Managing Energy Information

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University of Nebraska-Lincoln

(way out west, at the end of the Big 10)

- 25,800 students
- 14.1 million GSF in 190 buildings
- 2 utility plants (480 meters)
 - steam (139)
 - electricity (201)
 - CHW (132)
 - CTW (8)

University of Nebraska-Lincoln

(way out west, at the end of the Big 10)

- 25,800 students
- 14.1 million GSF in 190 buildings
- 2 utility plants (480 meters)
- Direct utility customers (306 meters)
 - electricity (84)
 - natural gas (110)
 - water (112)

How NOT to manage your data as recently as 2016...

- Multiple, overlapping data silos
- Responsibility spread across departments
- Non-standard (ad-hoc) reporting
- Reactive business processes

It used to look like...

auxiliary (chargeback) customers

- Manual reads recorded in spreadsheet
- Paper vendor bills added to spreadsheet
- Splits, deducts & special deals hard-coded
- 3-4 days/month to process

The Color-Coded Spreadsheet (proof that you're a real university utility)

	A	B C	D	G	Н		J	K	L	М	N	0 P		Q	R	S	Т
1	Meter Name	Rte # Vendor	Building	Current	Last Month	Differer	nce Fac	tor Usage	Units	Rate	Cost Bi	llable Current	Billing	INV #	SAP #	Credit GL	Cost Object
2	GAUN.STEAM.COND.EMCS		@ Jackie Gaughan Multicultural Center					327	22 /1000 #'s	5.3600	\$1,753.90	1 \$	1,753.90	17-1365794	17024816	592940	2142150002
3	GAUN.ELEC.BLDG.EMCS	54 UNL Electric	@ Jackie Gaughan Multicultural Center					22493	.00 /kwh	0.0660	\$1,484.54	1 \$	1,484.54	17-1365795	17024816	592950	2142150002
4	GAUN.CHW.BLDG.EMCS	55 UNL Chilled Wa	@ Jackie Gaughan Multicultural Center					1881	00 /ton hr	0.0540	\$101.57	1	\$101.57	17-1365796	17024816	592960	2142150002
5	TELC.STEAM.BLDG.EMCS	132 UNL Steam	@ NETV					750	92 /1000 #'s	5.3600	\$4,024.93	1 \$	4,024.93	17-1365797	17024816	592940	2227010001
6	TELC.CHW.BLDG.EMCS	133 UNL Chilled Wa	@ NETV					24244	61 /ton hr	0.0540	\$1,309.21	1 \$	1,309.21	17-1365798	17024816	592960	2227010001
7	FORL.STEAM.COND.EMCS		@ USDA Forage Research Lab			1		102	CE (1000 #~	E 2600	C1 027 0C	0 51	6619.98	17-1365799	17024816	592940	2333090003
8	FORL.ELEC.BLDG.MANUAL	130 UNL Electric	@ USDA Forage Research Lab	11935							-		.88	17-1365800	17024816	592950	2333090003
9	FORL.WATER.BLDG.MANUA		@ USDA Forage Research Lab	124								City	.69	17-1365801	17024816	592930	2333090003
10	FMP.ELEC.B&C.MANUAL		@ Commonwealth-Panel B & C	58 127							City / East Total	Stm/C.W./	Ea 36	17-1365802	17024816	592950	2333140007
11	FMP.ELEC.I.MANUAL		@ Commonwealth-Panel I	127		TECTOLO	LI LIGLOR				from LES plus	Cooling Twr	0.84	17-1365803	17024816	592950	2333140007
12	FMP.ELEC.MDA .MANUAL	101 UNL Electric	@ Commonwealth-Panel MDA	232 36			CAL USAGE:				Total Generated	Use	.04	17-1365804	17024816	592950	2333140007
	FMP.NGAS.COM.MANUAL		@ Commonwealth	0300.		anuary	11,409,494.00	3,872,930.00	7,536,564.00		12,160,794.00	580,800.00	.04	17-1365805	17024816	592910	2333140007
	FMP.NGAS.CUSTD.MANUAL		@ Commonwealth/Custodial	8153.98		ebruary	11,567,676.00	4,242,446.00	7,325,230.00		12,417,376.00	605,300.00	.00	17-1365806	17024816	592910	2333140007
	UHC.STEAM.BLDG.EMCS		@ University Health Center	99	N	larch	12,124,453.00	4,285,591.00	7,838,862.00		13,399,796.00	932,600.00		17-1365807	17024816	592940	2342120001
