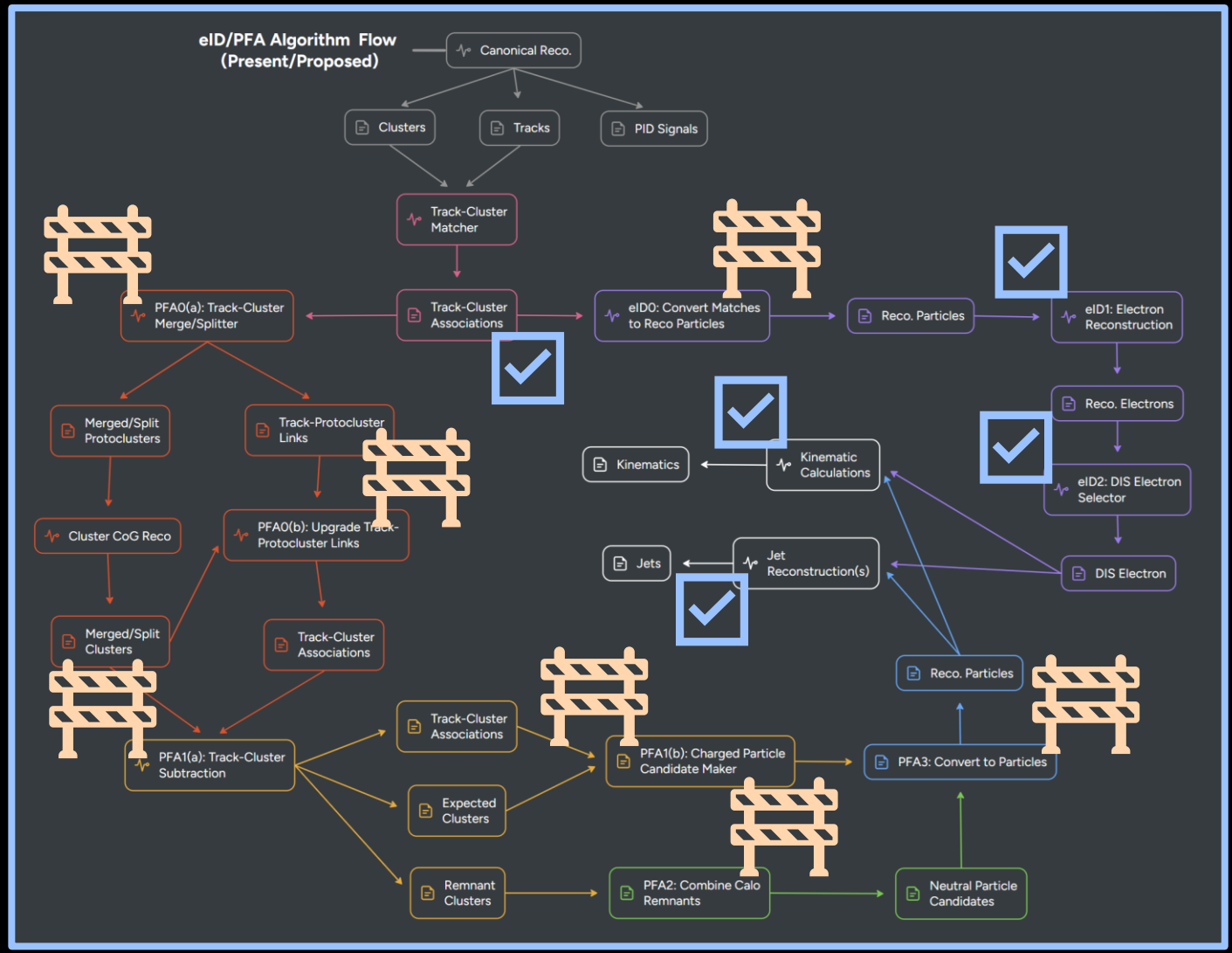
PF Status | Updates Since CM

- **PFA3 PR now available!** Currently in draft, but expect to open soon
  - See EICrecon#2399
- **Now code for all stages is publicly available!**
  - 👉 Huge thanks to **Subhadip Pal (CTU)** & **Esteban Molina (UMich)**
- **Additional labor:** have been discussing with Nihar Sahoo (IISER-Tirupati)
  - Student in group is interested in helping out!

