



Session 5 – Sustainable Transportation Projects
Understanding Financial Impacts of Green Infrastructure Projects

Presented By: Steven Eget, P.E., CEM, Dewberry

OVERVIEW OF PRESENTATION

- 1 • INTRODUCTION
- 2 • PHILOSOPHIES OF SUSTAINABILITY
- 3 • FRAMEWORK FOR EVALUATING ROI
- 4 • CASE STUDY – GREEN ROOFS
- 5 • QUESTIONS & COMMENTS

INTRODUCTION

**“SUSTAINABILITY WILL BECOME AS
TRANSFORMATIVE FOR BUSINESS AS
THE EARLIER QUALITY AND
INFORMATION TECHNOLOGY
REVOLUTIONS”**

BLOOMBERG BUSINESSWEEK. “WHY SUSTAINABILITY IS
WINNING OVER CEOs” MARCH 31, 2011

INTRODUCTION CLASSIC DEFINITION OF SUSTAINABILITY

**“MEETING THE NEEDS OF THE PRESENT
WITHOUT COMPROMISING THE ABILITY
OF FUTURE GENERATIONS TO MEET
THEIR OWN NEEDS”**

“OUR COMMON FUTURE”

(BRUNDTLAND COMMISSION - UN)

INTRODUCTION WORKING DEFINITION OF SUSTAINABILITY



SITTING ON A THREE-LEGGED STOOL IN THE REAL WORLD



“SUSTAINABILITY IS NOT AN UNATTAINABLE NEXUS OF THREE-UNRELATED FACTORS, IT IS A BEST CASE OUTCOME INCORPORATING ALL THESE FACTORS TO THEIR MAXIMUM EXTENTS.

IT IS NOT SUSTAINABLE IF YOU CAN'T PAY FOR IT!”

