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Northwest **Power** and **Conservation** Council

November 8, 2016

MEMORANDUM

TO: **Power Committee**

FROM: **Kevin Smit, Charlie Grist**

SUBJECT: Industrial Sector Research Results

BACKGROUND:

Summary   In April 2016, Council staff issued an RFP to conduced energy load and efficiency research for selected industrial segments. This presentation will summarize the results of this work, completed in September 2016.

Relevance   Several Seventh Power Plan Action Plan items called for improved data on the region's industrial sector.

Workplan: A. Implement the Seventh Power Plan and related Council priorities, and C. Prepare for 8th Plan.

Background: Council staff released an RFP in April and selected three different contractors to provide energy load and efficiency research on industries that make up the Northwest industrial sector. The approach was to find contractors with industry-specific expertise that could produce results from in-house and other available sources. These three contractors were able to provide data and information on 14 of our 20 industrial segments. The primary results include total segment energy consumption, end-use disaggregation, and energy efficiency measures. Also included for each segment is a large facility data set that will be used now and in the development of the Eighth Power Plan. The results of this effort will serve as the region's industrial stock assessment.

More Info: Separate reports or presentations are available for each industrial segment.

Industrial Load and Energy Efficiency Research

Power Committee Meeting

November 2016

Coeur d'Alene, Idaho

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Objective and Scope

- Staff issued RFP (April 2016) for energy load and efficiency research on the NW Industrial sector
- Overall goal of the research is to develop an Industrial sector stock assessment:
  - New data for segment-specific load forecasting
  - New baseline data for the Eighth Plan EE assessment
- Work scope - four components for each industry segment:
  1) industry description and detailed definition
  2) estimate of total annual energy use in the PNW
  3) electric end-use shares, i.e. lighting, motors
  4) energy efficiency and demand response information
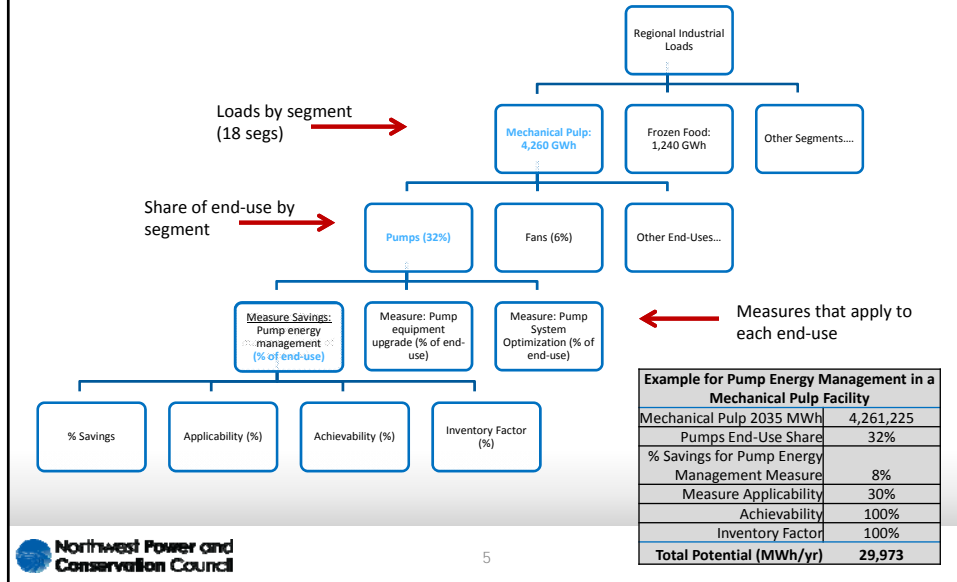
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Related Action Plan Items

- ANLYS-1 – Improve industrial sales data
  - Need data for segment-specific consumption
  - Need new metrics and trends for forecasting growth
- REG-7 – Sector specific stock assessments
  - Residential Building Stock Assessment (RBSA) - NEEA
  - Commercial Building Stock Assessment (CBSA) – NEEA
  - No one is planning an Industrial Stock Assessment
- ANLYS-9 – Improve understanding of electric savings in water and wastewater facilities
- Others:
  - Reg-1 – Develop end-use load shapes
  - Various DR – Obtain industrial demand response information

