2025 Water Reduction Strategic Plan

NYU Langone Medical Center & Hospital for Joint Diseases

NYU Langone MEDICAL CENTER

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Contents

Executive Summary

Water and sewer costs in NYC have increased 131% since 2006 and 1,395% since 1980, well outpacing the cost increases of other utilities as well as general inflation. At the same time, water supplies have become increasingly strained and issues continue to be fueled by a changing climate. As water becomes a more critical resource, water conservation must become a higher priority for both financial and sustainability reasons. Therefore, NYU Langone has developed a water reduction plan to curb water usage at the Main Campus and Hospital for Joint Diseases (HJD) by 35% from a FY2012 baseline by 2025 on a square foot normalized basis.

NYU Langone's water reduction plan is comprised of three main components:

1. **Metering and Data Analysis** – Understanding water consumption at diverse campuses and locations is critical to making intelligent decisions about water conservation. NYU Langone has developed resources to track water use and continues to make improvements to provide greater detail and granularity, which will further improve decision making and response to operational issues.
2. **Operational Improvement** – In a clinical and research setting, most water consumption is tied to processes—sterilization, cleaning, cooling, heating, etc. Steam heat requires water to quench the condensate and cooling requires cooling tower water. By reducing energy loads, water consumption is consequentially reduced as well. Additionally, efforts have been made to reduce water waste though increased preventative maintenance and commissioning.
3. **Conservation Projects** – NYU Langone has invested and plans to continue to invest capital money in water conserving technology and equipment such as low flow fixtures. As water costs increase, payback on these projects becomes shorter and investment is expected to increase as they become increasingly attractive. Additionally, NYU Langone is committed to using water efficient design and construction standards such as LEED certification and WaterSense labeled products when available.

Since starting to focus on water reduction in Fiscal Year 2012, water consumption has been reduced from 352,709 CCF (Hundred Cubic Feet) to 236,115 CCF in FY 2015. This represents a reduction of 33.1% overall and a 26% reduction in CCF/square foot.

Overview and Campus Description

Main Campus

The heart of NYU Langone Medical Center is its 2.3 million square foot Main Campus, which is bounded by 30th and 34th Streets and 1st Avenue and the FDR Drive in midtown Manhattan. Comprised of acute care clinical, rehab, research laboratory, vivarium, classroom, meeting and residence spaces, the Main Campus has over 43 OR and procedure rooms, 561 staffed beds, more than 125 labs and supports roughly 4560 FTEs, 230 contracted employees and the NYU School of Medicine.

Hospital for Joint Diseases

Located at 301 East 17th St in Manhattan, this 300,000 square foot orthopedic teaching hospital and rehabilitation center performs surgery in its 16 ORs seven days a week and supports roughly 1320 FTEs and 210 contracted employees. HJD also includes the Center for Children and the Harkness Center for Dance Injuries.

Water Reduction Strategy

The NYU Langone water reduction strategy can be divided in to 3 main components:

1. Metering and Data Analysis
2. Operational Improvement
3. Conservation Projects

Metering and Data Analysis

Tracking consumption is the foundation of any successful utility management plan as it allows for more precisely focused conservation efforts. NYU Langone has developed an internal water dashboard to track monthly water bills as well as individual water meter consumption at the Main Campus and HJD. This data has been used to identify sources of water waste and opportunities to reduce water consumption as well as billing issues and discrepancies. Additionally, energy data that correlates highly with water consumption is also tracked separately for comparative purposes. NYU Langone also tracks water usage for some properties through the EPA Energy Star Portfolio Manager tool and ASHE Energy to Care program to benchmark performance.

Operational Improvement

Most of the success NYU Langone has had in water reduction has come from operational improvements. Two of the most significant uses of water are cooling towers and steam condensate quenching. NYU Langone's significant reduction in heating and cooling load through energy management efforts have contributed greatly to reducing these loads. Additionally, through commissioning and preventative maintenance programs, these processes have been optimized to reduce water waste by eliminating over-quenching of condensate, cooling tower overflow and excessive cooling tower blowdown.

