Measure What Matters

Sustainability Data and Reporting

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What is "Sustainability"?

Balancing the ***environmental***, ***social equity***, and ***economic*** needs of our community, today – while making sure future generations will have what they need to thrive.

Outline

- Why measure?
- Common Sustainability Impacts and Metrics
- Materiality
- Reporting Frameworks
- Case Study – University of Notre Dame
- Exercise - Materiality

Why Measure?

Internal

- Make better decisions
- Understand risk
- Track improvement
- Identify waste and opportunity
- Reduce inputs and costs

External

- Brand reputation
- Competition
- Employee retention
- Customer demands
- Recognition/certification
- Corporate values

Impacts to Consider

- Energy use and renewable energy
- Water use and wastewater
- Land use and ecology
- Climate Change
- Waste and Recycling
- Purchasing and supply chain
- Community engagement, human rights
- Labor practices, employee safety, employee well-being
- Corporate governance (policies), avoiding corruption

Example Metrics

- **Energy use and renewable energy**
- Water use and wastewater
- Land use and ecology
- Climate Change
- Waste and Recycling
- Purchasing and supply chain
- Community engagement, human rights
- Labor practices, employee safety, employee well-being
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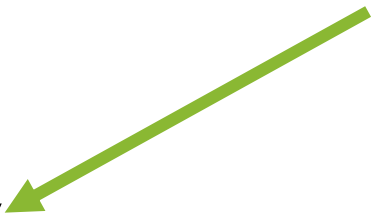

mmBTU per $ revenue

MWh renewable energy generated

% reduction in natural gas use

Example Metrics

- Energy use and renewable energy
- Water use and wastewater
- Land use and ecology
- Climate Change
- **Waste and Recycling**
- Purchasing and supply chain
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Total tons of hazardous waste created

% recycled materials in products

Tons of non-hazardous waste recycled

Example Metrics

- Energy use and renewable energy
- Water use and wastewater
- Land use and ecology
- Climate Change
- Waste and Recycling
- **Purchasing and supply chain**
- Community engagement, human rights
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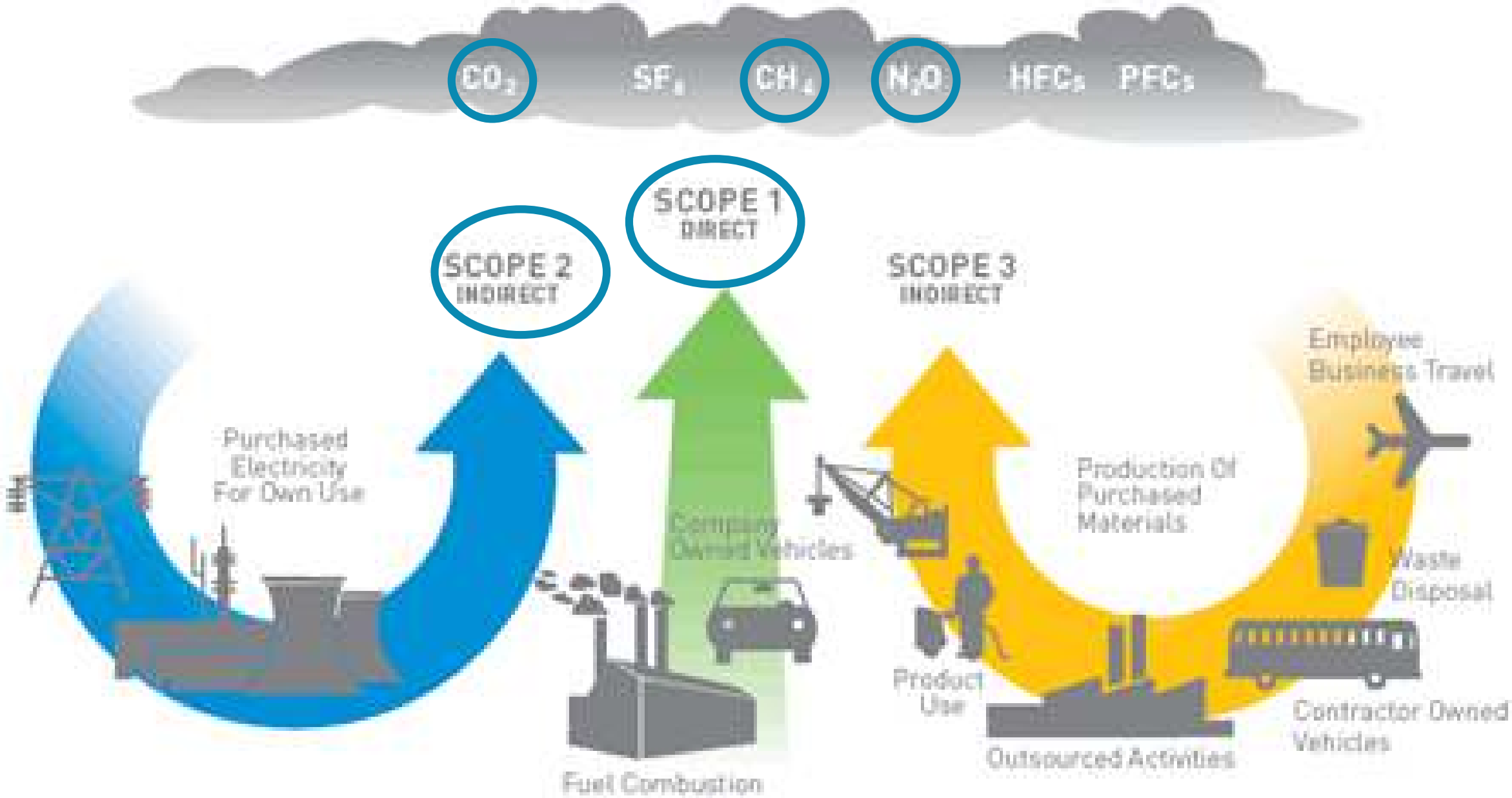
% purchases made from local suppliers

