

AUG 2024

ALCF-4 CONVENTIONAL FACILITIES OVERVIEW



JON CISEK

ALCF-4 Conventional Facilities CAM
Project Management Organization

OUTLINE

- Preliminary Baseline
 - Scope & WBS
 - Schedule
- Site Alternatives Analysis
 - Alternatives
 - Criteria
 - Results
- Path Forward



PRELIMINARY BASELINE



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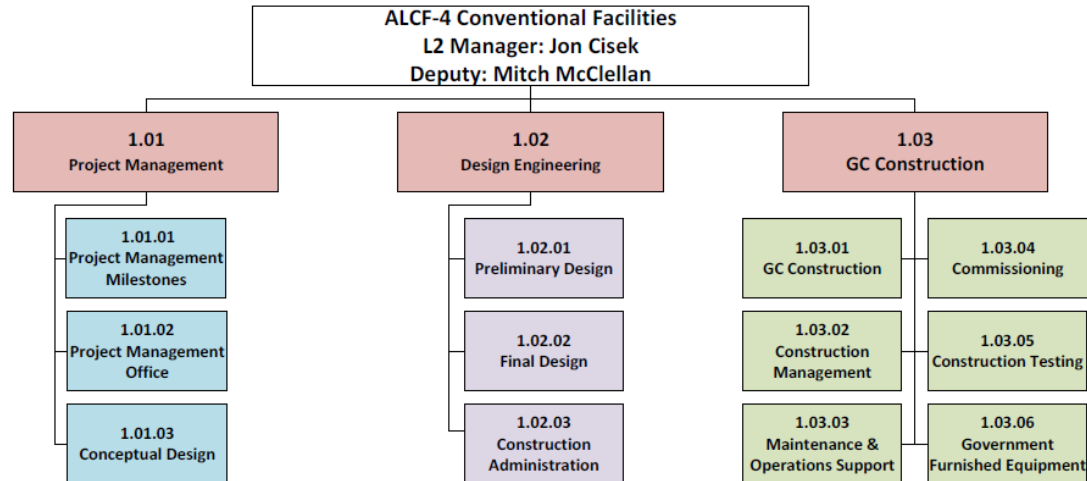


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PRELIMINARY BASELINE

SCOPE & WBS

- Conventional Facilities to support the deployment and operation of the ALCF-4 system and all supporting components. Includes upgrades to electrical and mechanical (cooling) systems.
- Covers power and cooling service capacity requests to the Theory and Computing Sciences building owner (TCSB).



PRELIMINARY BASELINE ORGANIZATION



Jon Cisek, PMP
L2 MANAGER & CAM

- Project Management Professional (PMP); Master's in CEE
- 15 years of project experience, 12 years at Argonne
- Select ANL Projects:
 - MDL
 - ECDC
 - AU2
 - 30+ Infrastructure Projects ranging from \$100k-\$5,000k



