

# State of the Art Ceramic UF Technology

By Nanostone Water



# Group of Companies

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Parent Company with interest in Water, Low Carbon Energy, Chemicals, Fuels, and Waste Harvesting



Ceramic UF technology for treatment of water and wastewater for potable and non-potable use



Fundamentally redesigning water electrolysis to create the ideal platform for producing Green Hydrogen



Developing new routes to produce high volume basic chemicals from commodity hydrocarbon feedstocks

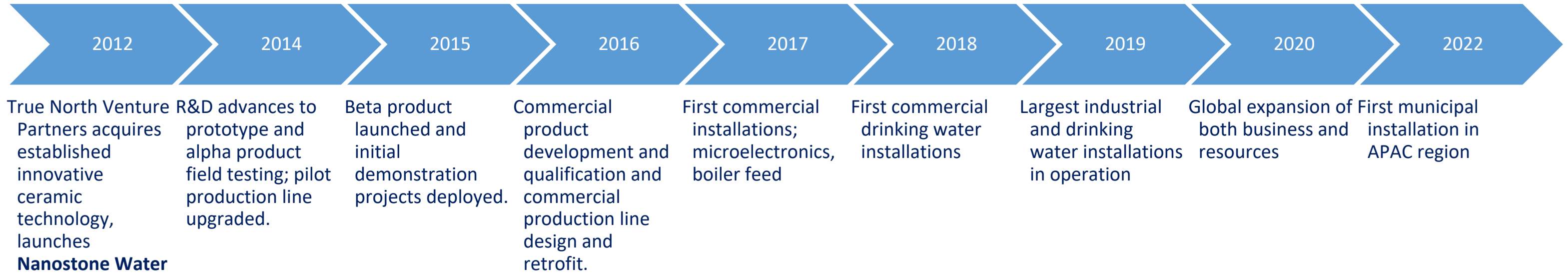


Novel Fermentation technology to process synthesis gas from multiple sources in to high value products

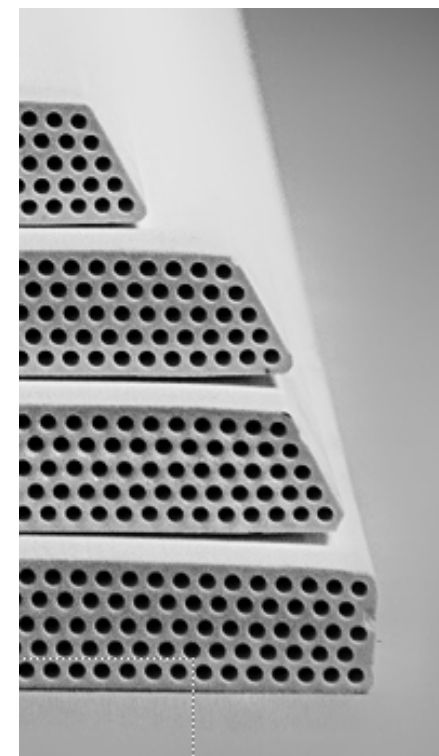
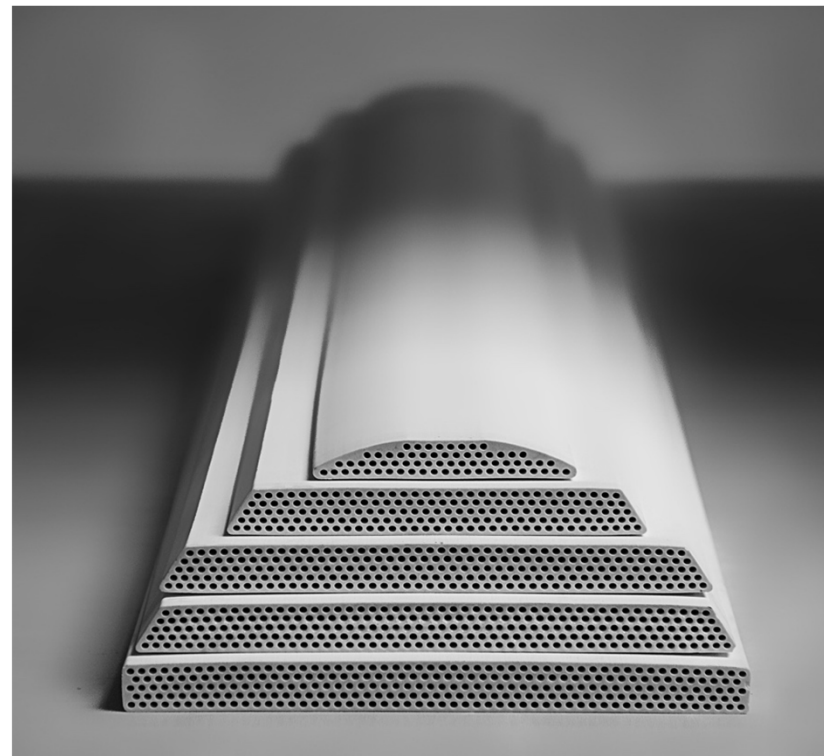