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Load Forecasting

- **EIA provides total industrial annual industrial load (not segmented)**
- **Three primary components for each segment:**
  - Consumption metric (e.g., MWh/employee, or MWh/output)
  - Total MWh for the segment
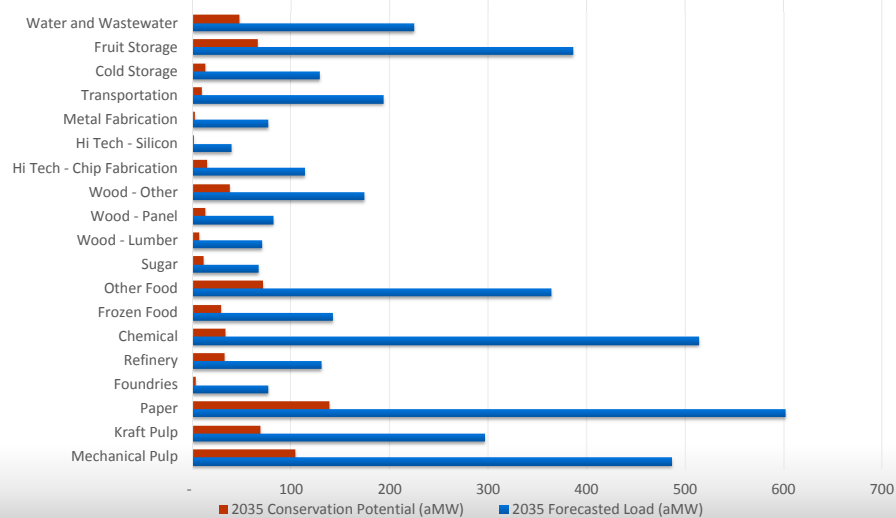 - Productivity index (from Advisory Groups)

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Industrial EE Model Structure

Example for Pump Energy Management in a Mechanical Pulp Facility	
Mechanical Pulp 2035 MWh	4,261,225
Pumps End-Use Share	32%
% Savings for Pump Energy Management Measure	8%
Measure Applicability	30%
Achievability	100%
Inventory Factor	100%
Total Potential (MWh/yr)	29,973

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Industrial Segments
(Forecasted Load and EE Potential)

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Research Approach

- **The approach was to work with industry experts:**
  - **Industry experts have in-house knowledge and quick access to key resources**
  - **Low cost:** **No surveys or direct contacts with industrial facilities (sensitive data & relationship)**
    - **Use in-house data**
    - **Available third party information**
  - **Hoped to complete 5-8 industrial segments in 2016 (out of 20)**
  - **Possible additional research in the 2017-2019 timeframes**

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Contractors and Segments

- **Three contractors selected:**
  - **Energy350**
    - Cold Storage
    - Wood (Lumber, Panel, Other)
    - Water and Wastewater
    - Metal Fabrication
  - **Northwest Food Processors Association**
    - Frozen Food
    - Sugar
    - Other Food
  - **Forefront Economics/SBW Consulting**
    - Mechanical pulp
    - Kraft pulp
    - Paper
    - High Tech – Chip Fabrication
    - Plus some screening of other industries

- Had significant in-house data and expertise
- Completed many in-region projects with utilities and industrial facilities

- Very focused industry experience
- Recent DOE energy efficiency project – significant data set

- 3rd Party database access and experience (InfoUSA) – provided verification and updates of data set
- Also worked with DOE MECS data

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Segment Research Coverage

7P EE Industry Segments	NAICS CODE	2016 Load (MWh)	2035 Forecasted Load (MWh)	2035 EE Potential (aMW)	Research Company
Wood - Lumber	3211	896,967	620,280	7	Energy350
Wood - Panel	32		18,938	13	Energy350
Wood - Other	32		25,349	38	Energy350
Cold Storage	493		29,112	13	Energy350
Water and Wastewater	22		71,000	47	Energy350
Metal Fabrication	332	1,217,707	668,274	2	Energy350
Foundries	331	919,014	673,247	3	Energy350
Mechanical Pulp	322	2,942,389	4,261,225	104	Forefront/SBW
Kraft Pulp	322	1,840,469	2,596,442	69	Forefront/SBW
Paper	322	3,534,456	5,267,664	139	Forefront/SBW
Hi Tech - Chip Fabrication	3344	1,006,046	999,801	15	Forefront/SBW
Frozen Food	31141	1,324,321	1,243,766	29	NWFPA
Other Food	311	2,411,166	3,189,467	71	NWFPA
Sugar	3113	418,210	582,684	11	NWFPA
Refinery	324	765,228	1,143,256	32	U
Fruit Storage	49313	1,661,027	3,380,049	66	U
Chemical	325	2,313,569	4,496,577	33	U
Hi Tech - Silicon	32518	284,345	347,399	1	U
Misc. Manufacturing		4,029,756	4,717,786	37	U
Transportation Equipment	336	1,076,667	1,697,223	9	U

Research conducted on 14 of our 20 Industrial segments.

