Performance Based Contracts in Non-Revenue Water Reduction Programs

March 2017

Session 4: What is a PBC?

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Introduction

- Importance of NRW Management

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Utilities worldwide lose a total of $14 billion/year in revenues to non-revenue water

Comparators in Africa

Country	Utility	Non-Revenue Water	Appx. Annual Revenue Lost to NRW in $	Year, most recent
Burundi	Bujumbura	40%	7.3 M	2006
Ethiopia	Addis	42%	6.9 M	2008
Kenya	Nairobi	38%	134 M	2013
Kenya	Mombasa	47%	13 M	2013
Malawi	Lilongwe	41%	19 M	2009
Mozambique	Maputo	47%	45.6 M	2013
Rwanda	Electrogaz	38%	5 M	2005
Tanzania	Dar es Salaam	56%	70 M	2009
Uganda	National	36%	61 M	2009
Zambia	Lusaka	45%	57.9 M	2013

Source: Author's calculations based on IB-NET data

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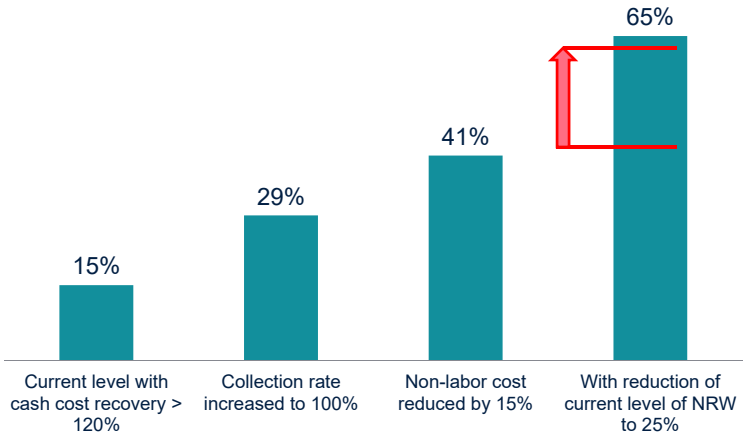
Compared to other interventions, NRW reduction represents largest gains in increased cash flows

Based on 600 utilities reaching a desired cash flow level of 120% of operating costs



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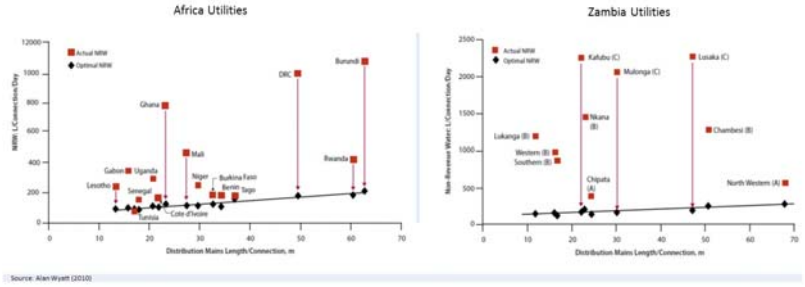
Despite making financial sense, why are utilities far from optimal levels of leakage?



- Tight budget, operating-cash strapped
- Weak incentives to perform in traditional approaches
- High risk of failure: no competition on methods to address NRW
- Additional production easier, more certain than managing leaks
- Cost of loss borne elsewhere (not by utility) e.g., Ministry of Finance

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What is a Performance Based Contract for Non-Revenue Water Reduction?

- Performance Based Contract for NRW
- Comparing Traditional NRW Consultancy and Leakage Contract and PBCs

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What is a *performance based contract for non-revenue water management*?

- Contract which requires the reduction of NRW, or the achievement of other results which depend on controlling NRW
- Performance Based Contract = a results-oriented contracting method that focuses on the quality and outcomes achieved by the contractor, and ties a portion of a contractor's payment to the achievement of specific, measurable results.
- Contractor is responsible for designing and carrying-out actions it believes necessary to fulfil the contract aim while maximizing the strong financial incentives of being efficient.
- This type of contract makes it necessary for the Contactor to have a good management capacity.

