



POWERING CANNABIS CULTIVATION

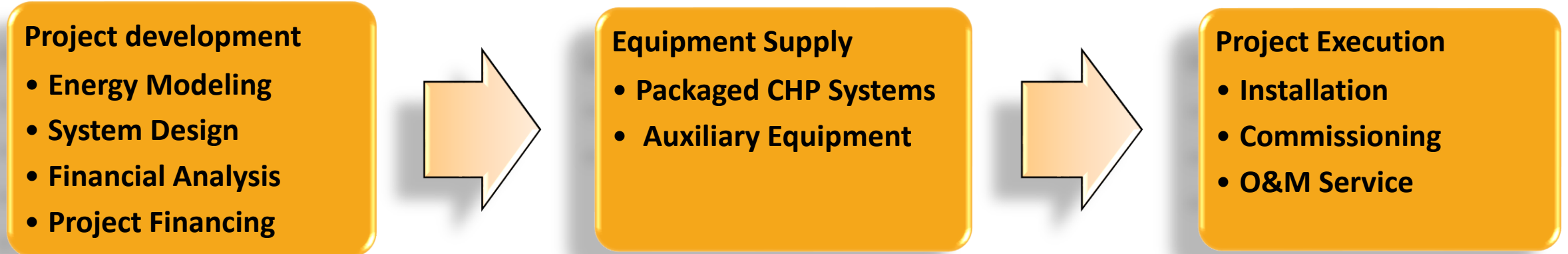
GPAEE Meeting
April 21, 2022

AGENDA



KINSLEY ENERGY SYSTEMS

A value-added CHP equipment and service provider



“We provide expert services throughout all phases of a project’s lifestyle”

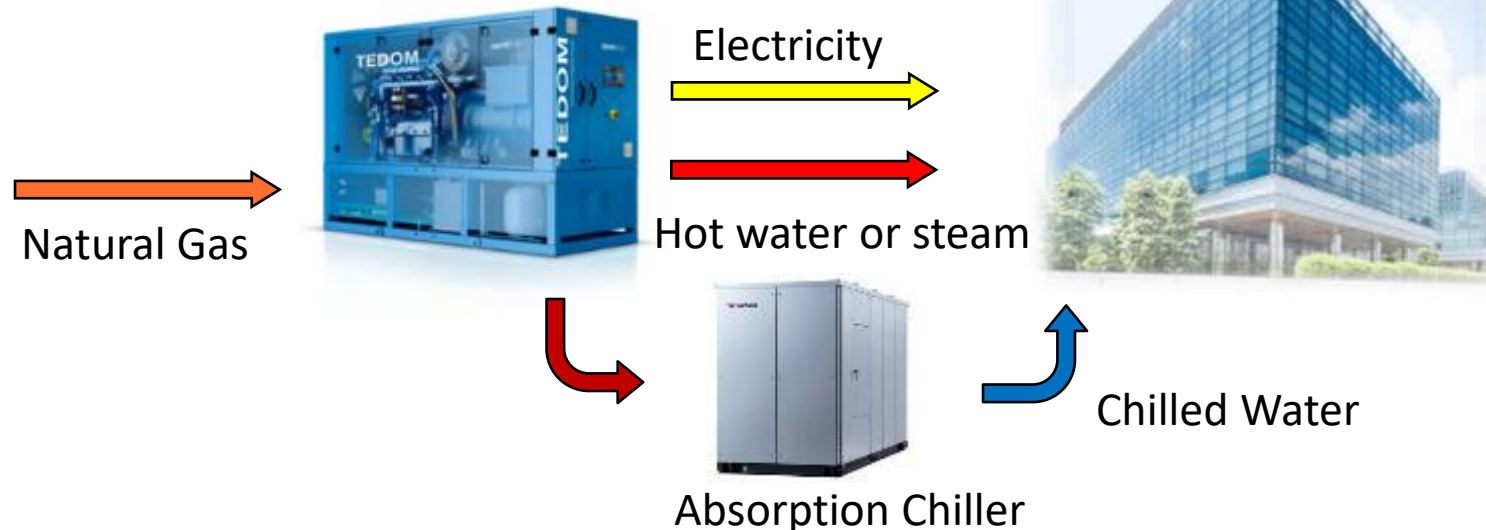
COMBINED HEAT AND POWER (CHP)

What is CHP?

