

Operationalizing the Circular Water Economy

Driving Accountability & Continuous Improvement: A Case Study of Bend, Oregon

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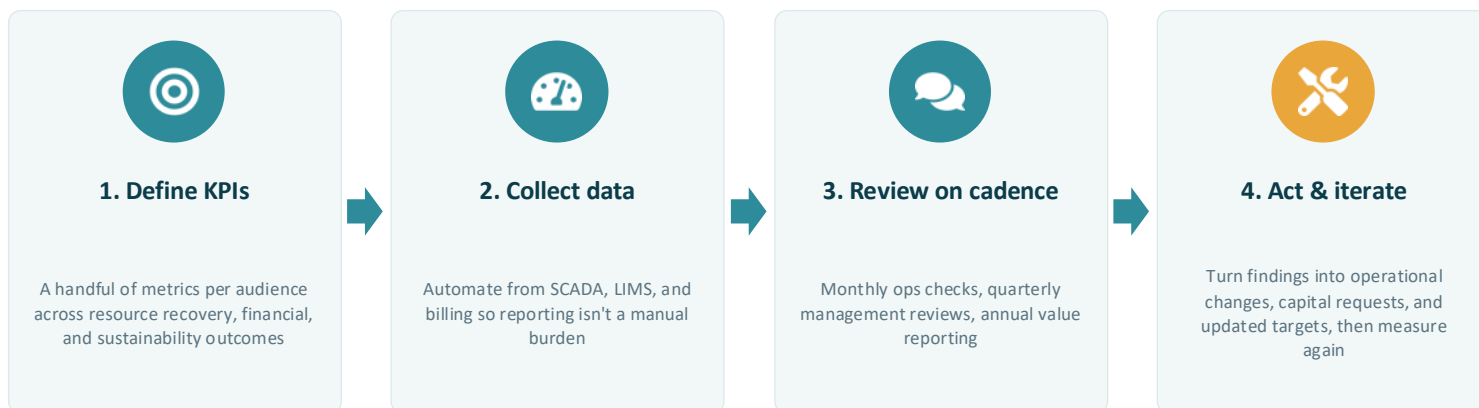
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THE TAKEAWAY, FIRST

A Performance Framework Any Utility Can Run

Measuring circular performance in four steps:



The loop closes: results feed the next round of KPI targets

Design principle: start small. A few well-owned KPIs reviewed on a real cadence beat a 40-metric dashboard nobody reads.

Meet Bend, Oregon: Fast Growth, Finite Water

2x

population growth in 25 years, ~55K to ~110K

6.4 MGD

avg influent at a plant built in 1981 for ~20,000 people

Class A

Oregon's strictest reuse tier (OAR 340-055): filtration + UV, 2 NTU limit, unrestricted public access

150–200 MG

recycled water delivered for golf irrigation each year



Bend Water Reclamation Facility on its 1,600-acre high-desert site



Juniper Preserve (formerly Pronghorn), irrigated with Class A water

THREE VALUE STREAMS RECOVERED



Class A water
for irrigation



Biosolids
~1,400 tons/yr to farmers



Biogas
62m cf process + building heat

An arid high-desert city where growth pressure lands directly on groundwater.

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Two Decades of Reuse: The Flow Wasn't Always Steady

2001

Pronghorn agreement: City sewer service + irrigation for two planned golf courses

2010–11

Setback compliance issues; deliveries paused, then BMP exceptions

2018–23

Avion supplies irrigation; Secondary Expansion, IFAS, solids handling

2026

Goal: 200 MG. Over 1.8 billion gallons reused since 2003



Seven years of zero deliveries is what happens when circular systems outgrow their controls and measurement. The City–Pronghorn partnership (now Juniper Preserve) held through it all, and data-driven investment brought the program back.

Continuous Improvement Needs People, Not Just Data



The WRF operations and maintenance team, inside a drained digester

~15 people run a 6.4 MGD plant plus the reuse program:

Operations: manager, supervisor, lead operator, 6 operators

Maintenance: supervisor, lead, 3 mechanics, electrician, I&C

Success looks different depending on who's looking.

Field staff, the WRF manager, and the director each judge this program by different boxes. KPIs are how those views get reconciled.

The framework is sized for this team: few KPIs, automated data, reviews that produce assignments this crew can actually absorb.

THE FRAMEWORK IN PRACTICE

Step 1: Select KPIs for the Audience That Uses Them

Same program, different scoreboards. Ask each audience: what decision does this metric help you make?



Operators

Run the process

Reuse turbidity & UV dose · daily reuse volume · filter performance · energy use



Managers

Lead execution

Monthly volume vs. target · compliance events · cost per MG · KPI trends



Executives & Council

Fund it, answer to ratepayers

Annual totals · revenue & avoided costs · groundwater offset · sustainability impact

Step 2: One Scorecard, Becoming a Live Dashboard

RESOURCE RECOVERY · 2025

159 MG

recycled water delivered

1,341 tons

biosolids beneficially used

2,699 lbs

total nitrogen recycled

9,225 lbs

total phosphorus recycled

FINANCIAL & SUSTAINABILITY

\$297.01 / MG

recycled water revenue ·

IN DEVELOPMENT:
cost/MG treated · cost/ton biosolids ·
groundwater offset · landfill diversion

HACH WIMS DASHBOARD

Reuse volume

MTD vs plan

Turbidity

NTU, live

Compliance

events, QTD

Cost / MG

trend

Revenue

YTD

Energy

kWh / MG

IN DEVELOPMENT · one shared, automated view for operators, managers, and executives, pulling from SCADA, LIMS, and billing.

