



XPRIZE
WATER
SCARCITY

مبادرة محمد بن زايد للماء
THE MOHAMED BIN ZAYED WATER INITIATIVE

للماء



INNOVATION LANDSCAPE REPORT

MAY 2026

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XPRIZE is the global leader in designing and operating incentive competitions to address humanity's most pressing challenges. By setting bold, measurable targets and opening the problem to innovators from anywhere in the world, XPRIZE creates the conditions for breakthrough solutions to emerge, be tested, and move closer to real-world adoption. Its model is built not around rewarding promising ideas alone, but around driving outcomes that can be demonstrated, validated, and ultimately scaled for lasting impact.

At XPRIZE, a breakthrough is not defined simply by a new idea or a moment of discovery. A breakthrough is the process of turning bold thinking into a solution that is dependable, affordable, and built to endure. It must prove itself not only in theory, but in practice – in its ability to perform under real conditions and create meaningful impact beyond the initial innovation. This emphasis on validated performance is central to the XPRIZE approach and reflects a broader commitment to transforming possibility into progress.

As a pioneer of the large-scale incentive prize model, XPRIZE has helped define how breakthrough innovation can be accelerated. XPRIZE designs its competitions with clear outcomes, rigorous evaluation, and the flexibility for diverse approaches to compete on the basis of results. In this way, XPRIZE does more than catalyze ideas: it builds pathways for solutions to be born, built, proven, and positioned to scale. When conventional approaches are too slow, too narrow, or too risk-averse, XPRIZE offers a model that combines audacity with discipline to accelerate global progress.

Within this broader framework, XPRIZE Water Scarcity applies that same philosophy to one of the defining challenges of this century: expanding access to sustainable, affordable water solutions for communities facing increasing water stress. The prize is intended not only to stimulate innovation, but to help surface and validate solutions capable of contributing to a more resilient water future.



EXECUTIVE SUMMARY

Water scarcity is among the most urgent global challenges of this century. Climate volatility, population growth, and industrial expansion are intensifying pressure on freshwater resources worldwide. While oceans contain an abundant supply of water, scalable and sustainable desalination remains constrained by energy intensity, environmental concerns, and cost barriers.

XPRIZE Water Scarcity was launched to catalyze a step change in desalination. Through a five-year global competition, the prize mobilizes innovators to reimagine systems, materials, and public engagement strategies that can transform how humanity sources freshwater from seawater.

This report documents the early phases of the competition, including global participation, qualification outcomes, and the technological patterns that emerged from Qualified Teams Testing. It provides a structured analysis of system architectures, energy strategies, economic signals, and technology readiness across the advancing cohort.

The findings reveal a rapidly evolving desalination landscape defined by:

- Integrated hybrid system architectures
- Renewable-native and alternative pressure strategies
- Circular approaches to brine management
- Breakthrough materials and separation methods
- Growing commercialization readiness

Together, these developments signal a shift from incremental optimization toward systemic innovation in seawater purification.



OVERVIEW

1.1 Introduction

Water scarcity stands among the most defining and urgent challenges of the 21st century.¹ Although water covers more than 70% of Earth's surface, accessible freshwater remains scarce and unevenly distributed.² Today, over four billion people experience severe water scarcity for at least one month each year – a figure expected to rise sharply as populations grow, economies expand, and the effects of climate change intensify.³

Desalination offers one of the most promising pathways to close this widening gap.⁴ By converting seawater into potable water, desalination decouples human water access from rainfall and river flows, providing a reliable and climate-resilient source of freshwater. Today, desalination sustains hundreds of millions of people, particularly in water-scarce coastal and island regions. Yet globally, desalinated water still accounts for about 1% of total freshwater withdrawals, and its full potential remains unrealized.⁵ Current systems are often constrained by high energy intensity, brine management challenges such as the safe handling, dilution, disposal, or beneficial reuse of concentrated saline discharge, and limited affordability, especially in low-income, off-grid, and inland communities.

XPRIZE Water Scarcity is a five-year global competition set to drive a step change in desalination technologies – reimagining systems, methods, and materials to make desalination more reliable, affordable, and sustainable. The prize seeks to accelerate the adoption of desalination as a reliable, equitable, and environmentally responsible water source for communities worldwide.

At its core, the competition aims to facilitate the widespread use of desalination in ways that promote both socio-economic equity and environmental sustainability. It addresses the world's growing water challenges by:

- Encouraging the development of **robust, affordable**, and **sustainable** desalination systems.
- Advancing **novel materials** and **methods** that enhance the performance of existing desalination technologies.
- Inspiring innovators to reframe **public perception** and **awareness** of global water scarcity.

By uniting scientific excellence, creative engineering, and bold vision, XPRIZE Water Scarcity seeks to redefine how humanity sources freshwater from the sea – transforming desalination into a sustainable solution for the planet's most water-stressed regions.

This report captures the early outcomes of that mission: a global snapshot of who is competing, what technologies they are developing, and how these innovations are reshaping the future of water.

¹ United Nations, The United Nations World Water Development Report 2023: Partnerships and Cooperation for Water. UNESCO, Paris

² U.S. Geological Survey. (2019, October 24). The distribution of water on, in, and above the Earth. USGS Water Science School. <https://www.usgs.gov/media/images/distribution-water-and-above-earth>

³ Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. *Science Advances*, 2(2), e1500323. <https://doi.org/10.1126/sciadv.1500323>

⁴ World Bank. 2019. The Role of Desalination in an Increasingly Water-Scarce World. © World Bank. <http://hdl.handle.net/10986/31416> License: CC BY 3.0 IGO.

⁵ Rosa, L., Gabrielli, P., & Sangiorgio, M. (2025). Global energy, costs, and emissions from reverse osmosis desalination under future water scarcity. *Water Research*, 289, 124825. <https://doi.org/10.1016/j.watres.2025.124825>

1.2 Prize Overview

1.2.1. Competition Tracks

Through its multi-tracked structure, the competition provides \$119 million in total prize purse, distributed across three complementary competition paths, with two primary technical tracks focused on desalination innovation and a third track focused on communicating the value of water:

TRACK A

Desalination: System-Level Innovation

Teams will design and operate a full-scale desalination system capable of reliably and sustainably generating one million liters (1,000 m³) of potable water per day from seawater over one year, at the lowest achievable cost to ensure global accessibility. Success will be demonstrated not only through performance but also through the solution's potential for global impact, assessed via its Total Addressable Market (TAM) and achievable lowest cost.

TRACK B

Desalination: Novel Materials and Methods

Teams will develop and demonstrate novel materials and/or methods for salt-water separation that can sustainably and cost-effectively produce potable water from seawater. This track welcomes advanced pressure-driven membranes as well as emerging non-traditional materials and processes, such as next-generation selective materials or alternative separation mechanisms. Winning solutions will demonstrate energy efficiency, scalability, and operational lifetimes of 10 years or more, either as direct replacements for or as advancements beyond conventional seawater reverse osmosis (SWRO) membranes.

IDEAS COMPETITION

The Value of Water

Teams will design novel and inclusive public-perception campaigns that highlight the value of water and inspire global action to address water scarcity. This track recognizes that solving the water crisis requires not only technological breakthroughs but also cultural and behavioral change. Winning ideas will drive awareness, empathy, and engagement, helping to reshape how individuals, institutions, and societies think about water as a shared and precious resource.

Together, these tracks advance the shared goal of making desalination globally viable – not only technically but economically and environmentally. By engaging innovators from across industries, academia, and research institutions, XPRIZE Water Scarcity is building a foundation for a world where clean water is abundant, accessible, and sustainable for all.

1.2.2. Moonshot Awards

To inspire groundbreaking sustainability in desalination, XPRIZE Water Scarcity includes Moonshot Awards within Track A – System-Level Innovation. These awards recognize teams that achieve exceptional performance in critical environmental and system-level metrics, reinforcing that the future of desalination must be not only affordable and scalable, but also environmentally responsible and resource efficient.

Across the Semifinals and Finals testing stages, Moonshot Awards recognize leadership in four key areas:



Marine-Friendly Intake Design

Minimizing ecological impact by reducing biomass entrainment and impingement at intake, with performance targets approaching near-zero marine life disruption and levels comparable to subsurface intake systems.



Resource Circularity and Brine Management

Maximizing seawater recovery while demonstrating economically viable strategies for brine reduction, reuse, or resource recovery, moving toward circular, low-discharge system configurations.



Energy Efficiency Step Change

Advancing desalination performance toward the theoretical thermodynamic limit of seawater separation, targeting ultra-low specific energy consumption under defined recovery conditions.



Minimal Physical System Footprint

Reducing land-use intensity through compact system architecture, modular design, or offshore deployment strategies that enable scalable desalination in space-constrained coastal environments.

By setting clear, measurable end-state performance targets, the Moonshot Awards elevate the competition beyond incremental improvement and toward audacious, system-wide sustainability breakthroughs.

1.2.3. Prize Purse

XPRIZE Water Scarcity is structured to drive innovation at multiple levels of technological maturity, from fully integrated desalination systems to breakthrough material and methods advancements. The Prize Purse is intentionally designed to reward progress across stages of development, incentivizing both near-term deployment and long-term transformative breakthroughs.

OVERVIEW

The total Prize Purse for XPRIZE Water Scarcity is \$119,000,000 (USD), distributed across Tracks A and B, and the Ideas Competition. Funds are disbursed progressively as teams advance through competition phases and successfully demonstrate performance against defined technical and sustainability criteria.

Track A awards (Figure 1) support fully integrated desalination system demonstrations, progressing from Qualified Teams Testing through Semifinals and Finals. Milestone awards and the Track A Grand Prize are distributed following successful completion of testing rounds.

Figure 1: Track A Prize Purse Breakdown

Description	Amount	Number of Awards	Subtotal
First Place	\$40,000,000	1	\$40M
Second Place	\$20,000,000	1	\$20M
Third Place	\$10,000,000	1	\$10M
Moonshot Awards Finals	\$3,000,000	4	\$12M
Moonshot Awards Semifinals	\$2,000,000	4	\$8M
Finalists Milestones	\$2,000,000	5	\$10M
Semifinalists Milestones	\$250,000	20	\$5M
Qualified Teams Milestones	A total of \$3M will be distributed among all Qualified Teams. Teams that are Qualified as a Full System Team will be awarded a full share. Teams that are Qualified as a Component/Partial System Team will be awarded a 50% share.		\$3M
Track A Total Prize Purse			\$108M

Track B awards (Figure 2) focus on breakthrough materials and separation technologies that reduce the cost of desalination while increasing reliability and sustainability. Awards are distributed across competition phases to incentivize material validation, prototype integration, and demonstrated performance improvements relative to existing technologies.