- High-Efficiency Natural Gas Engine
- Electricity Generation
 - 24/7 power in parallel with utility
 - Emergency power during utility outage
- Thermal Energy Output
 - Hot water
 - Steam (with steam generator)
 - Chilled water (with absorption chiller)

Why invest in CHP?

- ✓ Increase energy resiliency
- ✓ Reduce utility expenses
 - Electric supply charges
 - Electric demand charges
 - Heating fuel cost
- ✓ Reduce energy consumption
- ✓ Reduce greenhouse gas emissions



Net Utility Expenses
Energy Consumption
Greenhouse Gas Emissions

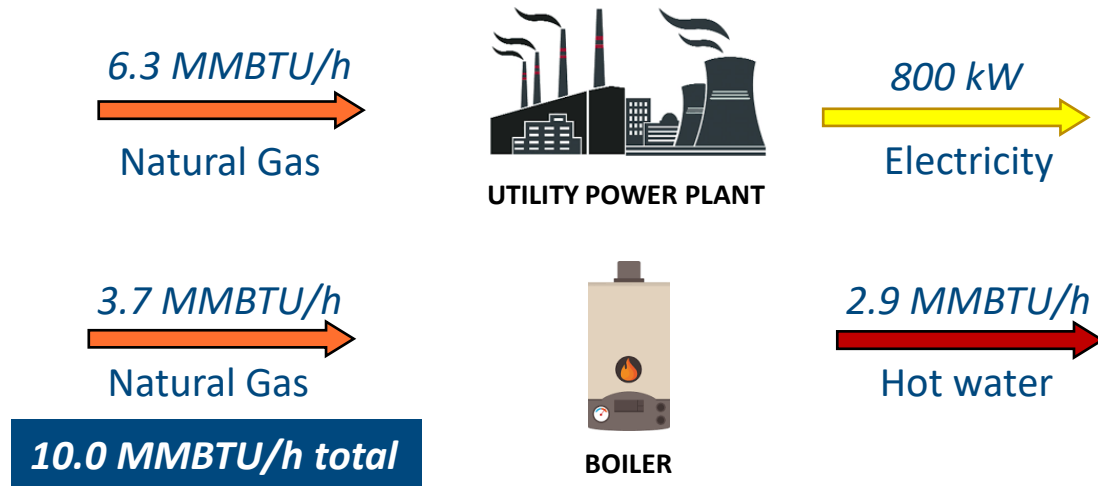


20 – 40% Reduction

KINSLEY

CHP Sustainability

Traditional Utilities



Summary for 800 kW CHP

Traditional Utility:

Fuel Use: 87,079 MMBTU/yr

GHG: 7,516 tons/yr

NOx: 3.32 tons/yr



CHP



CHP:

Fuel Use: 62,943 MMBTU/yr
28% reduction

GHG: 3,683 tons/yr
51% reduction

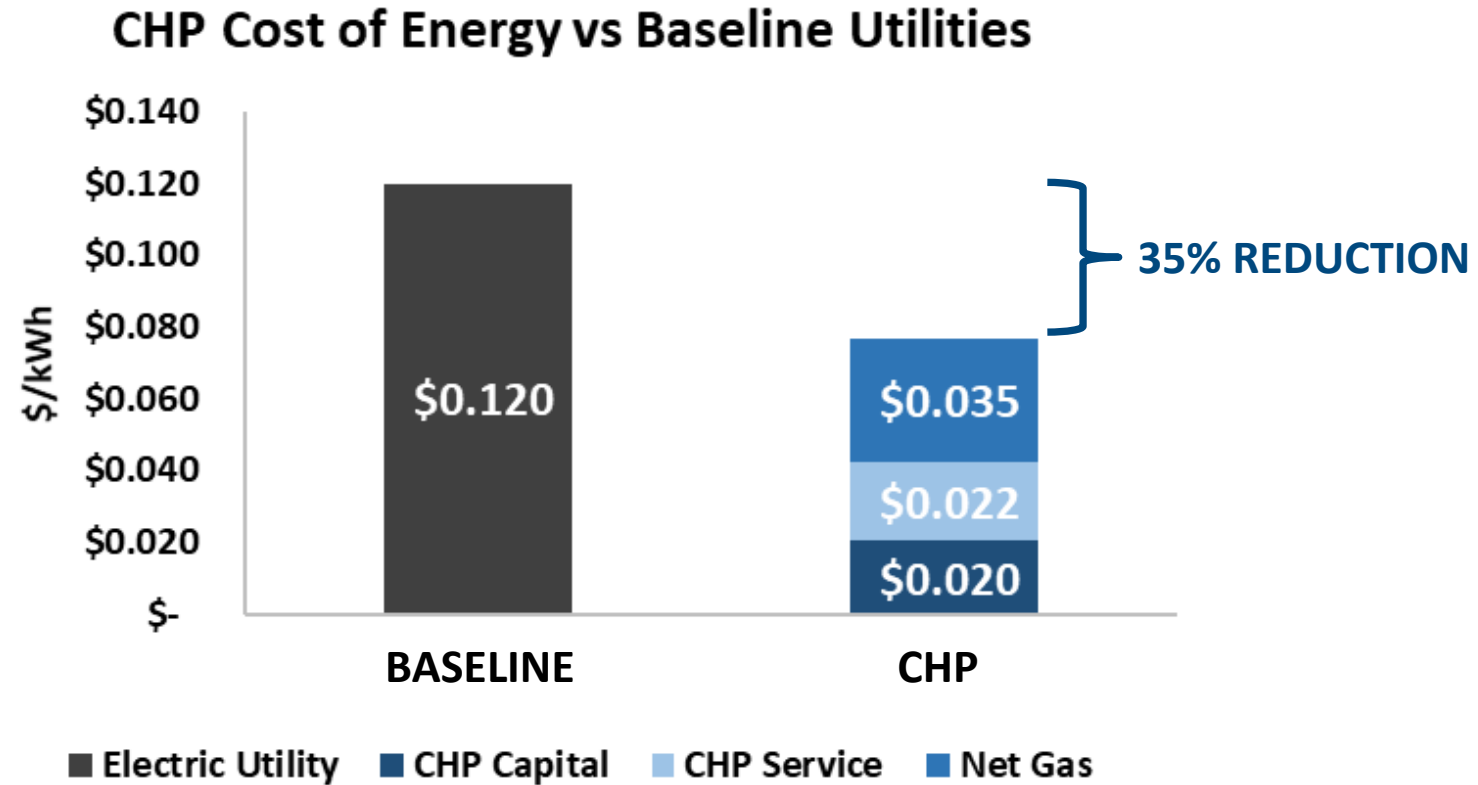
NOx: 1.04 tons/yr
69% reduction



CHP Utility Cost Savings

CHP Cost of Energy vs Baseline Utilities

(example based on typical 800 kW CHP installation with 60% hot water heat recovery)



Cost of CHP Equipment based on financing over 15 years at 6%. Includes 10% Federal Tax Credit, and 80% bonus depreciation.

