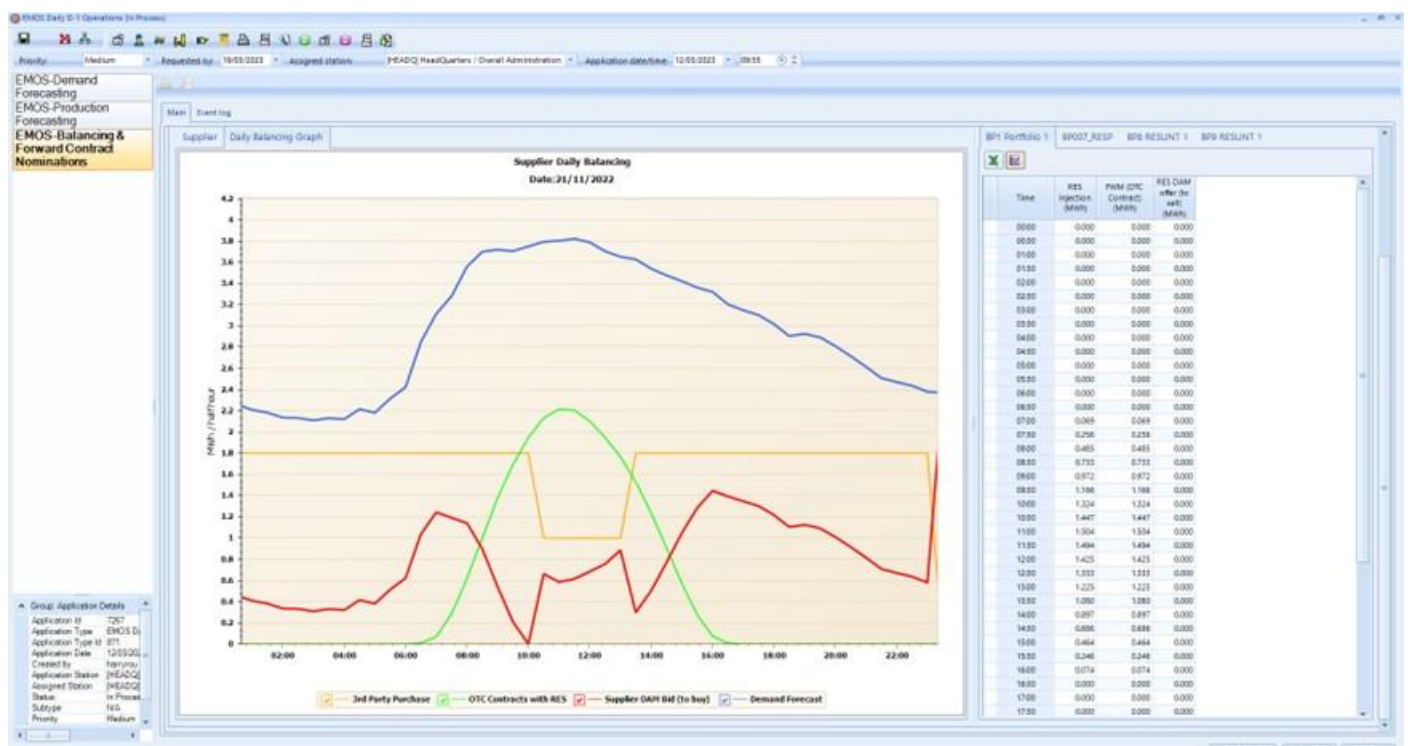
Daily and monthly processes and reconciliations are allowed for down to the level of production of all relevant invoices between the parties involved.

EDAMS-EMOS also comes in two versions:

- 1) EDAMS-EMOS (producer): This version is suitable for producers that simply want to sell their production in the market and not be associated with suppliers.
- 2) EDAMS-EMOS (supplier): The supplier version is for electricity utilities that sell electricity to consumers and at the same time produce solar energy. The module allows the supplier to handle transactions both for itself and on behalf of production units it manages.

At present the EDAMS-EMOS system does not trade in the Balancing Market or Ancillary Services market and thus it is not suitable for a Conventional Power generating unit.

Figure 3: Sample Dashboard from EDAMS Energy Trading software



EDAMS Solar is a comprehensive MIS solution for PV Parks Owners & Electricity Market Operators

EDAMS Electricity Market Operations

EDAMS Electricity Market Operations covers all requirements related to the continuous operation of the Electricity Market, including the comparison of production with supply and performance of all required reconciliations, both energy (kWh) and monetary wise, relating to (a) market arrangements as well as (b) Supplier vs Producer contractual arrangements. Furthermore, the exchange of information with the Market Operator as dictated by the published Market Rules

EDAMS Energy Planning

The main purpose of EDAMS Energy Planning is the forecasting of production and consumption enabling: (a) Short term planning for Declaration of forecasted production and sales, (b) Medium term planning for quantifying sales requirements to meet expected production, and (c) Long-term planning

for quantifying additional production requirements to satisfy a “healthy” growth in sales.



EDAMS Solar Solution

EDAMS Electricity Market Operations is part of the EDAMS Solar System an Integrated Management Information System that addresses all the business requirements of Photovoltaic Parks Owners & Operators about the production and selling of Electricity as well as the proper management of their assets.

EDAMS-Solar covers the complete spectrum of works of PV Park Owners and Operators from Park Development to Asset Management to Operations to Billing customers & Electricity Market Operation.

