­HV System Consortium Deliverables:

1. Hardware Deliverables
   1. CPA/FC Key Components
      1. Resistive Cathode Surface
         1. Fabrication
         2. QC
      2. Field Cage Profiles (metallic or resistive)
         1. Fabrication
         2. QC
      3. Field Cage Profile Caps (insulating/resistive/metallic)
         1. Fabrication
         2. QC
      4. Resistive Divider Boards and Electrical Components
         1. Board Design
         2. Component testing (Cold/HV)
         3. Assembly and test
      5. HV Bus and CPA Interconnects
         1. Fabrication
         2. QC
      6. Ground Plane Panels
         1. Fabrication
         2. QC (HV test)
      7. CPA Frame
         1. Fabrication
         2. QC (Fit check, cleaning)
      8. FC Frame
         1. Fabrication
         2. Surface treatment
         3. QC
   2. CPA Modules
      1. Design
      2. R&D/Optimization
      3. Production
      4. Testing
      5. Installation
   3. Top/Bottom Field Cage Modules
      1. Design
      2. R&D/Optimization
      3. Production
      4. Testing
      5. Installation
   4. Endwall Field Cage Modules
      1. Design
      2. R&D/Optimization
      3. Production
      4. Testing
      5. Installation
   5. HV Feedthroughs
      1. Design
      2. R&D/Optimization
      3. Production
      4. Testing (HV in clean LAr)
      5. Installation
   6. HV Power Supplies
      1. Procurement
      2. Testing
   7. HV Distribution (Cables/Filters/Tees)
      1. Design
      2. R&D/Optimization
      3. Fabrication/Procurement
      4. Testing (HV)
      5. Installation
   8. HVFT-CPA Interconnect (cups or other scheme for FD)
      1. Design
      2. R&D/Optimization
      3. Fabrication
      4. Testing (HV)
      5. Installation
2. Software Deliverables
   1. Supply CPA/FC Geometries into LArSoft
   2. Electric Field Map
      1. Identify known distortions
      2. Feed to LArSoft
   3. Calibration (???)
      1. Run Control Software
      2. Analysis Software
      3. Calibration Database
   4. Hardware Database
      1. QC Documentation
      2. Component Tracking
      3. Survey data
   5. HV Data Collection
      1. HV power supply control/monitoring/recording code
      2. HV camera system control/trigger/recording code
      3. HV diagnostic system monitoring/recording code
   6. HV System Performance Evaluation
      1. Analyze TPC data to determine HV system performance
3. Physics Deliverables
   1. Validation of HV System Requirements with respect to Physics Performance
      1. Field Uniformity->FC/CPA configuration/dimensional tolerances; Survey requirements
      2. CPA stability requirement under fluid flow
      3. CPA transparency requirements
      4. CPA/FC radiopurity requirements/material selection
      5. HV filter requirements
   2. Study of the Complete HV system response to a HV Discharge
      1. System redundancy; fault tolerance; partition of CPA
      2. CPA resistivity optimization; Resistive field cage study
      3. HV bus optimization (adding resistive/inductive segmentation)
   3. Simulation and Testing of Insulator Charging and its Impact on the TPC
   4. HV System Performance Validation via ProtoDUNE Data Analysis
   5. Editing of TDR chapter
4. Integration Deliverables
   1. HV system circuit diagram, grounding and shielding plan
   2. Internal/external interfaces
      1. CPA to DSS Connections
      2. CPA/FC Connections (electrical/mechanical)
      3. FC/APA Connections (electrical/mechanical)
      4. FC to Cryostat (ground connection)
      5. FC to Calibration (Laser?) Interface
      6. Other Cryostat Interfaces
   3. Integration Test Facility (Mechanical and electrical/HV validation )
      1. Design
      2. Fabrication
      3. Operation
5. System Monitoring/Calibration (this could be split into a ‘system monitoring/instrumentation consortium’ if available)
   1. Camera system for HV system monitoring
      1. Cold cameras / electrical feedthroughs / cables / readout / recording
      2. Warm cameras / optical feedthroughs / readout /recording
   2. CPA/FC dimensional stability monitoring
   3. Current monitoring via segmented ground plane/pickup electrodes/coronal monitors
   4. Define cryostat requirements on ports, support structure