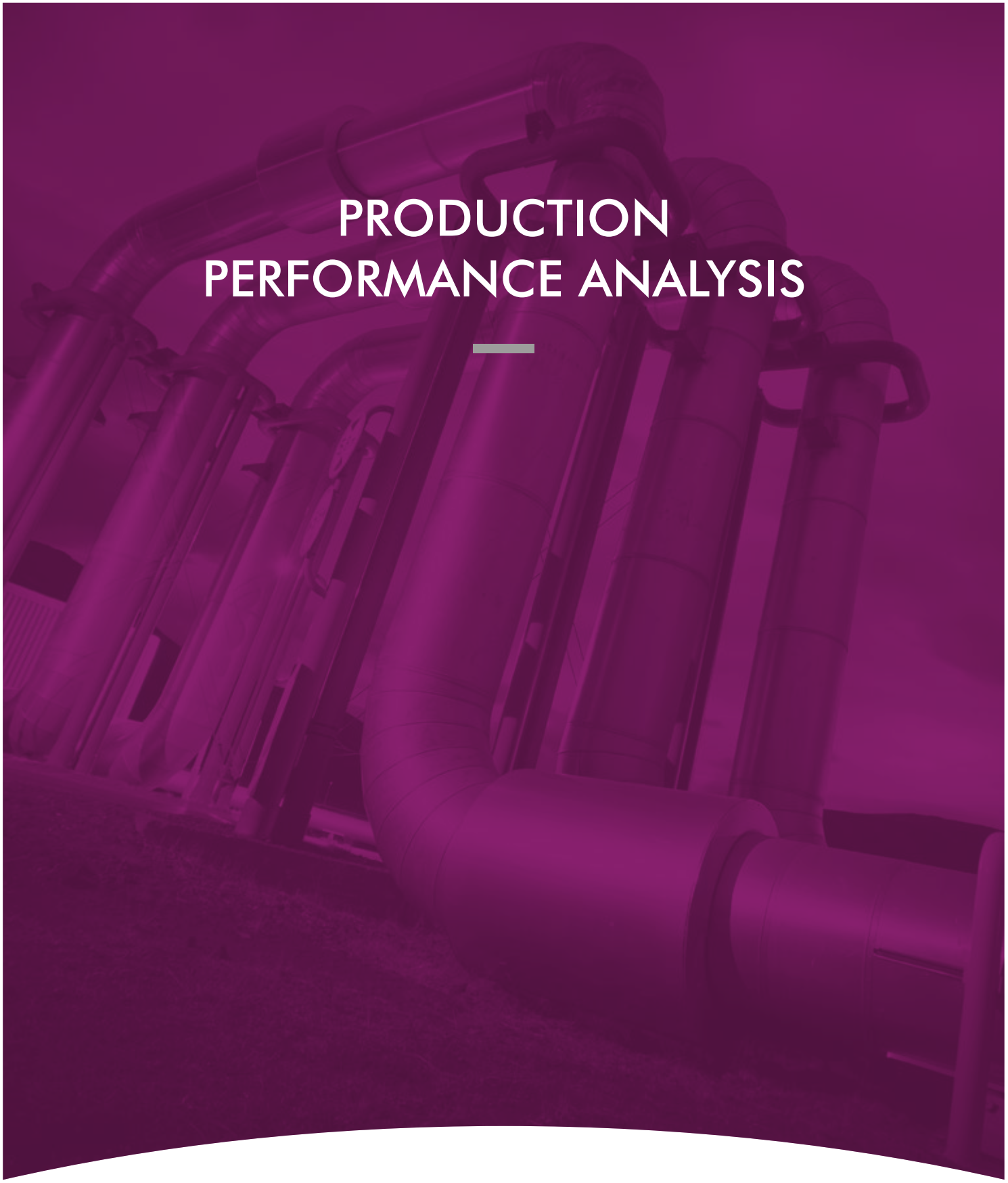

PRODUCTION PERFORMANCE ANALYSIS

eliteenergy Consultants

PRODUCTION PERFORMANCE ANALYSIS

Production Performance Analysis (PPA) can be a time-consuming, manumatic process requiring input from a number of databases. The process is executed for a week, month and annual time horizons to meet defined business needs. With the eProduction Management Framework (ePMF) in place, this task can be reduced to an objective, automated process, eliminating time wasted on data gathering and enabling time to be spent on analysing reasons for sub-optimum performance and deciding how to improve.