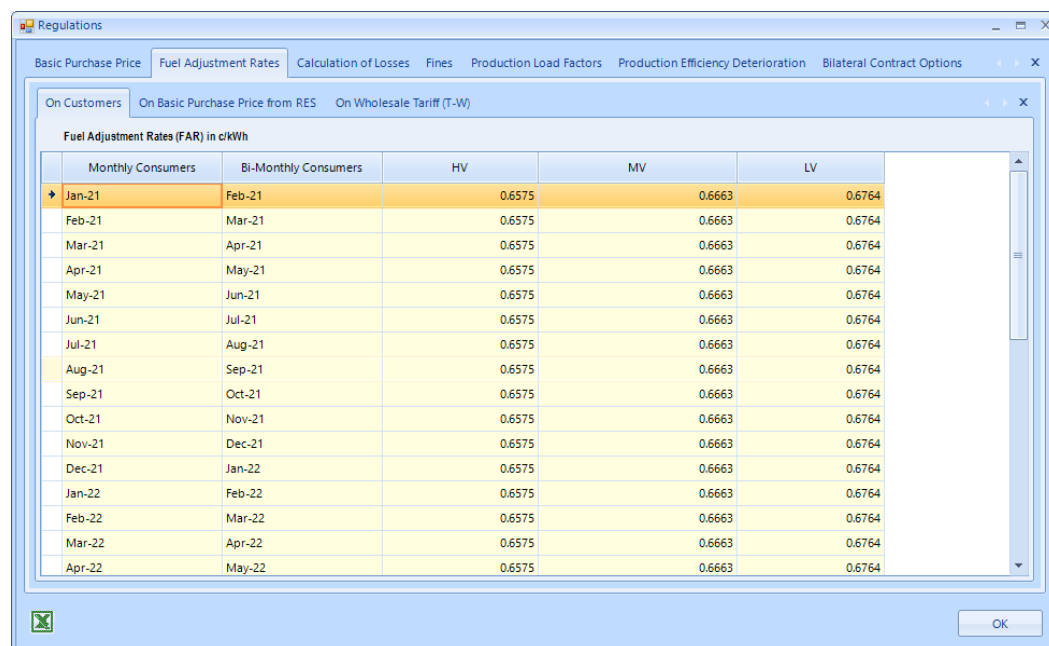


Regulations & Tariffs

Extensive Parametrization of Regulations & Tariffs

Regulations

Extensive parametrization of Regulation and settings is allowed covering: (a) Basic Purchase Prices (b) Fuel Adjustment Rates (c) Calculation of Losses (d) Fines (e) Production Load Factors (f) Efficiency Deterioration and (g) Bilateral Contracts.

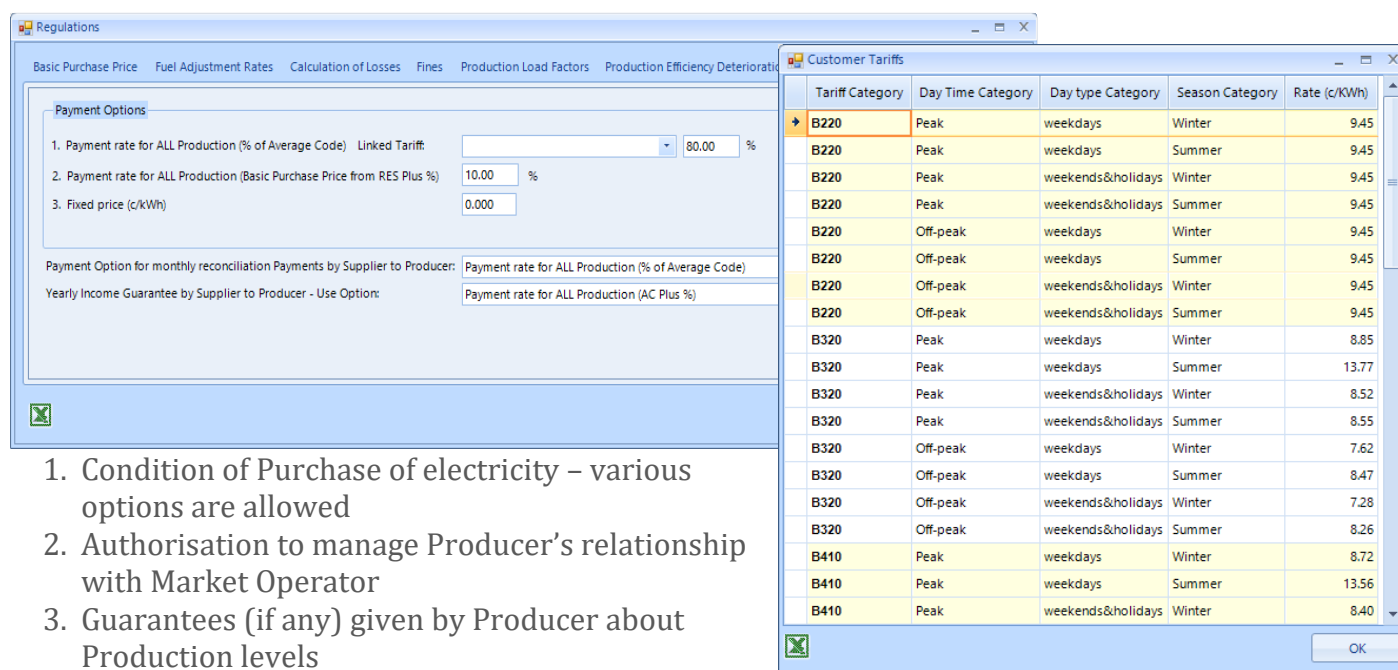


The screenshot shows the 'Regulations' window with the 'Fuel Adjustment Rates (FAR) in c/kWh' tab selected. The table displays rates for various consumer categories and months.

