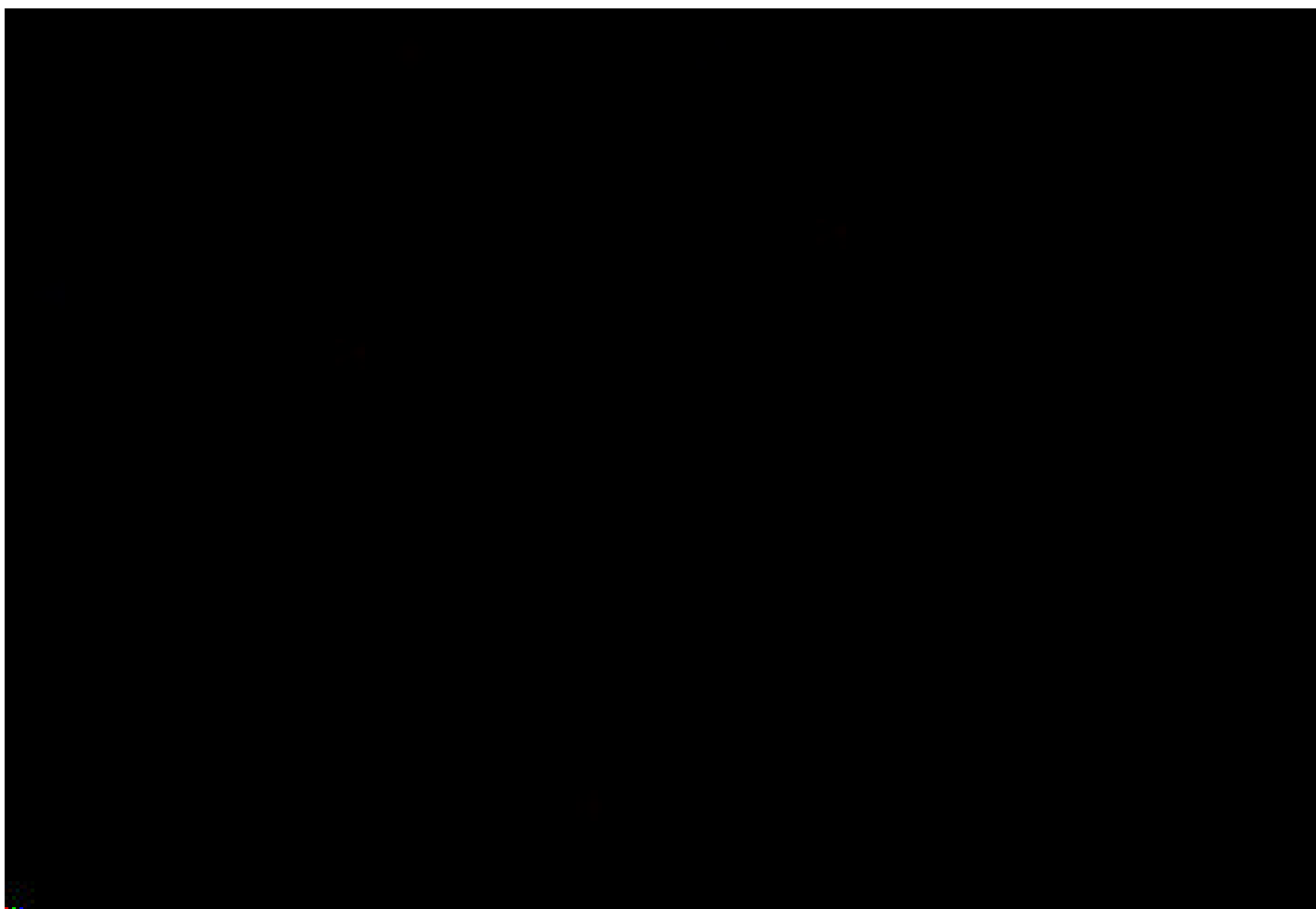


We're the  
dot in .com<sup>TM</sup>





“Sun Microsystems estimates  
that the cost of a power outage  
will cost us about 1 million  
dollars a minute”

-Karl Stahlkopf

Electrical Power Research Institute



# Power Requirements for iDCs

Industry Solutions, iDC

Rob Glenn - iDC Business Development Manager

Sun Microsystems, Inc.