Significant impacts in supply chain identified thru supplier audits

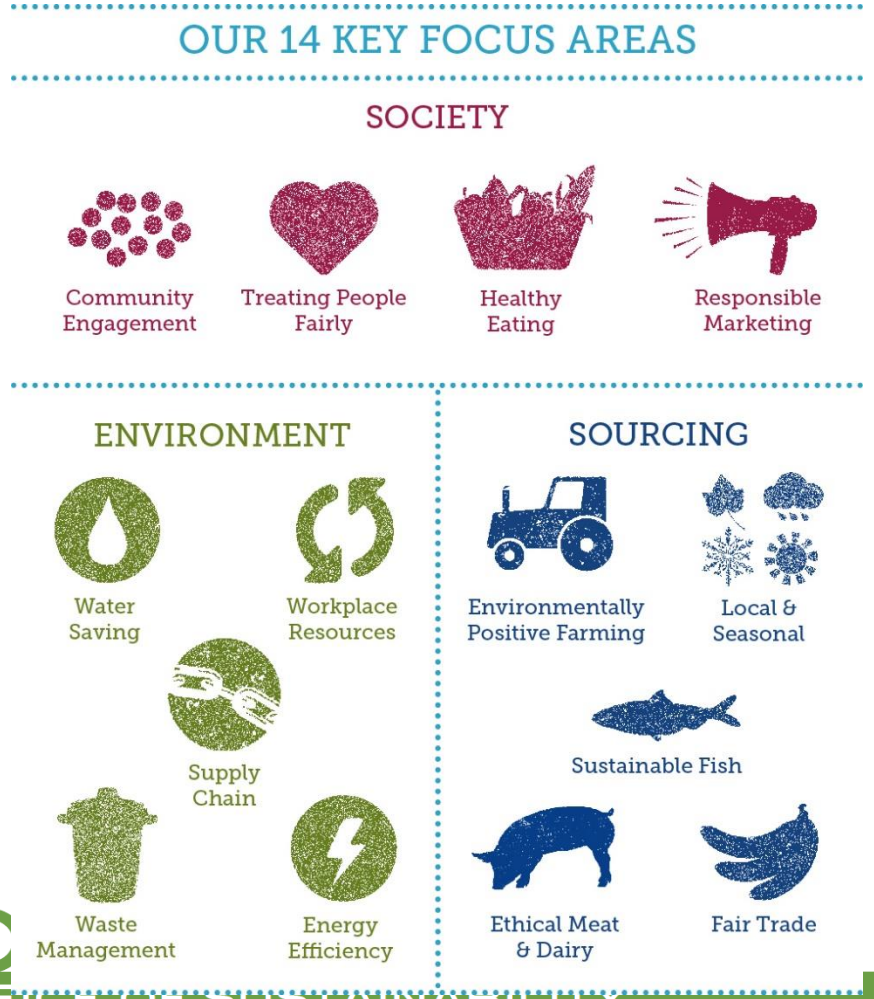

CO_2
SF_6
CH_4
N_2O
HFC_s
PFC_s
SCOPE 1
DIRECT
SCOPE 2
INDIRECT
SCOPE 3
INDIRECT
Purchased
Electricity
For Own Use
Company
Owned Vehicles
Fuel Combustion
Production Of
Purchased
Materials
Employee
Business Travel
Waste
Disposal
Product
Use
Contractor Owned
Vehicles
Outsourced Activities

Materiality

- "Relevance, Priority"
- Risk management
- Prioritize topics for reporting
  - Significant impact
  - Important to stakeholders
- Other factors
  - Business sector & core business
  - How much control do we have?
  - Strategy
  - Organizational values
  - Data availability (80/20 rule)
  - Location in supply chain
  - Competition

Varies by Sector

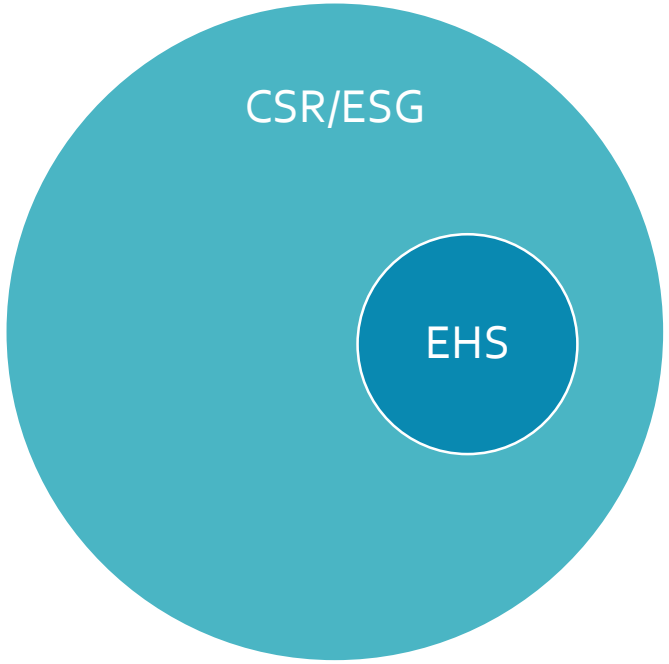
Restaurant



Health Care

Alphabet Soup

- **EHS** vs **CSR** vs **ESG**
  - **E**nvironmental **H**ealth and **S**afety
  - **C**orporate **S**ocial **R**esponsibility
  - **E**nvironment, **S**ocial, **G**overnance
- Compliance
- Risk vs Opportunity
- Stakeholders
  - Regulator/Employee
  - Investors
  - Broad stakeholder group



