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Solar PV for Farms

The ATU Contract Research Unit (CRU) as part of the Research Office provides a dedicated outreach Research & Innovation support to regional enterprises, communities and individuals.

SUSTAINABLE ENERGY COMMUNITIES

AgroRES
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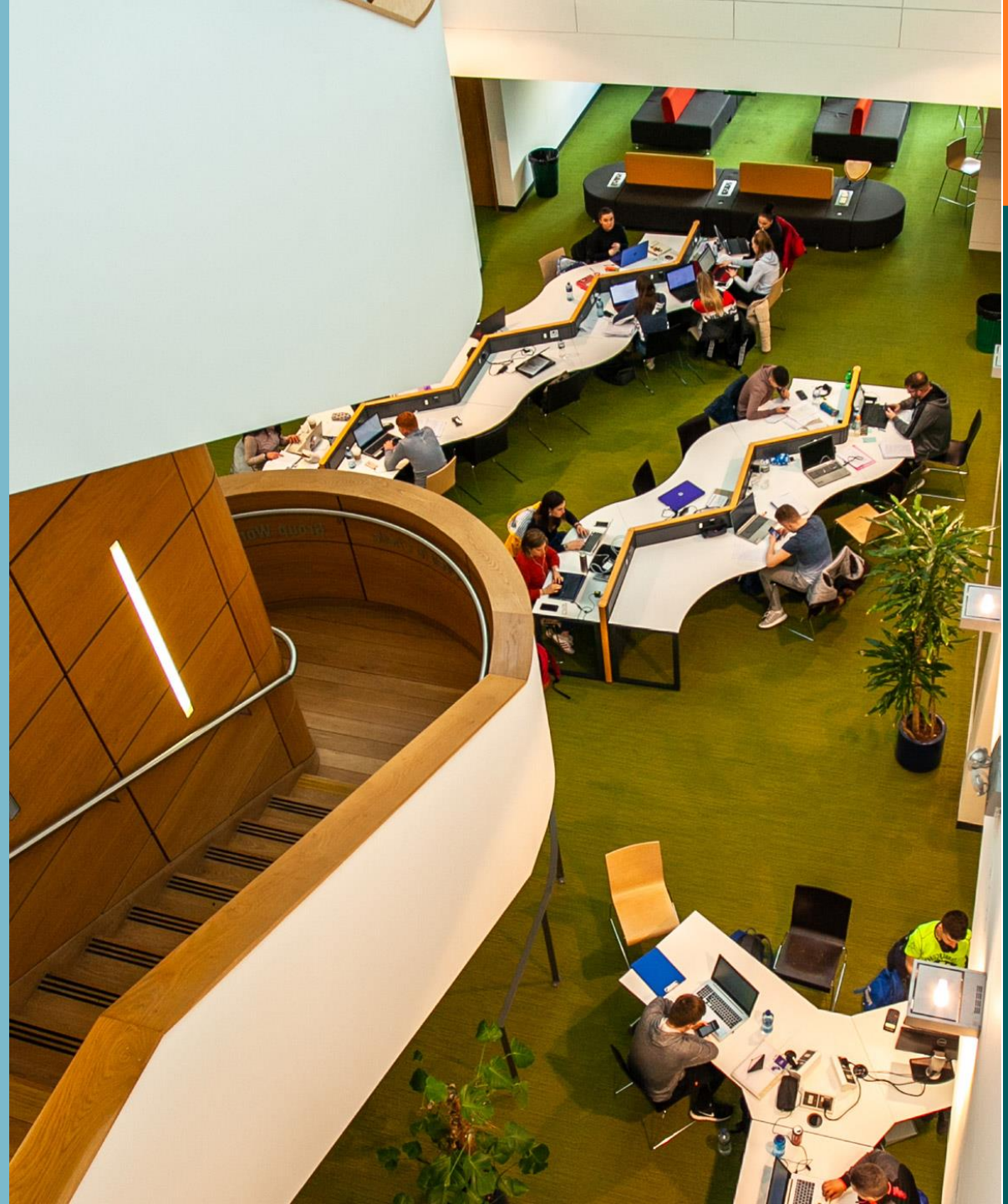
Assessing the value of Solar PV for farms



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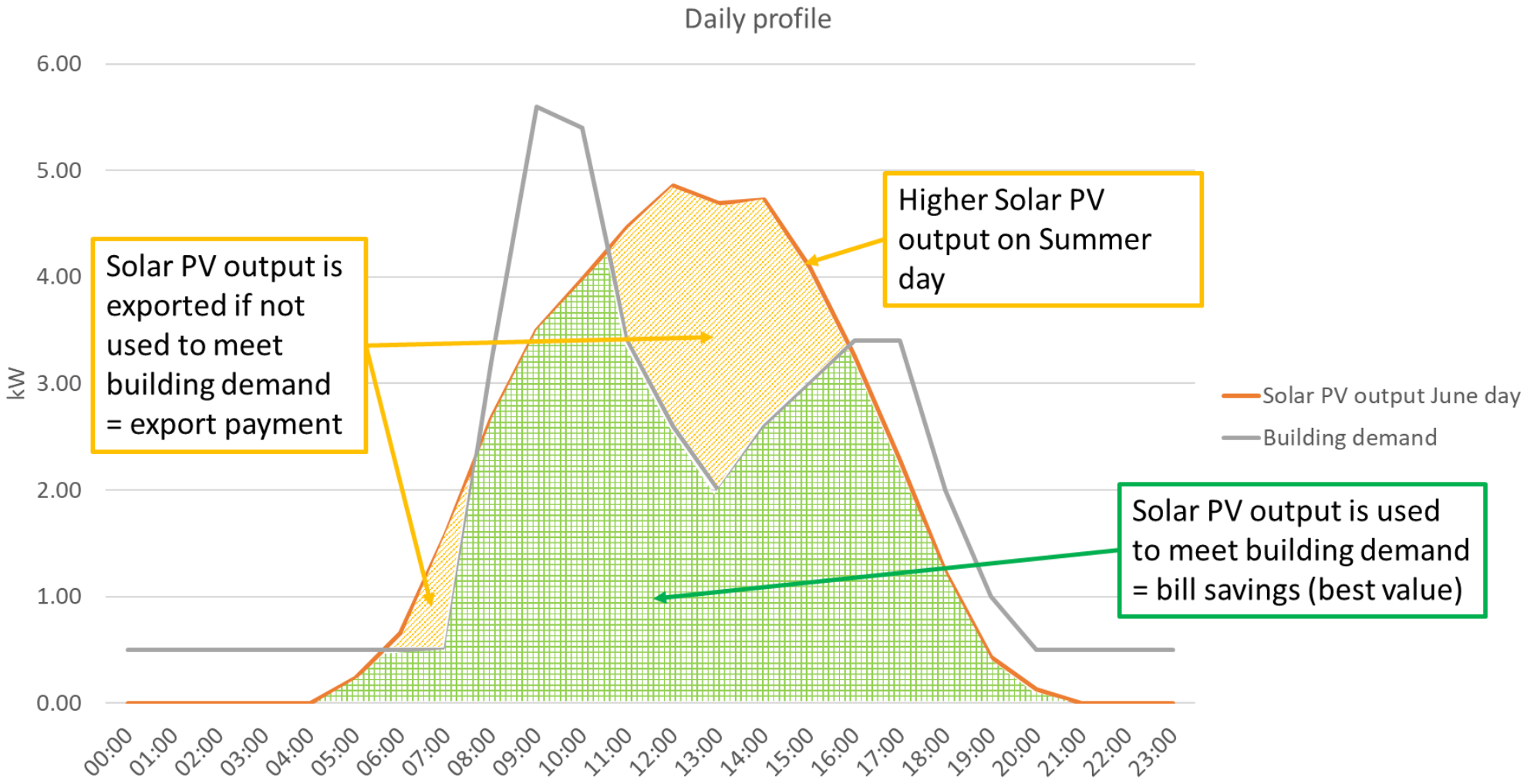
Is Solar PV right for your farm?

Solar PV v Electricity Demand

- Solar PV generates electricity during sunlight hours, increasing from sunrise to a peak around midday and decreasing to sunset.
- A Solar PV system will generate approx. 5 times more electricity on a summer day (May/June), than on a winter day (Dec/Jan).
- The best return on investment for Solar PV is to use the generated electricity in your own home or business as it is being generated.

Is Solar PV right for your farm?