Another area of focus has been leak and waste elimination. As part of a regular preventative maintenance program, in-house HVAC mechanics regularly examine cooling coils and the chilled water system for leaks and the plumbers do rounds on domestic water systems to detect and repair leaks. While the impacts of these efforts were not measured directly, the results are evident as water consumption has dropped significantly with very little capital investment.

Conservation Projects

Although the most reductions in water use have come from operational improvements, there have been some water conservation projects implemented as well. At HJD, low flow fixtures were installed in 2012. Additionally, new construction standards as outlined in NYU Langone's official Design Guidelines require low flow fixtures where available and has established LEED Gold minimum certification as a requirement for all new construction and major renovation.

Internal Water Dashboard

The water dashboard tracks monthly water consumption and cost. It also tracks and compares monthly meter reads to bills to check for errors. The water dashboard is a centralized location to house water data, perform analysis and present a high level overview of our water metrics.

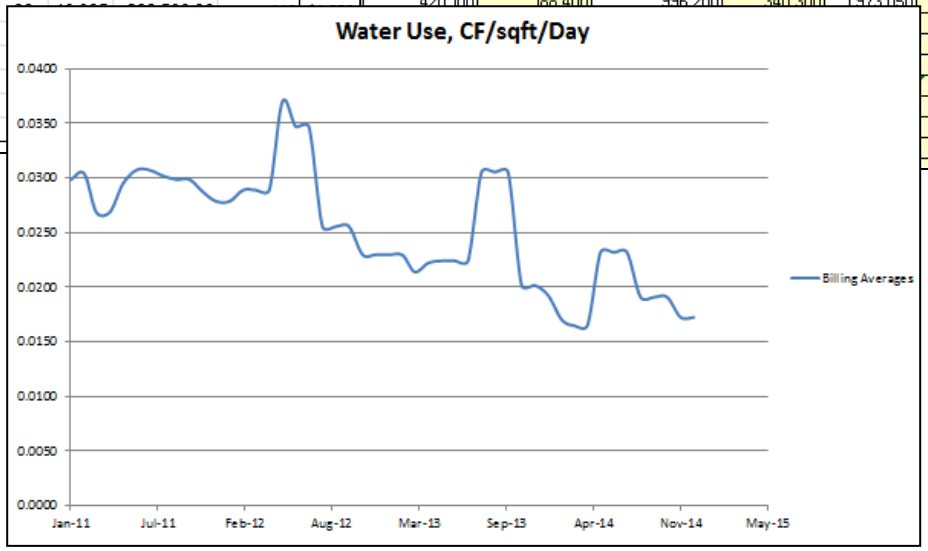
Skirball Animal Lab

E11021570 (Old Meter N31959596)