	UHC.ELEC.BLDG.MANUAL		@ University Health Center	145 00	A	pril	11,192,808.00	3,969,754.00	7,223,054.00		14,731,637.00	2,560,200.00		17-1365808	17024816	592950	2342120001
	UHC.CHW.BLDG.EMCS		@ University Health Center	01	N	lay	10,066,124.00	3,936,811.00	6,129,313.00		15,436,275.00	4,291,400.00	.63		17024816	592960	2342120001
	NU.STEAM.G.EMCS		@ Nebraska Union	02		une	9,605,400.00	3,564,031.00	6,041,369.00		15,908,435.00	5,048,600.00	.19		17024816	592940	2342151211
	NU.ELEC.BLDG.MANUAL		@ Nebraska Union	2619 03		uly	10,960,281.00	4,414,593.00	6,545,688.00		17,059,060.00	4,258,600.00	.18		17024816	592950	2342151211
	NU.CHW.BLDG.EMCS	58 UNL Chilled Wa				ugust	12,306,595.00	4,269,152.00	8,037,443.00		17,350,573.00	3,349,626.00	.00		17024816	592960	2342151211
	NU.ELEC.KITCHEN.MANUAL		@ Nebraska Union Kitchen	04		-		4,218,364.42					.00		17024816	592950	2342151211
	2 NU.ELEC.IMPPAL.MANUAL		@ Imperial Palace	367 05		eptembe	12,185,684.00		7,967,319.58		17,444,648.00	4,113,277.00			17024816	592950	2342151211
	NU.ELEC.PLANET SUB.MAN		@ Subway	06		ctober	13,089,608.00	4,791,794.58	8,297,813.42		15,717,789.00	2,103,097.00			17024816	592950	2342151211
	NU.ELEC.SBARRO.MANUAL		@ Subway Pizza	594 07		ovembe	11,119,407.00	4,144,023.00	6,975,384.00		14,329,683.00	2,827,400.00			17024816	592950	2342151211
	NEU.STEAM.COND.EMCS		@ Nebraska East Union	08	0	ecembe	11,489,683.00	4,197,695.00	7,291,988.00		13,290,721.00	1,562,670.00		17-1365817	17024816	592940	2342151411
	NEU.ELEC.BLDG.EMCS		@ Nebraska East Union	09									.55		17024816	592950	2342151411
	NEU.CHW.AHG.EMCS		@ Nebraska East Union	10									.76		17024816	592960	2342151411
	NEU.CHW.BLDG.EMCS		@ Nebraska East Union	11	Correct Sep	- State Fai	ir amount incorrect	was 35.217.42 sb	569.880				.99	17-1365820	17024816	592960	2342151411
	CREC.STEAM.SOUTH.EMCS		@ Sapp Rec Center	12					COMMENTS REPORTS				.22	17-1365821	17024816	592940	2342160001
	CREC.STEAM.WEST.EMCS		@ Coliseum	12	Electrical Lk	ane (Auvili	any) = total from rea	dings (which alrea	dy includes Deve	nev) nlus Sta	te Fair <mark>plu</mark> s Capitol (th	e total LES canito	39	17-1365822	17024816	592940	2342160001
	CREC.ELEC.BLDG.EMCS		@ Sapp Rec Center		Liectricaro	luge (riturin	V Srvs Bldg reading	ungs (milen alea	dy included befor	autiliant)	ite i un plus oupitor (in	e total EEO capito			17024816	592950	2342160001
	2 CREC.CHW.NORTH.EMCS		@ Sapp Rec Center-North	14		10	vi Sivs blug reading:	s - which are alrea	ay included in the	auxiliary.)			.31		17024816	592960	2342160001
	3 CREC.CHW.SOUTH.EMCS		@ Sapp Rec Center-South	15									.81	17-1365825	17024816	592960	2342160001
34			@ C/P Tennis Courts	40418. 16	E		uxiliary Formula						.65	17-1365826	17024816	592950	2342160001
	COOK.ELEC.BLDG.MANUAL		@ Cook Pavilion-Campus Rec	7183. 17			otal Auxiliary from						.44		17024816	592950	2342160001
36	MABL.ELEC.REC FIELDS.M	91 UNL Electric	@ Mabel Lee-Rec Field	164 18		+ S	tate Fair (Energy) f	rom LES bill					.64	17-1365828	17024816	592950	2342160001
				19		+ State Capital (Energy) from LES bill LESS IM Services from our readings											
				20		Beginning April 2004 - IM Svcs no readings											
					-					-							

