Savannah River Site (SRS)

- SRS Common Infrastructure and Utilities are Essential

- EM Integrated Life Cycle Estimate for Clean up Projection is currently to 2065
  - Common Facilities
    - Transportation - Roads, Bridges, Rail Roads
    - Facilities – Administrative, Shops, Warehouses, IT ....
  - Utilities
    - Electricity
    - Steam
    - Water – Domestic, Service/Process, Fire, Sanitary
    - River Water

- SRS Common Infrastructure and Utilities require consistent management attention to remain viable for future
Common Infrastructure and Utilities

SRS Map

Electric Power
(64 Miles High Voltage Lines)
(9 Large Substations)
(180 Miles Distribution Lines)

Facilities
(44 - Admin, Shops, Emer, Security)

Roads
(119 Miles Paved)

Domestic Water
(2M Gals/day)

Fire Water
(1500 Hydrants)

Rail Roads
(33 Miles Track)

Steam Energy
(5 Biomass Plants)

River Water (7500 GPM)

Sanitary Waste Water
(Central Sanitary Plant)

Lakes and Dams
(2 High Hazard Dams)
Common Infrastructure and Utilities

SRS Infrastructure Types

Mission Specific (Program) Infrastructure: All PBSs (Nuclear Materials, Liquid Waste, etc...)

Common Infrastructure: Supports more than one Site Tenant

Basic Infrastructure:
Maintenance of Site common infrastructure (examples: common use facilities, administrative facilities, roads, parking areas, and bridges .... )

Utilities:
Utility commodities (examples: electrical distribution, domestic water, steam, sanitary waste .... )

Service Centers:
Enables a critical service (examples: IT services, radios, telephones .... )
Program Baseline Summary – PBS (Control Point Level)
The budgeting and funding mechanism to resource specific DOE-SRS programs that are contained within the DOE-Environmental Management Work Breakdown Structure (PBS 14 – Liquid Waste Disposition, PBS 30 – Soil and Water Remediation, ....)

Utilities and Services

- DOE-SR Establishes Rates for consumption or use
- Utilities (Pool) (commodity and infrastructure)
- Services (Pool) (service and infrastructure)

DOE-SR Establishes Set Rate (s)

$ Common Infrastructure (LandLord Services)
Indirect Funded (Outside)
- LandLord Services
- Power (Utility) Pools

The Fence*
*Represents the agreed physical boundaries between Indirect and Mission Program responsibilities

Mission Program Funded (Inside)
Common Infrastructure and Utilities

Provide Infrastructure and Utilities to Mission Programs

Measure, Track/Trend, Improve, Report

- Daily Systems Reports & Site Heads-Ups
- Monthly Systems Status Review
- Weekly FY Infrastructure Improvement Execution Plan Schedule Status Reviews
Common Infrastructure and Utilities

Prepare Site for Future

- "Right Sizing" – Expand/Reduce/Modernize to most efficiently meet current and future missions
  - Infrastructure Alignment Studies (every 5 years)
  - 137 Recommendations: 31 Completed 74 In-process

- Sustainability
  - Maintenance, Replacement and Repair: Modernize with most Energy Efficient tools and equipment
  - Energy Intensity Reduction (since 2015)
    - "Cool" Roofs – 37 (No Major Roof Replacements in 2020!)
    - HVAC upgrades – 82 replacements (Increase SEER* Value)
    - LEDs – Over 2000 old fixtures replaced
  - Utility Scale (10 MW) Solar Study FY2019
    - Current Purchased Power Rates Competitive
    - Majority of Savings through Demand Peak Reductions
    - Not affordable w/o Subsidy
    - Evaluate FY22

*SEER – Seasonal Energy Efficiency Ratio
# Common Infrastructure and Utilities

## Prepare Site for Future through “Road to Green” Vision

### 12 Common Infrastructure / Utility Systems

- PECMEC and Transportation
- Domestic Water
- Steam Gen and Dist
- Electrical Dist
- Sanitary Waste
- Fire Water
- Facilities
- Chilled Water
- River Water
- Process/Service Water
- Dams, Outfalls, Basins, Lakes
- Roads, Bridges, Railroads