Mitch McClellan,
PMP
DEPUTY CAM

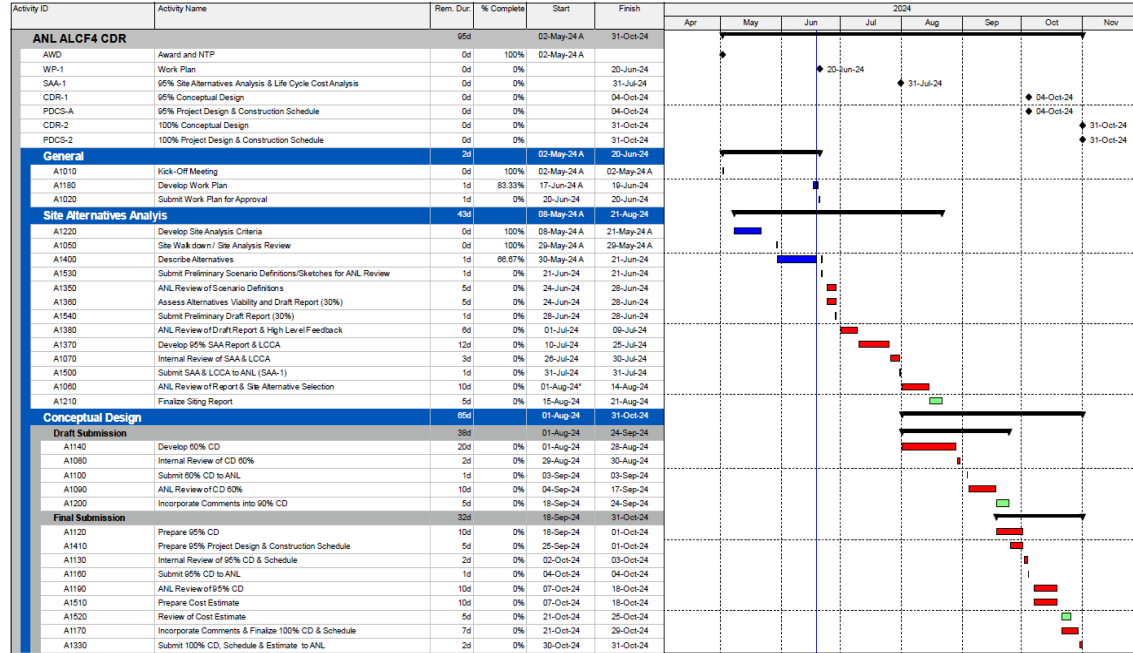
- Project Management Professional (PMP)
- 12 years of project management experience, 4 years at Argonne
- ALCF-3 Facility Upgrades CAM since 2021
- 15+ Infrastructure projects ranging from \$100k – \$2,500k

PRELIMINARY BASELINE SCHEDULE



Key Deliverable Dates:

- 05/02/2024 – Notice to Proceed
- 07/31/2024 – 95% Site Alternatives Analysis
- 10/04/2024 – 95% Conceptual Design Report (CDR)
- 10/31/2024 – 100% CDR and Project Design & Construction Schedule





SITE ALTERNATIVES ANALYSIS



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SITE ALTERNATIVES ANALYSIS

ALTERNATIVES SUMMARY

Four Alternatives:

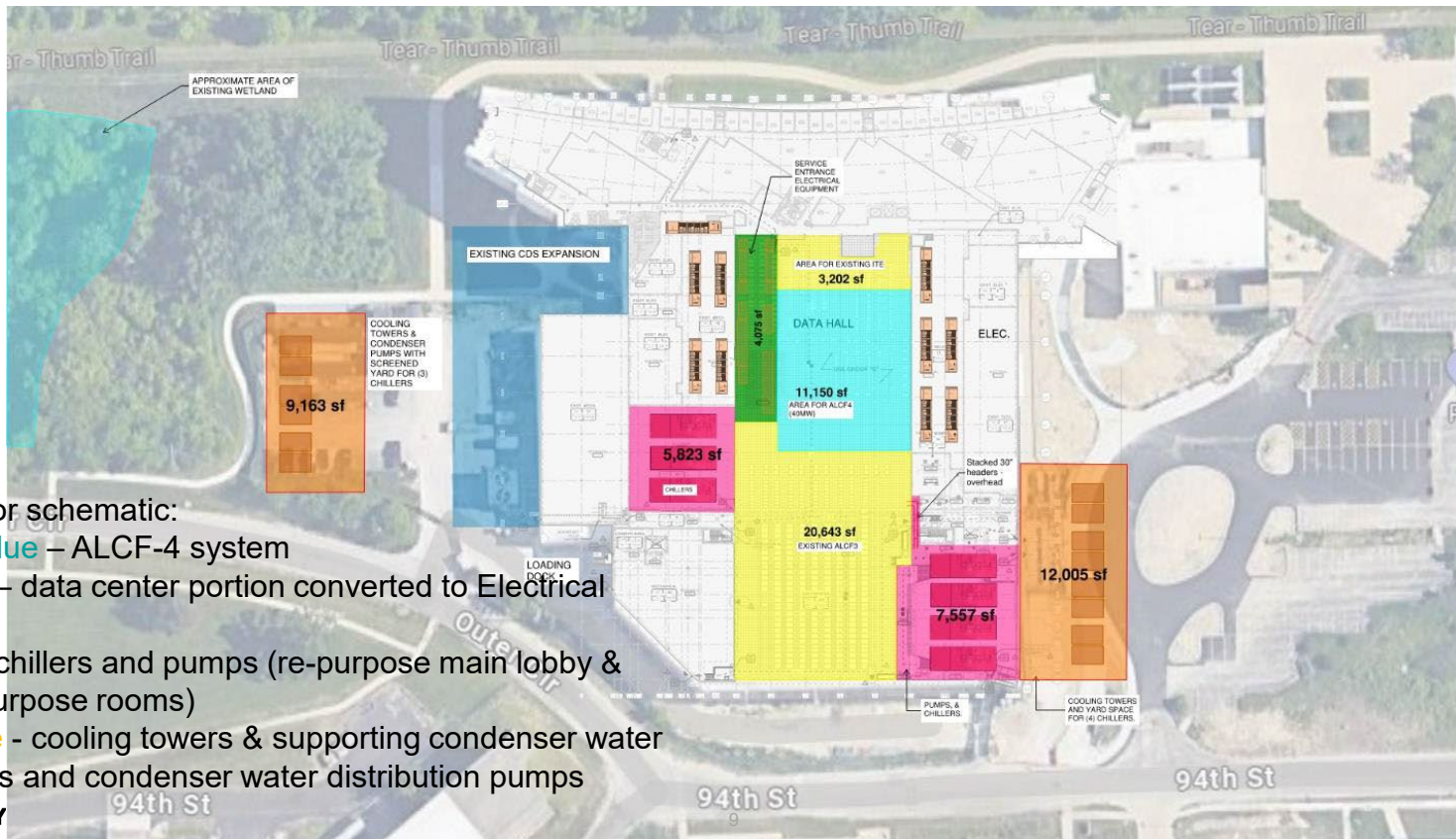
1. Utilize Existing 240 TCS Data Center with no building expansion
2. Expanded 240 TCS Footprint
3. Repurposed Building for Data Center
4. New Building for Data Center

Requirements:

- Power and cooling to support ~40MW
- Future expansion capabilities
- Adequate floor space
- MEP space to support power and cooling needs
- Dock/receiving space for equipment deliveries
- Office space for staff

