EE/RE Projects Financing – Measurement and Verification

Dr. Khaled ELFARRA

Energy Audits in Industrial Small Medium Enterprises (SMES) - Training Course

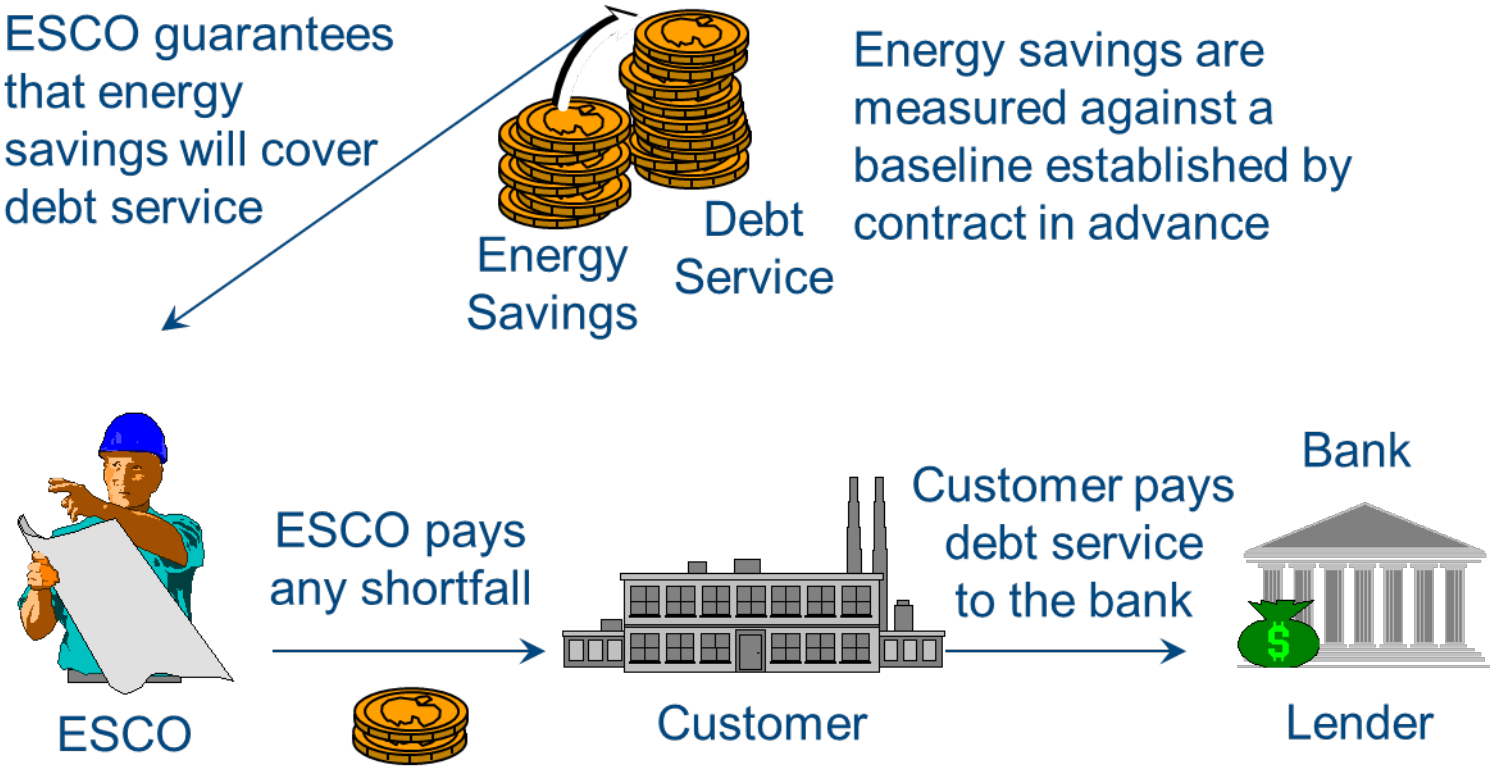
Tuesday, 10 December 2019 – Cairo, Egypt