It used to look like...

most buildings, including most auxiliaries

- Automatic, hourly meter reads stored in BAS
- Batch process summed monthly totals
- Non-auxiliary manual reads entered
- Manual data validation
- Batch process applied splits & deducts
- 1-2 days per month to process

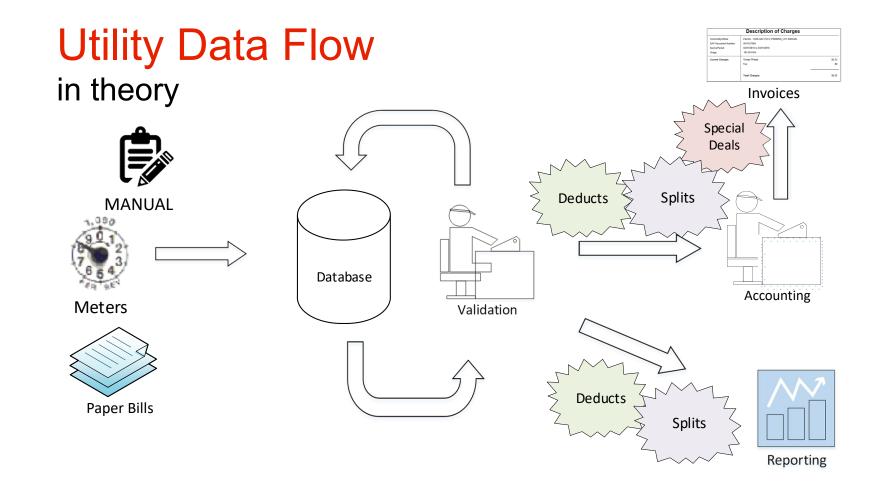
It used to look like...

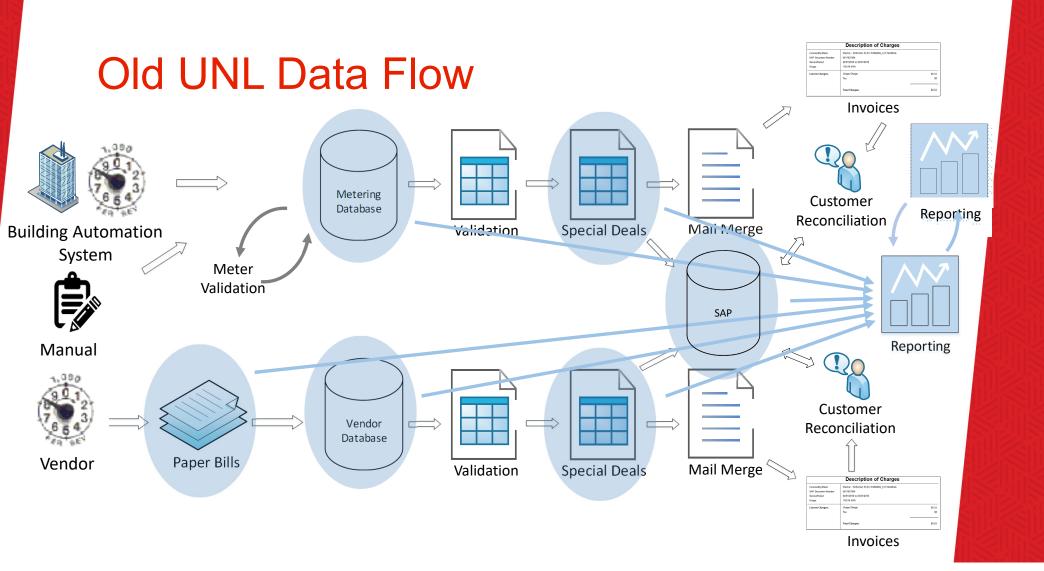
ad-hoc reporting

- Export data from BAS database into CSV
- Merge with accounting spreadsheets
- Manually remove duplicates
- Analyze data as requested
- 4 hours to 5 days per report

