# ENSURING THE RESILIENCY OF TH

TRANSPORNER

Dawn Cosentino, PE, CFM Eduardo De Santiago, Ph.D., PE, SE March 13, 2019

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# **Primera**

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# Agenda

Grid Resilience

Flood Risk Assessment and Prioritization

TSS 69 Floodwall Phase 1 Mitigation

Phase II Floodwall Design

Testing the Floodwall

The Keys to Success

#### Grid Resilience

# Severe Weather is the **#1 Cause of Widespread Power Outages**

#### Annual Cost to US Economy for Weather-Related Outages: \$18 - \$33 billion\*

\*August 2013, Economic Benefits Of Increasing Electric Grid Resilience To Weather Outages, Executive Office of the President (Report Prepared by President's Council of Economic Advisers and the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability, with assistance from the White House Office of Science and Technology

#### Grid Resilience



#### October 2011

Illinois Energy Infrastructure Modernization Act

#### **State Initiative**

- \$2.6 billion investment via a ratepayer increase
- Strengthen and modernize the state's grid
- Increase reliability
- Smart Grid Upgrades



#### Substation Flood Risk Assessment & Prioritization



#### Flood Risk Assessment and Prioritization



# TSS 69 North Chicago Substation Selected for Phase 1 Mitigation



#### FEMA Floodway of the Skokie River at TSS 69



### Flood Event at TSS 69



TSS 69 Flood Mitigation Design





#### **HEC-RAS Modeling**

#### Table 6.3: River Station Model Comparisons

FIRM	HEC-2	DUP	Skokie Existing	Skokie Proposed	GHA	GHA Proposed	ComEd	Com Ed Proposed	Comments
	43.876	152	152	152		-	157	152	
w	43,790	151.8	151.8	151.8			151.8	151.8	Pulaski (14 <sup>5</sup> )
			151.6	151.6			151.6	151.6	
			151.4	151 4			151.4	151.4	
			149,133*						
v	43.538	149	149	149	9127.928	9386.092	149	149	••
U	42,899	148			5625,302	5883,466	148	148	16 <sup>th</sup> St
-	42.883	147					- 10		
	12.003				5575	5806.205	147.5	147.5	
					5519 546	5750.45	146.9	146.9	
					5490	3730.13			
					5455 224	5717 296	146.8	146.8	
					5420				
	_				5378 375	5645 343	146.75	146.75	
					5340	3643.343	140.13	140.13	
	-				5297 109	5576 951	146.7	146.7	
					5367	3370.331			
					5330 139	5530 357	146.65	146.65	
	_				5100	5350.557	140.05	140.03	
					5128 220	5450.22	146.55	140.0	Electual
	_				5150.229	5450.25	140.33	140.33	Floodwall
	_				5125				
	_				5106.8/1				
	_				5100.373				
	_				5080	5384 888			The sector of the
	_				5056.489	5384.899	146.5	146.5	Floodwall
	_				5000				The stand
	_				4928.422	5282.913	146.45	146.45	Floodwall
	_				4870				
					4803.164	5182.603	146.4	146.4	Floodwall
					4740	5036.213	146.35	146.35	
	_				4676.387	4904.531	146.3	146.3	
	_				4630				
					4581.326	4801.176	146.25	146.25	
	_				4530				
					4479.356	4686.868	146.2	146.2	
	_				4427	4535.717	146.15	146.15	
	10.055					4395.302	146.1	146.1	
	42.661	146			4374.124	4374.124	146	146	
		145.5			4354.042	4354.038	145.5	145.5	MLK Drive
т	42.653	145			4333.959	4333.959	145	145	
					3550	3550	344 5	144 5	

TSS 69 Flood Mitigation Design



# FLOODWAY PERMITTING 3708 Rules for NE IL





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#### **FLOODWAY PERMITTING – 3708 Rules for NE IL**

To be eligible for a permit, the construction activity must

- 1. Be an Appropriate Use of the Floodway
- 2. Demonstrate that the appropriate use will not reduce floodway conveyance or storage
- 3. Will not increase velocities and flood heights

**Challenge:** None of the Appropriate Uses really fit this project other than #1. Could this project be defined as a Public Flood Control Project?

1. Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding or erosion (Section 18g of the Act) or water quality or habitat for fish and wildlife

"A flood control project which will be <u>operated and maintained</u> by a <u>public agency</u> to reduce flood damages to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed. Nothing in this definition or this Part shall preclude the design, engineering, construction or financing, in whole or in part, of a flood control project under this Part by persons or parties who are not public agencies."

A letter from IDNR-OWR dated December, 2015 concurs that this project falls under the definition of a Public Flood Control Project.

TSS 69 Flood Mitigation Design







#### Floodwall Design





### Access/Security



#### Lift Station Design



#### Agency Collaboration



### Phase III Construction



**Re-Establishment of the Skokie River Channel (ESDD – 2016-2017)** 

STAND AND



**Re-Establishment of the Skokie River Channel (ESDD - 2018)** 

Floodwall Construction April 2017 (inside the fence)

**Flood Gates** 

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Floodwall and new Security Fence, June 2017



#### Discharge, cubic feet per second

Most recent instantaneous value: 37.2 02-27-2019 10:45 CST



USGS 05535000 SKOKIE RIVER AT LAKE FOREST, IL

**USGS Gage Downstream of Substation** 

#### Gage height, feet

Most recent instantaneous value: 2.29 02-27-2019 10:45 CST



USGS Gage Downstream of Substation





Access to the substation during floods



Inundation of the surrounding area



# The Keys to Success:

Establish a Project Charter

Keep in Mind: Stakeholders have different priorities

Have Meetings early and often

Understand each other's constraints

Communicate the **BENEFIT** 

Perception is Someone's Reality

Improve! The Site, the Stream, the Watershed, the Perception

Closeout the Project as Partners in Mitigation



