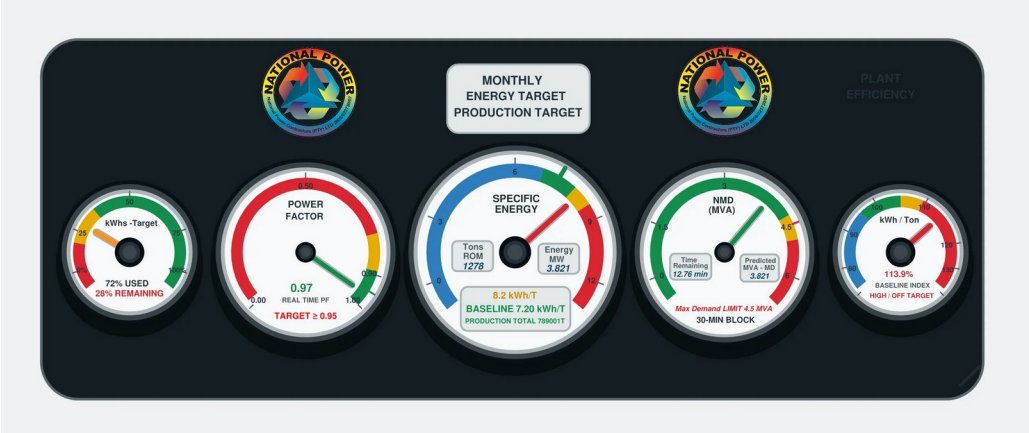
National Power Contractors Maximum Demand Control System

Predicted demand control using a SATEC PRO meter, plug-in I O modules and optional PLC integration



The control system forecasts the closing demand for the active demand interval. When the forecast rises above the configured threshold, approved loads are disconnected in a controlled sequence. Loads are restored only after the prediction has returned below a lower reset threshold for the required delay.

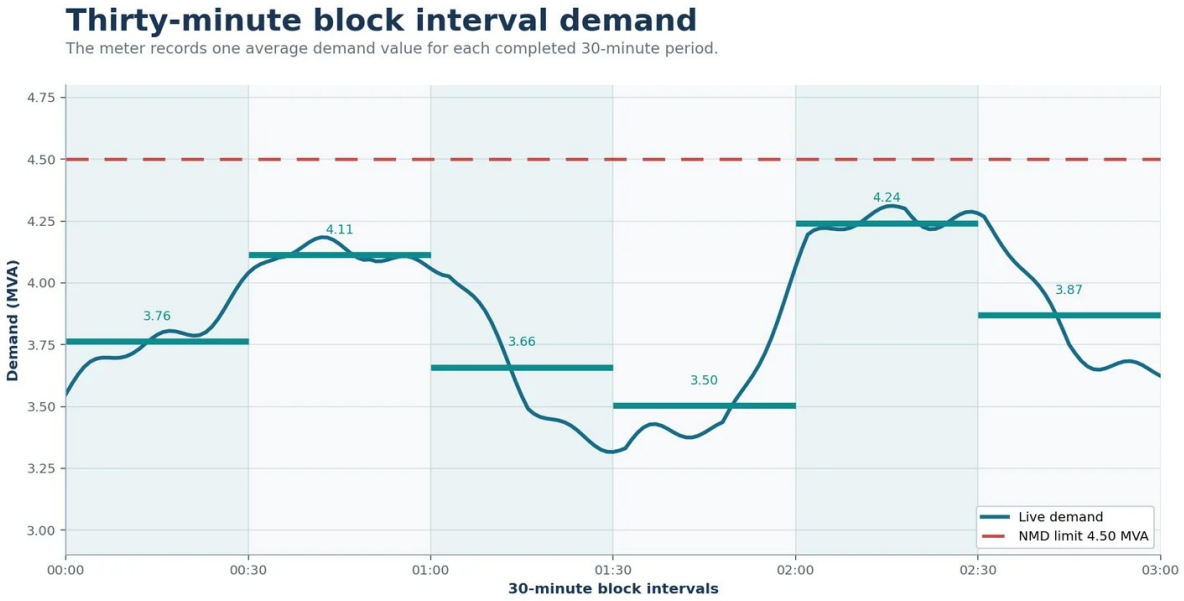
The objective is to prevent a high completed demand interval while protecting critical plant loads and production priorities.