Like a 'time and materials contract' with 3 main distinct features that drive quality of work:

Elements of PBC	Contrast to Time & Materials
1. Portion of payment to the contractor is based on achieving results rather than the cost of inputs;	1. Payment to the contractor is based on proposed time and materials (e.g. length of pipe surveyed, staff days, etc)
2. The contractor defines & competes on how results will be achieved, including the organization of teams, technology, priorities & sequence within scope defined by utility	2. Utility defines all the technical details of the NRW reduction program – no competition on method; all performance risk on utility
3. Usually, contractor has a stake in the upside that would come from exceeding the targets	3. Usually, utility budget is specified against targets that are not expected to be exceeded

Conventional contracts also have performance obligations

- They include some clauses for:
  - Performance bonds
  - Guarantees
  - Liquidated damages
  - Fines for non-performance
  - Bonuses for good performance

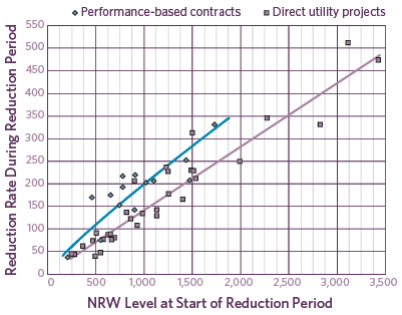
However, with today's PBCs, the private sector makes a larger investment and takes a larger risk, and is paid to reach or exceed specific targets

Examples of performance-based contracts

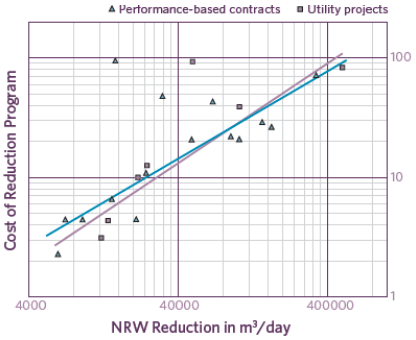
Project	Objective	Scope	Contract Amount ($ M)	Duration	Resulting reduction in m3/day	Cost of reducing per m3/day in $	Estimated payback period in years
Selangor, Malaysia	Increase water availability thru leakage reduction and metering accuracy	Established DMAs Pressure management Replaced/installed meters Installed data loggers	Phase 1: 4.5 Phase 2: 105	Phase 1: 18 months Phase 2: 9 years*	Phase 1: 20,898 As of 2006 117,000	Phase 1: $ 215 Phase 2: $ 528	8.9 years
Bangkok, Thailand	Reduce physical losses in distribution networks	Established DMAs Leak reduction and management	District 1: 16.3 District 2: 17.3 District 3: 22.6	5 years	District 1: 39,905 District 2: 33,397 District 3: 91,905	District 1: 409 District 2: 518 District 3: 246	6.6 years 7.9 years 4.4 years
Sao Paolo, Brazil	Replace meters	Replaced 27,000 meters Recalibrated old meters	18	3 years	41,208 increased billing	$436	1.5 years
Ho Chi Minh, Vietnam	Leakage reduction and management in Zone 1	Established DMAs Leakage reduction and management Emergency	15	5 + 1 years	92,000	$ 390	4.8 years

Comparing the Speed and Cost of Reduction under PBC versus Utility-only

PBC vs Utility-only Rate of Reduction (l/cnnx/day)



Cost of reduction in $m (2010 prices)



- Faster reduction through PBC where initial water losses are high
- No statistical significance of difference in cost

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Key Performance Risk Allocation Mechanisms in a PBC

- Payment
- Portion of Payment at Risk
- Basis of Payment
- Setting Conditions for Performance

- Links to Bidding
- Penalties and Bonus

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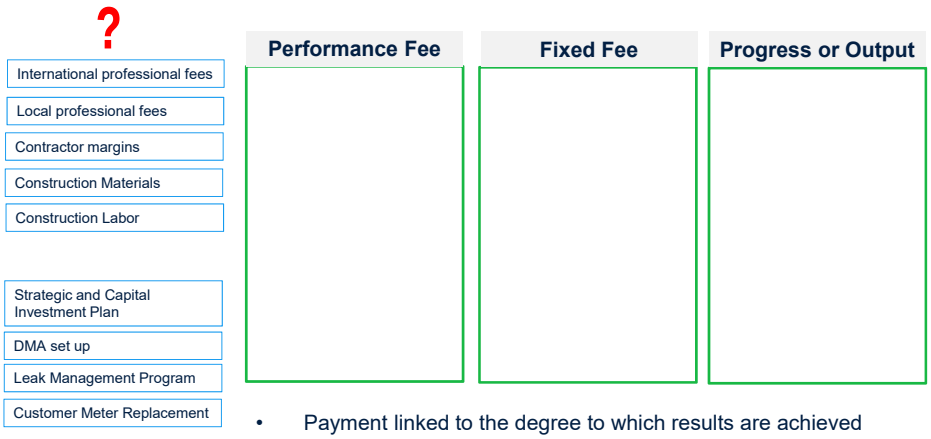
A key feature of the PBC is the "Payment at Risk"



- Payment linked to the degree to which results are achieved
- Higher performance incentive, the higher the financial risk to contractor – performance and price trade off
- 30 to 40 percent performance fee: depends on risk perception

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Specifying the performance fee in the bid documents