SITE ALTERNATIVES ANALYSIS

ALT 1- UTILIZE EXISTING 240 TCS DATA CENTER NO BUILDING EXPANSION

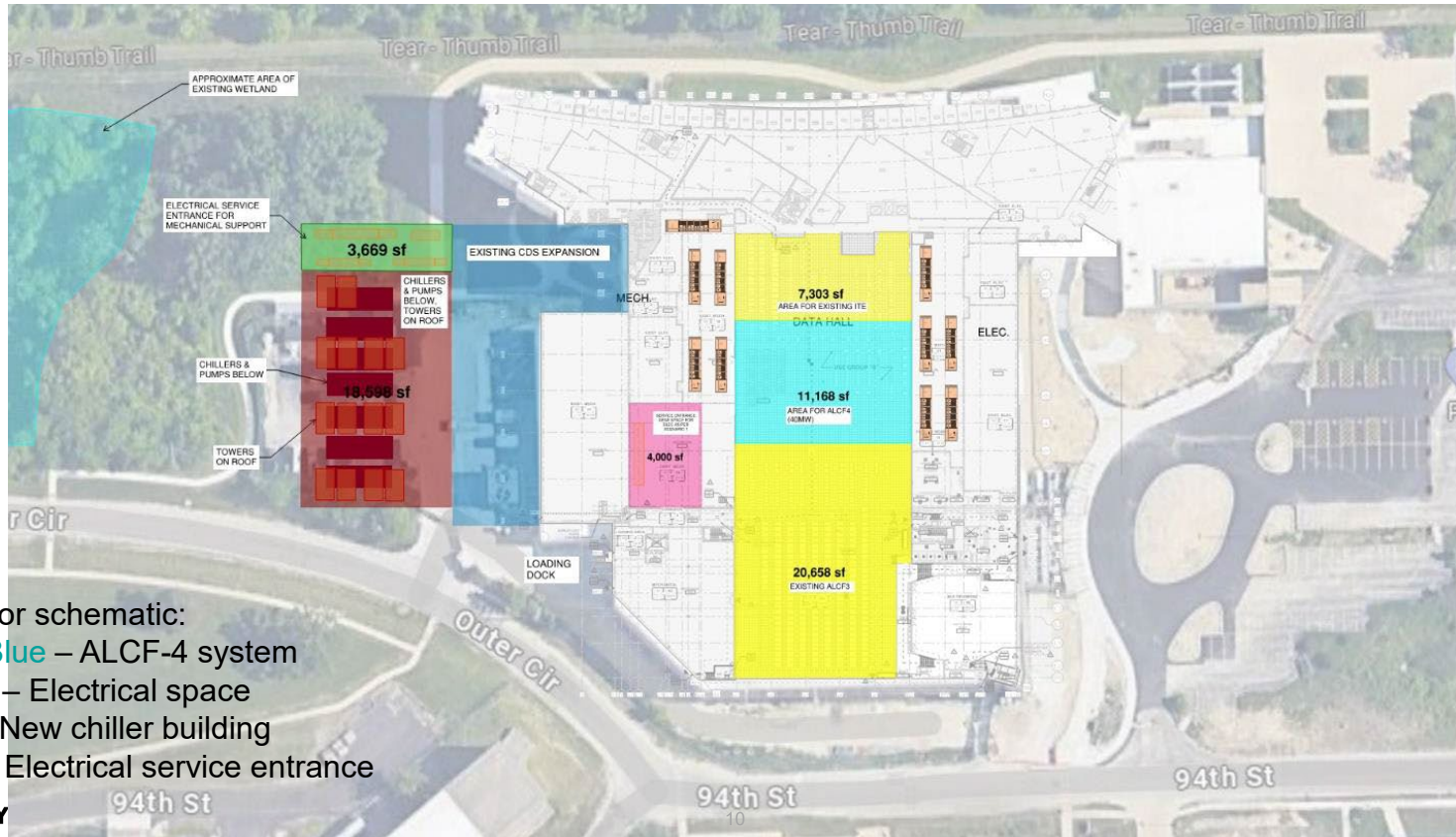


Color key for schematic:

- Light Blue – ALCF-4 system
- Green – data center portion converted to Electrical space
- Pink – chillers and pumps (re-purpose main lobby & multi purpose rooms)
- Orange - cooling towers & supporting condenser water systems and condenser water distribution pumps

SITE ALTERNATIVES ANALYSIS

ALT 2- EXPANDED 240 TCS FOOTPRINT



Color key for schematic:

- Light Blue – ALCF-4 system
- Green – Electrical space
- Red – New chiller building
- Pink - Electrical service entrance