Solar PV v Electricity Demand



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Farming sectors with daytime electricity demand

Sector	Potential electricity match for Solar PV	Notes
Pig & Poultry	○ Internal daytime lighting ○ Ventilation ○ Feeding systems ○ Heating pads	▪ Continuous lighting ▪ Ventilation generally increases in the summer – very good match for Solar energy
Horticulture	○ Cooling/Refrigeration ○ Food processing	▪ Cooling/refrigeration generally increases in the summer – very good match for Solar energy
Tillage	○ Grain drying (fans and electric heat)	▪ Seasonal operation ▪ Fans may be used mostly at night to utilise cheaper unit rates
Dairy	○ Milk cooling ○ Water heating ○ Milking machines / pumps	▪ **Peak demand is morning and evening – not a good match for Solar energy output** ▪ Water heating can use night rate electricity ▪ Battery storage may be required to make Solar PV effective – increases system cost

Advisory Service – Solar PV

Target Sectors

- Daytime electricity use
- Pig, poultry, horticulture
- Group Water Schemes

Solar PV toolkit

- Guidance document
- Solar PV Toolkit
- Regulatory guidance
- Bills analysis
- Yield assessment
- Financial Analyses

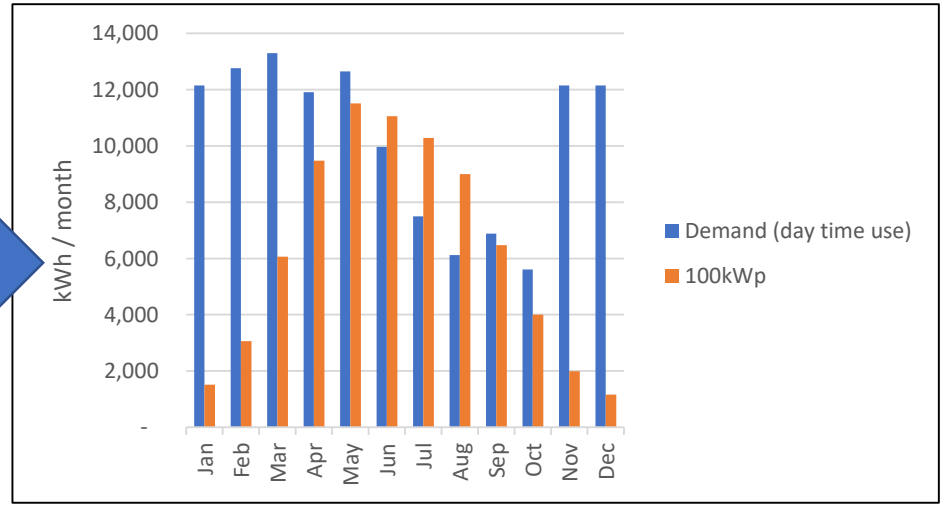
Delivery

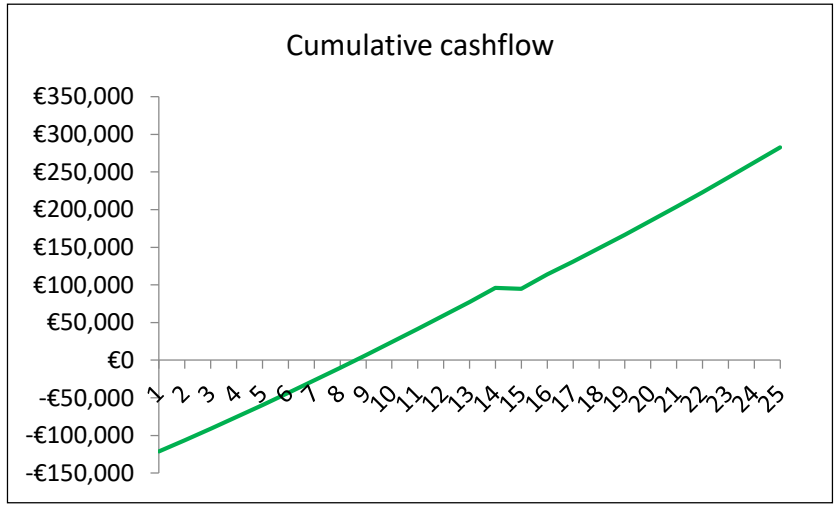
- Direct training on the Solar PV toolkit use
- Follow up support for market offers

€ Bills
kWh demand data

European Commission PVGIS

€ Investment estimates





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Advisory Service – Solar PV + battery

Solar PV + Battery toolkit

- Guidance document
- Solar PV + Battery Toolkit
- Regulatory guidance
- Yield assessment
- Financial Analyses

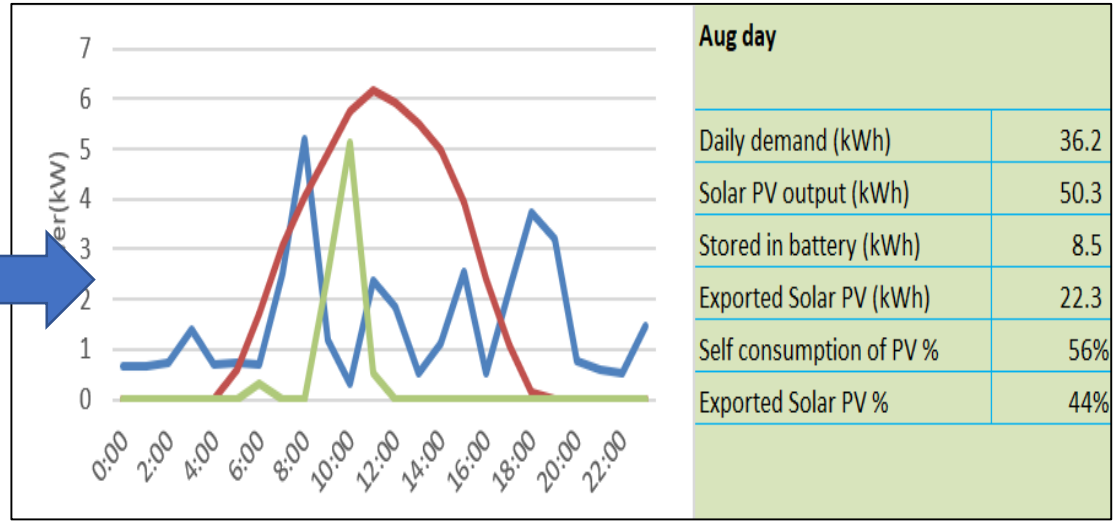
Delivery

- Direct advisory service with individual/groups farmers
- On-site data logger – daily demand profile
- Assessment and Specification provided to farmer
- Follow up support for market offers

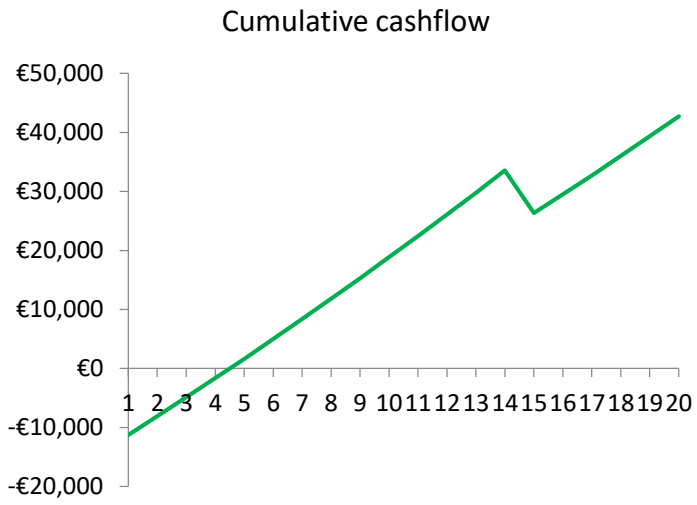
Direct monitored data

SOLARGIS

€ Investment estimates



Aug day	
Daily demand (kWh)	36.2
Solar PV output (kWh)	50.3
Stored in battery (kWh)	8.5
Exported Solar PV (kWh)	22.3
Self consumption of PV %	56%
Exported Solar PV %	44%