The current asset performance is thus available on demand – an analogue to the financial position of a company or bank; Cash Flow, P/L, Debtors Financial Indicators. You would never run the finances of a business without these on demand financial reports, so why try to run an E&P enterprise with sub-optimal tools?

PRODUCTION PERFORMANCE

To achieve a full suite of automated production performance dashboards, the following ePMF modules would be required:

- Production Allocation
- Production Forecasting
- Deferment Management
- Opportunity Development & Risk Management
- Operations Logbook
- Production Dashboard.

With the above applications in place, all the data required to conduct objective analysis is available in a structured database. The top-level model used as the basis of PPA is shown in Figure 1 below. Note, the relative sizes of some elements in Figure 1 are exaggerated for presentation purposes.

The model consists of the following elements:

- Base LMPP – Existing Well Production Capability
- Incremental Potential – New Wells, Side Tracks, Re-Perforation
- Planned Shut Down (or Turnarounds) – Major Event
- Planned Deferment – Well Entries, Plant Maintenance
- Unplanned Deferment – Trips, Plant Failures.

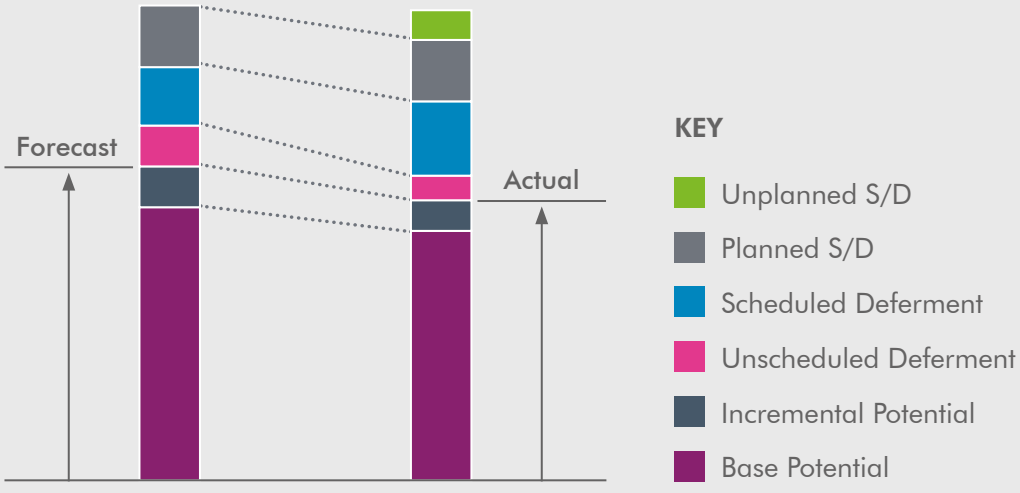

FIGURE 1: ANNUAL PRODUCTION PERFORMANCE ANALYSIS

PRODUCTION PERFORMANCE contd.

The Base, or No Further Activity (NFA), Lowest Maximum Production Potential the sum of the well potentials, taking into account current system capacity constraints, available at the start of the forecast period.

Incremental LMPP is the capacity increase expected during the forecast period, due to increased potential from new wells, side-tracks, production system optimisation activities such as additional perforations and stimulations and increased facility capacity through debottlenecking activities.

Planned Shut Down (or Turnaround) is the shut-down of a complete process train or facility, often for annual maintenance activities, but to minimize overall deferment, often utilized for other activities, which cannot be carried out on the live plant.

Planned (or Scheduled) Deferment is the reduction in availability due to other activities which can be planned.

Unplanned (or Unscheduled) Deferment is the reduction in availability due to events that cannot be planned, such as trips and breakdowns. An allowance, based on historical unscheduled deferment, will be included in forecasts.

FORECAST & ALLOCATION

The design of networks for production allocation will be driven by the availability of measurements, the need to separate areas of different data uncertainty and commercial requirements.

