

360° Approach to Support Digital Transformation to Green Steel Production

Qualicision-based Online Heat Scheduling In Hybrid Melt Shops

We Deliver Product Solutions Today To Keep The World Running For The Generations To Come

Agenda



Green Production Management

- Introduction
- Online Heat Scheduling in Hybrid Melt Shops
- Energy and Resource Demand Forecast
- Qualicision and Green KPIs
- Ecosystem – Production Scheduling & Energy Purchase
- Conclusion

PSI Software AG – Segments and Sustainability Cycles

Energy Management



Production Management

PSImetals – Bringing the Excellence Together

Energy Management

PSI Energy Markets



Energy Trade and Sales

Production Management

PSI Metals



Steel, Aluminium & Copper

PSI Fuzzy Logic



Manufacturing, Mining Industry

Decarbonization - Facts and Challenges of Today and next Decades

Steel production accounts for 8% of global GHG emission

CO₂
neutral
by 2030

CO₂
neutral
by 2045

Steel is vivid, it makes the world tick, the core pillar of our modern society.



Customers are asking more and more for **CO₂ reduced products**.



Classical BF/BOF steelmaking will be replaced by processes using **Green Hydrogen** and **DRI, Smelters** and **Electric Arc Furnaces**.



Enormous demand for **Green H₂, DRI**, hence **renewable Electric Energy** to drive the transformation.



“The future is Electric Energy”, we must deal with lack of availability, high and fluctuating prices

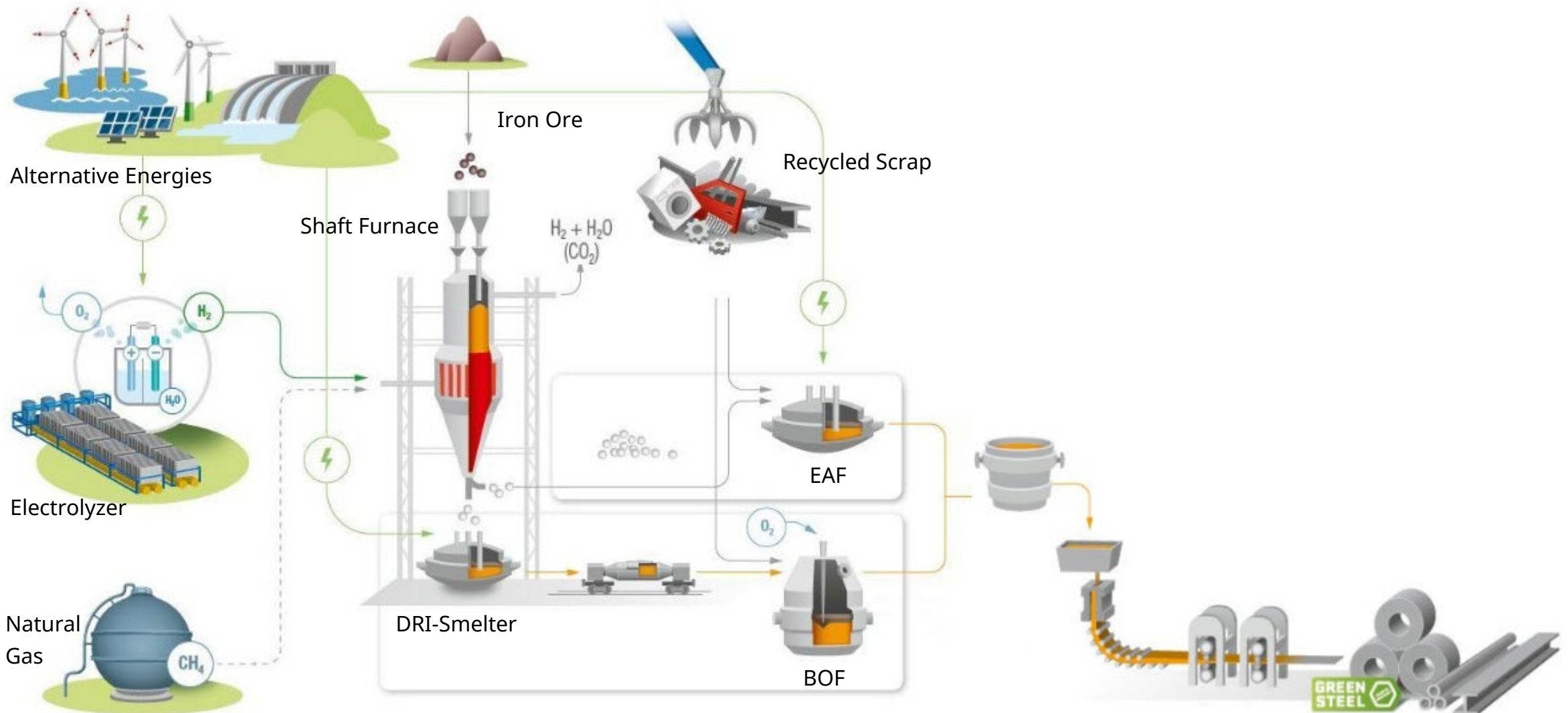


Transformation will take time – **Hybrid Steelplants** will be the solution for the coming decades.



ENERGY HAS TO BE MANAGED MORE THAN EVER.

The Silver Bullet to Climate Neutrality: Hydrogen-based Direct Reduction



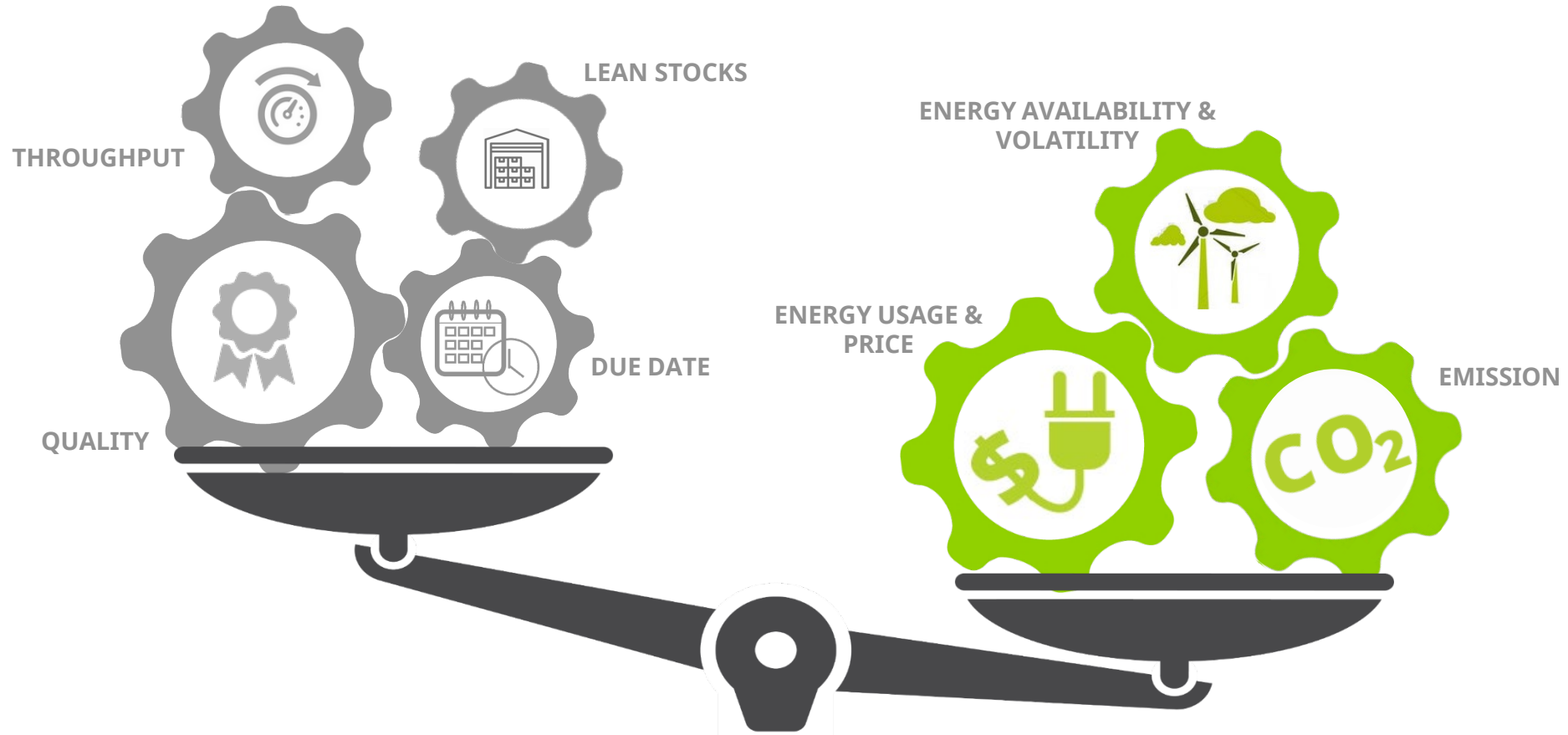
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Qualicision- based **Online** **Heat Scheduling** in Hybrid Melt Shops