System at a glance

Function	Implementation
Measure	SATEC PM335 PRO measures kW, kVA, power factor, energy and demand registers.
Predict	The algorithm forecasts the closing demand from accumulated interval energy, present load and time remaining.
Control	Relay outputs disconnect approved non-critical loads in sequence when the forecast exceeds the threshold.
Communicate	A communications module or the Ethernet port reports status and events to the operator, PLC or supervisory system.

Why predicted demand control is required

Maximum-demand charges are normally based on a completed demand interval, often a fixed 30-minute block. The instantaneous load can move quickly, but the billed value depends on the average established over the complete interval. The controller must therefore consider both the present load and the energy already accumulated in the interval.



Illustrative 30-minute profile. The blue trace is live load; each completed block average is a separate measurement.

Predicted closing demand

Predicted kVA = accumulated kVAh + recent kVA × hours remaining ÷ block hours

The prediction is recalculated as the load changes. An operating margin should be retained because the forecast is an estimate and because control equipment and plant processes have response delays. The installed meter register, demand period and site billing rules must be confirmed during commissioning.

Quantity	Meaning
Live load	The present kW or kVA reading.
Predicted demand	The estimated average at the end of the current interval.
Completed interval	The final average after the demand interval closes.
Control threshold	The internal limit that includes the required margin below the notified maximum demand.

Meter based control architecture

The compact arrangement below allows the meter to perform measurement, prediction and basic sequential load control without a separate PLC. Each controlled load requires an approved interposing relay or contactor arrangement. The meter output must not directly switch a large plant load.

Main incomer CTs and VTs → **SATEC PM335 PRO measurement and prediction** → **Plug-in relay outputs interposing relays** → **Load priority groups 1 2 3 4** ↔ **Cellular or Ethernet operator visibility**

Available meter functions

Meter capability	Application in this solution
Built-in measurement	kW, kVA, power factor, energy, demand and electrical status.
Programmable control	Up to 64 setpoints with logic, thresholds and operate or release delays.
Plug-in I O	Relay outputs for staged control and analogue or digital inputs for permissives and plant signals.
Communications	Dual Ethernet and supported industrial protocols for plant integration. Cellular communication is included where specified for the project.
Event evidence	On-board memory retains operating and event information for review.

All load-shedding priorities, interlocks and restoration conditions must be approved by the plant before automatic control is enabled.

Sequential control algorithm

The algorithm compares predicted demand with the configured control threshold. It then operates the available relay stages in priority order. Each step allows time for the forecast to respond before the next load is disconnected.

Stage	Condition	Action
Normal	Prediction below the lower reset threshold	All available loads remain in their normal approved state.
Warning	Prediction approaches the control threshold	Notify the operator and inhibit discretionary load starts where configured.
Stage 1	Prediction exceeds the threshold for the operate delay	Disconnect the first approved non-critical load group.
Stage 2	Prediction remains high after the response delay	Disconnect the next approved load group.
Further stages	Prediction remains above the threshold	Continue through the approved priority list, subject to permissives.
Restoration	Prediction stays below the lower threshold for the release delay	Restore loads one at a time in the approved reverse or site-defined sequence.

Control safeguards

- Use separate operate and release thresholds to prevent rapid switching around one value.
- Apply minimum run, minimum stop and response delays that suit the controlled equipment.
- Protect critical loads with hard permissives. They must never be included in the shedding list.
- Block automatic restoration when a process interlock, maintenance lockout or operator hold is active.
- Record every warning, relay operation, acknowledgement and restoration event.

The controller acts on predicted closing demand. It does not shed load merely because of a brief instantaneous peak.

Illustrative priority schedule

Priority	Typical load category	Control response
1	Low-impact discretionary load	First stage to disconnect.
2	Shiftable auxiliary load	Second stage after the response delay.
3	Process load approved for short interruption	Used only with process permissive.
Protected	Safety, control, communications and critical process loads	Excluded from automatic shedding.