Monthly Consumers	Bi-Monthly Consumers	HV	MV	LV
Jan-21	Feb-21	0.6575	0.6663	0.6764
Feb-21	Mar-21	0.6575	0.6663	0.6764
Mar-21	Apr-21	0.6575	0.6663	0.6764
Apr-21	May-21	0.6575	0.6663	0.6764
May-21	Jun-21	0.6575	0.6663	0.6764
Jun-21	Jul-21	0.6575	0.6663	0.6764
Jul-21	Aug-21	0.6575	0.6663	0.6764
Aug-21	Sep-21	0.6575	0.6663	0.6764
Sep-21	Oct-21	0.6575	0.6663	0.6764
Oct-21	Nov-21	0.6575	0.6663	0.6764
Nov-21	Dec-21	0.6575	0.6663	0.6764
Dec-21	Jan-22	0.6575	0.6663	0.6764
Jan-22	Feb-22	0.6575	0.6663	0.6764
Feb-22	Mar-22	0.6575	0.6663	0.6764
Mar-22	Apr-22	0.6575	0.6663	0.6764
Apr-22	May-22	0.6575	0.6663	0.6764

Bilateral Contracts

Bilateral Agreements are signed between the Supplier with the Producer for each Production unit specifying conditions of sale; The system allows flexibility for such conditions. A typical agreement will include:



The screenshot shows the 'Regulations' window with the 'Payment Options' and 'Customer Tariffs' tabs. The 'Payment Options' tab shows settings for payment rates, and the 'Customer Tariffs' tab shows a table of tariffs.

Tariff Category	Day Time Category	Day type Category	Season Category	Rate (c/kWh)
B220	Peak	weekdays	Winter	9.45
B220	Peak	weekdays	Summer	9.45
B220	Peak	weekends&holidays	Winter	9.45
B220	Peak	weekends&holidays	Summer	9.45
B220	Off-peak	weekdays	Winter	9.45
B220	Off-peak	weekdays	Summer	9.45
B220	Off-peak	weekends&holidays	Winter	9.45
B220	Off-peak	weekends&holidays	Summer	9.45
B320	Peak	weekdays	Winter	8.85
B320	Peak	weekdays	Summer	13.77
B320	Peak	weekends&holidays	Winter	8.52
B320	Peak	weekends&holidays	Summer	8.55
B320	Off-peak	weekdays	Winter	7.62
B320	Off-peak	weekdays	Summer	8.47
B320	Off-peak	weekends&holidays	Winter	7.28
B320	Off-peak	weekends&holidays	Summer	8.26
B410	Peak	weekdays	Winter	8.72
B410	Peak	weekdays	Summer	13.56
B410	Peak	weekends&holidays	Winter	8.40

1. Condition of Purchase of electricity – various options are allowed
2. Authorisation to manage Producer's relationship with Market Operator
3. Guarantees (if any) given by Producer about Production levels

Tariff Structures

Tariff Categories are user-definable, enabling changing of tariff structure as required. If Client uses the EDAMS Billing & CRM system, Customer tariffs categories & structures are read automatically from the EDAMS Billing & CRM system. Tariffs/ charges/ variables set by Market Operator such as: Basic Purchase Price of Solar Energy, (b) Fuel Adjustment Rates and (c) Loss Coefficients are also allowed for.

Planning – Production Analysis

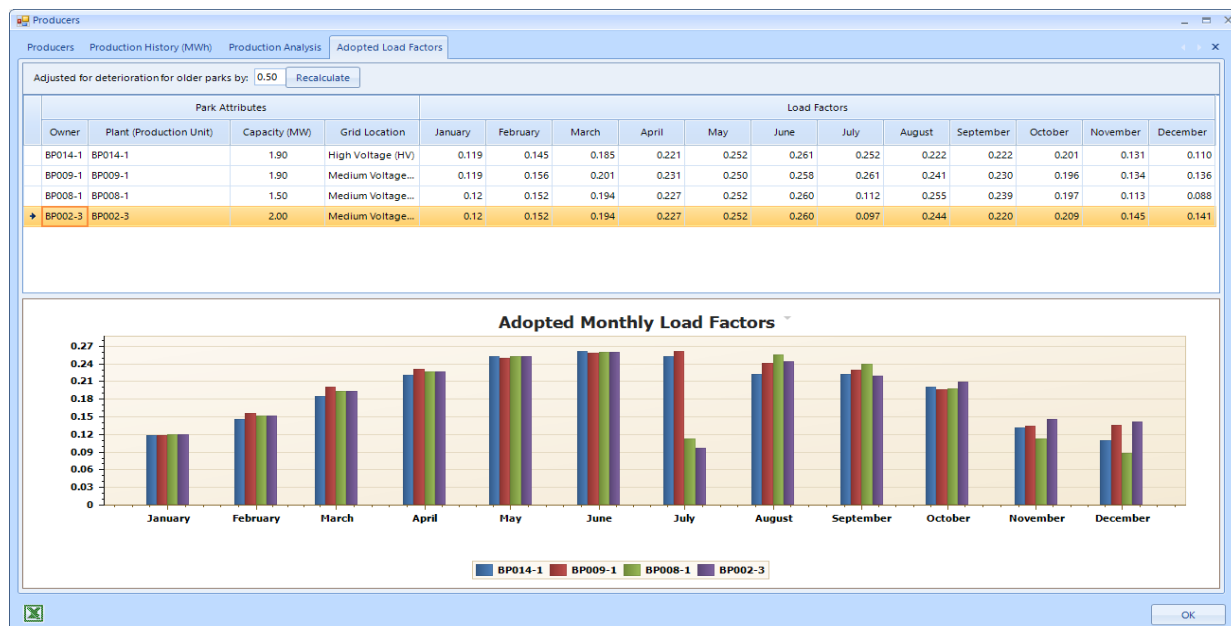
Production Analysis, Forecasting & Planning

