



Doomsday Prepping at the University of Iowa

Ben Fish

<http://channel.nationalgeographic.com/doomsday-preppers/>

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ABOUT US

Basic Facts

On any given day at UI Hospitals and Clinics, more than 9,000 employees, students, and volunteers collaborate to provide health care to our patients while exceeding their expectations with excellent service.

We are a 730-bed hospital that annually admits more than 32,000 patients for in-patient hospital care. In addition, in fiscal year 2014, we accommodated more than 56,000 emergency department visits. We also represent more than 200 outpatient clinics and care areas receiving just over 914,300 clinic visits at our main campus and community and outreach clinics.

Also in fiscal year 2014, we employed 1,617 physicians, residents, and fellows, and 6,730 non-physician employees, including 1,904 professional nurses. We're assisted each year by a dedicated corps of more than 1,300 volunteers.

We are a 730-bed hospital that annually admits more than 32,000 patients for in-patient hospital care. In addition, in fiscal year 2014, we accommodated more than 56,000 emergency department visits. We also represent more than

ADDRESS





101 Jessup Hall
Iowa City, IA 52242-1316
(319) 335-3500

WEBSITES

[University homepage](#)
[Financial Aid website](#)

ACCREDITATION

NCACS/THLC

-  80.23% Admission Rate
-  25.69% Enrollment Rate
-  69.62% Graduation Rate
-  85.84% Retention Rate

Three quarters of the University of Iowa's R&D expenditures went toward life science-related research in 2012 — but considering Iowa's role as a major contributor of farmed products, it's interesting to note that none of these funds support studies or projects in the field of agricultural science. The school derives virtually all of its R&D budget from either the federal government or institution funds; businesses, nonprofit organizations, and other donors provided only 6.7%.

Total R&D Expenditure: \$446,429

- Engineering: \$132,180
- Other: \$48,658

Funding Sources (thousands of dollars):

- Federal government: \$636,348
- State and local government: \$36,465
- Institution funds: \$80,878
- Businesses: \$62,918
- Nonprofit organizations: \$79,074
- Other donors: \$7,555



What's the worst that could happen?







003/45/7844

Today's talk: How has the University of Iowa prepared for an extended electrical grid outage?

ISAT GeoStar 45
23:15 EST 14 Aug. 2003

Automatic switching to island mode provides reliability – the highest priority



- Return to Menu
- Stm O'view
- Sub U
- Sub U TX 6
- Sub U TX 7
- Elec O'view
- EMERGENCY

