

# **U.S. Energy Freedom Center™ Strategic Plan**

## ***Introduction***

The concept of an “energy park” on the U.S. Department of Energy’s (DOE) Savannah River Site (SRS) has been discussed for some years. It is clear that the physical and intellectual assets of the SRS could be put to use to develop and demonstrate innovative alternative energy sources to move the country toward energy independence and security. More than a physical site, the “energy park” is a fully integrated technology community that promotes networking and strategic partnerships to promote sustainable economic development and use of all forms of renewable energy to benefit the people of the Central Savannah River Area (CSRA).

Implementation of an energy park concept will help the Savannah River Site Community Reuse Organization (SRSCRO) meet its mission to facilitate economic development by providing new business opportunities and jobs for the five-county, two-state region of Georgia and South Carolina. An “energy park” provides the community with another tool for economic development and as a supplement to, and a unique characteristic of, the CSRA to attract investment and jobs that might otherwise go to other locations outside the CSRA.

It will specifically build on the CSRA’s considerable nuclear infrastructure which encompasses commercial nuclear power plants, research and development, medical applications and cutting-edge technology designed to enhance a strong nuclear defense, minimize nuclear waste and lead the way toward future advanced nuclear-based technologies. To these ends, portions of the “energy park” community may be located “off-site” (outside the SRS fence but within the CSRA community) or “on-site” (inside the SRS fence or on property located within the boundaries of the Savannah River Site).

In the specific case of “on-site” enterprises, the envisioned energy park will provide the community with locations for new economic activity which could reutilize SRS assets and take advantage of the secure boundary of the Site. Whether located on or off the SRS energy park enterprises will provide unique advantages to all parties involved – tenants, DOE, local governments and regional economic development organizations. Energy park activities will further U. S. energy policy, leverage SRS capabilities for private sector jobs and investment and offer a unique commercial location for joint DOE and non-DOE private sector energy initiatives.

This strategic plan focuses on the vision for the “on-site” component of the energy park concept. In addition, under this approach surplus and underutilized DOE land, facilities, infrastructure, and human capital would be redeployed for the purpose of national energy security by helping to demonstrate and develop commercial supply chains for advanced nuclear technologies. The SRSCRO has adopted and endorsed the U.S. Energy Freedom Center™ as the most practicable long-term approach for the “on-site” energy park concept. In endorsing the U.S. Energy Freedom Center™, SRSCRO:

- Envisions this hybrid nuclear-fossil energy system and precursor facilities becoming the catalyst for development for the regional energy park.
- Understands that it fits within the Savannah River National Laboratory (SRNL) strategic objective to develop regional, national, and global partnerships that extend SRNL’s capability in advance technologies supporting nuclear, biotechnology and sustainable energy sources to support the national energy future.

## **Objectives**

SRSCRO has formed a **working group** with Savannah River National Laboratory (SRNL), Savannah River Nuclear Solutions (SRNS), DOE, community leaders, and the private sector to forge a **shared vision** for a regional energy park centered on SRS but extending into the surrounding Central Savannah River Area (CSRA). This vision redeploys the underutilized human and physical assets of the SRS and the surrounding Central Savannah River Area (CSRA) to create by 2035 a comprehensive network of innovative energy production systems collectively referred to as the U.S. Energy Freedom Center™.

The objectives underpinning SRSCRO’s endorsement of this vision are as follows:

1. Develop an engine for regional economic growth and industrial diversification.
2. Create tens of thousands of sustainable, high-paying jobs for residents of the CSRA.
3. Establish the CSRA as the premier incubator of technological solutions to global energy security and climate disruption challenges.
4. Secure enduring new research and development (R&D) missions that propel Savannah River National Laboratory (SRNL) as the linchpin in advance nuclear technologies, nuclear materials management, and leveraging its unique resources and capabilities to meet the nation’s energy security and climate change objectives.

## **Situation Analysis**

The working group has conducted and previously documented extensive analyses of the internal and external environments. Based upon the situation analyses of the strengths, weaknesses, opportunities, and threats presented below, the CSRA is clearly a suitable location for many clean and nuclear technologies and the preferred location for the U.S. Energy Freedom Center™.