# Agenda

- The Rise of Internet Data Centers
- Recent problems
- Power sources
- Current techniques
- Future of iDC power

# The Rise of Internet Data Centers

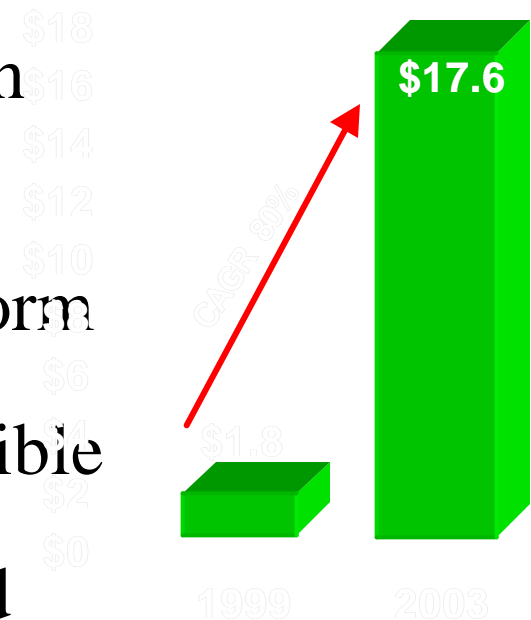
*Over 300 Internet Data Centers  
are under construction*

	Current	Announced	Planned 03
CyberCarriers & NSPs	290	481	771
Data Center Providers	139	454	593
ASPs w/Infras	74	13	87
Total	503	948	1,451

Source: Lucent, BAH Analysis

# Pressures of the Network Economy

- A worldwide Internet presence is a requirement
- Services must be up 24x7 with 99.999% availability
- Astronomical growth is the norm
- Business models must be flexible
- Difficulty hiring, training, and retaining skilled IT staff
- Constant pressure to reduce costs



# Power Shortage?

- Aging grids taxed by influx of iDCs
- iDCs on hold in Amsterdam
- 10 iDCs planned for London will increase demand by 20%
  - Could result in 10% electrical tax





# Are iDCs Draining the Power?

- One story Internet Data Center under construction in New York
  - Consume twice as much power as the WORLD TRADE CENTER