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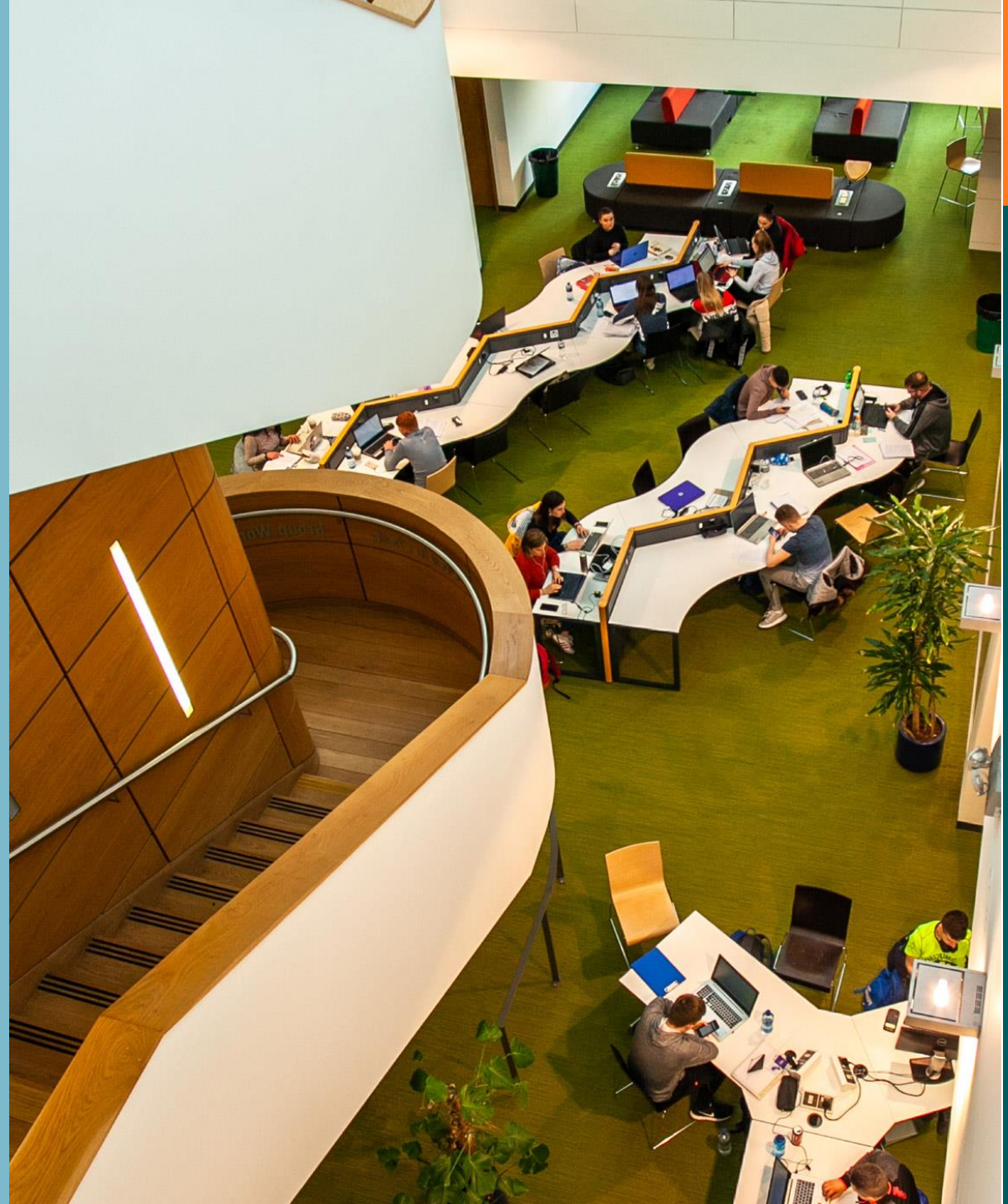
Advisory Service – Solar PV

Levelised Cost of Electricity

- Investment cost for the renewable electricity produced by the system €/kWh
- Calculated over a timeframe

$$\text{LCOE over 20 years} = \frac{\text{Total system life investment cost (€)}}{\text{Total Solar PV generation over 20 years (kWh)}}$$

Case studies



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Poultry – Free Range Eggs, Co. Cavan

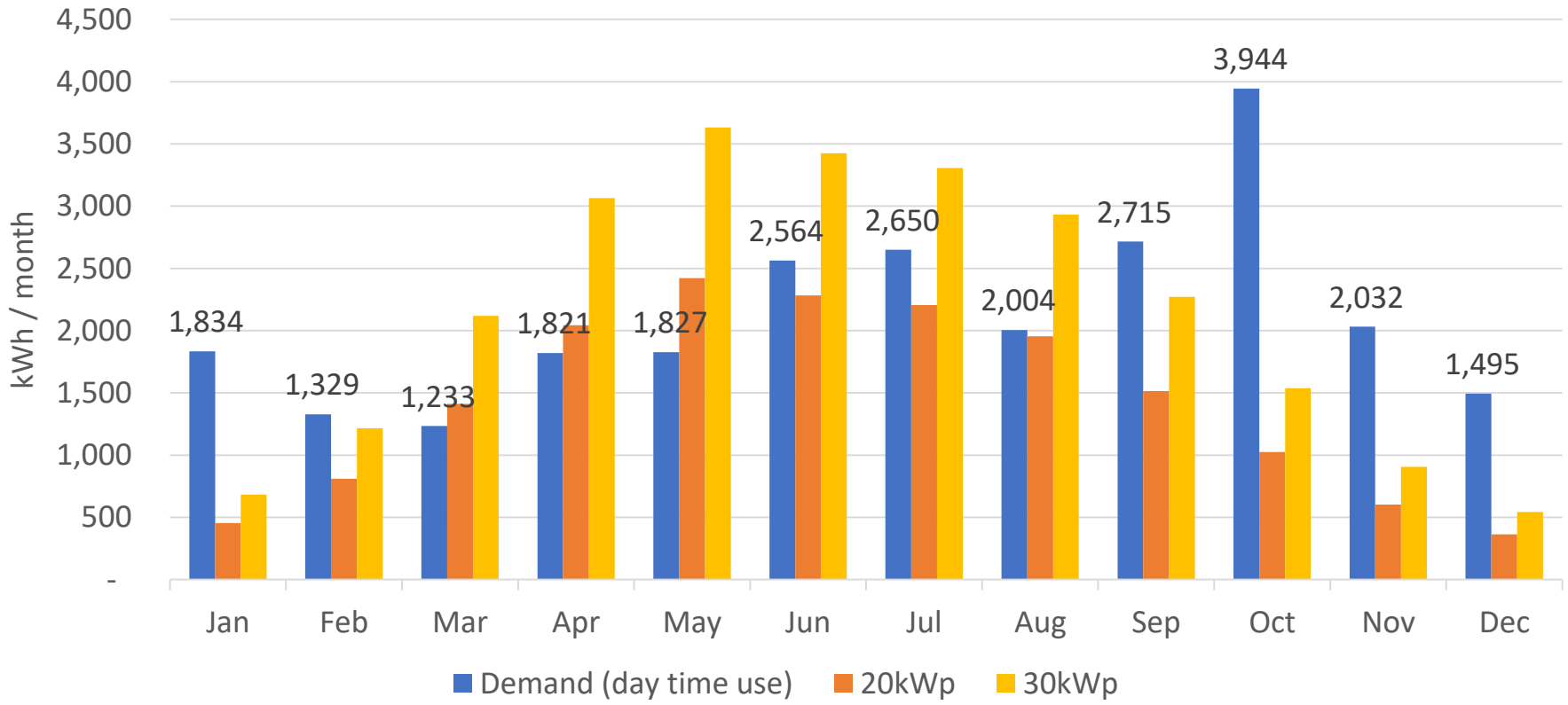
Free range eggs and rearing

- Site: 30,000 layers and 25,000 bird rearing shed
- Electricity: 3-phase, MIC 27kVA, approx. 50,000 kWh/year
- **Solar PV assessment:**
  - ❑ Option 1: 20 kWp
  - ❑ Option 2: 30 kWp
- **Analysis parameters/assumptions:**
  - ❑ Cost of electricity €0.35/kWh
  - ❑ Export tariff €0.135/kWh (Clean Export Premium, 15 years)
  - ❑ Solar PV investment cost €1,600 to €1,800 per kWp installed
  - ❑ TAMS grant 60% of system cost