How does **PSImetals** support the
Digitalization and
Decarbonization?

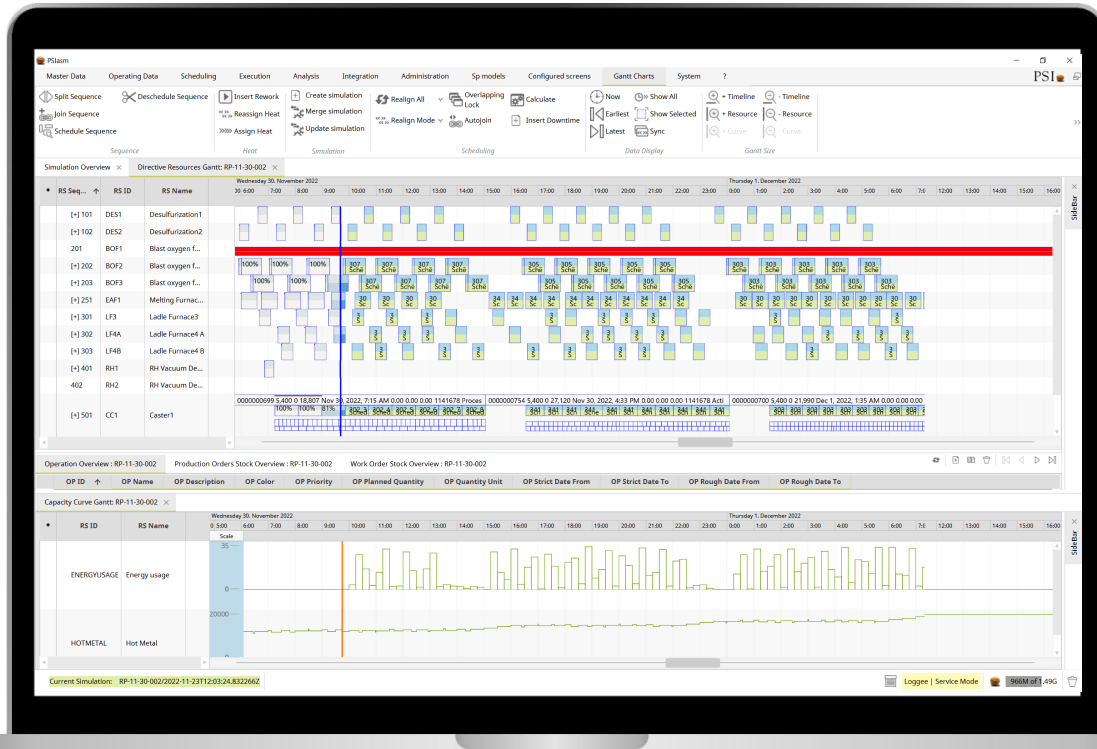
Smart Management of Conflicting Targets is More Key Now Than Ever



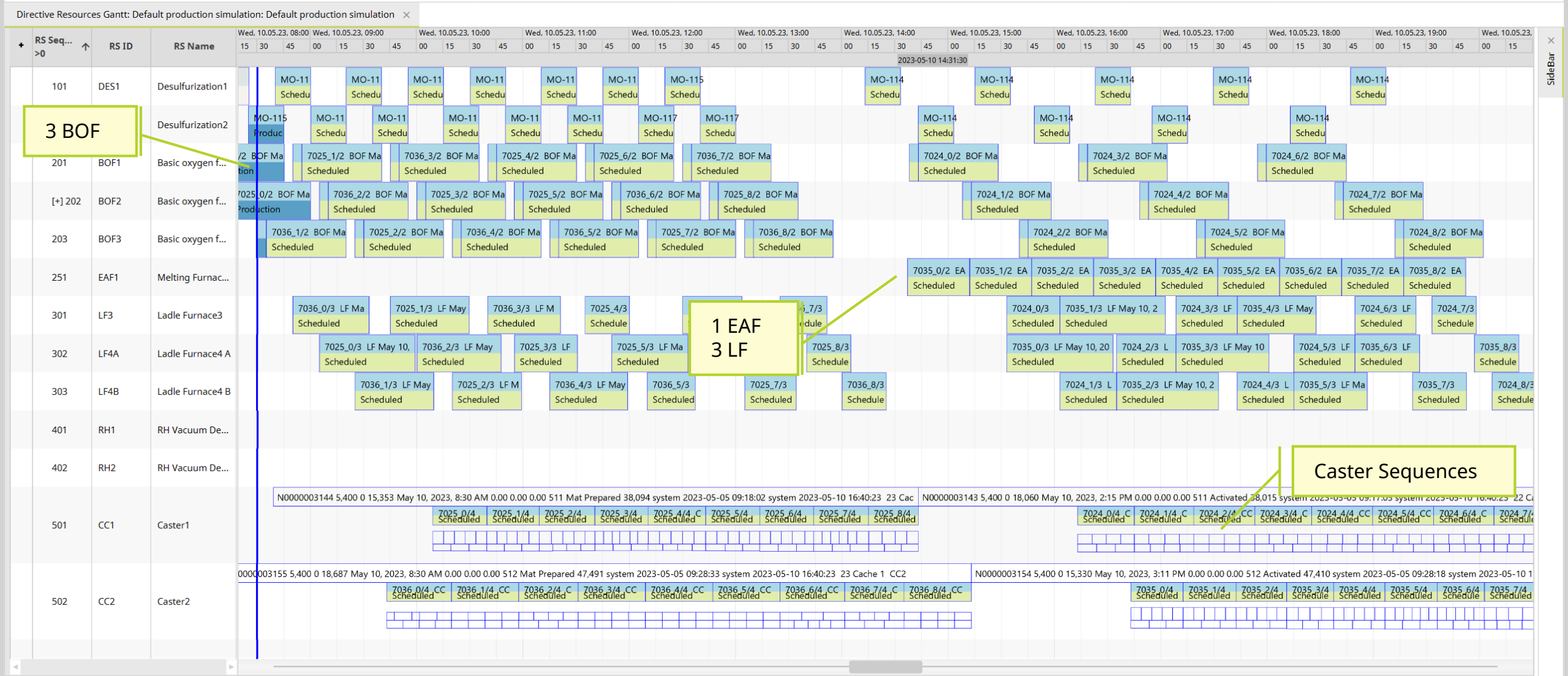
Nowadays “Green KPIs” have become crucial for production management and optimization