Reporting Across Sectors

Local Government

GLOBAL COVENANT of MAYORS for CLIMATE & ENERGY

CDP

STAR COMMUNITY RATING®

LEED FOR CITIES

University

stars a program of aashe

THE PRINCETON REVIEW A DESIGNATED GREEN COLLEGE 2017 NORTHLAND COLLEGE

SIERRA MAGAZINE COOLEST SCHOOLS 2016

Reporting Across Sectors

Corporate

Utilizing Data on the Macro and Micro Scale to Drive Carbon Reductions

October 23, 2018

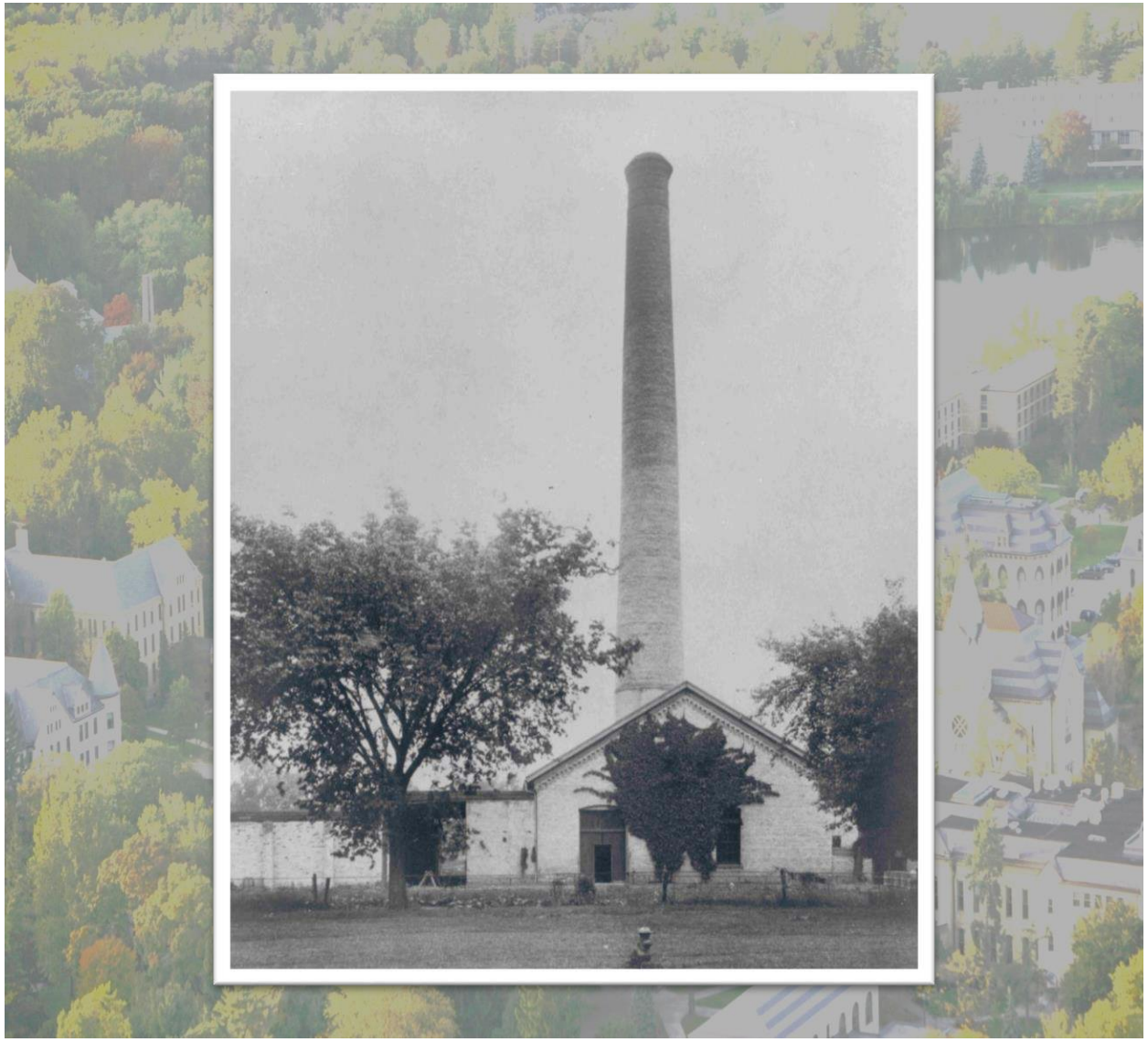
UNIVERSITY OF NOTRE DAME

Outline

UNIVERSITY OF NOTRE DAME

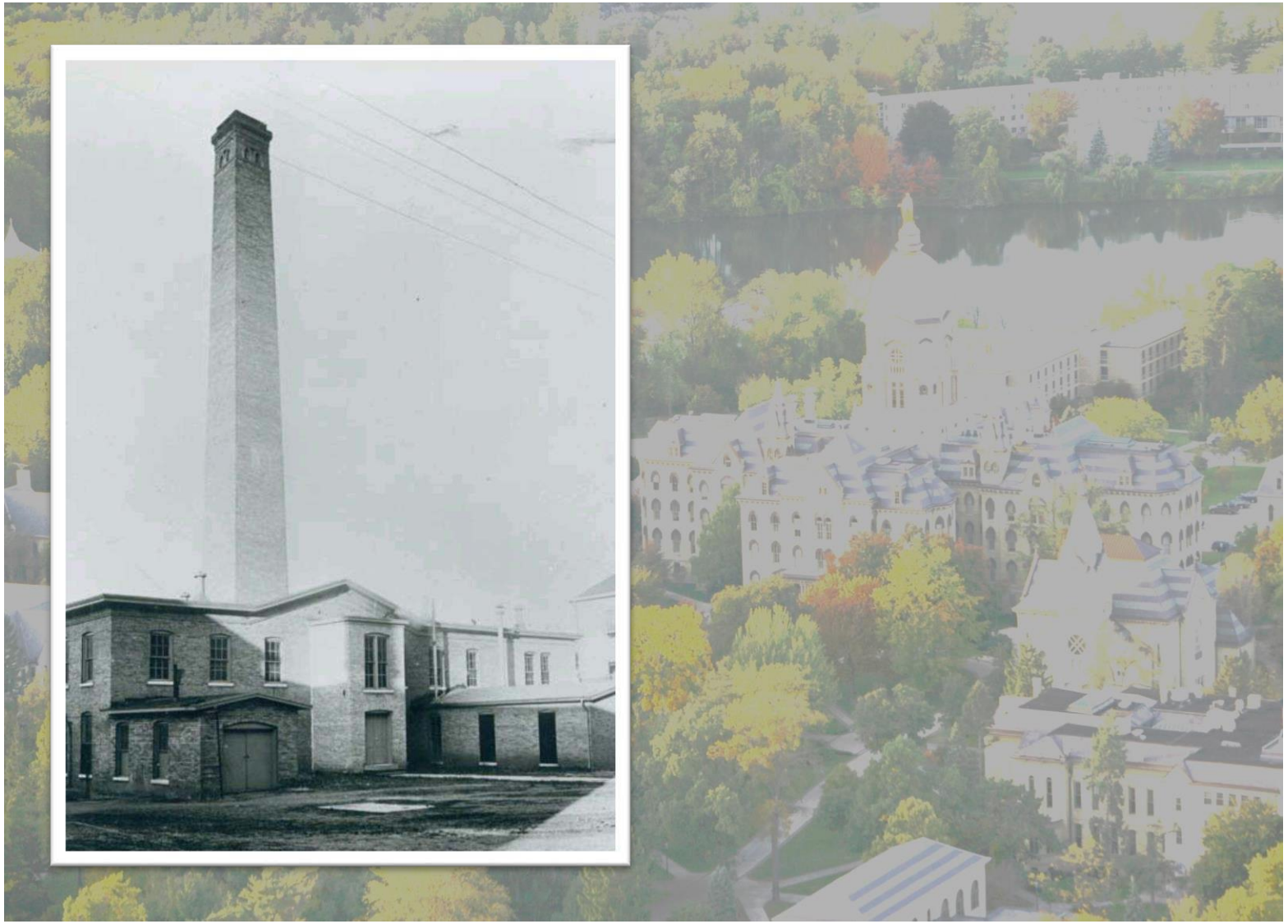
- History
- Services
- Sustainability Strategy
- Data & Decisions
- Projects
- Other Data Uses

Notre Dame History



- Central Energy production originates in late 1800's
- Adjacent to Main Building
- Steam Plant Only
- 1881 First University to generate electricity
  - Less than 10 kW to 8 lights in Main Admin.
- Rail line installed in 1896 (Michigan Central Rail) for delivery of coal and campus connection to outside world

