Using DWSRF Funds to Comply with the Radionuclides Rule

United States Environmental Protection Agency

The Drinking Water State Revolving Fund (DWSRF) program was established by the 1996 Safe Drinking Water Act (SDWA) Amendments and authorizes grants to states to capitalize revolving loan funds. The states provide low-interest loans to eligible systems for infrastructure improvements needed to ensure compliance with the SDWA and protect public health. The DWSRF program can play a significant role in helping systems, especially small systems, to meet the challenges of complying with new drinking water standards.

The Environmental Protection Agency (EPA) published revisions to the Radionuclides Rule on December 7, 2000 which further protect the public from exposure to radioactive substances in drinking water. The revisions include a new uranium maximum contaminant level (MCL) of 30 ppb and a requirement to monitor separately for radium-226 and radium-228, resulting in an increased number of systems out of compliance with the combined radium MCL. These changes will impose a financial burden on some water systems. The DWSRF can provide assistance to systems to help ease this burden, increase compliance, and protect public health.

WHY DID EPA CREATE THIS RULE?

EPA began regulating radionuclides in 1976 by establishing MCLs under the SDWA. In the quarter century since, EPA has learned more about the potential health effects from consuming water with high concentrations of radionuclides. The new uranium MCL of 30 ppb will provide additional protection for 620,000 people and decrease the incidence of cancers and kidney problems. Due to the mistaken conclusion that systems with low levels of radium-226 would also have low levels of radium-228, the current standards only required analysis of radium-228 when levels of radium-226 exceeded 3 pCi/L. Based on a better understanding of radium-228 incidence, EPA closed this loophole by requiring separate monitoring for radium-228. This change will reduce radium exposure for 420,000 people and reduce the incidence of cancer.

TO WHOM DOES THIS RULE APPLY?

The Radionuclides Rule applies to all community water systems (CWSs). Of all affected systems, 98% are small systems that serve fewer than 10,000 people. Higher levels of radionuclides tend to be found in ground water rather than surface water sources (i.e., lakes and rivers). Compared to the rest of the United States, western states and states in the Great Lakes region tend to have higher occurrence of radionuclides in ground water.

Source Type		System Type		Population Type	
Surface Water	✓	CWSs	✓	< 10,000	✓
Ground Water	✓	NTNCWSs		10,000 - 100,000	✓
GWUDI	✓	TNCWSs		> 100,000	✓

CRITICAL RULE DEADLINES & REQUIREMENTS

FOR SYSTEMS*		FOR STATES
	States began updating vulnerability assessments for beta photon and particle emitters and notifying systems of monitoring requirements.	December 8, 2000
	EPA explained new rules and requirements to states.	Spring 2001
	Deadline for states to submit primacy revision application to EPA.	December 8, 2002
December 8, 2003	New MCL and monitoring requirements take effect. Systems must begin initial monitoring. When allowed by the state, systems may be permitted to grandfather data collected before this date and June 2000.	
December 31, 2007	Initial monitoring must be completed.	

**Deadlines for a specific system may be affected by variances or exemptions granted by the State.*

HOW WILL THIS RULE IMPACT SYSTEMS?

The costs systems will face to meet the new Radionuclides Rule are significant. Systems will incur capital costs for two requirements under the rule:

- Compliance with the new uranium MCL of 30 µg/L; and
- Closing the combined radium monitoring loophole by requiring separate monitoring for radium-228.

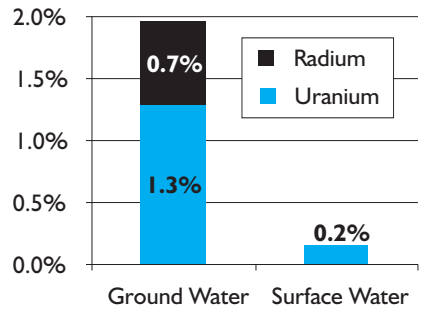
The total capital costs for investments in treatment technology and infrastructure to meet these provisions are estimated to be almost $350 million (see Figure 1). In addition, annual operation and maintenance (O & M) and monitoring costs for systems will top $34 million. As shown in Figure 2, most of the affected CWSs are ground water systems (radium is normally not present in appreciable levels in surface water).