### Current State and Plan to become and stay GREEN*

| Jan-13 | Jan-14 | Jan-15 | Jan-16 | Jan-17 | Jan-18 | Jan-19 | Jan-20 | Jan-21 | Jan-22 | Jan-23 | Jan-24 | Jan-25 | Jan-26 | Jan-27 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation | PECMEC & Transportation |
| Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water | Domestic Water |

### Historical Infrastructure System Status

- You Are Here

### Planned Future System Status

*Fulfilling Current Mission Needs “Today” with only minor deficiencies*
Common Infrastructure and Utilities

**Resourcing**

- SRS Common Infrastructure Operations, Maintenance, and Minor Improvements funded through Indirect Pools
Utility Pool Budget – Energy Costs are $73M (~66% of Total Utility Budget)

The Total Utility Pool budget for FY21 is $110.5 M

Operations and Maintenance Costs for maintaining utility systems
Total O&M $38.1M

- Water O&M $22.2M
- Steam O&M $8.3M
- Electricity O&M $7.6M

Ameresco ESPC for process steam generation and electrical turbine operations

Purchased power from Dominion Energy South Carolina

Dominion Energy $19.6M

Ameresco $52.8M
Common Infrastructure and Utilities

Planning for Infrastructure Improvements

The 5-Year Common Infrastructure Improvement Plan

The Fiscal Year Common Infrastructure Improvement Plan (upcoming FY)

The Fiscal Year Infrastructure Improvement Plan Execution Output (current FY)

Update each January
Complete September before upcoming FY
Complete September of current FY

SRS COMMON INFRASTRUCTURE IMPROVEMENTS ANNUAL PLANNING CYCLE
Common Infrastructure and Utilities

Asset Condition - Facility Information Management System (FIMS)

- Critical systems maintained and operated to Green/Yellow Dashboard status (Current)
- Consolidated Facility Condition Index scores are low to due to age and Deferred Maintenance (Future Risks)

<table>
<thead>
<tr>
<th>Mission Dependency Index</th>
<th>Asset</th>
<th># of Assets</th>
<th>Bldg Cond. Index or Lab Ops Board Avg</th>
<th>Haz Cat</th>
<th>Replacement Plant Value (RPV)</th>
<th>Quantity</th>
<th>Age</th>
<th>Deferred Maint./Repair Needs (DM/RN)</th>
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<tbody>
<tr>
<td>Mission Dependent</td>
<td>Domestic Water Systems (901000)</td>
<td>62</td>
<td>48</td>
<td>N/A</td>
<td>$ 558,485,572</td>
<td>418,986 Ft</td>
<td>Ave. 41</td>
<td>6 - 69 yrs</td>
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<tr>
<td>Mission Critical</td>
<td>Fire Water System (902000)</td>
<td>34</td>
<td>10</td>
<td>N/A</td>
<td>$ 53,963,371</td>
<td>312,427 Ft</td>
<td>Ave. 27</td>
<td>2 - 68 yrs</td>
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<td>Mission Critical - Not Mission Dependent</td>
<td>Sanitary Waste Water System (903000)</td>
<td>147</td>
<td>10</td>
<td>N/A</td>
<td>$113,841,398</td>
<td>297,341 Ft</td>
<td>Ave. 32</td>
<td>6 - 69 yrs</td>
</tr>
<tr>
<td>Mission Critical</td>
<td>Process/Service Water System (904000)</td>
<td>54</td>
<td>28</td>
<td>N/A</td>
<td>$132,276,131</td>
<td>44,646 Ft</td>
<td>Ave. 42</td>
<td>7 - 68 yrs</td>
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<tr>
<td>Mission Critical</td>
<td>Steam Generation/Distribution System (684000/682000)</td>
<td>13</td>
<td>95</td>
<td>N/A</td>
<td>$ 281,335,663</td>
<td>68,698 Sq. Ft</td>
<td>Ave. 10 (Plant)</td>
<td>26 - 68 yrs (Distri.)</td>
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<tr>
<td>Mission Critical</td>
<td>Riverwater Pumphouse (681003G)</td>
<td>1</td>
<td>10</td>
<td>N/A</td>
<td>$ 6,086,393</td>
<td>8,305 Sq. Ft</td>
<td>68 yrs</td>
<td></td>
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<tr>
<td>Mission Critical</td>
<td>Electrical Distribution System (503000)</td>
<td>292</td>
<td>58</td>
<td>N/A</td>
<td>$252,298,736</td>
<td>N/A</td>
<td>Ave. 34</td>
<td>2 - 70 yrs</td>
</tr>
<tr>
<td>Mission Critical - Mission Dependent</td>
<td>Common Infrastructure Facility (703044)</td>
<td>249</td>
<td>76</td>
<td>N/A</td>
<td>$548,009,234</td>
<td>2,438,926 Sq. Ft</td>
<td>Ave. 34</td>
<td>5 - 69 yrs</td>
</tr>
<tr>
<td>Mission Dependent Not Critical</td>
<td>Site Paved Roads (603000)</td>
<td>N/A</td>
<td>71</td>
<td>N/A</td>
<td>$421,797,481</td>
<td>289 Miles</td>
<td>Ave. 53</td>
<td>11 - 69 yrs</td>
</tr>
</tbody>
</table>