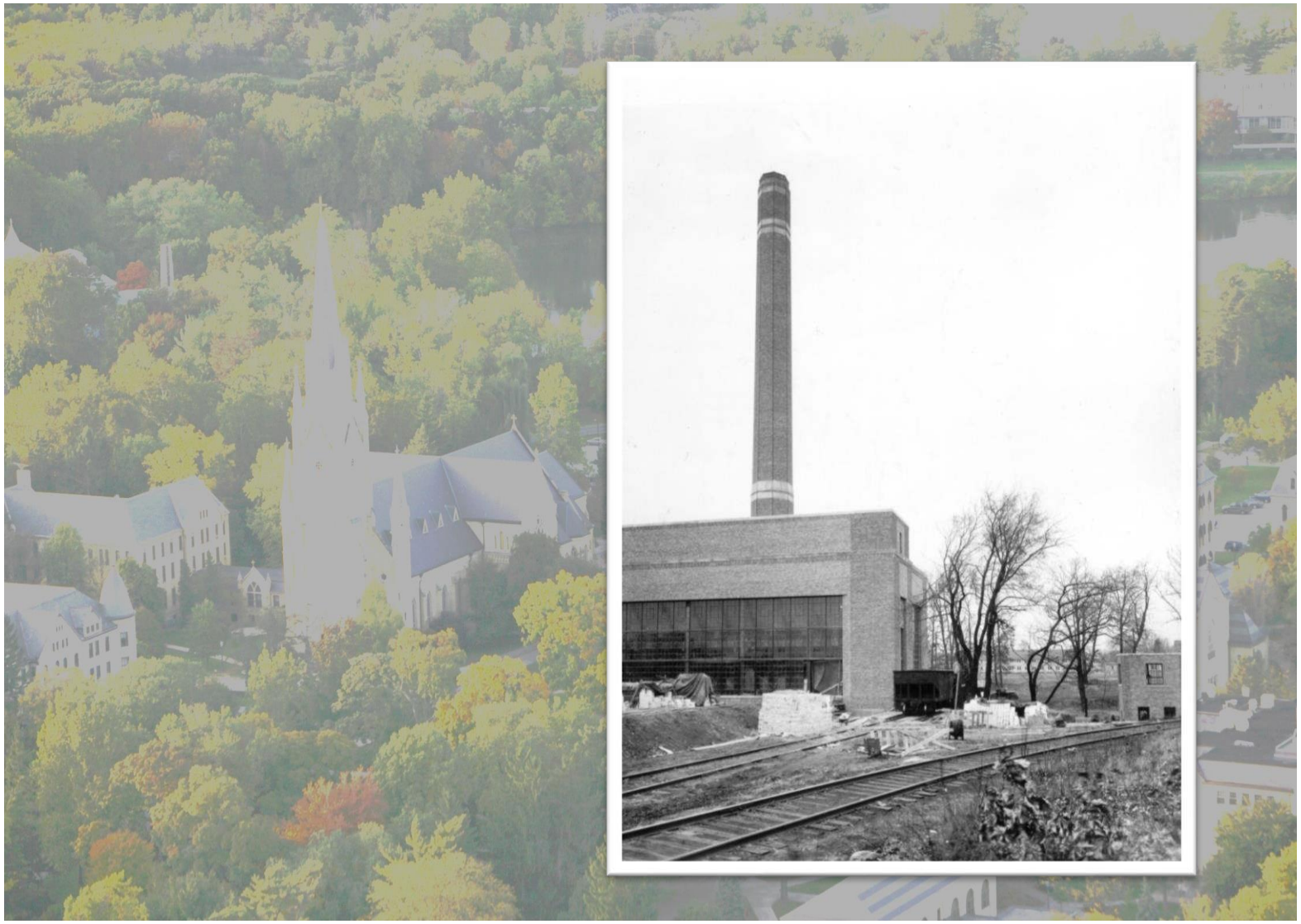
Notre Dame History



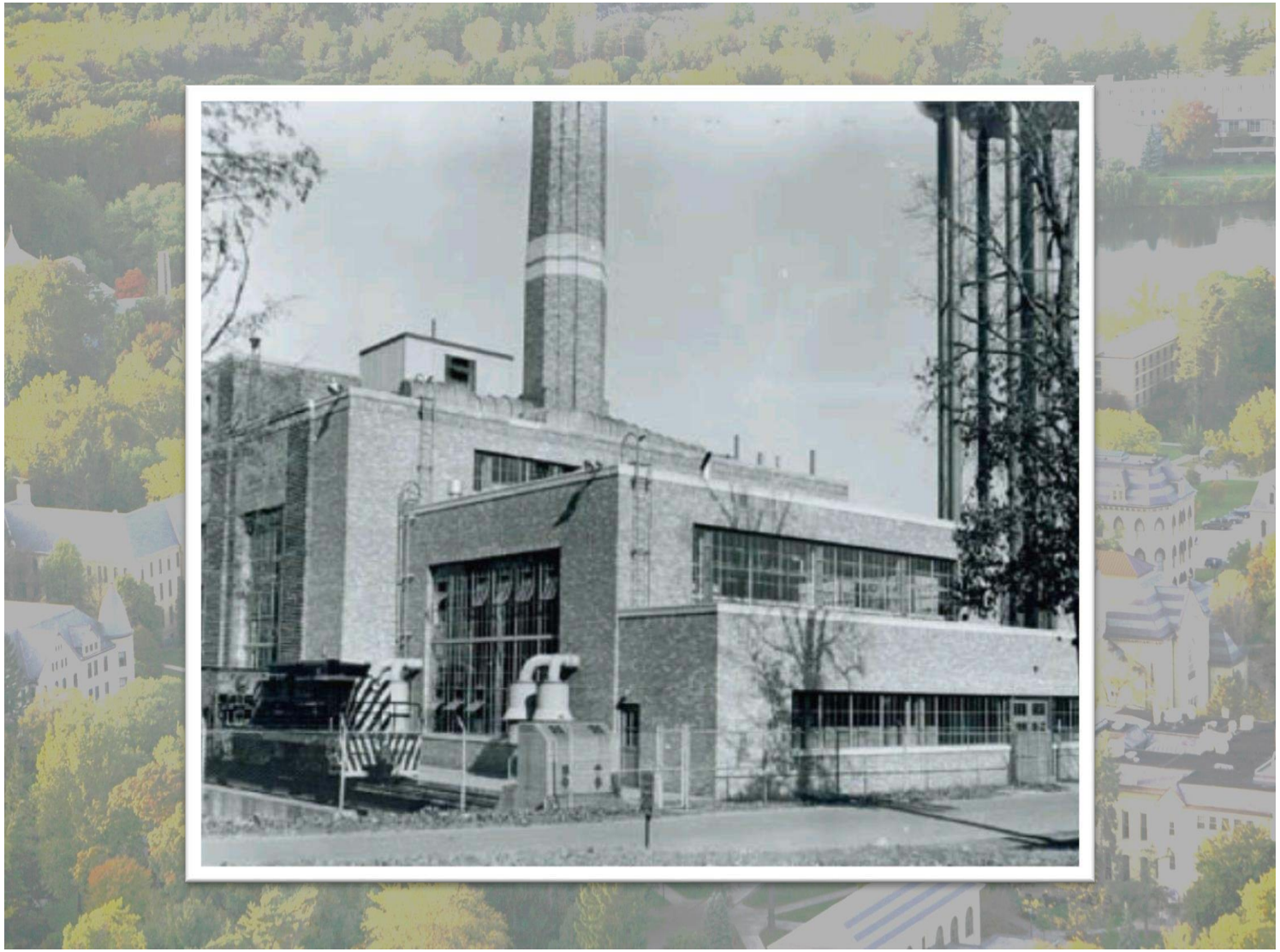
- Steam Plant circa 1900 to 1931
- Located on current site of St. Liam Hall
- Steam Plant only

Notre Dame History

- Current site occupied 1932 adjacent to St. Joseph Lake
- Lake essential resource for plant cooling water
- Steam plant only
- Coal fired, five (5) hand stoked boilers