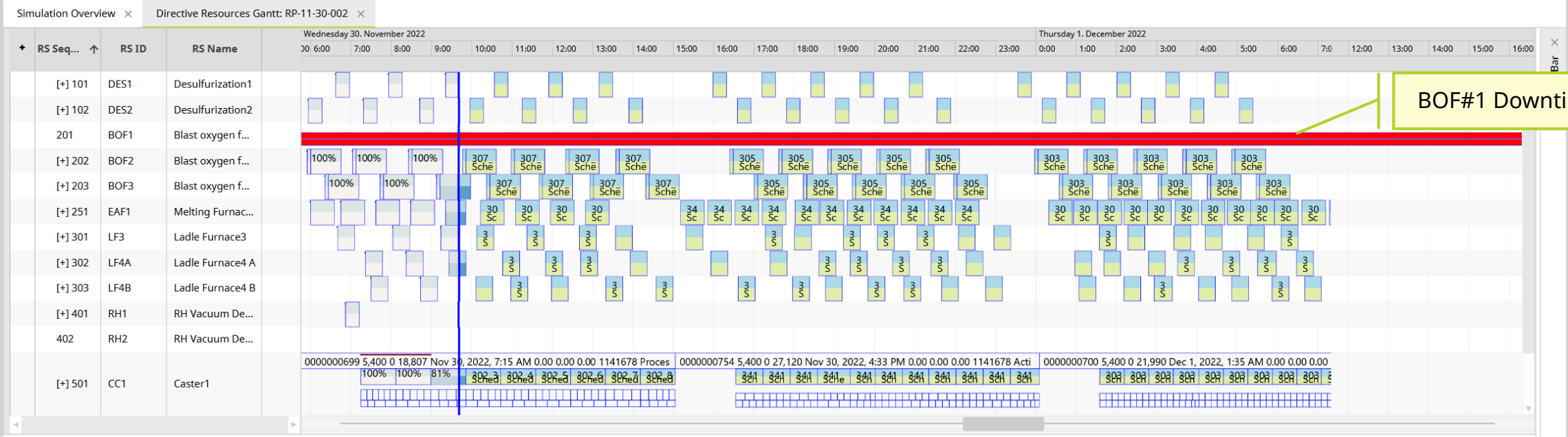
Online Heat Scheduling – Manage the Complexity of Hybrid Melt Shops

- Routing and exact scheduling based on steel grades and line availability
- Schedule material/crane logistics
 - Hot metal ladles, scrap baskets, DRI, steel ladles
- Schedule BOF/EAF campaigns based on availability/limitation of hot metal, H₂, DRI, energy
- Prioritize heats and sequences to increase hot connect rate to Hot Rolling Mill
- Optimize Timing to reduce Temperature Buffers
- Resource Demand forecasts:
 - Hot metal, Electrical Energy, DRI
- Provide forecasts to Energy Supplier



Green KPI-driven Heat Scheduling

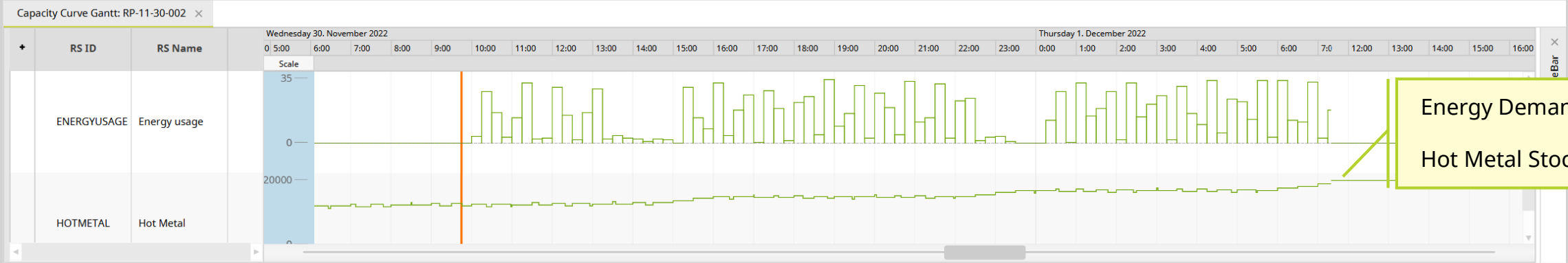




BOF#1 Downtime

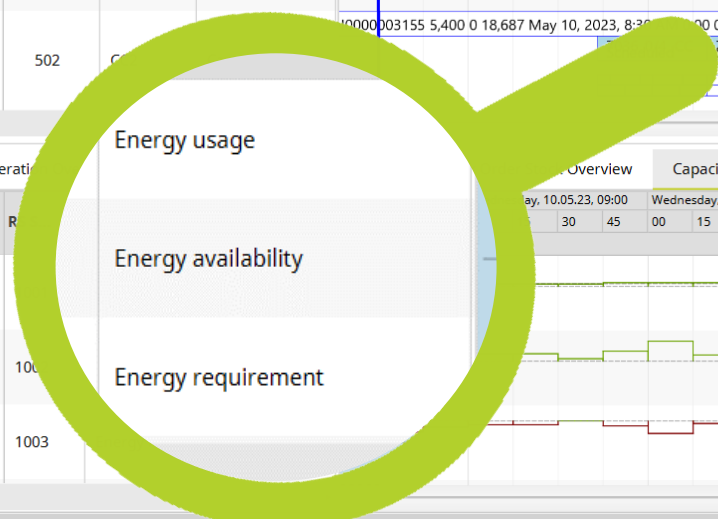
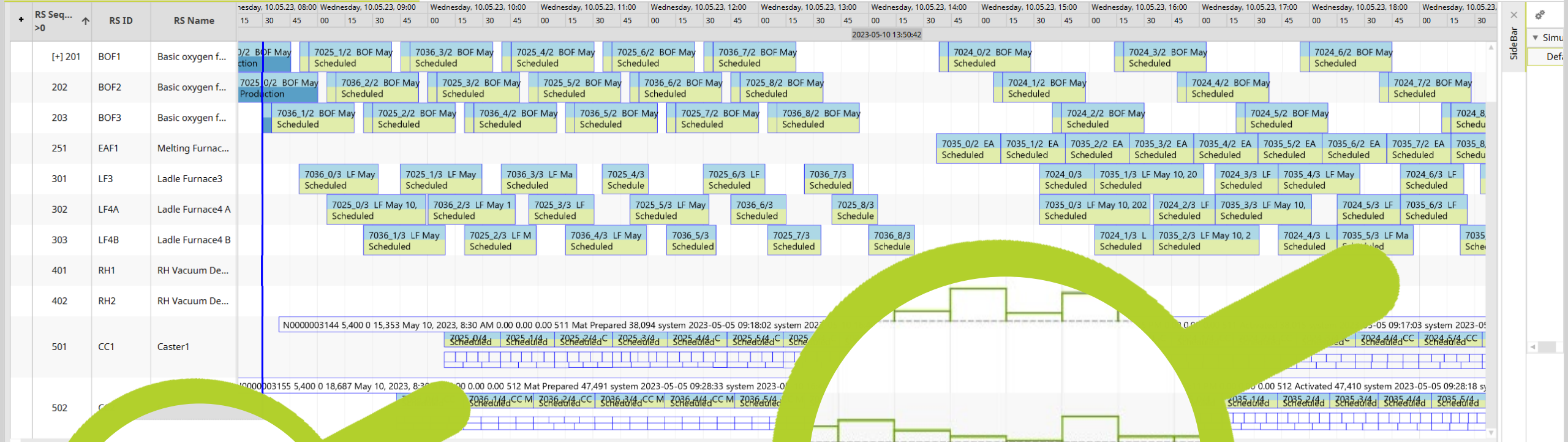
Operation Overview : RP-11-30-002 Production Orders Stock Overview : RP-11-30-002 Work Order Stock Overview : RP-11-30-002

OP ID	OP Name	OP Description	OP Color	OP Priority	OP Planned Quantity	OP Quantity Unit	OP Strict Date From	OP Strict Date To	OP Rough Date From	OP Rough Date To
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Energy Demand
Hot Metal Stock