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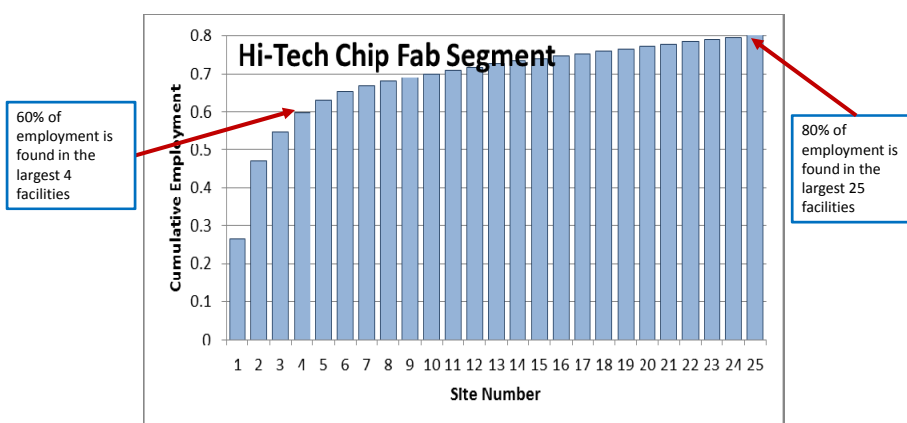
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Overall Results

- The research produced data sets for <u>14</u> of 20 industrial segments
- Have developed key metrics for each industry
  - kWh per employee (various segments)
  - kWh per MGD(million gallons per day, water)
  - kWh per cubic foot (cold storage)
- The data sets provide a solid and flexible platform
  - Plan to use this approach and analysis platform moving forward
  - Maintain database of key industrial facilities by segment
  - Staff will continue to augment the data through our contacts and utility partners

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Some Examples

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Data Screening Example

60% of employment is found in the largest 4 facilities

80% of employment is found in the largest 25 facilities

The contractor for this segment focused on data verification of the largest 25 facilities. For future updates the obvious place to start is the largest 4 facilities.
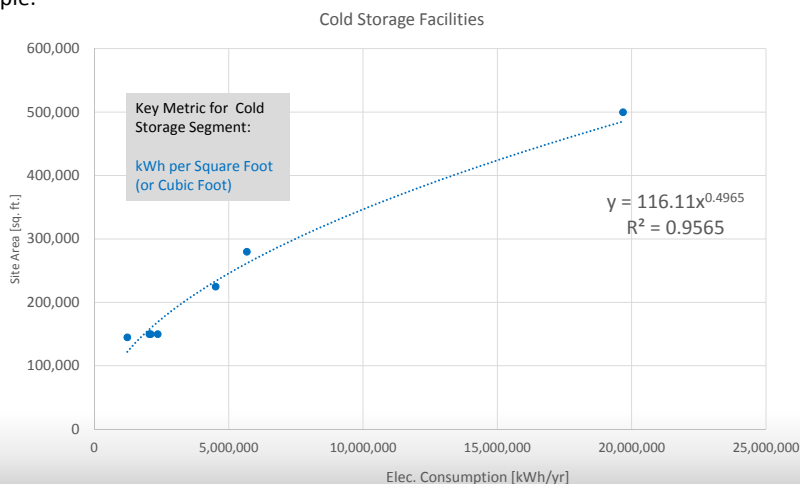
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Location Review

Example:

- **Correct company name and determine ownership changes**
- **Confirm address**
  - **With company website**
  - **Visual 'earth' view on Google Maps**
  - **Compare close-by addresses**
- **Add plants located but not on list**
- **Determine plant closures**
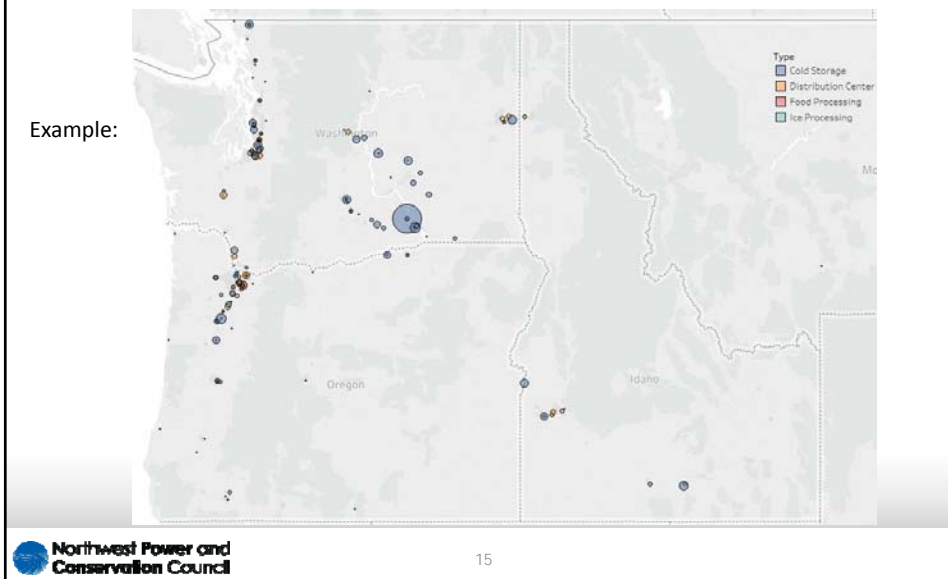
Intel Ronler Acres, Hillsboro OR
Google Maps