Producer Information

The system keeps Information on Production Units, such as: Owner, Plant name, Grid Location (HV/MV/LV), Capacity (MW), Connection date, earliest Connection date, Date Entering the Market and Bilateral Agreement Terms. The user can update the Planned Date Entering the Market.

Production Records Management

Historical Analysis of production records is carried out to calculate Monthly Load Factors per park.



Production Forecasting

Production/ Purchase Cost rates are forecasted and compared. Production is forecasted monthly as per Monthly Load factors adopted.



Planning - Consumption Analysis

Consumption Analysis, Forecasting & Planning

Customer Records Management

Information on Existing & Prospective Customers, including: Meter Serial Number, Customer Name, Tariff Category, Location (HV,MV,LV), Consumer Type, % Discount (on given tariffs),

Connection Status (CON/FUT) & Planned Connection date as well as Consumption historical data can be input or can be read from the EDAMS Billing % CRM system if used. The user can update the Customer Planned Connection date for Planning purposes

Customer Planning

Schema: 1

Connection Allocation Consumption Forecast Seasonal Deviation Sales Income Forecast Graphs

Consumer Pattern Deviation: Monthly Consumer patterns are compared with monthly production patterns to establish deviation. Consumers are given a priority index. As a secondary index the deviation of Weekend & Holiday Consumption to Weekday Consumption is also calculated. All "future" connections are ranked as per these indices and a combined index.

Customer Info						Seasonal Deviation from Production			Weekend & Holiday to Weekday Deviation			Overall Ranking (Combin...		Proposed Connection Date	
Meter Serial...	Customer Name	Connection...	Contr...	Data availability	Eligible for connection	Index-1	Eligible	Rank-1	Index-2	Eligible	Rank-1	Index-3	Rank-1	Date	Violation
579619	Ambrosia Oils (1...	EXIST		Yes	NO	69.7%			103.3%						
790234	Aquanova Ltd	EXIST		Yes	NO	66.8%			69.0%						
579709	Sigan Managem...	EXIST		Yes	NO	74.7%			23.2%						
585809	Galatariotis Brof...	EXIST		Yes	NO	81.1%			81.2%						
790434	Avghostinos Fo...	EXIST		Yes	NO	166.6%									
790434	Avghostinos Fo...	EXIST		No	NO										
578886	Avghostinos Fo...	EXIST		No	NO										
579905	Παυλός Παπαγι...	EXIST		Yes	NO	79.8%			17.5%						
788865	P&P Ice-cream E...	EXIST		Yes	NO	83.0%									
788860	La Patisserie Pa...	EXIST		Yes	NO	84.5%									
790458	Χρυσόβλα Bio...	FUT		Yes	YES				43.3%	43.3%	15				
789703	Χρυσόβλα Bio...	EXIST		Yes	NO	71.6%			26.0%						
626530	Eurofreight Logi...	FUT		Yes	YES										

Consumption Forecasting

Consumption is forecasted using the Consumption rates (MWH/H) per customer connected/ to be connected and the Calendar number of hours corresponding to each Consumption rate. The forecast is finalized using Energy Balancing Optimisation.



Planning - Energy Balancing

Matching Consumption with Production

Energy Balancing Model

Balancing

Graphs

Energy Balancing Optimisation

Implies matching Consumption (including losses) with Production (including losses). The system guides the user by calculating at all time deviation index [Sales/Production (year ahead) ratio] for the next 12 months to be used as guideline in allocation.

	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	
Season									
Weekdays	20 days	21 days	20 days	20 days	21 days	22 days	22 days	22 days	
Weekends & Holidays	8 days	10 days	10 days	11 days	9 days	9 days	9 days	8 days	