Substation L

Purchased Power 41.6MW

TX 3 T

7.4 MW

326 AMPS

13716 VOLTS

PI

TG from the previous picture

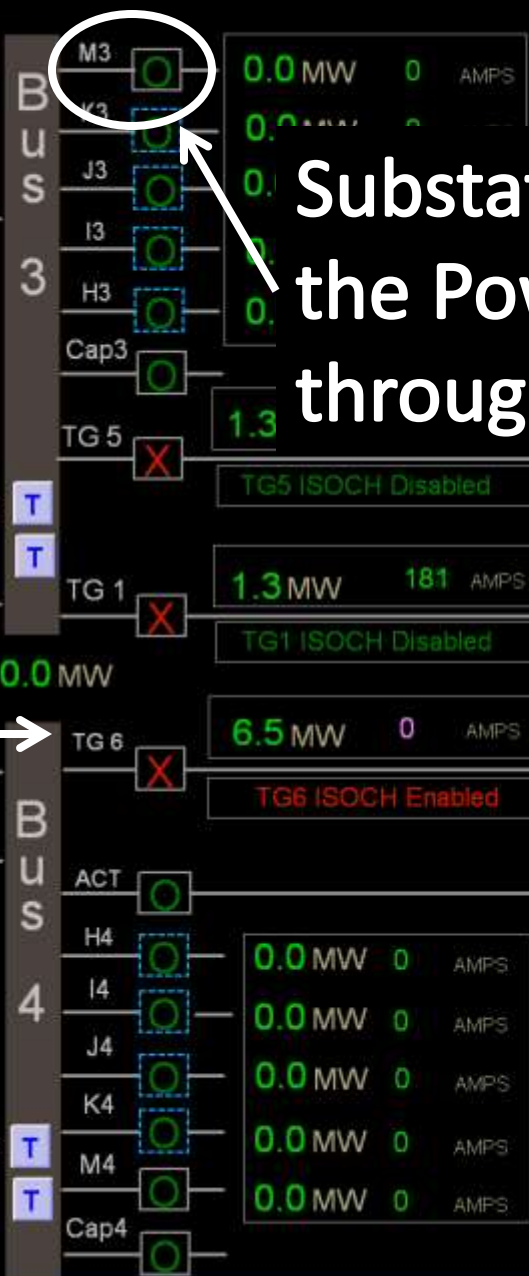
TX 4 T

0.0 MW

0 AMPS

13722 VOLTS

PI



Substation feeding the Power Plant through "M" loop

DG7 OFF T

0.0 MW

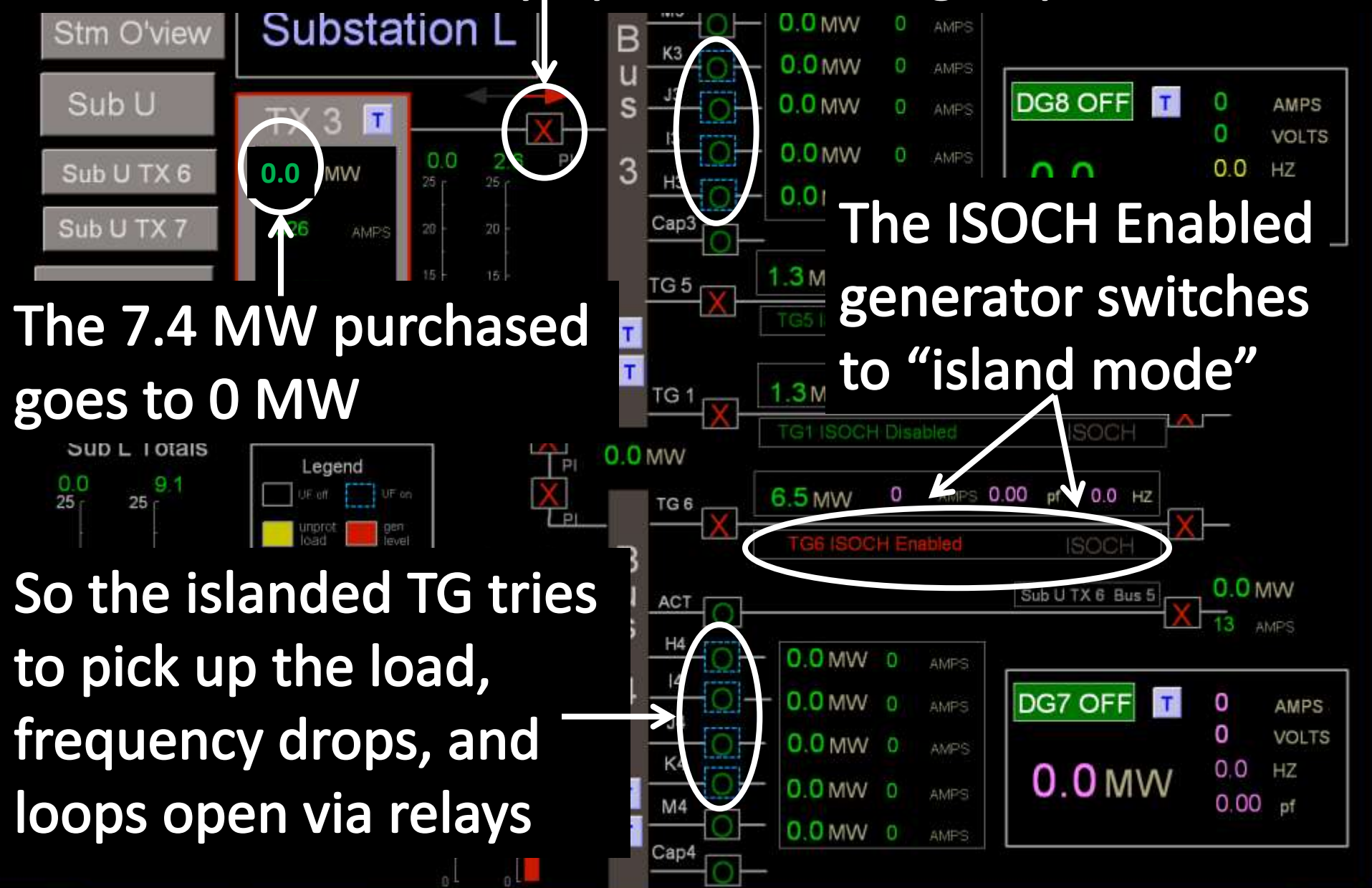
0 AMPS

0.0 VOLTS

0.0 HZ

0.00 pf

If the tie to the utility opens - loss of grid power





<http://www.vladi-private-islands.de>

SHIFT REPORT

CREW #1

6PM-6AM	XXX
6AM-6PM	XXX

Chief Operator:	Billman	Asst. Chief:	Gilmore
Boiler Operator:	Rogers	Utility Worker:	Billman
Start Date:	1-23-2008	End Date:	1-24-2008

EQUIPMENT ON/OFF

BLR 7	St. Bank	BLR 8	St. Bank	TB 1/2	On/On	BLR 10	Auto
BLR 11	Flow Control	TG 1	Air Layup	TG 5	On	TG 6	On

PERSONNEL ATTENDANCE INFORMATION:

Name	Time Of Call	Explanation (Well/Late/Sick/Etc.)	Result (Time Of Arrival, Etc.)	Abs. Rep. Submitted

ON-THE-JOB-INJURIES:

Name	Time	Injury	How It Happened

GAS	EAST	WEST	BLR, TG OUTAGES, SIDELINE DEPRESSURE: CALL PLANT / OPERATION MANAGER!!
9 AM			

TIME:	REMARKS:
6:00 PM	Biomass truck finishing up with unloading.
7:15 PM	Began regeneration of DI train #1.
7:30 PM	Blew soot on #10 boiler.
8:10 PM	Lit #8 boiler.
8:50 PM	#8 boiler on line for load reasons.
9:10 PM	Biomass truck unloading.
11:10 PM	Blew soot on #11 boiler.
11:25 PM	Finished with regeneration of DI train #1. Dumping neutral tank to sewer.
12:00 MID	Gas readings: East - 2685866, West - 4761629.