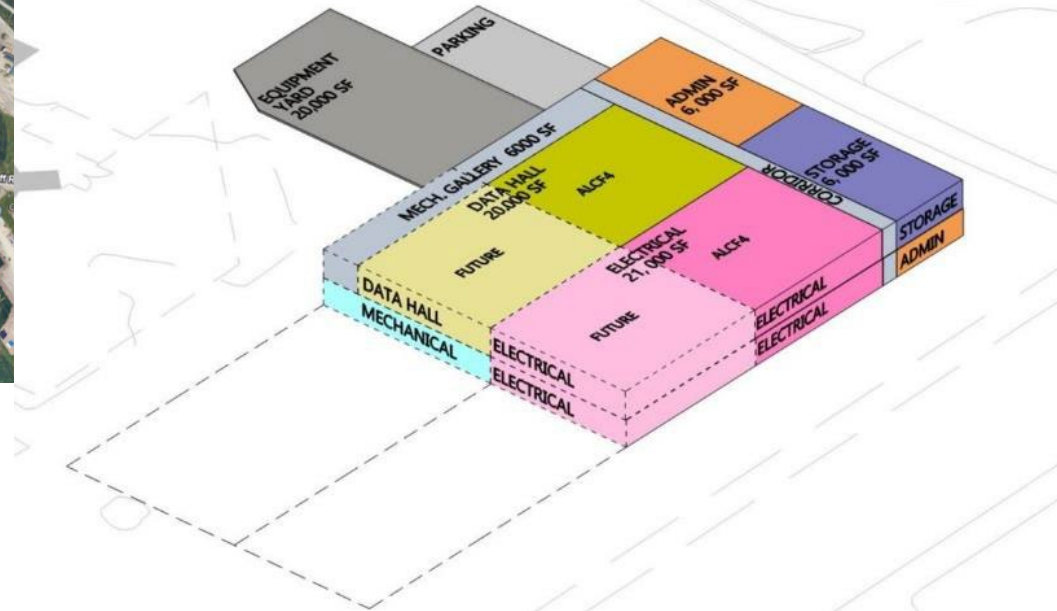
SITE ALTERNATIVES ANALYSIS

ALT 3- REPURPOSED BUILDING FOR DATA CENTER

- Goal to update an existing building on campus
- Reviewed potential building candidates, focused on Bldgs. 375 & 386
- None met day-1 or future expansion requirements for the datacenter or supporting MEP infrastructure needs
- Alt 3 considered non-viable

SITE ALTERNATIVES ANALYSIS

ALT 4- NEW BUILDING FOR DATA CENTER



SITE ALTERNATIVES ANALYSIS

EVALUATION CRITERIA & RATINGS

Criteria:

1. Sufficient Space for ALCF-4
2. Schedule
3. Minimizes Impact to Existing Data Center Operations
4. Minimizes Technical/Constructability Challenges for Utility System Improvements
5. Cost
6. Ability to Support Future Expansion

Ratings:

- Qualitative

- Fully Meets Criteria
- Moderately Meets Criteria
- Poorly Meets Criteria
- Fails to Meet Criteria

SITE ALTERNATIVES ANALYSIS

EVALUATION CRITERIA

Sufficient Space for ALCF-4

This screening criterion (go / no-go) confirms the alternative can house the required 10,000 SF of data center space for ALCF-4 and associated required MEP support areas. Meeting this screening criterion is demonstrated via a space planning diagram for each alternative.

Schedule

Based upon the current project schedule, the selected location must be ready for the final data center preparation by no later than January 2028, to allow enough time for the proper preparation of the data center: the installation of power distribution panels, cable trays, and the liquid cooling distribution.

In evaluating an alternative's ability to meet the project schedule, the analysis considers parameters such as gathering required approvals, funding acquisition, permitting, design time, construction, and risks related to the schedule

SITE ALTERNATIVES ANALYSIS

EVALUATION CRITERIA

Minimizes Impact to Existing Data Center Operations

Computer equipment is particularly sensitive to vibrations, dust, and operating temperature changes. Building construction within or next to the building containing an existing data center increases the potential for interruptions to the computer equipment.

Minimizes Technical / Constructability Challenges for Utility System Improvements

The new data center requires multiple utility improvements to support its operation (Electrical, Chilled/Tower Water, Canal Water, Lab Sewer) – upgrading these systems introduces challenges technical and constructability challenges.

While differential costs for the respective utilities are evaluated as part of the cost criterion, this criterion focuses on the technical and constructability challenges and risks.

SITE ALTERNATIVES ANALYSIS

EVALUATION CRITERIA

Cost

The improvements to the selected location must fit within the project's budget envelope, while leaving sufficient funds for the deployment of the system. Cost parameters include building construction/renovation, contingency, design, engineering, and the installation of the required utility system improvements (power, cooling equipment, canal water, domestic water, lab sewer).

