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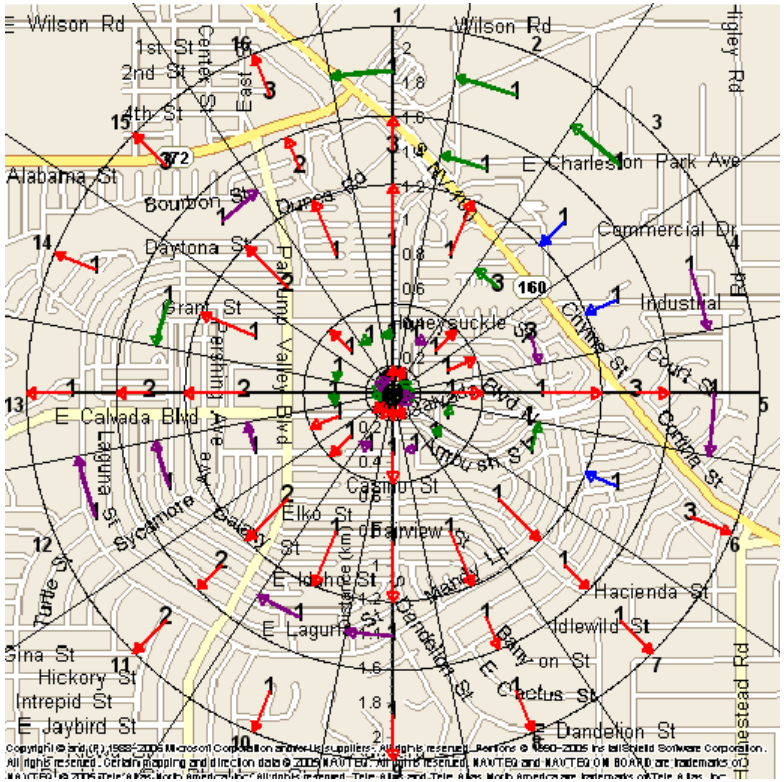

Basic EARLY Models and Parameters

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U.S. DEPARTMENT OF ENERGY
National Nuclear Security Administration

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Objectives

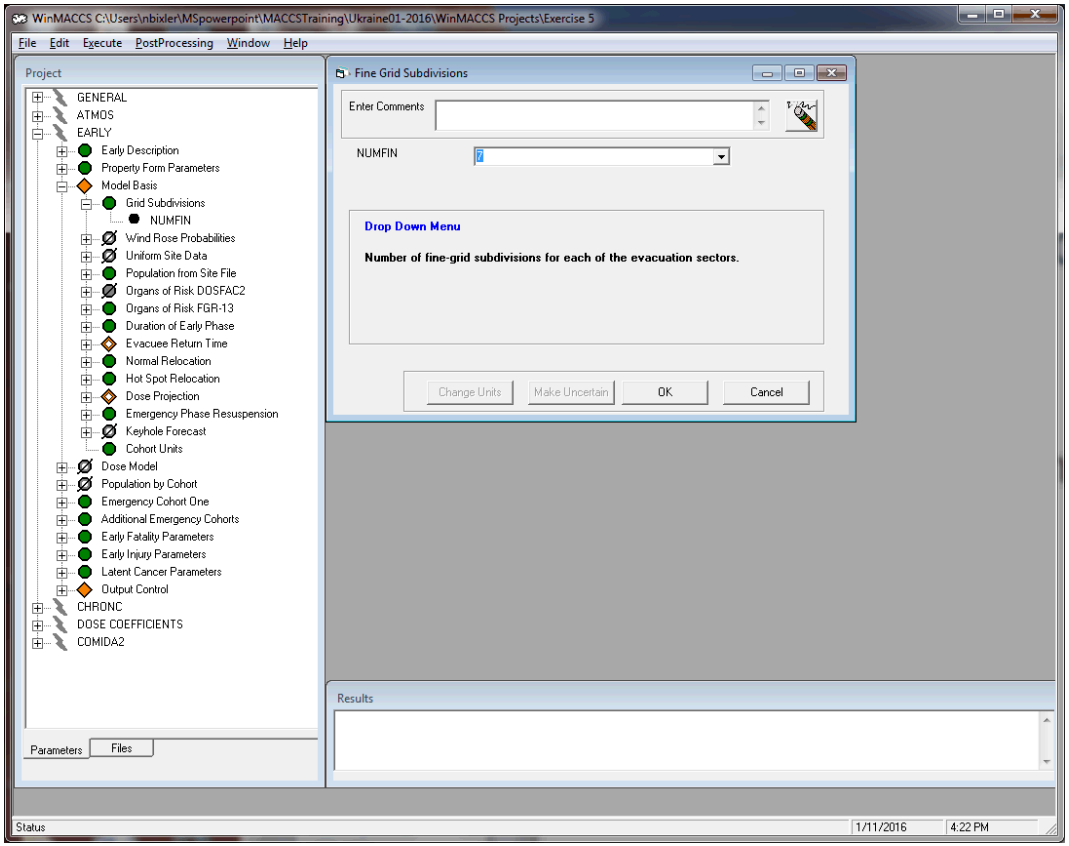
- Learn the basic model choices and inputs required for the EARLY module of MACCS
- Differentiate the portions of the inputs that are site or accident-scenario specific and those that are not