Advanced membrane technology that enable molecular level separations in industrial processes

# Company Background



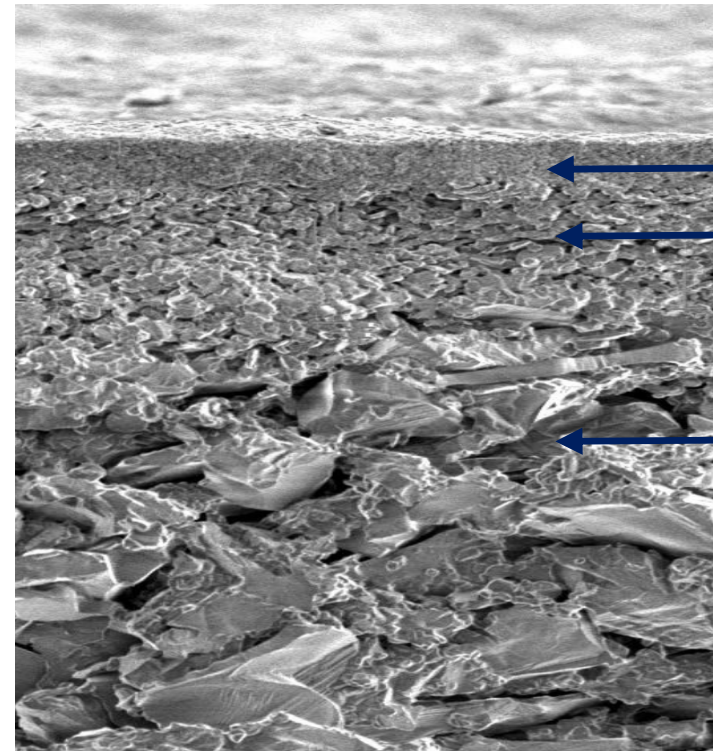
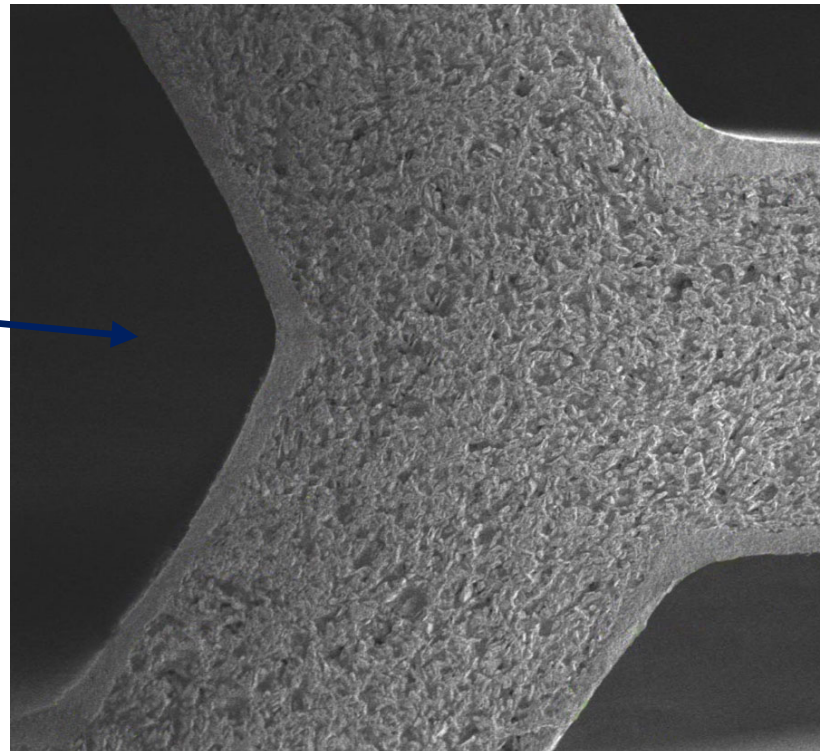
# Ceramic UF Technology