<b>Figure 1. Situation Analysis</b>	
National – United States	<ul style="list-style-type: none"> <li>• Huge energy and economic challenges which create a national security threat.</li> <li>• Environmental issues – climate change, water issues, some form of carbon tax likely.</li> <li>• Nuclear renaissance underway – but slow start.</li> <li>• No National Energy Policy.</li> </ul>
DOE-HQ	<ul style="list-style-type: none"> <li>• Huge organization with extensive resources.</li> </ul>

	<ul style="list-style-type: none"> <li>• Potential for collaboration between DOE laboratories and use of assets (some currently considered waste) at other DOE sites.</li> <li>• DOE has regulatory authority under the Atomic Energy Act.</li> <li>• Hindered by an entrenched outdated “stovepipe” organizational structure which is impacted by constant political change and different administration mandates.</li> <li>• Need for bold leadership and action plans.</li> <li>• Need to revitalize and reutilize assets that won the Cold War to meet new energy challenges of today.</li> </ul>
SRS	<ul style="list-style-type: none"> <li>• Existing infrastructure.</li> <li>• Available capacity.</li> <li>• The unique facilities of SRNL and the greater SRS, including the hot cells, H-Canyon, and MOX Plant.</li> <li>• A secure, isolated, highly-characterized, 310-square-mile site on which to locate the nuclear backbone of the regional U.S. Energy Freedom Center™ energy park.</li> <li>• Highly-skilled workforce with best-in-class safety culture and unsurpassed expertise in nuclear materials processing, hydrogen, and biomass.</li> </ul>
CSRA	<ul style="list-style-type: none"> <li>• Supportive community.</li> <li>• Geographic location at the center of the domestic nuclear renaissance.</li> <li>• Access to growing industrial and consumer markets in the Southeastern U.S.</li> <li>• Training in nuclear technology available at several local institutions.</li> </ul>

<b>Figure 2. Potential Threats and Response</b>	
DOE Internal Politics	<ul style="list-style-type: none"> <li>• More than a year after announcing its intent to launch an Energy Park Task Force at the Under Secretary level, the DOE has yet to either charter or populate the group. Pressure from</li> </ul>

	<p>the communities and Congressional delegations surrounding DOE Sites is needed to force DOE to take this important first step. <b>Response:</b> SRSCRO work with Energy Communities Alliance (ECA) to implement a complex-wide community position and influence on the establishment of the a DOE-HQ energy park Task Force.</p> <ul style="list-style-type: none"> <li>• There remains significant resistance to energy parks from other parts of the government, most notably the Office of Management and Budget (OMB). Questions raised by OMB following recent SRNL announcements of MOUs with Hyperion and GE-Hitachi, in fact, prompted contractual direction from DOE to SRNS to stop all spending on energy park matters, pending further direction from DOE-HQ. Clearly, pressure from the communities and Congressional delegations surrounding DOE Sites is needed to force DOE to free up the seed funding that is critical to the initiation of the energy park. <b>Response:</b> SRSCRO work with Energy Communities Alliance (ECA) to identify seed funding opportunities and congressional support for existing energy park legislation in FY2011 appropriation bills.</li> </ul>
Lack of Congressional Support	<ul style="list-style-type: none"> <li>• Unlike energy park endeavors at Oak Ridge, Hanford, and elsewhere, the CSRA community has not provided sufficient educational support to its Congressional delegation on the potential energy park benefits to local constituents and to the nation to garner a clear leader and major advocate. A concerted program of Congressional communications is needed to obtain support equivalent to that enjoyed by other communities. <b>Response:</b> SRSCRO work with the “Energy Park” working group to develop a strategy to educate congressional delegation on the regional U.S. Energy Freedom Center™ and identify one or more “champions” within the congressional delegation.</li> </ul>

SRS is an ideal place to develop and demonstrate the new technology components of the Energy Freedom Center TM and offers the following socio-economic benefits to the CSRA and the nation:

- Direct job creation
- Indirect job creation, including development of manufacturing capabilities
- Export of U.S. goods and service
- Benefits to national security and energy policy
- Reductions in greenhouse gas emissions

As evidence to the possible socio-economic impact this vision may have, an assessment of potential jobs created by “development, manufacture, and deployment” of small modular reactors in the U.S. was unveiled on September 29, 2010 at a Center for Strategic & International Studies forum. The study was underwritten by the American Council on Global Nuclear Competitiveness. The study concludes that “development of a robust domestic SMR industry will result in significant economic benefits.” The analysis was a collaborative effort by the Boise State University in conjunction with the University of New Mexico. According to the report:

*A prototypical SMR costing \$500 million to manufacture and install on-site is estimated to create nearly 7,000 jobs and generate \$1.3 billion in sales, \$627 million in value-added, \$404 million in earnings (payroll) and \$35 million in indirect business taxes. In addition, the annual operation of each 100 MW SMR unit is estimated to create about 375 jobs and generate \$107 million in sales, \$68 million in value-added, \$27 million in earnings payroll, and \$9 million in indirect business taxes.... total economic impacts were determined to range from \$200B – \$400B.*

## ***Vision***

At the highest level, the situational analysis conducted by the working group points to the inescapable conclusion that the core of the regional energy park must be nuclear. At lower levels, the analysis suggests that the nuclear focus on three pressing national priorities—sustainable energy security, reduction of greenhouse gas emissions, and nuclear nonproliferation.