Ability to Support Future Expansion

ALCF is expected to continue to field larger/faster/more energy-intensive systems after the ALCF-4 project is in production

This criterion examines how the site location affects the long-term progression of the ALCF and any limitations that the alternative puts on fielding the follow-on systems.

Rubric used in Summary Matrix on next slide



Fails to Meet Criteria



Poorly Meets Criteria



Moderately Meets Criteria



Fully Meets Criteria

SITE ALTERNATIVES ANALYSIS

EVALUATION RESULTS

Criterion	Utilize Existing TCS Building Footprint	Expand TCS Building Footprint for Supporting MEP	Repurpose Existing Building on Campus for ALCF4	New Building on Campus for ALCF4
Sufficient Space for ALCF-4	Significant remodeling of existing spaces	Constrained by Wetland, parking lot, requires converting mechanical rooms to electric rooms	Suitable space not available, alternative deemed not feasible.	
Schedule	2-4 yrs from construction NTP to CF completion— Assumes CD-3a for Elec & Mech long lead items.	-Approval/Agreement by DOE/ANL/Trust to expand building. -2-4 yrs from construction NTP to CF completion— Assumes CD-3a for Elec long lead items.		- Approval/Agreement by DOE/ANL to build new - 2-4 yrs from construction NTP to CF completion— Assumes CD-3a for Elec & Mech long lead items.
Minimizes Impact to Existing Data Center Operations	Significant remodeling of existing DC support area and BLDG program spaces for new MEP systems.	Remodeling of existing DC support area for new MEP systems.// Utility Tie-ins of Exist CHW/Elect/Canal serving ALCF-3 et.al.		
Minimizes Technical /Constructability Challenges for Supporting Utility System Improvements	-Highly congested UG utilities in 94 th street. -Hydraulically remote for canal water system (pumping/piping/challenges) -Lab Waste believed to be already undersized at peak demand (and is located in 94 th street) -Requires expansion of substation and tying into 138kV system.	Same as Alternative #1.		Requires expansion of substation and tying into 138kV system. Requires working under the APS overhead electrical feeds. Closer to source of canal water and substation.
Cost	X	1.15X		1.35X
Ability to Support Future Expansion	Additional areas to renovate for future expansion would be very difficult and practically speaking do not exist.	Constrained by Wetland, parking lot, requires converting mechanical rooms to electric rooms		

PATH FORWARD



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PATH FORWARD

CDR ALTERNATIVE

Project asked to move ahead to study Alt 2 – Expanded TCS Footprint

- Facility plans align with tech specs

Key challenges:

- Resolve schedule constraint regarding OMB approval of TCS expansion
- Routing of large distribution piping will require careful planning for installation thru existing MEP spaces supporting the ALCF-3 machine.
- It cannot be understated that extension of utility services for the additional 40MW compute load come with challenges. It is generally known that the 94th street area is highly congested with existing utility routings and crossings presenting risks beyond the active services to TCS.
- Future expansion capabilities remain limited to just the eastern portion of the property for the next generation installation after ALCF-4. Building growth in this direction comes with continued utility support challenges and complications.

PATH FORWARD

CD-1 EXPECTATIONS

- Complete CDR
- Incorporate CDR design & construction schedule into preliminary baseline
 - Demonstrate feasibility of current budget & schedule constraints
- Resolve Alternative #2 OMB approval concerns
- Complete NEPA documentation
- Engage TCSB to begin conceptual design within Bldg. 240

SUMMARY

- ✓ Preliminary Project Baseline: **To be further developed for CD-1 reviews**
- ✓ Site Alternatives Analysis: **Study completed. Path forward to study Alternative #2, Expanded 240 TCS Footprint**
- ✓ Design: **Conceptual Design Report is underway, to be completed October 2024**
- ✓ Key Takeaways: **Many design challenges to work through, but solutions are feasible**



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