Pore size:  
30 nm ~ 0.03  $\mu$

Material:  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>

2.4 mm  
Feed  
Channel



Membrane Coating  
Inner Layer

Ceramic Extruded  
Support

# Ceramic UF Technology

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Height: 1,918mm (75.5")

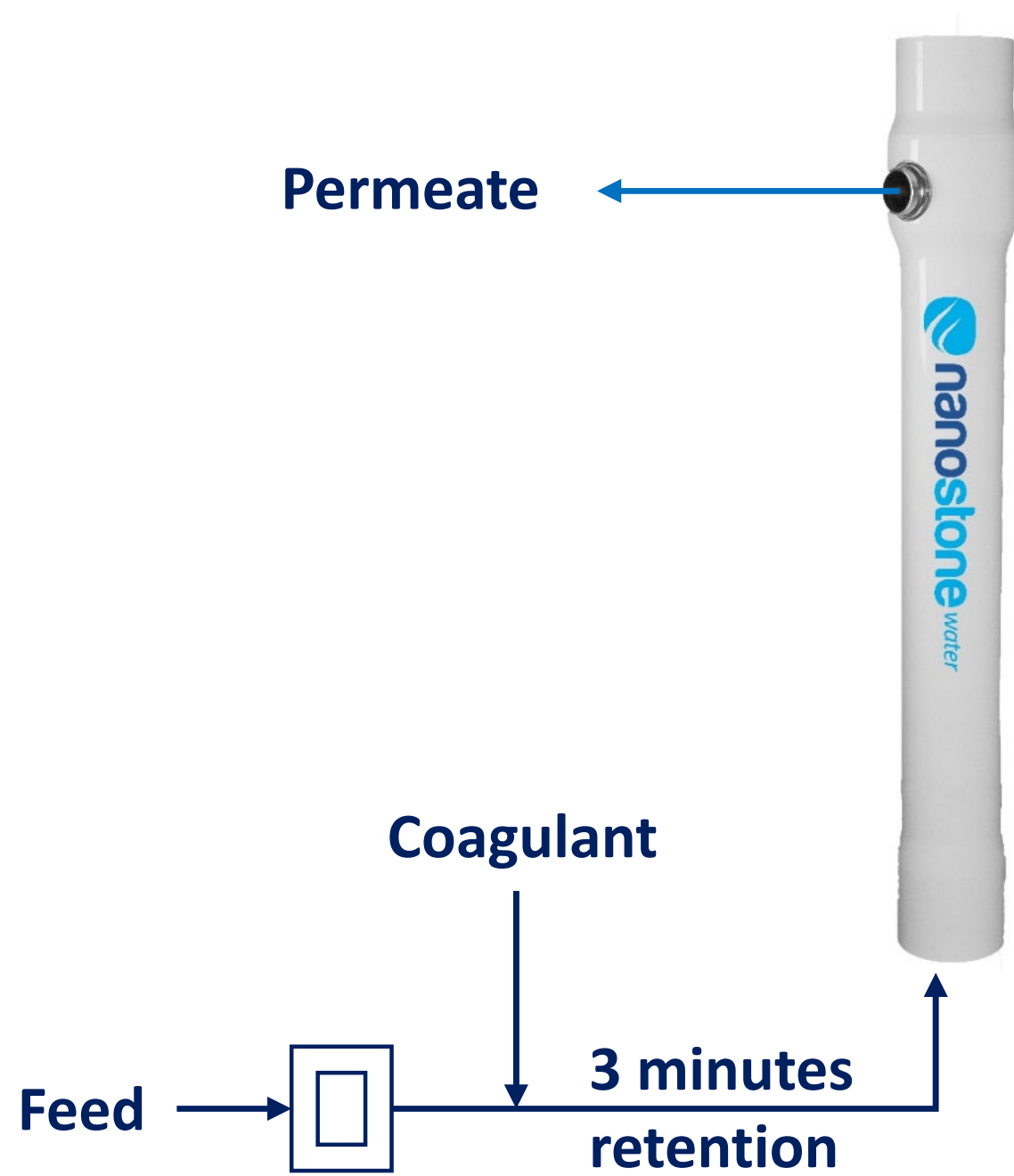
Diameter: 249mm (9.8")