50001-20435-001

Bill Start Date	Bill End Date	Days	CCF	$	CCF/Day	$Day	$/CCF	B D
12/1/2005	2/28/2006	89	14,937	$63,833.27	168	$ 717.23	$ 4.27	
2/28/2006	5/25/2006	86	17,357	$74,175.14	202	$ 862.50	$ 4.27	
5/25/2006	8/24/2006	91	14,964	$67,696.35	164	$ 743.		
8/24/2006	11/27/2006	95	16,639	$78,001.97	175	$ 821.		
11/27/2006	2/27/2007	92	6,028	$28,258.66	66	$ 307.		
2/27/2007	5/29/2007	91	18,186	$85,254.15	200	$ 936.		
5/29/2007	9/4/2007	98	10,509	$53,114.53	107	$ 541.		
9/4/2007	11/30/2007	87	12,784	$66,883.33	147	$ 768.		
11/30/2007	2/28/2008	90	2,676	$14,000.30	30	$ 155.		
2/28/2008	5/28/2008	90	6,488	$33,943.92	72	$ 377.		
5/28/2008	3/1/2010	642	55,621	$346,653.38	87	$ 539.		
3/1/2010	5/30/2010	90	7,860	$53,132.81	87	$ 590.		
5/30/2010	8/23/2010	85	12,512	$92,357.33	147	$1,086.		
8/23/2010	11/25/2010	94	10,770	$82,288.19	115	$ 875.		
11/25/2010	2/24/2011	91	8,585	$65,593.69	94	$ 720.		
2/24/2011	5/23/2011	88	8,605	$65,746.50	98	$ 747.		
5/23/2011	8/25/2011	94	10,890	$86,901.02	116	$ 924.		
8/25/2011	11/28/2011	95	9,725	$79,845.17	102	$ 840.		
11/28/2011	2/28/2012	92	6,935	$56,938.43	75	$ 618.		
2/28/2012	5/28/2012	90	7,275	$59,729.93	81	$ 663.		
5/28/2012	6/9/2012	12	1,176	$9,655.31	98	$ 804.		
6/9/2012	8/27/2012	79	9,036	$78,293.71	114	$ 991.		
8/27/2012	11/28/2012	93	6,842	$60,073.44	74	$ 645.		
11/28/2012	2/26/2013	90	5,810	$51,012.38	65	$ 566.		
2/26/2013	4/6/2013	39	2,381	$20,905.18	61	$ 536.		
4/6/2013	5/29/2013	53	4,954	$43,496.85	93	$ 820.		
5/29/2013	8/28/2013	91	8,627	$78,498.24	95	$ 862.		
8/28/2013	11/25/2013							
11/25/2013	2/26/2014							
2/26/2014	5/28/2014							
5/28/2014	8/26/2014							
8/26/2014	11/27/2014							
11/27/2014	2/24/2015							

M	N	O	P	Q	R	S
Smilow		Smilow		Tisch CT		Tisch CT
E13273092		E13262247		V84017885		V84018186
00001-20436-001		00001-20436-001		50001-20435-001		50001-20435-001
Smilow Mezanine, Behind Beam, Pump Room		Smilow Mezanine, Behind Elevators		18th Floor Mechanical Room		Roof Penthouse, East
10		10		10		10
Neptune 6 digit Odometer-Style		Neptune 6 digit Odometer-Style		Neptune 6 digit Odometer-Style		Neptune 6 digit Odometer-Style
261,511	24,147	486,275	171,379		67,150	
6,219,470		516,660		1,794,130		1,711,190
261,518	1,267	511,922	35,527		0	
6,221,450		529,600		1,794,130		1,716,660
261,511	1,973	540,344	41,362		0	
6,223,560		543,610		1,794,130		1,728,570
261,517	2,116	547,576	21,242		0	
6,227,310		562,110		1,801,340		1,741,967
261,514	3,747	621,868	92,792		7,210	
6,232,680		585,210		1,808,550		1,755,363
261,516	5,372	688,231	89,463		7,210	
103,900	103,900	426,700	426,700	1,815,760	7,210	1,768,760
231,700	127,800	655,900	229,200	1,852,670	36,910	1,782,410
420,100	188,400	996,200	340,300	1,973,050	120,380	1,842,300
					57,000	1,860,270
					36,860	1,873,680
					5,270	1,878,830
					0	1,885,055
					0	1,891,280
					0	1,895,060
					0	1,899,360



Current Results

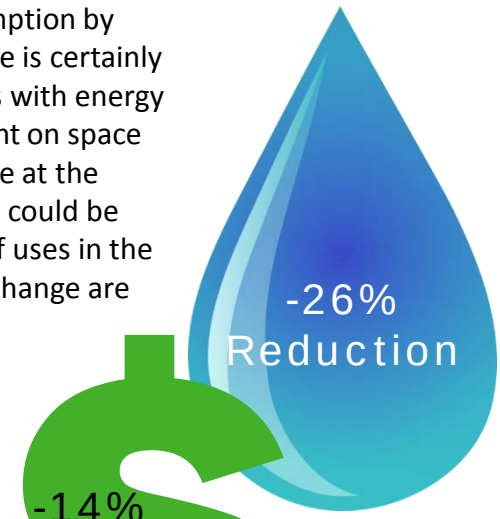
Since water conservation efforts began in fiscal year 2012, NYU Langone has reduced combined Main Campus and HJD water consumption by 33.1%. While the savings stemming from overall energy use reduction is the single largest source of water savings over this time period, additional savings have come from both operational improvements and capital projects.