Funded by the European Union

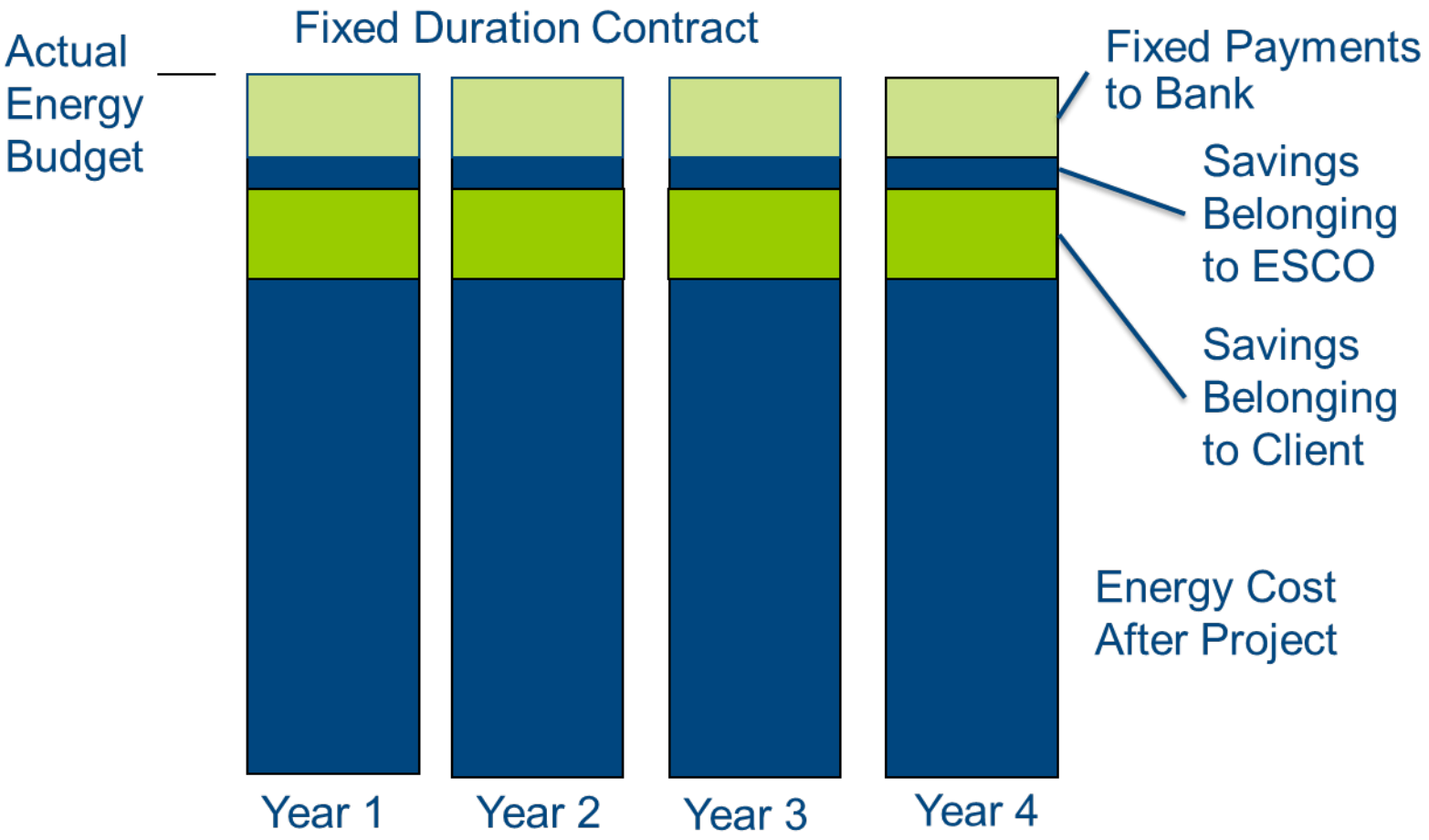
How to Finance EE/RE Projects?

- The Projects Financing could be through;
  - Facility Self Financing Mechanism.
  - Energy Service Companies;
    - Guaranteed Savings Contracts.
    - Shared Savings Contracts.
    - Independent Service Providers Contracts.
- All above financing mechanisms need to study the associated risks towards the investment security.