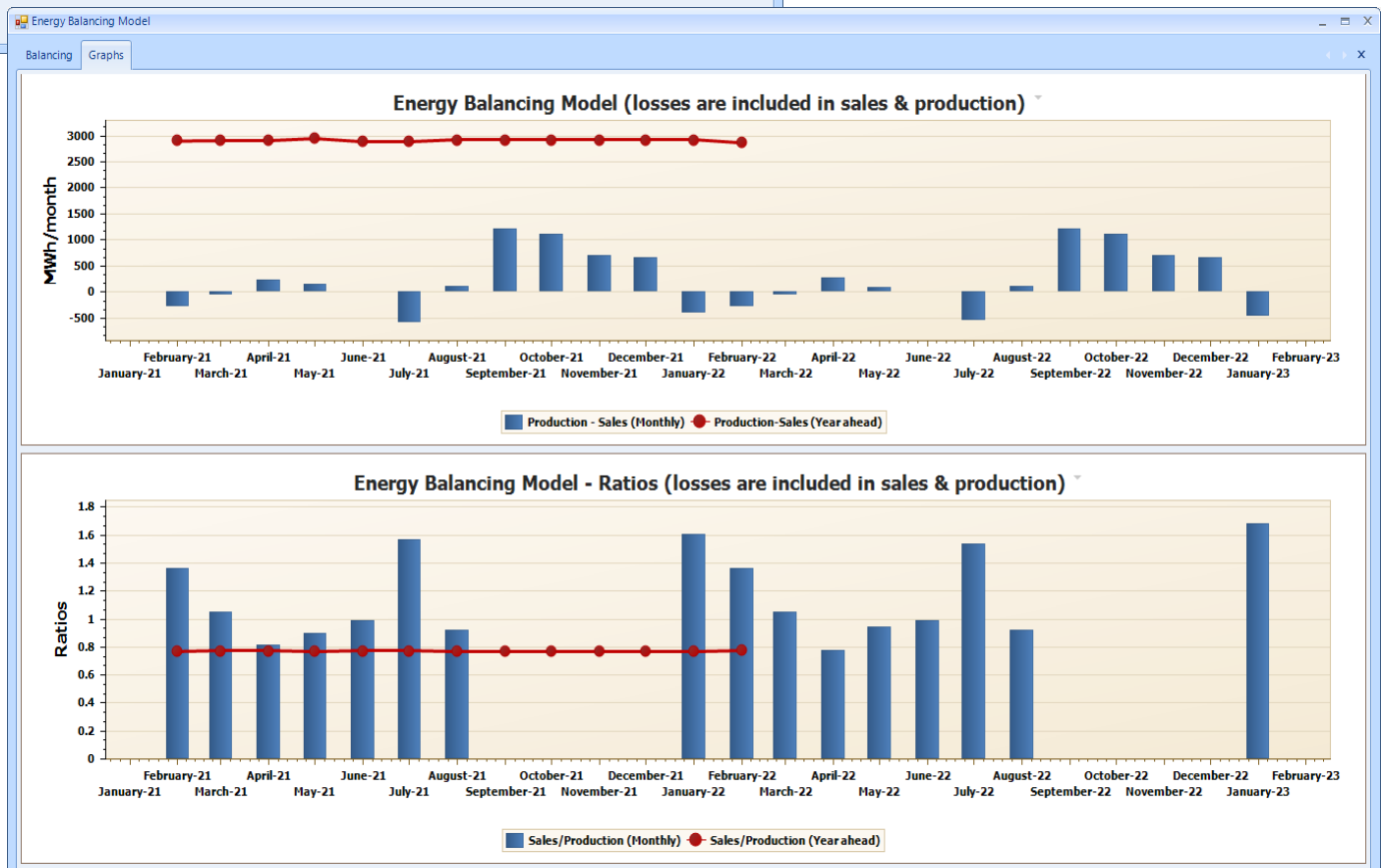
Tariff Band	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	
Peak-weekdays	140 hours	147 hours	140 hours	140 hours	294 hours	308 hours	308 hours	308 hours	1
Peak-weekends&holidays	56 hours	70 hours	70 hours	77 hours	126 hours	126 hours	126 hours	112 hours	3
Off-peak-weekdays	340 hours	357 hours	340 hours	340 hours	210 hours	220 hours	220 hours	220 hours	3
Off-peak-weekends&holidays	136 hours	170 hours	170 hours	187 hours	90 hours	90 hours	90 hours	80 hours	2

	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	
Total Sales	1,037.40	1,132.00	992.10	1,254.70	1,387.60	1,596.60	1,224.60	
Existing Connectons	1,037.40	1,132.00	992.10	1,254.70	1,387.60	1,596.60	1,224.60	
Proposed Connections	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sales - HV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sales - MV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sales - LV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Loss Coefficient - HV	1.45%	1.45%	1.45%	1.45%	1.45%	1.45%	1.45%	
Loss Coefficient - MV	2.759%	2.759%	2.759%	2.759%	2.759%	2.759%	2.759%	
Loss Coefficient - LV	4.28%	4.28%	4.28%	4.28%	4.28%	4.28%	4.28%	
Losses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sales + Losses	1,037.40	1,132.00	992.10	1,254.70	1,387.60	1,596.60	1,224.60	
BALANCING								
Production Increase Milestone								
Sales + Losses	1,037.40	1,132.00	992.10	1,254.70	1,387.60	1,596.60	1,224.60	
Production + Losses	759.88	1,076.40	1,219.27	1,398.87	1,398.19	1,017.29	1,333.98	
forward 12 month Sales	9,689.50	9,689.50	9,689.50	9,646.30	9,709.60	9,709.60	9,673.70	
forward 12 month Production	12,591.17	12,591.17	12,591.17	12,591.17	12,591.17	12,591.17	12,591.17	
Production-Sales (monthly)	-277.52	-55.60	227.17	144.17	10.59	-579.31	109.38	
Production-Sales(year ahead)	2,901.67	2,901.67	2,901.67	2,944.87	2,881.57	2,881.57	2,917.47	
Sales/ Production(monthly)	1.4%	1.1%	0.8%	0.9%	1.0%	1.6%	0.9%	
Sales/ Production(year ahead)	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	

Energy Balancing Model

Energy Balancing Optimisation implies matching Consumption (including losses) with Production (including losses).

