2018 MN Power Systems Conference

Spill Prevention Control and Countermeasures (SPCC) - Planning & Development for Substations

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Spill Prevention Control & Countermeasures (SPCC) Regulation

Prevent “Oil” Release to “Navigable” Waters of the U.S.

1973 Federal Regulation
40 CFR 112
SPCC Applicability Criteria

1. Total volume of “oil” in “storage containers” at a “facility” > 1320 gallons.

2. “Reasonable likelihood” oil discharge will reach navigable “Water of the U.S.” (WOTUS)
SPCC History & Substations

- Does transformer = “Oil Storage Container” ??
- 1991 EPA proposes including transformers
- USWAG* lobbied EPA to shape final rule

*Utilities Solid Waste Activities Group
2011 SPCC Amendments

- Added “Oil-Filled Operating Equipment” (OFOE)
  - $55$ gal. capacity
  - Transformers, generators…
- Definition of “Facility” flexibility
  - Can split by operational oversite
  - Allows multi-facility SPCC plans
2011 Amendment - OFOE Containment

- “General Containment”
  - vs sized & impermeable
  - Oil release must not reach WOTUS
  - May consider gravel bed, topography, groundcover…
May adopt
“Alternative Requirements”

- Clean discharge history,
- Inspection program (PE approved),
- Written contingency plan (per 40 CFR 109),
- Senior management certification.

Option is selected instead of ensuring general containment.
Utilities Response to SPCC Amendments

Containment
- All Subs

Site Specific Risk
- Low
- Available

Risk Tolerance
- High
- Resources $$

Alternative Requirements
- Limited
NSP Substations History

Environmental & Substation Engineering Collaboration

- 1980’s start SPCC plans/containment at risky sites
- 2008 Began site-specific evaluations using EPRI software – *(mostly w/o site visits)* – Phase I
- 2009 Began containment retrofits
- 2012 Evaluations redone w/site visits – Phase II
- 2020 Containment retrofits completed
2012 NSP Substation Evaluations

Over 500 Substations

Environmental Services staff, interns & contractors
Substation SPCC Evaluation Process

- Gather Information
- Site Visit
- Determine discharge to WOTUS likelihood
- Document results
- Peer/ SME review
Gather Information

- Site engineering drawings
- Aerial & Topo maps
- State water/ wetland maps
- Stormwater system maps
- Previous equipment inventories
Site Visit Documentation - Substation

- Equipment inventory
- Sub drainage
- ID TR for modeling
- Estimate oil discharge coverage
- Surface cover
Site Visit Documentation - Offsite

- Quantify offsite Sections
  - From Substation to water (WOTUS)
  - Similar characteristics: surface cover, slope, soil
Site Visit Documentation - Offsite

- End-Point WOTUS
  - Lakes, rivers
  - Tributaries to WOTUS
  - Storm drains to WOTUS
  - Wetlands & stormwater ponds connected to WOTUS
Site Visit Documentation
Site Visit Documentation

Key
- Runoff
- Storm Drain
- Culvert
- Buffer
- R.R.
- Man-Made Structures
- Distance

1. Footprint
   Area ~ 1,800 ft², Slope ~1%

2. Moses Section 1,
   ~240' x 25', Grass, Slope 1%

3. Moses Section 2,
   ~20' x 25', Dense Weeds/Water Plants, Slope 2%

Unnamed Stream - connects to Mississippi River

City Stormwater Pond - likely isolated
Site Visit Documentation

Key
- Runoff
- Storm Drain
- Culvert
- Buffer
- R.R.
- Man-Made Structures
- Distance

1. Footprint
   - Area ~1,350 ft², Slope ~1%

2. Discussion
   - Section 1
     ~200’ x 20’, Tall Grass/Weeds/Brush, Slope ~5%

3. Natural Pooling
   - Area ~2,940 ft², Vol. ~87,970 gal, Pond/Weeds ~4’ Deep
Discharge to WOTUS Likelihood

- Obvious Yes/ No
- OR
- EPRI Mineral Oil Spill Evaluation System (MOSES) program
EPRI MOSES Model Inputs

- Oil volume - 100% of largest/ highest risk TR
- Oil coverage area and characteristics
- Distance to water...
- Soils & frozen days/year

- Precipitation
  - Average annual
  - Days rain/ yr
  - 25 year max

- Cannot consider manmade features
  - For SPCC coverage
  - Dikes & ditches
  - Stormwater ponds
EPRI MOSES Modelling

- Model runs simulations with combinations of weather/climate & input ranges
- Used 20,000 runs per EPRI
MOSES Output Report

- Lists all inputs
- Output - probability oil reaches end-point WOTUS

Summary of Results for Base Case

- Probability of spill occurring: Initial 1.0, Recalculated 1
- Spill remaining on gravel bed: Initial 0, Recalculated 0

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<th>Probability of Spill Reaching Surface Water</th>
<th>Initial</th>
<th>Recalculated</th>
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Probabilities include frozen conditions

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Spill contained on land

- Maximum distance travelled: NA ft
Evaluation Challenges/ Discoveries

- Substation drainage
- Contain. For multiple TR’s in Sub:
  - All based on worst case
  - Where appropriate model individual TR’s
- Complex path to WOTUS
  - Long distances
  - Through numerous wetlands/ waters before reach WOTUS
- Used conservative values when in doubt
Management/ Legal set MOSES threshold for SPCC coverage

Also set threshold for requiring containment

Substation Engineering coordinates retrofits
Containment Options

- Concrete dike – *most common*
- Fiberglass walls – *if limitations*
Containment Options

- Clay berms or ditches
- Pond w/ controlled outlet
  - Often required at new sub
- UG vaults in XE Colorado
NSP Evaluation Results

- ~400 evaluations performed
- ~180 Subs identified as subject to SPCC
- SPCC Substations Multi-facility plans
  - NSP MN
  - NSP WI
- 25 Subs under co-located plant SPCC plan
SPCC Multi-Facility Plan

- Lists covered subs
- Evaluation process
- Site documents location (SharePoint)
- Prevention measures
- Inspections program
- Oil release response
- Training
Substation Construction/Modification SPCC Evaluation

- Required whenever
  - Designing new substations,
  - Adding transformers/oil-filled equipment,
  - Replacing existing TRs/oil-filled equipment
- Sub Engineering requests evaluation by Environmental Services.
- Documented in Project Design Guide
SPCC O&M Issues

- Containment maintenance
- Stormwater discharge
- Temp tank containment