Figure 2: Track B Prize Purse Breakdown

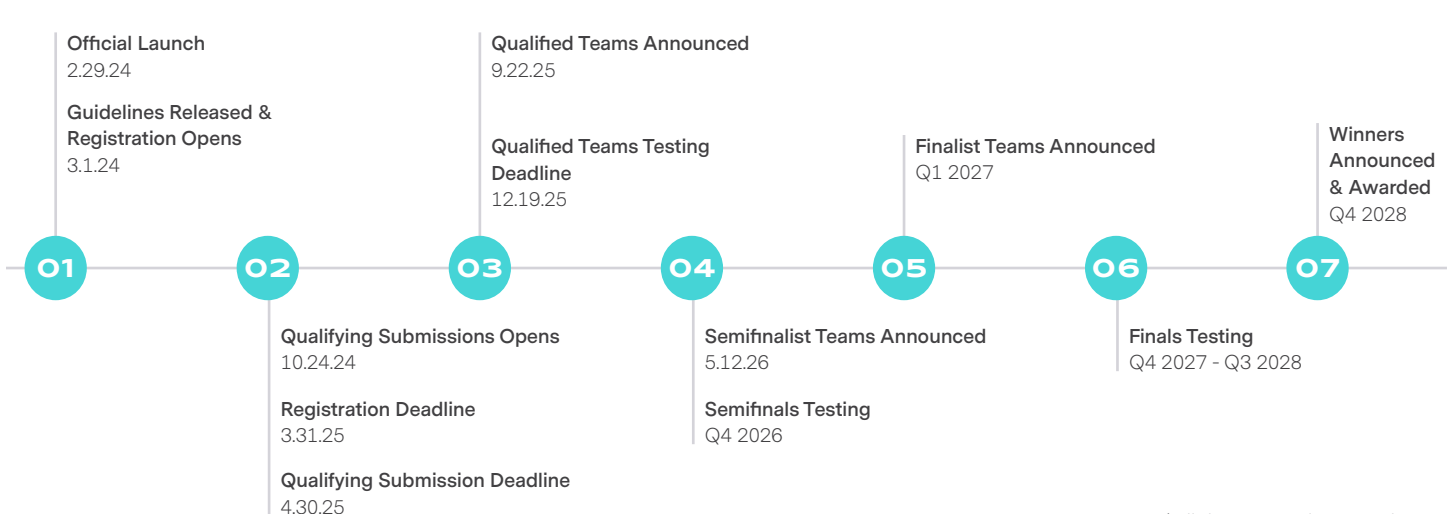
Description	Amount	Number of Awards	Subtotal
First Place	\$8,000,000	1	\$8M
Second Place	\$1,000,000	1	\$1M
Third Place	\$500,000	1	\$500,000
Finalist Milestone Award	\$220,000	5	\$1.1M
Semifinalist Milestone Award	\$10,000	30	\$300,000
Track B Total Prize Purse			\$10.9M

1.2.4. Prize Timeline

The following figures (Figures 3–4) present an overview of the major milestones and phases of XPRIZE Water Scarcity. The competition is structured as a multi-stage, five-year progression designed to advance teams from early validation to increasingly rigorous system testing and large-scale demonstration.

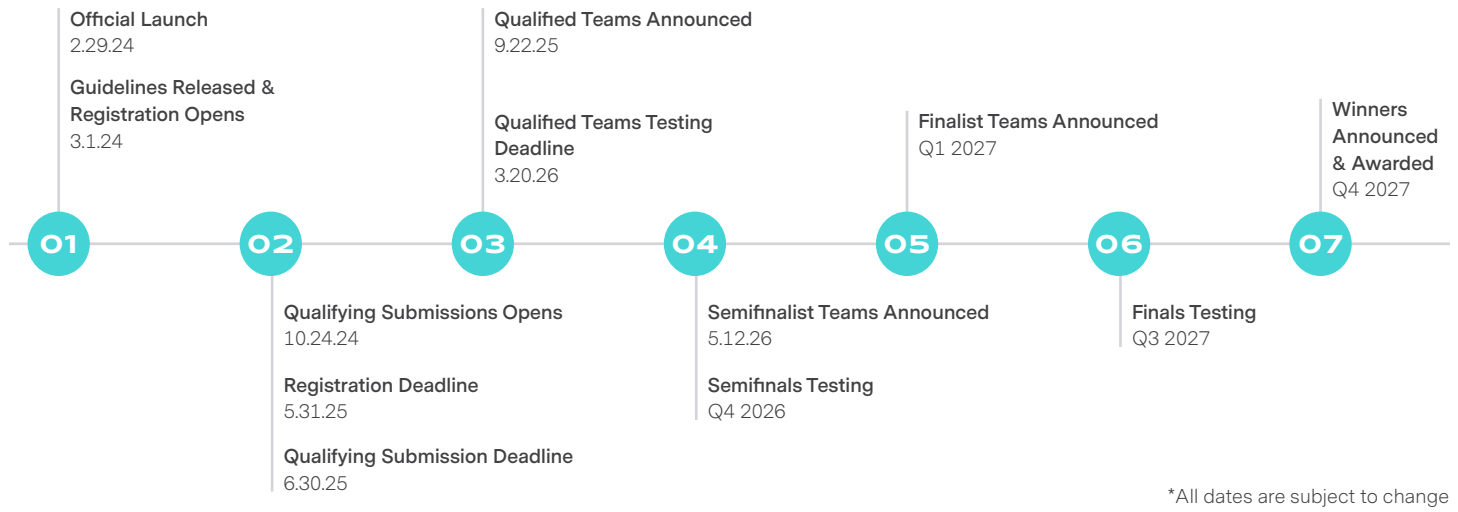
Following registration, teams submitted detailed Qualifying Submissions, outlining their proposed system architecture, innovation approach, development pathway, and strategy for meeting competition criteria. Based on evaluation of these written proposals, selected teams advanced to Qualified Teams Testing and subsequently progressed through defined evaluation rounds, including Semifinals and Finals, each introducing heightened technical requirements, expanded performance validation, and greater operational scale.

Figure 3: Track A - System-Level Innovation Timeline



*All dates are subject to change

Figure 4: Track B - Materials and Methods Timeline





COMPETITION OUTLOOK

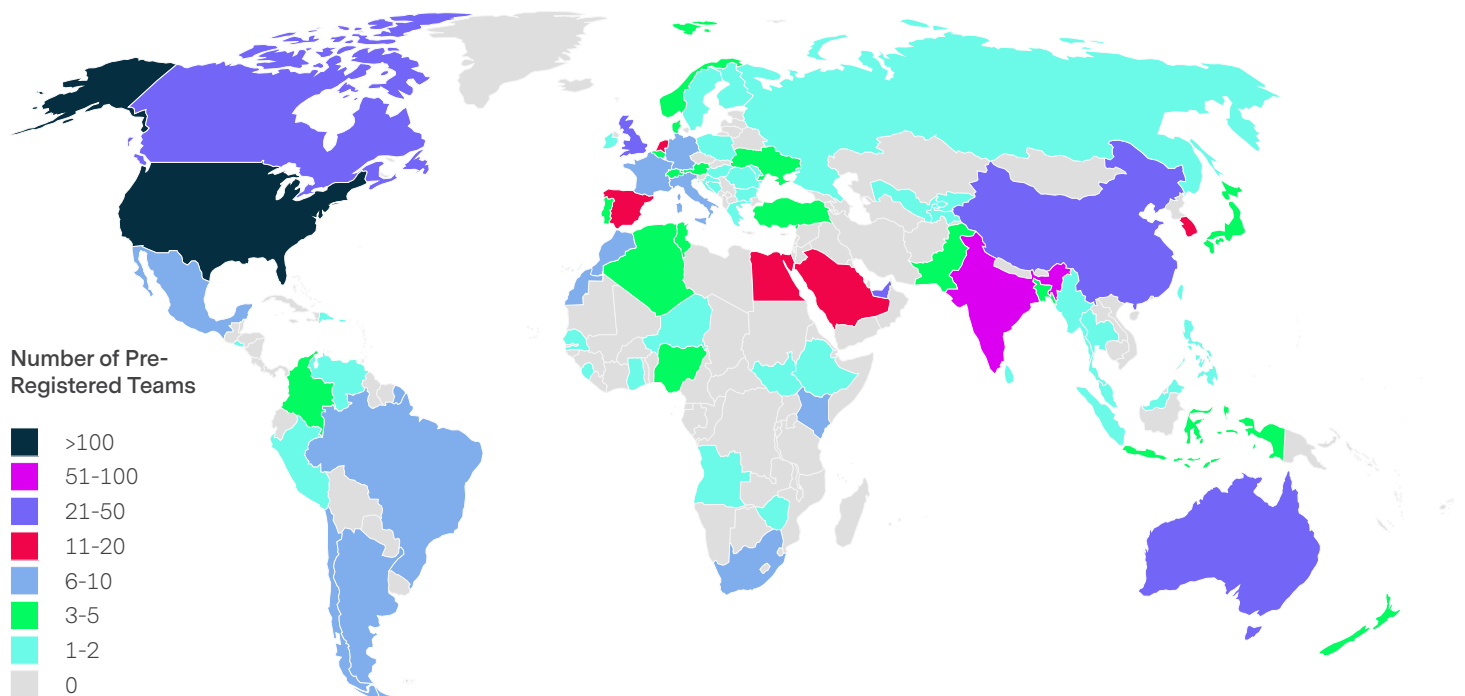
The launch of XPRIZE Water Scarcity has generated remarkable global interest, mobilizing innovators from across disciplines to address one of the world’s most pressing challenges: securing sustainable freshwater through desalination. The diversity of participating teams – from early-stage research groups to established technology companies – reflects a growing convergence between science, engineering, and entrepreneurship in tackling water scarcity.

2.1. Global Interest and Pre-Registration

Since the launch of the prize in February 2024, 674 innovators and organizations pre-registered their intent to compete, representing 86 countries across every major region of the world (Figure 5). Early engagement reflected strong global recognition that desalination will play a critical role in addressing water scarcity through technological advancement and expanded access to reliable freshwater supplies.

Teams spanned multiple sectors, including academic research labs, startups, corporations, non-profits, and independent inventors. This cross-sector participation highlights the prize’s ability to bridge traditional boundaries between academia, industry, and civil society.