Basic Functions of EARLY

- Fine grid
- Organs of risk
- Duration of emergency phase
- Definition of normal and hotspot relocation
- Emergency-phase resuspension

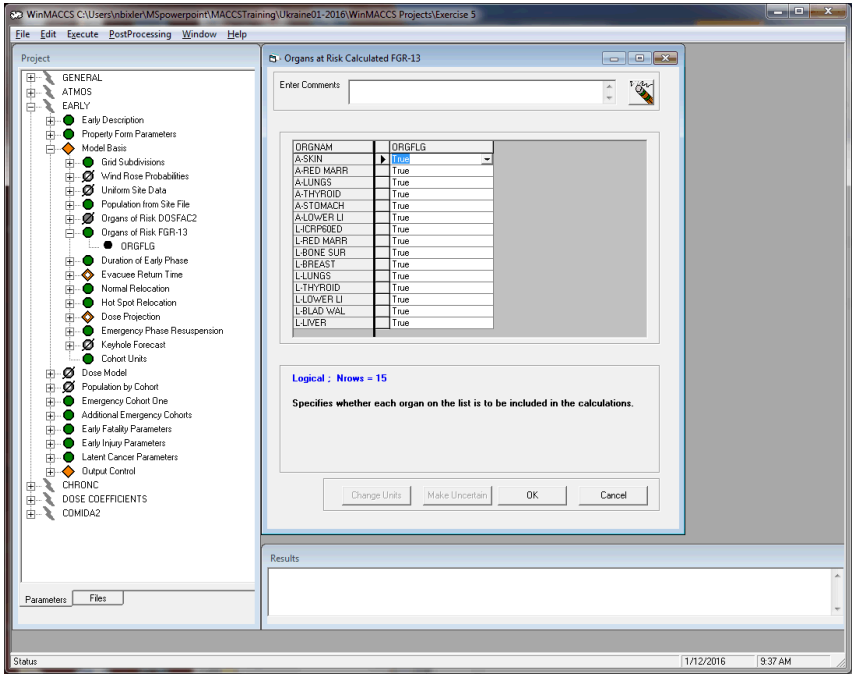
Fine Grid Definition

- Fine grid is used to improve resolution for nonlinear health effects during emergency phase
- Recommend always using maximum resolution - 7