Figure 1: TOTAL RADIONUCLIDES RULE PRICE TAG (in millions of 1999 $)

Capital Costs	
Uranium MCL	$215
Closing Radium-228 Loophole	$131
CAPITAL COST GRAND TOTAL	$346
Annual O & M Costs	$31
Annual Monitoring Costs	$3

Capital Costs by System Size	
< 100	$4
101-500	$14
501-1,000	$11
1,001-3,300	$29
3,301-10,000	$38
10,001-100,000	$142
>100,000	$108

Figure 2: Percent of Systems Affected by the Radionuclides Rule



Approximately 53,156 CWSs are subject to the provisions of the Radionuclides Rule, less than 1,000 of which will have to install treatment. EPA estimates that 98% of the systems that will need to take action to come into compliance with the uranium or combined radium MCLs serve less than 10,000 people. Therefore, most of the capital costs created by the rule will fall on the shoulders of small water systems (see Figure 3). Most of these systems will have to take action to comply with the new uranium MCL.

Figure 4 illustrates how much it will cost systems (on average) to meet the new standards. Systems that would be out of compliance with the new uranium MCL may have to install new technologies, upgrade existing technologies, consolidate into larger systems, or develop new water sources. The requirement to monitor separately for radium-228 and radium-226 will result in more systems facing non-compliance with the combined radium MCL, creating infrastructure needs and annual compliance costs similar to those for the uranium MCL. With the closing of the radium monitoring loophole, approximately 270 to 320 systems currently in compliance with the combined radium MCL due to assumed low levels of radium-228 will now have to take action to retain their compliance status.

The average increase in costs per household to meet the new uranium MCL and the new radium monitoring requirements depends on the size of the water systems and how many people are served by that system. The estimated compliance cost per system is considerably lower for small systems than for large systems because less water must be treated. However, the burden on small system households is significantly higher because the costs must be paid from a much smaller revenue base. EPA estimates that the average annual household water bill for ground water systems out of compliance may increase by $18-$180 for the uranium MCL and $8-$126 for the combined radium MCL. The uranium compliance costs will be significantly cheaper for surface water systems ($3-$72 per household).

Figure 3: Number of CWSs Affected by the Radionuclides Rule

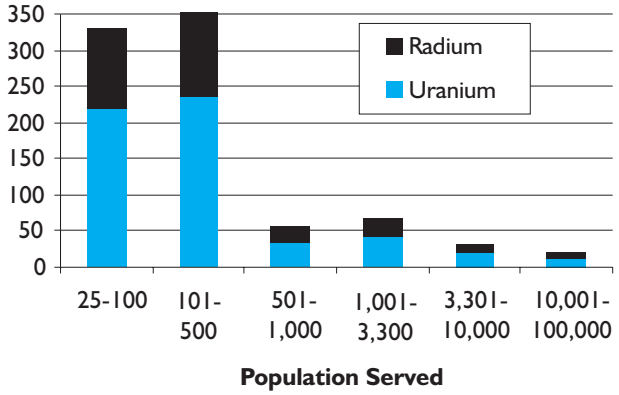
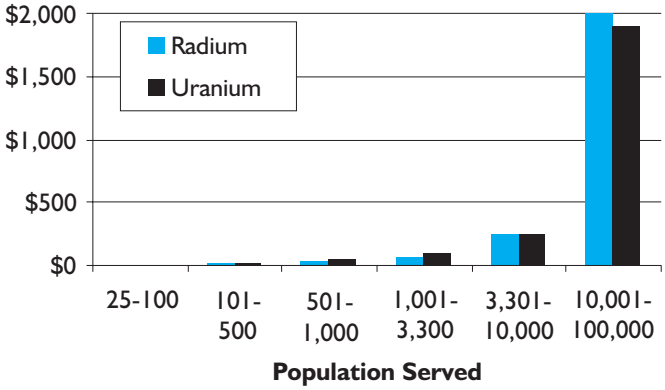


Figure 4: Average Annual Compliance Cost per CWS Exceeding Uranium or Combined Radium MCL (in thousands of 1999 $)



Note: Costs based on total costs amortized over 20 years at a 3% discount rate.

WHAT TYPE OF TREATMENT WILL SYSTEMS HAVE TO PUT IN PLACE?

There are many available technologies capable of removing radionuclides. These treatment options differ greatly in terms of capital and O & M costs and operator skill required for proper operation. The characteristics of a system's source water, the skill level of its operators, and other compliance considerations will greatly impact which treatment train is most appropriate as well as the ultimate cost of compliance. Systems with treatment trains in place that can remove radionuclides will face lower compliance costs than those without pre-existing treatment capability. For instance, most surface water systems already have treatment in place (coagulation or filtration) that, if enhanced, is capable of removing uranium.

