CHP MINOR SOURCE PERMITTING – THE FUTURE IS SMALL

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Session 4C – Regulations, Permits & Codes

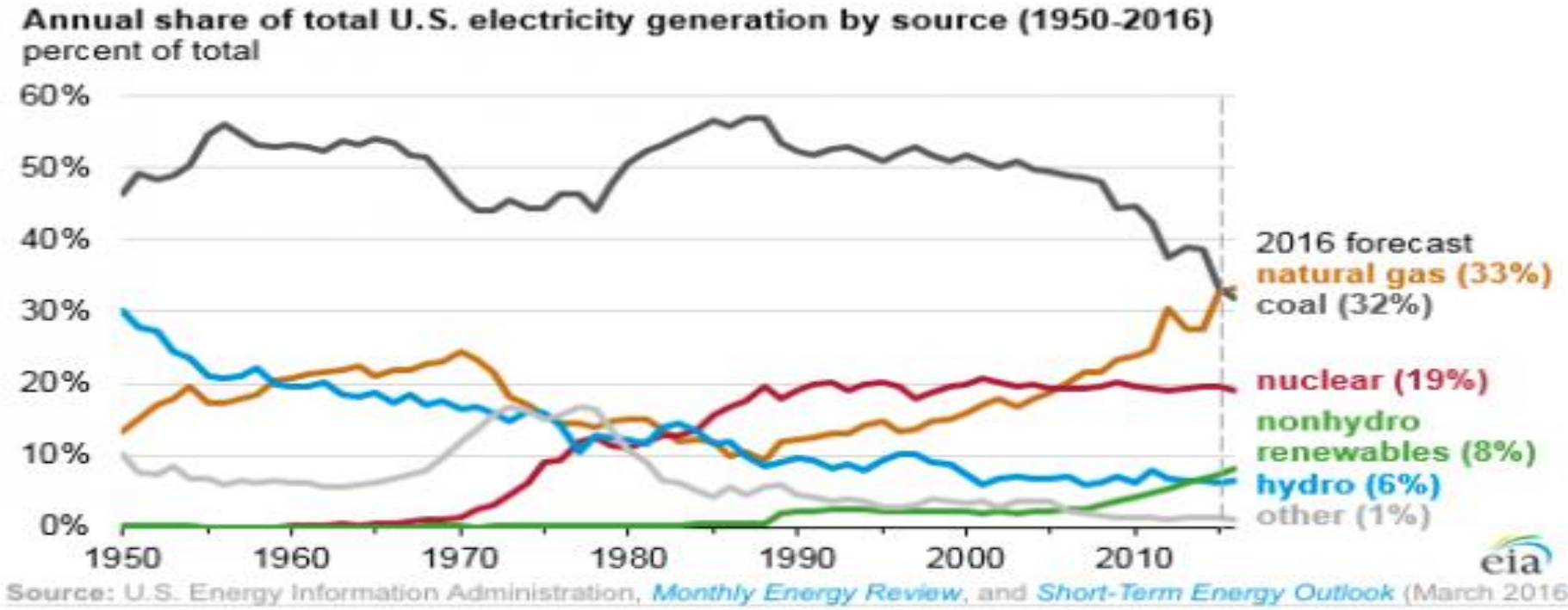
February 22, 2017

CampusEnergy2017
February 20-24 | Hyatt Regency Miami | Miami, FL

Agenda

- Introduction
- Permitting Overview
- Permitting Steps
- Takeaways

Introduction



- Many new rules (NAAQS/NSPS/MACT/CCR/ELG/GHG/CPP)
- Decreased demand / Increased renewables / Gas fracking
- Coal plant retirements +
- New gas-fired CTG / RICE / CHP / DG / Microgrids

Introduction

My Presentation

- *Permitting can be quicker and easier, need to be strategic*
- *Focuses on new, small CTGs at existing industrial plants*
- *Applies to industry, district energy, university, municipal utility*
- *Cautions*
- *Case Study of BYU Retrofit of CHP at Heating Plant*

Permitting Overview

Construction Permitting

- *Permit Required*
- *New Source Review (NSR) guides the process*
- *PSD review/permit*
- *Nonattainment Area (NAA) review/permit*
- *Major or minor modification*
- *"True" minor or "synthetic" minor*
- *Synthetic minor requires operational restrictions*

Overview: PSD Major Modification

Adds Permitting/Project Time, Cost, Uncertainty

Best Available Control Technology (BACT)

- *Lowers emission limits / Adds emission controls*
- *May be required by state anyway*

