



U.S. Army Research, Development and Engineering Command

Field Deployable Hydrolysis System Technology Selection, Design, Fabrication, and System Attributes



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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- Capabilities Assessment
- Production Decision
- Design/Production Team
- Requirements
- Basis of Design
- Production
- Transition and Planning





FDHS Project Timeline



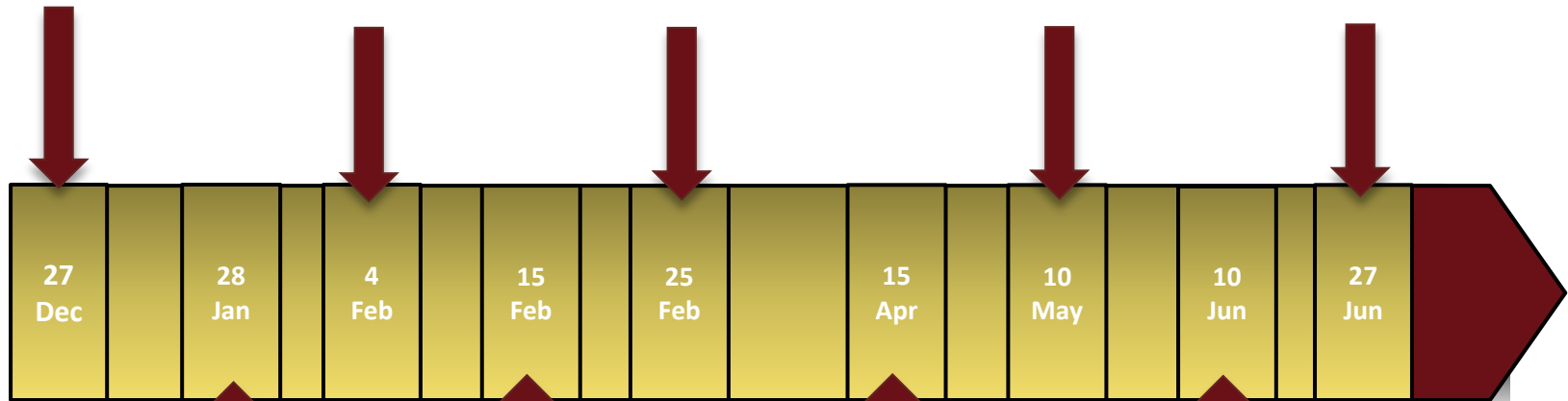
Threat Reduction
Advisory Committee
(TRAC) tasks
CMA/ECBC with
Capabilities Assessment

\$1.6M in initial
funding received
from DTRA. Balance
of funding received
21 March

Start of FDHS
support equipment
fabrication

Start of FDHS
hydrolysis skid
fabrication

Demonstration of
FDHS System #1



Official decision
by Mr. Weber to
proceed with
FDHS following
21 January IPR.

Direction provided
to accelerate
schedule and
provide full
deployable
capability. New
completion date of
1 July.

Start of FDHS
reactor skid
fabrication

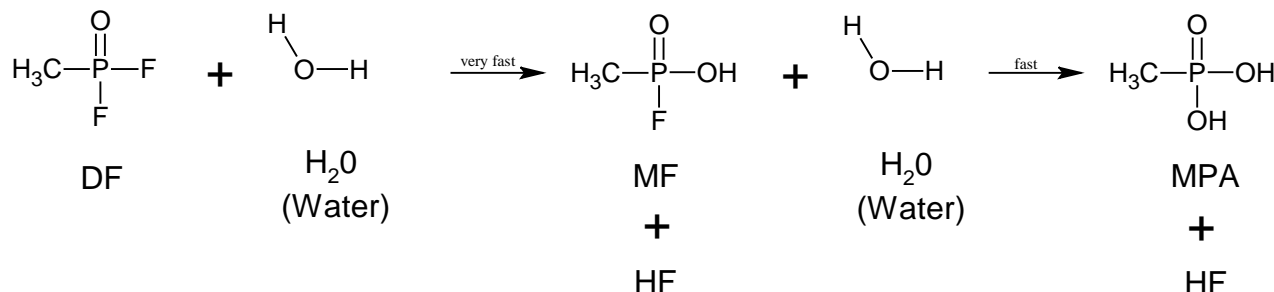
Start of
demonstration site
setup

- **Capabilities Assessment requested by Threat Reduction Advisory Committee (TRAC) on December 27, 2012**