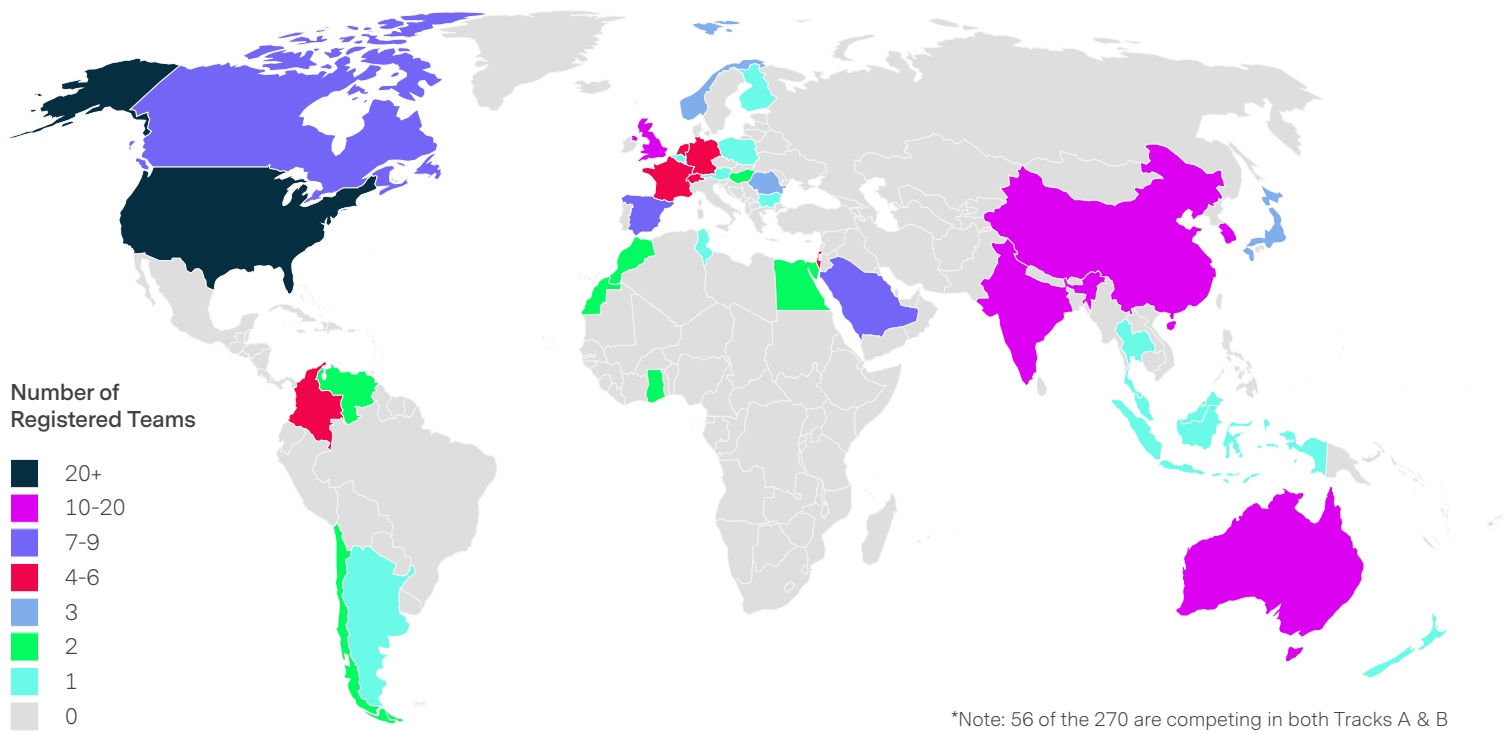
Figure 5: Pre-Registration Distribution Heat Map



2.2. Registration and Geographic Representation

At the close of registration, 270 teams had formally entered the competition, collectively representing 41 countries (Figure 6). The largest participation came from the United States (94), United Arab Emirates (16), China (15), United Kingdom (14), India (11), South Korea (11), and Australia (10), followed by a growing presence from low- and middle-income regions, reflecting expanding innovation ecosystems in areas most affected by water stress. Of the total participants, 56 teams competed in both Tracks A and B, demonstrating strong cross-disciplinary engagement between system-level and materials-based approaches to desalination.

Figure 6: Registration Global Heat Map



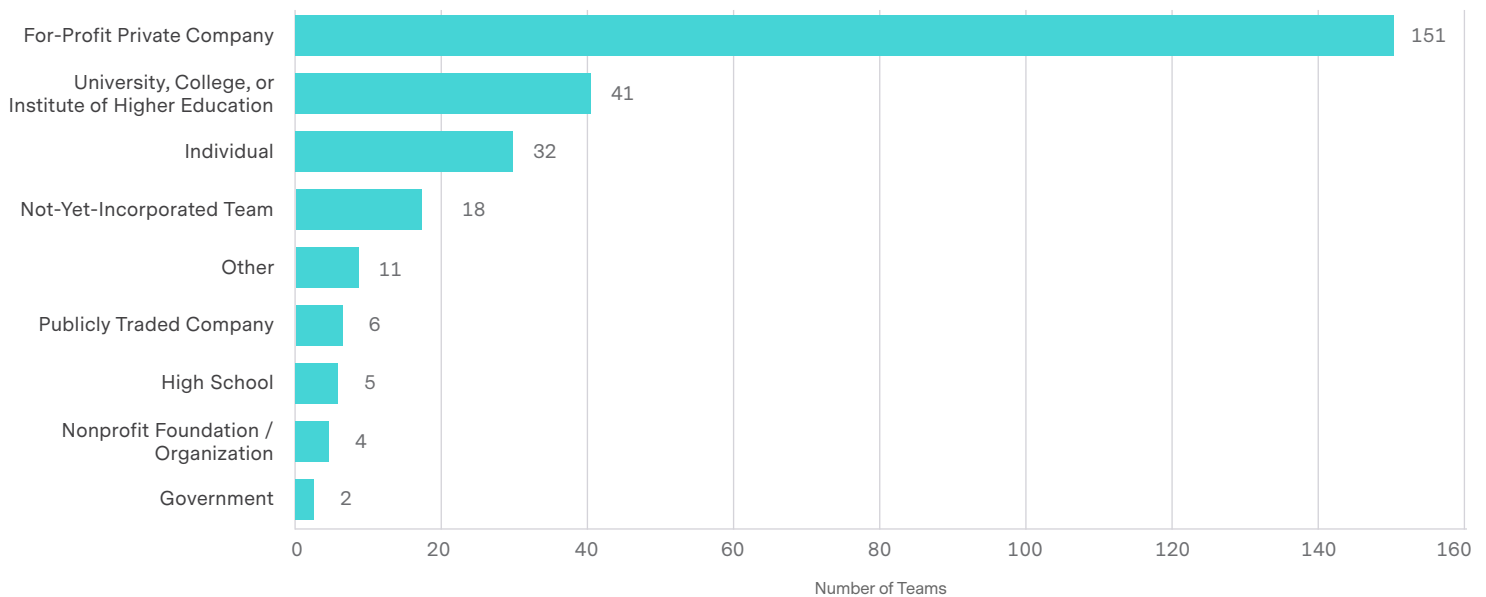
AFRICA	ASIA	EUROPE	N. AMERICA	S. AMERICA	OCEANIA
6 Countries (9 Teams)	13 Countries (83 Teams)	14 Countries (55 Teams)	2 Countries (102 Teams)	4 Countries (10 Teams)	2 Countries (11 Teams)

2.3. Sector and Team Composition

The competition attracted a diverse range of participants spanning the research, private, and public sectors. As shown in Figure 7, the majority of entrants – 151 teams (56%) – represented for-profit private companies, highlighting strong commercial interest in desalination innovation. Academic engagement was also significant, with 41 university- or institute-led teams (15%), complemented by 32 individual innovators and 18 not-yet-incorporated teams showcasing early-stage entrepreneurial activity.

Smaller but notable contributions came from publicly traded companies (6 teams), nonprofit foundations (4), government entities (2), and high school groups (5), underscoring the competition’s ability to inspire participation across generations and disciplines. This blend of academic rigor, startup agility, and corporate scale reflects a robust innovation ecosystem working toward affordable and sustainable desalination.

Figure 7: Registered Teams Organization Type



2.4. Qualifying Submissions

By the end of April 2025, marking the close of the Qualifying Submission phase, 233 teams had successfully completed their submissions – 145 in Track A (System-Level Innovation) and 88 in Track B (Novel Materials and Methods). These teams provided detailed technical documentation outlining their proposed systems, materials, and methods. In addition, this submission included an assessment of their technology readiness and described strategies for scalability, cost reduction, and sustainability.

The high response rate reflects the willingness of teams around the world to commit time, resources, and technical expertise to advancing desalination innovation. While participation in Track A was higher, reflecting the strong global

focus on integrated desalination systems ready for deployment, Track B attracted a substantial number of material-focused innovators working at the scientific and experimental frontier. Together, these submissions illustrated a vibrant and multidisciplinary innovation ecosystem spanning full-scale engineering solutions and fundamental material breakthroughs – a critical dual approach for the future of sustainable desalination.

2.5. Qualified Teams

Following the evaluation of 233 qualifying submissions, 143 teams from 29 countries advanced as Qualified Teams through review by an independent panel of expert judges, representing the most promising innovators in sustainable desalination. This cohort spanned a wide spectrum of expertise, from academic research groups developing next-generation materials to startups and established companies designing complete, deployable systems.

The distribution between Track A and Track B highlighted complementary strengths across the competition, bringing together system level integration and materials innovation within a single global innovation community working to make desalination more efficient, affordable, and environmentally responsible.

2.5.1. Track A Qualified Teams

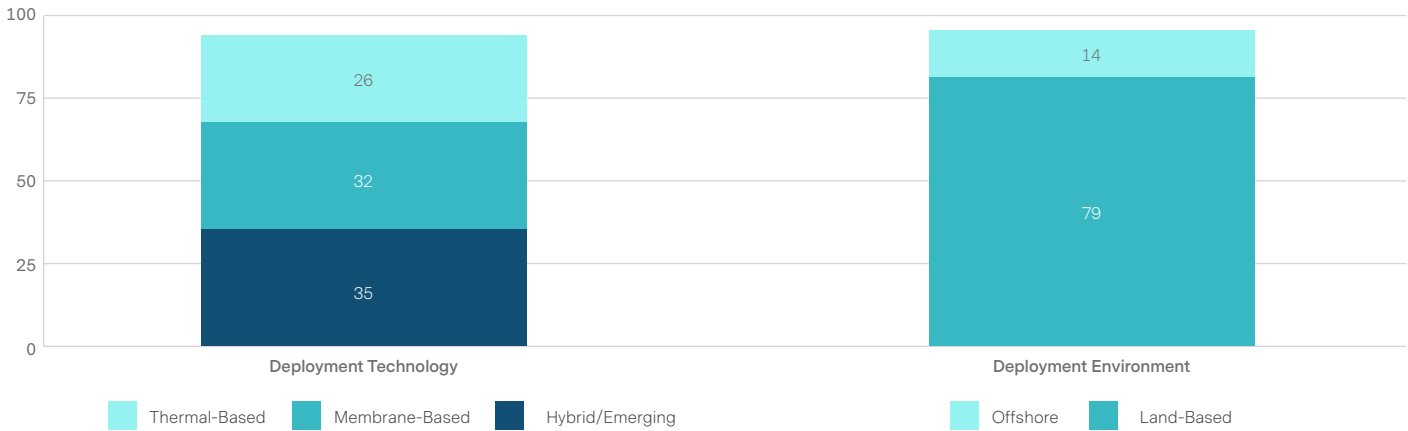
Among the 93 Qualified Teams competing in Track A – System-Level Innovation, the majority (74 teams) advanced fully integrated desalination systems designed to deliver end-to-end seawater treatment. A smaller subset of teams (19 teams) developed partial or subsystem innovations, including advanced pretreatment modules, next-generation RO pressure and vessel architectures, wave-powered intake and offshore infrastructure concepts, energy efficiency and recovery solutions, and brine valorization technologies focused on mineral and chemical recovery. While Track A is structured around integrated system demonstration, these component-level innovations represented critical enabling technologies within the broader desalination value chain. In recognition of their potential impact, XPRIZE Water Scarcity intentionally fostered wider inclusion by developing structured pathways that allowed subsystem innovators to integrate, partner, or evolve toward full-system deployment in the next round of the competition. This approach strengthened the overall innovation ecosystem while maintaining the competition’s emphasis on scalable, system-level solutions.