1:45 AM	Got alarm for "low condensate receiver" for Oakdale. Got a hold of Dave Swartzendruber, and he is going to check it out.
2:15 AM	Biomass truck unloading.
2:25 AM	Lost TX3 and H4, I4, and J4. TG #6 went into ISOC and picked up the load reasonably smoothly. MidAmerican said they lost a 69-KV feeder (I think?) and that caused the problem. Called Electrical Distribution, Ed Alcock, Ben, Steve, and Ferman. At Ferman's direction, I also called Dan Heater.
2:45 AM	TB #1 tripped on low gas pressure at burner.
3:30 AM	Plant back on MidAmerican feed through TX4. Power restored to H4, I4, and J4 also. Ben and Steve tried to get TB #1 going, but low gas pressure problems persist. Will button up boiler as needed and look at the problem first thing in the morning. TX4 selected and ISOC is enabled for this feed. TX3 is "fried" and OOC until further notice.
3:45 AM	Blew soot on #10 boiler a second time.
4:35 AM	Mike called from Oakdale. A line on the dealkalizer broke that resulted in the low condensate receiver alarm. The plant is stable. Mike and Dave are on site working on repairs.
4:50 AM	Biomass truck unloading.
5:30 AM	Got TB #1 to relight. TB #2 tripped about 5 minutes later.
*****	Blew down water columns on all operating boilers.
*****	Greased feeders on #10 boiler.
*****	Attempted to cycle isolation valves for #11 boiler's bottom ash system.
	Neither valve is working.
*****	Stack obstruction lights working correctly throughout our shift.
	See next page

