Predictive & Operational Analytics Tools for the Adelaide Metropolitan Water Distribution Network

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Presentation Outline

- Introduction
- Video Presentation
- North South Interconnection System Project (NSISP)
- SA Water Decision Support Tools
  - Demand Forecast Tool (DFT)
  - Distribution Optimisation Tool (DOT)
  - Network Operations Model (NOM)
  - Network Status Display (NSD)
- Features and Benefits
- Network Operations Model and IWLive (more detail)
- Demo
• $400 million infrastructure project

• Improve system reliability and redundancy

• Integrate new water source (Desalination)

• Allow for growth to 2050

• Operational flexibility, but also additional complexity
As part of NSISP, Decision Support Tools were therefore needed to support network planning and operations, especially for the control room.

These tools are unique in that they enable real-time operational analytics and predictive analytics:
- what is happening now across the network and how should we respond to it
- what will happen in the future given forecast conditions

This innovative predictive and operational analytics project is a world first for a water utility.

The suite of Decision Support Tools consists of four components.
DEMAND FORECASTING TOOL
Prediction of demand throughout the network for 7 days

NETWORK OPERATIONS MODEL
Predicted behavior of every asset for 7 days

DISTRIBUTION OPTIMISATION TOOL
Optimised Network Configuration

NETWORK STATUS DISPLAY
Performance Dashboard showing performance of network
DEMAND FORECASTING TOOLS

- Customer Type
- Historic Demand
- Historic Weather
- Predicted Climate
- Time of Day
- Day of Week
- Season
- Special Events

Predicted demand through the network for 7 days

Optimised Network Configuration
- Predicted Demand
- Available Water
- Catchment Inflows
- Cost of Pumping
- Cost of Treatment
- Cost of Transfer

Performance Dashboard showing performance of network
- Predicted Demand
- Predicted Network Performance
- SCADA Data
- Water Quality Data
- Asset Data
- Customer Data
- Weather Data

DISTRIBUTION OPTIMISATION TOOL

NETWORK STATUS DISPLAY
NETWORK OPERATIONS MODEL

- Predicted Demand
- Network Status

Predicted behavior of every asset for 7 days

DISTRIBUTION

- Predicted Demand
- Available Water
- Catchment Inflows

Network Status Display

- Predicted Demand
- Predicted Network Performance
- SCADA Data
- Water Quality Data
- Asset Data
- Customer Data
- Weather Data
DEMAND FORECASTING TOOL
- Customer Type
- Historic Demand

DISTRIBUTION OPTIMISATION TOOL
- Predicted Demand
- Available Water
- Catchment Inflows
- Cost of Pumping
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Network Dashboard showing performance of network
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- Customer Data
- Weather Data

NETWORK STATUS DISPLAY
Features and Benefits

- **More than technology and tools:**
  - business transformation approach
  - stakeholder engagement
  - change management
  - capability building
  - training and ownership of the solution

- **Global benchmark for the water industry**
  - Focus on the industry is now operational efficiency under increasing regulatory pressures
  - Customised technologies are widespread in the industry, but an comprehensive set of integrated tools such as these is unique to SA Water
Features and Benefits

• **Real-time hydraulic modelling technology**
  – New technology in the marketplace
  – One of the largest “live” hydraulic models built

• **Sophisticated optimisation techniques**
  – Integrated solution: data collection/development and optimisation algorithms
  – Optimisation code enhanced and extended to the suite the Adelaide “source to tap” network
  – Built to meet users needs and use cases

• **Integration of the tools**
  – Combined suite of tools, with outputs of one tool used as inputs to other tools
  – Seamless integration and automation (especially of live data streams)
Features and Benefits

• **Reliable, dependable and accurate information**
  – Tools provide key historic, current and future network performance
  – Improved access to data for the business
  – Provide relevant information that assists in decision making

• **Realising Economic Benefits**
  – Real time monitoring and forecast performance of the network with NOM
  – Optimisation to minimise the cost of operations: Bulk water pumping costs, water treatment plant production costs, network transfer pumping costs
Network Operations Model: IWLive

- Adelaide all mains network
  - 100,000 pipes
  - 100 tanks
  - 100 pumps
  - 300 control valves
- 500 Live data signals – SCADA
  - Set start levels of tanks
  - Set status of pumps
  - Set status of valves; within the user programmable scripts
- Baseline Model: Infoworks -> IWLive
- Integrated with Demand Forecast Tool
  - Patterns for 13 customer types
  - Base demands from customer billings – seasonal average demands
- Results integrated into the Network Status Display
  - Results export to database; flows, pressures, tank levels
Questions?