**Weight: 95 Kg**

**Surface Area: 24.3 m<sup>2</sup>**

# Flow Directions

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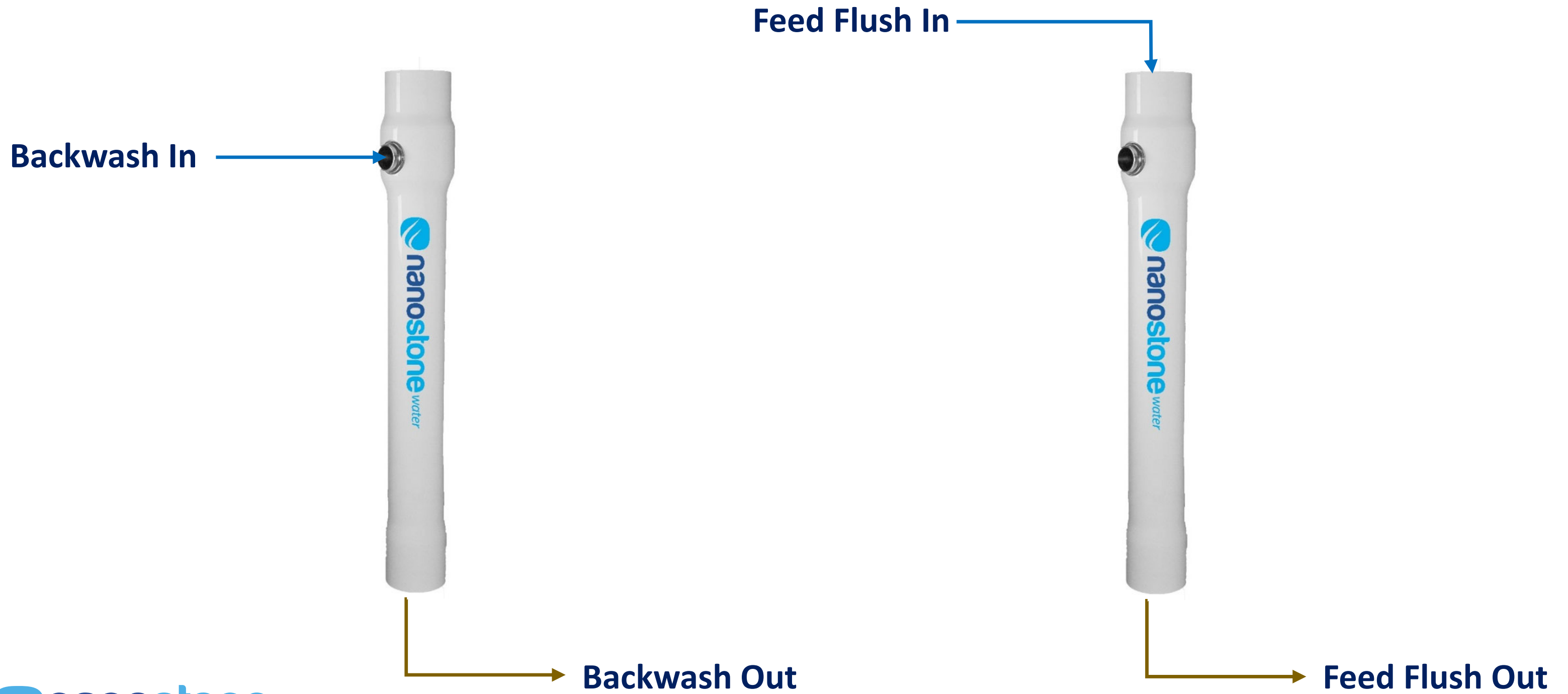


