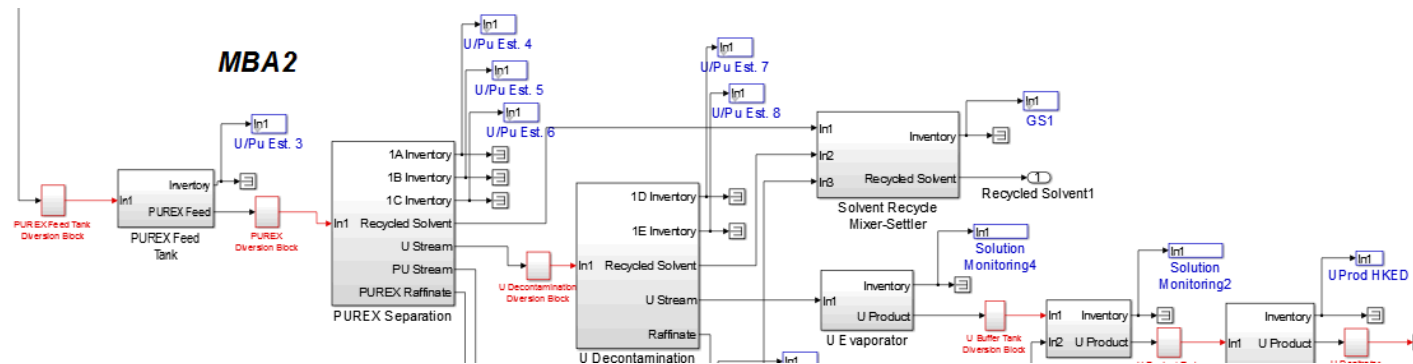


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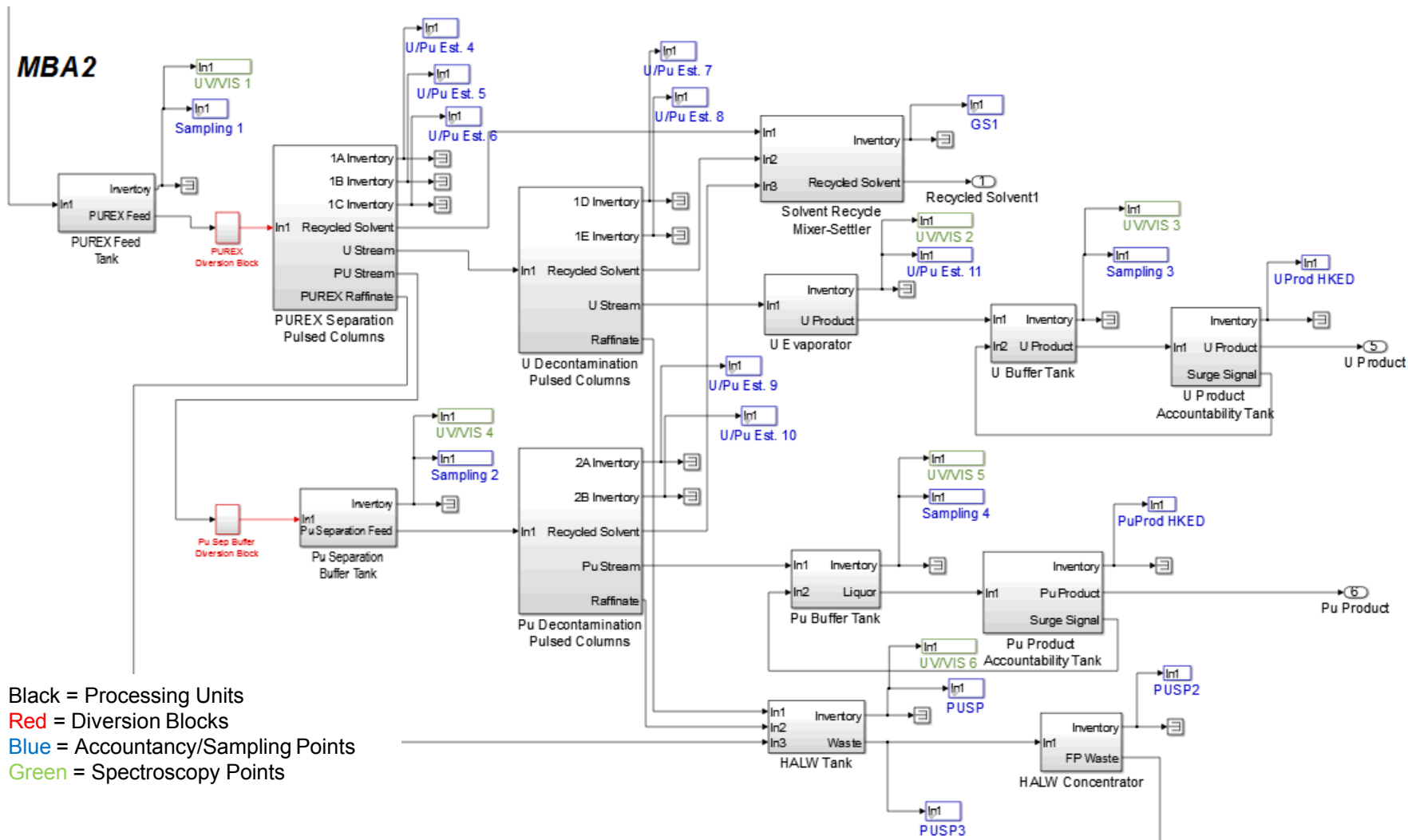
## CoDCon Dynamic Mod/Sim Overview