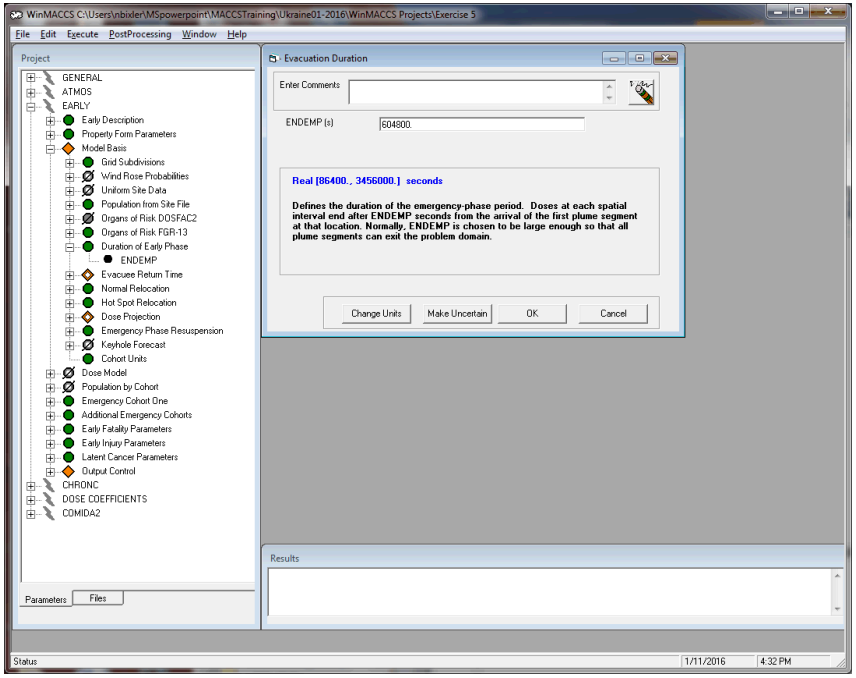
Organs of Risk

- Defines the set of organs that can be used for dose and health-effect calculations
- Generally, all of them should be selected



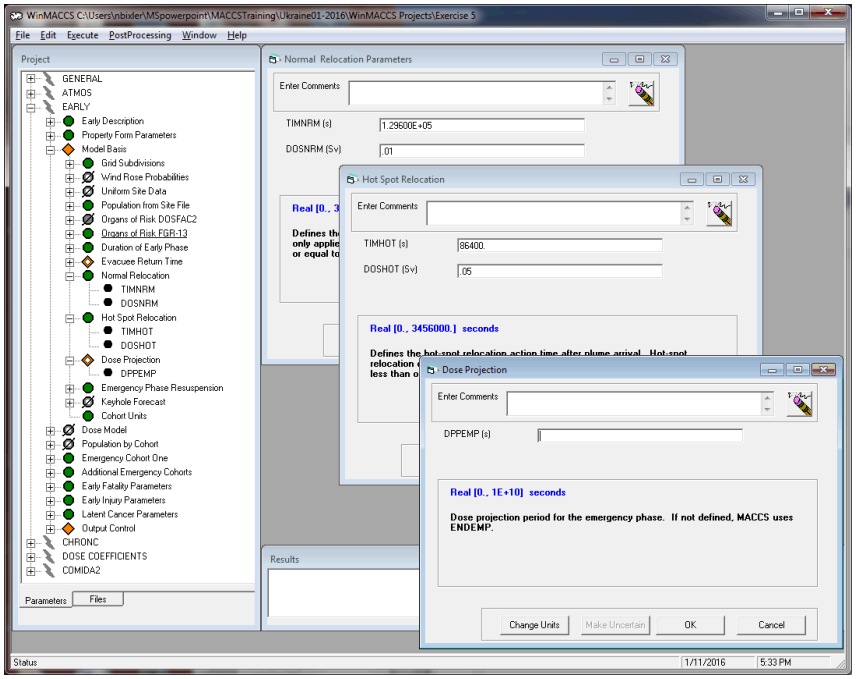
Duration of Emergency Phase

- Emergency phase starts with the initiating event and ends after both
  - Transport of releases is complete
  - Evacuation and relocation are complete
    - Evacuation is triggered by declaration of emergency at plant
    - Relocation is triggered by dose projections exceeding acceptable levels
- Typical duration is 1 week but can be longer or shorter depending on scenario