Age of Operating Common Infrastructure & Utilities Assets

- >51 Years: 25%
- 31 - 50 Years: 36%
- 15 - 30 Years: 31%
- <15 Years: 8%

Total Assets

- Poor: 31%
- Very Good: 37%
- Fair: 14%
- Good: 18%
Notable Infrastructure Functionality Issues – Electric Power

• Missions Supported: All SRS “Lettered” Areas
• Delivery:
  – M&O Contractor (SRNS)
    • Distribution (13.8KV to 480V)
    • Local Grid Management and Maintenance
  – Dominion Energy SC Contract and Lease
    • Power and Transmission Maintenance (115KV/13.8KV)
      – Contract: $325M, 10 years (Expires 2025)
    • Transmission System Lease: 40 years (Expires 2036)
• Risks and Challenges:
  – Aged Substations: Transformers and Switchgear (C, F, H, K, L)
  – Obsolete Control and Monitoring System (SCADA)
• Solutions
  – Program Partnering (NNSA/DOE-SR K & L Area Switchgear)
  – Power Pool Rate Increase
Notable Infrastructure Functionality Issues – Water

- **Missions Supported:** All SRS “Lettered” Areas
  - Domestic Water
  - Sanitary Waste Water
  - Fire Water
  - Service/Process Water
- **Delivery:** M&O Contractor (SRNS)
  - Manage, Operate, and Maintain
- **Risks and Challenges:**
  - Aged / Corroded Distribution Pipe (Fire, Service)
  - Aged Packaged Sanitary Waste Systems (K and L Areas)
  - Failing Electric Power Switch Gear (H-Area Process Water)
- **Solutions**
  - Power Pool Rate Increase
Common Infrastructure and Utilities

Notable Infrastructure Functionality Issues – Facilities (Common)

- **Missions Supported:**
  - Administrative
  - Training
  - Shops
  - Maintenance
  - Warehouses
  - Medical

- **Delivery:** M&O Contractor (SRNS)

- **Risks and Challenges**
  - Roofs
  - HVAC
  - Habitability
  - Fire Systems
  - Age
  - Interiors/Exteriors

- **Solutions**
  - Increase LandLord Services (Indirect) Rates

*Construction of Railroad Shops (616-C), October 23, 1951, SRS Negative 6-163*

*2014 Roof Leak “Diaper” with hose and bucket. We have come a long way!*
Common Infrastructure and Utilities