The design of networks for opportunity development and forecasting will be driven by the choke model (ie points of capacity restriction). By utilizing the flexibility of the ePMF network model, one network can be set up that meets both needs and thereby allows roll up of forecast data to compare with actual measurements where available. The model is also flexible enough to allow daily changes, allowing for forecasts and production allocations that reflect real operations.

This use of a consistent network model for both production allocation and forecasting is one of the keys to achieving automated PPA, as shown by the example in Figure 2 below.

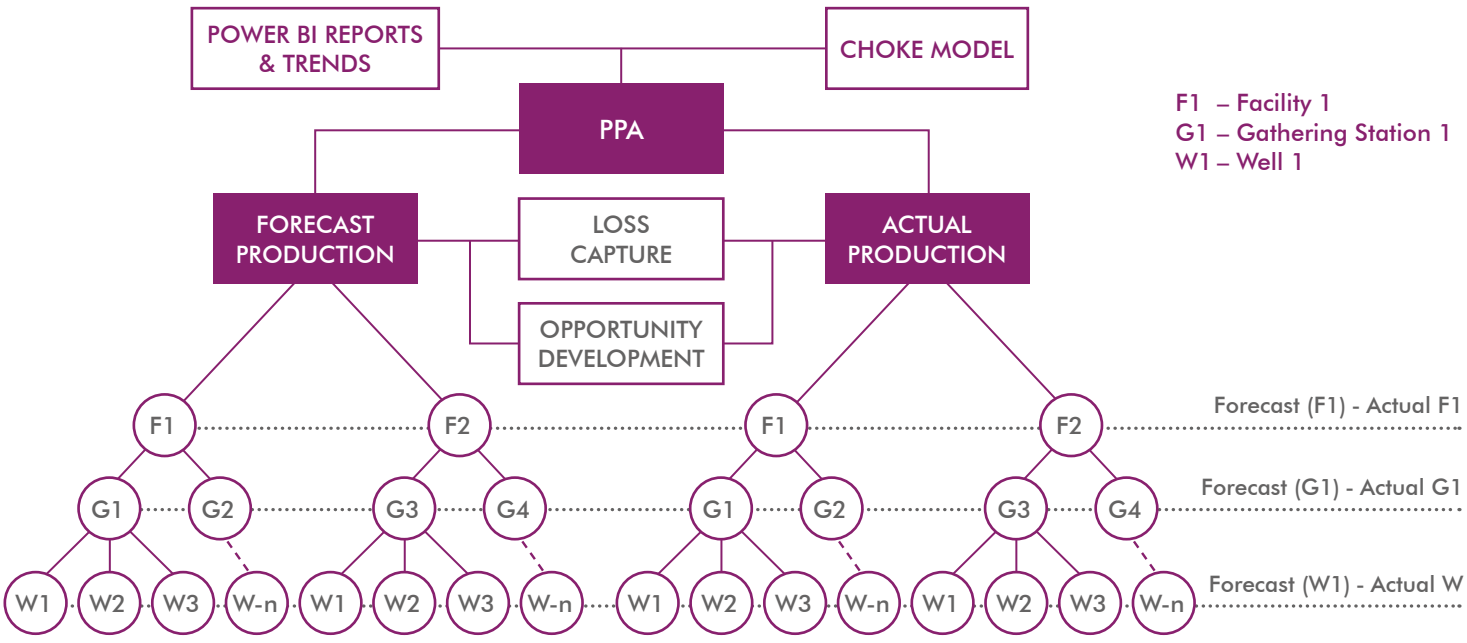

FIGURE 2: FORECAST & ALLOCATION NETWORK MODELS

ANALYSIS

Allocating the difference (Figure 3) between planned and actual production contributing elements can be presented graphically:

- Difference between actual and planned Lowest Maximum Production Potential (LMPP) or Integrated Production System Capacity (IPSC)
- Difference between actual and planned 'uptime'
- Difference in duration between actual and planned shutdown events.

The mathematics used in the PPA application of ePMF can be represented graphically as shown in Figure 3. This can be performed for any specified time period, in addition to the year to date, and the complete year. The dashboard provides a breakdown by node and trends over time. This is key to analysis and therefore continuous improvement of the planning process.