- Limiting the fixed fee portion of the relevant program costs
  - Bidders estimated cost: $10 million
  - Performance fee set to e.g. 20%
  - Maximum fixed fee is $ 8 million divided into quarters of contract duration (e.g. 4 years) or $500,000 per quarter
  - Unit price of reduction set by total volume specified in bid document – total volume set at x% of estimated reduction
    - Example: Estimated reduction potential is 30,000 m3/day set at 80% is 24,000 m3/day
    - THEREFORE, unit rate is $2 million (20% performance fee) divided by 24,000 m3/day or $83 m3/day

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Basis of Payment

- Common target formulations:
  - leak reduction m3/day or m3/connection/day
  - % of service connection converted to continuous supply
  - billed consumption m3/day
- Linked to standards or conditions of performance
  - e.g., pressure levels
  - sometimes with a minimum target

Examples of contract payments and penalties and bonus

Project	Objectives	Activities	Targets set in m3/day	Resulting water savings m3/day	Payment Mechanism	Rewards and Penalties
Selangor, Malaysia	Increase water availability through leakage reduction and metering accuracy	Established DMAs Pressure management Replaced/installed meters Installed data loggers	198,900	198,900	Fixed fee negotiated	Portion of unachieved target x 5% of contract value ($5 M) Performance guarantee of 10% of contract
Bangkok, Thailand	Reduce physical losses in distribution networks	Reduce physical losses in distribution networks	No targets were set	165,207	Performance fee of 50% of tariff of NRW improvement levels for expats, operation & profit Fixed fee for local staff Materials reimbursement	
Sao Paolo, Brazil	Replace meters	Replace meters	Replace 27,000 meters	41,208 increased billing	Per meter installed (incremental revenues from water saved)	Built in based on per meter installed fee
Ho Chi Minh, Vietnam	Leakage reduction and management in Zone 1	Leakage reduction and management in Zone 1	37,000 m3/day Establish 119 DMAs	92,000	Leakage reduction: 30% fixed, 70% performance-based DMA set up: fee per DMA	VND 800,000 per m3 for unachieved amount against annual minimum targeted DMA: 10% liquidated damages/month delay

Examples of contract payments and penalties and bonus

Project	Objectives	Activities	Targets set	Resulting water savings in m3/day	Rewards and Penalties	Rewards and Penalties
Tegucegalpa, Honduras	Demonstrate quick, visible improvements in service continuity	Update of cadaster, Establish DMAs, rehabilitate reservoir and pumps Leak detection and reduction Meter reading and normalization of illegal connections	Increase continuity from average of 4.5 hours/day to 14 hours/day Increase metered consumption by 30%	Data not yet available although meters have been replaced, reports indicate that very little of the leakage detection and control had been done	Lump sum payments for 85% of contract costs 15% performance fee based on target continuity of service and increase in metered consumption	Built into the performance payment
Jamaica	Augment revenues of utility	Water audit DMA set up Pressure management Commercial surveys and geo-referencing customers Meter installation	NRW reduced from 71% to 53% Billable consumption increases from 41,000 m3/per day to 55,000 m3/day	27,000	Fee component of the contractor paid on pro-rated basis to achievement of results at implementation and sustainability phase	
New Providence, Bahamas	Financial & operational sustainability by reducing NRW – 90% of water from desalination, cost to customer $3.4/m3	Diagnostic Leak detection & repair Replacement Illegal connections Metering NRW management and software	Reduce NRW to 9,400 m3/day @25psi (avg) w/in 5yrs; then to 7,570 m3/day year 7	Currently exceeding target: at 11,000 on year 4	Quarterly fixed fee for capital works and installations Monthly performance payment (target x performance level)	Performance security for failure to achieve targets 2 consecutive years

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Stages of Performance Based Contract Development

- General Process for PBC Preparation
- Tools Available for Decision Making
  - Screening Good Candidates
  - Deciding: To PBC or Not to PBC?

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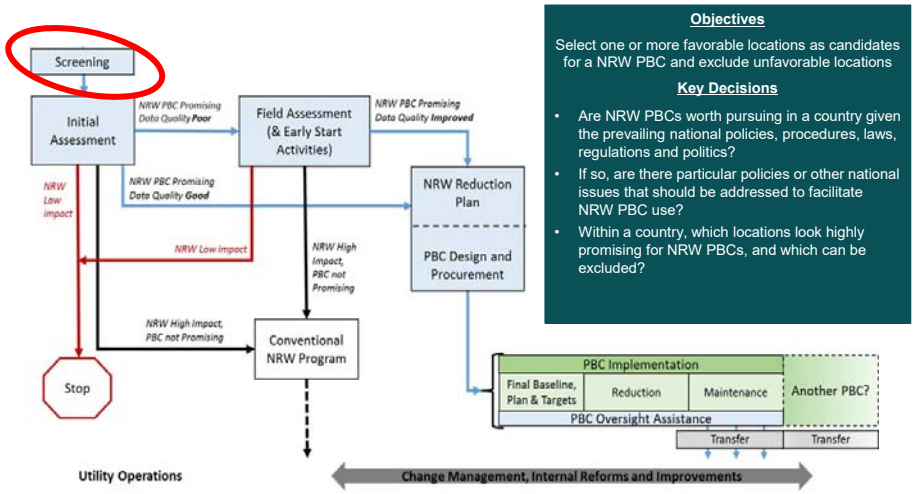
Country and Location Screening (1-2 months)