Plug in modules and field signals

SATEC PRO Series modular arrangement. Final module selection depends on the required number and type of field signals.

Module or interface	Purpose in maximum demand control
Relay output modules	Operate interposing relays or PLC inputs for the approved load stages.
Analogue inputs	Accept external process measurements or control references where required.
Digital inputs	Receive equipment availability, feedback, manual override and process permissives.
Cellular communications	Provide remote status, alarms and event access where the project includes a cellular module or gateway.
Dual Ethernet ports	Connect to a PLC, SCADA or plant network using the approved network design and supported protocol.

Relevant PRO Series data

Item	Brochure information
Metering accuracy	Class 0.2S active-energy accuracy.
I O capacity	Up to three add-on I O modules; configuration can provide multiple digital inputs and outputs.
Control logic	64 control setpoints with programmable logic, thresholds and delays.
Communications and storage	Two independent Ethernet interfaces, supported industrial protocols and 16 GB on-board memory for data and event records.

ExpertPower monitoring and mobile access

ExpertPower provides the monitoring and reporting layer for the maximum demand control system. Operators and energy managers can review live electrical values, demand trends, events and reports from a workstation or an authorised mobile device. The control sequence remains subject to the approved meter or PLC logic and plant interlocks.

Workstation dashboard

Tablet and mobile access

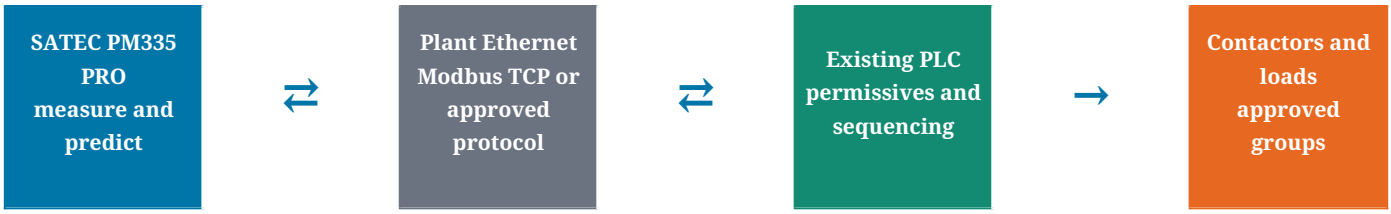
How ExpertPower supports demand control

ExpertPower view	Use in the demand control process
Live readings	Displays kW, kVA, power factor, energy and other configured meter values.
Demand trends	Shows the current and historical demand profile so the operator can see when the site approaches its limit.
Events and alarms	Provides visibility of configured warnings, meter events and control-related status information.
Reports	Supports review of demand performance, operating periods and recurring high-demand conditions.

ExpertPower extends visibility beyond the control panel. Access from a tablet or phone depends on the approved communications, cybersecurity and user-access configuration.

PLC integration option

Where the plant already has a PLC, the PM335 PRO can provide live demand, predicted demand, energy and status values over its TCP IP interface. The PLC then applies the approved load-control sequence through the existing control system. This arrangement is suitable when plant interlocks, equipment states and operator commands already reside in the PLC.



Select the control arrangement

Meter based control	PLC integrated control
Compact solution for a defined number of load stages.	Best where many interlocks and plant operating states must be evaluated.
Relay sequence is configured at the meter and associated control panel.	PLC owns the final permissives, sequencing, feedback and operator interface.
Lower integration effort when the controlled loads are independent.	Uses existing PLC and SCADA standards, alarms and maintenance practices.

Commissioning requirements

- Confirm the tariff demand basis, interval length, clock alignment, NMD value and billing register.
- Verify CT and VT ratios, demand values and communications against a trusted reference.
- Agree the control threshold, operating margin, stage sizes, priorities and restoration order.
- Prove every permissive and relay output with the final plant wiring before enabling automatic operation.
- Test recorded scenarios including normal operation, rapid load increase, missing data, communications failure and manual override.
- Begin with monitoring and alarms. Enable automatic stages only after the plant approves the witnessed test results.

Final settings must be based on the customer tariff, the installed meter configuration and the approved plant control philosophy.