Exhibit 1: Radionuclide Treatment Technologies & Strategies*

	Treatment Technology or Strategy	FOR... Uranium	FOR... Combined Radium	FOR... Surface Water?	POU Option
1	Lime Softening**	T Y	T Y	YES	
2	Ion Exchange/ Activated Alumina	T Y	T Y		YES
3	Reverse Osmosis	T Y	T Y		YES
4	Enhanced Coagulation/ Filtration***	T Y		YES	
5	Greensand Filtration		Y		
6	Other, including source change, regionalization, and blending.				

T = Best Available Technology

Y = Small System Compliance Technology

*Referenced in Figures 5 and 6.
**Central treatment is only uranium SSCT for systems >500.
***Assumes that a system already has coagulation/filtration in place.

The rule lists several Best Available Technologies (BATs) for the removal of radionuclides (see Exhibit 1). In addition, the rule lists Small System Compliance Technologies (SSCTs), which are specifically recommended for use by small systems serving fewer than 10,000 people. When considering SSCTs, EPA looks at the affordability of the technology (since per household costs for central treatment tend to be higher for smaller system customers) and technical complexity (since many small systems do not have access to well-trained water system operators). The SSCTs represent technologies that are affordable and achieve compliance across the small system size categories (25-500; 501-3,300; and 3,301-10,000 people). For example, reverse osmosis and ion exchange/activated alumina point-of-use (POU) devices are viable options for small systems, especially those serving fewer than 200 people. Both BAT and SSCT treatment technologies must be operated in very different modes depending on which radionuclide is being removed.

Figure 5: Percent of CWSs Using Various Treatment Technologies and Strategies for Uranium Removal

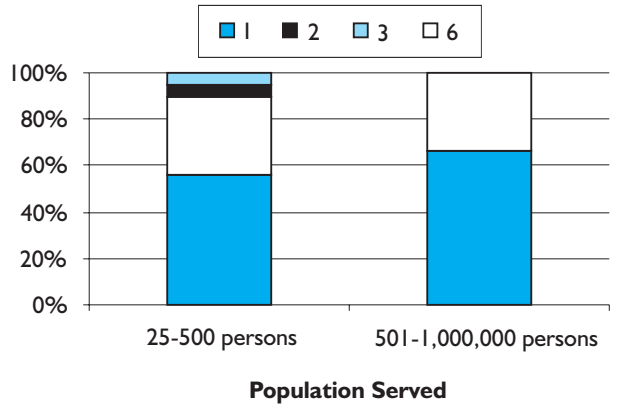
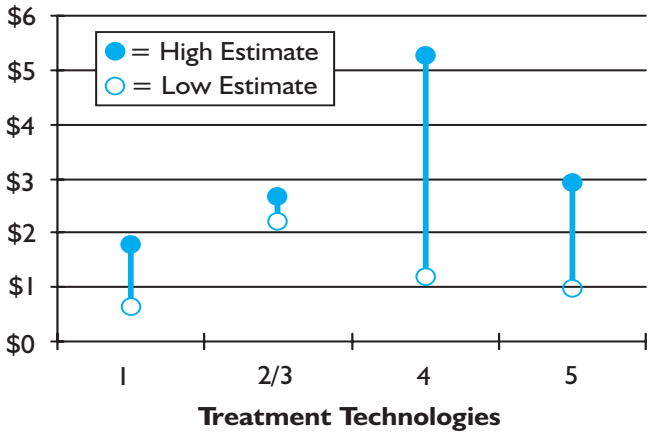


Figure 5 illustrates the estimated CWS compliance strategies for uranium removal. Despite operating difficulty, most systems are expected to install lime softening capability. Approximately 17% of CWSs are expected to develop an alternative water source, while an equal number will comply through regionalization or water blending. About 10% of small water systems are expected to elect to comply by installing either ion exchange, activated alumina, or reverse osmosis POU devices. Technology choices for radium removal are expected to mirror those for uranium removal, except that up to 20% of CWSs will choose greensand filtration over lime softening.

To ensure cost-effective compliance with the uranium and combined radium MCLs, systems will need to evaluate their treatment technology options as a first step. All other factors being equal, systems will most likely choose the cheapest treatment option that ensures compliance. Figure 6 illustrates estimated cost ranges for an average CWS serving between 25 and 500 people that operates the technology at 30% removal efficiency. The costs are production costs per 1,000 gallons treated for both surface and ground water systems removing either radium or uranium. These estimates include costs associated with residuals handling and disposal.