◯ = To-do
🚧 = In progress
☑ = Done/already in EICrecon
⊗ = Blocked



PF Status | Development Tasks

Task	Description	Issue/PR	Exp. Campaign
PFA-1/eID3	Deprecate MatchClusters, replace w/ pure reco equivalent	EICrecon#1956	**26.05.0**
PFA0(a)	Complete merge/splitter update	EICrecon#1699	**26.04.0**
PFA0(b)	Implement track-protocluster link promotion algorithm	EICrecon#2293	**26.04.0**
PFA1(a)	Revive and finish track-cluster subtractor	EICrecon#1627	**26.04.0**
PFA1(b)	Track-cluster converter (synergy w/ PFA-1)	EICrecon#2124	**26.04.0**
EDM0	Flagging ecal vs. hcal clusters	epic#994	**26.04.0**
PFA2	Implement calo remnant combiner	EICrecon#2195	**26.04.0**
PFA3	Implement particle regressor/convertor	EICrecon#2399	**26.04.0**
INT	Tie all stages into single workflow	EICrecon#900	**26.04.0**

- Goal is to complete implementation by **end of CY26.Q1, so expect all stages in by 26.04.0**
  - All contributors working on best effort basis, 1.5 months is reasonable estimate
- Status of PFA-1 is uncertain, need to check in w/ Tristan
  - May need additional support, so **26.05.0** is reasonable target

PF Status | Benchmark Tasks (1/2)

Tasks	Issue/PR/Note	Exp. Campaign	Assignee
PFA-1/eID3 Benchmark **- input:** Sum eClust, sum pTrk, nClust, nTrk, E/p matched clusters, sum eGenPar, eGenPar, nGenPar **- output:** Sum eRecPar, eRecPar, ePar, nRecPar, nPar, PES/R of reco pars	**To-do**	**CY26.Q3**	**HELP**
PFA0 Benchmark **- input:** Sum eClust, eClust, pTrk, nTrk, nClust, E/p matched clusters **- output:** Sum eSMClust, eSMClust, nSMClust, E/p SM clust, dRct SM	**Some work done**	**CY26.Q3**	**HELP**
PFA1 Benchmark **- input:** Sum eClust, eClust, sum pTrk, pTrk, nTrk, nClust, E/p matched clusters, sum pChrgPar, pChrgPar, nChrgPar **- output (expected):** sum eEXClust, eEXClust, nEXClust, E/p EX clust, dRct EX **- output (remnant):** sum eREClust, eREClust, nREClust **- output:** sum eEXClust + eREClust	**To-do**	**CY26.Q3**	**HELP**

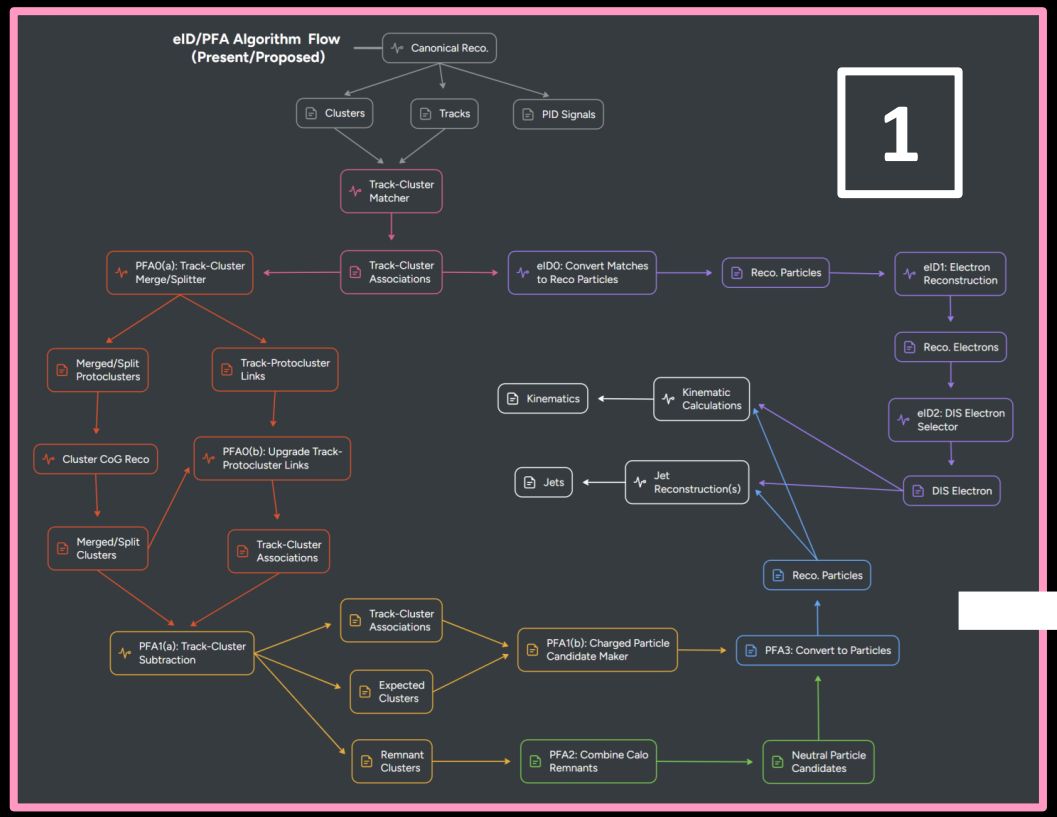
- Benchmarking + tuning parameters will be a large effort!
  - Tough to identify target campaign at this stage (need support, need to merge code)
  - 👉 **These are great entry tasks, though!**
- **Notes:**
  - PES/R = Particle Energy Scale/Resolution
  - SM = Split/Merge, EX = Expected, RE = Remnant
  - dRct = distance b/n cluster & matched track