In terms of deployment approach, 79 teams were pursuing land-based solutions, while 14 teams were exploring offshore designs aimed at reducing coastal land use and environmental impact. The rise of offshore systems reflects a growing interest in decentralized and floating or deep sea desalination platforms capable of serving dense coastal populations.

As shown in Figure 8, the competition also showcases a wide range of technological approaches. Hybrid or emerging systems (35 teams) led in representation, combining multiple processes to achieve higher efficiency. Membrane-based systems (32 teams) remained a strong focus area, driven by efforts to optimize

SWRO performance and reduce energy intensity. Meanwhile, thermal-based designs (26 teams) continued to evolve through enhanced heat recovery and low-temperature operation, ensuring their relevance in specific regional contexts.

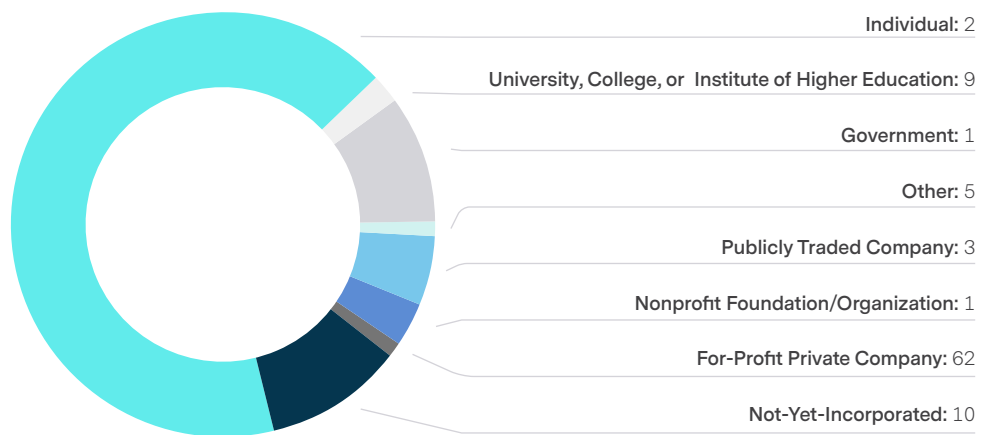
Figure 8: Track A Qualified Teams: A) Desalination Technology, and B) Deployment Environment



The Track A cohort is also defined by a diverse organizational landscape (Figure 9). Most competitors – 62 teams – were for-profit private companies, demonstrating strong industry readiness and commercialization intent. Academic institutions contributed to 9 teams, complemented by 10 not-yet-incorporated innovators and smaller numbers of participants from nonprofits, individuals, and public organizations. This blend of entrepreneurial and research-driven participation underscored the field’s momentum toward deployable, market-oriented desalination solutions.

Together, this data illustrates the innovation diversity and global engagement defining Track A. From established technology firms to emerging startups, teams are developing system-level solutions that prioritize energy efficiency, environmental responsibility, and scalability.

Figure 9: Track A Qualified Teams Organization Type

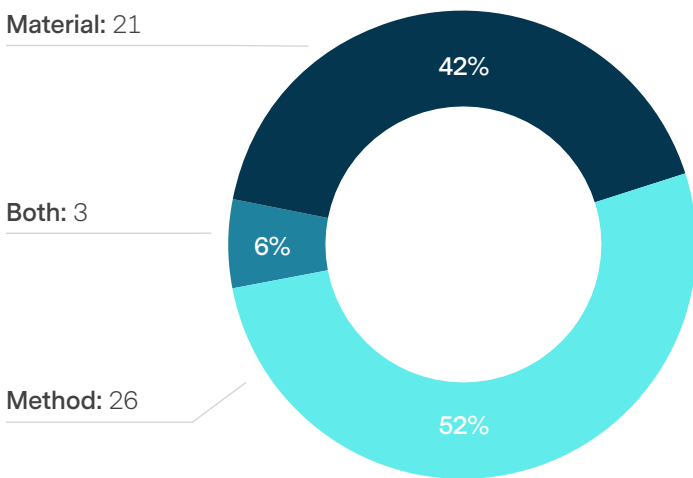


2.5.2. Track B Qualified Teams

Track B focuses on pioneering new materials and salt-water separation methods that redefine how desalination removes salt and impurities from seawater. The 50 Qualified Teams in this track were advancing innovations that range from novel membrane materials and surface coatings to non-traditional separation techniques capable of achieving higher selectivity, energy efficiency, and operational lifetimes.

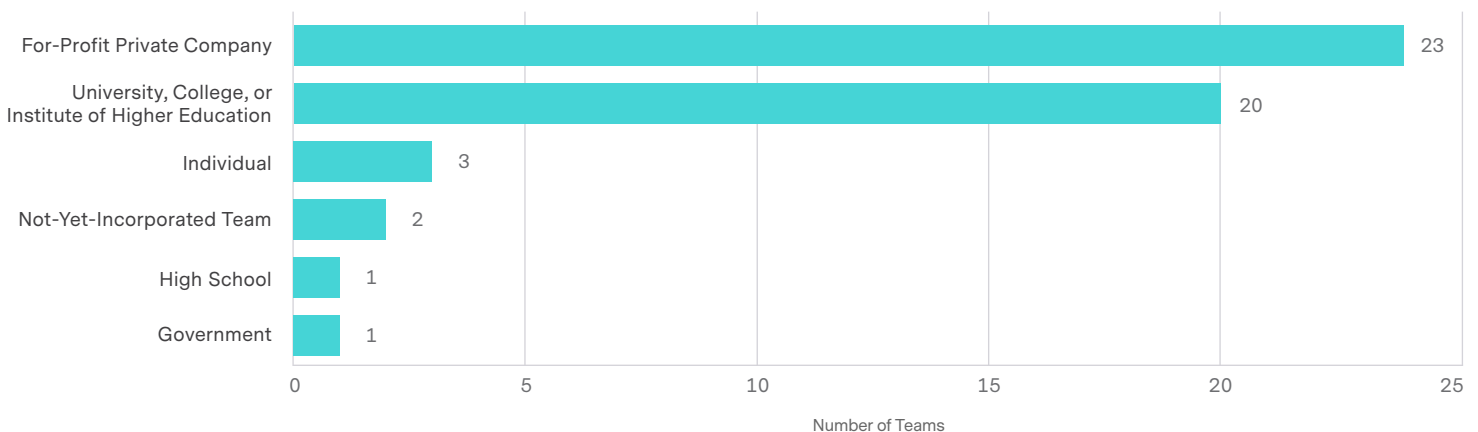
Innovation focus (Figure 10) was broadly distributed: 26 teams were developing new methods of desalination (such as electrochemical, capacitive, or solvent-based processes), 21 teams were creating new materials, and another 3 teams were pursuing hybrid approaches that combine both material and process innovation. This diversity reflected the scientific maturity and creative depth driving the field beyond conventional pressure-driven systems.

Figure 10: Track B Qualified Teams Technology Type



In terms of organizational composition (Figure 11), for-profit private companies dominated with 23 teams, demonstrating strong commercial interest in emerging desalination materials. Academic institutions remained key contributors, with 20 university- or institute-led teams. In addition, 3 individual innovators, 2 not-yet-incorporated teams, one high school team, and one government team contributed to the Track B cohort. This distribution underscored the close collaboration between academia and industry—a defining strength of Track B’s innovation ecosystem. The strong academic presence reflected the early-stage and research-intensive nature of many Track B innovations, while private-sector participation signaled growing commercial pathways for novel materials and methods.

Figure 11: Track B Qualified Teams Organization Type



COMPETITION OUTLOOK

Together, the Track B teams represent the scientific frontier of desalination – where advances in materials chemistry, nanostructure design, and separation physics have the potential to unlock breakthroughs in both performance and cost. These innovations not only promise to enhance today’s seawater reverse osmosis systems but also lay the foundation for entirely new desalination paradigms for the future.

The advancement of 143 Qualified Teams marks more than a numerical milestone. It reflected the emergence of a focused, technically credible innovation cohort prepared to transition from written proposal to operational validation.

Across both tracks, distinct patterns began to surface: integrated hybrid architectures, renewable-native energy strategies, brine circularity models, and advanced material platforms designed for durability and selectivity.

These developments signaled a shift in desalination—from incremental efficiency optimization toward systemic reengineering.



FROM CONCEPT TO DEMONSTRATION:

Innovation Progress and Deployment Readiness

After being selected as Qualified Teams, competitors entered the first physical testing phase of the competition: Qualified Teams Testing. In this stage, teams moved from conceptual designs to operational prototypes, testing their technologies under defined conditions.

This transition marked a critical inflection point in the XPRIZE Water Scarcity competition. What began as written proposals outlining system architectures and innovation strategies evolved into operational demonstrations under real-world constraints. The testing phase enabled direct, evidence-based assessment of each team's technology, providing not only technical validation but also insight into system integration, performance reliability, scalability pathways, and readiness for deployment.

The analysis that follows examines how innovations matured through testing, what differentiated advancing teams, and how structured evaluation revealed both technological strengths and ecosystem barriers shaping the path from concept to implementation.

3.1. Defining "Game-Changing" Innovation in XPRIZE Water Scarcity

Innovation in desalination is occurring across multiple dimensions, from advances in separation science to system-level transformations that will reshape how desalination is deployed and operated. Some breakthroughs are emerging from fundamentally new materials or separation mechanisms. Others are arising from solving system-level constraints that have historically limited deployment, scalability, affordability, and institutional adoption.

Within XPRIZE Water Scarcity, "game-changing" innovation is therefore defined not solely by scientific novelty, but by the potential to shift performance, economics, scalability, or adoption dynamics at meaningful scale. Because the two technical tracks address different layers of the desalination challenge, the nature of breakthrough innovation differs across Track A and Track B.

3.1.1. What "Game-Changing" Means within Track A

In Track A, innovation is game changing when it transforms how desalination systems are designed, deployed, financed, or integrated at scale. While some Track A solutions build upon established separation technologies, their impact lies in solving persistent system-level bottlenecks that have historically constrained adoption.

Game-changing innovation in Track A includes:

- Redesigning system architectures to reduce energy intensity, footprint, or environmental impact
- Enabling new deployment models, such as offshore, modular, distributed, or renewable-native configurations
- Integrating advanced automation, digital control, and reliability frameworks
- Reducing total cost of water through architectural simplification or operational efficiency
- Introducing financial or business model innovations that improve bankability and procurement viability

Qualified Teams Testing demonstrates that several Track A teams are not merely optimizing components, but rethinking pressure generation, intake design, recovery strategies, modular scaling, and integration pathways. These advances shift how desalination can be deployed in real-world infrastructure contexts, particularly in space-constrained, off-grid, or emerging-market environments.