Total Consumption & Cost

Current Results

Square Foot Normalized

Since water conservation efforts began in fiscal year 2012, NYU Langone has reduced combined Main Campus and HJD water consumption by 26% on a square foot normalized basis. While square footage is certainly correlated with water use, the correlation is not as strong as with energy consumption because water consumption is more dependent on space use than size. Therefore, while the changes in square footage at the Main Campus due to Hurricane Sandy and new construction could be expected to have some impact on water use, the diversity of uses in the new and removed spaces means the effects of square foot change are much lower than effects of water conservation measures.



CCF per Square Foot

Case Study: HJD Steam Project

HJD campus has both steam to hot water and dual temp heat exchanger (HX) units and a multitude of steam traps. A survey was done in 2014 that revealed two key findings:

1. 42% of energized steam traps were leaking or failed to open
2. All 6 heat exchangers were found to be leaking

Steam Trap Infrared Analysis

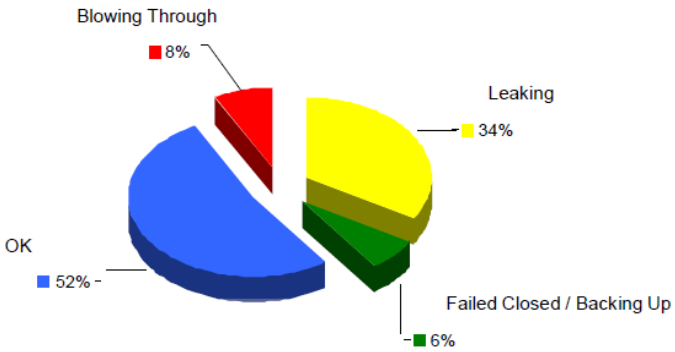
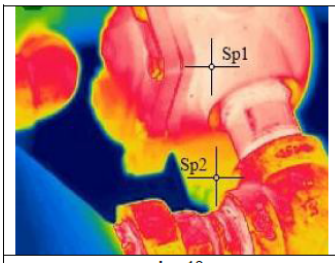
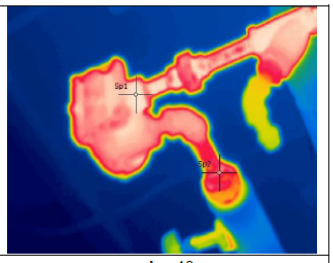


Table 4 – Comparison Between an OK Steam Trap and a Failed Open Steam Trap

	
psig: 18 **Trap Type / Application:** 1 1/4 in F&T / Drip	**psig:** 18 **Trap Type / Application:** 3/4 in F&T / Drip
Point Sp1 240 °F / **Point Sp2** 182 °F	**Point Sp1** 249 °F / **Point Sp2** 243 °F
T: 58 °F	**T:** 6 °F
Conclusion: OK	**Conclusion:** Failed Open

- Pressure testing revealed that all 6 HX units were faulty and needed to be replaced
- Leaks through the tubes required increased makeup water, which also needed to be heated
- Leaking valves caused more steam than necessary to pass through the units


Leaky unit undergoing pressure test

Actions Taken

1. Deficient steam traps were rebuilt or replaced
2. All HX units were repaired by installing new tube bundles

Results

Overall, HJD steam use was reduced by 8% total and 12% weather normalized from winters 2014 to 2015 with the reduction primarily attributable to these two projects layered on top of operational improvements.

Planned Projects and Efforts

As water costs increase, reductions in water consumption are becoming an increasing priority. NYU Langone plans to invest significantly in water conservation efforts over the next several years to reach its 2025 goal. The projects currently under development include the following:

Metering of Chilled Water Make-Up Pumps

Both the Main Campus and HJD have pumps that make up chilled water (CHW) due to any leaks in the system. Leaks in CHW systems are relatively common and can be a significant waste of water. By monitoring how much water is flowing into the system, operators will be able to determine if there is a leak and can then go into the field to find and repair these deficiencies to eliminate the unnecessary water waste.