**Dead end operation**

**Operating Pressure: 2 – 3.5 Bar**

# Flow Directions

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# Value Proposition



## Operating Flux: 140 – 360 LMH

- 3 – 6 times PUF operating Flux

## Recovery: Greater than 94%

- Reduced wastage of water
- Lower capacity of intake system

## No Pre-treatment

- Lower OPEX
- Similar CAPEX
- Reduced footprint
- Simple operation

## Robust performance

- Consistent product water quality of  $< 0.1$  NTU /  $< 2.5$  SDI
- No fiber breakage – no stoppage of the plant for maintenance.
- Wide cleaning pH range: 2 – 12
- Wide operating temperature:  $0.5 - 45^{\circ}\text{C}$  /  $33 - 113^{\circ}\text{F}$

## Module warranty: up to 20 years – depending upon application

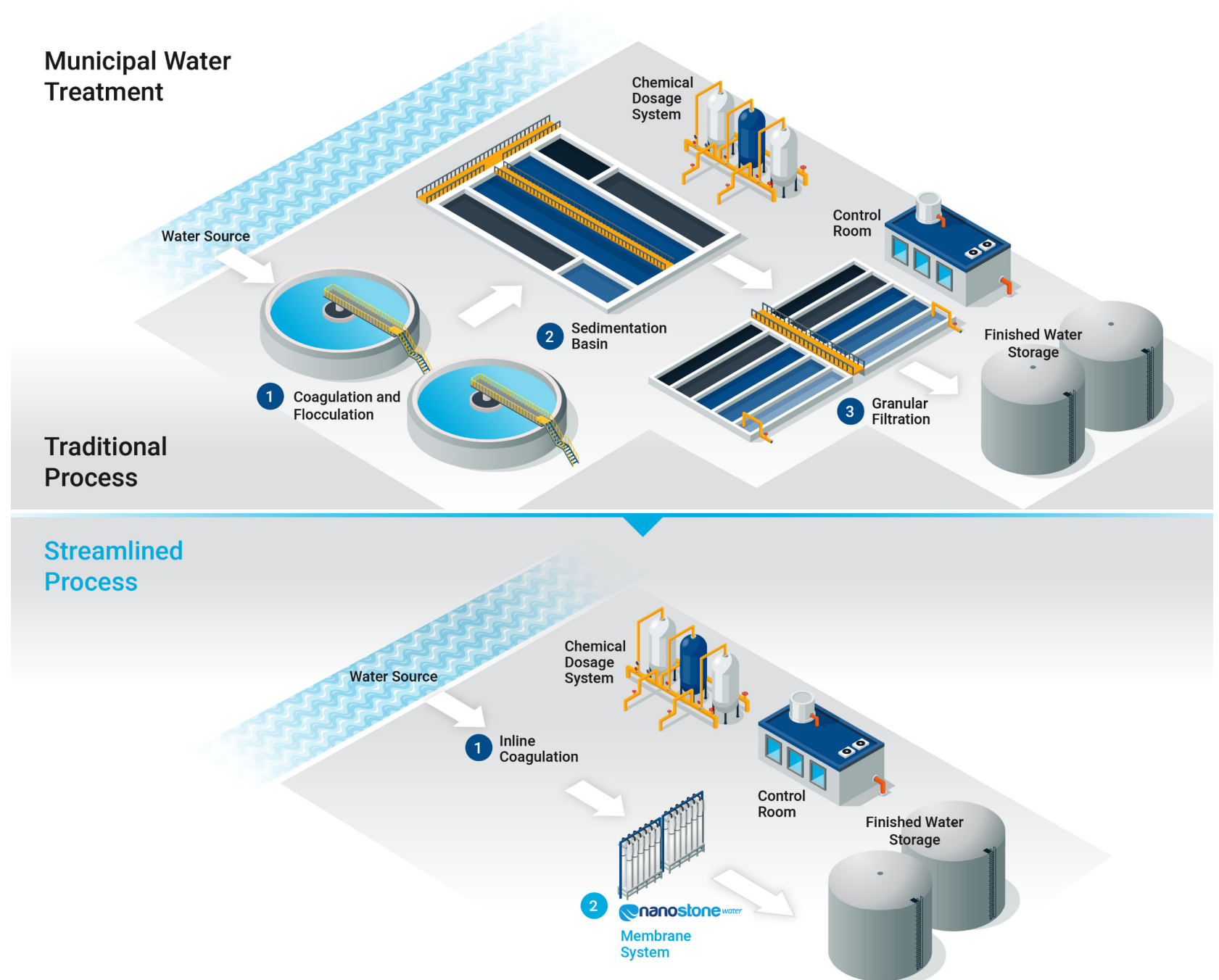


# Value Proposition – Surface Water

Clarifier / DAF / Media Filter not required.