As illustrated below, the U.S. Energy Freedom Center™ vision addresses these priorities by:

1. **Synthesizing carbon neutral hydrocarbon fuels from a wide range of inexpensive, abundant, and entirely domestic carbon feed stocks** (switch grass, sorghum, algae, and carbon dioxide); providing inherent predictability and stability of supplies and production costs without the adverse impacts on food prices attendant to corn ethanol.
2. **Recycling CO<sub>2</sub> captured from industrial sources** (coal-fired or biomass power stations, cement kilns, etc.); significantly reducing net greenhouse gas (GHG) emissions.
3. **Beneficially eliminating surplus nuclear weapons materials**; promoting nuclear nonproliferation and President Obama’s vision of a world free of the threat of nuclear weapons.
4. **Recycling used commercial nuclear fuel**; helping to expand the safe civilian use of nuclear power needed to combat climate change, while providing a diminished reliance on a federal repository.

It also meets the previously-stated SRSCRO objectives by diversifying the region’s industrial base, creating up to 25,000 new primary and secondary jobs, and catapulting SRNL into a global leadership role utilizing its expertise and technologies to solve critical national issues, especially in advanced nuclear technologies and secure, sustainable energy initiatives. Regarding these objectives, SRSCRO expects the U.S. Energy Freedom Center™ will spur the development of supply chains for SMRs and renewable fuels in the communities surrounding SRS. This expected outgrowth includes, but is not limited to:

- Reactor and generator manufacturing
- SMR fuel fabrication and recycle
- Instrumentation and process controls

- Biomass production
- Transportation and logistics
- Training for operations and maintenance personnel.