With data held in the deferment management module of EnergySys, the individual reasons for under or over performance can be extracted. This allows the drill down from the top analysis level to more detailed analysis. Access to operator's logbooks and other narrative sources provides additional information to analyse reasons for deviations from plan.

The PPA model also provides the Dashboard with data based on the Choke Model, and the automated visual representation of the Choke Model provides the Opportunity Management process with the required starting point.

The time horizon is as the business demands, aligned with the business & activity planning, forecasting and optimization process cycles.

The key is the speed at which the analysis can be produced to actively manage the business.

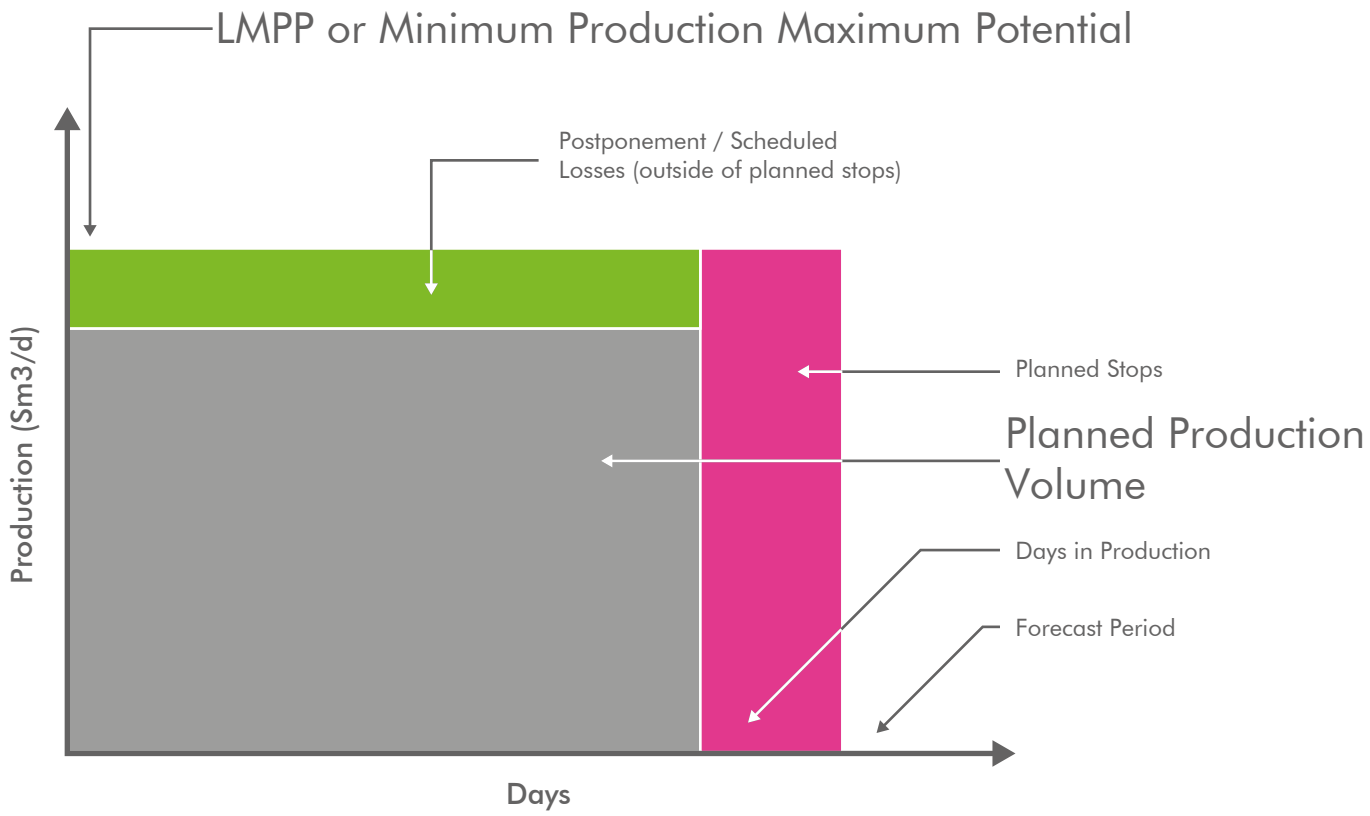

FIGURE 3: ANALYSIS FRAMEWORK