Dispersion Modeling

- *Stringent impact limits can lower limits and raise stacks*
- *May be required by state anyway (or prudent)*

Ambient Monitoring (possible)

- *Pre-application / Post-construction*

Overview: NAA Major Modification

Adds Permitting/Project Time, Cost, Uncertainty

Lowest Achievable Emission Rate (LAER)

- *Equal to or better than BACT*
- *Lowers emission limits / Adds emission controls*

Offsets

- *Purchase emission reduction credits (ERCs) from regional sources*
- *ERCs may not be available in region*

Permitting Steps

1. Define Project (Key*)**

- *Consider CTG, HRU, hours, capacity, options*
- *Ensure team understanding and agreement*
- *Carefully consider revisions*

2. Prepare Application

- *Incorporate project definition and calculations*

3. Agency Review

- *Coordinate with agency review and permit issuance*

Step 1: Define Project

Who Defines

- *Either everything is determined for you, or*
- *You influence the definition (recommended).*

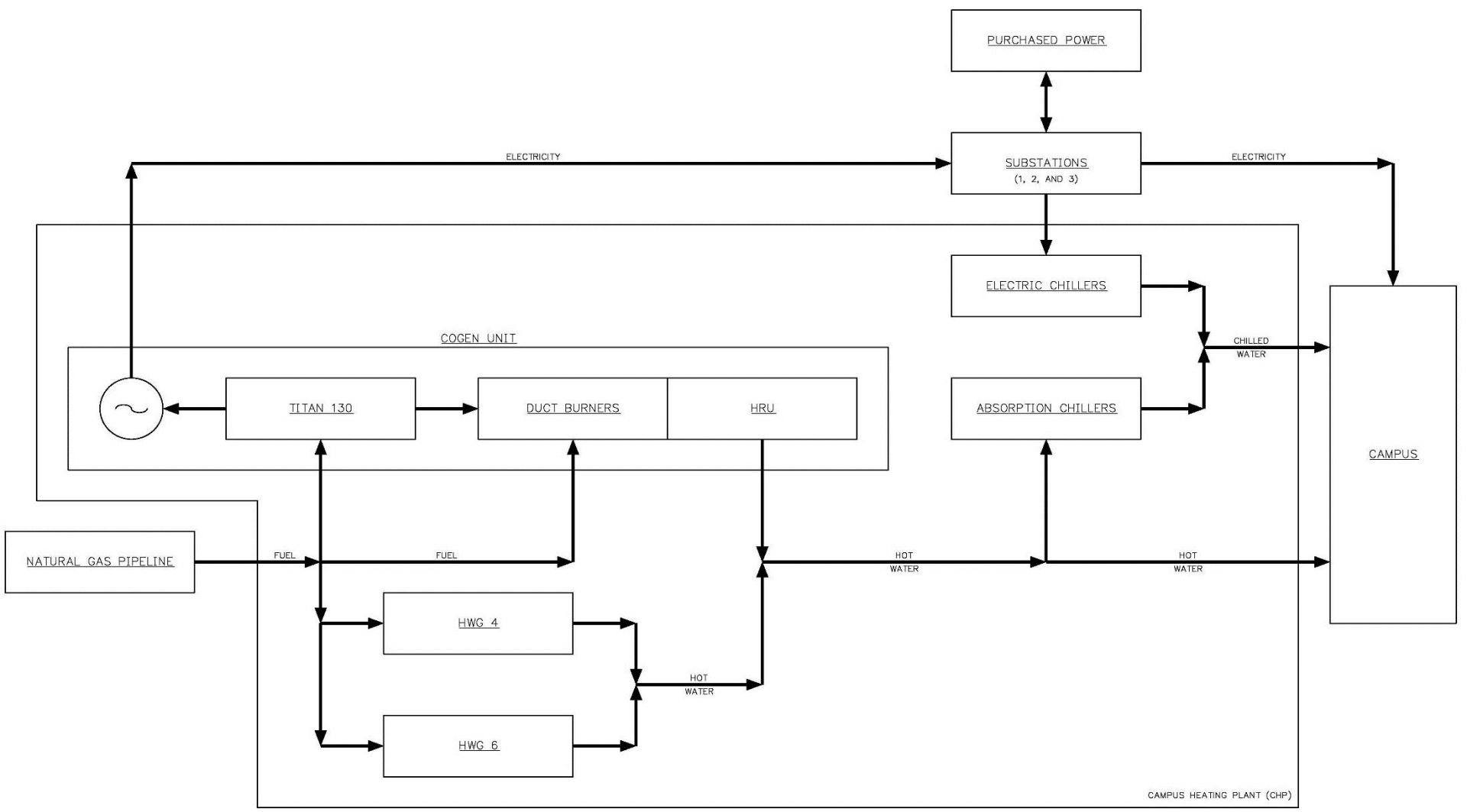
Participate In The Process

- *Understand the Goals and Constraints*
- *Educate the Team of Permitting Criteria*
- *Assess (CTG vendors, HRU vendors, fuels, hours, capacity)*
- *Develop Options*
- *Communicate – Provide Feedback and Influence*