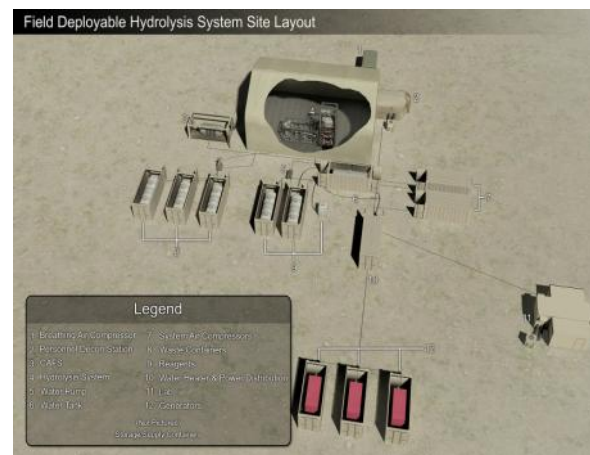


- **Identify technologies that are currently available, or could be available within 6-12 months, capable of:**
 - **Destroying bulk liquid chemical agent or precursors**
 - **Operating in a remote location**
 - **Operating in semi-permissive or uncertain environment**

- **28 Jan 2013: Edgewood Chem/Bio Center (ECBC) and Joint Program Manager – Elimination (JPM-E) directed to demonstrate a suitable technology by 31 Jul**
- **Neutralization (hydrolysis) was selected as the only technology that could be demonstrated in this time frame**



- **15 Feb 2013: Scope and schedule changes:**
 - Required to produce and demonstrate a full deployable capability
 - Deadline moved to 1 Jul 2013





CBARR



- ECBC chem/bio operations division
- Overall project management responsibility
- Assembled reactor and hydrolysis skids and other components

JPM-E



- Chemical weapons elimination experts
- Co-designers with ECBC
- Funded second and third FDHS prototypes

ADM



- ECBC rapid-prototyping unit
- Computer-aided drafting, simulation support, and fabrication of parts

ECBC R&T



- ECBC's research and technology directorate
- Bench-scale chemistry and analysis of waste

DTRA



- Chem/Bio Defense Program's R&T funding organization
- Funded first FDHS prototype

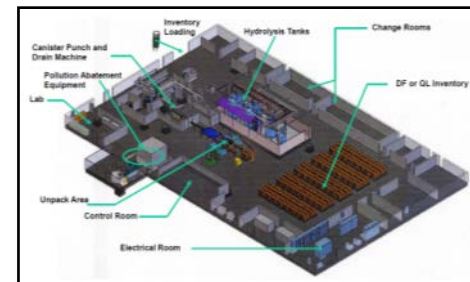
ACC



- Edgewood branch of Army Contracting Command
- Dedicated Contracting Officer support

- **Destroy bulk liquids in metric ton quantities**
- **Destroy HD (sulfur mustard), DF (sarin precursor), possibly other precursor compounds**
- **Achieve 99.9% destruction efficiency**
- **Achieve throughput rate of at least 3 MT/day**
- **Operate 24 hours/day, 7 days/week**
- **Be transportable by standard modes of transportation**
- **Operate at remote sites**
- **Be operable within 10 days of equipment arriving on site**

Binary Destruction Facility (BDF) managed by Chemical Materials Agency (CMA) destroyed 127 tons of DF from 2003-2006