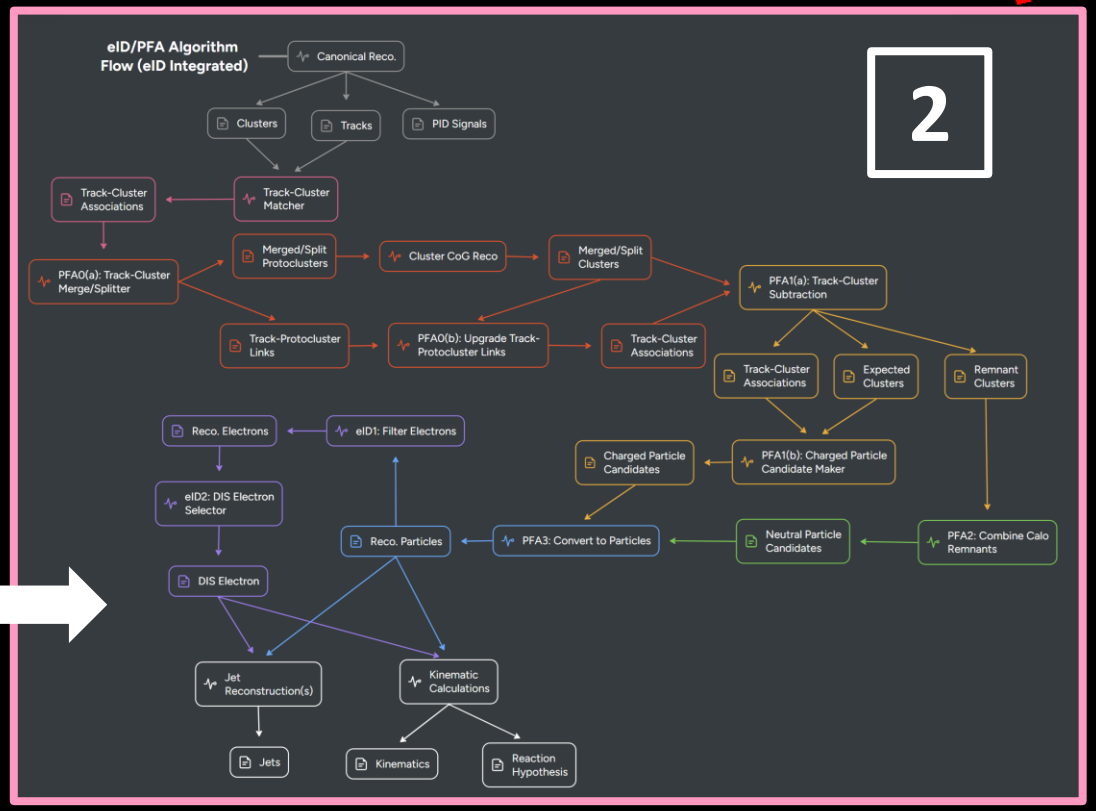
PF Status | Benchmark Tasks (2/2)