TEDOM Packaged CHP Systems

TEDOM manufactures complete factory tested CHP systems for modular installation in the field

Integrated packaged CHP

- Natural gas recip engine/generator
- Grid paralleling & BOP controls
- Hot water heat recovery from engine jacket and engine exhaust
- Indoor, outdoor, & sound attenuated enclosures
- Emissions control equipment
- Emergency and turbo cooling radiators



Micro: 35, 55 kW



Cento: 150 - 555 kW



Quanto: 600 - 4,000 kW

Controlled Environment Agriculture (CEA)

CEA is an advanced and intensive form of hydroponically-based agriculture where plants grow within a controlled environment to optimize horticultural practices.

Benefits

- Year round growing season
- Local distribution to customer
- Pesticides and chemical free
- Higher quality control

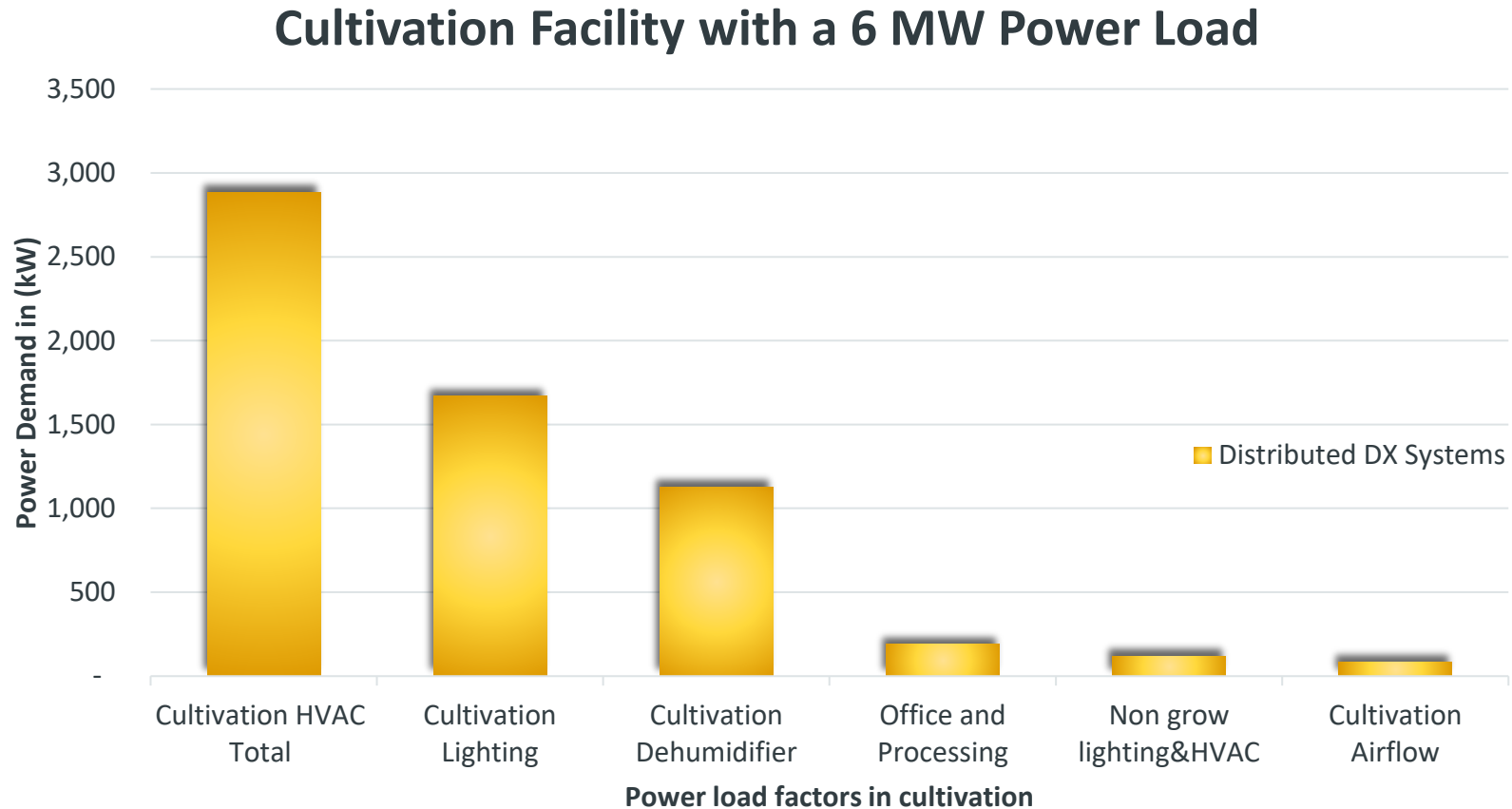


PA Options for Wellness grow facility

Note: CEA definition sourced from [Cornell CEA Team](#)

Power Demand for Indoor Cannabis Cultivation

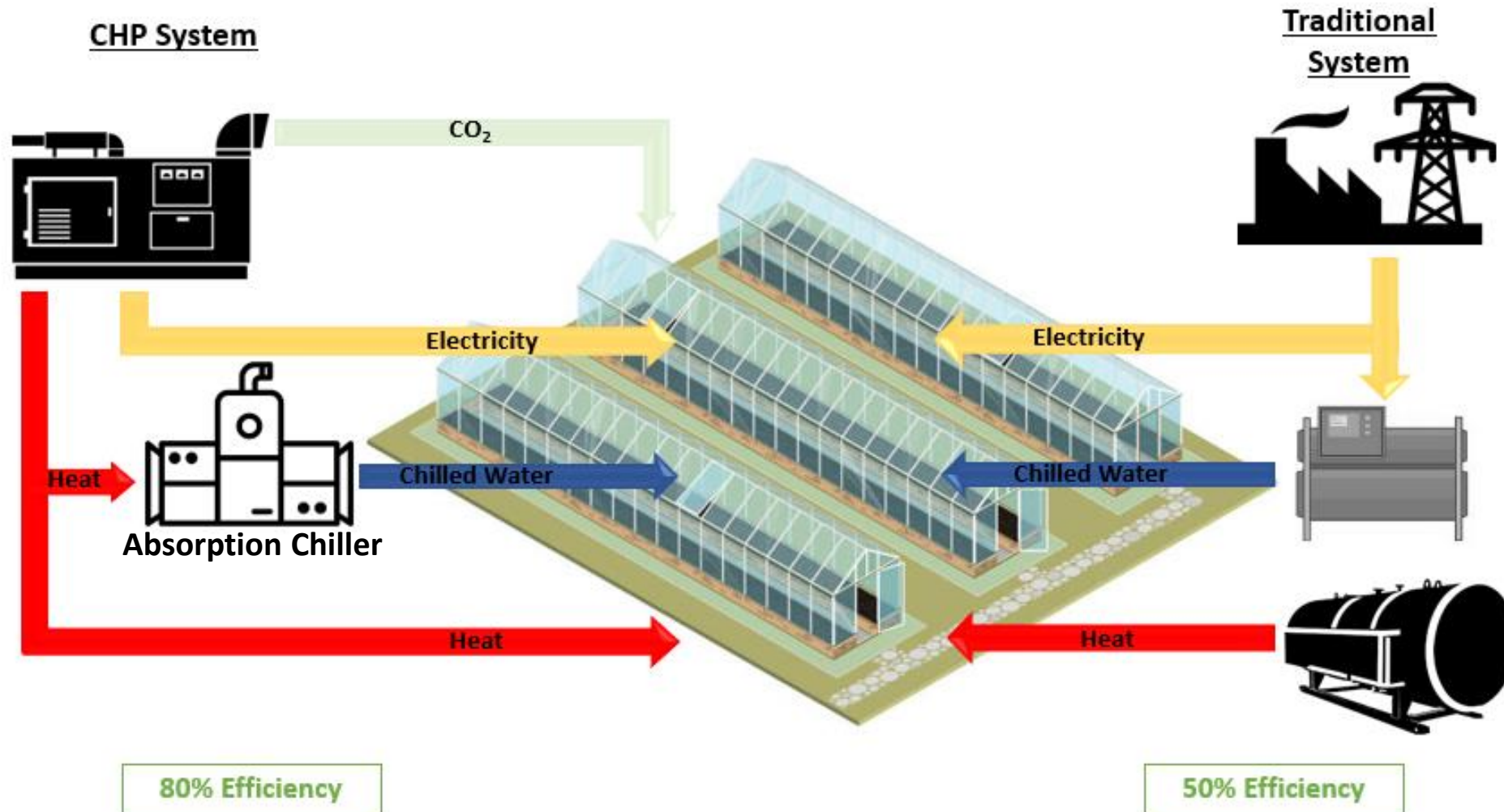
To optimize plant growth, tight climate and lighting control is required, which creates a large energy demand and expense.