Directive Resources Gantt: Default production simulation: Default production simulation



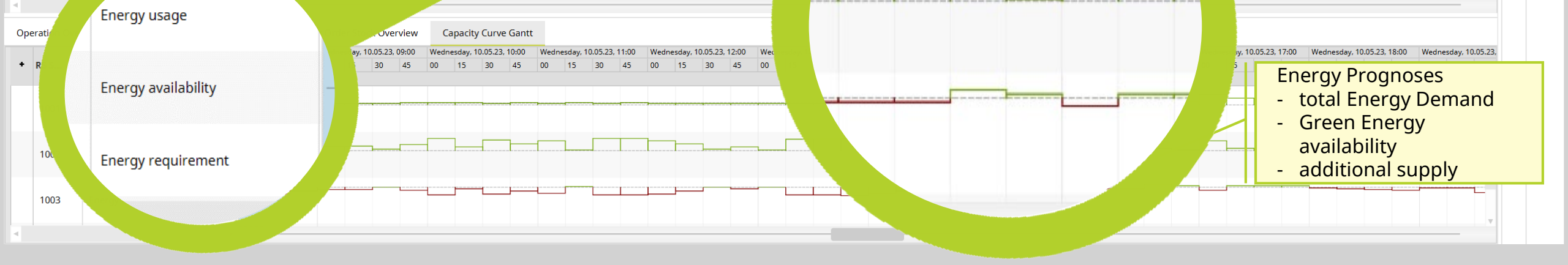
Energy usage

Energy availability

Energy requirement

Energy Prognoses

- total Energy Demand
- Green Energy availability
- additional supply

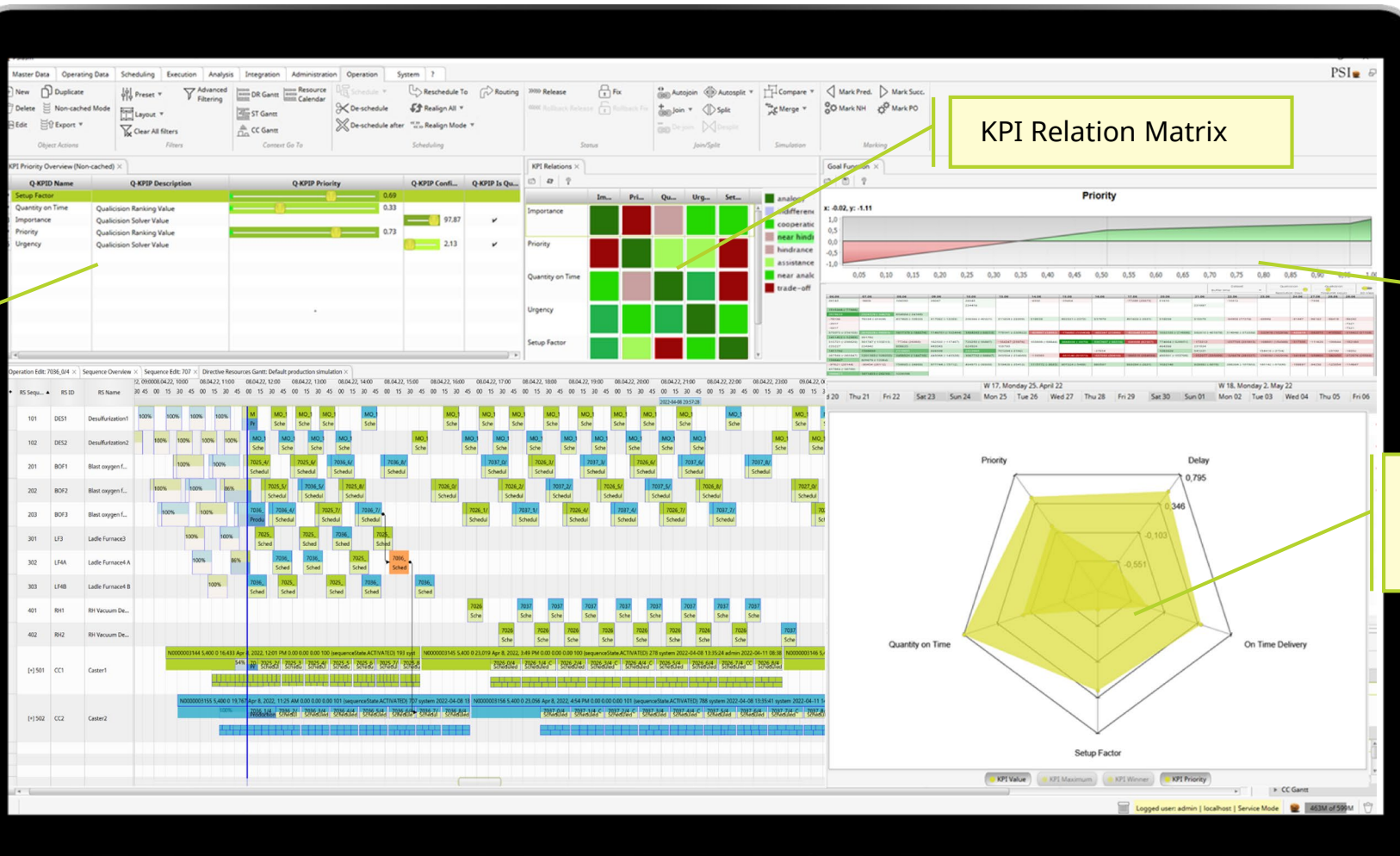




Qualicision and Green KPIs

How does **PSImetals** support
Digitalization and
Decarbonization?