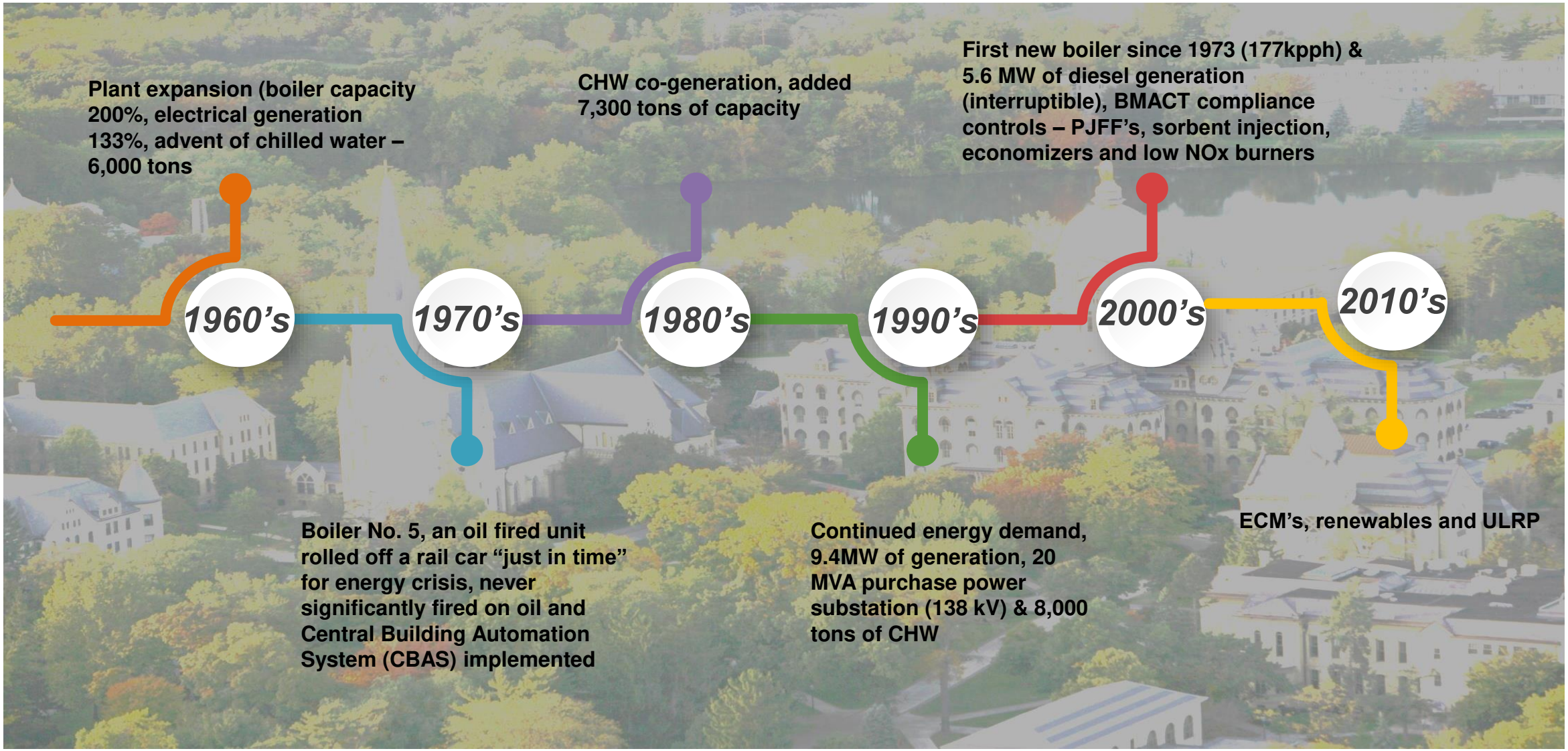


Notre Dame History



- 1952 **Addition of co-generation** steam turbine and diesel generators
- Two new coal fired boilers
- 100% power independent
- The original Green Energy System!

Notre Dame History



Notre Dame Services and Services Area

UNIVERSITY OF NOTRE DAME

Services:

1. Steam – 400 psi (plant), 70 & 10 psi (distribution) in 8.3 miles of tunnels and 1.5 miles of ricwel
2. Chilled Water – 15.1 miles of direct buried steel pipe
3. Electrical – 31.7 miles of 4.16KV distribution underground in concrete encased ductbanks
4. Water – 26.5 miles direct buried cold, 9.8 miles of hot in tunnels (supply and return)
5. Storm Sewers – 35.8 miles draining to lakes and basins
6. Sanitary Sewers – 19.6 miles with conveyance to South Bend WWTP

Areas:

(Current and growing)

1. Steam – 8.9 Mgsf
2. Chilled Water – 6.7 Mgsf
3. Electric – 10.2 Mgsf

Notre Dame Sustainability Strategy

UNIVERSITY OF NOTRE DAME

Energy and Emissions "Aspirational Goals"

The Utilities Long Range Plan (2010) was the impetus to set an aspirational goal to reduce our Scope 1 (direct) and Scope 2 (indirect from electricity and energy purchases) carbon emissions by 50% per gross square foot from 2005 levels by 2030

The longer range goal is to reduce such emissions by 83% from 2005 levels by 2050 and eventually become carbon neutral

What does our Plan entail?

UNIVERSITY OF NOTRE DAME

Energy Conservation Measures (ECM Phase 1, 2, 3 & 4) 2008 and beyond

- $13.8M invested with aggregate savings of $20.8M to date

Evolve our Central Plant (2010 Plan)

- Fuel Switching, move from coal to natural gas
- Steam first to Electricity first Combined Heat and Power Operation – implement Combustion Turbines
- Increase efficiency and reduce carbon emissions
- Increase capacity – to serve campus growth

Change in Plans (2015)

- ***Laudato Si,*** Pope Francis's encyclical ***"On Care for our Common Home"***
  - Cease use of coal by 2020 develop renewable/recoverable energy sources

Remain flexible and able to respond to technological developments that could support our goals, protect

“Macro” Scale Data

- Energy Inputs
  - Coal, Gas, Oil (MMBtu)
- Emissions (Calculated from Energy Inputs)
- Produced Power/Purchased Power (kWh)
- Potable Water Well Production (MGD)
- Steam Production (klbs)
- Chilled Water Production (tons of chilling capacity)
- Service Area (GSF)
- Costs (Fuel, Purchased Power, Maintenance)

- Fuel Qualities (BTU, Sulfur, Ash)
- Equipment Run Time (hrs)
- Steam Temperature
- Condensate Volume
- Boiler Feedwater
- Make Up Water

“Micro” Scale Data

- Building Consumption
  - Electricity
  - Steam
  - Chilled Water
  - Domestic Cold Water
  - Domestic Hot Water
- Building Automation Systems
  - Heating/Cooling Systems

Data Driven Decisions

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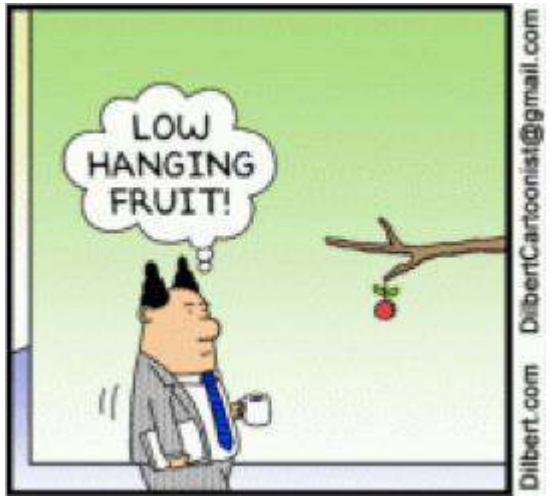
- Focus your resources
  - Low Hanging Fruit…Most Bang Per Buck
    - Lighting:
      - Higher Use Buildings/Rooms
      - T-12 to T-8/T-5 to LED
    - HVAC:
      - Constant Volume Systems to Variable Volume (VFD)
      - Occupancy Sensors
    - Water:
      - “Smart” Sprinkler System