STEVEN EGET

PHILOSOPHIES OF SUSTAINABILITY



**ALTRUISTIC
PURPOSES
(ENV & SOCIAL)**

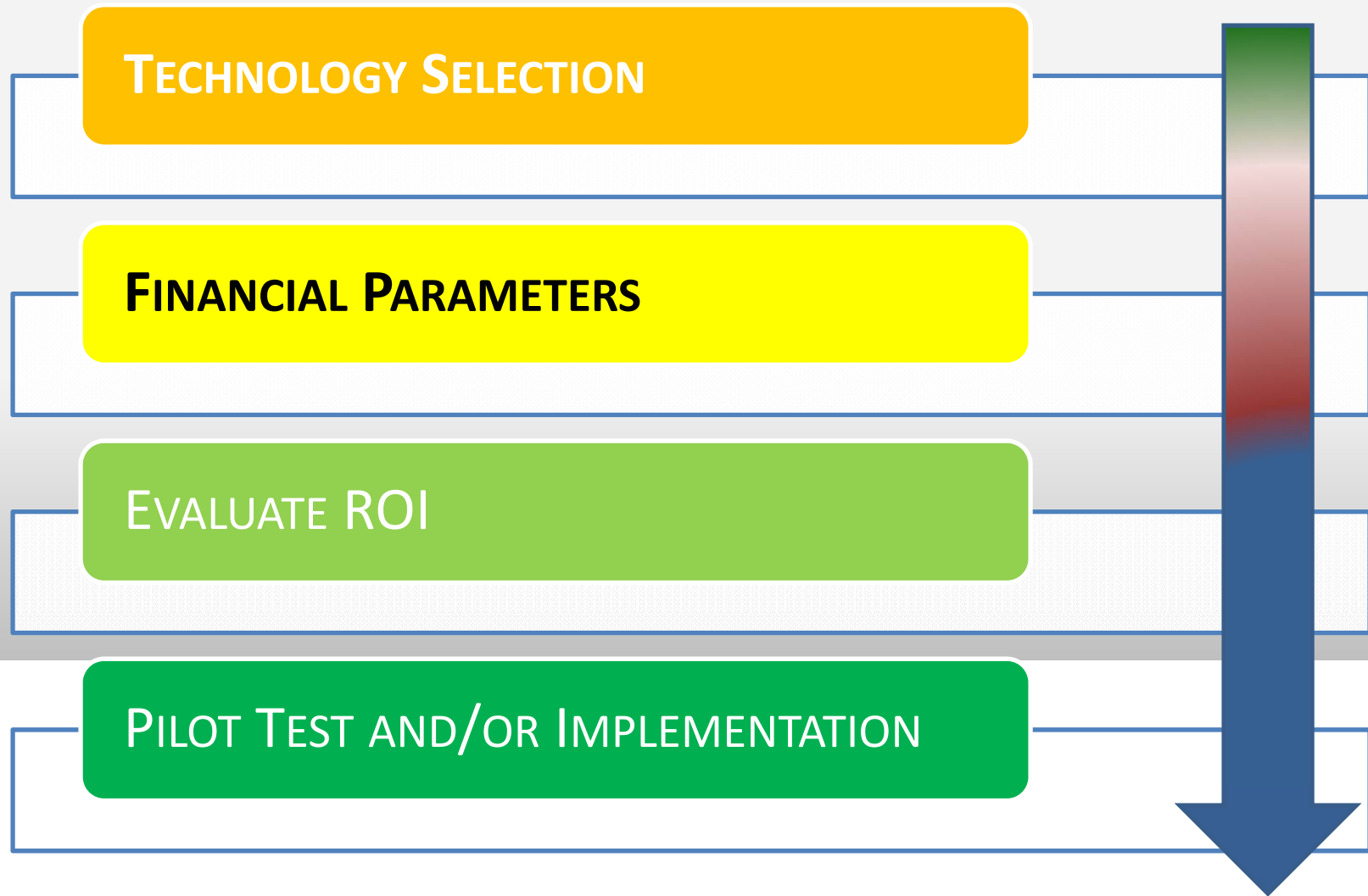


**FINANCIAL
BENEFITS**

DIFFERENT SHADES OF GREEN



FRAMEWORK FOR EVALUATING ROI



FRAMEWORK FOR EVALUATING ROI *USING CASH FLOW ANALYSIS*

CASH FLOW ANALYSIS – SUM OF **DEFICITS** AND **BENEFITS**, ITEMIZED ON PERIODIC BASIS

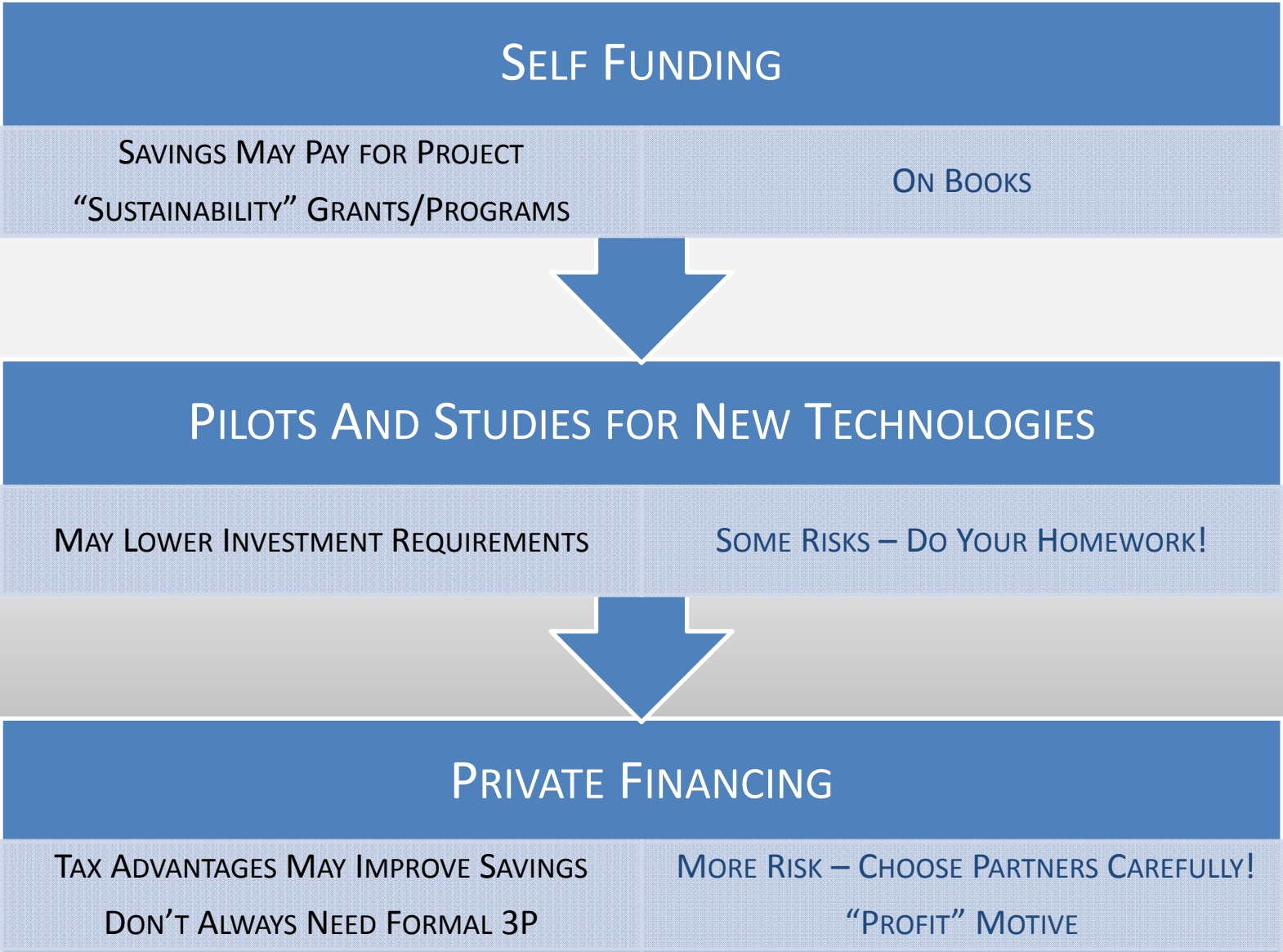
- **DEFICITS:** CAPITAL INVESTMENTS, OPERATION AND MAINTENANCE COST, COMPONENT REPLACEMENT, INSURANCE, FEES
- **BENEFITS:** TAXES, ENERGY SAVINGS, ENVIRONMENTAL ATTRIBUTES, REDUCED FEES, EQUIPMENT LIFE EXTENSION



LESSONS LEARNED EVALUATING ROI

- MULTIPLE TECHNOLOGIES MAY BE SELECTED FOR COMPARISON
- NAIL DOWN EVALUATION PARAMETERS
 - **No Two Organizations Are Alike!**
- CONSIDER SAVINGS FROM ENVIRONMENTAL (*AND ENERGY*) BENEFITS