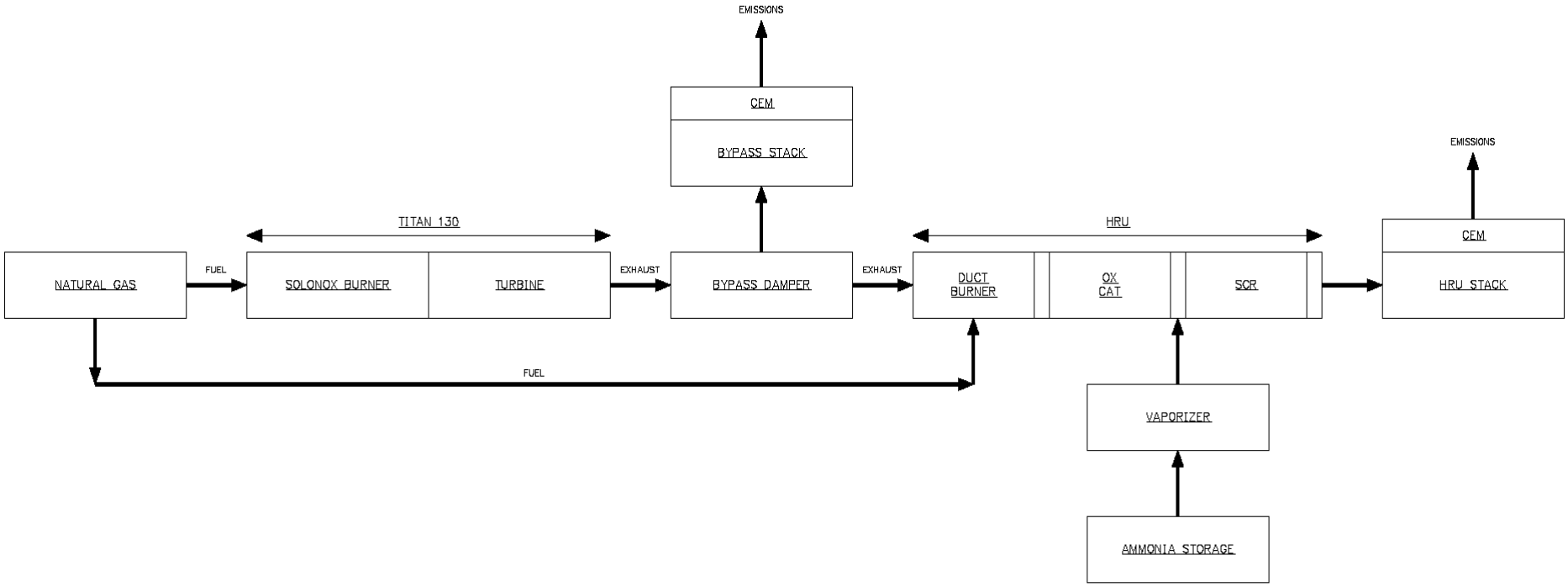
BYU Central Heating Plant - Before

BYU Central Heating Plant – After CHP

BYU Central Heating Plant CHP



BYU Central Heating Plant CHP



Step 1: Define Project

Turbine	Solar Mars 100		SGT-400 12.9 MW		Solar Titan 130 15 MW		SGT-400 14.4 MW		Solar Titan 130 16.2 MW	
HRU Option	**85**	**140**	**85**	**140**	**85**	**140**	**85**	**140**	**85**	**140**
Turbine (tons)	5.40	5.40	8.03	8.03	7.86	7.86	13.42	13.42	13.96	13.96
Bypass (tons)	0.02	0.02	0.12	0.12	0.29	0.29	1.95	1.95	1.48	1.48
Duct Burner (tons)	1.75	2.12	1.56	1.93	1.37	1.75	0.99	1.36	1.11	1.48
HWG (tons)	6.45	0.02	6.45	0.02	6.45	0.02	6.45	0.02	6.45	0.02
Total (tons)	**13.62**	**7.56**	**16.16**	**10.10**	**15.98**	**9.91**	**22.80**	**16.74**	**22.99**	**16.83**