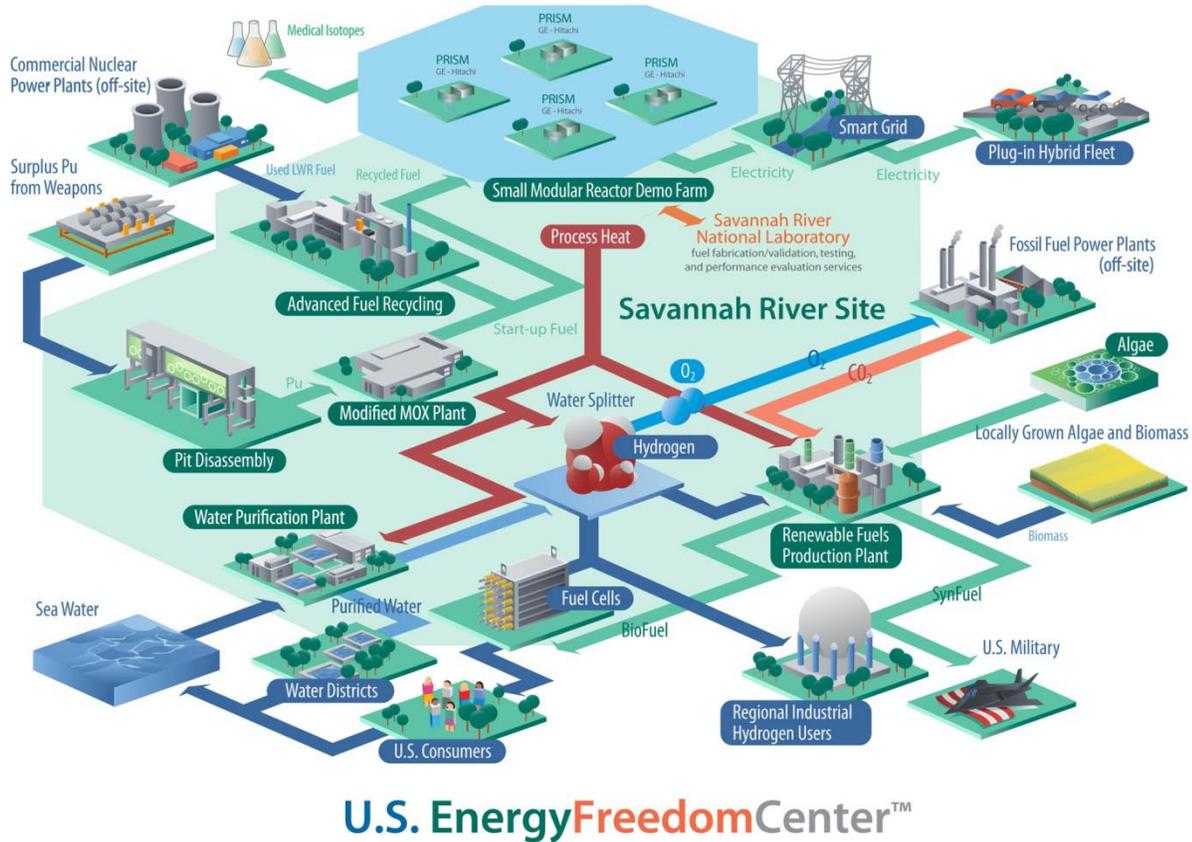


Figure 3. The CSRA regional energy park will provide the roadmap to sustainable national energy security.

## Implementation

After many months of collaboration, it is abundantly clear to the working group that:

- DOE has not identified significant leadership and funding support to launch a Complex-wide energy park initiative.
- As a result, the community and the private sector will have to take the lead with the SRSCRO being the primary champion.

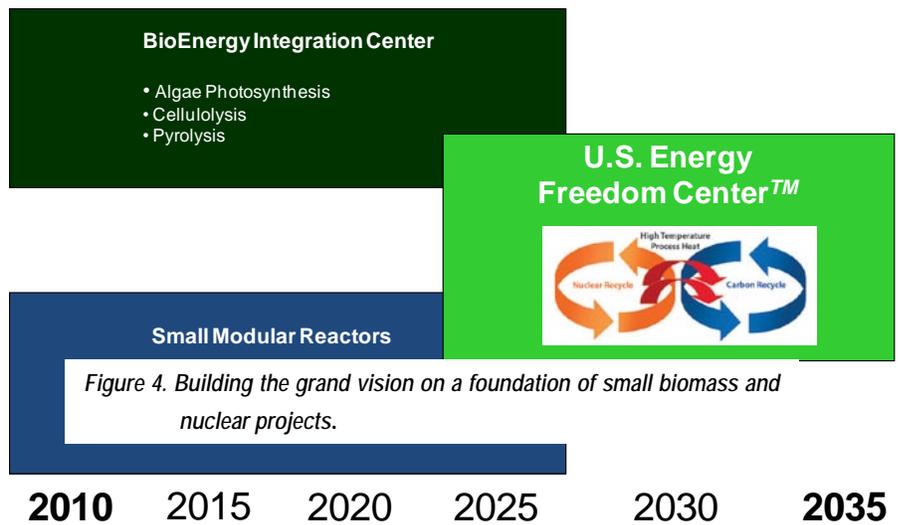
With these facts established, the consensus of the working group is that the best strategy for implementing the U.S. Energy Freedom Center™ is as follows:

- Forge a broad community-industry-government partnership like this working group and the SMR partnership currently composed of working group members and Hyperion Power Generation Inc. and GE-Hitachi; with clear and definitive roles and responsibilities.
- Develop a compelling business case which resonates with the President’s agenda for sustainable energy security, climate disruption, and nuclear nonproliferation.

- Induce an “Apollo-like” Presidential challenge to galvanize a broad coalition of national support.
- Segment the grand vision into smaller, time-phased, and manageable implementing projects which leverage existing assets of the SRS and greater CSRA while consistently vectoring the energy park toward the U.S. Energy Freedom Center™ vision.
- Establish public-private partnerships and secure funding for each implementing project.
- Launch each project with resolve.

Citing the cutting-edge R&D in renewable biofuels ongoing at SRNL and the unique nuclear assets of the SRS, particularly H-Canyon and the SRNL hot cells, the consensus of the working group is that implementation of the grand U.S. Energy Freedom Center™ vision should begin with a series of bioenergy and small modular reactor (SMR) projects, as illustrated in Figure 4:

- **BioEnergy Integration Center**—An integrated industrial-scale biorefinery which manufactures “plug-in” transportation fuels via algae photosynthesis, enzymatic cellulolysis, pyrolysis and other routes from diverse local carbon feed stocks (recycled CO<sub>2</sub>, biomass, solid waste recycling residue).



- **Modular Reactor Demonstration Complex**—SMRs of various advanced and high temperature designs, principally fast burner reactors, will be constructed and operated at SRS to accelerate their commercial deployment and, following testing, provide process heat and electricity to the balance of the energy park, including the biorefinery. An added benefit of the Demonstration Complex is the possibility of using waste from SRS or other DOE sites as a fuel source for some of the SMRs, thus reducing the legacy waste at SRS. In addition, by “burning” waste product the overall DOE-EM mission of site cleanup is enhanced.
- **Modular Reactor Power Park**—One or more SMRs will be sited at SRS to power a secure mini-grid for facilities with critical national security missions at SRS and nearby Department of Defense (DOD) installations (Fort Gordon, Fort Jackson, Kings Bay, and others).