Notable Infrastructure Functionality Issues – River Water

- **Missions Supported:**
  - Steam Energy for Canyon, Tank Farms, Tritium, DWPF (H, F, and S Areas)
  - *Boiler Feed Water for the BioCogeneration Facility*
  - L-Area Fire Water
  - L & K Area Sanitary Treatment
  - Cover Rad Sediments in L Lake and Par Pond

- **Delivery:** M&O Contractor (SRNS)

- **Risks and Challenges**
  - 70 Year old Electrical Power System
  - 70 Year old River Water Intakes (traveling screens)

- **Solutions**
  - Increase LandLord Services (Indirect) Rates
Common Infrastructure and Utilities

Notable Infrastructure Functionality Issues – Roads

- **Missions Supported:**
  - All Site Missions and Areas

- **Delivery:** M&O Contractor (SRNS)

- **Risks and Challenges**
  - Deteriorating Pavement (Asphalt)
  - Obsolete Guardrail material
  - Greatest LandLord Services Funding Challenge

- **Solutions**
  - Increase LandLord Services (Indirect) Rates
Change Control Example - Tropical Storm Sally

- FY21 budget was set for indirect budget scopes.
- An emergent need to remediate buildings impacted by Tropical Storm Sally.
- A Change Control Package was submitted to the DOE Indirect Oversight Team.
- The DOE Indirect Oversight Team approved the reduction of Road E refurbishment scope to redirect the indirect funding to accommodate the emergent need.
### Facility Information Management System (FIMS) Data

- **Age of Operating Common Infrastructure & Utilities Assets**
  - >51 Years: 25%
  - 31 - 50 Years: 36%
  - 15 - 30 Years: 31%
  - <15 Years: 8%

### Operating Assets

- **Very Good**: 39%
- **Good**: 8%
- **Fair**: 32%
- **Poor**: 22%
Roofing Criteria - age, repair costs over past 5 years, amount of roof top equipment etc.

HVAC Criteria - units past a service life of 15 years, average number of personnel impacted by unit outage

Interior Criteria - floors, walls/ceilings, restrooms, fire systems and industrial hygiene concerns

Exterior Criteria - windows, siding/foundation, doors, steps/walkways and parking
Operating Budget - 100% Indirect Funded ($6.7M)

Cost Distribution

Maintenance 86%

Habitability 14%

Habitability Costs
- Interior Repairs
- Exterior Repairs
- Fire Panel Replacements
- HVAC Replacements

Maintenance Costs
- Labor
- Minor Repairs to maintain existing building conditions (i.e. HVAC repairs, roof repairs)
Recent Sustainability DOE Awards

• 2017 - Rhombo Balls Project
  o 12-sided Rhombo Ball floating cover reduced the volume of water needed to meet discharge limits.
  o Interlocked to form a cover to prevent algae growth

• 2019 - Drone surveillance P Reactor
  o Identified concrete cracks
  o Drones reduced the energy requirements of helicopter surveillance

• 2020 - Permeable Reactive Barrier
  o Passive remediation to destroy chlorinated volatile organics
Zero Emission Vehicles: Electric Vehicles (EV) and Charging Stations

- FY21 - Developing plan for implementation
  - light-duty and heavy-duty vehicle replacement
  - dual charging stations sitewide
- FY22 – 2 Additional EVs (3 Total for SRS)
  - Construct Charging Stations for FY23
- FY23 – 61 EVs (goal 10% of Light Duty fleet)
- FY30 – 611 EVs (goal 100% of Light Duty fleet)
Sustainability and Cost Savings Initiatives

- Road C Milled Asphalt Refurbishment Recycle (2019/2020)
  - Approximately 21,000 tons of milled asphalt was recycled by taking it directly to reconditioning secondary gravel roads as an erosion control stabilizer.
  - This process eliminated hauling and storing the millings at the C & D Landfill until a suitable need is identified for its use. Cost avoidance of $922K.
  - This CI Project received the Global Silver Green award from IDEAS America.

