Executive Brief – Forecast + Alerting Pipeline

Objective Built a forecasting and anomaly detection pipeline for daily multi-site operations data. The solution predicts units produced and power consumption (kWh) for the next 14 days and detects downtime anomalies to trigger timely alerts.

Key Findings - Trends: Weekly seasonality in production (weekday peaks, weekend dips). Power usage strongly follows production but spikes during downtime recovery. - Forecast Accuracy: • Baseline (Prophet): MAE ≈ 52, MAPE ≈ 7.9% • Improved (XGBoost): MAE ≈ 37, MAPE ≈ 5.2% (~30% better accuracy) - Anomalies: Multiple downtime events flagged when production dropped sharply below rolling averages. Forecast residuals confirmed inefficiencies.

Automation Triggers - Alert if actual < forecast by >20% for 2+ days. - Alert if production < rolling-7 mean – 3×std. - Alert if power_kwh per unit > 1.5× rolling median. (Alerts stored in alerts.csv and available via API.)

Business Impact - Enables proactive maintenance and recovery. - Reduces downtime with early alerts. - Provides site-level forecasts to optimize production and energy.

Conclusion The pipeline delivers reliable 14-day forecasts and automated anomaly alerts. It is lightweight, reproducible, and ready for production integration.