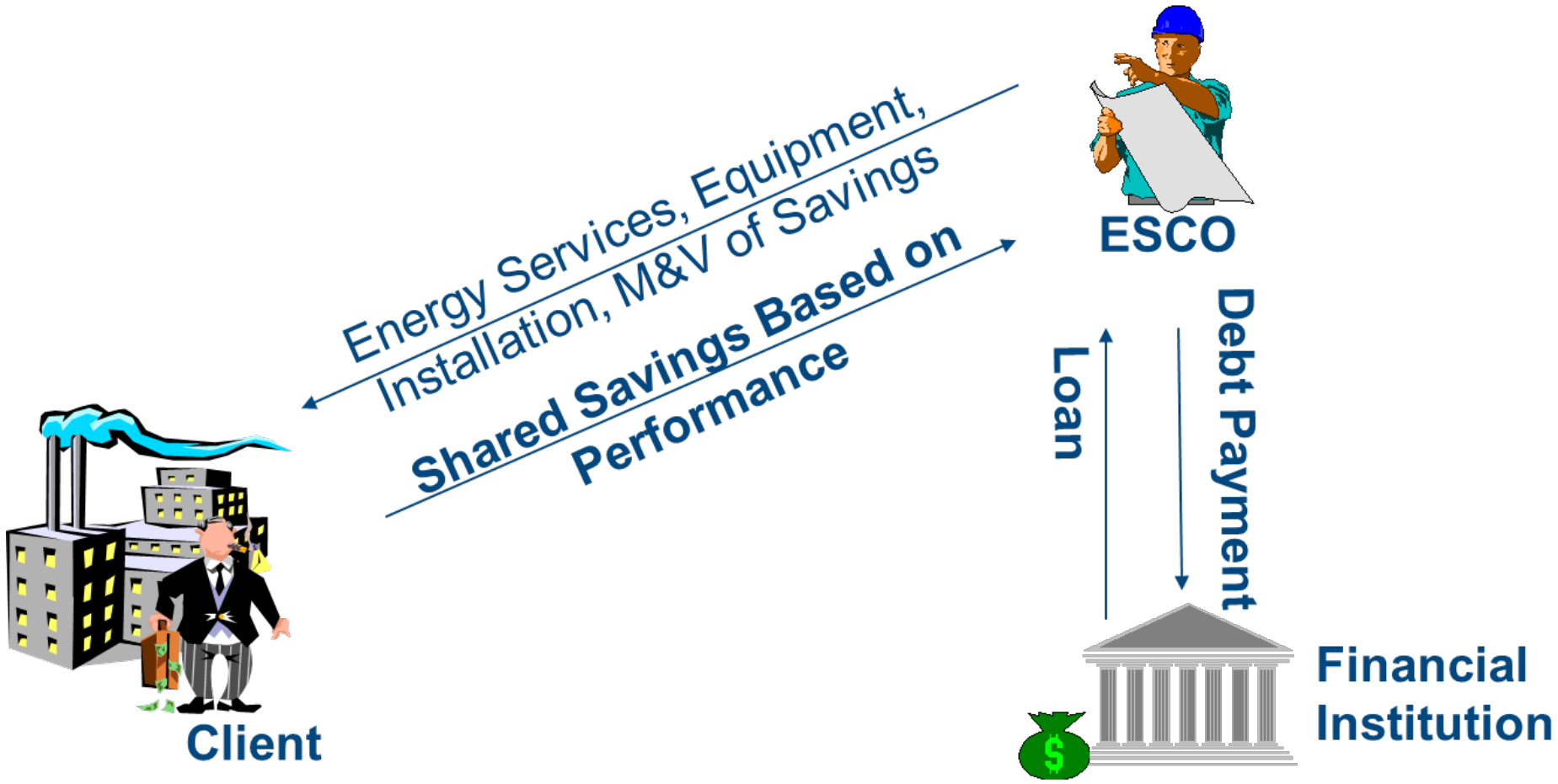
Guaranteed Saving



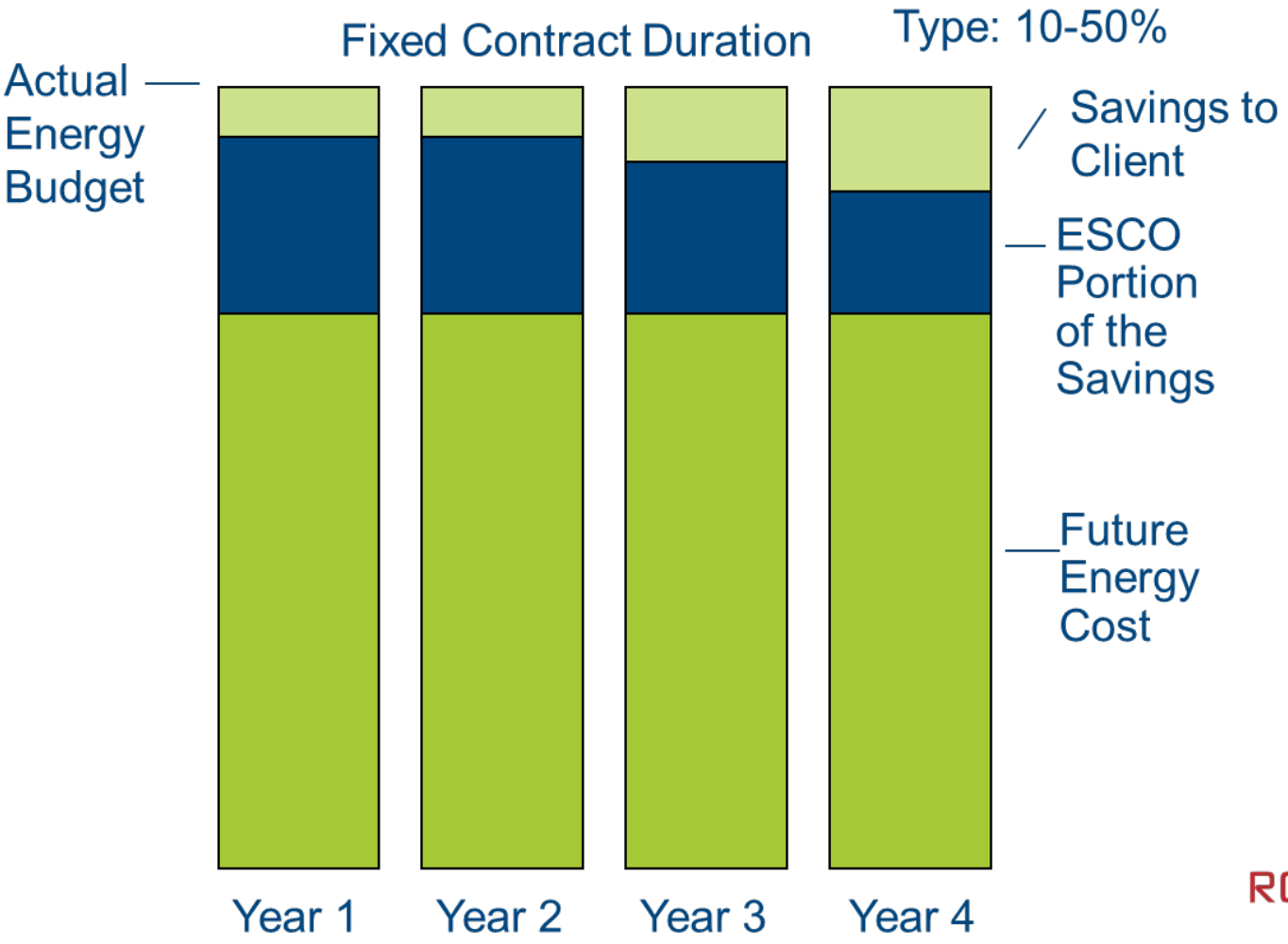
Guaranteed Saving



Shared Savings Contract



Shared Savings Contract



Comparing Guaranteed vs. Shared Savings

- Guaranteed savings contract may seem more risky, however, it should be borne in mind that:

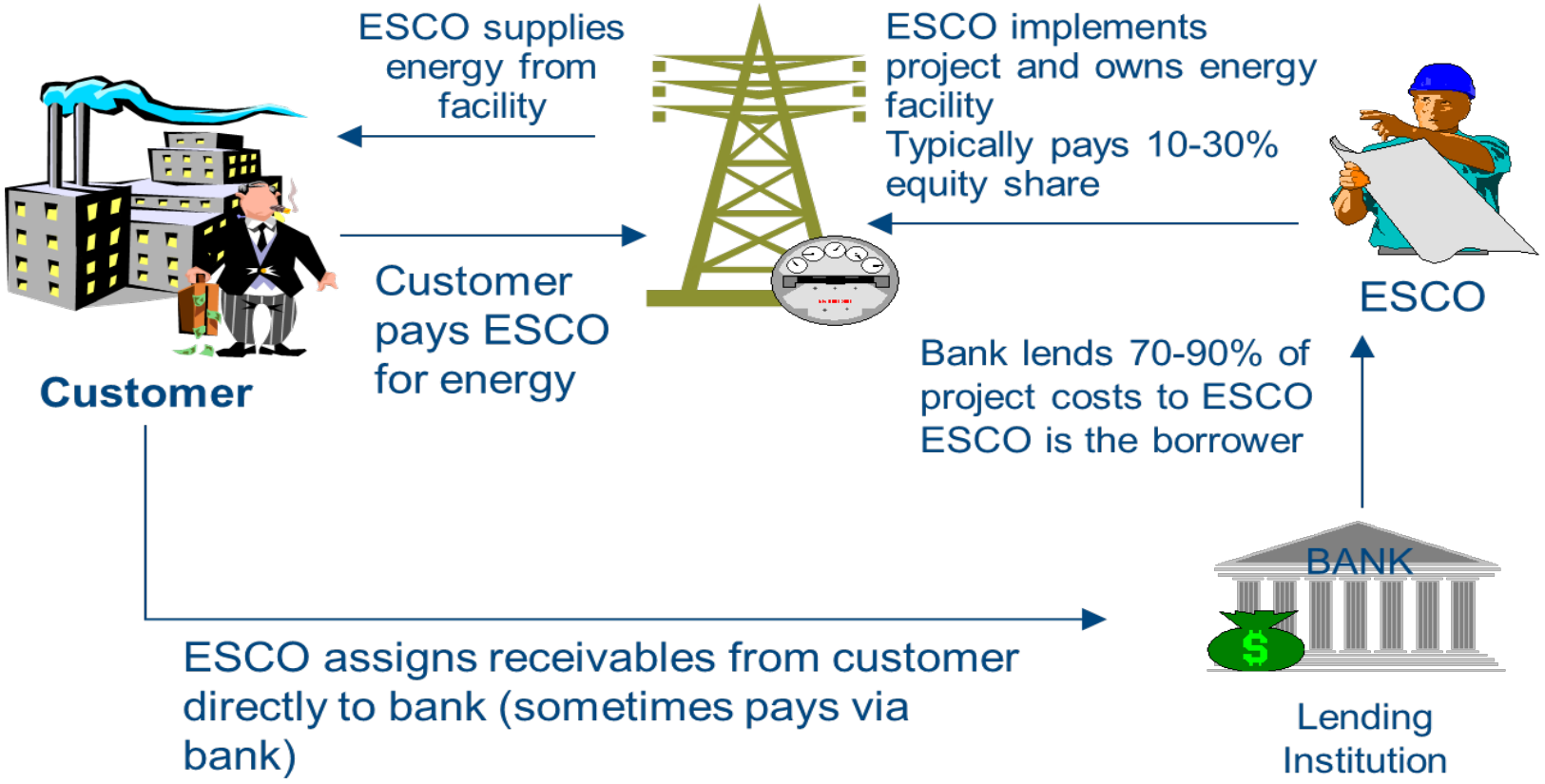
  Shared-savings contracts which provide financing have an implicit guarantee (if savings are under expectations, the ESCO isn't paid back its investment).
- Shared-savings contracts with financing also expose the ESCO to credit risk from the customer and require the ESCO to be very well capitalized.
- Shared-savings contracts without financing are the lowest risk contract for an ESCO. Indeed, ESCO exposure is limited to its contribution of labor costs to project development and implementation.

Chauffage Contracts (Independent Service Provider)

- “Chauffage” contracts were originally a French term for heat supply contracts (often for buildings). However, they have come to mean any contract in which the ESCO owns the assets and sells energy to the customer.

- Usually found in projects where the ESCO takes charge of building operation and payment of energy bills.
    - e.g.: power plant operation and energy efficiency program