Figure 1 - Estimated Annual CHP NOx Emissions (PRELIMINARY)

Turbine	Solar Mars 100		SGT-400 12.9 MW		Solar Titan 130 15 MW		SGT-400 14.4 MW		Solar Titan 130 16.2 MW	
HRU Option	**85**	**140**	**85**	**140**	**85**	**140**	**85**	**140**	**85**	**140**
Uncertainty (tons)	5.98	4.69	6.46	5.17	7.25	5.96	10.29	9.00	9.90	8.61
Best Case (tons) (from Fig. 1)	13.62	7.56	16.16	10.10	15.98	9.91	22.80	16.74	22.99	16.93
Total (tons)	**19.59**	**12.24**	**22.62**	**15.28**	**23.22**	**15.88**	**33.09**	**25.74**	**32.89**	**25.54**

Figure 2 - Estimated Annual CHP NOx Emissions with Uncertainty (PRELIMINARY)

Step 1: Define Project

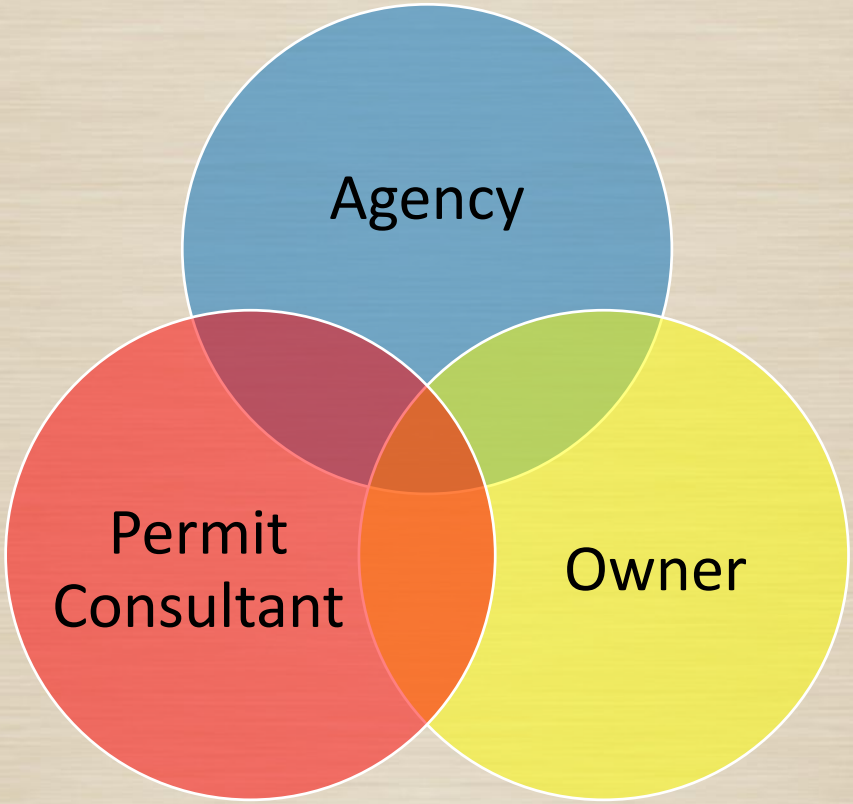
Key Definitions – BYU CHP Project

- *HRU bypass damper/stack to match current campus demand.*
- *Limit annual NOx from CTG/HRU and existing gas-fired boilers (HWGs) to become minor.*
- *CEMS to limit NOx – maximize operation. (UDAQ Input)*
- *Modeling and architecture – Impact on stack height/diameter.*