- CONSIDER PUBLIC / PRIVATE OPTIONS
 - TAX BENEFITS FOR PRIVATE CONCERNS MAY INCREASE SAVINGS
- PILOTS AND STUDIES FOR NEW TECHNOLOGIES

FINANCING MECHANISMS FOR SUSTAINABILITY PROJECTS



EXAMPLES OF PRIVATE FINANCING

- **FORMAL 3P AGREEMENTS**

- TOLL ROADS/BRIDGES

- **ENERGY SAVINGS PERFORMANCE CONTRACTS**

- GUARANTEED OR SHARED SAVINGS AGREEMENTS
- M/V MAY CUT INTO SAVINGS

- **POWER PURCHASE AGREEMENTS**

- PAY SET ELECTRIC RATE FOR SET TERM

- **SALE / LEASE BACK**

- REAL ESTATE

CON EDISON LEARNING CENTER (*LONG ISLAND CITY, NY*)



CON EDISON LEARNING CENTER (VIEW FROM SPACE)



COURTESY GOOGLE MAPS (7/20/11)

GREEN ROOF DEFINITION

GREEN ROOF IS A ROOF OF A BUILDING THAT IS PARTIALLY OR COMPLETELY COVERED WITH **VEGETATION** AND A **GROWING MEDIUM**, PLANTED OVER A WATERPROOFING MEMBRANE.



