CASE STUDY

I4F-WP1-Task 3

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the theoretical inner potential of Feng Tech STE system within the agricultural sector of milk-fed calves breeding.
The current academic example focus on a holding without on-farm processing and set in Pays de la Loire. The assumptions are that it owns a herd of 185 calves for which it needs around 48470 kWh of energy supply per year in order to clean its milking parlours and milk tanks.
After enumerating the main characteristics of this typical and fictional calves farm, a simulation with the Feng Tech STE system illustrating expected results will be tackled.
This file will be completed and crossed with a real-life case with similar attributes.

PART I: ACADEMIC CASE

- *N°/Nickname:* N°2 / French Calves farms
- *Type of holding:* Milk-Fed Calves Breeding
- *Location (Country/Region):* France / Pays de la Loire
- *Date:* 22th July 2021

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Number of cows:** 370 calves/year (2 lots of 185 places per year)
- **Type of production:** Calves
  [Placing photos of the structures and equipment]
- **Water Use (frequency, quantity, timeframe, etc):** Feeding of Calves with heated milk
- **Frequency***:* 2 times a day
- **Quantity:** *1300 L/day*
- **Version of FT STE system**: ETF (version without pressure)
- **Temperature needed (in °):** 80°C
- **Standard fossil energy used:** Propane
- **Price per kWh:** *0.10 EXCL. TAX/€/kWh*
- **Energy consumption for the activity (in kWh):** 48470 *kWh/year*
  cf.with energy waste, the energy need accounts for 370 calfs x 131 kWh/year/calf = 48470 kWh/year
- **Expenditure of energy consumption (in €/kWh):** 4847 *€ EXCL. TAX/year*
  cf. 0.10 EXCL.TAX/€/kWh x 48470 kWh/year = 4847 EXCL. TAX €/year
- **Available subsidies for STE:** between 20 and 40% of the equipment cost (*Fonds Chaleur*)
- **Amount of CO2 emission:** 13 329 *kg CO2/year*
  cf. given that 1kWh with propane produces about 0.275 kg CO2(eq), 0.275kg CO2/kWh x 48470 kWh/year = 13329 kg CO2/year = 13,329 t CO2/year

Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V11 Lille Study Case

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 50% at least - HERE = 56%
  cf. precising when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case

- **Number of STE units to reach the energy needs:** 7 units
  cf. potential energy savings = 27 088 kWh/year

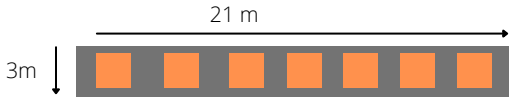
- **Overall front surface of capture:** 28 m2
  cf.1 FT = 4m2 ; 4m2/unit x 7 units = 28 m2

- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)

- **Power (kW/unit):** 2.5kW/unit

- **Number of sensors needed for remote surveillance and monitoring:**
  Commercial scope = 2 thermometers + 2 flowmeters

- **Surface requirement for the equipment:**
  cf. Length of concrete slab = size of panels (2x2,5m) + space between panels (0.5m x t panels) / Width = 3 m



- **Irradiance & Cold Water Measurements:**

Solar irradiance value (Calsol INES)	Lille 45°	Albedo	0,8										
Unit (kWh / m² / day)	January	February	March	April	May	June	July	August	September	October	November	Décember	Year
Direct irradiance	0,57	0,96	1,61	2,11	2,21	2,36	2,13	2,11	2,05	1,43	0,72	0,45	1,56
Diffus irradiance	0,45	0,79	1,29	1,87	2,29	2,49	2,4	2,05	1,53	0,97	0,54	0,36	1,42
Cold water temperature (°C)	6,2	6,5	8,1	9,5	11	13	14	14	13	10	8,1	6,7	10

- **Solar energy contribution (in kWh)**: 27 088 *kWh/year*
  - Yearly Basis: 7 FT STE units' full potential = **27 088 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to **17 065 kWh/year useful solar energy** (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 27 088 kWh/year / 365 days = **74.2 kWh/day**