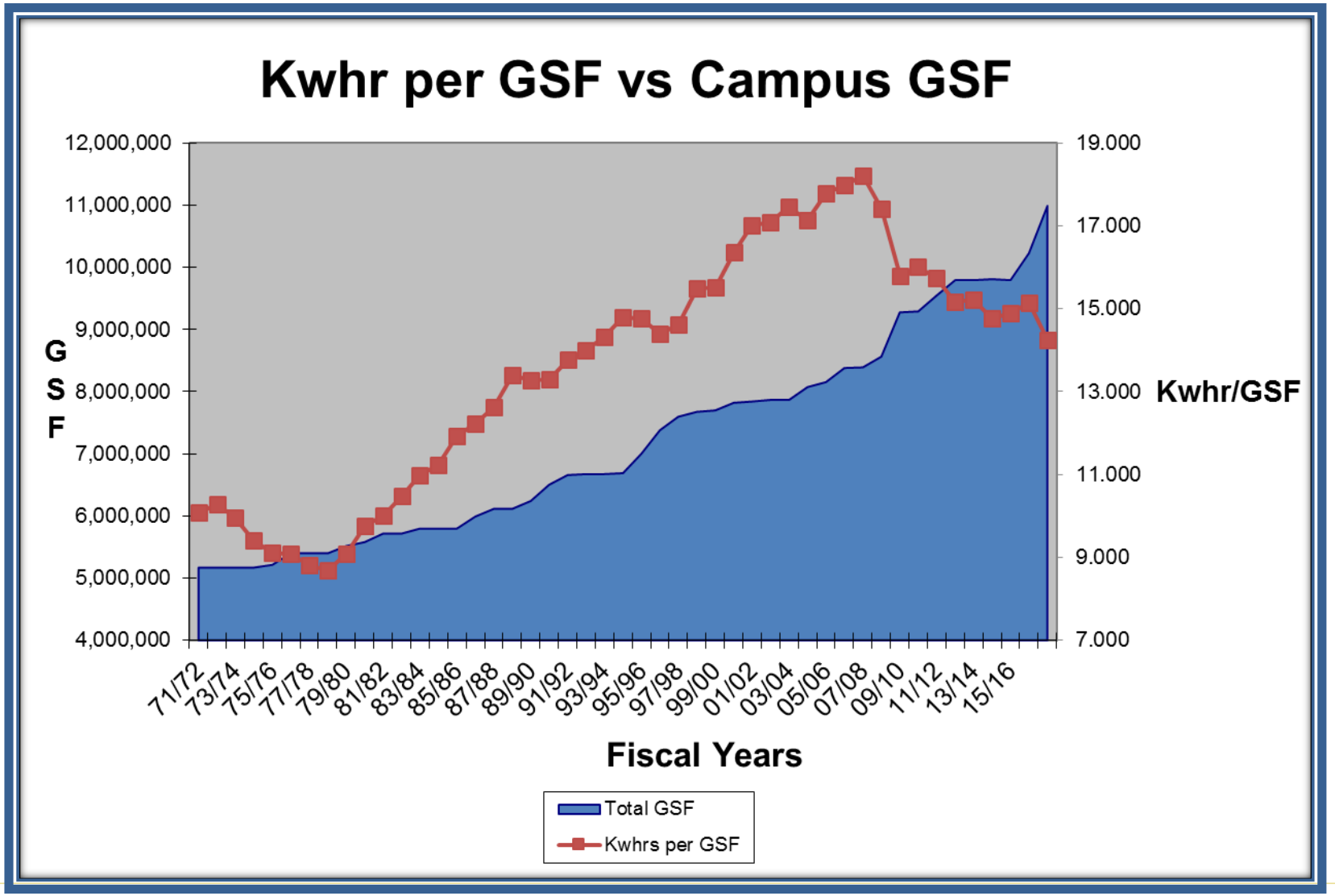


Data Driven Decisions

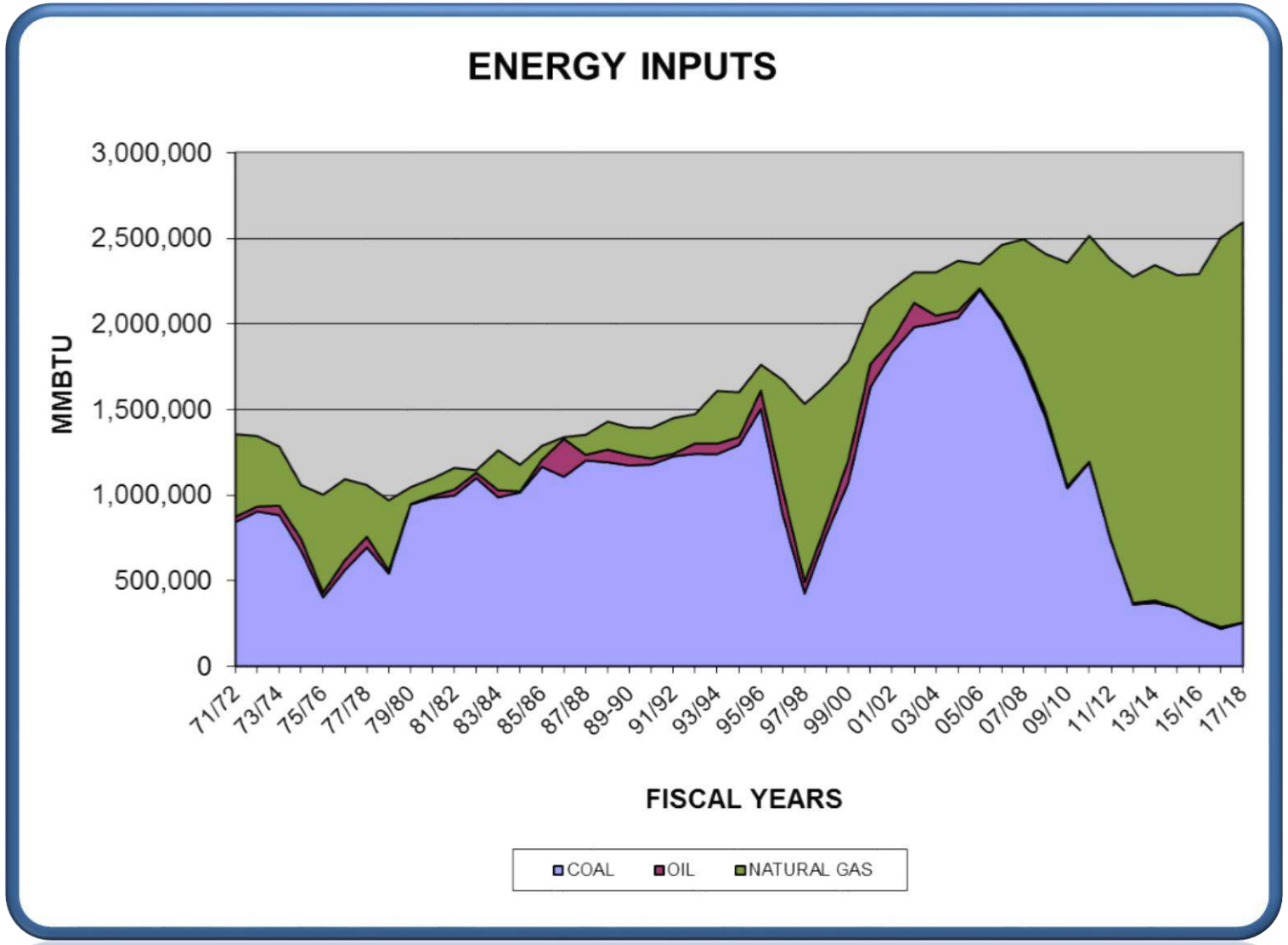
- Then Move To

  - Higher Hanging Fruit…A Little Less Bang
    - Lighting: Lower Use Buildings/Rooms
    - HVAC: Replace Pneumatics with Electronic Controls
    - Water: Low Flow Fixtures