Objectives

Select one or more favorable locations as candidates for a NRW PBC and exclude unfavorable locations

Key Decisions

- Are NRW PBCs worth pursuing in a country given the prevailing national policies, procedures, laws, regulations and politics?
- If so, are there particular policies or other national issues that should be addressed to facilitate NRW PBC use?
- Within a country, which locations look highly promising for NRW PBCs, and which can be excluded?

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Screening tools: National and local

Local Screening Tool

Criterion		Red	Amber	Green	Your Utility
NRW levels high (assessed assuming 24/7)		NRW <15%	15%<NRW<40%	NRW >40%	
Water supply intermittent			24-18 hours	<18 hours	
Variable operating costs high			$0.00-0.20/cu.m	cost >$0.20/cu.m	
Production inadequate			PC>500lpcd	PC<500lpcd	
Resources scarce		Unlimited high-quality water available with little pumping or storage costs	Between	All available water allocated, solutions such as desal being considered	
Demand growth (%p.a.)		Growth <0%	0%<Growth<5%	Growth >5%	
High LRMC ($/cu.m)		LRMC <$0.30	$0.30<LRMC<$1.00	LRMC >$1.00	
Social support		No	Not Clear	Yes	
High priority on improving water service in this area	Ministry of Water Ministry of Finance	No	Not clear	Yes	
	City Government	No	Not clear	Yes	
Conclusion of Screening					Include/ Exclude

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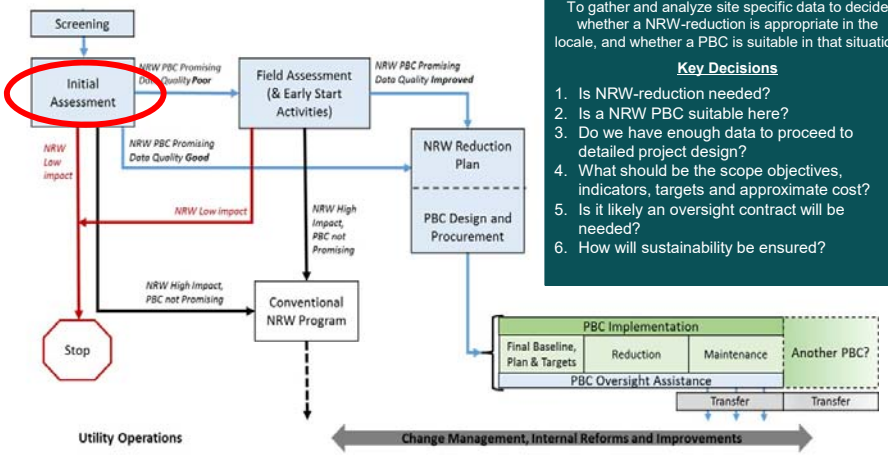
Initial Assessment (1-3 Months)
Output: Initial Project Concept



Objectives

To gather and analyze site specific data to decide whether a NRW-reduction is appropriate in the locale, and whether a PBC is suitable in that situation

Key Decisions

1. Is NRW-reduction needed?
2. Is a NRW PBC suitable here?
3. Do we have enough data to proceed to detailed project design?
4. What should be the scope objectives, indicators, targets and approximate cost?
5. Is it likely an oversight contract will be needed?
6. How will sustainability be ensured?

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Decision-Making List: To PBC or not to PBC?