.com

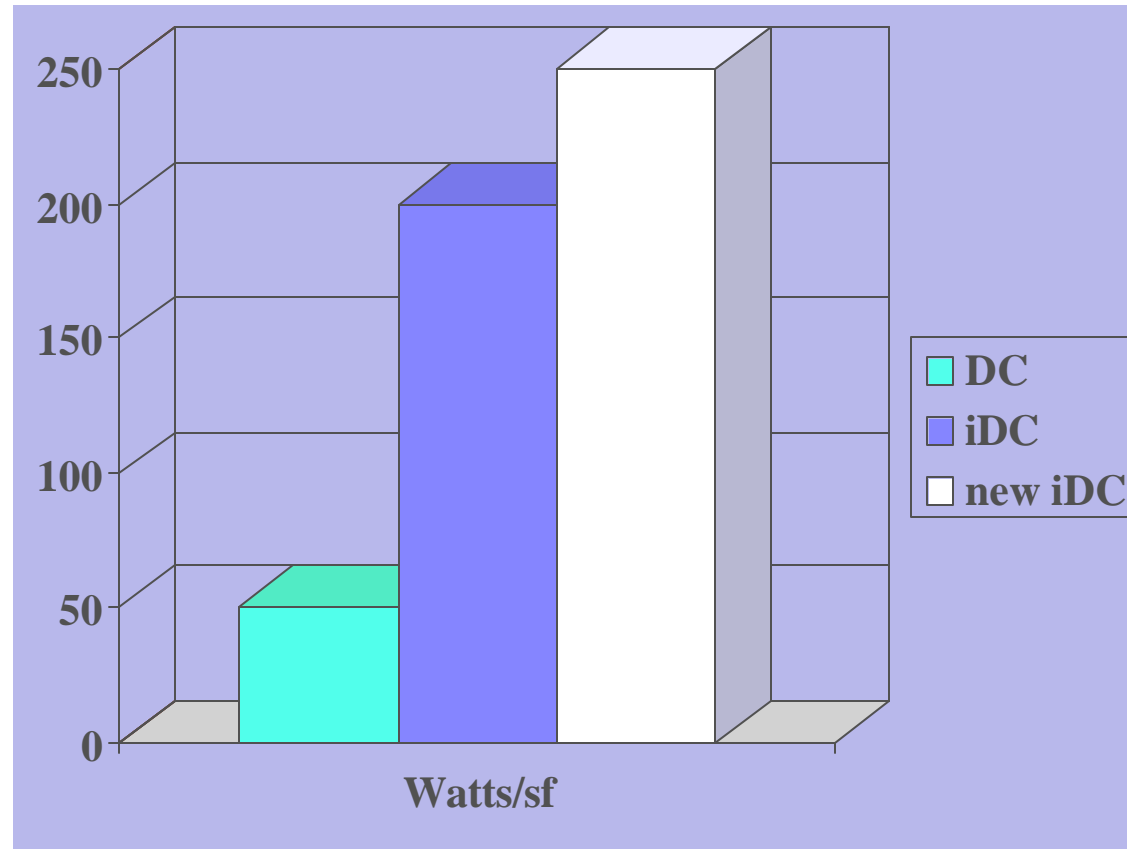
- Average internet data center = 5,000 to 10,000 homes
- 1,800 square meter facility in Virginia consumes as much power as 6 baseball stadiums

– Max Smetannikov  
Keeping Juiced

# Server Power Usage

1U Server	Sun Netra T1	Cobalt Raq 4i	Compaq DL360
Power	90 W	60 W	170 W
Full Rack 40 Units	3600 W	2400 W	6800 W

# Continuous Available Power



**Example:** 15,000 Watts/meter in a 1,000 sq/meter iDC will need **1500 megawatts** from the power Grid

# iDC Power Sources



→ Power Grid



→ Co-generation



→ UPS

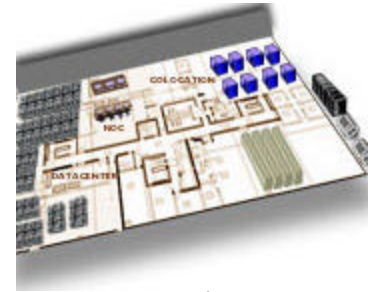
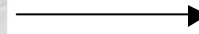


→ CPS



→ Generators

# Local Grids

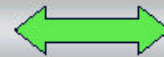


- ☐ Dual Feeds
- ☐ Raw, unconditioned power
- ☐ Line current fluctuations
- ☐ Dangerous for electrical equipment

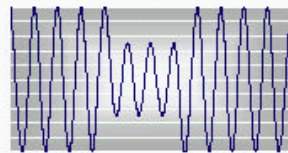
# UPS

## PROBLEM

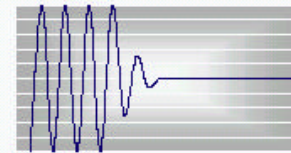
Micro-Interruptions



Blackouts



- **Spike**  
caused by a nearby lightning strike
- **Surge & Sags**  
results of high-powered  
electrical motors



- **Blackout**  
caused by excessive demand  
on the power grid, lightning storms,  
ice on power lines, etc.