Typical Chauffage Contracts



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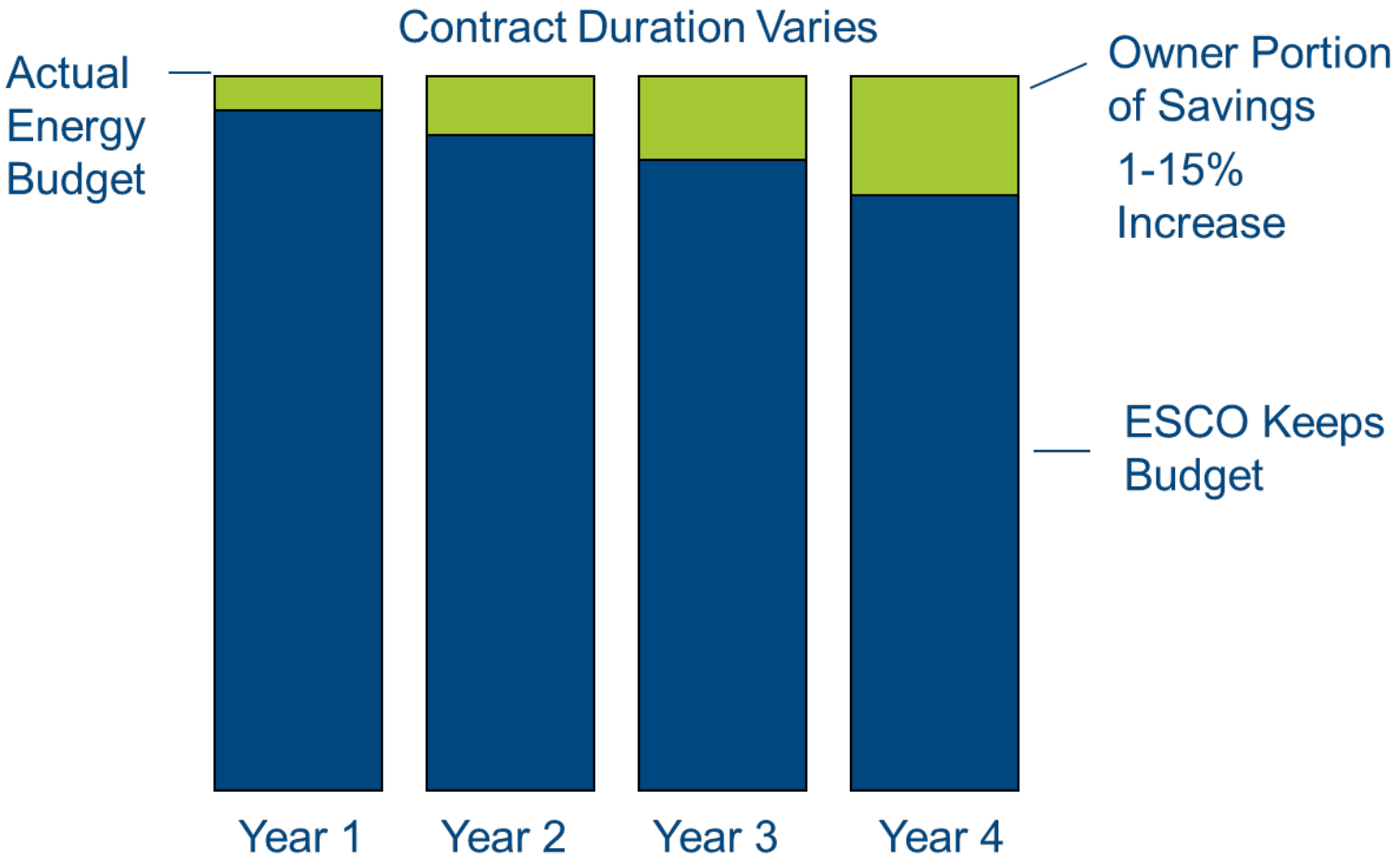
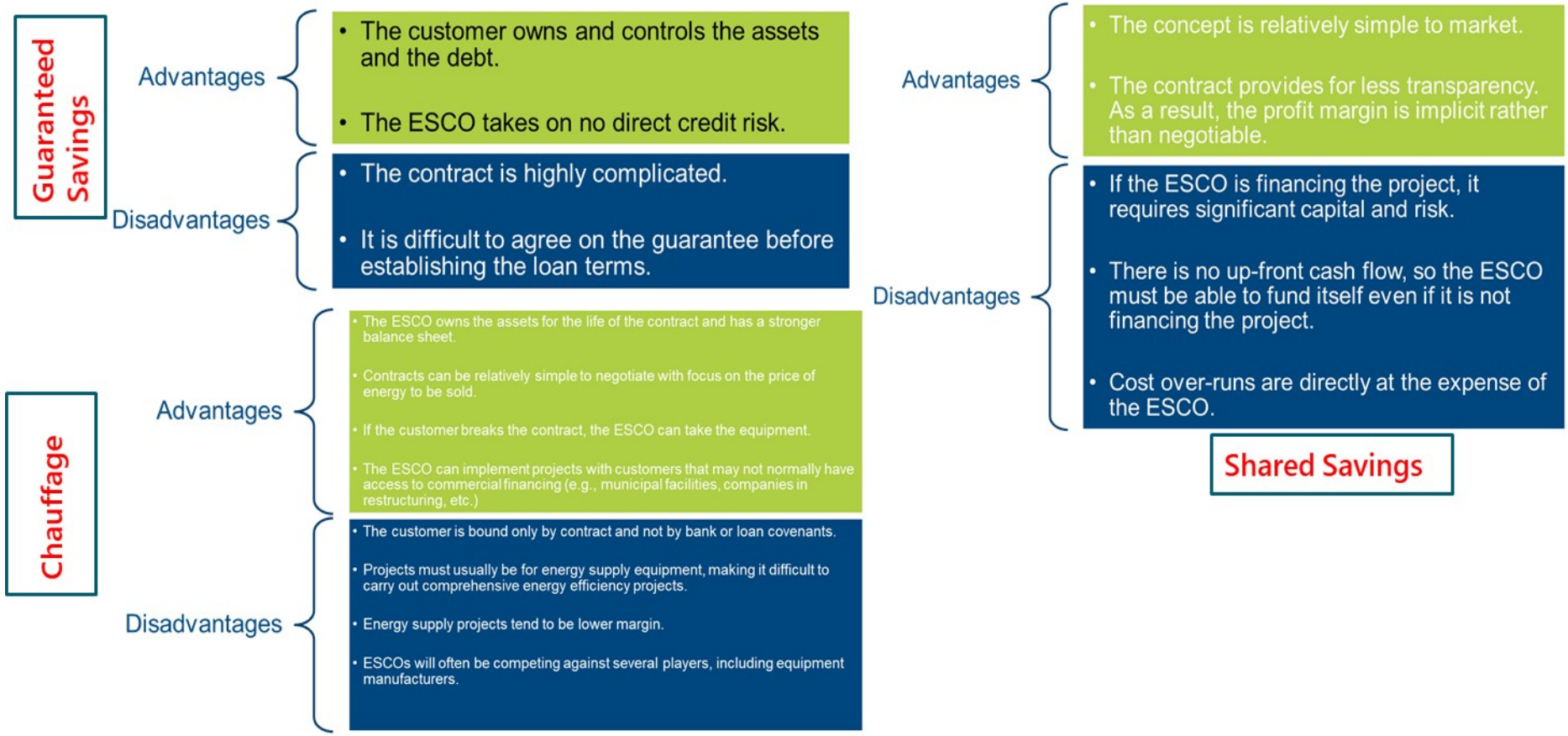