Tasks	Issue/PR/Note	Exp. Campaign	Assignee
PFA2 Benchmark **- input:** sum eREClust (EM, H), eREClust (EM, H), nREClust (EM, H), sum eNeuPar, eNeuPar, nNeuPar **- output:** sum eRecPar, nRecPar	**To-do**	**CY26.Q3**	**HELP**
PFA3: **- input:** Sum eClust, sum pTrk, nClust, nTrk, E/p matched clusters, sum eGenPar, eGenPar, nGenPar **- output:** Sum eRecPar, eRecPar, ePar, nRecPar, nPar, PES/R of reco pars	**To-do**	**CY26.Q3**	**HELP**
PHYS Benchmark: JES/R	**To-do**	**CY26.Q3**	Dener, **HELP**
PHYS Benchmark: Jets - E, mass, FFs (jt, z), Substructure (dRcst, angularity, EECs)	**To-do**	**CY26.Q3**	Dener, **HELP**
PHYS Benchmark: Events - TEECs, NECs	**Some work done**	**CY26.Q3**	Derek, **HELP**

- Benchmarking + tuning parameters will be a large effort!
  - Tough to identify target campaign at this stage (need support, need to merge code)
  - ☞ **These are great entry tasks, though!**
- **Notes:**
  - EM = “Electromagnetic”, H = “Hadronic
  - dRcst = constituent delta-R

eID Status | Updates since CM





- **Great progress!** Stephen has already introduced PRs to fix boost.h issues and add isolation
  - ☞ See EICrecon#2378 **(merged)** and EICrecon#2404

- **Above:** flowcharts to illustrate PF + eID workflows after each milestone
  1) Existing eID workflow w/o truth info + prototype developments
  2) Integration w/ PF

eID Tasks | Toward Milestone 1

Task	Description	Issue/PR/Note	Exp. Campaign
eID0	Resolve missing EMCal-track associations	Need to follow-up	**26.04.0**
eID1	☑ Resolve issues with boost.h	EICrecon#2378 **(merged)**	**26.03.0**
eID2	Add isolation cut to DIS electron selection	EICrecon#2404	**26.03.0**
eID3/PFA-1	Deprecate MatchClusters, replace with pure reco equivalent	EICrecon#1956	**26.05.0**
eID4	Wire reco DIS electrons into kinematic calculations (step 1)	EICrecon#2333	**26.04.0**

Milestone 1: there are well-defined steps to bring EICrecon e^--finder to next level, meaning that

1. Updates are integrated from Inclusive PWG's prototype code, and
2. Use of truth information is removed.

ETA: end of CY26.Q1 (excl. eID3)

- **Notes:**
  - All tasks decoupled, can proceed independently
  - Reco kinematics in eID4 *do not* have to be made default until collaboration is ready

