



ADVANCED REACTOR SAFEGUARDS & SECURITY

Security-by-Design for Microreactors

ARSS FY24 Program Review

PRESENTED BY

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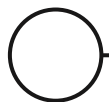
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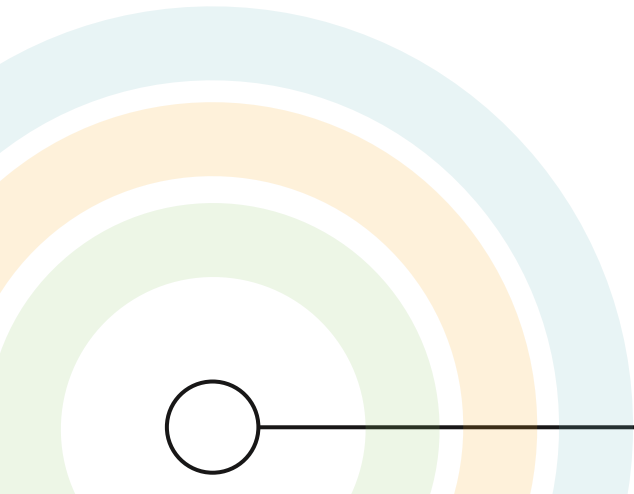
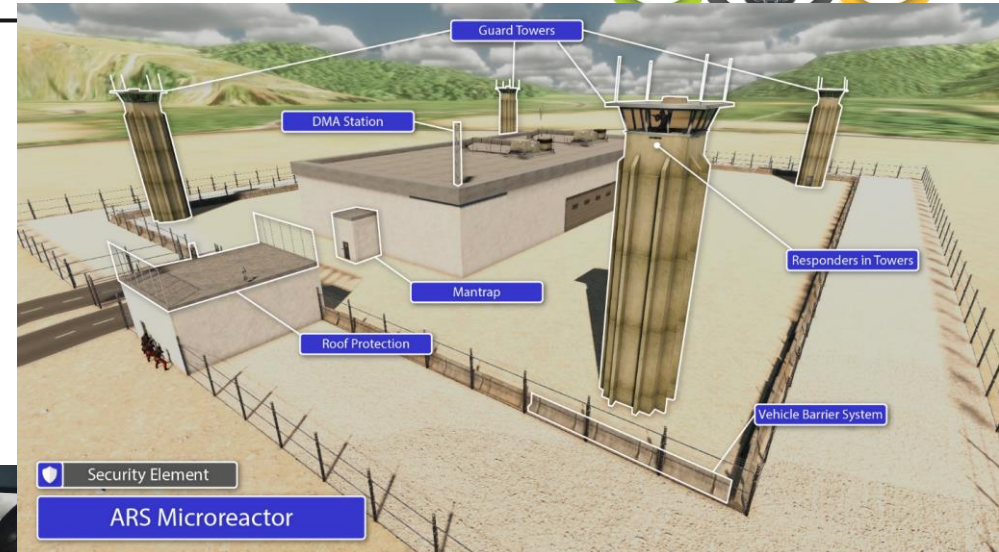


Outline

- Previous Work
- New PPS Design
- Response Force Strategy
- PPS Results
- Conclusions and Recommendations