Choosing the Right Contract



Measurements and Verification (M&V)

- The Process of Providing Verification of Agreed Upon Goals for:
  - **Performance** and/or
  - **Energy Savings** and/or
  - **Cost Savings**
- Why M&V makes Sense?
  - Provides the ability to weigh and reduce risk
  - Increase in the amount of Performance Contracting being performed
  - Provides options for financing projects that may not meet the Company Standards for payback

Most Influential Factor to M&V

- Documentation of existing conditions
  - Equipment condition
  - Equipment efficiencies accurately defined
  - Inspections & spot measurements
- Establish & Verify Baseline
  - Pre-Installation Energy Use
  - Verification of baseline conditions
- Identify variables affecting loads

What is Important?

- For M&V the most important thing that is needed is an agreed, documented, M&V plan, that outlines clearly and transparently, HOW and WHEN the performance of the energy improvement project will be verified, and that this plan is agreed and documented BEFORE the improvement works takes place.

- Baseline
  - This is the energy use before the project was implemented AND the conditions that existed when the baseline was measured.
  - Baseline measurement requires one full cycle of operation.
  - A baseline that is not understood is meaningless.

Constant or Variable Energy Use?

- Baseline and post-installation energy use constant:
  - Example: Lighting project where operating hours do not change during term of agreement.
- Baseline and post-installation energy use vary:
  - Example: HVAC project where occupancy changes during term of agreement.
- Baseline energy use constant and post-installation use variable:
  - Example: Lighting occupancy sensors installed change operating hours.