Ferman
Jerry
Ben
Joe
Hal
Mark
Tom
Bob
Office

SHIFT REPORT

CREW #1

6PM-6AM	XXX
6AM-6PM	XXX

Chief Operator:	Billman	Asst. Chief:	Gilmore
Boiler Operator:	Rogers	Utility Worker:	Billman

2:25 AM	Lost TX3 and H4, I4, and J4. TG #6 went into ISOC and picked up the load reasonably smoothly.
	MidAmerican said they lost a 69-KV feeder (I think?) and that caused the problem. Called Electrical

PERSONNEL ATTENDANCE INFORMATION:

Name	Time	Explanation	Result	Abs. Rep.
------	------	-------------	--------	-----------

Low temp that night: -13 F

GAS	EAST	WEST	BLR, TG OUTAGES, SIDELINE DEPRESSURE: CALL PLANT / OPERATION MANAGER!!
9 AM			
TIME:	REMARKS:		
6:00 PM	Biomass truck finishing up with unloading.		
7:15 PM	Began regeneration of DI train #1.		
7:30 PM	Blew soot on #10 boiler.		
8:10 PM	Lit #8 boiler.		

Island mode has been used 5 more times since this incident in 2008

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	look a
	is "fr
3:45 AM	Blew
4:35 AM	Mike
	receiv
4:50 AM	Biom
5:30 AM	Got T
*****	Blew
*****	Grinded regulator on #11 burner.
*****	Attempted to cycle isolation valves for #11 boiler's bottom ash system.
	Neither valve is working.
*****	Stack obstruction lights working correctly throughout our shift.
	See next page

**Reliability first,
then resilience**

rw condemnate	
rs.	
	Ferman
	Jerry
	Ben
	Joe
	Hal
	Mark
	Tom
	Bob
	Office

If reliability fails.....