## SOLUTION

Uninterruptable Power Supply

# UPS

## Micro-Interruptions

### Energy Storage

- Battery
- Flywheel
- Fuel Cells

## Long Term Interruptions

### Local Electric Power

- Diesel Engines
- Gas Engines
- Gas Turbines
- Combined Cycle



# Uninterruptible Power Supply (UPS)

- ❑ Battery Back Up
- ❑ Redundant N+1 or 2 architecture
- ❑ Conditions the raw power
- ❑ Must be designed for expansion
- ❑ Handle 100% of peak load requirements from 5 to 20 minutes
  - Some customers may require higher specs



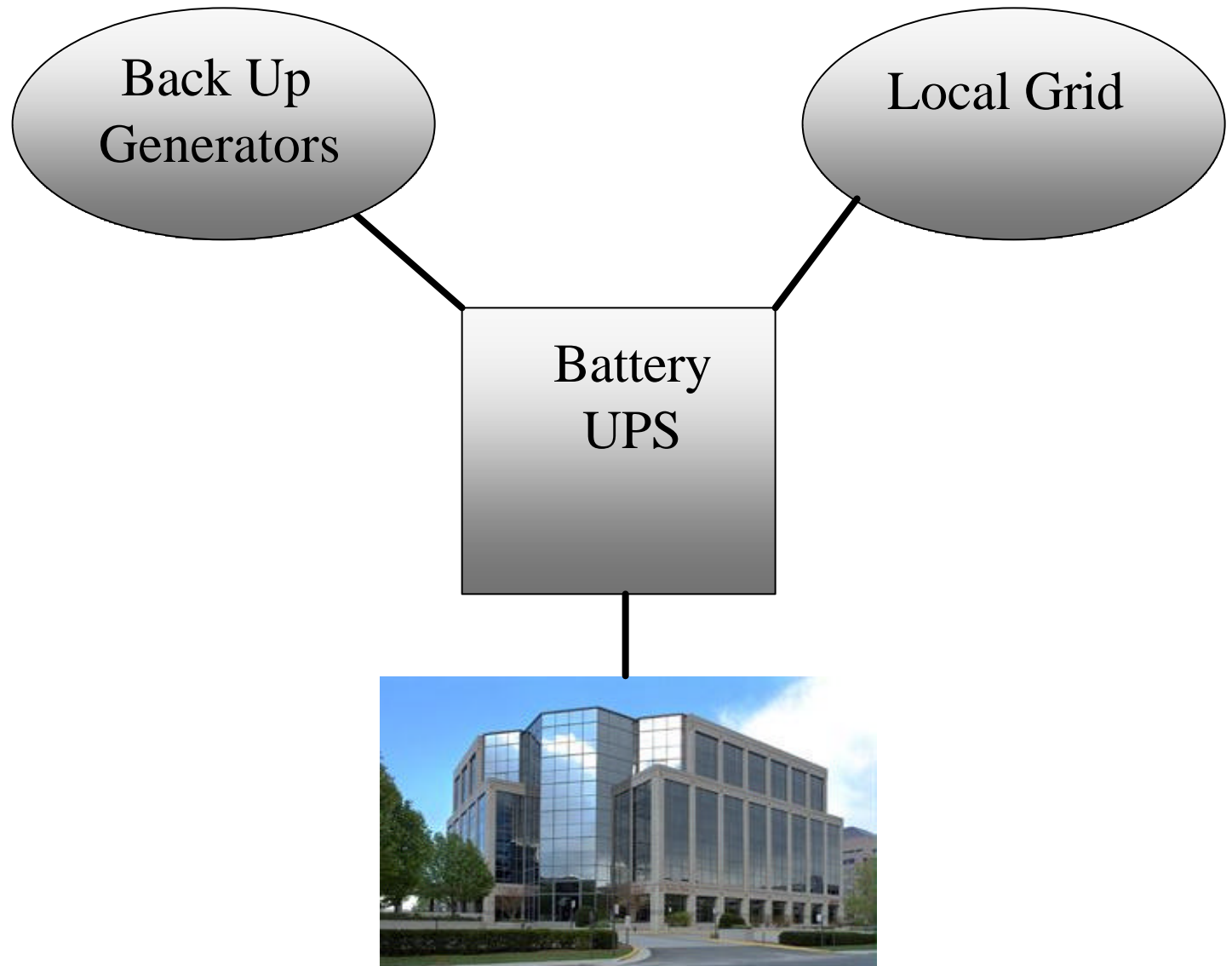
# Continuous Power Supply Systems (CPS)