Destruction and Throughput Requirements



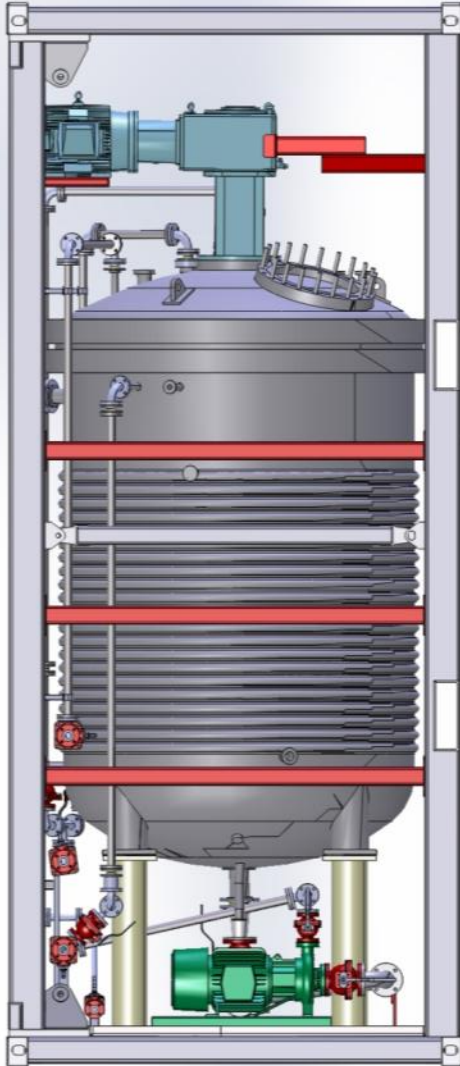
Aberdeen Chemical Agent Disposal Facility (ABCDF) managed by CMA destroyed 1,621 tons of HD from 2003-2005

| Requirement | Characteristics | Achieved By |
|--------------------------------|---|---|
| Destruction/ Throughput | <ul style="list-style-type: none"> • Reliance on proven technology • Process flexibility | <ul style="list-style-type: none"> • Basing process flow and chemistry on ABCDF • Using 2 surplus reactor vessels from ABCDF • Designing for varying recipes and flow rates • Using chemical -resistant materials of construction |
| Transportability | <ul style="list-style-type: none"> • Modular design | <ul style="list-style-type: none"> • Designing system to fit within 20' ISO frames • Selecting ancillary systems that fit within 20' ISO containers |
| Remote Location | <ul style="list-style-type: none"> • High availability • Operator-level maintenance • Self-sufficiency | <ul style="list-style-type: none"> • Installing redundant components • Using flanged connections • Procuring generators and water heaters • Designing custom electrical and air distribution systems |
| 10-Day Setup/ Systemization | <ul style="list-style-type: none"> • "Plug-and-play" setup • Simplicity | <ul style="list-style-type: none"> • Designing transport configuration to be very similar to operational configuration • Quick disconnects and easy-to-install flexible connections between components • Color-coding and component labeling |

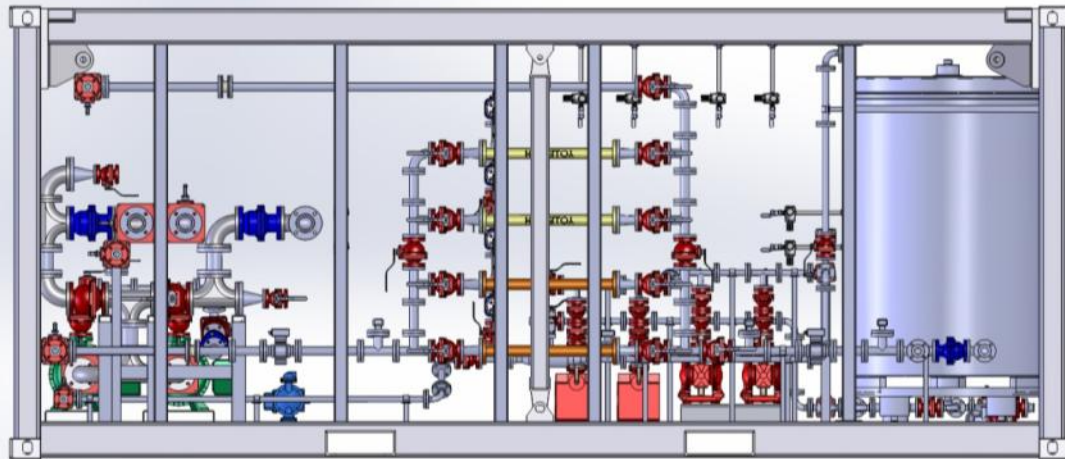


Computer-aided drafting model of primary skids by ADM (March 2013)