Energy Results



Energy Results



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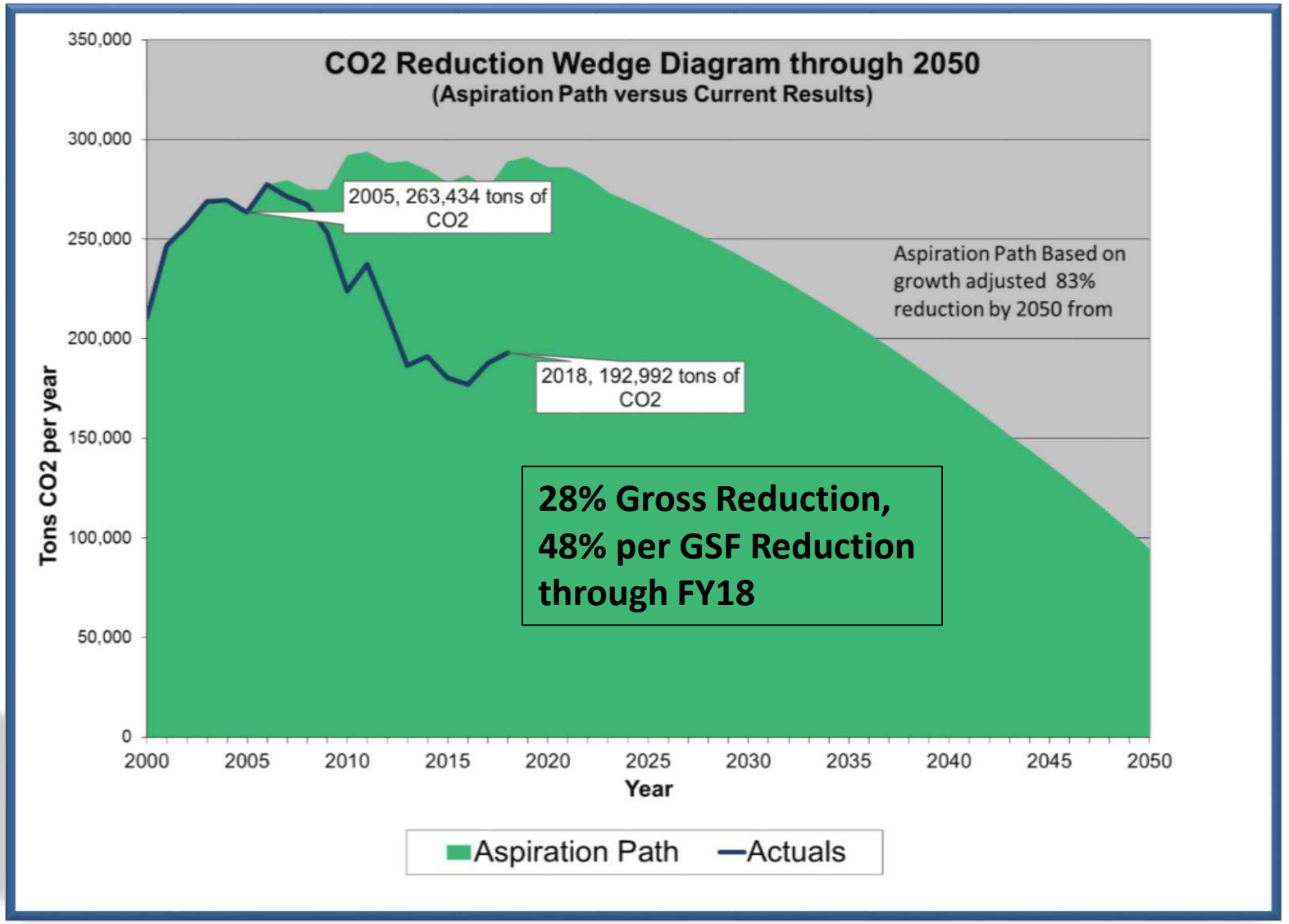

Low Carbon Strategies

Combustion Gas Turbines (CGT) with Heat Recovery Steam Generators (HRSG) 2 – 5.5 MW units to provide increased electrical capacity, incremental steam capacity, higher efficiency and continued benefits of CHP approach

Low Carbon Strategies

2-2000 ton Electric Chillers to use the energy produced by the CGT's along with 2 Mgal of thermal storage to make use of off-peak electricity

Renewable/Recoverable Initiatives

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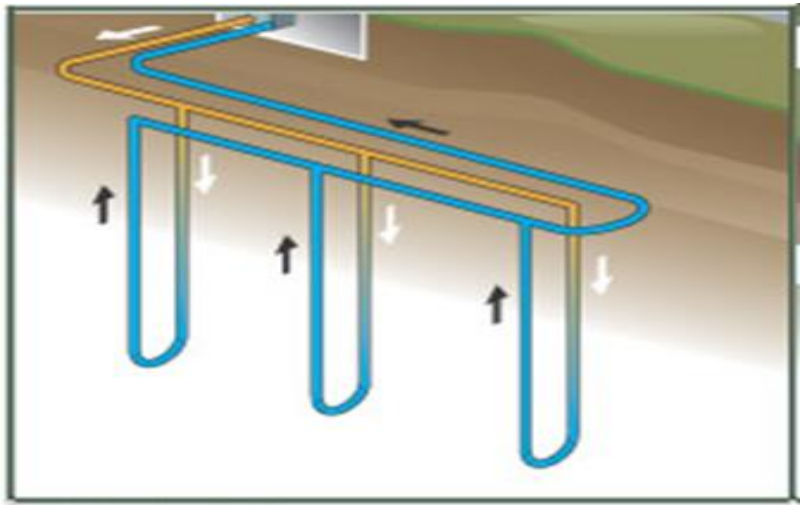
East Quad Geothermal	South Campus Geothermal	Ricci Fields Geothermal
A 300-ton well field estimated to reduce CO2 by 1,336 tons annually	A 1,000-ton geothermal well field will have the capacity to reduce CO2 by 4,454 tons	A 1,350 ton well field estimated to reduce CO2 by 6,013 tons



Renewable/Recoverable Initiatives

UNIVERSITY OF NOTRE DAME

Kenmore Warehouse Photovoltaic Array

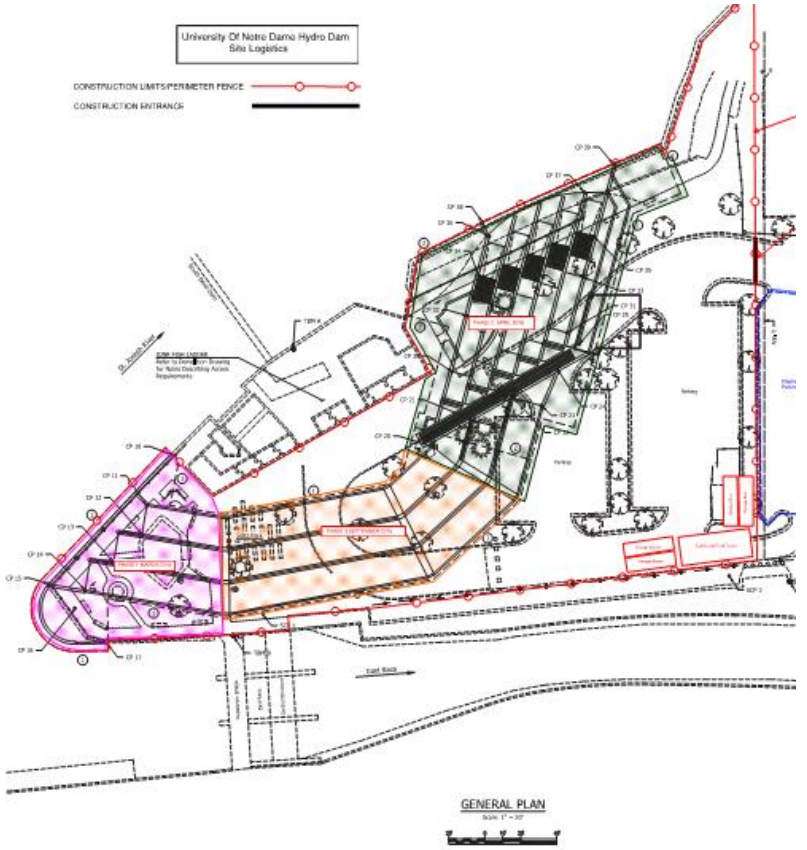
At a warehouse facility owned by the University near the Michiana Regional Airport a ground-mounted PV array has been installed. The system has a rated capacity of 145 KW. This would provide an estimated 122 tons of CO2 reduction on an annual basis.