- ☐ Feed from local grid
- ☐ Grid powers facility
- ☐ Grid spins flywheel
- ☐ Flywheel's momentum provides UPS to facility
- ☐ Generators fire on and take over

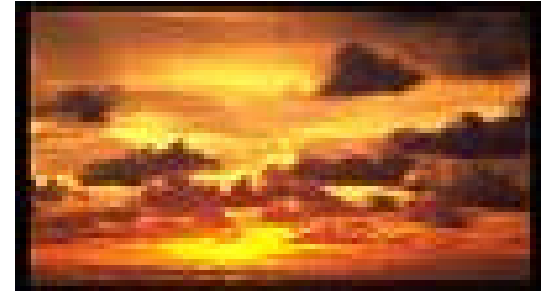
# Back-Up Generation

- ☐ Typically use Diesel Fuel Generators
- ☐ Standard is N+1 moving to N+2
- ☐ Fuel supply must between 48 to 72 hours
- ☐ Must be frequently tested and fuel must be changed
- ☐ Agreements with fuel companies to provide fuel indefinitely

# Traditional Power Failover



# On the Horizon



- ☐ Internet Data Centers provide their own power
- ☐ Creating fully independent “Data Cities”
  1. iDCs are teaming up Electricity providers
  2. Co-Generation



# Thinking Outside the Box



iDC

## TEAMING UP

Electrical Utilities  
Company





## Internet Data Centers and Electric Utilities form partnerships

- ❑ TXU is installing generators powerful enough to provide electricity for a small city at Teleplace's facilities
- ❑ This new arrangement will mean that Teleplace will no longer rely on the local grid for ensuring 99.999% uptime
- ❑ Enhances the ability to scale the power specifications



## □ Business model

- ✓ Bandwidth
- ✓ Electricity
- ✓ Internet Data Centers





# Alternatives

- ❑ Enron also has plans to develop power plants with higher specifications that will be dedicated to supporting Data Centers.
- ❑ Terremark (iDC) is negotiating a deal with the local Power Company to have their facility listed as a utility company

# Co-Generation

- ❑ Definition: The production of electricity without wasting heat.
- ❑ Conventional way up to 65% of heat generated can be lost
- ❑ Efficiency
  - Conventional: 35% to 58%
  - Co-generation: 86% to 90%
- ❑ After the facility uses the power they need, the excess electricity can either be sold to the local grid or used to power another facility





# Co-generation

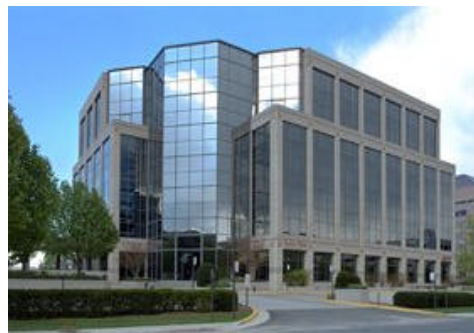


Power another  
facility



Sell back to grid

Power iDC



# Summary

- ❑ Large influx of iDCs
- ❑ Current power methods being pushed to the limit
- ❑ Creative new ways of architecting power solutions
- ❑ Future of iDC power

We're the  
dot in .com<sup>TM</sup>