Reactor
Skid



Hydrolysis
Skid

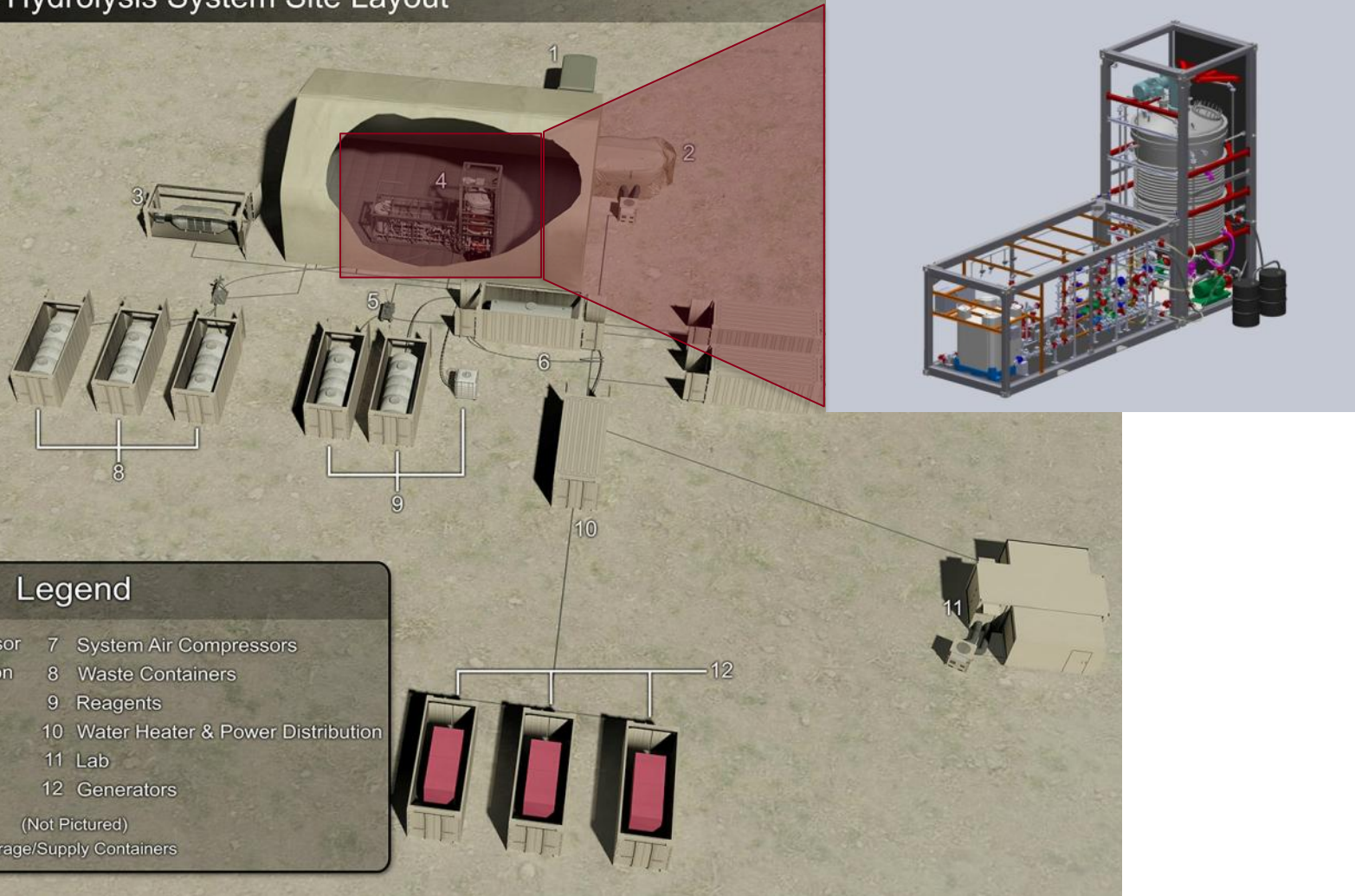




Modular System Design with FDHS Technology



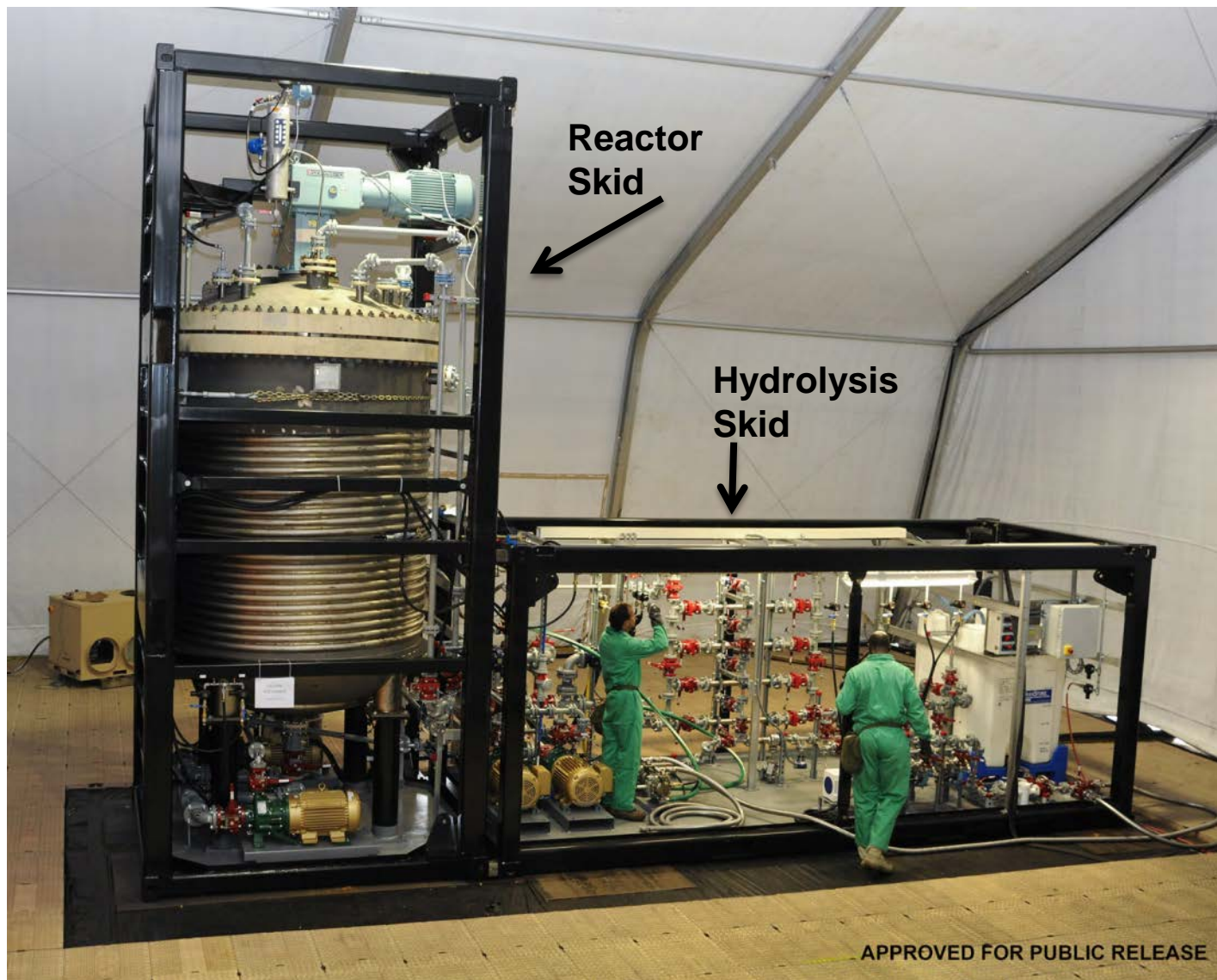
Field Deployable Hydrolysis System Site Layout



Legend

- | | |
|----------------------------|--------------------------------------|
| 1 Breathing Air Compressor | 7 System Air Compressors |
| 2 Personnel Decon Station | 8 Waste Containers |
| 3 CAFS | 9 Reagents |
| 4 Hydrolysis System | 10 Water Heater & Power Distribution |
| 5 Water Pump | 11 Lab |
| 6 Water Tank | 12 Generators |

(Not Pictured)
Storage/Supply Containers



- **FDHS technology transferred from DTRA to Joint Program Executive Office for Chem/Bio Defense (JPEO-CBD) on June 27, 2013**
- **Concept of Operations planning**
 - **6 systems deployed at 2 or 3 sites in country**
 - **Tabletop exercises**
 - **Materiel release for active duty operators**
- **Capability demonstration and validation conducted September 16-22, 2013**
- **7 FDHS systems procured/fabricated through May 2014**

