

Can the Water Network Take the Hottest Day, the Fire and the Broken Main?

Peaking, tomorrow's demand, fire flow, single points of failure and pump health, answered from the data a water utility already holds

PRODUCT

Grid Data Enhanced Analytics

AUDIENCE

Water planning engineers, operations, asset managers, fire-protection liaisons

The questions that come back every year

Every water utility faces the same planning questions. Can the system carry the hottest day of the summer? If a structure fire breaks out on that day, how much water can each area deliver? If a main breaks, who loses service, and who just loses pressure? Are the pump stations still doing the job they were bought to do?

These questions shape capital plans, insurance ratings, building approvals and emergency plans. Yet the answers often live in a consultant study from several years ago, a spreadsheet one engineer maintains, and the experience of operators who know which main "you really don't want to lose."

Much of what is needed to answer them afresh is already in the utility's own data: the network model in GIS and the flows, pressures and pump status in SCADA.

Why it's hard

Peaks hide. Storage tanks exist to meet short peaks, so the treatment plant can run steadily while the network draws hard. Read the peak hour at the plant and it looks mild. The real peak hour shows up closer to where customers actually draw water.

Forecasts rarely show their track record. A demand forecast can look reasonable and still add nothing. In water, today's demand is often a lot like yesterday's, so a forecast is only useful if it does better than a naive guess. Few forecasts say whether they do.

Fire flow carries legal weight. Insurance ratings and building approvals depend on it. A utility already knows its recorded fire-flow deficiencies. A number from a network model that quietly disagrees with that record, without saying it is a model estimate, causes more confusion than it resolves.

Criticality is often a matter of memory. Which pipes are single points of failure is frequently known from experience rather than tested across the network. New development, closed valves and changed connections can quietly turn a redundant pipe into a critical one.

Pumps wear quietly. A station can lose performance, start and stop far more often than it should, or run well away from its rated duty for months before anyone notices, because it still moves water.

Principles of a good approach

Read each peak where it shows. Measure each peak where the data is reliable and storage can't mask it.

Make the forecast grade itself. Compare every forecast with a simple baseline and report the result. When the forecast doesn't beat the baseline, say so plainly.

Put fire flow on top of a hard day. Estimate available fire flow with the network already carrying maximum-day demand, not an average day. Label the result as a model estimate, to be checked against hydrant flow tests and the utility's calibrated model.

Know which pipes you can't lose. For any pipe, planners should know whether its failure would cut customers off or leave them below adequate pressure. That separates single points of failure from pipes the network can do without.

Watch pumps for the slow problems. Flag signs of wear, frequent cycling and running far from the rated operating point, while there is still time to plan the work.

Advise, don't operate. Planning analytics should inform engineers and operators, never change setpoints or dispatch crews.

What it looks like in GDEA

Grid Data Enhanced Analytics (GDEA) joins the utility's GIS network model, SCADA telemetry and meter data into one live picture of electric, gas and water networks, with a hydraulic solver for water. Its water demand and capacity view uses that picture and the utility's own history.

Peaking factors. GDEA reports maximum-day and peak-hour factors, each read where it is most reliable and labeled with where it came from.

Tomorrow's demand. GDEA forecasts tomorrow's demand and shows a report card beside it: how the forecast has performed against a simple baseline. When it doesn't beat that baseline, the page says so.

Available fire flow. For each district, GDEA estimates how much fire flow the network can supply on top of maximum-day demand, and what limits it. The result is labeled as a model estimate, and the background demand can be adjusted to explore harder days.

Criticality. GDEA ranks pipes by what their loss would mean, separating single points of failure from pipes the network can manage without, and shows which customers would be cut off or left below adequate pressure. This measures the consequence of a failure, not its likelihood.

Pump stations. Each station is checked for wear, frequent cycling and running far from its rating, with a plain reason given for every station that needs attention.

GDEA is monitoring-only. It does not start pumps, change setpoints or dispatch crews. Burst detection, leakage and pressure-reducing valves are covered in a companion paper, *Finding Lost Gas and Water*.

AN ILLUSTRATIVE EXAMPLE (HYPOTHETICAL)

The following scenario is hypothetical. A planning engineer is preparing a summer readiness review. The plant's peak-hour figure looks comfortable, but GDEA's peak-hour factor shows a newer hillside district peaking much harder than the rest. Storage had been absorbing it.

The demand forecast for the coming days is shown with its report card. Over a mild stretch, it has not beaten the baseline, and the page says so. The operations team keeps using it as one input, knowing exactly how much weight it has earned.

The fire flow view shows the hillside district with the lowest estimated available fire flow, limited by the single main that feeds it. The criticality ranking tells the same story from the other direction: losing that main would cut the district off entirely. The engineer takes both findings to the utility's calibrated hydraulic model and asks for hydrant flow tests in the district before anything goes to the fire-protection liaison or into the capital plan.

The pump station that serves the hillside is flagged for frequent cycling. Operations reviews its controls and storage levels, and the asset team adds an inspection to the next maintenance window.

Questions to ask any vendor

- Are peak-hour factors read where storage can't hide them, and does each figure say where it came from?
- Does the demand forecast report its own track record against a simple baseline, and say so when it doesn't beat it?
- Is available fire flow estimated on top of maximum-day demand, and clearly labeled as a model estimate?
- Does the product show which customers a pipe's loss would cut off and which it would leave below pressure?
- Can it tell single points of failure from redundant pipes, and rank them?
- Are pump stations checked for wear, frequent cycling and running far from their rating, with a reason given?
- Does every operating and dispatch decision stay with your staff?

Closing

The hottest day, the fire and the broken main are not hypothetical for long. A utility that can read its peaks where they show, grade its own forecasts, estimate fire flow honestly and know its single points of failure plans with evidence instead of memory.

Learn more about Grid Data Enhanced Analytics at perinimble.com/grid-data-enhanced-analytics/, or talk with our team at perinimble.com/contact/.

ABOUT PERINIMBLE

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