		Indicates Public Sector NRW-Reduction Program	Indicates NRW PBC
NRW	Urgency of reducing NRW	Low	High
	Value of reducing NRW	Low	High
Utility	Capacity of the utility to manage complex new endeavors	High	Low
	Level of expertise in the utility on NRW-reduction	High	Low
	Strength of incentives for good performance among utility managers and staff	High	Low
Stakeholders	Openness of stakeholders to engaging private companies to carry out specific functions	Low	High
	Openness of utility staff to cooperating with a specialized contractor	Low	High
	Ministry of Finance willingness to commit funds to the utility to manage	High	Low
	Water regulator's confidence in utility's ability to reduce NRW	High	Low
	Likelihood that skilled NRW-reduction contractors will want to work in this location	Low	High

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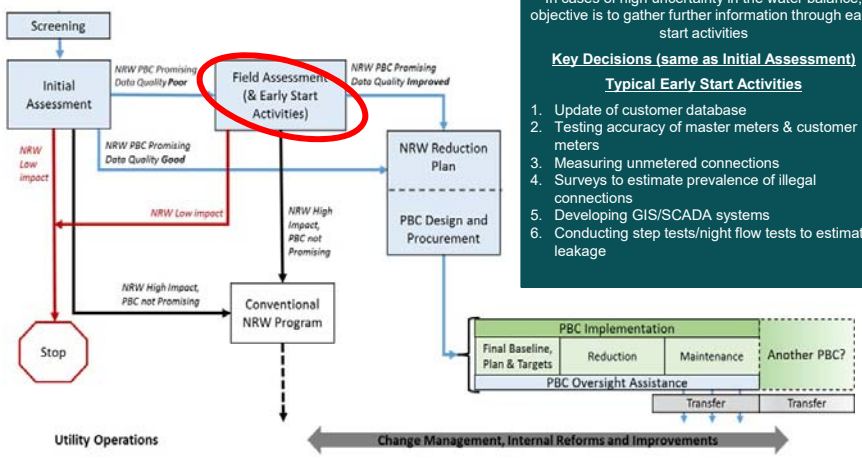
Extended Field Assessment and Early Start Activities (3 months or >, depending on size of service area)



Objectives

In cases of high uncertainty in the water balance, objective is to gather further information through early start activities

Key Decisions (same as Initial Assessment)

Typical Early Start Activities

1. Update of customer database
2. Testing accuracy of master meters & customer meters
3. Measuring unmetered connections
4. Surveys to estimate prevalence of illegal connections
5. Developing GIS/SCADA systems
6. Conducting step tests/night flow tests to estimate leakage

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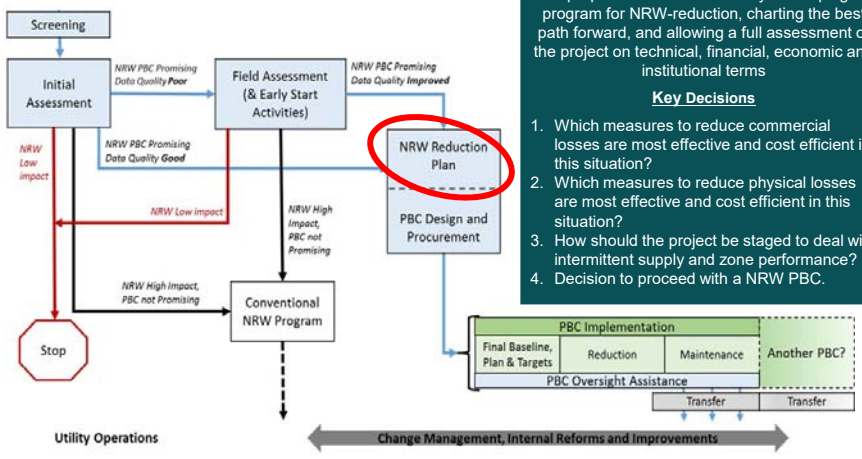
NRW Reduction Planning (4-7 Months)



Objectives

To prepare for a PBC tender by developing a program for NRW-reduction, charting the best path forward, and allowing a full assessment of the project on technical, financial, economic and institutional terms

Key Decisions

1. Which measures to reduce commercial losses are most effective and cost efficient in this situation?
2. Which measures to reduce physical losses are most effective and cost efficient in this situation?
3. How should the project be staged to deal with intermittent supply and zone performance?
4. Decision to proceed with a NRW PBC.

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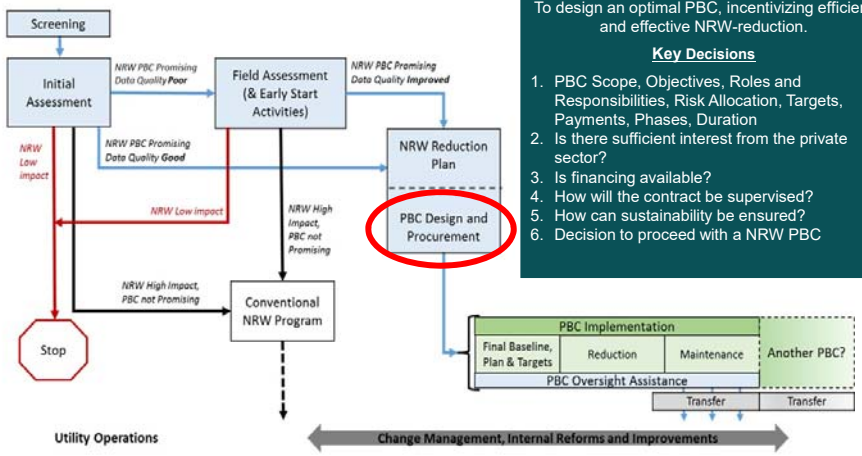
PBC Design: (1-2 Months)



Objectives

To design an optimal PBC, incentivizing efficient and effective NRW-reduction.