BENEFITS OF GREENROOFS (DEFINED)

■ STORMWATER MANAGEMENT

- MAY ALLOW FOR LARGER BUILDING FOOTPRINT
- REDUCE “TRADITIONAL” STRUCTURES

■ ENERGY SAVINGS

- PRIMARILY THROUGH LOWER ROOF TEMPERATURES, REDUCTIONS IN HEAT FLOW AND ADDITIONAL THERMAL MASS
- POTENTIAL TO DOWNSIZE HVAC EQUIPMENT (*NEW*)

■ EXTENDED ROOF LIFE

- 100% INCREASE ANTICIPATED (*NEW*)
- POTENTIAL TO EXTEND EXISTING (*RETROFIT*)

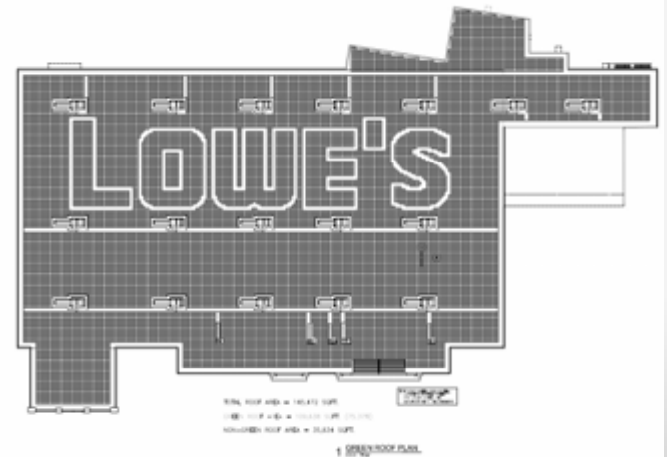
■ SITE SELECTION/DEVELOPMENT TOOL



BENEFITS OF GREENROOFS (SOFT)

- PUBLIC RELATIONS / COMMUNITY SUPPORT
- RESALE VALUE ENHANCEMENT

- MARKETING TOOL
- SOUND MITIGATION
- AERIAL ADVERTISING
- AESTHETICS
- LEED®
- EMPLOYEE SATISFACTION



CON EDISON LEARNING CENTER (LONG ISLAND CITY, NY)²

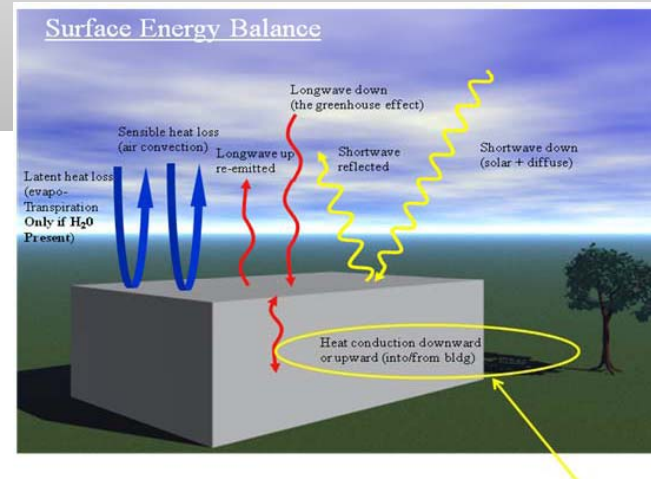
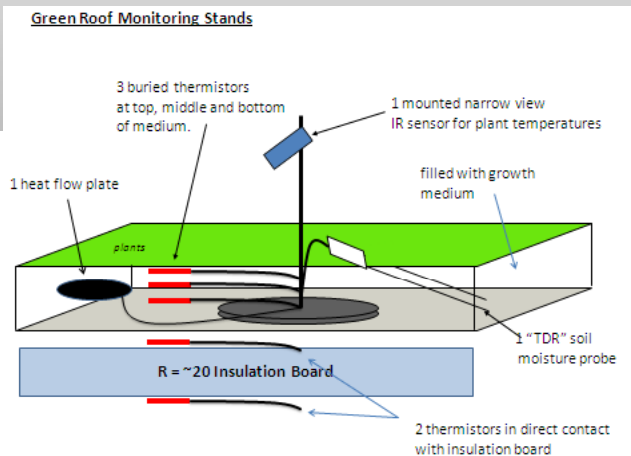