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10/05/2016

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Cold Storage Facilities:
Correlation of Building SF and kWh

Example:

Cold Storage Facilities

Key Metric for Cold Storage Segment:

kWh per Square Foot (or Cubic Foot)

$y = 116.11x^{0.4965}$
$R^2 = 0.9565$

Site Area [sq. ft.]

Elec. Consumption [kWh/yr]

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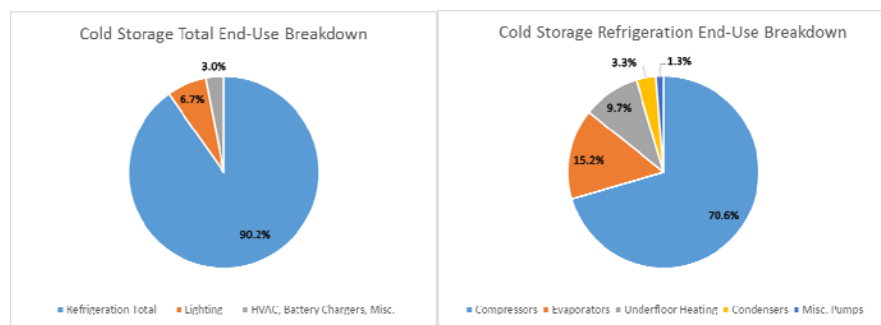
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Cold Storage Facilities in the PNW

Example:

Cold Storage - Electricity End-Uses

Example:

High Level Results
(Note: not the final answers)

7P EE Industry Segments	NAICS CODE	2016 Load (MWh)	Results of Research (MWh)	Key Metric	Research Company
Wood - Lumber			932,000	kWh per MMBF[1]	Energy350
Wood - Panel			1,141,400	kWh per MMBF[1]	Energy350
Wood - Other			1,525,000	kWh per MMBF[1]	Energy350
Cold Storage			648,036	kWh/SF (cu.ft.)	Energy350
Water and Wastewater			1,358,000	kWh/MGD[2]	Energy350
Metal Fabrication			480,924		Energy350
Foundries			1,010,904		Energy350
Mechanical Pulp					Forefront/SBW
Kraft Pulp			3,618,718	kWh per Employee	Forefront/SBW
Paper					Forefront/SBW
Hi Tech - Chip Fabrication			4,299,603	kWh/employee	Forefront/SBW
Frozen Food			1,919,006	kWh per pound	NWFPA
Other Food				kWh per pound	NWFPA
Sugar				kWh per pound	NWFPA
Refinery	324	765,228			U
Fruit Storage	49313	1,661,027			U
Chemical	325	2,313,569		Future research	U
Hi Tech - Silicon	32518	284,345			U
Misc. Manufacturing		4,029,756			U
Transportation Equipment	336	1,076,667			U

Staff will continue to work with the data sets and templates and improve confidence prior to Eighth Plan

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1. Million Board Feet
2. Million Gallons per Day

Summary

- **We now have an industrial stock assessment similar to the RBSA and CBSA** (for 70% of the Industrial Sector)
  - Detailed industry definition – production, employment, trends, processes, metrics, etc.
  - Estimate of total energy consumption by segment
  - Breakdown of segment consumption by end-use or process
  - Identification of energy efficiency measures and savings
  - Database of large industrial facilities
    - Will enable us to track shifts in the industry over time
    - Will maintain confidentiality where necessary
  - Flexible platform: can easily add and update as needed
- **The primary benefits include**
  - New data for industry-specific load forecasting
  - The improved segment loads will result in better industrial potential estimates for the 8th Plan

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