KPI Dashboard - Analyzing and Balancing Classical vs. Green KPI



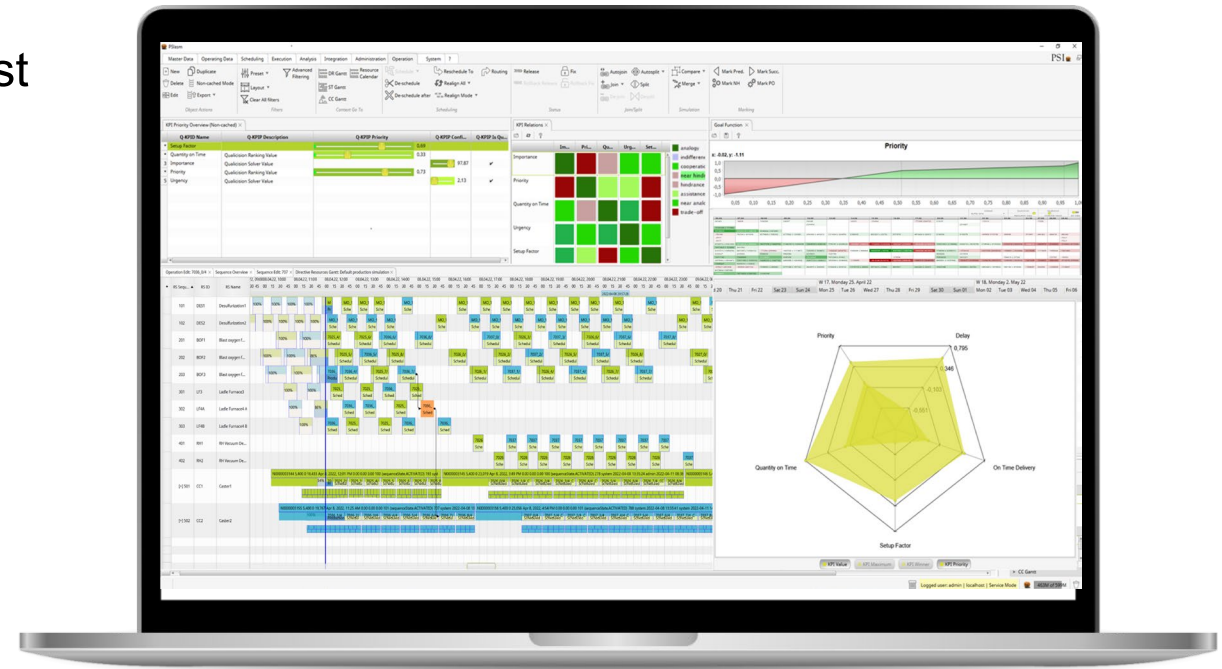
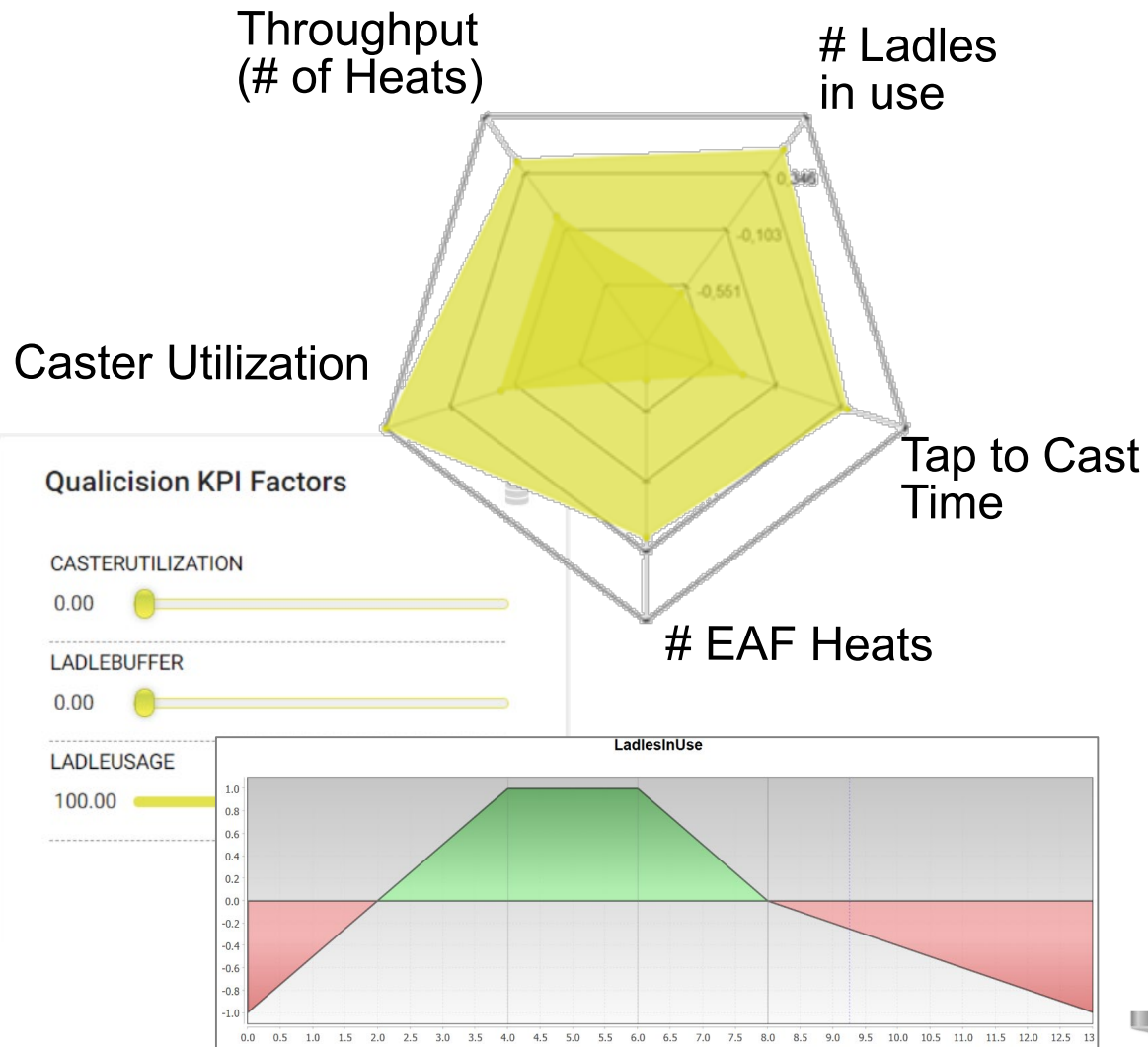
KPI Priority Setting and scenario selection

KPI Relation Matrix

KPI Goal Definition

Qualicision Radar: KPI goal evaluation for different scenarios

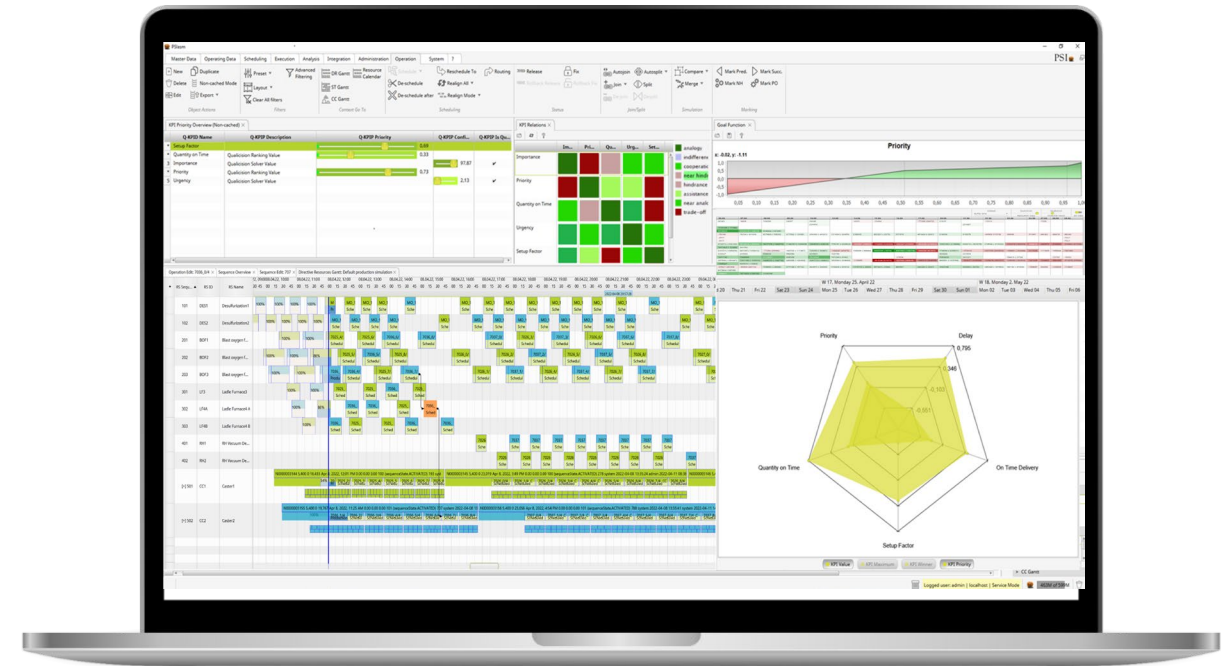
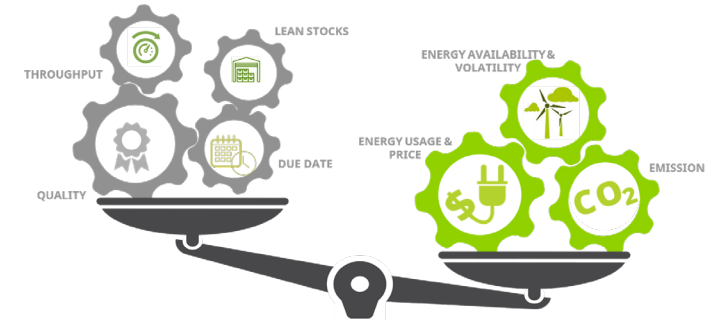
Qualicision Solver and Green KPIs to Steer Heat Schedule Optimization