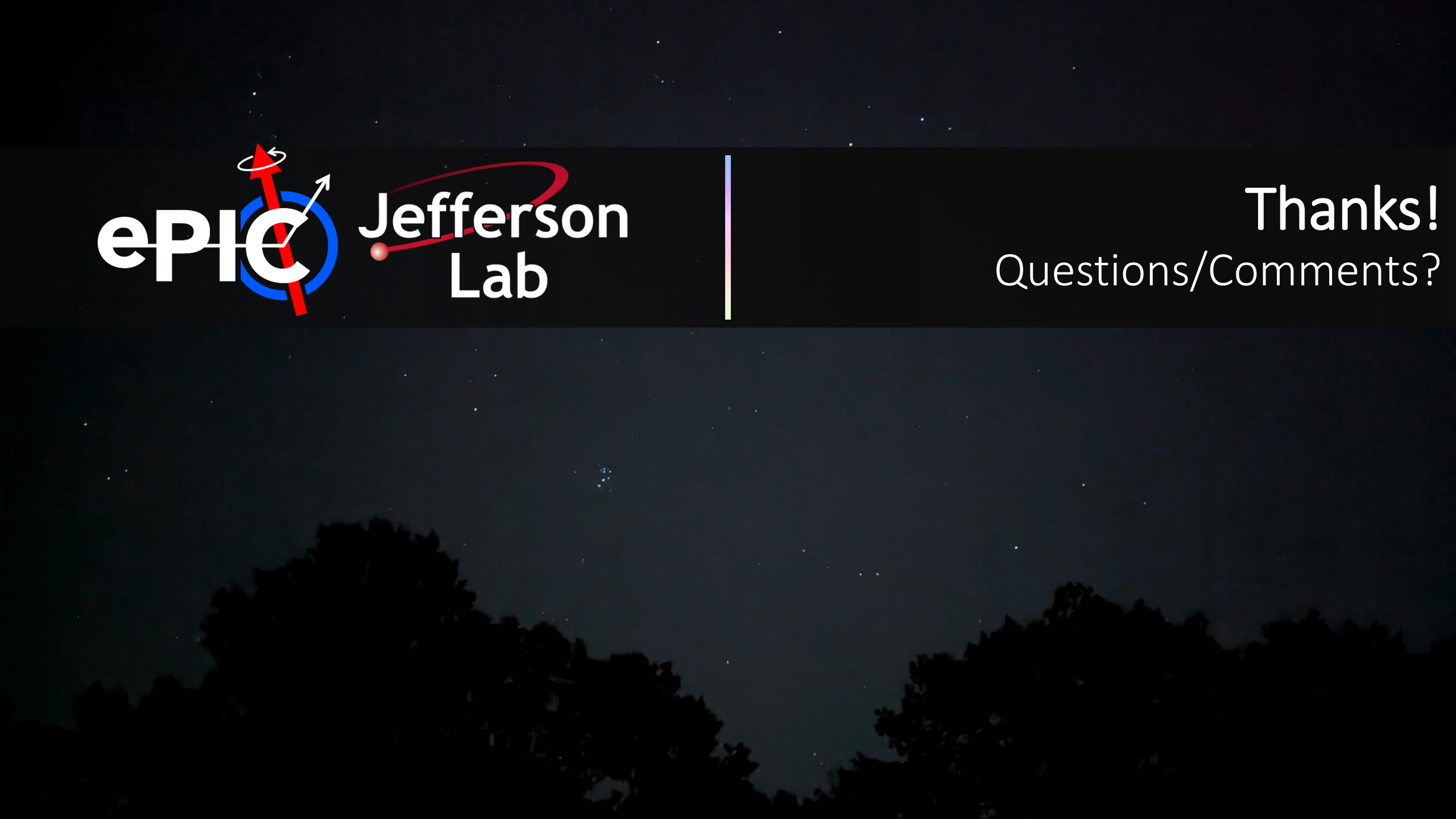
eID Tasks | Toward Milestone 2

Task	Description	Issue/PR/Notes	Exp. Campaign
eID5	Wire reco DIS electrons into kinematic calculations (step 2)	EICrecon#2333	**26.06.0**
eID6	Improve DIS selection (adding p_T ranking, etc.)	Needs more planning	**CY26.Q2**
eID7	Improve kinematic calculations (handling different beams)	Needs more planning	**CY26.Q2**
eID8/PFA4	Integrating PFAlpha + eID	Contingent on PF	**CY26.Q3**

Milestone 2: tasks still require elaboration. But can identify high-level steps towards next major milestone, which will be partly defined by integrating PF and eID.

ETA: end of CY26.Q3

- **Notes:**
  - These tasks might be better done sequentially to assess impact
  - Tough to assign specific campaigns for eID6 – eID8 before having clearer picture of work scope



Thanks!

Questions/Comments?