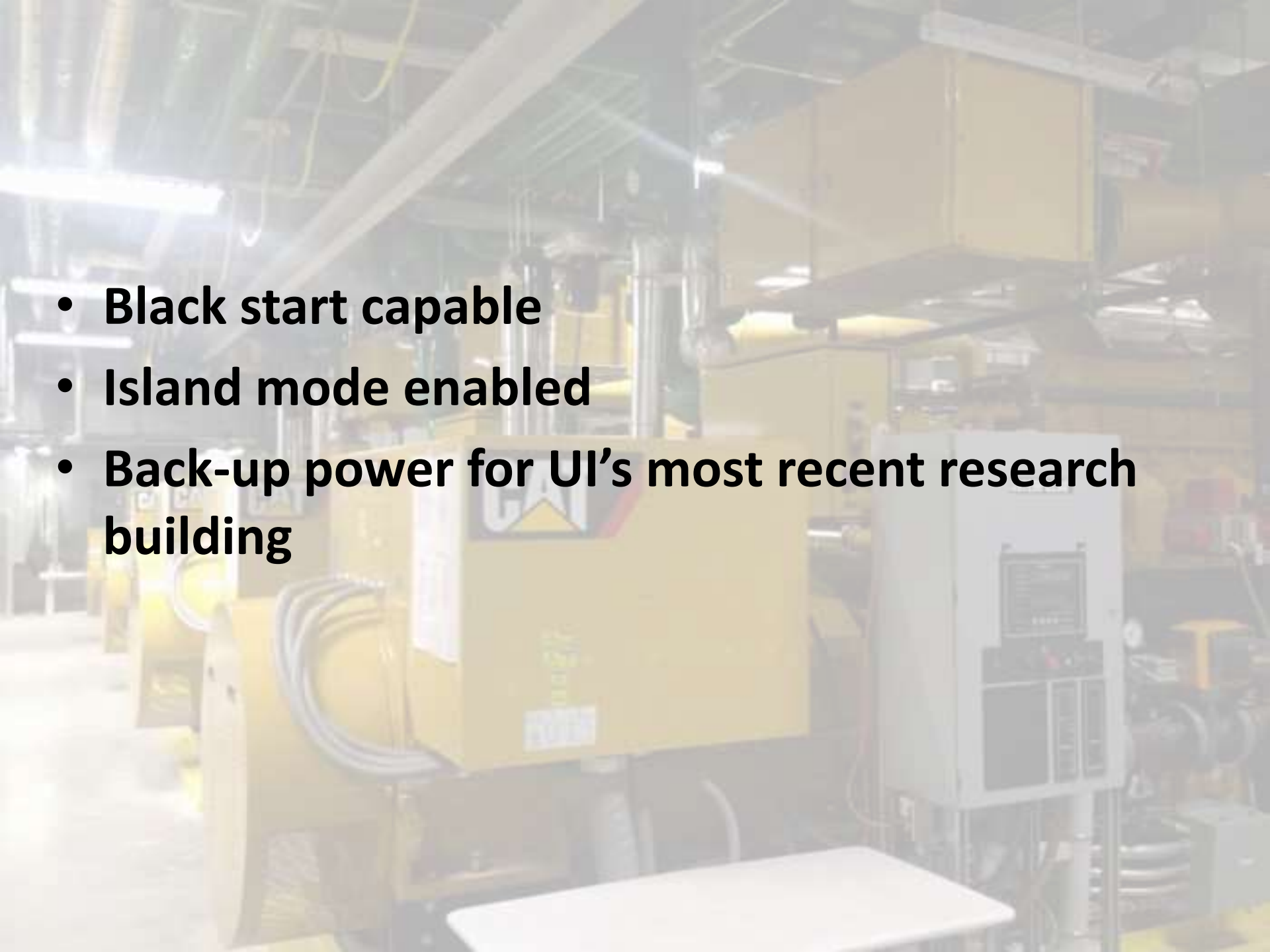
- Diesels in buildings will start up and power emergency circuits
- Problem with this scenario: no steam and no chilled water
- UI response.....

