Low hanging fruit

1. Start collecting ENERGY DATA real time, display, analyze, correlate with weather, etc. Also for sub-systems (e.g. chillers, plug loads, lighting). Make energy use visible! So, you know what your building is doing in terms of energy. Must capture interactions! Per minute not per hour
2. Another useful outcome: Observability question: what do you need to know to tell what you will be using.

Low hanging fruit

(3000 CA state buildings were monitored at monthly level. This tool could be applied to such buildings in the future)

3. Need to better understand how poorly is the building operating -- without it we won't be able to improve it. Throw in CO2 monitors so you know at least one metric for Indoor Env. Quality.
4. Need to *understand why,* if the energy use higher than expected? How do we do this as a low-hanging fruit project?

- **Low hanging fruit**

Goal: minimize energy consumption of buildings -- subject to constraints of lighting, comfort, CO2 level, etc.

5. Uncertainty Analysis method/software as a wrapper for EnergyPlus -- Algorithm exists. Igor. Need uncertainty to compare predictions with observations. Parameter estimation for key uncertainties. Dynarum. LBNL also has some work on this regarding tracer gas flow in large buildings.

- **Low hanging fruit** ideas

6. Replicating and quantifying what has been done
7. Revisit a retrofitted building, and see what has been left out

Low Hanging Fruit must create new technology and new knowledge!!

Data assimilation methods were the biggest advance in weather prediction modeling

Energy Management Systems and Energy Information Systems are NOT integrated. Getting them to integrate is a vital step.

- **Low hanging fruit ideas**
- Three stages:
- better Data -->
- better Models of building (analysis and structure) -->
- better Control

8. Data can be used for principle component analysis of buildings

Time-scale of the data and model is important to understand the control sub-system interactions

Model-based commissioning (the model assumes optimal best performance). Model can’t be used to predict what is broken!?

Schedule to prepare for Feb. 2008:

(Need to get to different agencies)

Document all relevant ongoing programs in the country to be able to say why and how we are different

Fine tuning what this entity is trying to accomplish. Need to package that story.

List the first set of projects to undertake.

Explain how that fits into the landscape of what others are trying to accomplish

Who else should be a part of this consortium

Paul Wright: CITRIS building going up -- to be finished next year. Will retrofit one floor with sensors and DR capability. Add UCSB and Merced Campus buildings as labs for retro-commissioning. Make the process less expensive and more effective. LBNL buildings retrofitting of new controls is another possible testbed.

Another quick project: model Merced UCSB CITRIS buildings in Modelica or EnergyPlus.

Answer to DOE: What is the unique that you are doing?? ASHRAE meeting Jan 22 in NYC