In this sense, Track A breakthroughs operate at the systems and deployment level, redefining how desalination infrastructure can be financed, integrated, and scaled in real-world contexts.

3.1.2. What "Game-Changing" Means within Track B

In Track B, innovation is game changing when it expands the scientific frontier of salt-water separation. These breakthroughs typically occur at the material, membrane, or mechanism level and aim to redefine the technical limits of desalination performance.

Game-changing innovation in Track B includes:

- Fundamentally new separation mechanisms beyond conventional pressure-driven processes
- Novel membrane materials with enhanced selectivity, permeability, or fouling resistance
- Extended operational lifetimes beyond current seawater reverse osmosis benchmarks
- Step-change reductions in energy intensity relative to existing technologies

While many Track B teams operate at earlier technology readiness levels, their innovations represent foundational shifts in separation science that could redefine the technical limits of desalination over the coming decade.

3.2. Complementary Pathways to Transformation

The two tracks therefore address distinct but interdependent layers of innovation. Track B expands the scientific boundaries of desalination performance. Track A confronts the engineering, integration, financing, and procurement barriers that determine whether breakthrough technologies can be deployed at global scale.

Transformational impact in desalination requires both scientific step change and system-level reconfiguration. XPRIZE Water Scarcity is intentionally structured to catalyze both forms of transformation simultaneously.

Together, these two tracks reveal how scientific breakthroughs and system-level innovation interact to shape the future of desalination deployment. Importantly, these innovation pathways have the potential to expand reliable freshwater access in water-stressed regions, climate-vulnerable coastal communities, and emerging urban systems where traditional supply solutions are increasingly constrained.

The following sections examine the dominant innovation themes emerging from Qualified Teams Testing and how these ideas are translating into real-world technological and development pathways.

3.3. Overview of Innovation Themes

The innovations emerging from XPRIZE Water Scarcity reveal a rapidly evolving global landscape of desalination technologies – one defined by cross-disciplinary integration, sustainability-driven design, and material science breakthroughs. Across both competition tracks, teams are reimagining every stage of the desalination process, from salt separation to energy recovery and brine reduction and resource recovery.

Several dominant themes characterize this innovation ecosystem:

1. Energy Efficiency and Process Optimization

Many system-level teams are targeting significant reductions in specific energy consumption through the integration of renewable power, low-pressure operations, advanced energy recovery devices, and AI-based control systems. These approaches aim to move desalination closer to its thermodynamic limits while maintaining reliability and cost efficiency.

2. Sustainability and Circularity

Teams across both tracks are prioritizing brine management, water recovery, and resource reuse, reflecting a shift from desalination as a linear process to one embedded within circular resource systems. Some teams are transforming brine into valuable mineral products, while others explore zero-liquid discharge configurations.

3. Material and Membrane Innovation

A major share of Track B teams are developing next-generation membranes and materials, including nanocomposite, ceramic, and bio-inspired designs. These innovations aim to increase permeability, resist fouling, and extend operational lifetimes beyond current SWRO limits.

4. Hybrid and Emerging Systems

The boundaries between membrane, thermal, and electrochemical desalination are blurring. Several Track A teams are developing hybrid configurations that couple membrane separation with thermal, electrochemical, or solvent-based stages, enhancing recovery and efficiency while expanding deployment options.

5. Compact and Decentralized Solutions

Consistent with the competition's focus on accessibility, a notable portion of teams are designing modular, small-footprint systems deployable in off-grid, island, or emergency settings. These approaches aim to democratize access to desalination technologies by reducing infrastructure and maintenance demands.

Collectively, these themes illustrate a paradigm shift in desalination – one moving beyond conventional engineering toward a holistic, sustainability-centered approach that balances energy, environment, and equity. The following sections provide a detailed look at the innovation trends within each track, highlighting how competitors are reshaping the technological frontiers of seawater purification.

3.4. From Qualified Teams Testing to Semifinals: Advancement Context

Qualified Teams Testing marked the competition’s transition from concept-stage proposals to demonstrated system performance. In this round, teams were expected to move beyond theoretical design and demonstrate functioning desalination solutions under defined testing and reporting conditions, with requirements tailored to each competition track.

For Track A, the objective was to evaluate complete, integrated desalination systems capable of delivering reliable, affordable, and sustainable water solutions. Teams were required to demonstrate a working prototype of an end-to-end system – from intake to potable water output – operating at their chosen test location in compliance with local environmental regulations. Systems were operated over a two-week testing period, generating a minimum of 1 m³/day (1,000 liters per day) of drinking water, and evaluated based on performance metrics, system innovation, sustainability considerations, and scalability potential.

For Track B, the focus was on advancing novel materials and methods that could improve the cost, reliability, and sustainability of desalination, in comparison to the baseline technology of existing seawater reverse osmosis systems. Teams validated their innovations under controlled or field-relevant conditions and submitted performance data demonstrating technical maturity and alignment with Track B evaluation metrics. This included comparative benchmarking against conventional SWRO performance, along with supporting documentation such as water quality results, performance analyses, and evidence of operational feasibility.

Together, these requirements established the basis for evaluating whether teams could translate innovation into credible, measurable progress toward real-world application.

Qualified Teams Testing revealed a broad spectrum of innovative desalination concepts. Due to the structured design of the competition and a defined cap on the number of advancing teams, a highly competitive selection process determined which teams progressed to the Semifinal stage. Advancement decisions were based on a balanced assessment of system integration, technical feasibility, data quality, scalability potential, and alignment with competition requirements.

This section provides context for the Innovation Landscape analysis that follows, clarifying how the Semifinalist cohort was selected within this competitive framework and how evaluation criteria shaped advancement decisions.

System Integration and Completeness - Teams advancing to the Semifinals round generally demonstrated end-to-end desalination systems, even when operating at small scale. In contrast, several non-advancing submissions focused on individual components, partial subsystems, or proof-of-concept demonstrations that did not yet constitute a complete, integrated desalination solution.

Judges consistently prioritized systems capable of producing potable water while addressing intake, separation, energy use, and brine management in an integrated manner, reflecting the competition's emphasis on deployable solutions rather than isolated technologies.

Data Quality, Transparency, and Validation - A key differentiator between advancing and non-advancing teams was the completeness and verifiability of reported data. Submissions that provided clear energy breakdowns, operating conditions, water quality results, and mass-energy balance information enabled more confident technical evaluation.

Conversely, teams with limited datasets, unclear reporting structures, or insufficient validation of performance claims faced challenges advancing, even when underlying concepts appeared promising. Judges observed that inconsistent metrics, missing contextual assumptions, or poorly defined testing conditions reduced the strength of submissions and, in some cases, limited their competitiveness for progression to the Semifinal stage.

Feasibility, Scalability, and Engineering Maturity - Advancement decisions placed strong emphasis on the feasibility of scaling technologies beyond pilot conditions. Systems demonstrating credible pathways toward higher throughput, modular expansion, or replication – supported by engineering rationale – were favored.

While many concepts demonstrated compelling innovation, progression required sufficient engineering maturity, defined scaling strategy, and operational robustness to support advancement within the competition timeline. In some cases, promising technologies required further technical refinement or validation before demonstrating readiness for the next phase.

Role of Qualified Teams Testing as a De-Risking and Learning Phase - The Qualified Teams Testing phase fulfilled its intended role as a filter for readiness rather than a final judgment on innovation quality. For advancing teams, Qualified Teams Testing validated operational feasibility and data integrity. For non-advancing teams, Qualified Teams Testing identified critical development gaps related to integration, validation, and scalability.

Importantly, XPRIZE competitions are intentionally structured as staged advancement processes, meaning that not all teams progress at each phase. Non-advancing concepts may still remain relevant to the broader desalination innovation ecosystem and may benefit from further development, alternative deployment contexts, or future competitive opportunities.

3.5. Track A: System Demonstration and Integration

This section focuses on Track A Semifinalist teams based on data reported during the Qualified Teams Testing phase. The Track A Semifinalist cohort demonstrated substantial diversity in integrated desalination system architectures, including RO-based, hybrid, thermal, and emerging designs, all validated through Qualified Teams Testing submissions (Figure 12).

Most teams operated fully integrated prototypes, often under continuous or semi-continuous operation. Importantly, Semifinalist data indicated that intermittent operation frequently reflected external testing constraints rather than intrinsic system instability. Many teams accepted scale-dependent inefficiencies to validate hydraulic stability, automation, control logic, and environmental compliance – consistent with real-world pilot practice.

Hybrid systems were particularly prominent, integrating advanced pretreatment, staged recovery, electrochemical processes, renewable energy inputs, or alternative pressure architectures. These systems emphasized robustness and scalability over single-metric optimization.

Deployment environments were similarly diverse (Figure 13). While land-based installations remained common, Semifinalist demonstrations showed increasing maturity in offshore and subsea desalination concepts, highlighting new pathways to reduce environmental impact and infrastructure constraints.

Figure 12: Track A — Semifinalists by Technology Category Distribution

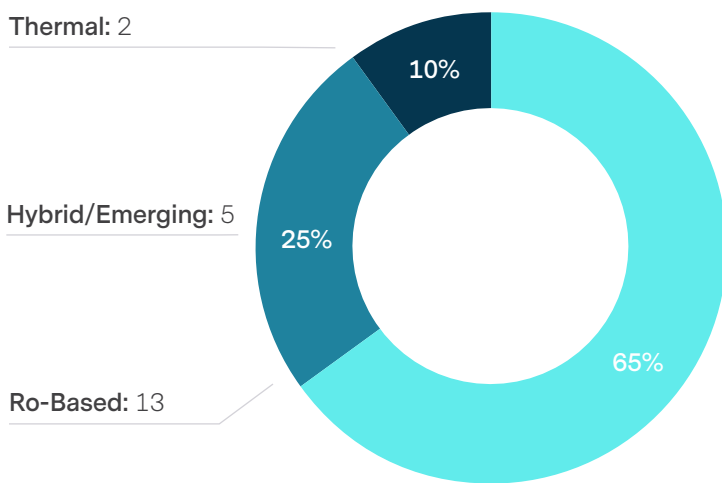
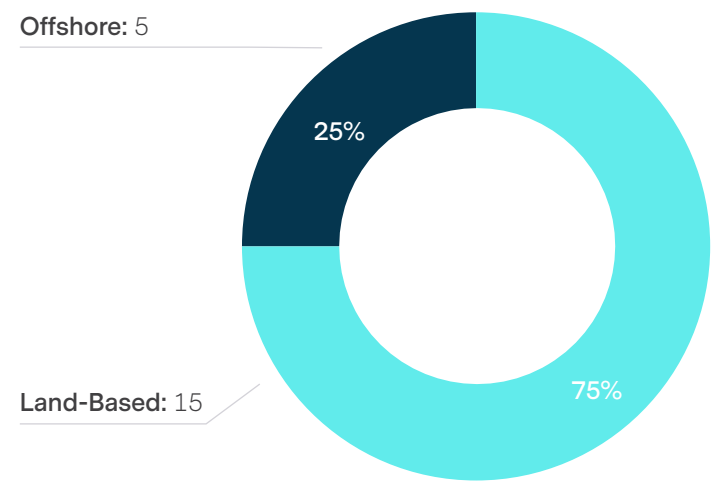


Figure 13: Track A — Semifinalists by Deployment Environment (Land-Based vs Offshore)



Overall, the Track A Semifinalist demonstrations emphasized feasibility, scalability, and operational realism, positioning many Semifinalists for successful progression into larger-scale testing and deployment.