Poultry – Free Range Eggs, Co. Cavan

Analysis results

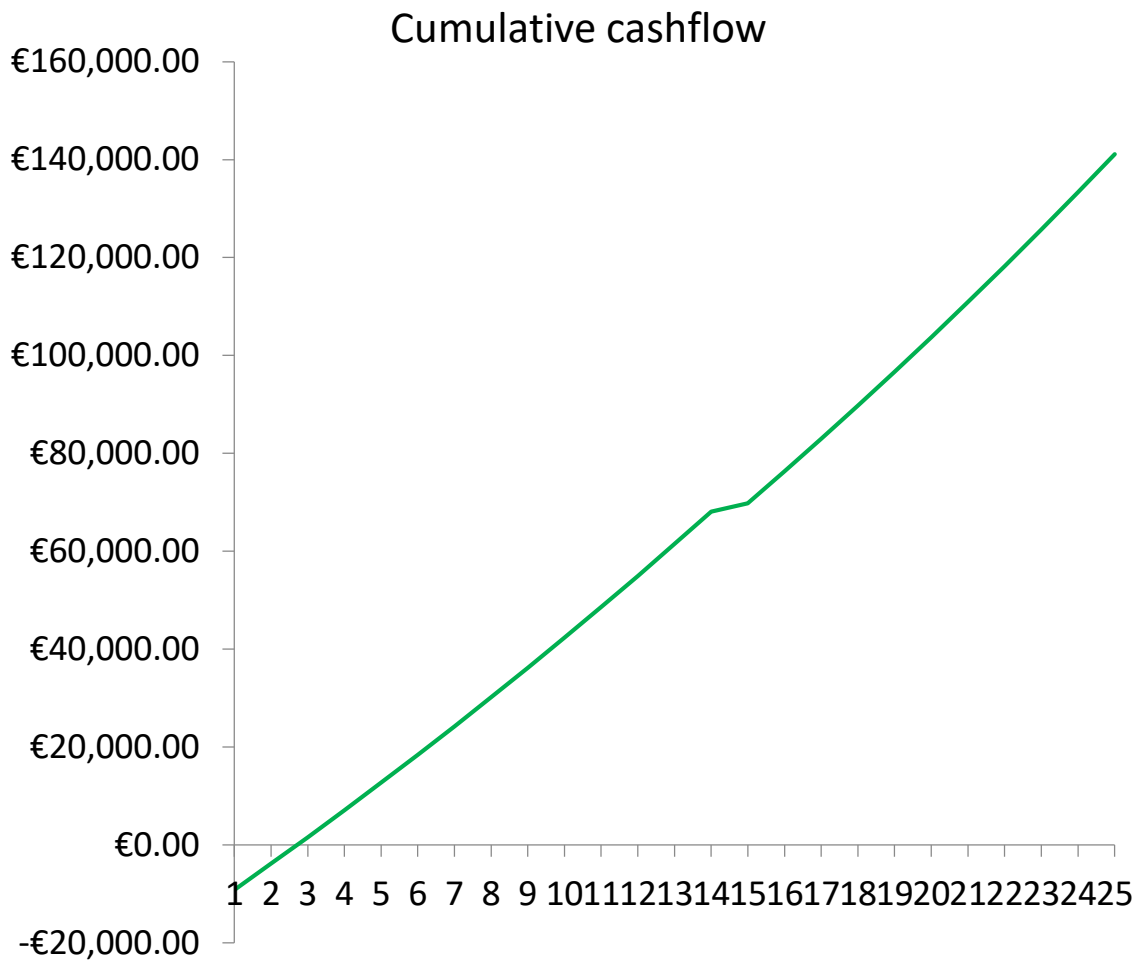
- 20kWp output C. 17,000 kWh/year (Self-consumption 85%, export 15%)
- 30kWp output C. 25,600 kWh/year (Self-consumption 60%, export 40%)



Poultry – Free Range Eggs, Co. Cavan

Analysis results 20kWp

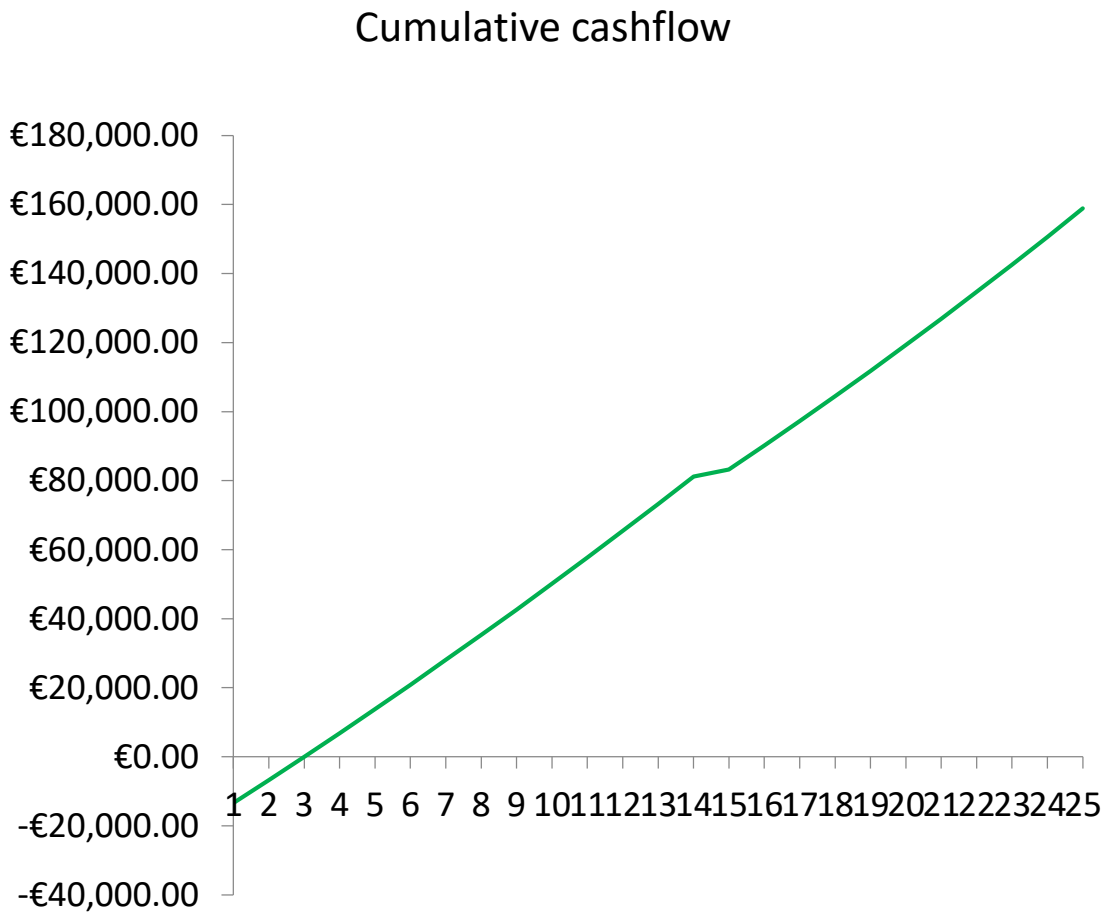
- System cost €36,000
- TAMS grant 60%
- Initial investment €14,400
- Output C. 17,000 kWh/year
- **Simple payback in Year 3**
- **Value in year 10 = €42K**
- **LCOE (20 years) = €0.07/kWh**



Poultry – Free Range Eggs, Co. Cavan

Analysis results 30kWp

- System cost €50,000
- TAMS grant 60%
- Initial investment €20,000
- Output C. 25,600 kWh/year
- **Simple payback in Year 4**
- **Value in year 10 = €50K**
- **LCOE (20 years) = €0.06/kWh**



Poultry – Free Range Eggs, Co. Sligo

Free range egg farm

- Site: 12,000 layers
- Electricity: Single-phase, MIC 16kVA, approx. 24,000 kWh/year
- **Solar PV assessment:**
  - ❑ Option 1: 16 kWp
  - ❑ Option 2: 20 kWp + 6kWh battery
- **Analysis parameters/assumptions:**
  - ❑ Cost of electricity €0.30/kWh
  - ❑ Export tariff €0.135/kWh (Clean Export Premium, 15 years)
  - ❑ Solar PV investment cost €1,600 to €1,800 per kWp installed
  - ❑ TAMS grant 60% of system cost