Key Decisions

1. PBC Scope, Objectives, Roles and Responsibilities, Risk Allocation, Targets, Payments, Phases, Duration
2. Is there sufficient interest from the private sector?
3. Is financing available?
4. How will the contract be supervised?
5. How can sustainability be ensured?
6. Decision to proceed with a NRW PBC

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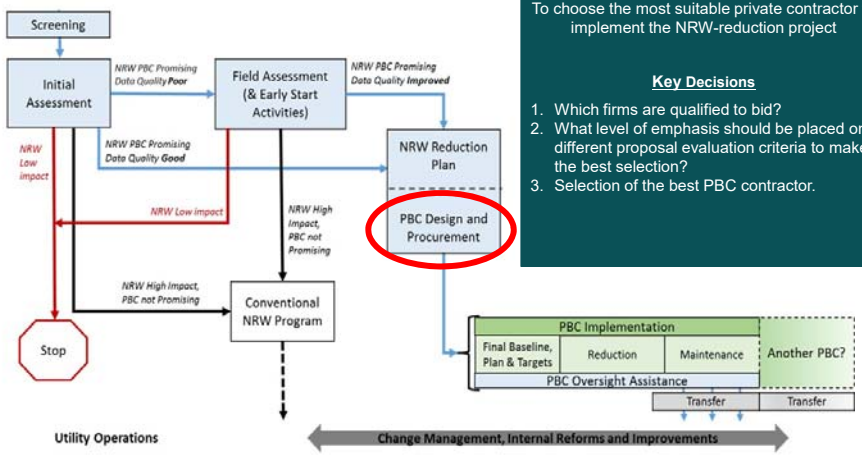
Procurement (7-10 Months)



Objectives

To choose the most suitable private contractor to implement the NRW-reduction project

Key Decisions

1. Which firms are qualified to bid?
2. What level of emphasis should be placed on different proposal evaluation criteria to make the best selection?
3. Selection of the best PBC contractor.

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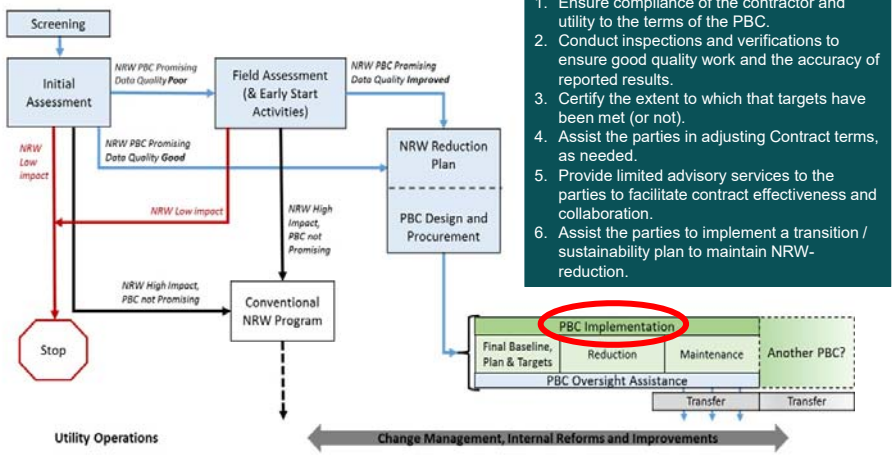
Oversight and Support
(Duration of contract + 3 months)



Key Actvities

1. Ensure compliance of the contractor and utility to the terms of the PBC.
2. Conduct inspections and verifications to ensure good quality work and the accuracy of reported results.
3. Certify the extent to which that targets have been met (or not).
4. Assist the parties in adjusting Contract terms, as needed.
5. Provide limited advisory services to the parties to facilitate contract effectiveness and collaboration.
6. Assist the parties to implement a transition / sustainability plan to maintain NRW-reduction.

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Scope and Target Setting

- Identify Most Significant Losses
- Conduct Cost Benefit and Payback Analysis
- Understand Current NRW Practices

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What should you consider when defining the target and scope of the PBC?