3.5.1. Cross-Cutting Technologies and Enablers (Observed in Track A Qualified Teams Testing)

Across Track A Qualified Teams Testing submissions, several cross-cutting technologies emerged as key enablers of system performance and reliability.

Automation and Digital Control – Many Semifinalists employed advanced control strategies, remote monitoring, and automated operation to maintain stability, manage variability, and support high data integrity during testing.

Energy Recovery and Energy Architecture – Energy efficiency was treated as a system-level design principle, not a component-level add-on. Some teams employed advanced energy recovery devices (ERDs), while others eliminated ERDs entirely through batch operation, hydrostatic pressure utilization, or non-hydraulic separation mechanisms.

Sensing and Data Transparency – Qualified Teams Testing submissions consistently demonstrated robust sensing, mass–energy balance tracking, and transparent reporting, reinforcing the competition’s emphasis on verifiable performance.

These cross-cutting approaches reflected a shift toward adaptive, data-informed desalination systems capable of operating reliably across diverse environments.

3.5.2. Moonshot Innovations (Observed in Track A Qualified Teams Testing)

Within the Track A Semifinalist cohort, Qualified Teams Testing submissions revealed several bold and unconventional system concepts aligned with the Moonshot Award philosophy. These include:

- Subsea and hydrostatic-pressure-driven desalination systems
- Membrane-free or electrochemical separation architectures
- Fully renewable-powered or mechanically driven desalination platforms
- Integrated brine-to-resource and circular-economy systems
- Solar-powered zero-liquid-discharge concepts

While some of these approaches involved elevated technical risk, their successful operation at Qualified Teams Testing underscored the role of de-risking ambitious innovation through structured, transparent testing. These demonstrations validated not only technical feasibility, but also the viability of challenging long-held assumptions in desalination system design.

3.5.3. Energy Architectures and Performance Signals

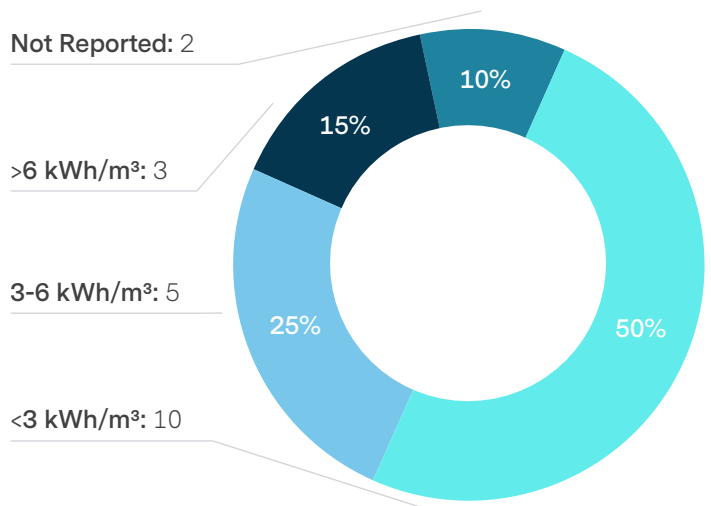
Energy performance at Qualified Teams Testing provided insight into how innovation is applied, rather than how systems are expected to perform under optimized commercial conditions. Claimed energy intensity values should therefore be interpreted as architectural signals, reflecting operating modes, pressure strategies, and energy sourcing choices rather than final efficiency outcomes.

Across the cohort, teams employed a range of primary energy sources, including grid electricity, hybrid systems combining grid and renewables, and fully renewable configurations such as solar or wave-powered operation. ERDs were present in many systems, but several teams intentionally eliminated or deferred ERDs through alternative pressure architectures, batch operation, or hydrostatic depth utilization.

Claimed energy intensity (Figure 14) spanned three broad buckets (<3 kWh/m³, 3–6 kWh/m³, and >6 kWh/m³), with lower values frequently associated with non-conventional pressure generation, renewable-native designs, or batch and semi-batch operation. Higher reported values typically reflected small-scale inefficiencies, non-optimized auxiliary loads, or intentional prioritization of data integrity and environmental validation over energy optimization.

Because Qualified Teams Testing was conducted under varied system scales, operating environments, and optimization priorities, reported energy values were not directly comparable across teams. Instead, these data points provided insight into how different system architectures challenged conventional assumptions about pressure generation, recovery, and energy sourcing in seawater desalination.

Figure 14: Track A — Claimed Energy Intensity Buckets at Qualified Teams Testing Round



3.5.4. Cost Signals and Economic Design Strategies

Although cost performance was not formally evaluated as a scoring criterion during Qualified Teams Testing, cost related data reported by Track A Semifinalists provided useful insight into how architectural innovation may shape long term desalination economics.

Reported costs at Qualified Teams Testing should be interpreted as signals of design intent, reflecting where innovation was applied within the system rather than indicators of final commercial performance. Across submissions, cost was consistently treated as a downstream outcome of architectural and operational decisions.

Qualified Teams Testing data indicated that higher pilot-scale costs often corresponded to non-conventional operating modes or deployment contexts, including offshore and subsea systems, batch and semi-batch operation, electrochemical separation, and renewable-native energy inputs. In these cases, reported costs reflected testing conditions rather than intrinsic inefficiency.

Recurring long-term cost-reduction strategies observed included:

- Reducing energy input and pressure-generation requirements
- Simplifying system architecture and reducing unit operations
- Extending asset lifetimes and reducing chemical use
- Minimizing brine handling and disposal costs through recovery or dilution strategies

For most teams, potable water remained the sole product, with financial viability pursued through cost reduction rather than revenue diversification. A smaller subset of systems pursued brine valorization or circular-economy pathways, reframing water production as part of a broader system value proposition.

Taken together, Qualified Teams Testing cost signals indicated that Track A Semifinalists are not competing to minimize cost at pilot scale, but to redefine where cost resides within the desalination system. These architectural and economic signals provided important context for assessing team readiness and pathways toward commercialization, examined in the following section.

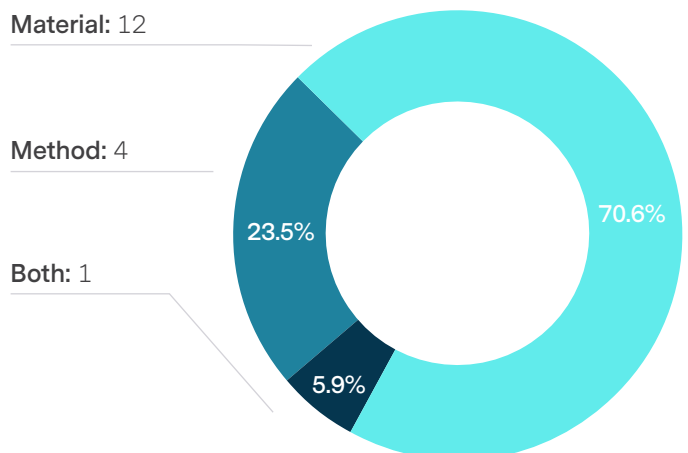
3.6. Track B: Materials and Methods Innovation

Track B Semifinalists represent the scientific and technological frontier of desalination, advancing novel materials, membranes, and alternative separation methods that aim to redefine the fundamental limits of salt-water separation.

Following Qualified Teams Testing, 17 teams advanced to the Semifinalist stage, demonstrating validated performance across a wide spectrum of innovation approaches. As shown in Figure 15, the majority of these teams (12 of 17) focus on material-driven innovations, while 4 teams advanced novel separation methods and 1 team integrated both material and method-based approaches.

Unlike Track A, which emphasizes integrated system performance, Track B innovations primarily target core process limitations – seeking to improve energy efficiency, selectivity, durability, and operational resilience at the material and method level.

Figure 15: Track B — Semifinalists by Innovation Type



This cohort reflects a diverse innovation landscape spanning three primary categories:

Advanced Membrane Materials and Surface Engineering - The majority of teams focus on next-generation membranes, including nanocomposite, biomimetic, graphene-based, and carbon nanotube-enhanced designs. These approaches aim to overcome longstanding tradeoffs between permeability, selectivity, and fouling resistance.

Component and Module-Level Innovations - Several teams are reengineering membrane modules and flow dynamics through spacer redesign, surface patterning, and active fouling mitigation techniques such as ultrasonic integration.

Alternative and Hybrid Separation Methods - A subset of teams are pursuing non-conventional desalination pathways, including solvent-based extraction, electrochemical modulation, pressure-driven distillation, and CO₂-mediated separation systems. These approaches expand beyond traditional pressure-driven desalination and introduce new process architectures.

Overall, the Track B Semifinalist cohort reflects a strong concentration of innovation at the material and separation mechanism level, with a clear emphasis on advancing the fundamental performance limits of desalination processes. While many solutions remain at earlier stages of technical maturity, their demonstrated performance during Qualified Teams Testing provides meaningful signals on feasibility, scalability potential, and compatibility with existing desalination approaches. Collectively, these insights establish a foundation for continued validation and development in subsequent competition phases, positioning these innovations as potential enhancements to the core separation function at the heart of desalination systems.