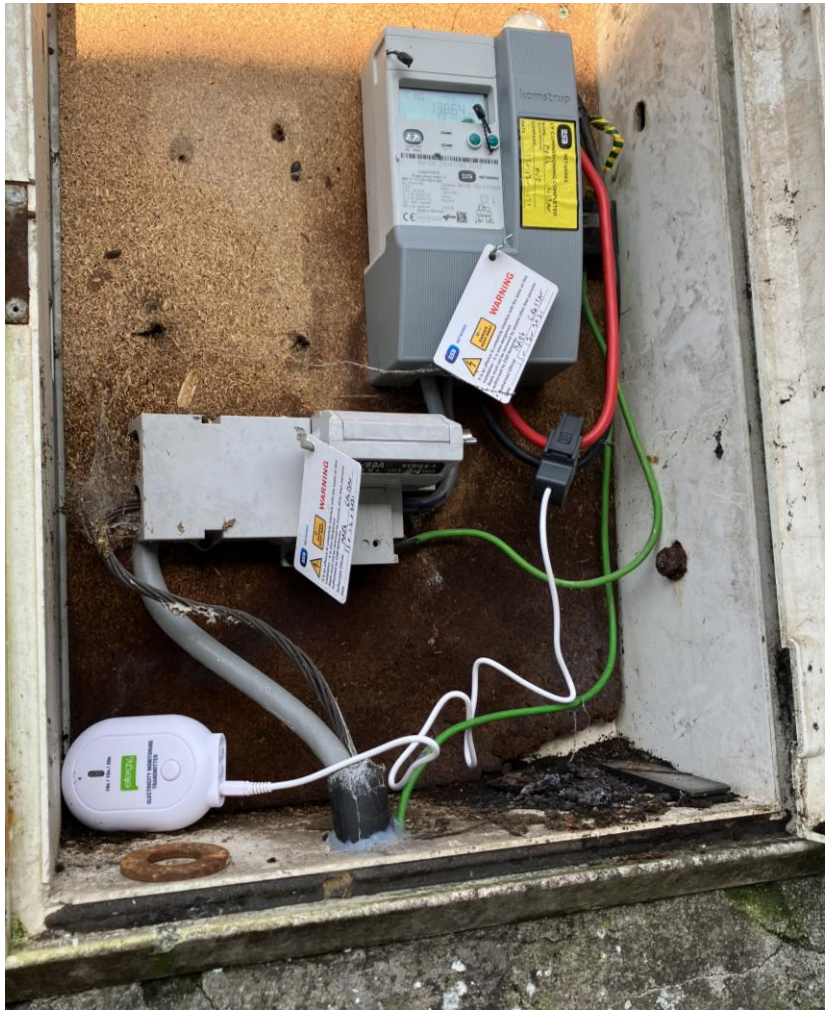
Poultry – Free Range Eggs, Co. Sligo

Free range egg farm

- Electricity monitor installed on-site
- **Good access to electricity meter cables**
- **Internet router with available LAN port**

Efergy Energy Hub (available for single and 3-phase)

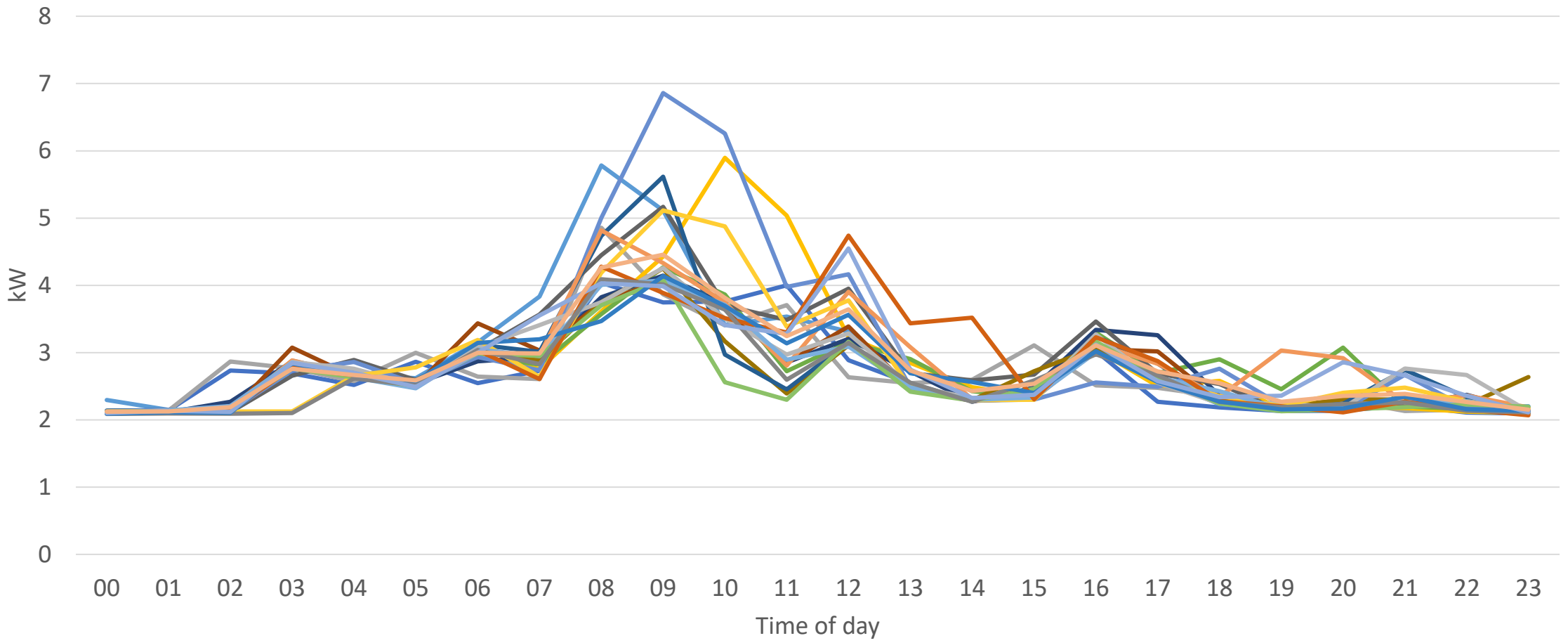
Owl Intuition (available for single and 3-phase)



Poultry – Free Range Eggs, Co. Sligo

Free range egg farm

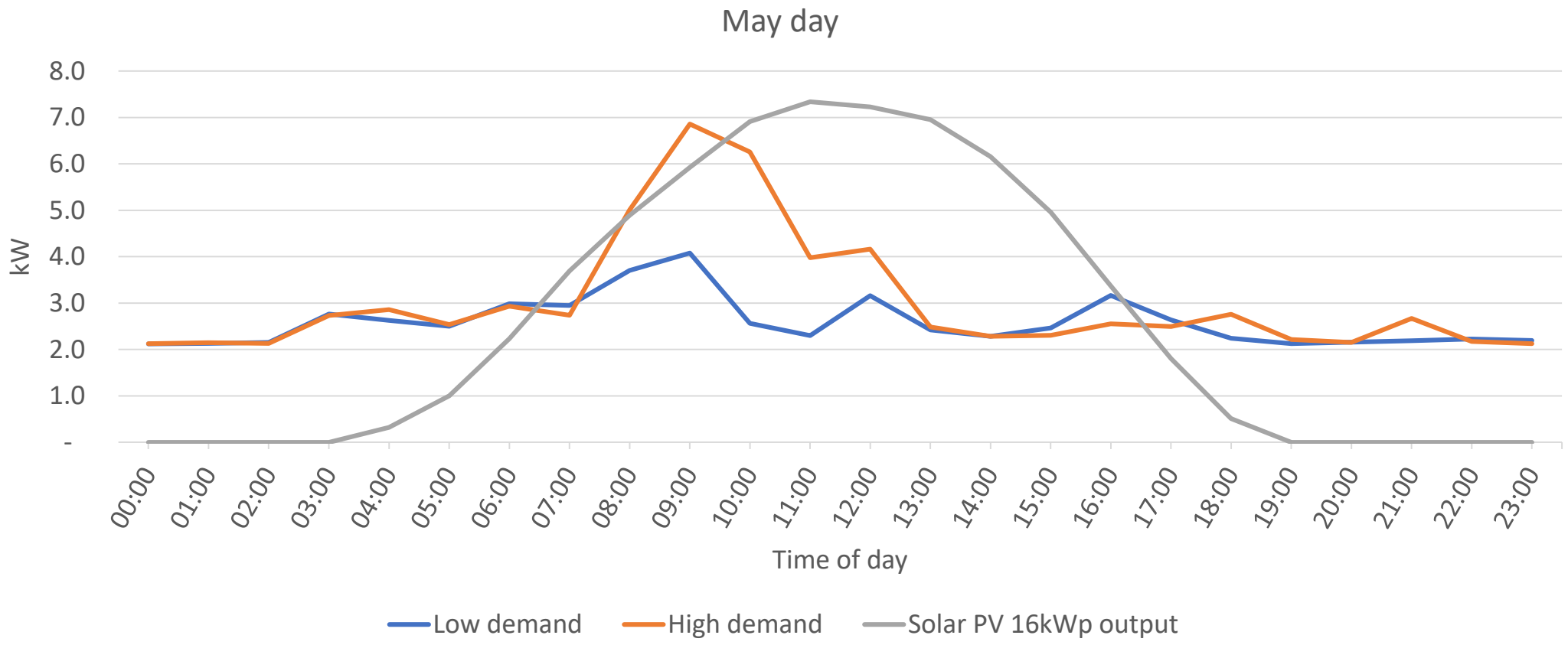
- Metered data – shows general daily demand trend