Note: Preliminary load analysis of a 100,000 sqft cultivation facility with 75,000 sqft of total canopy.

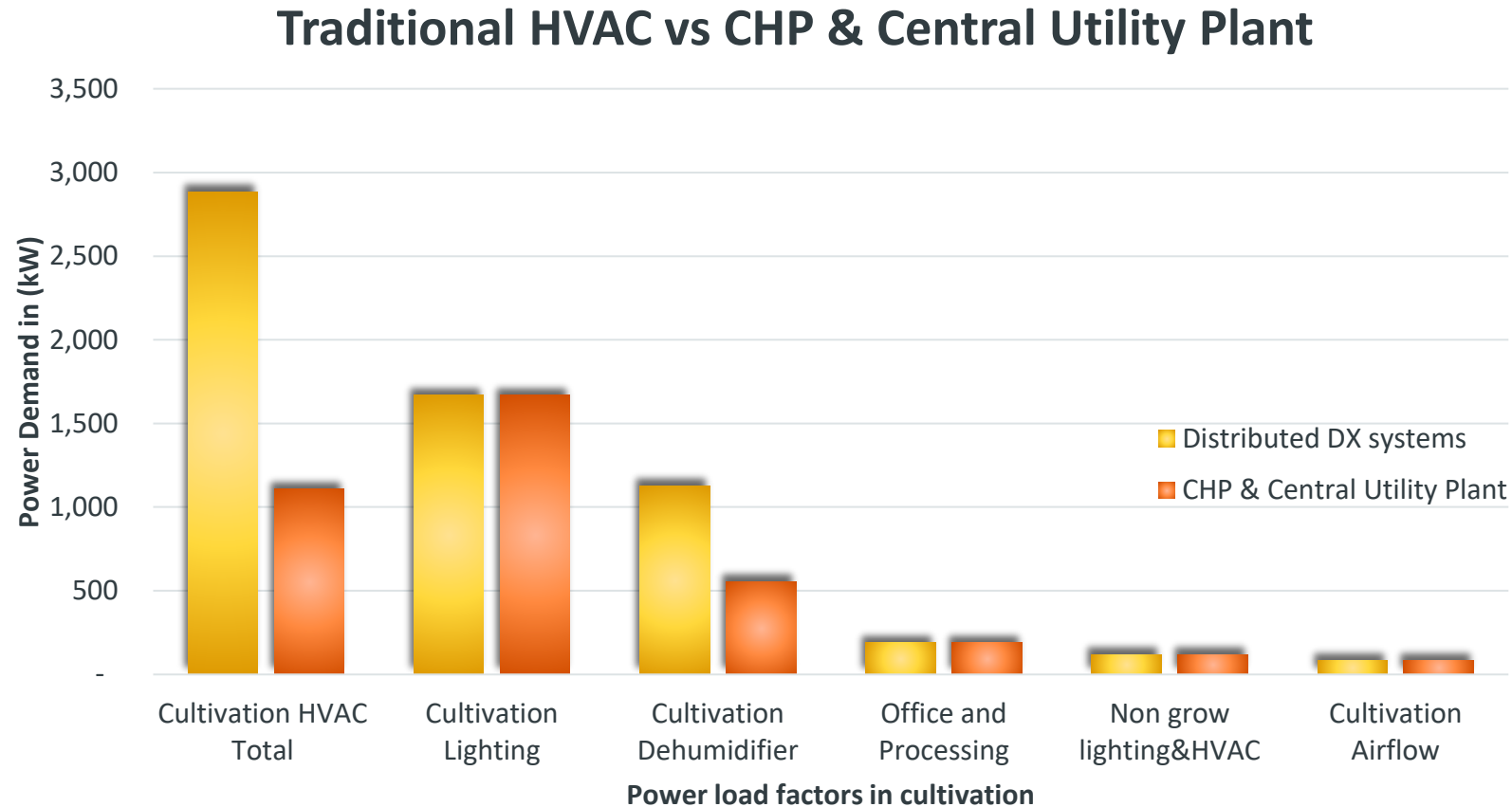
CHP Increases Efficiency & Reduces Cost

CHP solutions provide onsite electricity, hot water, chilled water, and CO₂ for optimized cannabis cultivation.



Reduced Energy Demand with CHP & CUP

CHP heat recovery and the increased efficiency of a CUP allows a cultivator to reduce their power demand and heating fuel use by over 50%.



Note: Preliminary load analysis of a 100,000 sqft cultivation facility with 75,000 sqft of total canopy.

Key Factors Driving CHP for Cannabis Cultivators

Facility Size

- CHP offers economies of scale with lower operating costs as size increases
- Canopy of 20,000 sq. ft. or higher
- Peak operational load of 800 kW or higher

Utility

- The utility cannot provide the power required by your facility
- A cost of utility energy over \$.12/kWh
- The utility has reliability concerns

Operating procedures

- Cultivators that have, or are considering building, a central utility plant
- Cultivators that have a consistent demand for energy from grow room lighting close to 24/7

Credit

- Facilities with a credit history can benefit from third-party owner/operators.
- This minimizes up front capital cost while maintaining energy savings.

PA Options for Wellness Cannabis Cultivation Facility

A state of the art, newly constructed cultivation facility near Harrisburg for medicinal cannabis production

- Founded in 2014 with a focus on research and education in the medical cannabis industry
- First recipient of a Clinical Registrant permit in PA
- Clinical Partnerships
 - PSU College of Medicine
 - University of the Sciences in Philadelphia, College of Pharmacy