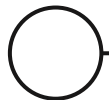
Previous Microreactor Designs



Previous PPS Design Staffing Requirements



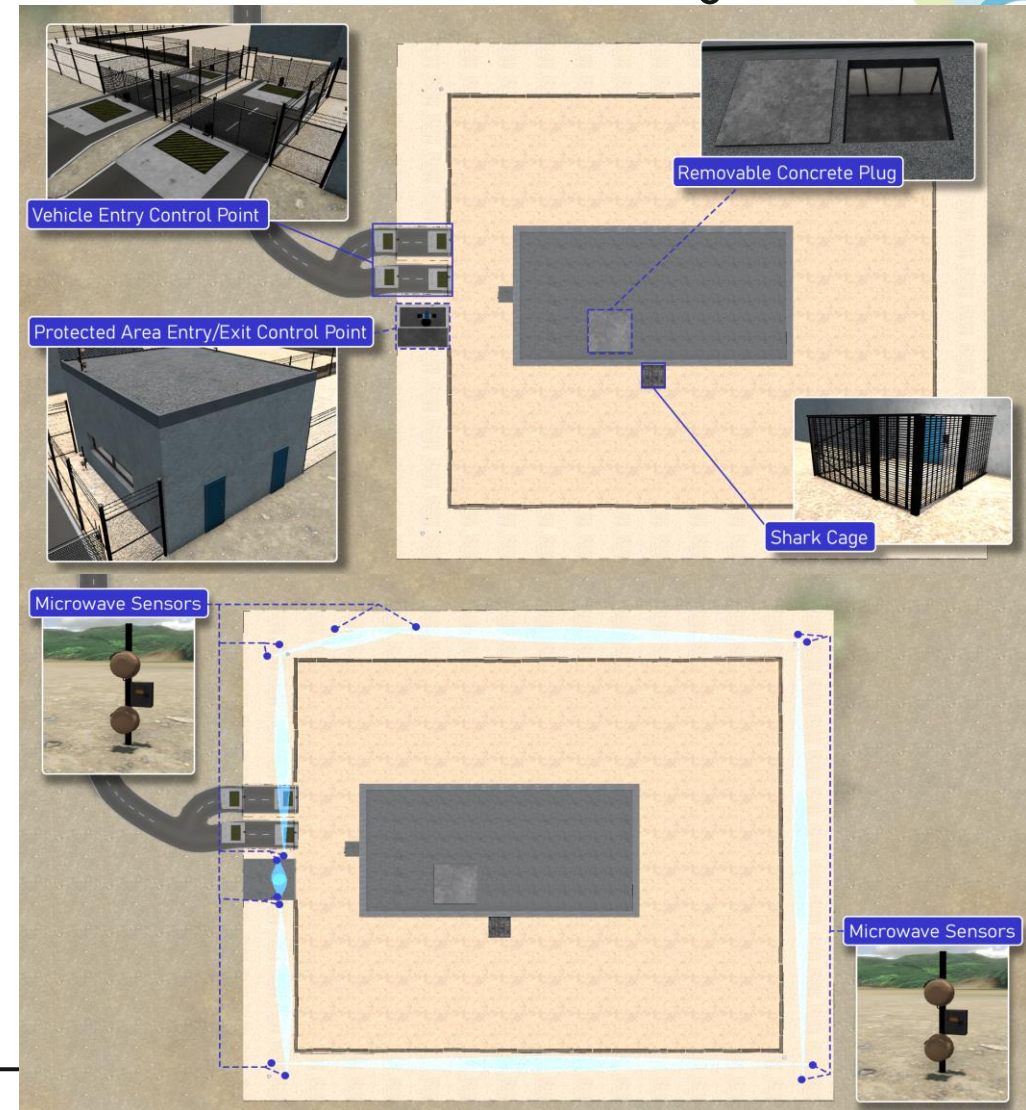
Position	24/7 12 hr. Rotating Shift	FTE
Security Shift Supervisor	1	4
Response Team Lead	2	8
Alarm Station Operators (CAS/SAS)	3	12
Armed Responders	5	20
Armed Security Officers (Personnel, vehicle, and material processing)	3	12
Total	14	56



New Microreactor PPS Design



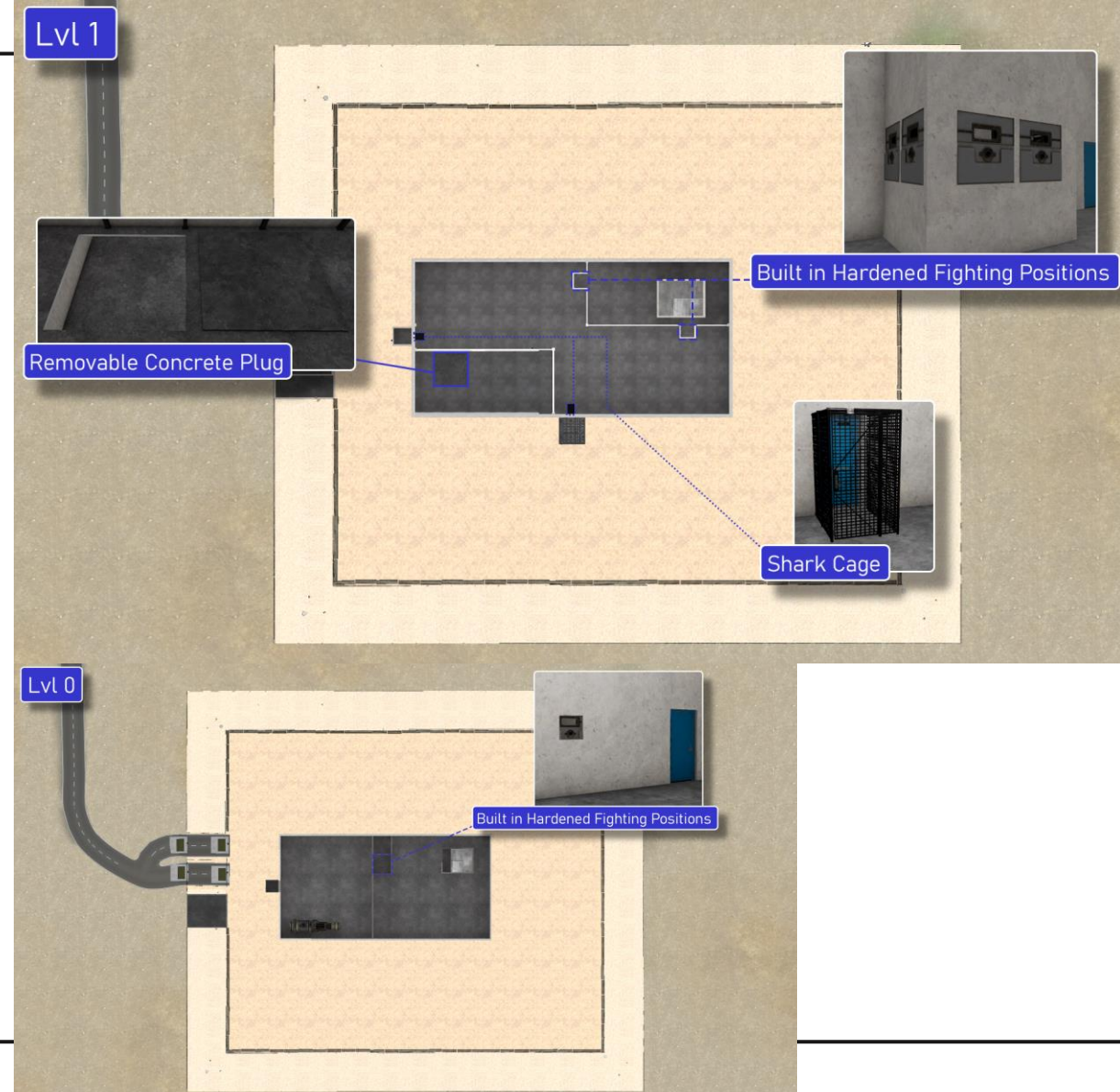
- Small entry and exit portal
 - Entry point would only be staffed during shift changes or vehicle arrival
 - Entry control point would be locked out by the CAS operator
- Microwave sensors around the perimeter and vibration on turbine grating fence line
 - Increase adversary breach time and complexity
 - Decrease nuisance alarm rate on fence
- Shark cages and man traps around the perimeter
 - Force adversaries to use more breaching equipment