Poultry – Free Range Eggs, Co. Sligo

Free range egg farm

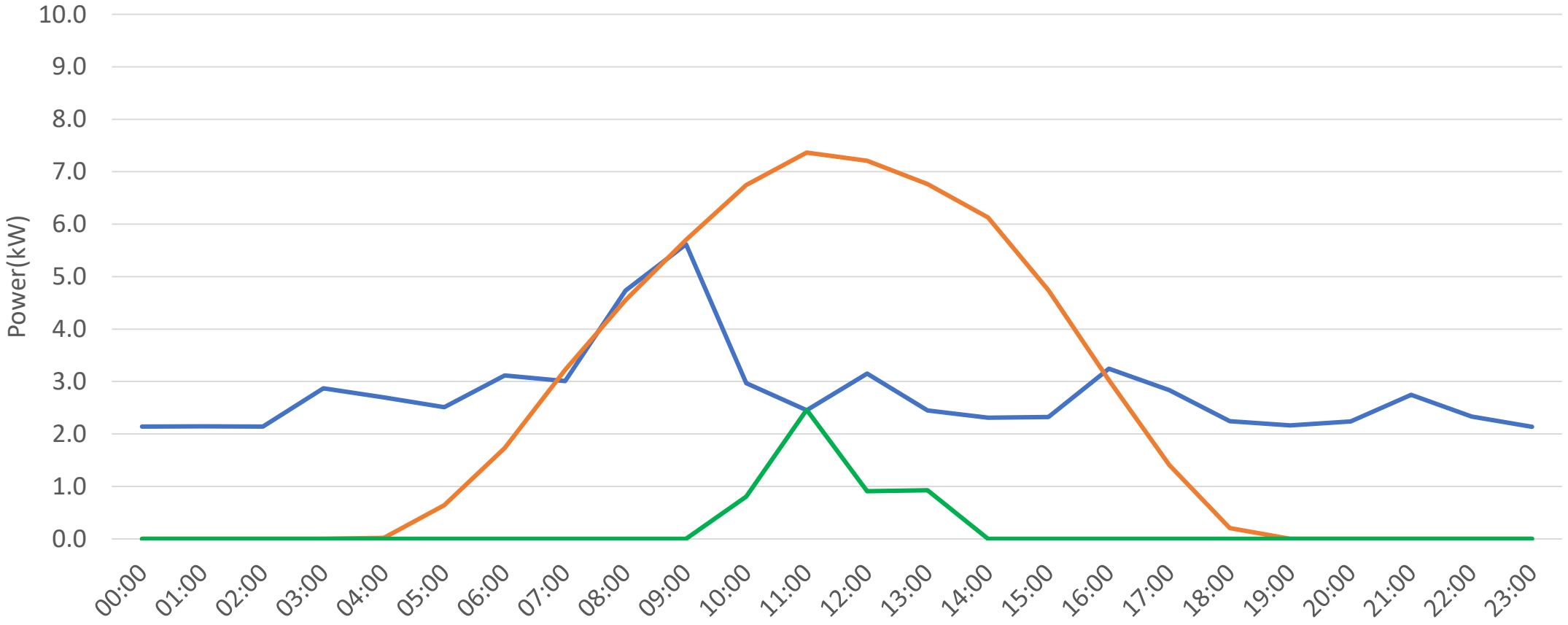
- Metered data – more accurate estimate of self-consumption and export



Poultry – Free Range Eggs, Co. Sligo

Free range egg farm

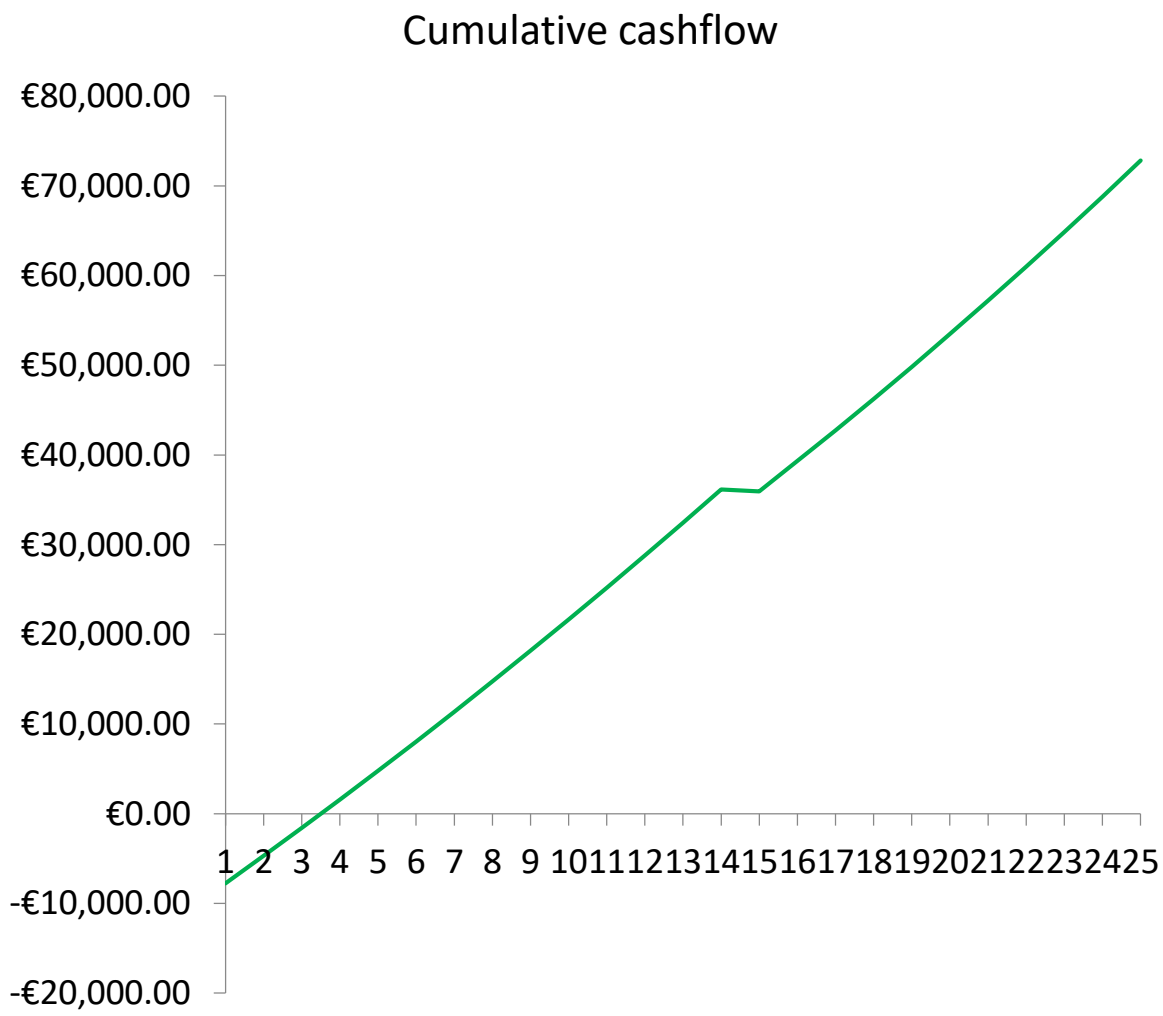
- Metered data – allows battery value to be assessed