Qualicision Solver and Green KPIs to Steer Heat Schedule Optimization

Adding Green KPIs for „Qualified Decision“

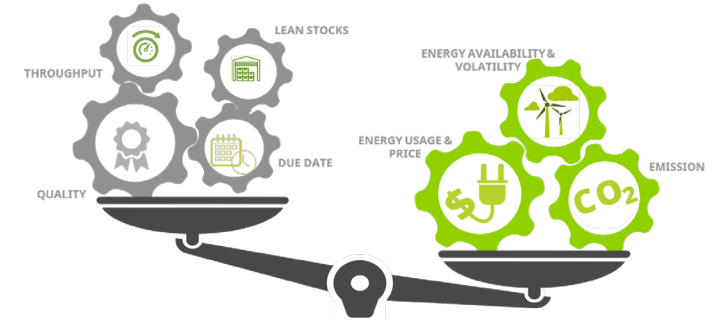
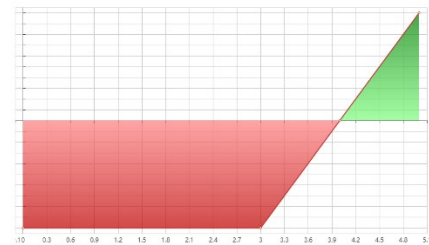
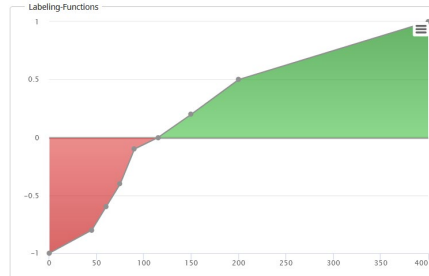
- Renewable Electricity usage
- DRI / Hydrogen usage
- Electricity Price
- Tap Temperature
- LF Heating Temperature
- Ladle Re-Heating Energy
- CO2 Emission



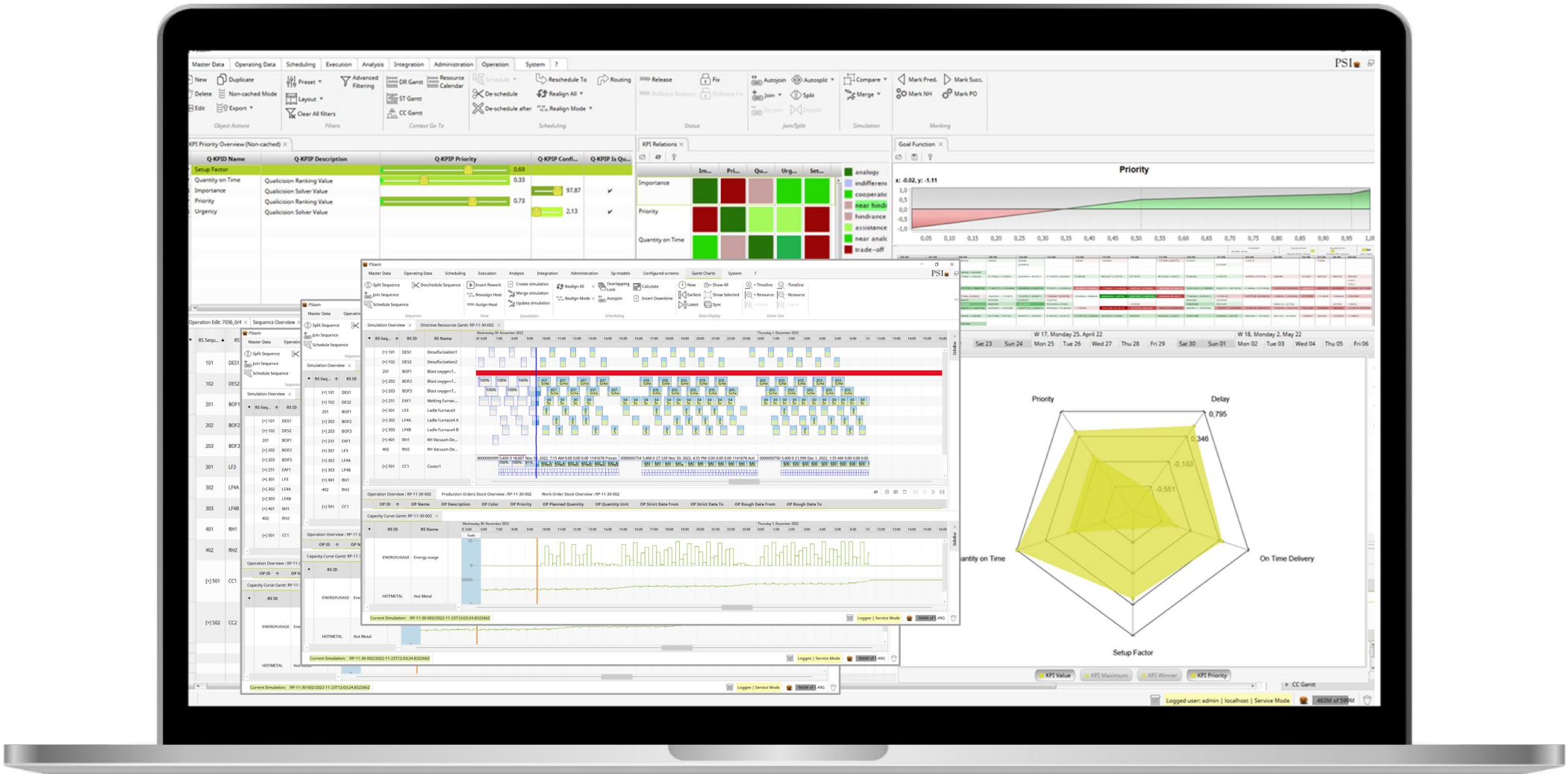
Qualicision Solver and Green KPIs to Steer Heat Schedule Optimization

Adding Green KPIs for „Qualified Decision“

- Renewable Electricity usage
- DRI / Hydrogen usage
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- LF Heating Temperature
- Ladle Re-Heating Energy
- CO2 Emission



Qualicision KPI Dashboard – Scenario Management



Green KPI-driven Optimization – Keeps Planning & Scheduling with Production in Sync



PSImetals

- forecasts energy and resource demand
- considers availability, limitations and price
- aligns and optimizes production accordingly
- balances economical and ecological goals
- saves energy and CO₂ emissions