Reduced civil work – faster execution

Handles variation in feed water quality very effectively



# Value Proposition – Seawater Desalination

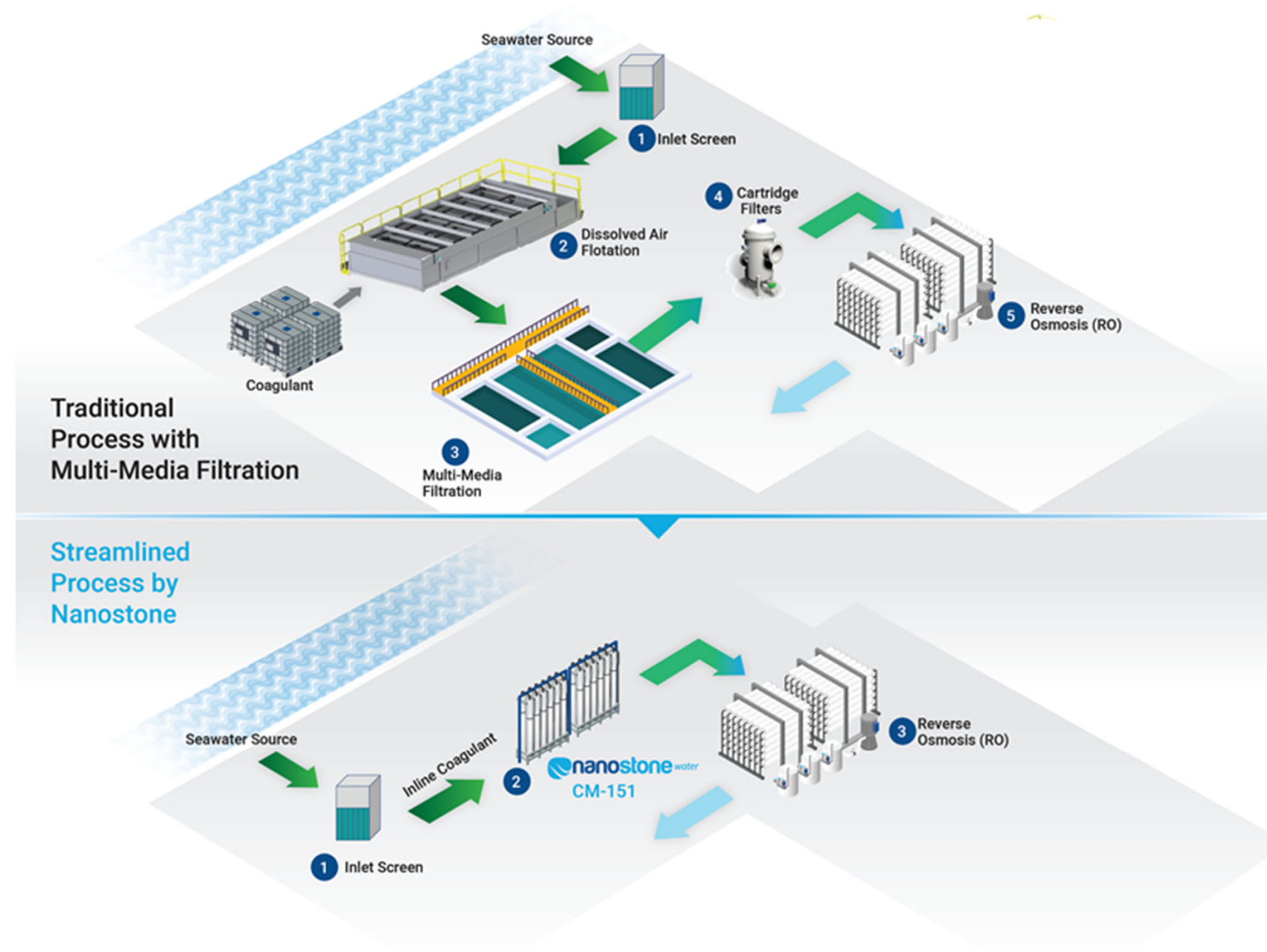
Clarifier / DAF / Media Filter not required.