Why ratepayers care: every dollar of reuse revenue or avoided cost is a dollar not collected through rates. Circular value shows up to the public as rate stabilization, and these KPIs are how you prove it.

THE FRAMEWORK IN PRACTICE

Steps 3 & 4: Review on a Cadence, Then Act on It



Monthly

Operations check-in

- Reuse volume vs. plan
- Flow & treatment performance
- Energy use
- Upsets & near-misses: what tripped, why

Owner: Operations Supervisor



Quarterly

Management review

- Regulatory compliance status
- Cost performance vs. budget
- KPI trendlines, not snapshots
- Corrective actions: assigned & tracked

Owner: WRF Manager



Annual

Value & planning review

- Total reuse & biosolids volumes
- Cost, revenue, and avoided costs
- Sustainability impact metrics
- Targets & capital needs for next year

Owner: Utility Director

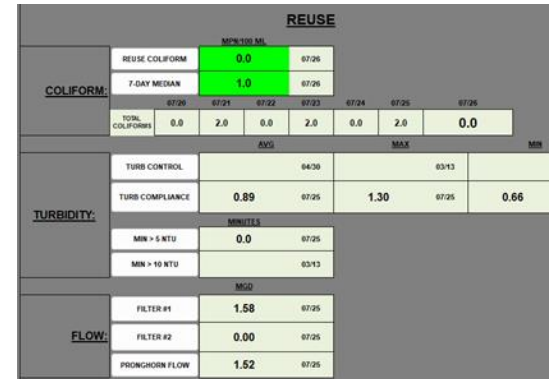
Step 4 lives in the last agenda line: every review ends with owners and dates. A review that produces no assignments was a status meeting.

Step 2: Collect the Data Once, Automatically

Bend's Hach WIMS dashboard pulls SCADA, LIMS, and lab data into one live view: actual vs. target, color-coded, no manual reporting.



Plant-wide view: headworks, activated sludge, secondary, solids, digestion, disinfection



Reuse sub-dashboard: the Class A compliance view

0.89 NTU

avg reuse turbidity vs. the 2 NTU Class A limit

0.0 min

time above 5 NTU: the engineered control working

1.52 MGD

flow to Pronghorn, metered and billed

Drill-down

sub-dashboards per process area, one click

Why ratepayers care: every dollar of reuse revenue or avoided cost is a dollar not collected through rates.

DEMONSTRATING VALUE

Value Beyond the Numbers



Resident trumpeter swans on recycled-water ponds at Juniper Preserve

Not everything a circular program produces fits in a KPI table.

- The reuse-fed ponds host a resident pair of trumpeter swans, locally beloved as “Swan Travolta” and “Olivia Newton Swan”
- A partnership with the Trumpeter Swan Society and Oregon Dept. of Fish & Wildlife: cygnets hatch on a course island, overwinter at Zoo Idaho, and are released at Summer Lake Wildlife Refuge

For your annual review: pair the KPI table with the habitat, partnership, and community stories your program creates. Councils and ratepayers remember the swans.

A 90-Day Playbook for Your Utility

- 1** WEEKS 1–2 **Inventory your circular streams.** List every recovery stream you already have (reuse water, biosolids, biogas, nutrients) and who touches each.
- 2** WEEKS 3–4 **Pick 6–10 KPIs, by audience.** A few each for operators, managers, executives. Include one financial and one sustainability metric, even if they start “in development.”
- 3** WEEKS 5–8 **Wire up the data.** Pull SCADA, LIMS, and billing into one dashboard. Automate; don't assign a spreadsheet hero.
- 4** WEEKS 9–12 **Hold the first reviews.** Run the monthly and first quarterly review with today's agendas. End each with named owners and dates.
- 5** ONGOING **Close the loop, publicly.** Report annually in ratepayer terms. Feed results into next year's targets, budgets, and capital plans.

CONCLUSION

Circular water works when you can prove it works.

1.8B+

gallons recycled for beneficial use since 2003, and counting

100%

Class A since the 2024 resumption

200 MG

delivery goal for the 2026 season

\$297.01

revenue per MG, one of a growing set of value KPIs

The program succeeded despite real setbacks: distance setbacks, water quality challenges, and educating end users about recycled water.

It runs on a durable partnership: the City's WRF manager and the golf course superintendent have collaborated since the beginning, through suspension and resumption alike.

And now it has a measurement backbone: KPIs, feedback loops, and review cadences that make the next 1.8 billion gallons provable, accountable, and continuously improving.



Bend's WRF manager and the course superintendent, collaborators since day one

Measure what matters, then keep the loop turning.



Measurement is essential to demonstrate value



KPIs enable accountability and transparency



Feedback loops improve operational reliability



Continuous improvement requires both data and dedicated resources

Something to think about:

- Which of your circular streams has no KPI attached to it today?
- Who would own your quarterly review, and what would be on its first agenda?
- What would your delivery chart look like if you drew it for the last 10 years?

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