CON EDISON LEARNING CENTER *PROJECT SPECIFICATIONS*

- **BUILDING OWNER: CONEDISON**
- **LOCATION: LONG ISLAND CITY, NY**
- **GREENGRID[®] SIZE: 10,680FT²**
- **LANDSCAPE DESIGN: CONEDISON**
- **ROOFTOP SYSTEM: EXTENSIVE [2' x 4' MODULES]**
- **STATUS: COMPLETED JULY 2008**
- **NOTES: TEST PLOT TO BETTER QUANTIFY THE ENERGY SAVINGS BENEFITS OF GREEN ROOF SYSTEMS. COLUMBIA UNIVERSITY IS WORKING TO MONITOR LONG-TERM THERMAL AND ENERGY PERFORMANCE**

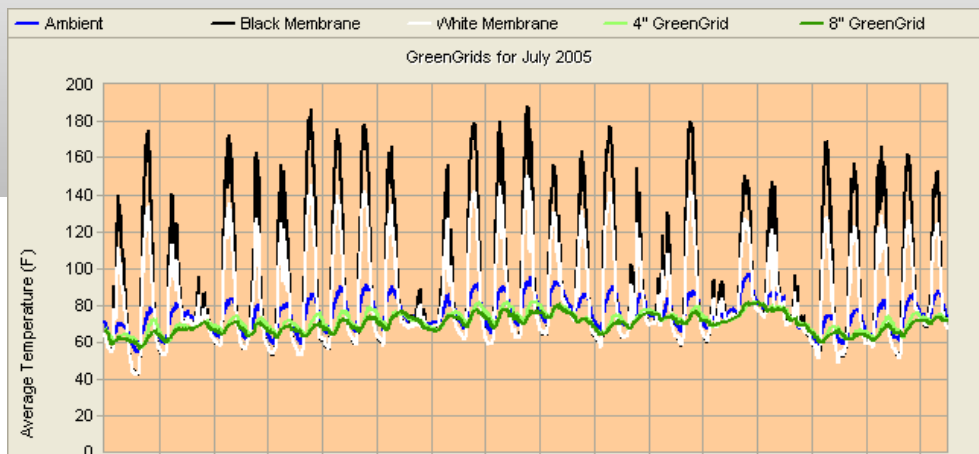
CON EDISON LEARNING CENTER (ROI)

- DETAILED ENERGY STUDY PERFORMED
 - QUANTIFY SAVINGS
 - COMPARE W/ BLACK & WHITE ROOF OPTIONS
 - YEAR-LONG STUDY
- EXTENDED ROOF-LIFE
- AS RETROFIT, SOME BENEFITS NOT QUANTIFIABLE



ENERGY SAVINGS (THE SPECIFICS)

- EFFECTIVE ALBEDO
 - HOW “WHITE” WOULD A ROOF HAVE TO BE TO SHOW SIMILAR TEMPERATURES
 - DOES NOT ACCOUNT FOR ACTIVE COOLING & THERMAL MASS
- EFFECTIVE R-VALUE
 - HOW MUCH INSULATION NEEDED FOR SIMILAR REDUCTIONS
 - DRAMATIC SEASONAL VARIATION, SYSTEM SPECIFIC DATA NEEDED



Green roof produces 25% energy savings in project's first year

by Jacqueline Boucher
Assistant Editor

First-year data charting the progress of Tobyhanna's vegetative (green) roof indicates the project is right on schedule.