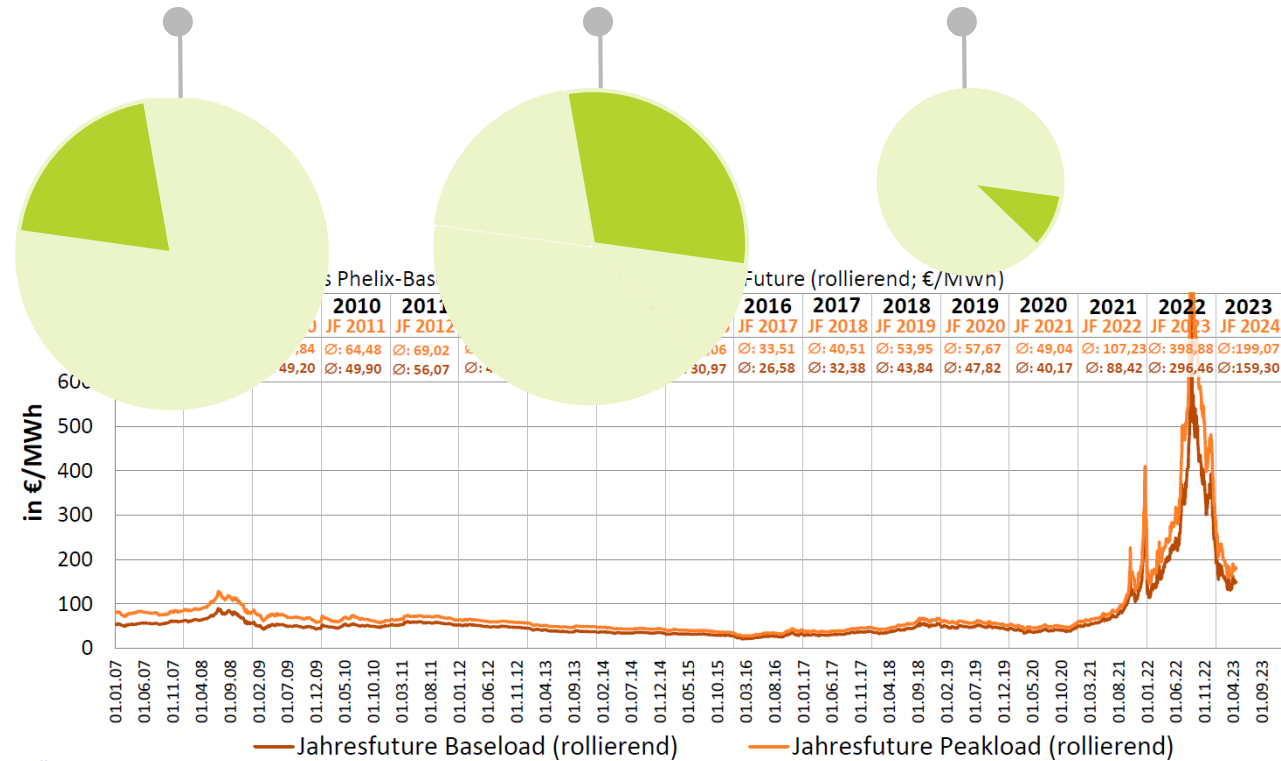
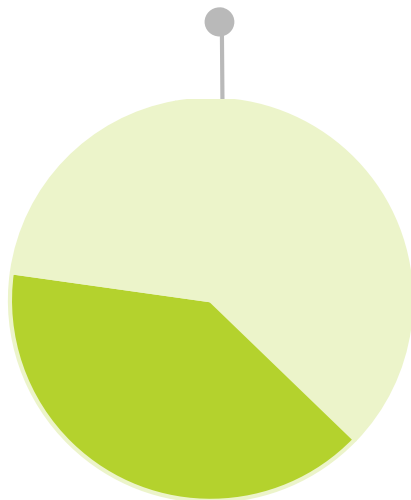
Scheduling impacts Energy Management and Purchase

How does **PSImetals** support the
Digitalization and
Decarbonization?

Energy Procurement – Typical Energy Mix

Industrial consumers procure energy based on a mix

➤ long-term ➤ medium-term ➤ own production ➤ day ahead/ intraday



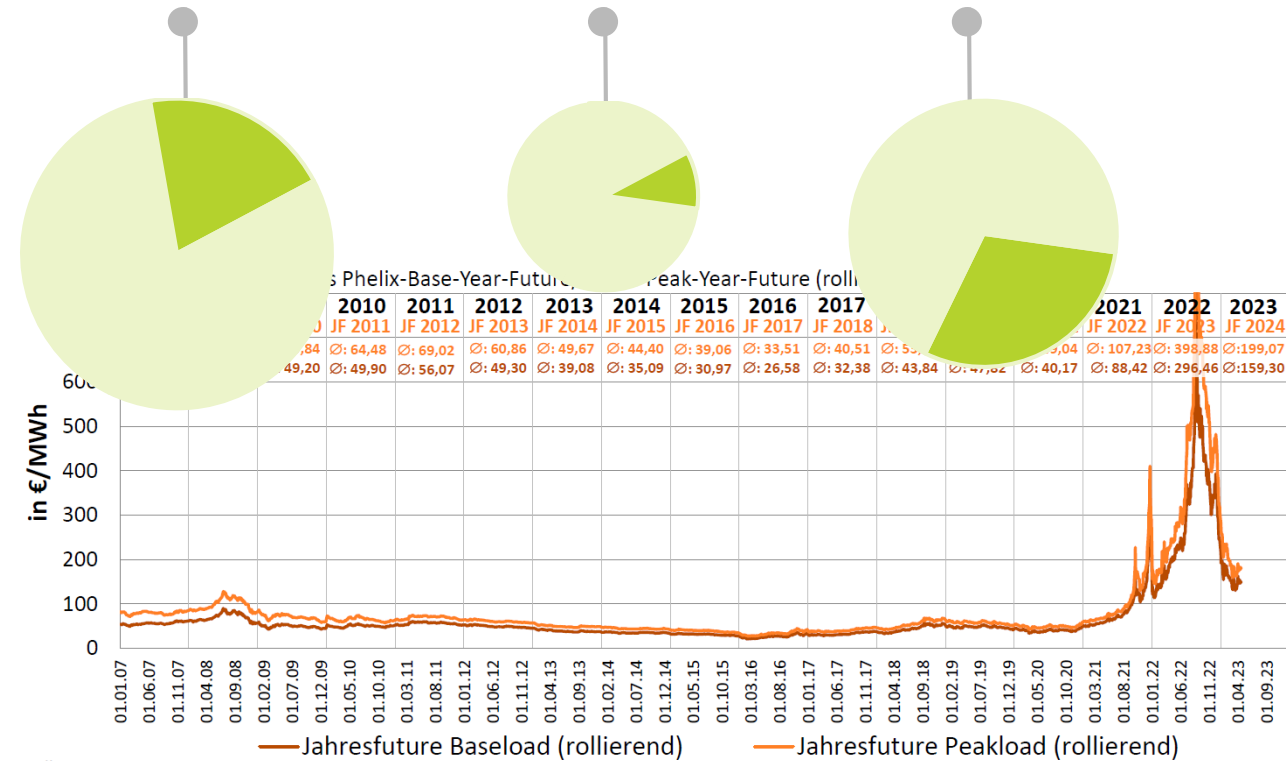
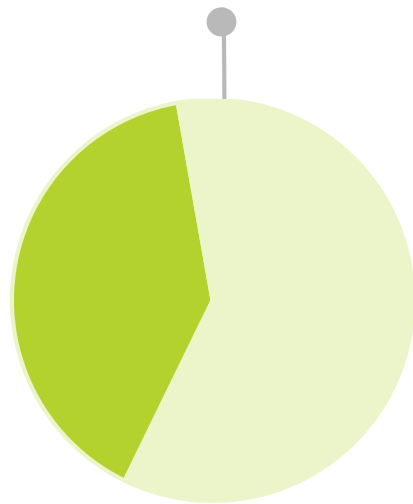
Quelle: EEX



Energy Procurement – Typical Energy Mix

Industrial consumers procure energy based on a mix

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Quelle: EEX



Harmonising Production Planning & Scheduling with Energy Procurement & Trading



PLANNING & SCHEDULING

Long-term planning
(S&OP)

Mid-term planning
(Order & Material Planning)

Short-term planning
(Line Scheduling)

Schedule Execution
(online)