Ben Cipiti

# Dynamic Mod/Sim Goals

- Leveraging past work, we can generate a dynamic simulation of the CoDCon flowsheet and associated on-line measurements fairly rapidly.
  - Built using the Simulink platform from an existing PUREX SSPM model.
  - Utilize integration of AMUSE (SASPE) from past work.
  - The model will simulate the transient response of contactors to process flow changes.
  - On-line measurements will be simulated to determine timing required to make process changes.
  - The overall measurement error will be tracked to show the uncertainty on the final U/Pu ratio.
- The simulation will be used to demonstrate how on-line measurements can help control the process. The model will be validated by experiment, and can be compared to Dynamic AMUSE.

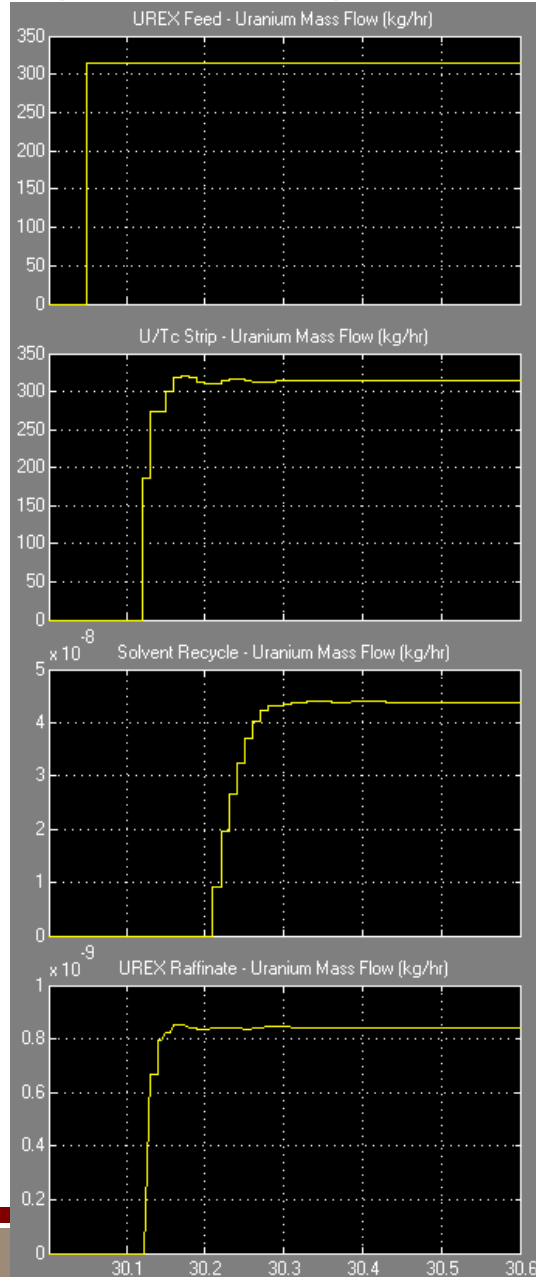
# Various SSPM PUREX Models Exist



Black = Processing Units  
 Red = Diversion Blocks  
 Blue = Accountancy/Sampling Points  
 Green = Spectroscopy Points