Improved Water Metering/Submetering

Currently, there is no live metering of water meter data. NYU Langone has planned to take steps to integrate water meters into its building management system (BMS). Having live water meters would allow for faster detection of anomalies in water use patterns that could be indicative of leaks, overflowing cooling towers or other sources of water waste. Automatic “smart” alarming would allow staff to be quickly dispatched to assess issues rather than having to wait several weeks or longer for a water bill to come in and be analyzed to identify the same issues. Additionally, adding submetering to isolate individual buildings, rooms or pieces of equipment would create a better understanding of where water is being used (and wasted). This would allow water conservation efforts to be focused on the buildings that would benefit the most as well as more accurately measure the results of water conservation efforts.

Combined Heat and Power (CHP) Condensate Quench Reduction

The installation of a CHP plant on the Main Campus will entirely replace the purchased district steam heat that is currently being used. Unlike district steam condensate, which must be quenched and dumped to drain, most condensate from the CHP will be returned to the plant. This is expected to drastically reduce the amount of water that is being used to quench condensate. However, the CHP will also consume water as a result of generating steam on campus (from boiler blowdown, makeup, etc). While this will nominally increase the water that is consumed on campus, the net effect will be neutral as this water was previously being purchased from ConEdison in the form of steam.

Planned Projects and Efforts

Installation of Condensate Quench Tank at HJD

HJD currently quenches its condensate in a straight pipe with a temperature sensor and a two-position automatically actuated valve. The result of this setup is that when the temperature in the pipe reaches setpoint, it over-quenches the condensate because the valve cannot close fast enough as the temperature comes down below setpoint. A project to build a quench tank where the condensate can blend with the quench water will allow much less water to be used for condensate quenching as the water temperature will rise and fall more slowly.

Industrial Steam Chiller Plant Controls

The Main Campus currently uses electric chillers to generate most of the campus CHW load. However, with the transition to CHP, steam will be available very cheaply during peak cooling season. The result will be a shift to using steam chillers, which are currently used for electric peak shaving only, as the base load chillers on the campus. Not only are steam chillers less efficient than electric chillers on a BTU basis, but the steam used to drive them must be condensed as well. This will result in an increase in cooling tower water used for the steam chiller plant. However, a project to optimize the chiller programming using industrial controls is simultaneously in the works. This will allow the steam chillers to operate much closer to their surge curves and significantly improve their efficiency. This should yield a significant water savings, both through makeup water to the CHP plant that is generating the steam, as well as the cooling towers, which will have less heat to reject.