Backup | Longer Term eID Tasks

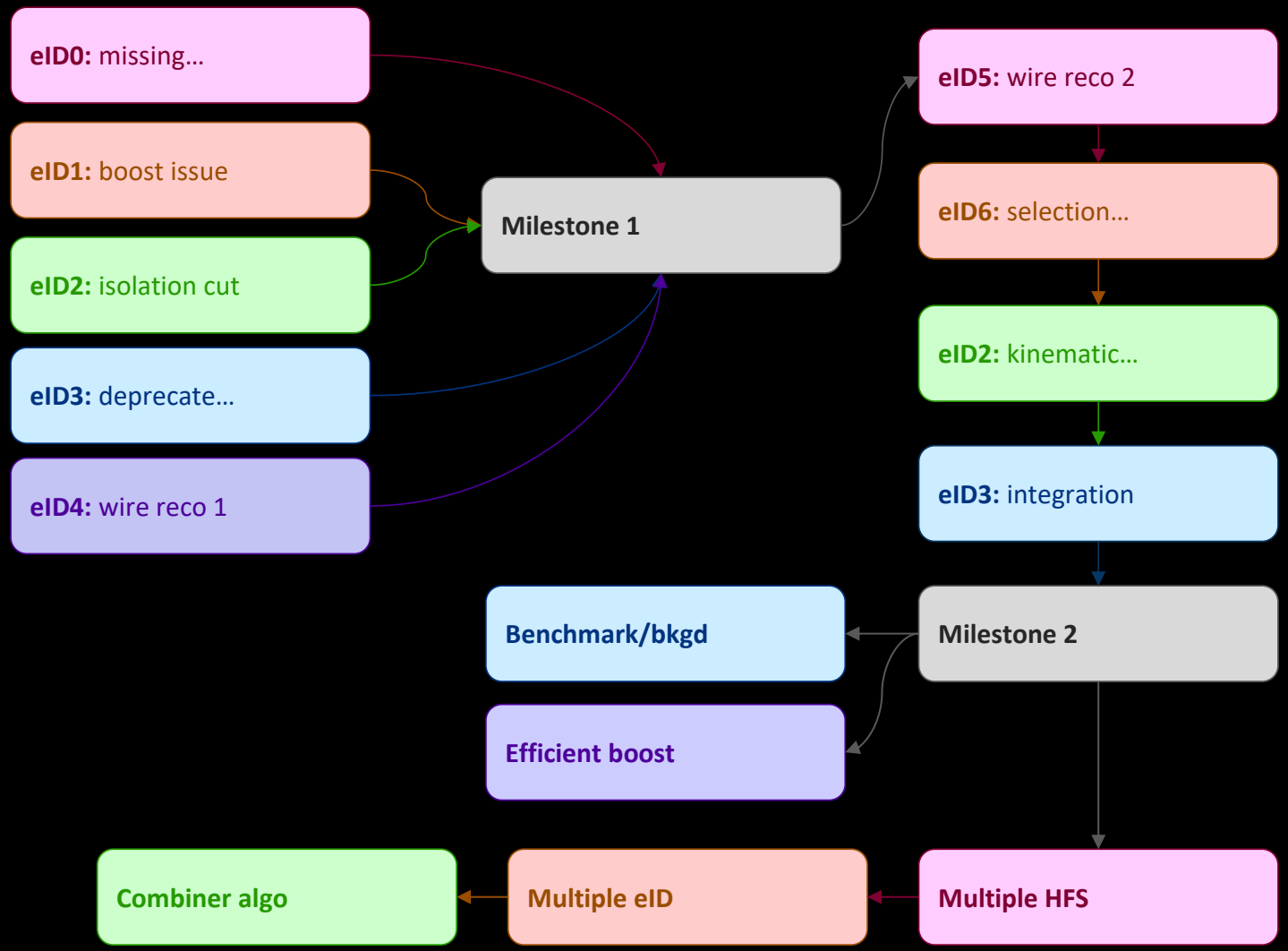
- Several longer term topics to think about:
  - **Handling multiple HFS***
    - Multiple e^- candidates means multiple HFS need to be checked
  - **Handling multiple eID algorithms***
    - Each will have a HFS + kinematic set attached
    - Doing calculations in EICrecon can help with combinatorics downstream
  - **Algorithm to combine multiple kinematics, HFS***
    - Ideally would have algorithm to integrate over combinatorics, provide default values
  - **Standardized benchmarks + assessing backgrounds**
    - Critical for performance eval.

- Long term (cont.)
  - **More efficient boost calculation**
    - Boost to CoM really only needs to be calculated once per beam setting
  - **Settling boundary between reconstruction, analysis**
    - Broader question which touches on every PWG
    - Where do analysis tools like RAD fit in?

- **Lastly:** e^- finder is important *for everyone,* so *everyone* is open to help here!
  - These tasks are a great way to learn about both DIS physics and our software framework!

* **Note:** synergy w/ event reco priority

Backup | eID Task Flowchart



Backup | Baseline Overview

- **In broad strokes:** the overall algorithm is

1) **[PFA-1]** Match tracks to EMCal, HCal clusters
2) **[PFA0]** Merge clusters based on track E/p in a cone of size R_0
   - Split merged clusters between matched tracks
3) **[PFA1a]** Subtract expected track energy from merged clusters
   - Split into tracks + expected energy, and remnant clusters (leftover energy)
4) **[PFA1b]** Convert tracks + expected energy to particle candidates
5) **[PFA2]** Combine remnant EMCal, HCal clusters in a cone of size R_1, convert to particle candidate
6) **[PFA3]** Convert candidates to reconstructed particles