New Microreactor PPS Design – Response Strategy



- Response force strategy was designed with two armed responders in bullet-blast resistant enclosures (BBREs)
- BBREs are designed to be resistant to two adversary weapons
- BBREs only have ball ports for the muzzle of responder weapons
- BBREs equipped with smaller and bullet resistant viewing ports

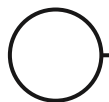


New Microreactor PPS Design Analysis Results – Scenario One



- Scenario One analyzed all 8 adversaries breaching through one door of the facility at a time
- Adversary disadvantages
 - Too small of a space to fit all 8 adversaries in at one time using tactical movements
 - Adversaries are not protected and likely don't have time to go prone
- Response force advantages
 - Shooting from prone or crouched positions
 - Bullet resistant enclosures
 - Minimal movement of adversaries

Number of Adversaries	Engagement Number	Number of Responders	Blue Wins	Red Wins
8	1	2	887	113
7	1	2	924	76
6	1	2	913	87
5	1	2	951	49
4	1	2	990	10



New Microreactor PPS Design Analysis Results – Scenario Two



- Scenario One analyzed two groups of adversaries breaching two doors simultaneously
- Adversary disadvantages
 - Too few targets for each responder to engage
 - Adversaries are not protected and likely don't have time to go prone
- Response force advantages
 - Shooting from prone or crouched positions
 - Bullet resistant enclosures
 - Minimal movement of adversaries
 - Smaller number of targets to neutralize

Number of Adversaries	Engagement Number	Number of Adversaries in Engagement	Number of Responders	Blue Wins	Red Wins
8	1	4	1	892	108
	2	4	1	902	98
7	1	3	2	930	70
	2	4	2	902	98
6	1	3	2	930	70
	2	3	2	934	66
5	1	2	2	972	28
	2	3	2	934	66
4	1	2	1	972	28
	2	2	1	967	33

New Microreactor PPS Design Staffing Plan



- All personnel are trained in all positions
 - Allows for rotation of individuals
 - Decreases complexity of training program
 - Increases awareness of all PPS areas at the facility
 - Allows for reduction in total staffing headcount
- **Reduction of 8 personnel compared to previous designs and a total of 32 less personnel needed to operate the facility**

Position	24/7 12 hr. Rotating Shift	FTE
Security Shift Supervisor	1	4
Response Team Lead	1	4
Alarm Station Operators (CAS/SAS)	1	4
Armed Responders	2	8
Armed Security Officers (Personnel, vehicle, and material processing)	1	4
Total	6	24



Conclusions and Recommendations

- This PPS design shows that a small enough microreactor building if designed well can reduce the number of onsite security staffing
- Utilize roof hatches to decrease the need for large roll-up doors
- Use shark cages on internal doors to force adversaries into small spaces
- Utilize state-of-the art BBRE designs to mitigate and minimize the likelihood of adversary success
- Minimize entry points and force adversaries to “choke points” where they must pass an armed responder
- Use of ROWS has not been analyzed but likely similar results may be achieved