There were some good things

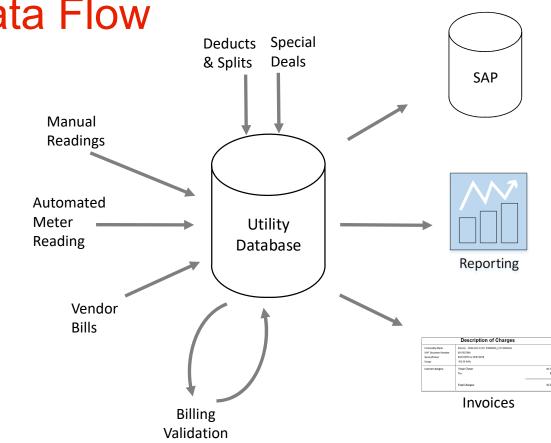
- Almost all meters connected to our BAS
- 6-10 years of historical data available
- Splits and deducts were well documented
- BAS had good data visualization tools
- LUCID dashboards for dorm competitions





Goals for Good Energy Data

- Single, accessible system-of-record
- Efficient means to
 - maintain data
 - invoice customers
 - prepare standard & special reports
- Visibility to campus
- CONFIDENCE



Ideal Data Flow

Who uses this data?

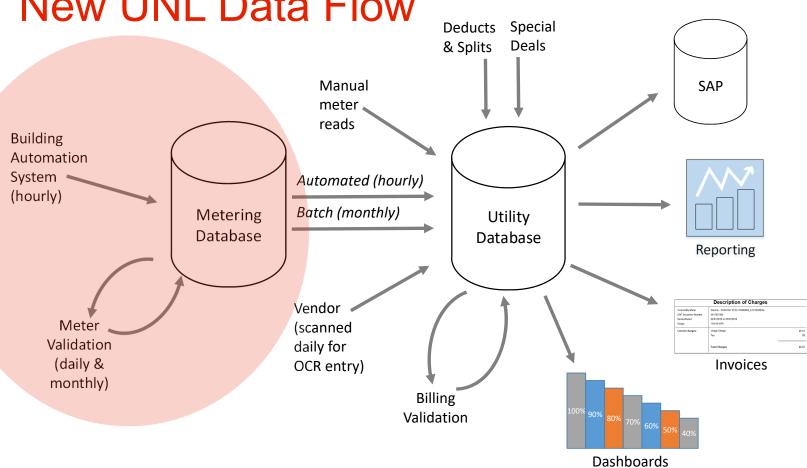
(or would, if it was reliable and they could find it)

- Administration
- Accounting
- Utility Plant
- Facilities

- Faculty
- Sustainability
- Students
- Public

Implementation

- Ten-month process
- Configure new system (many reviews)
- Import old meter definitions and data
- Verify correct meter configuration
- Validate against historical data
- Change & create SOPs



New UNL Data Flow

Conclusions

reduced staff overhead

- $\frac{1}{2}$ day to process billing
- OCR BillCapture replaces manual entry
- reduced time to prepare reports
 - EnergyCAP standard reports
 - database structure makes SQL reports easier
- standard audit/correction procedures

Conclusions

improved data visibility & usability

- standard, clickable graphic display
- one-click copy data to clipboard
- simple meter selection (well-designed tree)
 - separate views for accountants and engineers
 - separate views for other NU campuses
- effortless weather data normalization
- dashboard widgets provide data to campus users

Conclusions

improved CONFIDENCE in our data

- single system-of-record
 - standard, repeatable reports
 - audit trail & consistent correction processes
 - secure, but widely available
- automatic billing audits improve validation steps
- improved collaboration between data users
- common language to describe our data