SDI < 2.5 to reduce fouling of SWRO membranes

Handles Algal Bloom effectively

Filtered water pump / Cartridge filter not required

Higher Recovery – lower intake capacity



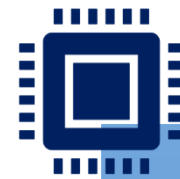
# Segments and Applications

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## Municipal

- Surface Water Treatment
- Sea Water Desalination
- Wastewater Reuse



## Micro-electronics

- Cutting, Grinding Wastewater Treatment
- Mixed Wastewater Treatment
- CMP Wastewater Treatment



## Mining

- Coal Mine Wastewater Treatment
- Lithium Mining



## Power

- Raw Water Treatment
- Cooling Tower Blowdown Treatment

# Certification

NSF / ANSI 61 / 372  
Certification

NSF / ANSI 419  
Certification

Virus testing using  
MS2 Challenge –  
NSF

State Approvals in  
US

UK Regulation 31  
Approved

China drinking  
water approval  
in process

**CERTIFICATE OF COMPLIANCE**

Certificate Number: 20161202-MH61725  
Report Reference: MH61725-20161128  
Issue Date: 2016-DECEMBER-02

Issued to: Nanostone Water, Inc.  
10250 Valley View Road, Suite 143  
Eden Prairie MN 55344

This is to certify that representative samples of DRINKING WATER SYSTEM COMPONENTS  
Trade designation - CM-151.

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: NSF/ANSI 61-2014a  
Additional Information: See the UL Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.  
Look for the UL Certification Mark on the product.

**NSF International**  
789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES  
**Nanostone Water Inc.**  
Facility: Halberstadt, Germany

AS COMPLYING WITH NSF/ANSI 419 AND ALL APPLICABLE REQUIREMENTS.  
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE  
AUTHORIZED TO BEAR THE NSF MARK.

This certificate is the property of NSF International and must be returned upon request. This certificate remains valid as long as this client has products in NSF's Official Listings for the referenced standards. For the most current and complete Listing information, please access NSF's website ([www.nsf.org](http://www.nsf.org)).

November 20, 2017  
Certificate# C0298781 - 01

Tina Yerkes  
General Manager, Water Systems

# Major References

## Municipal

- 19 MLD WTP at Rapid Valley Sanitary District, USA – in operation since April 2018
- 20 MLD WTP at Putatan for Maynilad, Philippines – under execution
- 11 MLD WTP at Standing Rock Rural Water, USA – in operation since April 2022

## Micro-electronics

- 5 MLD Cutting and Grinding WW treatment at Wistron Corporation, China – in operation since August 2018
- Complete wastewater management at SanDisk Shanghai, China – in operation since September 2016
- Complete wastewater management at Huatian Kunshan Project, China – in operation since February 2018

## Mining

- 48 MLD WW treatment at Menkeqing Coal Mine WWR Project, China – in operation since May 2020
- 36 MLD WW treatment at Xiaojihan Coal Mine WWR Project, China – in operation since May 2019
- Lithium extraction project at Lanke Lithium Project, China – in operation since December 2021

## Power

- 5.4 MLD Boiler feed water treatment plant at Sheyang Power Plant, China – in operation since December 2020
- 14.4 MLD CTBD plant at Datang Yuncheng Power Plant, China – in operation since October 2021
- 4.3 MLD CTBD plant at Pingshan Power Plant, China – in operation since February 2021