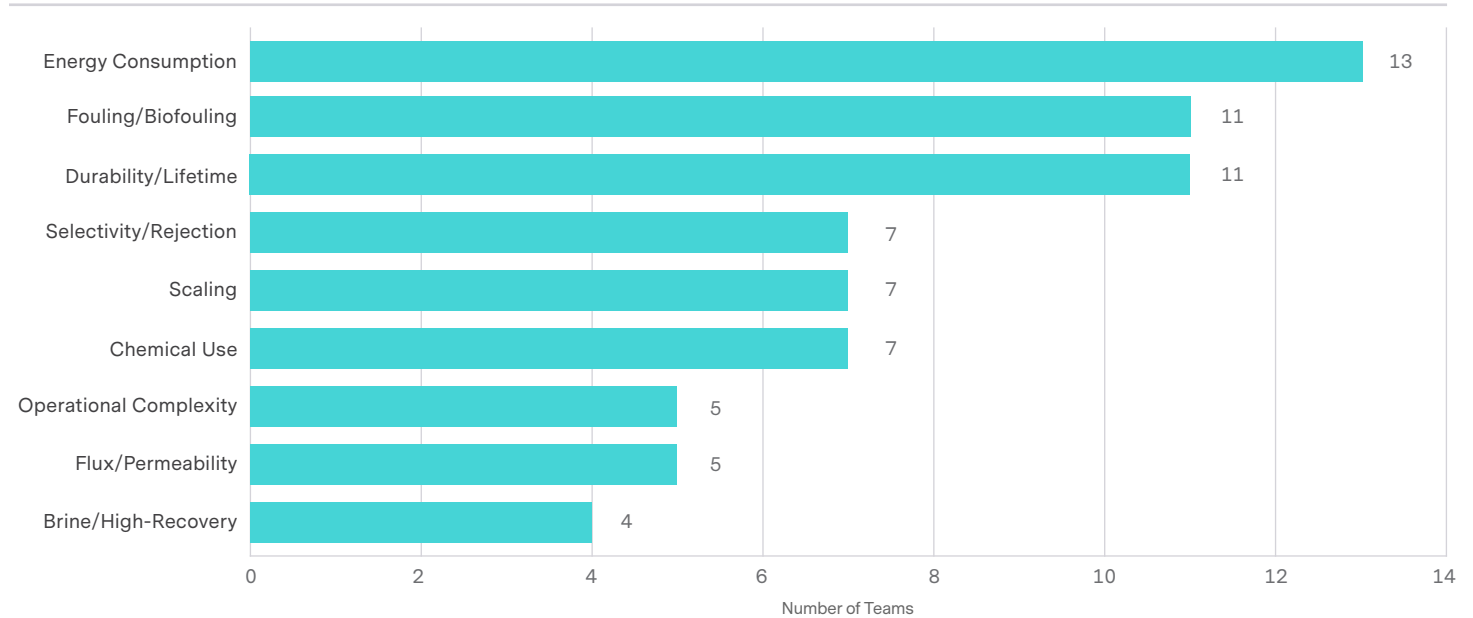
3.6.1. Targeted Performance Challenges and Innovation Focus

Across the Track B Semifinalists, innovation is consistently directed toward addressing a set of persistent and structurally limiting challenges within desalination systems. These include fouling and biofouling, scaling and associated chemical dependency, high energy intensity and pressure requirements, limited material durability and operational lifetime, and the intrinsic selectivity–permeability tradeoff that constrains membrane performance.

As shown in Figure 16, these priorities are not uniformly distributed, but instead reveal a clear convergence of effort across the cohort. Energy consumption emerges as the most widely targeted challenge, followed closely by fouling and biofouling, and durability and operational lifetime. This distribution indicates that teams are prioritizing not only improvements in efficiency, but also system reliability and long-term performance, key factors that are critical for real-world deployment.

Secondary areas of focus, including selectivity, scaling, and chemical use, further reflect efforts to address both fundamental performance tradeoffs and operational constraints within desalination systems. These challenges define the current performance boundaries of desalination technologies.

Figure 16: Track B - Targeted Performance Challenges Across Semifinalist Teams



The concentration of innovation in these areas reflects a deliberate effort by teams to push beyond these limitations by reengineering the fundamental properties of separation materials and mechanisms. In doing so, Track B innovations target the core scientific constraints of desalination, with the potential to reshape efficiency, reliability, and long-term system performance.

3.6.2. Performance Signals and Claimed Improvements

Track B Semifinalists report a range of performance improvements observed primarily under laboratory conditions, with a smaller number demonstrated at pilot scale and in early field environments. Across the cohort, innovations demonstrate notable gains in permeability, with several approaches achieving flux improvements on the order of two to four times relative to conventional membrane baselines. These gains are often accompanied by reductions in energy intensity, enabled through enhanced transport properties or alternative separation mechanisms.

In parallel, teams report consistently high salt rejection performance, alongside meaningful reductions in fouling and scaling through surface engineering and active mitigation strategies. Durability and operational stability also emerge as consistent areas of focus, with the majority of teams reporting high or moderate-to-high stability under accelerated testing conditions. In several cases, these durability improvements are coupled with enhanced chemical resistance, including tolerance to oxidants such as chlorine, reflecting a strong emphasis on extending operational lifetimes.

While some solutions remain sensitive to specific operating conditions or require further validation under long-term real seawater exposure, these results signal meaningful progress toward improving reliability in desalination processes. At this stage, these outcomes should be interpreted as validated performance signals under controlled or semi-representative conditions, rather than fully optimized commercial performance.

3.7. Barriers & Resource Needs

The innovation trends observed across XPRIZE Water Scarcity testing demonstrated significant technical progress. However, advancing desalination from promising demonstration to sustained global deployment requires more than technical performance alone. The transition from innovation to infrastructure requires alignment across financing, regulation, procurement, and partnership ecosystems.

3.7.1. Current Industry Context

Despite desalination's growing role in addressing global water scarcity, widespread deployment remains constrained by persistent technical, economic, and institutional challenges. These barriers affect not only technology adoption, but also the pace at which innovative solutions can progress from pilot demonstration to large-scale deployment.

High energy intensity remains one of the most significant cost drivers for seawater desalination, particularly in regions reliant on fossil-fuel-based power. Qualified Teams Testing submissions from Track A Semifinalists showed that energy performance at pilot scale is often limited by scale-dependent inefficiencies, including undersized pumps, non-optimized pressure recovery devices, and auxiliary loads that do not scale linearly. These effects can mask the underlying efficiency of the core desalination architecture.

Brine management continues to pose environmental and regulatory challenges, especially in sensitive coastal and inland settings. While several Qualified Teams Testing demonstrations employed compliant dilution or temporary storage strategies, many teams explicitly framed brine handling at Qualified Teams Testing as a staging step, with more advanced recovery or circularity strategies planned for subsequent phases.

Capital intensity, permitting complexity, and regulatory uncertainty further constrain deployment timelines. These challenges are compounded by utility conservatism toward unproven technologies, which often limits access to operational test sites and slows adoption of non-incremental solutions.

XPRIZE Water Scarcity helps address these barriers by de-risking innovation through structured, competition-based validation and visibility. By enabling teams to demonstrate performance, reliability, and environmental mitigation under transparent, data-driven conditions, the competition accelerates trust, investment readiness, and pathways to real-world deployment.

3.7.2. Barriers and Partnership Needs

Insights gathered from registered teams – also reinforced by observations from Qualified Teams Testing demonstrations – highlighted several persistent constraints on innovation progress. These barriers operate at different stages of innovation maturity: early-stage development, pilot validation, and commercial adoption.

FROM CONCEPT TO DEMONSTRATION

As shown in Figures 17 and 18, funding remained the most frequently cited barrier, reported by 130 teams. The capital intensity of developing, testing, and validating desalination systems at meaningful scale continued to constrain innovation timelines. In parallel, teams reported technology development complexity (47 teams) and limited access to specialized technical expertise (45 teams), particularly in advanced system integration, automation, and materials manufacturing. These internal constraints shape how quickly solutions can mature technically.

Figure 17: Biggest Challenges to Completing the Competition for Registered Teams

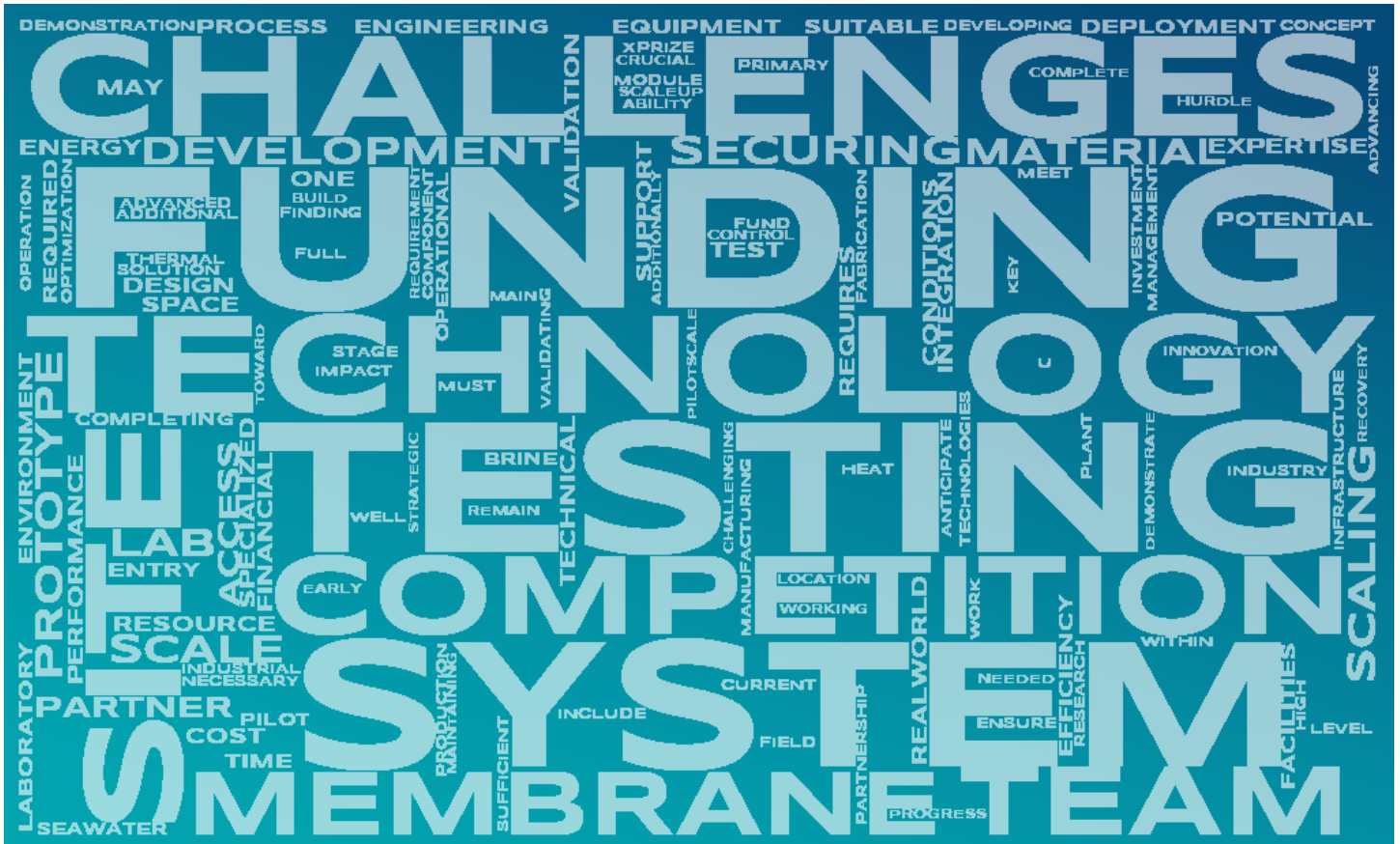
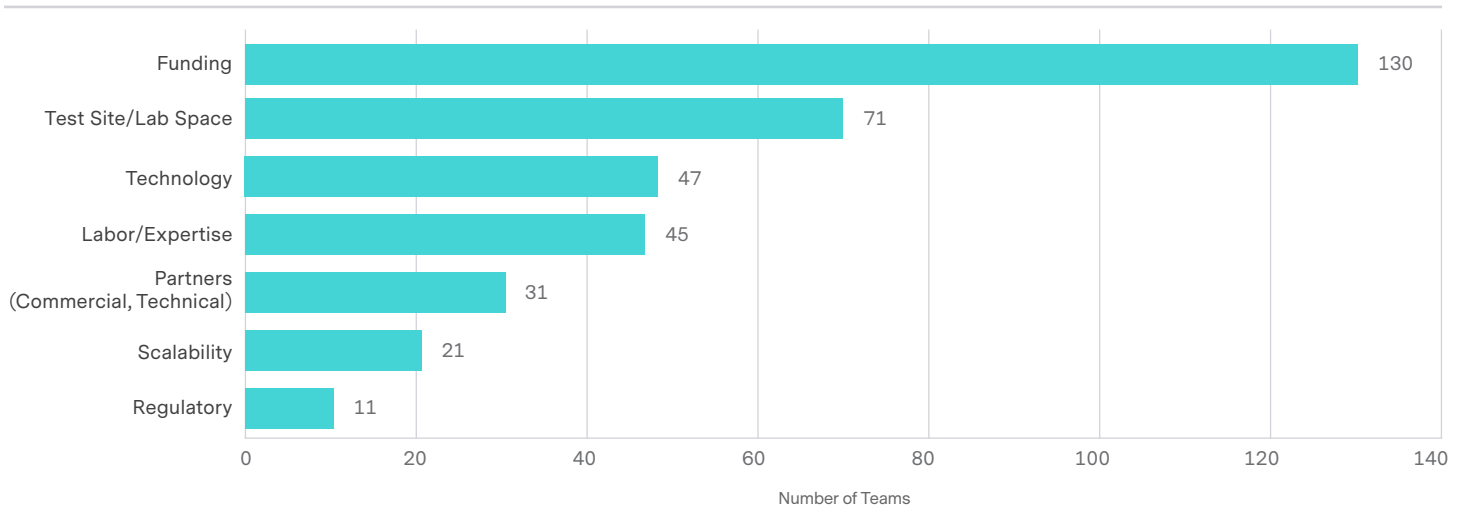