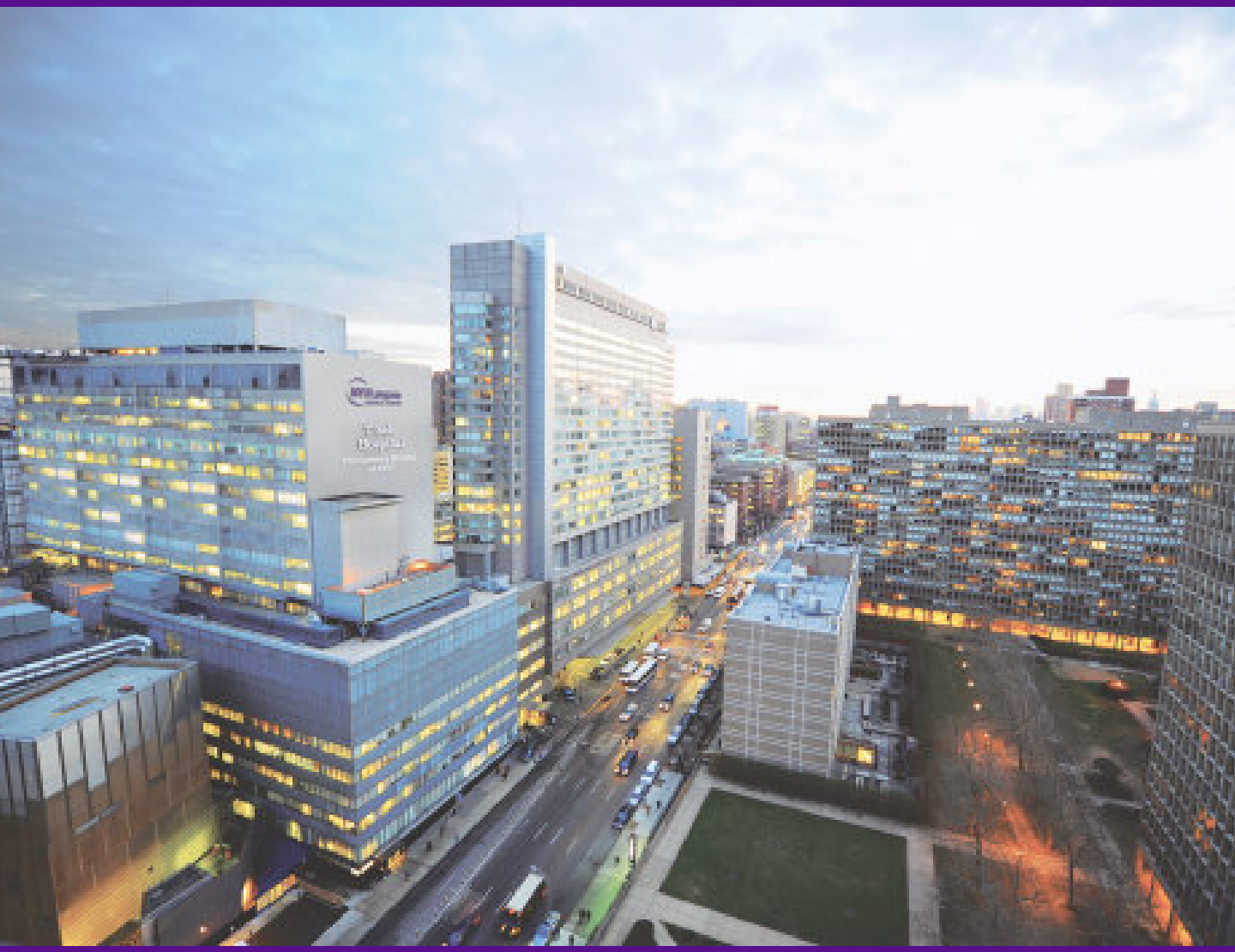
Additional Energy Conservation Efforts

Numerous energy conservation efforts are constantly being developed at both the Main Campus and HJD. While the main purpose of these projects are usually HVAC-focused and not water conservation, the projects usually also reduce the heating and cooling loads of the buildings. These projects then save water by reducing condensate quench, boiler makeup in the CHP, steam for humidification and cooling tower water.

Next Steps and Conclusion

While NYU Langone has made significant strides in water reduction, the needs of the organization and utility environment are constantly evolving. The Main Campus is growing, with two new buildings under construction and the Combined Heat and Power (CHP) plant start up and testing commencing in 2015. While this expansion will significantly increase water consumption, it will also provide increased opportunities to improve campus water efficiency. Water costs are expected to outstrip the rate of inflation over the foreseeable future as NYC's water infrastructure ages. At the same time, the CHP plant will reduce traditional energy costs on the Main Campus. As a result of these conditions, water conservation will be increasingly prioritized. This is evident from the amount of planned water reduction projects under development and the trend is only expected to accelerate. NYU Langone will also work to track and invest in conservation at an increased number of sites including the newest hospital merger, NYU Lutheran, Cobble Hill and other sites acute care settings such as our largest ambulatory care and outpatient surgery centers.

In conclusion, while the achievements in water reduction have been significant, water conservation will become increasingly critical priority to the energy management and sustainability plans of NYU Langone in the future across our entire portfolio of sites. Even more effort and investment in this area will be expected over the coming years as NYU Langone strives to be a leader in water conservation the same way it has with energy conservation. NYU Langone will continue to expand its investment in long term water conservation to reach its goal of 35% reduction by 2025.



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