4 x 2MW Natural Gas Recip Engines Foundation of the UI microgrid

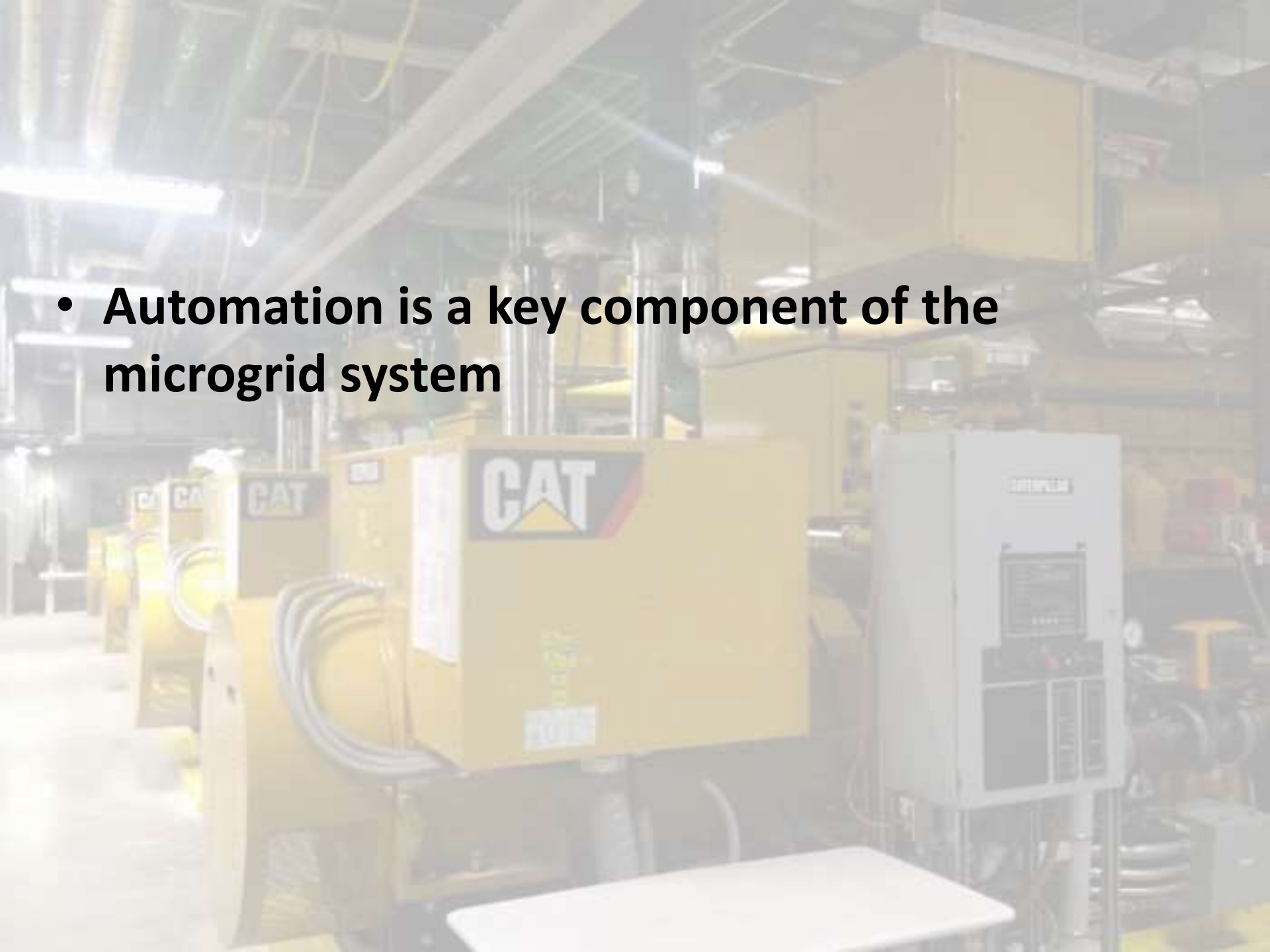




500 year flood level

- 
- The background image shows an industrial environment. In the center, there is a large yellow piece of machinery, possibly a lathe or mill, with a 'GEM' logo on its side. To the right, a grey control cabinet with a digital display and various buttons is visible. The ceiling is high with exposed pipes and lighting fixtures. The overall scene is dimly lit, with the machinery and control panel being the primary focus.
- **Black start capable**
 - **Island mode enabled**
 - **Back-up power for UI's most recent research building**

- **Automation is a key component of the microgrid system**





Steam TG's = 24 MW

Nat Gas Recip
Engines = 8 MW



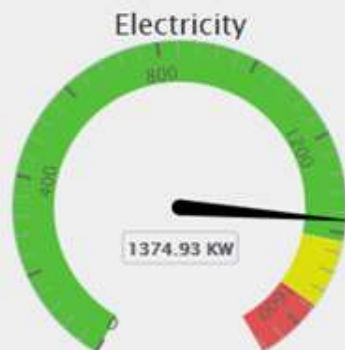
**Next Step – Include building
generators in the microgrid**