1. **Your goal**– What you are trying to achieve as a utility and how reducing NRW can help
2. **Your Most Significant Losses –** Areas of significant losses and potential solutions
3. **Your Project Financial/Economic Results –** Optimal targets (and possibly minimum targets), scope and timeframe
4. **Your Weaknesses** – What you are good at and areas where you need help from a PBC contractor

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Step 1: Define your goal

Goal	Type of NRW-reduction that can help
Provide 24/7 service to more customers	Reduce leakiness of infrastructure, so that that physical losses do not increase as hours of supply increase
Expand water service to more customers	Reducing physical losses in existing network will increase water available to new customers
Ensure enough water is available to satisfy expected demand growth	Reducing physical losses will increase the amount of water available to meet future increases in demand
Improve financial performance	▪ Reducing commercial losses will increase revenues. ▪ Reducing physical losses may increase sales, or reduce costs. ▪ Improving collections (not strictly NRW-reduction, but closely related) will increase operating cash flow. ▪ Reducing energy consumption (not NRW-reduction, but related) will reduce costs.
Increase security of supply in the face of climate change and other risks	Lower levels of physical losses in the network means that any given level of storage can provide supply for longer

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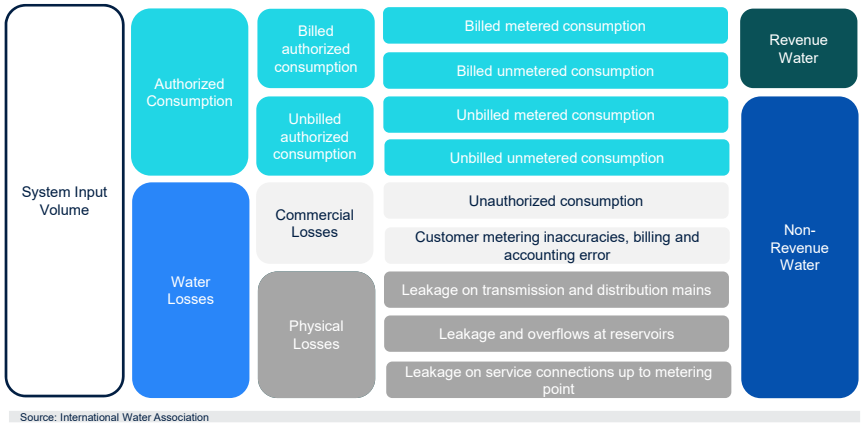
Step 2: Identify most significant water losses



Source: International Water Association

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Step 3: Appraise investment, optimize targets & timeframe

Example NRW Program, Costs and Benefits

Activity	m3/day Recovered	Program Cost ($)	Net Financial Benefit* per Year ($)	Life Cycle Financial Benefit (5 Years) $	Deferred Capital Benefit** $	Nature of Benefit
Plan and Improve GIS, Hydraulic Model	0	2,500,000	0	0	0	Sunk cost
Repair Reservoirs	250	5,000	2,190	10.950	37,500	Operations cost saved, Deferred capital
Introduce Customer Meters	8,000	4,800,000	1,168,000	5,840,000	none	Revenue recovered
Replace Service Connections	4,500	3,000,000	492,750		8,437,500	Operations cost saved, Deferred capital
Manage Pressure	2,550	1,750,000	279,225	1,396,125	4,781,250	Operations cost saved, Deferred capital
DMA and Manage Backlog Leaks	10,200	10,250,000	1,116,900	5,584,500	19,125,000	Operations cost saved, Deferred capital
Regularize Illegal Connx	1,000	1,050,000	146,000	730,000	none	Revenue recovered
Mains Replacement	3,000	3,500,000	328,500	10,950	5,625,000	Operations cost saved, Deferred capital
Total	**29,500**	**26,855,00**	**3,533,565**	**17,667,825**	**38,006,250**	

***Revenue benefit:** Average tariffs ($0.4/m3) **Operating Cost Savings benefits:** Operating cost ($0.3/m3)
Assumed **cost of new production development $1,875 m3/day. In this scenario the saved m3/day would have served an additional 30,000 customers

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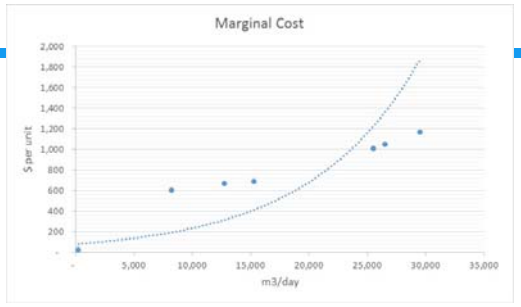
Activities have different profiles of cost and payback

- Start with the least expensive
- Activities may cost more per unit, but have faster payback
- Exceeded PBC target benefits utility even if extra recovery is paid: per unit recovery likely quoted at lower marginal cost