### ***Roles and Responsibilities***

The U.S. Energy Freedom Center™ is a long-term endeavor; its success dependent on stable and committed leadership. DOE has publicly stated that it expects the “community” to provide leadership of the energy park initiative. SRNS, the M&O contractor at SRS, is limited in its ability to lead the initiative by the scope and term of its contract with DOE. Of the remaining members of the working group, only SRSCRO has the requisite charter and resources needed to lead implementation of the vision.

Accordingly, the working group has concluded that the SRSCRO must assume the leadership role in the path forward with others assuming the roles and responsibilities listed in Figure 5.

**Figure 5. Clearly-defined roles and responsibilities will help ensure the successful implementation of the U.S. Energy Freedom Center™ vision.**

Organization	Roles and Responsibilities
SRSCRO	<ul style="list-style-type: none"> <li>• Increase leadership role in the U.S. Energy Freedom Center™.</li> <li>• Formulation and leadership of public-private partnerships for implementing projects funded by non-DOE sources.</li> <li>• Coordination of external communications and education of elected officials and government leaders at all levels.</li> <li>• Partner with SRNL on development of a phased Business Case for bioenergy and small modular reactor (SMR) projects.</li> </ul>
DOE-SR	<ul style="list-style-type: none"> <li>• Access to DOE land and facilities using leases, permits, or property transfers.</li> <li>• Utilization of DOE resources, infrastructure, human capital and expertise for mission development and asset utilization.</li> <li>• Leadership of National Environmental Policy Act (NEPA) activities.</li> <li>• Review and adopt agreement for phased Business Case.</li> <li>• Build on SRNL’s status as the Environmental Management Corporate Laboratory and work with other National Laboratories to expand SRNL’s mission.</li> </ul>
SRNL	<ul style="list-style-type: none"> <li>• Gradual transfer of the U.S. Energy Freedom Center™ leadership to the SRSCRO.</li> <li>• Collaboration with SRSCRO in developing U.S. Energy Freedom Center™ concepts and implementing projects.</li> <li>• Provide expertise in advanced nuclear technologies and secure, sustainable energy initiatives to support the development of the U.S. Energy Freedom Center™ and as a base for expansion into new national energy missions.</li> <li>• Formulation and leadership of public-private partnerships for implementing projects funded by DOE or requiring access to</li> </ul>

	<p>surplus DOE nuclear materials.</p> <ul style="list-style-type: none"><li>• Partner with SRSCRO on development of a phased Business Case for bioenergy and small modular reactor (SMR) projects.</li></ul>
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## ***End State***

The U.S. Energy Freedom Center™ is an ambitious undertaking, the magnitude of which has not been attempted at SRS since the Site’s original construction in the 1950s. Realization of the U.S. Energy Freedom Center™ vision will require many years of committed effort. The final “End State” – operational status of the U.S. Energy Freedom Center™ - may not be realized for several decades. With this understood, it will be necessary to establish a series of intermediate actions against which progress toward the overall vision can be periodically measured. Each of these intermediate actions will also continue to evolve. Some may accelerate toward their individual “end state” or completion, while others may be delayed. New steps or actions may also need to be identified and added to reach the ultimate vision. The **working group** understands the dynamic nature of this undertaking and will make course adjustments to the action strategy toward the “End State” as required.

Major actions proposed for FY 2011 are as listed below.

<b><i>FY 2011 Actions</i></b>	
<b>Action</b>	<b>Completion Date</b>
Adopt unified energy park vision	11/30/2010
Segment vision into phased implementing projects	12/31/2010
Finalize vision for bioenergy and small modular reactor (SMR) projects	1/31/2011
Complete phased Business Case for bioenergy and small modular reactor (SMR) projects	2/28/2011
Complete Communication Plan for disseminating bioenergy and small modular reactor (SMR) project information	2/28/2011
Develop overarching National Environmental Policy Act (NEPA) guidance	3/30/2011
Develop uniform land use guidance for implementing projects	3/30/2011
Establish formal public-private partnership	4/30/2011
Complete conceptual design of first implementing project	9/30/2011

Tentative objectives for the out-years are as listed below.

<b><i>Action Items for Out-Years</i></b>	
<b>Action</b>	<b>Completion Date</b>
Complete NEPA documentation for first implementing project	3/30/2012

Complete engineering design and acquire financing for first implementing project	3/30/2012
Begin construction of first implementing project	4/30/2012