**90+ Commercial Installations**

**400+ MLD of Water Treated**

# Case Study: Surface Water at Rapid Valley, USA

|                    |  |
|--------------------|--|
| End-User Name      | Rapid Valley Sanitary District, USA    |
| Application        | Direct Filtration (River Water Source) |
| Installation Date  | April 2018                             |
| Incumbent          | Pall Asahi MF                          |
| Overall Plant Flow | 19 MLD                                 |
| Feed Quality       | 10-100 NTU                             |
| Design Flux        | 214 LMH                                |
| Recovery           | >96%                                   |

|                   | Incumbent | Nanostone |
|-------------------|-----------|-----------|
| Number of modules | 50        | 50        |
| Operational flow  | 3.5       | 5.2       |



*“Increased from 3 MGD to 5 MGD in the exact same footprint...In our opinion it is a considerably superior product.”*

**Rusty Schmidt** | RVSD General Manager

# Case Study: Challenged SWRO Plant at PUB, Singapore

## Public Utility Board's Tuas Test bedding Facility - Singapore

Installation Date: October 2020

### CHALLENGE

Unreliable SWRO pretreatment necessitating **multiple pretreatment steps** (DAF)

Variable seawater quality causing **frequent plant shutdowns**

Inadequate pretreatment requiring **frequent SWRO cleans**

**Expensive** combination of processes

### NANOSTONE SOLUTION

Dependable, uninterrupted pretreated water with a **single step**

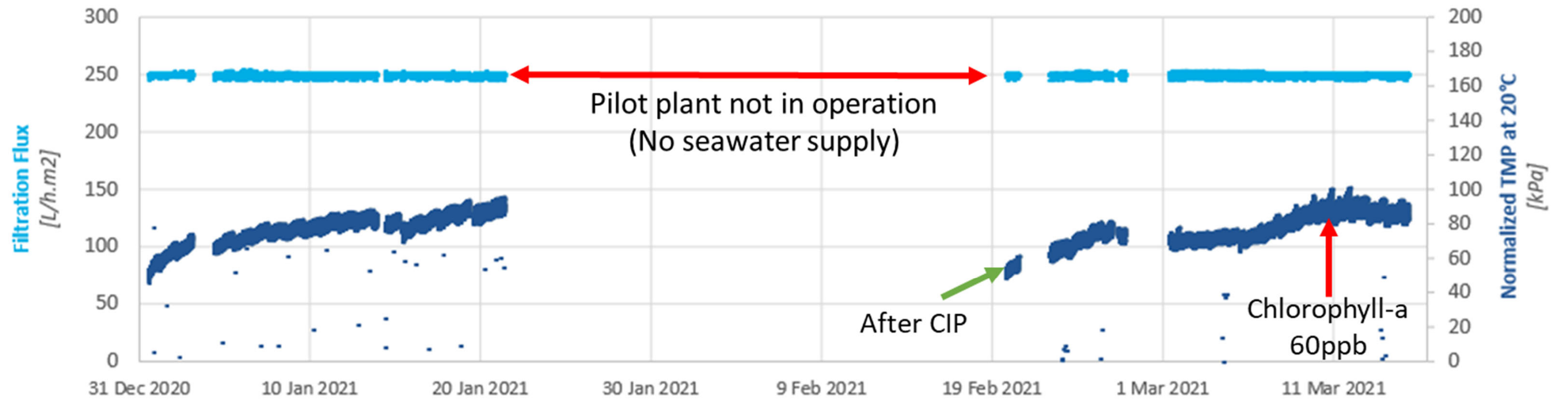
Operates through algal blooms with **no downtime, no intervention**

**Dependable, consistently high-quality feed to SWRO**

**Lowest cost of ownership** available



# Case Study: Challenged SWRO Plant at PUB, Singapore



| Key Pretreatment Water Quality Parameters |           |
|---|-----------|
| SDI                                       | 2.0       |
| Turbidity                                 | <0.05 NTU |
| TOC Removal                               | 30-70%    |
| UVT                                       | 98%       |

| Key Operational Parameters |         |
|----------------------------|---------|
| Flux                       | 250 LMH |
| Recovery                   | 98%     |
| Uptime*                    | 97%     |
| Estimated CIP Frequency    | 90 days |

\* Not including interrupted supply from client



**A HIGHLY RELIABLE SOLUTION  
THAT DELIVERS ROBUST  
PERFORMANCE**

**Nanostone Water**

[www.nanostone.com](http://www.nanostone.com)