Figure 6: Representative Production Costs for CWSs Serving Populations of 25-500 (in 1999 $ per 1,000 gallons treated)



HOW CAN THE DWSRF ASSIST SYSTEMS?

States use DWSRF capitalization grant monies to provide low-interest loans to publicly- and privately-owned public water systems for infrastructure improvements needed to continue to ensure safe drinking water. States may offer principal forgiveness, reduced interest rates, or extended loan terms to systems identified by the state as serving disadvantaged communities. States also have the ability to reserve a portion of their grants (i.e., set-asides) to finance activities that encourage enhanced water system management and help to prevent contamination problems through source water protection measures. Based on the fiscal year 2002 appropriation of $850 million, capitalization grants ranged from $8.0 million to $82.4 million per state. Where funding is not adequate for all systems that require treatment, states may choose to offer extended compliance schedules through exemptions, where appropriate, to some systems.

Most capital projects – including adding new technologies and upgrading existing technologies – needed to comply with the Radionuclides Rule are eligible for funding under the DWSRF (see Exhibit 2). Consolidation and restructuring of systems can be a cost-effective option for small systems that are affected by the rule. The DWSRF can fund consolidation, including situations where a system is unable to maintain compliance for technical, financial, or managerial reasons. POU devices will be an attractive option to small systems because of cost. The DWSRF can fund these devices as long as the units are owned and maintained by the water system.

Exhibit 2: Projects/Activities Eligible for DWSRF Funding to Comply with the Radionuclides Rule

Type of Project/Activity	Eligible Under Infrastructure Fund	Eligible Under Set-Asides
Treatment		
Water Softening/Iron Removal	Yes	No
Ion Exchange	Yes	No
Reverse Osmosis	Yes	No
Enhanced Coagulation/Filtration	Yes	No
Greensand Filtration	Yes	No
POU Devices	Yes*	No
Planning & Design Activities	Yes	Yes**
System Consolidation	Yes	No
System Restructuring	Yes	Yes
System Administrative Improvements		
Hire Staff	No	No
Staff Training	No	Yes
Public Outreach	No	Yes
Monitoring	No	No
Rate Increase Process	No	Yes
State Administrative Improvements		
Hire Staff	No	Yes
Staff Training	No	Yes
Public Outreach	No	Yes
Compliance Oversight	No	Yes
Enforcement	No	Yes
Pilot Studies	No	Yes

*Must be owned and maintained by system.
**For small systems only.

Jackson, Nebraska

The Village of Jackson is a small economically disadvantaged community of 230 people in northeast Nebraska. To achieve compliance with regulations for radium-226, radium-228, and Gross Alpha Particle Activity, the ground water system in Jackson developed a $500,000 project to install a new well in a different aquifer, build a water treatment plant for iron removal, and make needed improvements to its distribution system. The system received a Community Development Block Grant of $250,000 and a $250,000 DWSRF loan with $125,000 in principal forgiveness. With this assistance, Jackson was able to afford the project and complete it in the spring of 2000.

States can use set-aside funds from the DWSRF to assist systems directly as well as to enhance their own program management activities (see Exhibit 2). A state may use set-asides to make administrative improvements to the entire drinking water program, which faces increased costs in implementing the Radionuclides Rule. States can provide training to small systems on meeting the requirements of the rule as well as technical assistance in identifying appropriate technologies. In addition, states can provide assistance to small systems to cover the costs of project planning and design for infrastructure improvements.

Since the DWSRF program is managed by states, project and set-aside funding varies according to the priorities, policies, and laws within each state. Given that each state administers its own program differently, the first step in seeking assistance is to contact the state DWSRF representative which can be found on the EPA DWSRF website.

FOR MORE INFORMATION...

DWSRF and Radionuclides Rule

DWSRF Website:
http://www.epa.gov/safewater/dwsrf.html

Radionuclides Implementation Website:
http://www.epa.gov/safewater/rads/implement.html

General Information

SDWA Hotline
1-800-426-4791

EPA's Ground Water & Drinking Water Website:
http://www.epa.gov/safewater/

Office of Ground Water and Drinking Water (4606M)

EPA 816-F-02-008

May 2002

Printed on Recycled Paper