CON EDISON LEARNING CENTER (ROI)

■ EXPENDITURES

- INITIAL CAPITAL INVESTMENT (\$200,000)
- ANNUAL MAINTENANCE (\$5,000 / YR)

■ BENEFITS

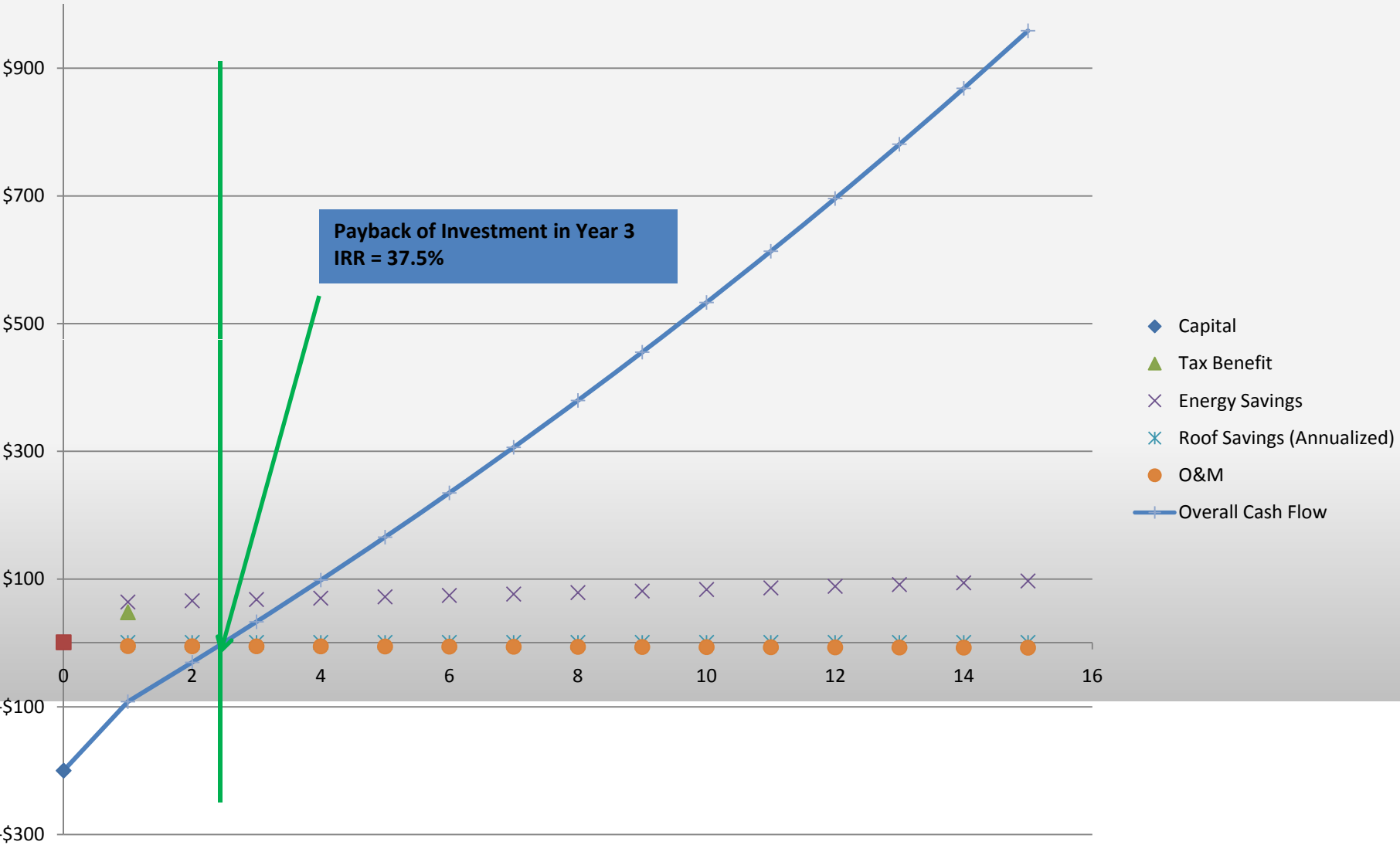
- NYC TAX BENEFITS (\$4.50/SF OR \$24,300 INITIAL)
- LOWER ENERGY COSTS (\$6/SF OR \$32,400 / YR)
- ADDITIONAL ROOF LIFE