Definition of Relocation

- Normal relocation
  - Triggered at lower dose
  - Requires more time
- Hotspot relocation
  - Triggered at higher dose
  - Requires less time
- Relocation occurs when projected dose exceeds action level based on
  - Dose projection period
  - Critical organ for cohort



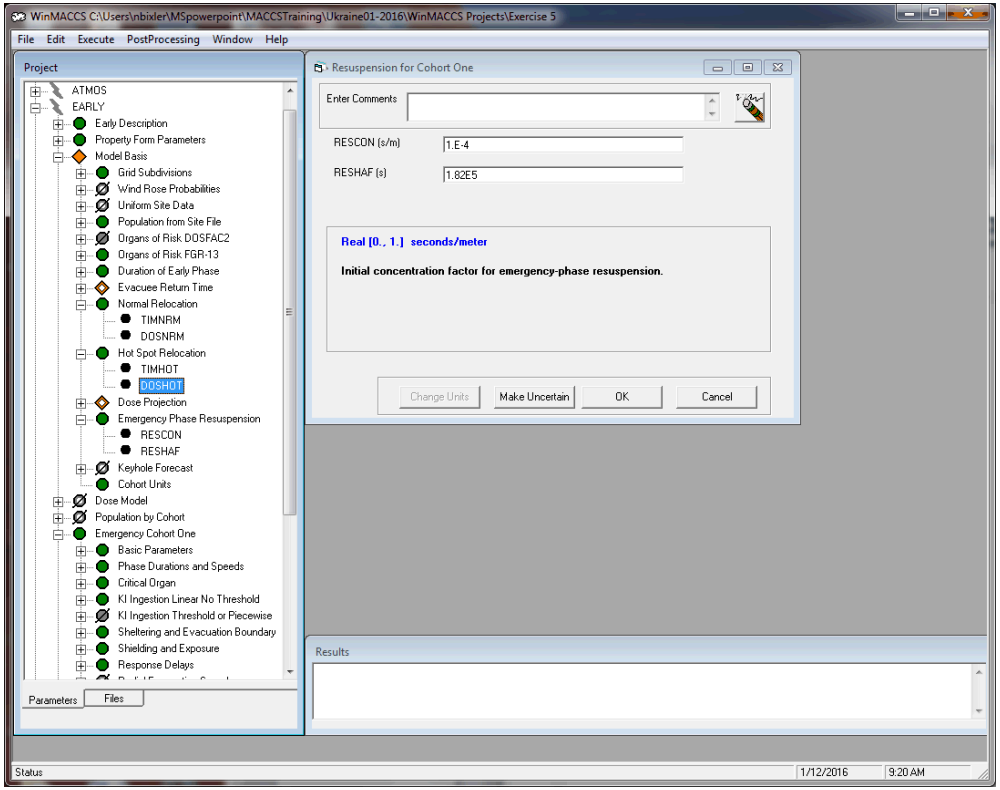
- Parameters depend on site and accident scenario

Considerations on Relocation

- Most countries implement national or international guidance on acceptable dose levels during an emergency
  - Critical organ (usually “effective”)
  - Dose projection period (4 days in the US)
  - Dose level (1 to 5 rem in the US)
- Evacuation of the population near the site is first priority
- Timing is of evacuation is relative to either an alarm or plume arrival
- Dose projections for relocation could be evaluated using computer codes or field measurements
- Timing of relocation may depend on availability of emergency responders
- Relocation does not account for travel route or time
- All non-evacuees are subject to relocation

Emergency-Phase Resuspension

- Parameters are typically
  - Chosen conservatively to account for effects of traffic
  - Don't need to be changed unless new data become available
- Can add up to about 20% to inhalation dose for those who don't evacuate or relocate



Summary

- Most of the basic parameters in the EARLY module are independent of facility and accident scenario
- Relocation dose parameters need to be considered for each site
  - Critical organ for dose projection
  - Dose projection period
  - Levels that trigger hotspot and normal relocation
- Relocation timing parameters may depend on facility and accident sequence and need to be considered for each consequence analysis