Considerations

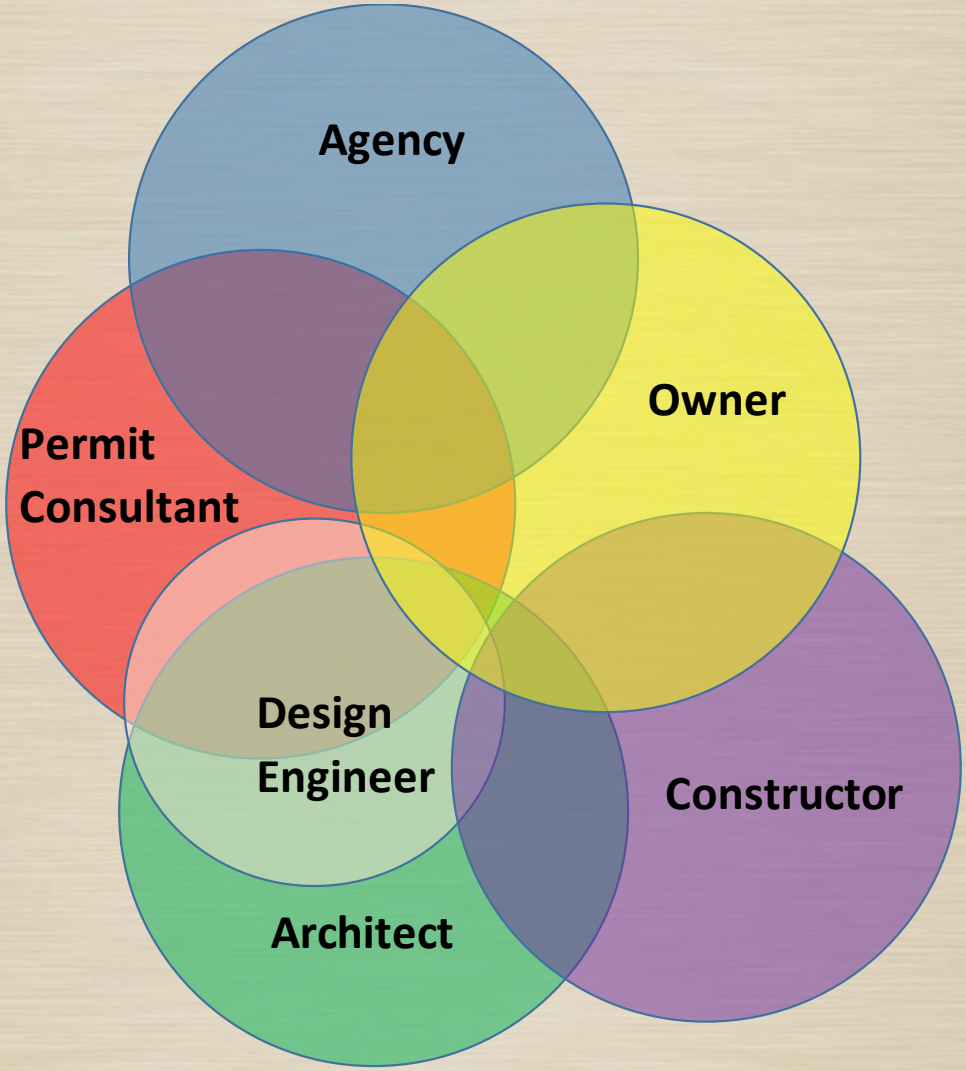
- *Requires clear explanations. Do not assume something is acceptable just because you don't hear back.*
- *Ensure commitment is made high enough in the "food chain."*
- *Communication, clarity, commitment.*

As an Aside: Communications



Typical Simple Project Communications Diagram

As an Aside: Communications



Non-Traditional Project Communications Diagram

Step 2: Prepare Application

What

- *Cover letter, forms, calculations, and supporting text document.*

Considerations

- *Communicate with agency to completely understand.*
- *Clearly and completely reflect the project and all operational features.*
- *Clear netting analysis with all steps and documentation included.*
- *Clearly propose emission/operation limits and monitoring requirements.*
- *Include process flow diagrams and proposed permit conditions.*

Goals

- *Package understood by Owner and design team.*
- *Package with low chance of agency confusion and information requests.*

Step 3: Agency Review

BYU CHP Retrofit at Heating Plant

- *Application submitted early August 2016.*
- *Meetings. BYU has excellent relationship.*
- *Required separate application for demo/construction period.*
  - *Gas boilers must cover campus demand throughout entire period.*
  - *Temporary stack for boiler operation.*
  - *Annual gas consumption beyond current permit limit.*
  - *Gas-fired boiler operation beyond 10% annual capacity factor limit.*
  - *Triggers NSPS CEMS in temporary stack.*
- *Draft permit conditions soon to be issued for review.*

Takeaways

1. *"Small" CHP plants on the rise.*
2. *Avoid major source NSR to improve schedule, cost, and certainty.*
3. *Influence the definition. Consider equipment and operational options to produce a variety of scenarios for team discussion and agreement.*
4. *A properly defined project will be the result of matching source/budget/operational needs with strategic selection of equipment, emission, monitoring, and operational conditions.*
5. *Understand Non-Utility Environment: More players, unique design requirements, space limitations, and operational needs.*
6. *Ensuring complete understanding and agreement to project definition is key to a successful permitting process with minimal surprises.*
7. *Of utmost importance:* ***COMMUNICATION, CLARITY, COMMITMENT!***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