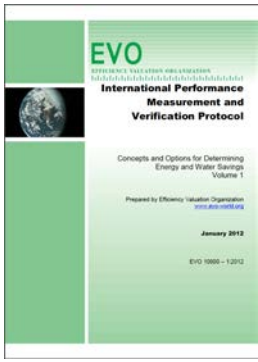
Some Tips for M&V

- Put a clear and transparent plan in place
- Use IPMVP as guidance for what information should be included in a plan.
- Give a realistic assessment of costs and time involved

International Performance Measurement and Verification Protocol (IPMVP)

“Rulebook” to deal with variances such as:

- Facility Changes (enrollment, expansion, operating hours, construction periods, etc.)
- Production Changes (# widgets/day, # shifts/year, shutdown periods, etc.)
- Other Variances that will happen (plug load growth, etc.)



IPMVP

- Option A = Retrofit Isolation-Key Parameter Measurement
- Option B = Retrofit Isolation-All Parameters Measurement
- Option C = Whole Facility Measurement
- Option D = Calibrated Simulation

Non-Measured = “Stipulated” Savings

Option A

Options A & B are both related to measurement of a single ECM:

- Option A = Key Parameter Measurement [measure change of key (but not all impacted) parameters]
  Option A allows for assumptions and stipulated parameters

- Option B = All Parameter Measurement [measure change of all impacted parameters]

Both Options can be short-term or continuous measurement

Option B

- Applicable ECMs:
  - Variable Load (i.e. HVAC, controls)
  - Device/System/ECM can be Isolated
  - Few Measurement Pts Needed (i.e. chiller, boiler)

- Well Suited for:
  - Large Projects (can absorb M&V cost)
  - Time Available for Baseline Measurement
  - Owner Unwilling to Assume Savings Risk

Option C

- Applicable ECMs:
  - Any/All Within a Metered Building or Group
- Well Suited for:
  - Projects Where Savings are Projected to be > 10 to 20%
  - Aggregation of Various ECMs Within a Metered Building or Group
  - Fast Track Projects
  - Owner Unwilling to Assume Savings Risk

Option D

- Applicable ECMs:
  - Any/All
- Well Suited for:
  - Projects with No Available Metered Data
  - Large Projects (that can absorb simulation cost)
  - Aggregation of Various ECMs Within a Metered Building or Group
  - Assess Performance of Individual ECMs within a Facility (e.g., where individual performance can't be independently determined from direct measurement)
  - Projects with Anticipated Future Baseline Adjustments
  - New Construction

Concepts and Methodology for M&V

Energy Savings = Base year Energy Use – Post-Retrofit Energy Use ± Adjustments

- Adjustments bring energy use in the two periods to the same set of conditions.
- Conditions commonly affecting energy use are weather, occupancy, plant throughput, equipment operations required by these conditions.

M&V Formula Adjustment Factors

- **Routine Adjustments:** Adjustments for changes in parameters that can be expected to happen throughout the post-retrofit period and for which a relationship with energy use/demand can be identified. These are often seasonal or cyclical. This protocol defines four basic options for deriving routine adjustments
- **Non Routine Adjustments:** Adjustments for changes in parameters which cannot be predicted and for which a significant impact on energy use/demand is expected.

M&V Costs

M&V Approach	Typical Costs (% of ECM Cost)
Option A, Spot Measurement: Key performance factors (e.g., lighting wattage or chiller efficiency) are determined with spot or short-term measurements. Operational factors (e.g., lighting operating hours or cooling ton-hours) are stipulated. Performance is verified annually.	**1 - 5%** Primarily dependent on quantity of measurement points.
Option B, Continuous Measurement: Savings are determined by continuous measurements taken throughout the term of the contract at the device or system level. Performance and operations factors are monitored.	**3 - 10%** Primarily dependent on qty. & type of system(s) measured, and the duration of metering & analysis.
Option C, Utility Bill Comparison: Savings are determined at the "whole-building" or facility level using current year and historical utility meter or sub-meter data.	**1 – 10%** Primarily dependent on qty. & complexity of parameters in analysis.
Option D, Calibrated Simulation: Savings are determined through simulation of facility components and/or the whole facility.	**3 – 10%** Primarily dependent on qty. & complexity of systems being evaluated

Contact us!

www.meetmed.org

meetMED Project

@meetmed1

info@meetmed.org