Long-term Procurement

Mid-term Procurement

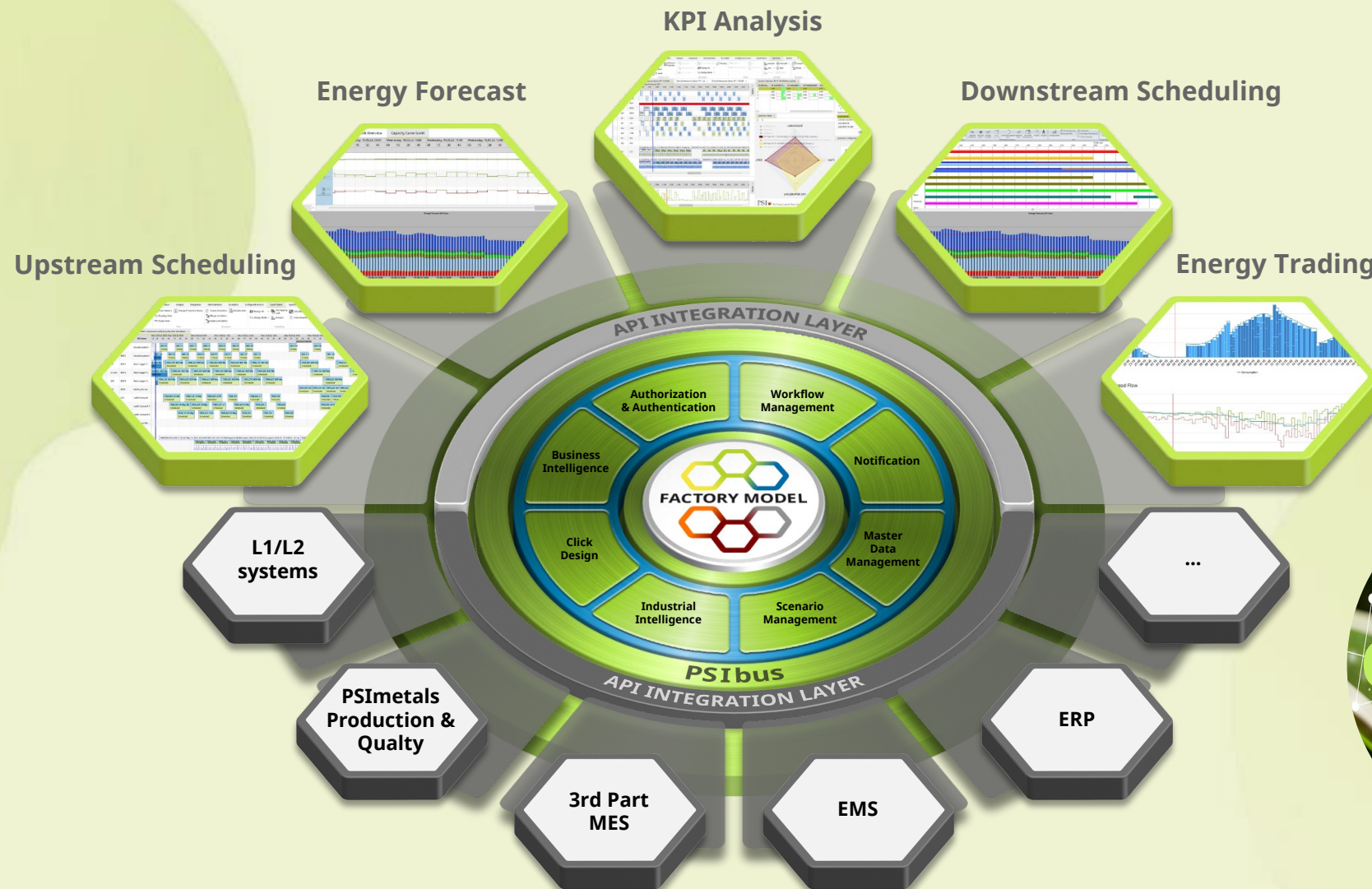
Own Production

Day Ahead / Intraday Market

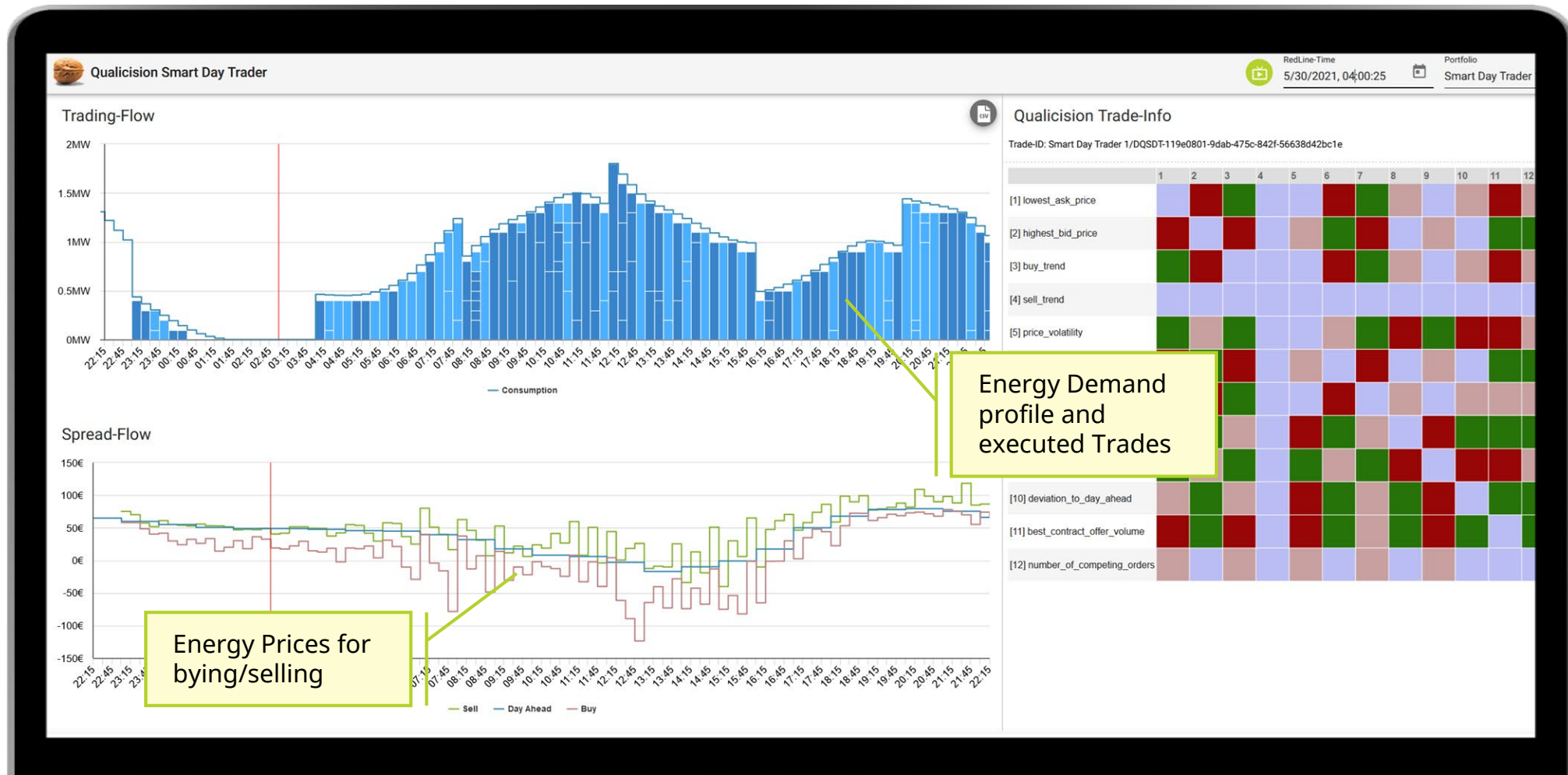
ENERGY PROCUREMENT



Ecosystem - Production Scheduling and Energy Trading powered by Qualicision AI



Qualicision Smart Day Trader – Energy Trading Based on Scheduled Energy Demands





Conclusion

How does **PSImetals** support the **Digitalization** and **Decarbonization**?

PSImetals supports the Digitalization and Transformation to Green Production Management



Classical Planning & Scheduling Services

- optimize and balance process flows and resource usage,
- they use efficiency KPIs as optimization targets,
- where cost effectiveness often implies sustainability.

With PSImetals, we are setting a new Impulse

- The smart combination of schedule optimization,
- combined with energy demand forecasts,
- powered by green KPI driven Qualicision methods,
- solves the challenges of cost-effectiveness,
- and sustainable resource usage,
- in the complex world of Hybrid Steel Plants.

Trading off Economical and Ecological Production Management

Meet Us at METEC – Hall 04 / Stand C10

Thank you for listening

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- Sebastian Grob – PSI Metals GmbH

Explore With Us the Driving Elements of Production Management