Select A Building ▾

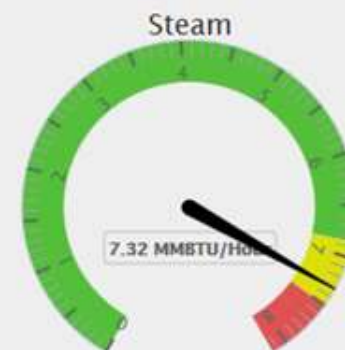
Bowen Science Building



\$128.34 per hour



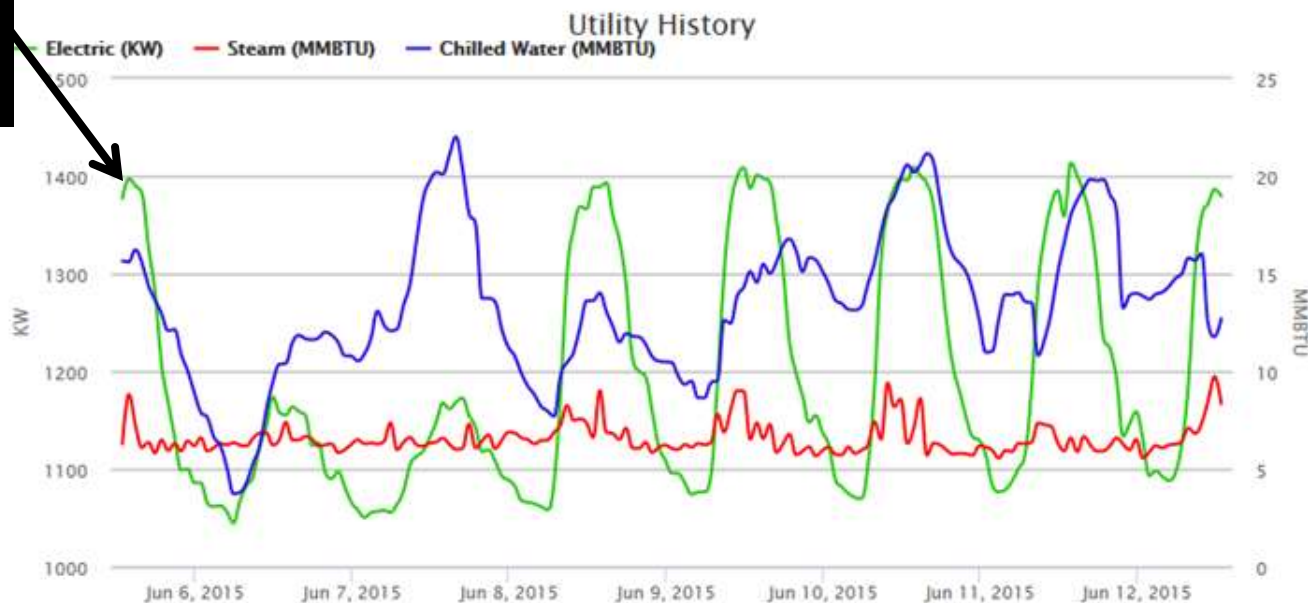
\$281.59 per hour



\$127.65 per hour

Total Utility Cost: \$537.58 per hour

*Ranges are based on hourly prediction. Green=0-105% Prediction; Yellow=105-115% Prediction; Red=115% and up



Normal
electric usage
1.4 MW

Building
generator
1.5 MW


5 emergency diesel generators will be added to the micro grid

Capacity of 6.6 MW



Microgrid summary

- Power Plant steam turbine generators 24 MW
- Power Plant natural gas reciprocating engine generators 8 MW
- Building diesel generators 6.6 MW
- Total microgrid capacity 38.6 MW



Thank you for your attention.

Ben Fish
University of Iowa

Begin deleted slides

Water supply

- Back-up plans for water supply
 - RO system
 - Wells, with back-up power
 - Cross tie with local utility

Steam/Chilled Water

- Boilers to restart after gas gens come up
- West side plant planned to assist in restart of steam
- UIHC boiler saved evacuation in 2008

Electrical back-up

- Across campus tie-two subs are a benefit
- UIHC has back-up gen
- Power plant normally operational TG's
 - Hope to keep these on
 - Trip off loops as island mode goes into effect
- Back-up power plant
 - Used if power is lost to restart
- Micro grid
 - Gives additional power to restart more buildings

Sub U TX 7



0.00 pf

35

GE

TG6 ISOCH Enabled ISOCH

0.00 nf

DG7 OFF T 0 AMPS
0 VOLTS
0.0 MW 0.0 HZ
0.00 pf

25

□

Amps