3.5 MW CHP and Central Utility Plant

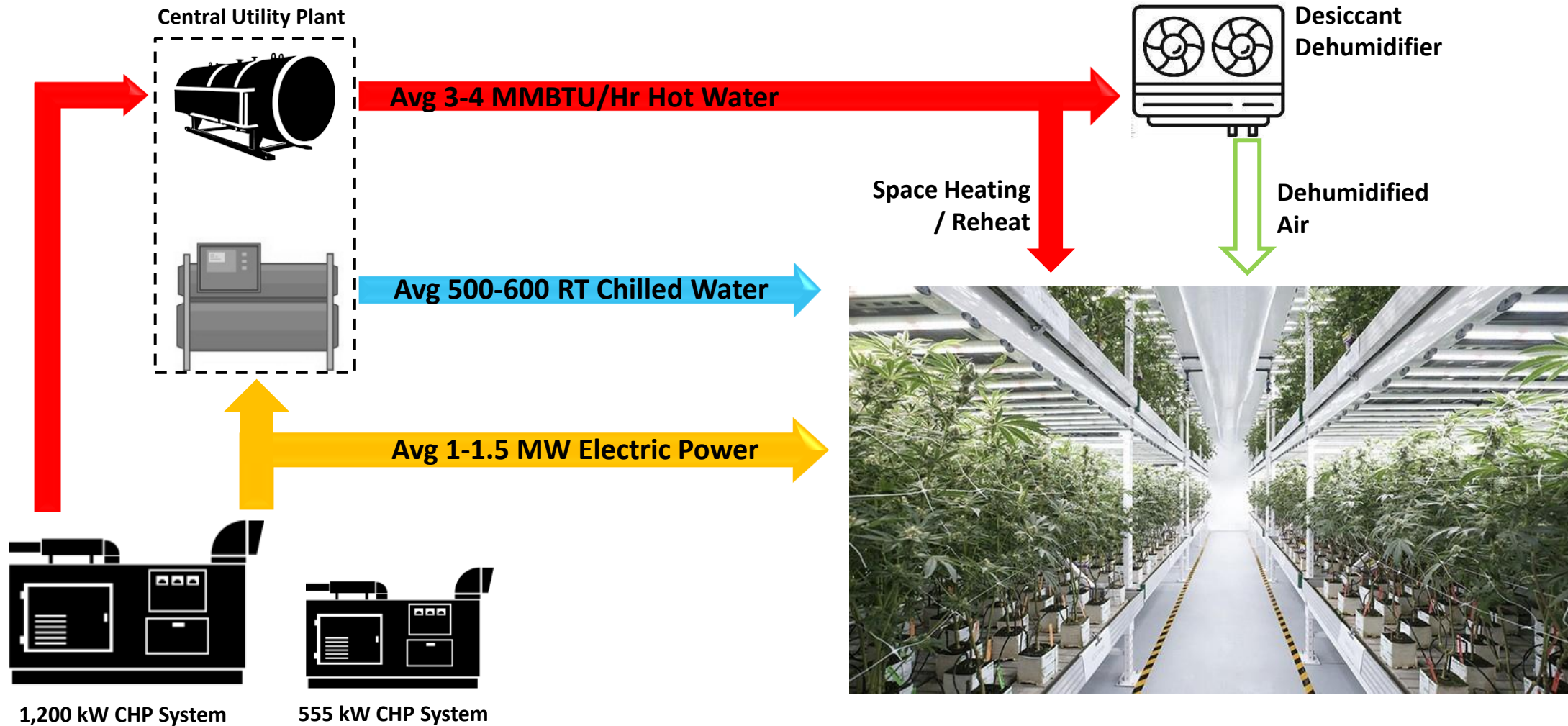
Kinsley developed and supplied a complete power and central utility solution operating independently from the local grid

- 2 x 555 kW TEDOM Cento M555
- 2 x 1,200 kW TEDOM Quanto D1200
- Integrated Central Utility Plant
 - 2 x 600T magnetic bearing water-cooled chillers
 - Cooling towers
 - Back up HW boilers
 - CHW, CW and HW pumps
 - Complete BAS controls
- 100% island-mode operation
- Full N+1 redundancy of power and HVAC equipment



CHP and Central Plant Output

Power and recovered thermal energy from the CHP systems is utilized in a closed loop system by the central utility plant and cultivation facility to maximize efficiency



Key Technical Considerations for Island Mode Operation

- **Load management**
 - Nominal load during full operations is 1-1.5MW, including chiller plant
 - CHP units must run between 50% and 90% of rated output
 - 1 x D1200 and 1 x M555 operate together in a pair while the other pair is in standby
 - Units start and stop automatically to maintain reserve power margin and ensure capacity for transients
- **Load shedding**
 - In island mode, a shut down of one generator can result in overloading the remaining units
 - Automatic load shed function detects frequency drop and shuts off facility lighting
- **Low startup load conditions & chiller operations**
 - Below 900kW, a M555/D1200 pair drops below 50% rating
 - The system will shift to 2 x M555
 - Leveling lighting and chiller load minimizes transients to prevent chiller and generator cycling.



THANK YOU!

Steven Mathews
Smathews@kinsleyenergy.com
267-665-1888