■ ADDITIONAL ASPECTS

- BRANDING OPPORTUNITY
- SAVES NYC MONEY FOR STORMWATER CONTROL
- AIR FILTER CHANGE OUT FREQUENCY REDUCED



GREEN ROOF ROI CONEDISON LONG ISLAND CITY, NY

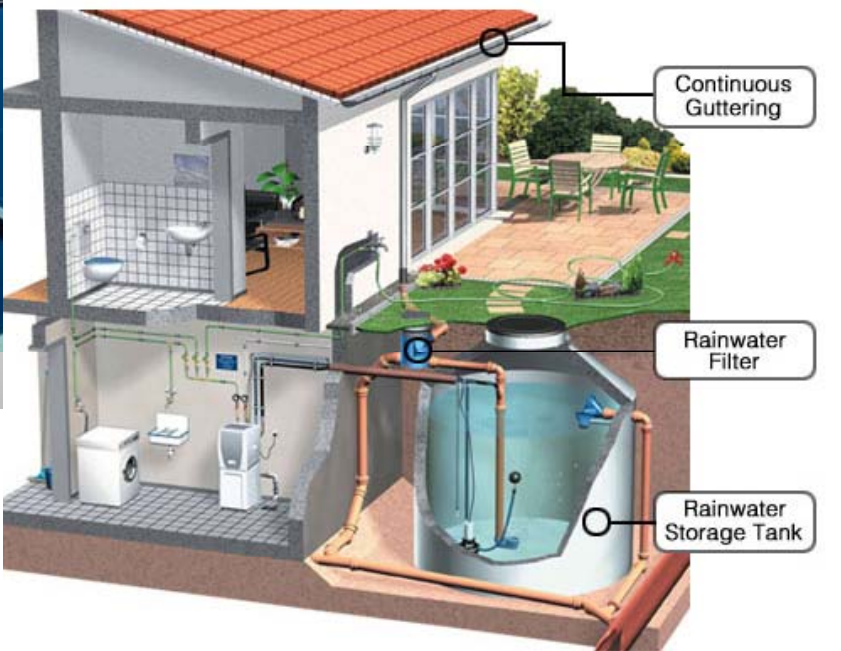


OTHER SUSTAINABLE TECHNOLOGIES

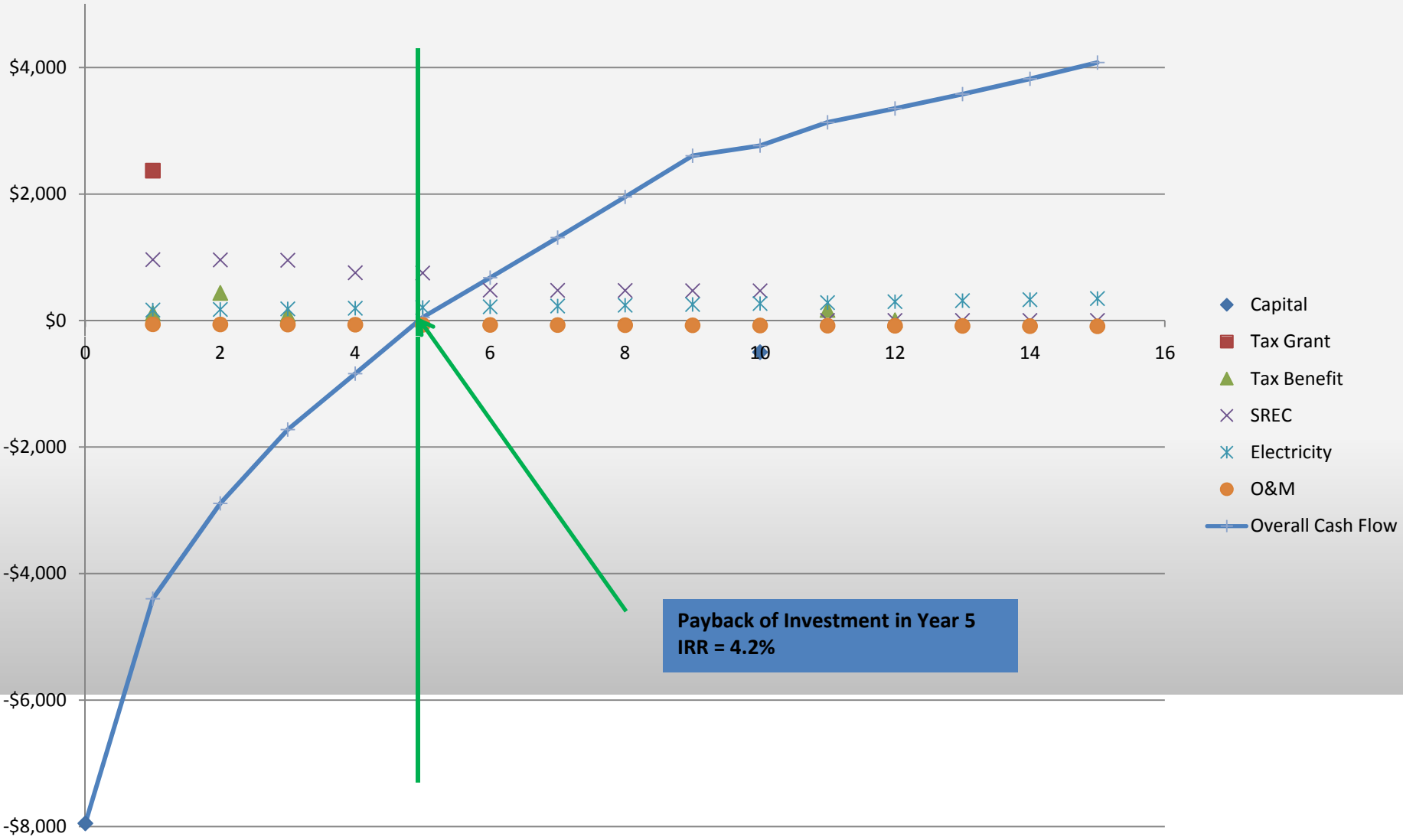
ROOF TOP SOLAR



RAINWATER COLLECTION



INTRODUCTION SAMPLE CASH FLOW (2MW SOLAR PROJECT IN NJ)



POINTS TO CONSIDER

- SUSTAINABLE PROJECTS CAN BE FINANCIALLY ATTRACTIVE AS WELL
 - CASH FLOW ANALYSIS SIMPLE MEANS OF COMPARING ROI'S FOR DIFFERENT MEASURES
- ALTERNATIVE FINANCING SHOULD BE CONSIDERED IN ADDITIONAL TO TRADITIONAL (I.E. SELF FINANCING)
 - EDUCATE YOURSELF ON ADDITIONAL RISKS

REFERENCES

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PHOTO OF TRADITIONAL GREEN ROOF COURTESY OF ERIK CHRISTENSEN (VIA WIKIPEDIA)
PHOTO OF CHICAGO CITY HALL COURTESY OF WIKIPEDIA
- PH. 14 – 17 PHOTOS COURTESY OF GREENGRID
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