Poultry – Free Range Eggs, Co. Sligo

Analysis results 16kWp

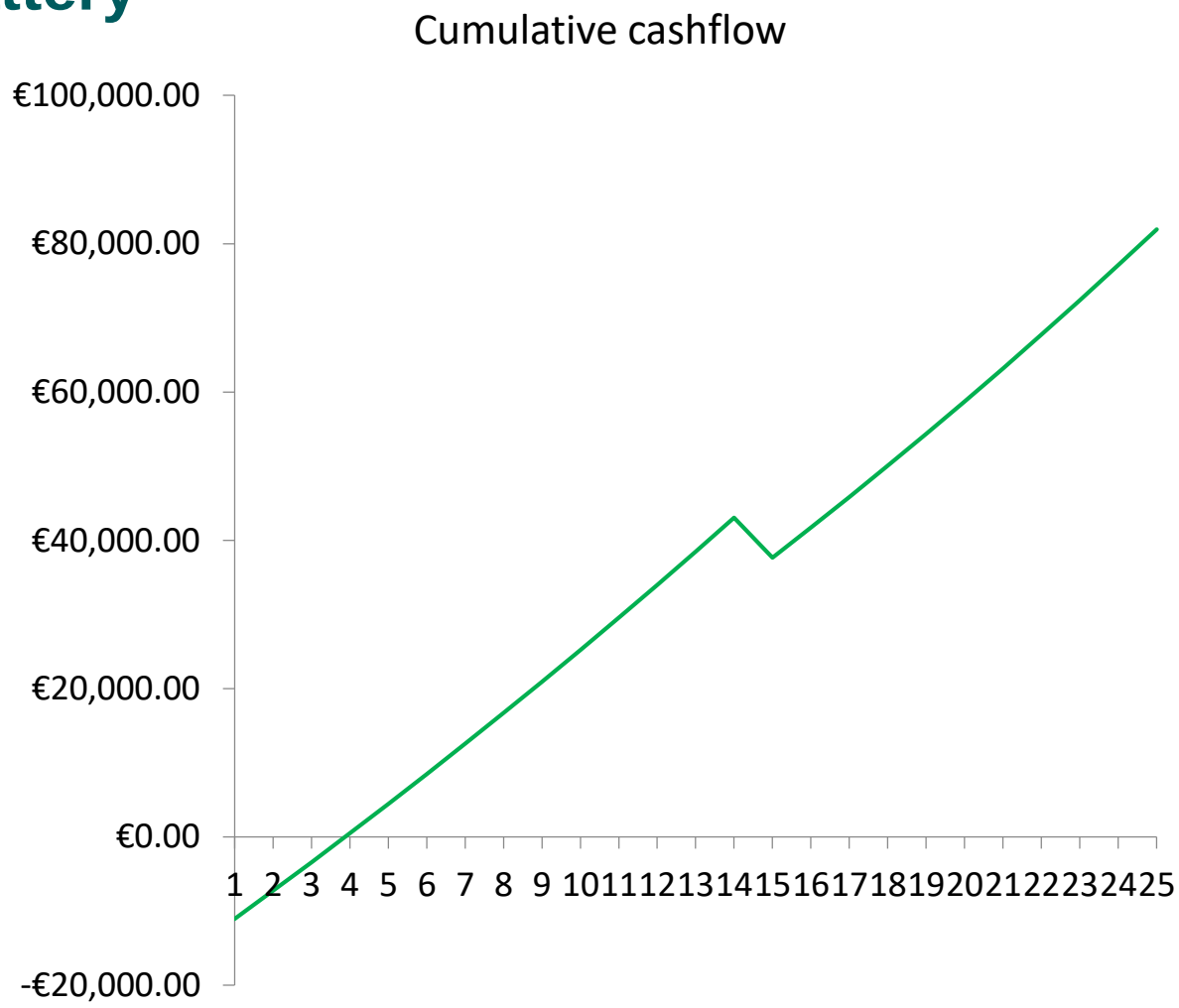
- System cost €27,000
- TAMS grant 60%
- Initial investment €10,800
- Output C. 12,800 kWh/year
- **Simple payback in Year 4**
- **Value in year 10 = €22K**
- **LCOE (20 years) = €0.08/kWh**



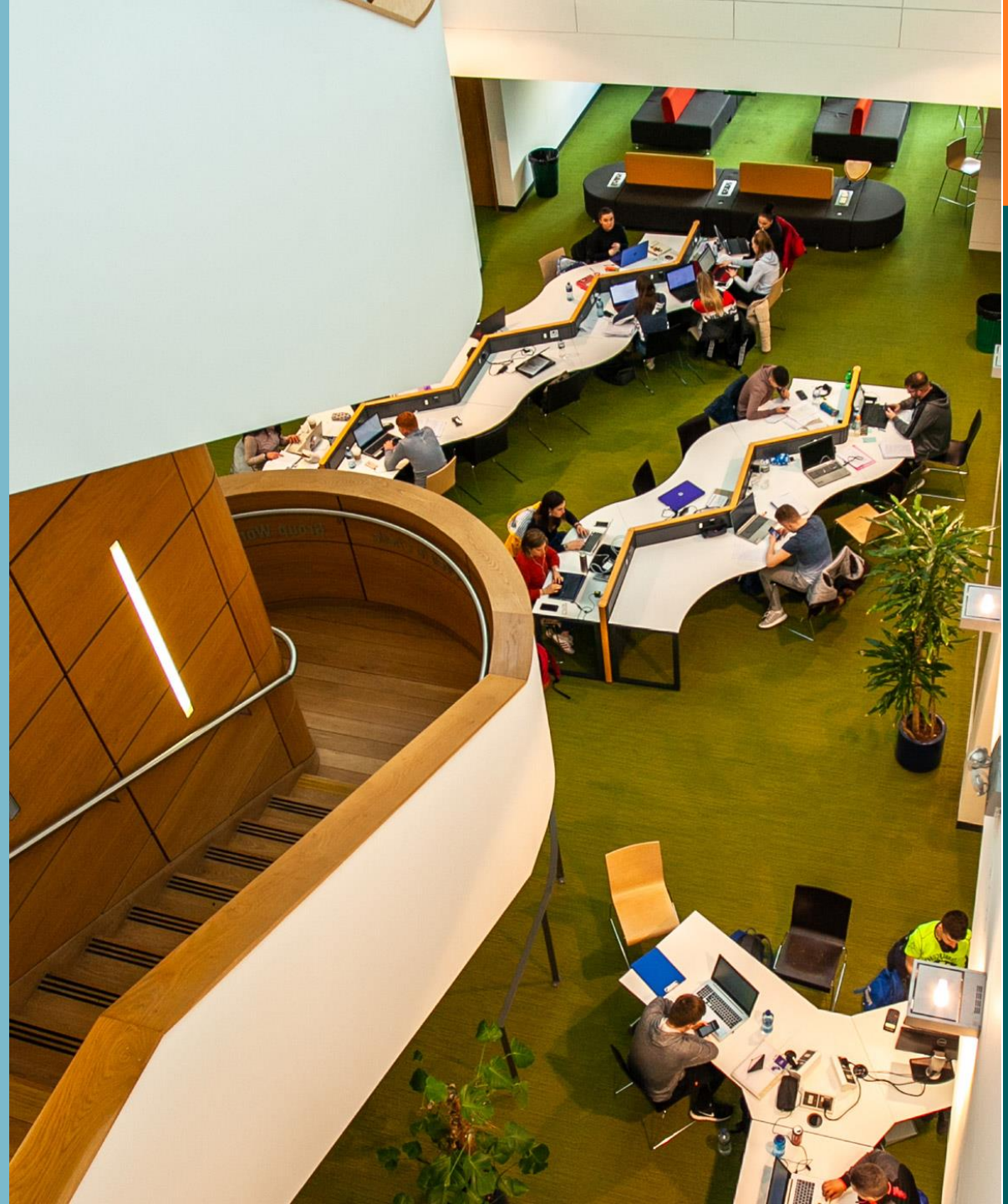
Poultry – Free Range Eggs, Co. Cavan

Analysis results 20kWp + 6kWh battery

- System cost €37,000
- TAMS grant 60%
- Initial investment €14,800
- Output C. 16,000 kWh/year
- **Simple payback in Year 4**
- **Value in year 10 = €25K**
- **LCOE (20 years) = €0.07/kWh**



What to do next?



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Solar PV project development

Preparation

- Collate at least 1 year of electricity bills
- Confirm MIC, single-phase or 3-phase

Solar PV toolkit training

- Guidance document
- Excel toolkit (must be familiar with Excel)

Electricity monitors

- Can be ordered online and self-installed (no electrician required)
- Must have access to meter cables and internet router with spare LAN port