Renewable/Recoverable Initiatives

UNIVERSITY OF NOTRE DAME

Hydroelectric Plant

- A project to build a 2.5MW hydroelectric plant on the St. Joseph River at the South Bend Dam. The project is estimated to produce 7% of campus's current electrical energy usage and would offset nearly 9,710 tons of CO_2 annually.



Other Data Uses

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- Benchmarking
  - Similar building type comparisons
    - Building Type to Building Type
    - University to University
- “Continuous Commissioning”
  - Discover system anomalies that contribute to energy inefficiencies
- Sustainability Competitions

QUESTIONS?

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Data Planning Activity

Materiality

- "Relevance, Priority"
- Risk management
- Prioritize topics for reporting
  - Significant impact
  - Important to stakeholders
- Other factors
  - Business sector & core business
  - How much control do we have?
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  - Data availability (80/20 rule)
  - Location in supply chain
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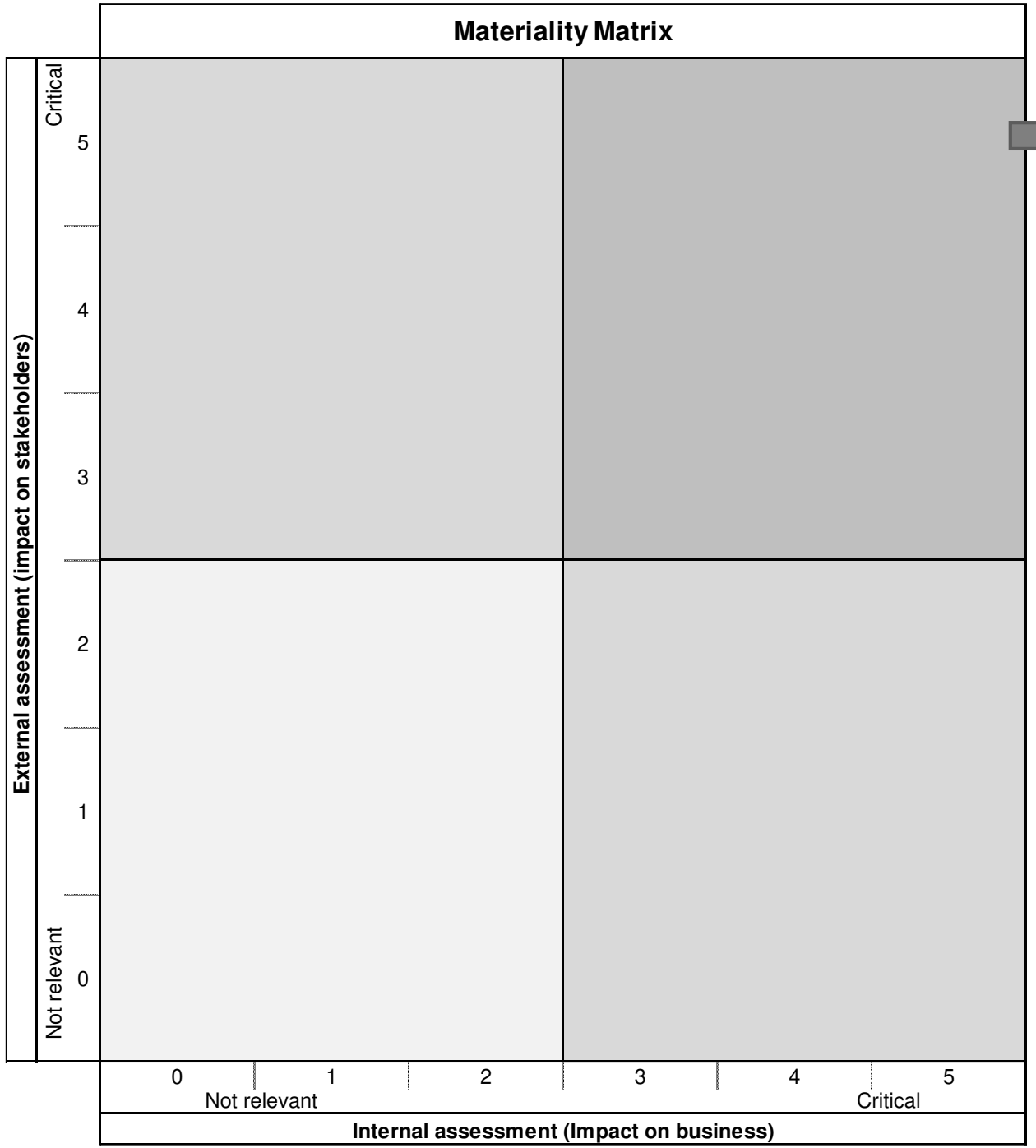
Instructions

- Review the sample list of impacts
- Rank impacts from 1 (least) to 5 (most) important to
  - Stakeholders
  - Your core business
- Map impacts on the Materiality Matrix based on the two scores
  - The dark grey quadrant = "critical issue"
- For all critical issues, consider the "Reporting on Critical Issues" questions. Use the blank space to take notes.

Environmental (E)	Social (S)	Corporate Governance (G)
E1. Direct & Indirect GhG Emissions	S1. CEO Pay Ratio	G1 Board -Separation of Powers
E2. carbon Intensity	S2. Gender Pay Ratio	G2. Board -Transparent Practices
E3. Direct & Indirect Energy Consumption	S3. Employee Turnover Ratio	G3. Incentivized Pay
E4. Energy Intensity	S4. Gender Diversity	G4. Fair Labor Practices
E5. Primary Energy Source	S5. Temporary Worker Ratio	G5. Supplier Code of Conduct
E6. Renewable Energy Intensity	S6. Non-Discrimination Policy	G6. Ethics Code of Conduct
E7. Water Management	S7. Injury Rate	G7. Bribery/ Anti-Corruption Code
E8. Waste Management	S8. Global Health Policy	G8. Tax Transparency
E9. Environmental Policy	S9. Child & Forced Labor Policy	G9. Sustainability Report
E10. Environmental Impacts	S10. Human Rights Policy	G10. Other Framework Disclosures
	S11. Human Rights Violations	G11. External Validation Assurance
	S12. Board - Diversity	

https://business.nasdaq.com/media/ESG-Reporting-Guide_tcm5044-41395.pdf



Reporting on Critical Issues

Data availability/quality
Relevance to core business, corporate values
Competitors excel/lack/create baseline
Strategic advantage
Level of control, location in supply chain