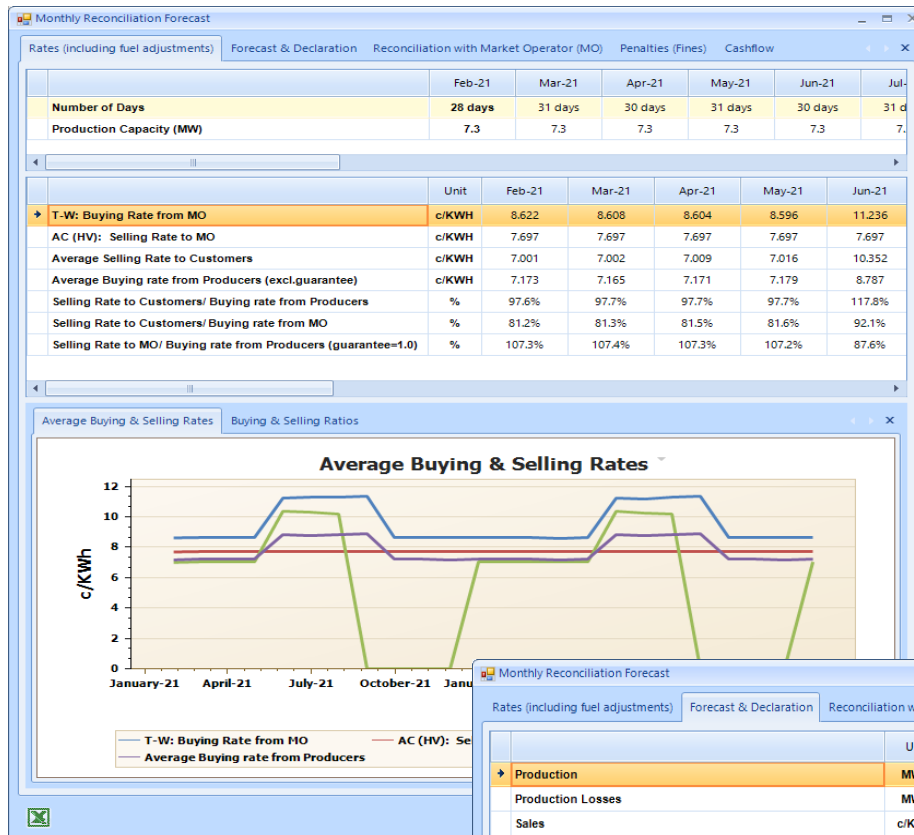
The system guides the user by always calculating an Overall deviation index [Sales/ Production (year ahead) ratio] for the next 12 months to be used as guideline in Customer Connection allocation.



Planning – Performance Forecasting

Projecting Monthly Gross Profit (loss) for financial Planning purposes

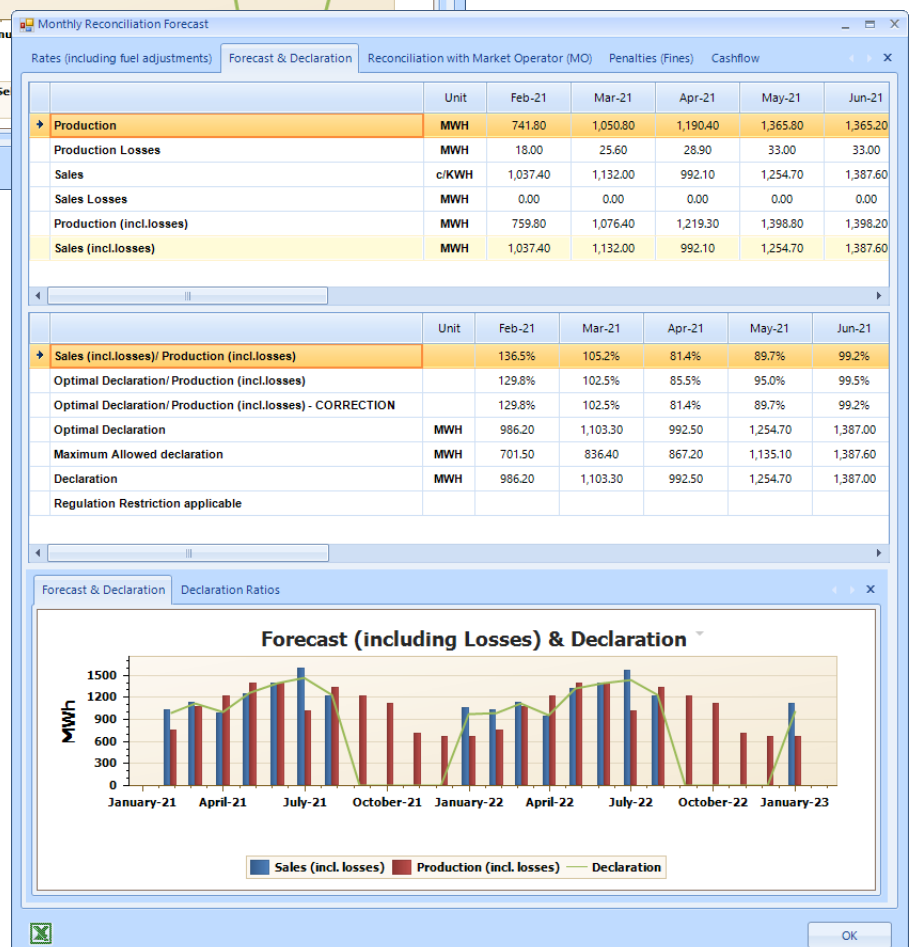
Average Monthly selling and purchasing rates are compared to indicate extend of profit (or loss) in different months of trading



Detailed Monthly Reconciliation is carried out using Optimal declaration levels (to avoid fines) to determine sales excesses (requiring purchases) and production excesses (to be sold to Market Operator)

The detailed Monthly Reconciliation will also indicate expected Sales, Production as well as optimal monthly declaration levels

Similar graphs/ tables are produced in monetary terms for Purchases, Sales and Gross Profits.