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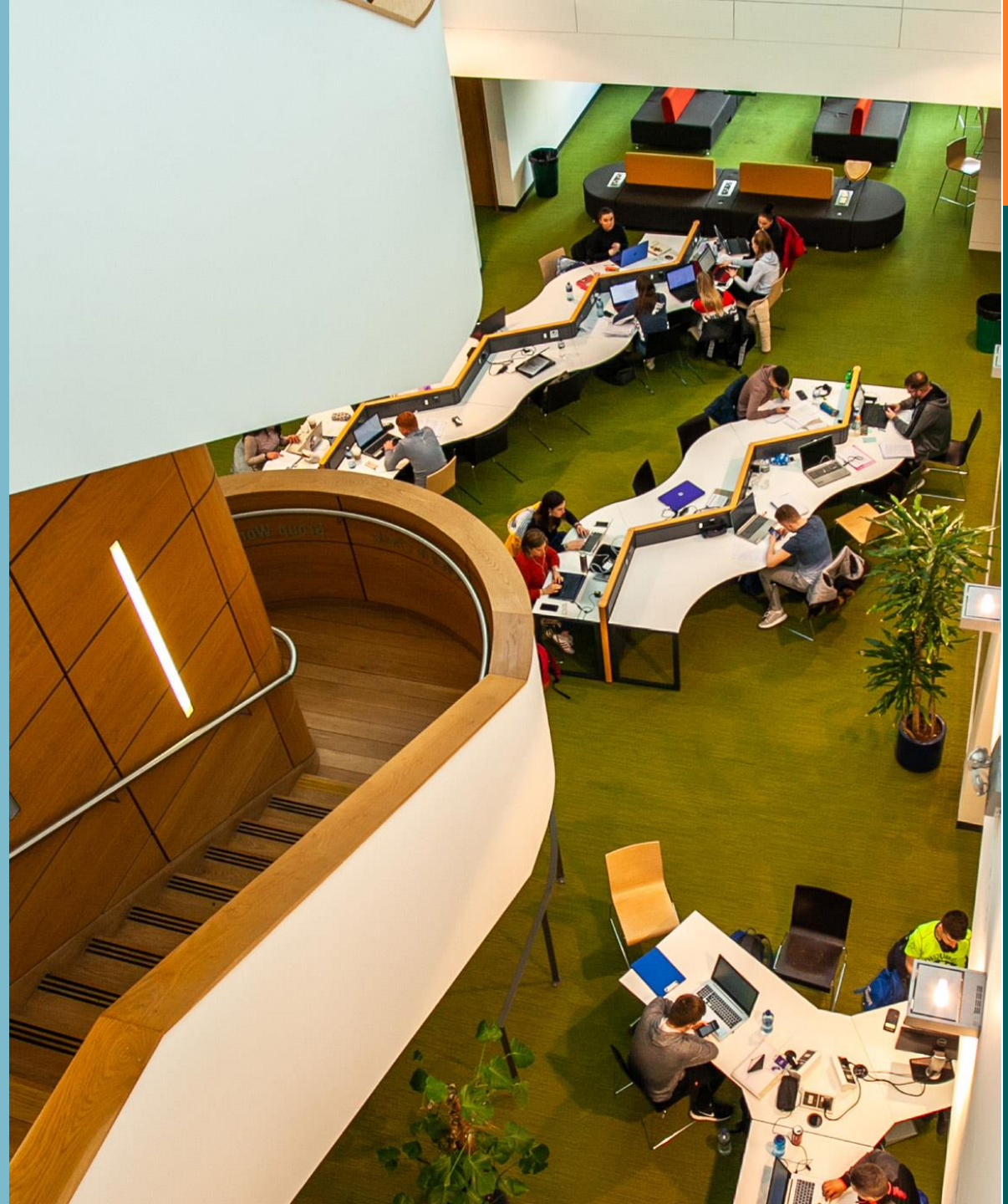
Mel Gavin – ATU Sligo

Mel.gavin@atu.ie

086 3099184

Thank you

Microgeneration Support Scheme (MSS) & the Small-Scale Generation (SSG) support scheme



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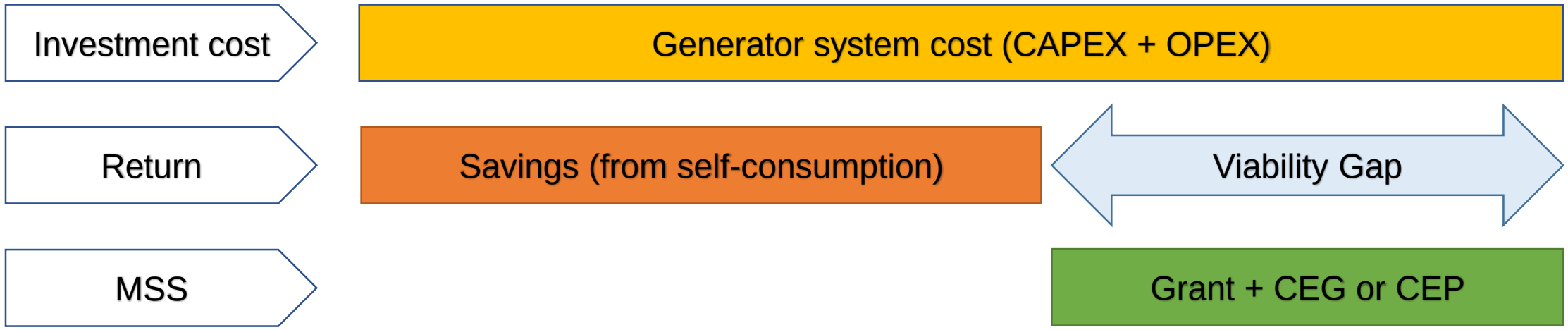
Policy support for Renewable Electricity

Support scheme for Small-Scale Generation
50kW to 6MW

Microgeneration Up to 50kW	Small-Scale Generation 50kW to 500kW	Large Scale Generation Over 0.5MW
Microgeneration Support Scheme (MSS): • Installation grant up to 6kW • Clean Export Guarantee (Domestic) • Clean Export Premium (Non-Domestic) • Improved regulatory routes: grid connection; planning	Support Scheme for Small-Scale Generation (SSG): • Identified for action in Climate Action Plan 2021	Renewable Electricity Support Scheme (RESS): • Auction based system for contract electricity price • Exclusive Community project pot • Community Enabling Framework

Microgeneration Support Scheme

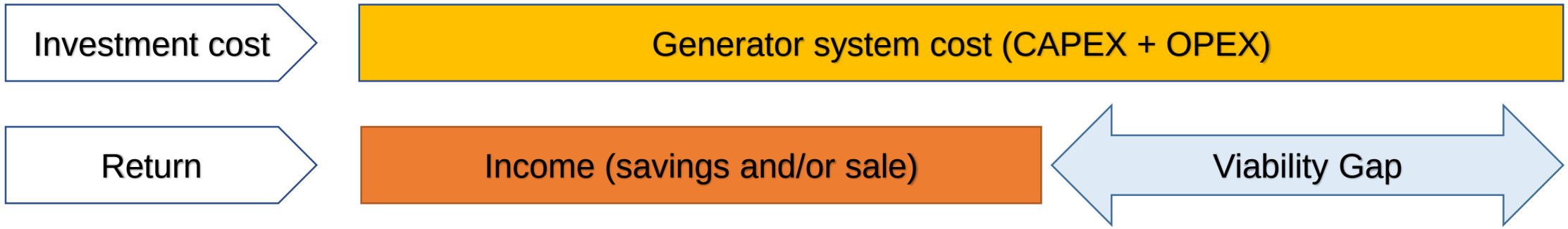
Support design based on 'Viability Gap'



- **Installation grant:** For all projects up to 6kW. Max €2,400.
- **Clean Export Guarantee (CEG):** Paid by electricity supplier, linked to wholesale market price of electricity – variable.
- **Clean Export Premium (CEP):** For non-domestic 6.1kW to 50kW. Paid by the MSS (managed by suppliers) scheme at a fixed tariff for 15 years. Export capped at 80% of capacity.

Public Consultation – design

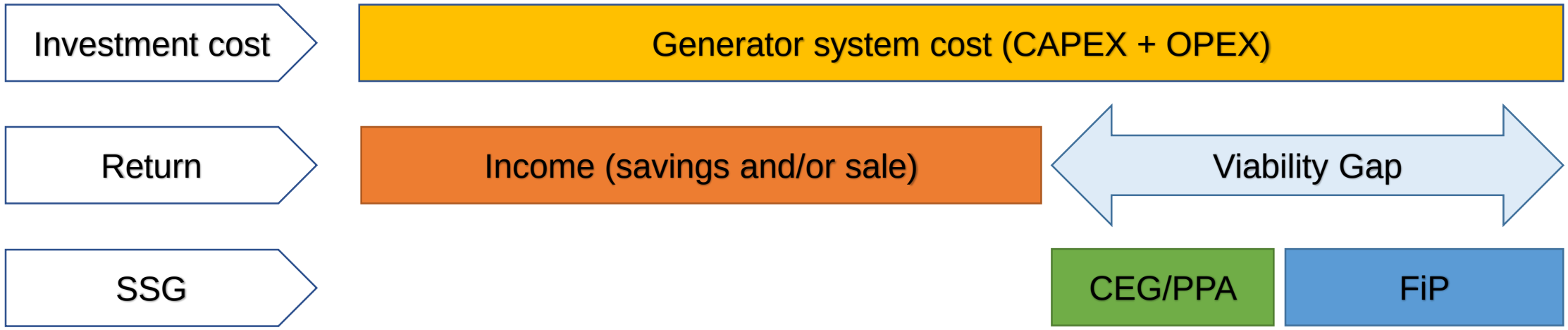
Support design based on ‘Viability Gap’



The **Viability Gap** is defined as the difference between lifetime costs and lifetime income (from savings and/or sale of electricity)

Public Consultation – design

Support design based on ‘Viability Gap’



- **Clean Export Guarantee (CEG):** Paid by electricity supplier, linked to wholesale market price of electricity – variable
- **Power Purchase Agreement (PPA):** Contract for sale of electricity with licensed electricity supplier
- **Feed in Premium (FiP):** Paid by the SSG scheme to make up the Viability Gap