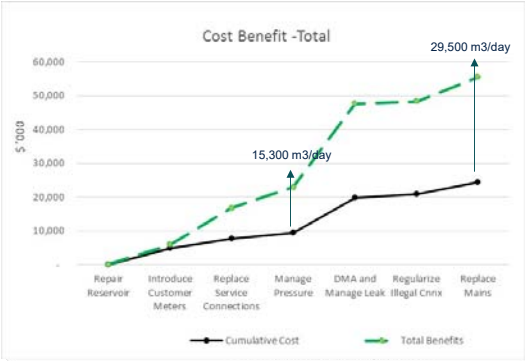


Activity	m3/day Recovered	Program Cost ($)	Ave Cost m3/day ($)	Financial Benefit per Year ($)	Payback Period (years)
Plan and Improve GIS, Hydraulic Model	0	2,500,000		0	
Repair Reservoirs	250	5000	20	2,190	2.3
Introduce Customer Meters	8,000	4,800,000	600	1,168,000	4.1
Replace Service Connections	4,500	3,000,000	667	492,750	6.1
Manage Pressure	2,550	1,750,000	686	279,225	6.3
DMA and Manage Backlog Leaks	10,200	10,250,000	1,005	1,116,900	9.2
Regularize Illegal Connx	1,000	1,050,000	1,050	146,000	7.2
Mains Replacement	3,000	3,500,000	1,167	328,500	10.7
Total		**26,855,00**	**747**	**3,533,565**	**7.6**

Reduce losses up to the point where cost of reduction equals the value of water (benefit)

Potential Benefits

- Direct financial benefits
  - saving on cost of operation (energy, chemicals)
  - revenues
- Indirect financial benefits
  - deferred capital investment in production of water
- Economic benefits



Usually, the budget, not the "benefit," is the biggest constraint. Some PBCs have been designed to encourage optimal investment programs.

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Optimal Decision Criteria and Rules of Thumb

Goal	Optimal Decision Criteria for when NRW-reduction is desirable	Rule of Thumb that may indicate NRW-reduction is desirable
Provide 24/7 service to more customers	Cost of reducing physical losses is less than cost of bulk supply increases that would be needed to achieve goal	If physical losses x $\frac{24}{\text{current hours of supply}} > 30\%$ it is likely that physical losses reduction is warranted, unless adding to bulk production in sufficient quantity to achieve 24/7 is unusually low cost (plentiful water nearby, gravity-fed, low treatment costs, low capex costs).
Expand water service to more customers	Cost of reducing physical losses is less than cost of bulk supply increases that would be needed to achieve goal	If physical losses <15% and costs of new production are at typical levels (say $1mil/MLD or more) NRW-reduction is likely to be desirable
Ensure enough water is available to satisfy expected demand growth	Cost of reducing physical losses is less than cost of bulk supply increases that would be needed to achieve goal	If demand growth would require a significant ne bulk water scheme to be constructed within 5 years, at a cost of $1mil/MLD (or more), and physical losses exceed 15%, then NRW-reduction is likely to be desirable
Improve financial performance	Is the PV of cost of the NRW-reduction program less than the PV of the increase in operating cashflow expected, when discounted at the utility's cost of capital	▪ If total NRW>30% then reducing NRW is likely to be desirable ▪ If commercial losses >15%, then NRW-reduction is likely to be desirable ▪ If collection efficiency is <95%, then including collection improvement in any NRW-reduction effort should be considered.
Increase security of supply in the face of climate change and other risks	NRW-reduction is cheaper than providing an equivalent increase in storage	If NRW>20%, then NRW-reduction is likely to be desirable

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NRW Practices Assessment

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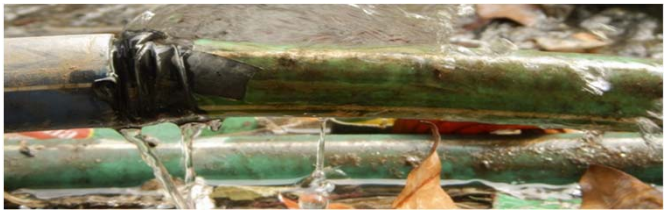
Global Program to Support the use of NRW PBCs

Objective

Develop good practices on Performance Based Contract in the Marketplace to Manage Non-Revenue Water

Partnership with

International Water Association, IDB and WBG



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PPIAF
Enabling Infrastructure Investment

WORLD BANK GROUP
Water

Program Activities

- **Develop knowledge** – TOR, Term sheets, Standardized contracts
- **Support PBC projects** – Kenya, Tanzania, West Bank, Pakistan
- **Support private sector skills** – Training, Supply Chain analysis
- **National scale up** – How to get beyond one utility at a time

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