Operations - Declarations

Optimised Declaration Allocations

Declaration Level

Production (with losses) and Sales (with losses) are forecasted for the declaration period (month) in the same manner as with Planning forecasts.

The Supplier optimal overall declaration level is calculated in such a manner so as to limit the risk of getting fines. The declaration level lies between the forecasted production and sales amounts. History of forecasted amounts is kept for comparison with actual amounts.

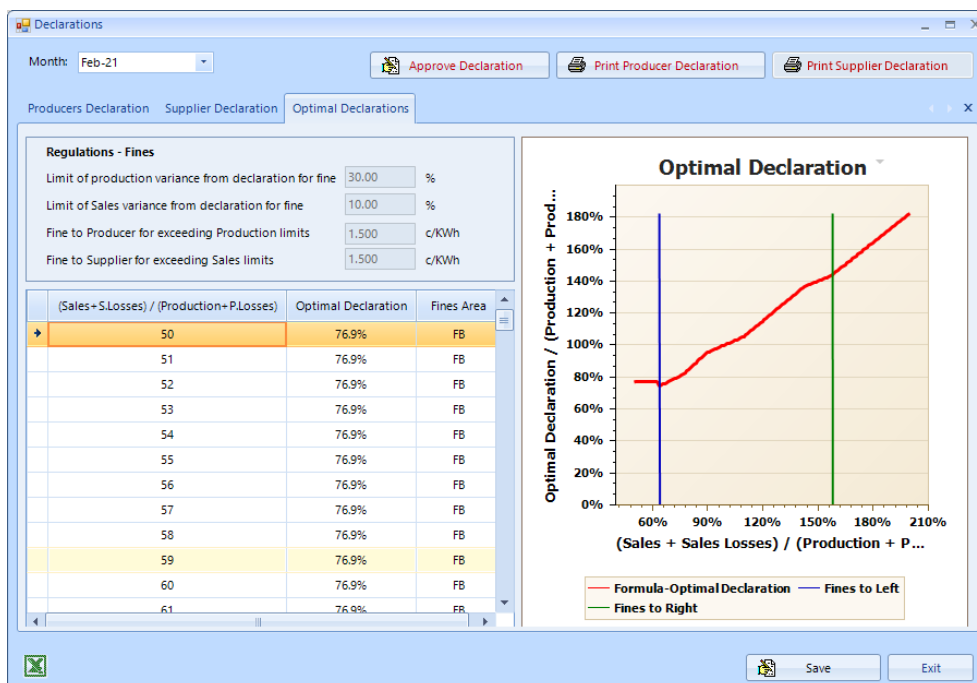
Producer	Id	P/ Park	Location	Capacity (MW)	Forecasted Production (MWh)	Losses (MWh)	Forecasted Production at Generation Level (MWh)	Declaration
BP014-1	1	BP014-1	High Voltage (HV)	1.90	185.14	2.68	187.82	0
BP009-1	2	BP009-1	Medium Voltage (MV)	1.90	199.18	5.50	204.68	0
BP008-1	3	BP008-1	Medium Voltage (MV)	1.50	153.22	4.23	157.45	0
BP002-3	4	BP002-3	Medium Voltage (MV)	2.00	204.29	5.64	209.93	0
		Total		7.30	741.83	18.05	759.88	0

Declaration Allocation

Each Production Unit is allocated a declaration level. This is done pro-rata their forecasted production for the month.

The user can overwrite any specific plant declaration and the rest will be adjusted accordingly.

Appropriate Declaration Forms both for projected production & Sales are produced for submission to the Market Operator.



Operations - Reconciliations & Settlements

Automation of Reconciliation & Settlement Process

Reconciliation Matrix

Reconciliation Matrix per Production Unit and Overall used for producing settlement forms.

Reconciliation Matrix must be approved by authorized person prior to proceeding with settlements.

Reconciliation with Market Operator

Inconsistencies with regard to Sales, Sales losses, Production & Production losses as well as settlement amounts between Market Operator and Producers as well as Market Operator and Supplier are reflected in a report to be sent to Market Operator for investigation.

Settlements

Produces Settlement forms for (a) Supplier vs Producers (b) Supplier vs Market Operator (c) Production Unit vs Market Operator and (d) a Settlement Summary.

Reconciliation Matrix per Production Unit and Overall used for producing settlement forms.