Figure 18: Challenges to Completing the Competition for Registered Teams



For Track B teams, additional barriers emerge at the material level. Analysis of Qualified Teams Testing submissions indicates that performance optimization remains a primary focus, with many teams continuing to refine permeability, selectivity, and long-term stability under realistic operating conditions. Manufacturing scalability also represents a significant constraint, as translating laboratory-scale materials into consistent, high-volume production processes introduces technical and economic challenges. In parallel, teams reported integration challenges when incorporating new materials into existing system architectures, as well as testing limitations related to long-duration validation and real seawater exposure. These barriers highlight the complexity of translating scientific innovation into deployable desalination technologies, even when early performance results are promising.

Beyond development-stage challenges, innovators face two distinct deployment barriers.

Access to piloting opportunities emerged as the second most significant constraint, cited by 71 teams. Many innovators encountered difficulty securing utility-hosted pilot sites, accessing standardized testing infrastructure, or navigating permitting requirements for demonstration-scale operation. Qualified Teams Testing submissions indicated that limited pilot access directly influenced operational decisions, including intermittent operating schedules, simplified configurations, or deferred integration of subsystems such as energy recovery devices or brine valorization units. These constraints affected a team's ability to generate sustained, real-world performance data under representative operating conditions.

Separate from piloting access is the challenge of transitioning from pilot success to commercial procurement. Even after demonstrating technical feasibility, innovators often encountered extended procurement timelines, bankability requirements tied to vendor track record, integration risk assessments, and institutional risk management frameworks. Securing a pilot project does not inherently result in long-term purchasing or project contracts. Infrastructure procurement decisions involve multi-decade asset commitments and public accountability frameworks that inherently favor proven technologies over emerging alternatives. This barrier reflects the institutional and financial considerations that govern infrastructure adoption, rather than proof of technical performance.

Scalability constraints (21 teams) and regulatory hurdles (11 teams) further underscore the complexity of moving from demonstration to deployment across diverse geographic and permitting environments.

Across all barrier categories, partnerships emerged not merely as a support function but as a structural requirement for progression. Thirty-one teams identified the need for stronger commercial, utility, or research collaborations to bridge both pilot validation and commercialization pathways.

Collectively, Qualified Teams Testing data and team feedback point to three critical ecosystem needs:

- Expanded access to standardized testing infrastructure capable of supporting sustained, real-world operation
- Funding mechanisms that bridge early-stage R&D and demonstration-scale deployment
- Structured partnerships linking innovators with utilities, investors, and infrastructure owners to enable both pilot execution and commercial adoption

Through its testing framework and ecosystem-building activities, XPRIZE Water Scarcity directly addresses these needs—reducing risk, enabling demonstration, and opening pathways to real-world deployment and impact.



TEAM READINESS & MATURITY

4.1. Technology Readiness Levels (TRL)

Based on Qualified Teams Testing submissions, Track A Semifinalist teams predominantly operated within TRL 5–7 at the time of testing, indicating a transition from laboratory validation to prototype and pilot-scale demonstration (Figure 19). Several teams demonstrated maturity consistent with pre-commercial or early commercial deployment, supported by prior field experience or validated subsystems. This TRL distribution confirms that the Track A cohort is technically mature enough for meaningful large-scale testing, while still offering significant headroom for optimization and scale-up.

In contrast, Track B Semifinalists span a broader and generally earlier range of technology readiness levels, reflecting the scientific and experimental nature of material and method innovation. As shown in Figure 20, the cohort includes 2 teams operating at TRL 7 or higher, demonstrating pilot-scale or early deployment readiness, 10 teams within TRL 5–6, representing the core group of technologies undergoing component-level validation and performance optimization, and 5 teams at TRL 3–4, focused on early-stage material or method development. This distribution highlights the role of Track B as a pipeline for advancing fundamental separation technologies, where technical feasibility is established prior to large-scale system integration and deployment.

Together, these TRL distributions illustrate the complementary roles of the two tracks, with Track A advancing system-level deployment readiness and Track B developing the underlying technologies that may shape future performance improvements.

Figure 19: Track A — TRL Distribution at Qualified Teams Testing

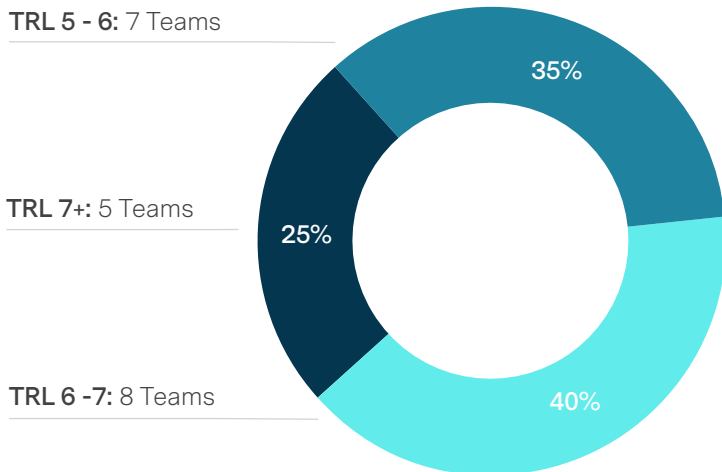
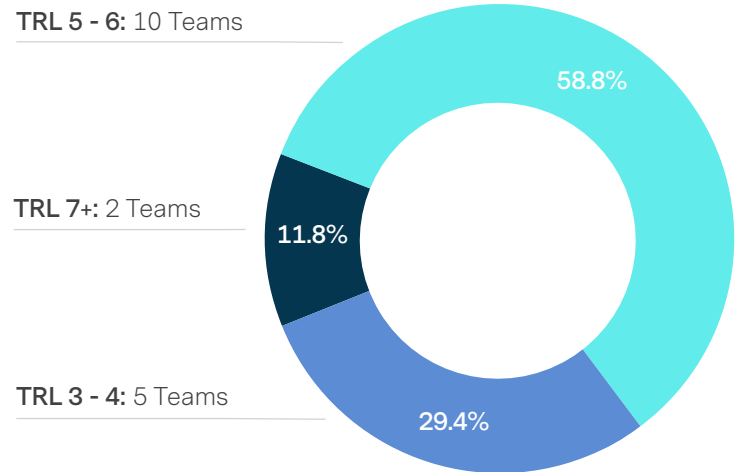


Figure 20: Track B — TRL Distribution at Qualified Teams Testing



4.2. Commercialization Stage and Market Pathways

Track A Qualified Teams Testing submissions indicated a wide range of commercialization strategies. Industrial teams typically targeted near-term utility deployment, while startups and academic spinouts pursued mid-term commercialization following further validation and partnership development.

Target markets identified include:

- Municipal and industrial utilities
- Off-grid and remote applications
- Offshore and island installations
- Emergency and resilience-focused water supply

This diversity reflects the expanding role of desalination beyond centralized infrastructure toward context-specific, modular solutions.

In contrast, Track B teams are generally positioned earlier in the commercialization pathway, with a primary focus on continued technical validation, performance optimization, and material scale-up. However, analysis of intended application and system compatibility reveals a strong orientation toward real-world adoption pathways. The majority of Track B innovations are designed as enhancements to existing seawater reverse osmosis systems, with many solutions demonstrating drop-in compatibility or requiring only minor system modifications. These approaches indicate a clear pathway toward near-term deployment, particularly for membrane-based innovations that can be integrated into existing infrastructure with limited disruption.

A smaller subset of Track B teams are pursuing entirely new desalination pathways, including brine concentration and zero liquid discharge systems, which may require more substantial system redesign or new infrastructure. While these approaches represent longer-term opportunities, they also introduce the potential for step-change improvements in system performance, resource efficiency, and sustainability.

4.3. Geographic and Institutional Patterns

Track A Semifinalists represented a globally distributed innovation ecosystem, with strong participation from North America, Europe, and East Asia. Qualified Teams Testing submissions highlighted the importance of academic–industry collaboration, particularly in advancing novel concepts toward system-level validation under real-world operating constraints.

Track B participation reflects a similarly global and research-driven landscape, with representation spanning North America, Europe, Asia-Pacific, and the Middle East. The cohort includes a diverse mix of academic institutions, startups, and industry-led teams, underscoring the central role of materials science and applied research environments in advancing next-generation separation technologies.

4.4. Readiness for Continued Testing and Demonstration

The Qualified Teams Testing phase demonstrated that Track A Semifinalists possessed not only technical innovation, but also the organizational readiness required for structured testing, data reporting, and iterative improvement. While constraints such as site access and scale-dependent efficiency remained, the cohort is well positioned to advance toward larger-scale demonstration in subsequent competition phases.

For Track B teams, readiness is defined by progression from controlled validation toward increasingly representative testing environments. Most teams have advanced beyond isolated material testing, with a significant portion demonstrating performance at the component level within system configurations. A smaller subset of teams have achieved integration within pilot-scale systems, providing early validation under more realistic operating conditions, while a limited number of concepts remain at the standalone stage.

This distribution reflects a clear maturation pathway across the Track B cohort, from material validation to system-level testing. For XPRIZE Water Scarcity, Qualified Teams Testing provided an important mechanism for assessing how emerging approaches are progressing from scientific innovation toward practical application.

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