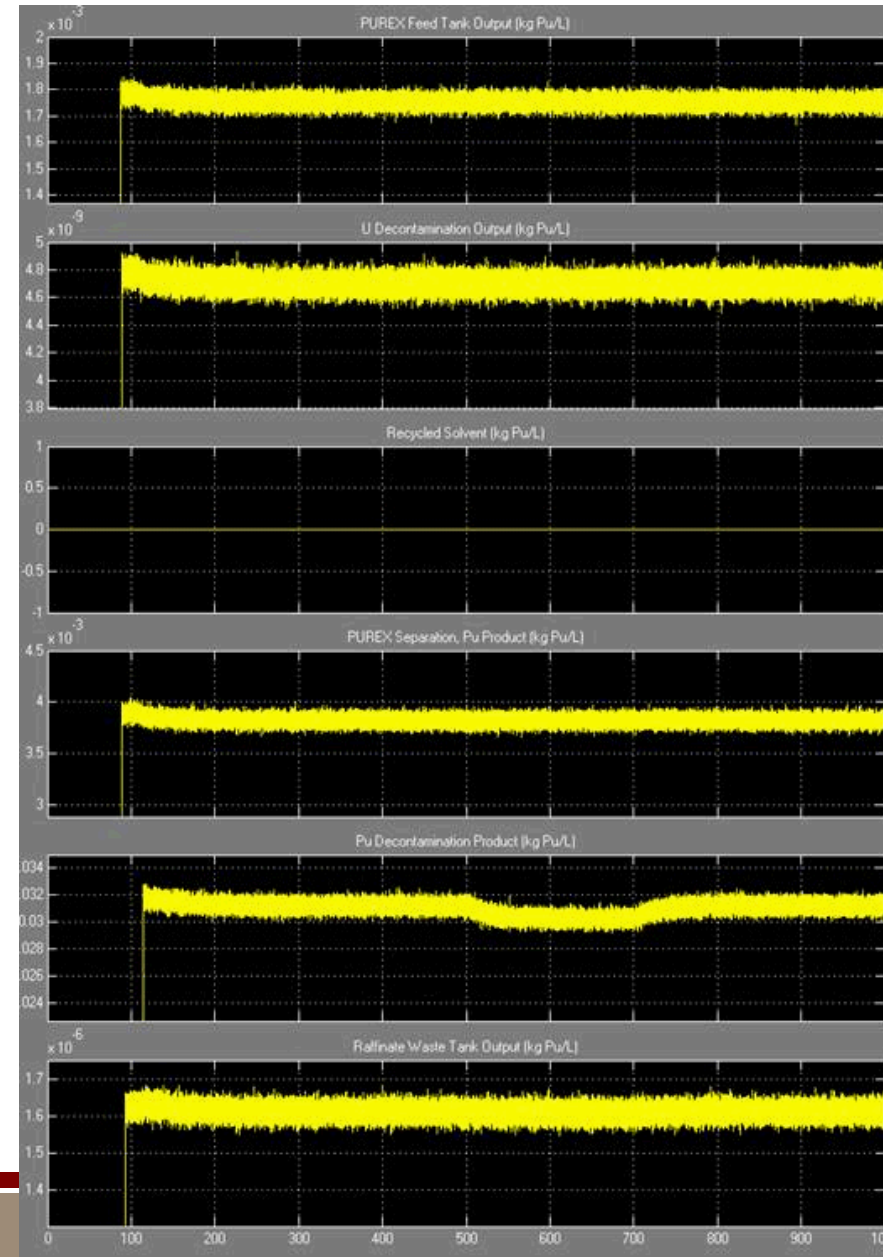
# Integration of SASPE (AMUSE)

- AMUSE uses SASPE to calculate the distribution ratios and SASSE to calculate the mass balance.
- Since the SSPM already does a mass balance, we only needed to integrate SASPE.
- The figures on the right show transient nature of the UREX contactor bank after SASPE was integrated.
- We will need to work with ANL to modify the integration for the flowsheet that is chosen.



# NA-24 On-Line Spectroscopy Simulated Data

- For an NA-24 project, we simulated the use of 6 UV-Vis probes in various areas of the flowsheet.
- The Pu concentrations are shown on the right.
- The fifth plot shows a drop in the concentration when a substitution diversion scenario was simulated.
- The more formal analysis will tie these results to the bulk measurements to calculate a real-time material balance, and we can determine the overall uncertainty of using it for process control.



# Uncertainty Calculation

- The SSPM is set up to automatically calculate inventory differences and the overall measurement uncertainty ( $\sigma_{MUF}$ ) in real time.
- For CoDCon, we're mainly interested in the uncertainty in using the on-line measurements for process control, so the calculation will be modified slightly to determine the uncertainty on the output concentration.
- We can plot out the output concentration and uncertainty as a function of time.