Reconciliation Matrix must be approved by authorized person prior to proceeding with settlements

Description	Unit	Supplier	BP014-1	BP009-1	BP008-1	BP002-3
Cmv Measured Consumption of Customers at MV	MWH	830.000				
Civ Measured Consumption of Customers at LV	MWH	0.000				
PRODUCTION						
Phv Measured Production of Plants on HV Network	MWH		0.000	0.000	0.000	0.000
Pmv Measured Production of Plants on MV Network	MWH		200.000	300.000	400.000	500.000
Plv Measured Production of Plants on LV Network	MWH		0.000	0.000	0.000	0.000
4. CALCULATION OF LOSSES						
CL Consumption Losses	MWH	52.220				
PL Production Losses	MWH		5.290	7.940	10.590	13.240
5. RECONCILIATION						
5.1 Supplier						
SIM Supplier Imbalance = Declaration - (Consumption + Consumption L...	MWH	-1,472.020				
SS Sales Shortfall = Declaration - (Consumption + Consumption Losses)...	MWH	0.000				
SE Sales Excess = (Consumption + Consumption Losses) - Declaration(if...	MWH	1,472.020				
= SS * AR Payment from MO to Supplier for Sales Shortfall(sell energy t...	euro	0.000				
= SE * T - W Payment from Supplier to MO for Sales Excess(buy energy fr...	euro	126,708.540				
5.2 Producer						
PIM Producer Imbalance = Declaration - (Production + Production Losses)	MWH		195.580	92.930	-94.110	-91.270
PS Production Shortfall = Declaration - (Production + Production Losses...	MWH		195.580	92.930	0.000	0.000
PE Production Excess = (Production + Production Losses) - Declaration(if...	MWH		0.000	0.000	94.110	91.270
= PS * T - W Payment from Producer to MO for Production Shortfall(buy...	euro		16,835.140	7,999.230	0.000	0.000
= PE * AR Payment from MO to Producer for Production Excess(sell ener...	euro		0.000	0.000	7,243.650	7,025.050
6. CALCULATION OF PENALTIES(FINES)						
6.1 Supplier						
Allowed Sales Deviation(from declaration) (10.00 %)	MWH	154.020				
Sales Deviation above allowed limit	MWH	1,318.000				
Sales Deviation Fine (1.50 c / KWH)	euro	19.770				
6.2 Producer						
Allowed Production Deviation(from declaration) (30.00 %)	MWH		120.260	120.260	94.940	126.590
Production Deviation above allowed limit	MWH		75.320	0.000	0.000	0.000
Production Deviation Fine (1.50 c / KWH)	euro		1.130	0.000	0.000	0.000

Reconciliation Matrix

From EDAMS-AM: System retrieves Production readings and calculates production and production losses for each plant

From Market Operator: User must enter production and production losses for each plant

Compare Production amounts and production losses from own figures and MO figures and produce report

Reconciliation must be approved by authorized person prior to proceeding with settlements

Plants				Measured Production from Plants				Measured Production by MO		Difference
Owner	Producer	Location	Capacity	HV (MWh)	MV (M...	LV (MWh)	Losses	Production	Losses	(MWh)
BP014-1	BP014-1	Medium Volta...	1.90	0.00	200.00	0.00	5.29	220.00	0.00	0.00
BP009-1	BP009-1	Medium Volta...	1.90	0.00	300.00	0.00	7.94	320.00	0.00	0.00
BP008-1	BP008-1	Medium Volta...	1.50	0.00	400.00	0.00	10.59	420.00	0.00	0.00
BP002-3	BP002-3	Medium Volta...	2.00	0.00	500.00	0.00	13.24	520.00	0.00	0.00

About EDAMS Technology

EDAMS Technology is the development arm of the Hydro-Comp group of companies.

Hydro-Comp is an international Information technology and consulting company specialising in integrated management information systems (called EDAMS) and related services for Utilities, Municipalities and Government Environmental departments.

Hydro-Comp provides a unique combination of Billing & CRM, Asset Management and Operations software together with related services aimed at improving overall utility performance and efficiency.

The EDAMS Business Solutions for the Solar Energy Industry include:



- Electricity Billing and Customer Relations Management
- Solar Park Development (Licensing & Permits)
- Solar Park Asset Management (GIS/Data Management, Maintenance Management & Asset Management Planning)
- Solar Park Operations
- Electricity Market Operations (Monthly trading & Day Ahead Market)
- Solar Park Owner Portal
- PhotoVoltaic Installations (Licensing, Installation, Maintenance & CRM)
- Management Dashboards & Reports

Deployment and Services

The EDAMS Solar software is modular and scalable allowing Operators to utilize only the required modules. The EDAMS Solar software is offered as a SAAS (Software as a service), giving the option to the Customer to host the software on its premises or on Cloud. In both cases an annual fee applies, payable in advance. Cloud services are charged extra.

- The annual fee entitles the Customer to free remote support as well as free upgrades.
- An initial fee is charged to allow for data conversion, system configuration and training.
- Additional support/ consulting is charged extra based on manpower rates (if required).
- Both annual fees and initial fees vary per Customer size, with commercial software charges being a function of sales (GWH/year sales) and technical software charges being a function of Solar Park Capacity (MW). In this manner the software is affordable by Operators of all sizes.
- The number of users for the software is unlimited.

The EDAMS Solar Software modules/ packages applicable for Suppliers include:

- Billing & CRM for Energy Sector
- Customer Portal & Mobile app
- Energy Transitional Market Model (a monthly market trading model)
- Energy Market Operational system (Supplier) (a daily market trading model)
- Business Intelligence-Dashboards (Supplier)

The EDAMS Solar Software modules/ packages applicable for Producers include:

- Solar Park Asset & Maintenance Management
- Solar Park Operations
- Solar Park Control Centre
- Solar Park Control Centre (with Market interface)
- Energy Market Operational system (Producer) (a daily market trading model)
- Business Intelligence-Dashboards (Producer)
- PV Park Development (Licensing) software

EDAMS GIS & EDAMS MDMS systems are supplied at no extra charge with all relevant software.

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