- Road C Remove and Replace 60 Culverts (2019)
  - It was technically feasible and the most cost-effective approach to mitigate the asbestos exposer hazard and revise the scope to leave the existing culvert drainage units in place and (1) fill each with Concrete Low Shrink Material, (2) install the new culvert and (3) cover area which resulted in a Cost avoidance of over $440K.
Recent Accomplishments – New HVAC System at 736-A

Update to the 736-A, Standards Lab HVAC System

736-A Old HVAC

736-A New HVAC
Common Infrastructure and Utilities

Recent History and Accomplishments – Interior Improvements to 766-H

766-H Cafeteria (Before)

766-H Cafeteria (After)
Common Infrastructure and Utilities

Recent History and Accomplishments – Update to Employee Onboarding 703-47A

703-47A Exterior (Before)  
703-47A Renovated Exterior (After)
Common Infrastructure and Utilities

Recent History and Accomplishments – 703-47A New Roof

703-47A New Eco-White Cool Roof
Challenges - Interior/Exterior Building Conditions

Degraded interior and exterior conditions in numerous buildings due to age and wear and tear.

703-5B Chipped floor coating

707-C Damaged floor tiles

714-N Peeling exterior finishes
Common Infrastructure and Utilities

Challenges - Interior/Exterior Building Conditions cont’d

703-42A Water damaged wall coverings

717-F Degraded shop wall insulation

703-A Water-stained carpet
Infrastructure Projects are Prioritized by Risk Factors

Example: Risk (2062) - Electrical equipment failure at 681-3G River Water Pumphouse causes loss of river water pumping capability.

Project Title: Replace Obsolete Switchgear 681-3G

Risk Consequence Categories

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score (0-5)</th>
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<tbody>
<tr>
<td>Cost ($K)</td>
<td>5</td>
</tr>
<tr>
<td>Schedule</td>
<td>3</td>
</tr>
<tr>
<td>Safety</td>
<td>2</td>
</tr>
<tr>
<td>Sec.:</td>
<td>1</td>
</tr>
<tr>
<td>Infra.:</td>
<td>4</td>
</tr>
<tr>
<td>Legal Comp.:</td>
<td>1</td>
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<tr>
<td>Env.:</td>
<td>1</td>
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<tr>
<td>Com. Rep.:</td>
<td>4</td>
</tr>
<tr>
<td>Prof. Rep.:</td>
<td>4</td>
</tr>
<tr>
<td>Mis. Del.:</td>
<td>4</td>
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</table>

Risk Consequence Categories (Score 0-5)

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<tr>
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<td>4</td>
</tr>
<tr>
<td>Mis. Del.:</td>
<td>2</td>
</tr>
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Probability Ratings

<table>
<thead>
<tr>
<th>Rating</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>5: Almost Certain</td>
<td>(P&gt;90%)</td>
</tr>
<tr>
<td>4: Very Likely</td>
<td>(71%&lt;P&lt;90%)</td>
</tr>
<tr>
<td>3: Likely</td>
<td>(31%&lt;P&lt;70%)</td>
</tr>
<tr>
<td>2: Unlikely</td>
<td>(11%&lt;P&lt;30%)</td>
</tr>
<tr>
<td>1: Very Unlikely</td>
<td>(1%&lt;P&lt;10%)</td>
</tr>
</tbody>
</table>

Business Impact Grading Criteria (Score 0-5)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Score (0-5)</th>
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<tbody>
<tr>
<td>(Total Cost / Project Cost) Ratio</td>
<td>4</td>
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<tr>
<td>Item Maturity</td>
<td>4</td>
</tr>
<tr>
<td>Urgency / Timeliness of Scope</td>
<td>2</td>
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<tr>
<td>Partial Funding</td>
<td>1</td>
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Common Infrastructure and Utilities

Conclusion

Site Services Employees Local Safety Improvement Team

New A-Area Firewater Water Pump House and Tank Completed 2020

703-46A SRS Badge Office Refurbishment Complete 2019