- **Savings on energy consumption (in €)**: 2708.8 *€ EXCL. TAX/year*
  cf. Given that, with energy waste, the energy saving accounts for 27 088 kWh/year x 0.10€/kWh = 2708.8 €/year

- **Remaining share of the standard energy used (per year):** 2138.2 *€/year* (44% ; 21 382 kWh/year)
  - In %: solar thermal energy represents 56% here so, remaining share of **44%**
  - In kWh: 48470 - 27 088 = **21 382 kWh/year**
  - In €: 21 382 kWh/year x 0.10 €/kWh = **2138.2 €/year**

- **Remaining emission of CO2:** 5880.1 *kg CO2 (CO2 reduction up to 7449 kg CO2)*
  cf. 21 382 kwh/year x 0.275kg CO2 = 5880.1 kg CO2/year

WITH AIDS

- **Previsionnal Cost (total - subsidies):** 27 750 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 35000€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 7 units x 5000€/unit = 35000€
  - **Cost of the site preparation:** 5000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *12250€*

    cf. average grant = 35% ; 35000 x 0.35 = 12250€ *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 2990 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **27 750 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 27 750 € / 10 years = 2775 €/year ; taking into account the loan rate: **2990 €/year** (in average per year for 10 years)

- **Return on investment (global expense / annual savings):** 10 *years & 3 months*
  - Global expense = **27 750 €**
  - Annual energy savings = **2708.8 € per year** during 30 years so in total : 2708.8 €/year x 30 years = **81 264 €**
  - ROI = 27750 € / 2708.8 € = **10 years & 3 months**
  - ROIC = 2708.8 € / 27750 € = **9.76%**

- **Yearly Earnings (Annual savings and yearly loan payment):** - 281.2 *€/year* (first year)

  cf. good if savings > loan
  - Annual savings = **2708.8 €**
  - Yearly loan payment = **2990 €**
  - Difference = 2708.8 - 2990 = **- 281.2 €/year of earnings during the first year of the 10 year-loan period / after = 2708.8 €/year**

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Costs without STE	4847	5089	5344	5611	5892	6186	6496	6820	7161	7519	7895	8290	8705	9140	9597	10077	10581	11110	11665	12248
Loan repayment	2990	2990	2990	2990	2990	2990	2990	2990	2990	2990	0	0	0	0	0	0	0	0	0	0
Gas remaining to buy	2138	2245	2357	2475	2599	2729	2866	3009	3159	3317	3483	3657	3840	4032	4234	4445	4668	4901	5146	5403
System maintenance	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
Costs with STE	5128	5235	5348	5465	5589	5919	6062	6211	6368	6532	3715	3896	4086	4285	4495	4714	4945	5186	5440	5706
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy saving (1-5) €HT/Y	-281	-146	-4	146	302	267	434	609	794	987	4180	4394	4619	4854	5102	5363	5636	5923	6225	6542
Energy saving €HT/m	-23	-12	0	12	25	22	36	51	66	82	348	366	385	405	425	447	470	494	519	545

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

CASE STUDY

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NO AIDS

- **Previsionnal Cost (total - subsidies): 40 000** *€*

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 35000*€*

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 7 units x 5000€/unit = 32000€
  - **Cost of the site preparation:** 5000*€*

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *0€*

    cf. average grant = 35% *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 2739 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **40 000 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 40 000 € / 10 years = 4000 €/year ; taking into account the loan rate: **4310 €/year** (in average per year for 10 years)

- **Return on investment (global expense / annual savings):** 14 *years & 9 months*
  - Global expense = **40 000 €**
  - Annual energy savings = **2708.8 € per year** during 30 years so in total : 2708.8 €/year x 30 years = **81 264 €**
  - ROI = 40 000 € / 2708.8 € = **14 years & 9 months**
  - ROIC = 2708.8 € / 40000 € = **6.77 %**

- **Yearly Earnings (Annual savings and yearly loan payment):** 1601.2 *€/year* (first year)

  cf. good if savings > loan
  - Annual savings = **2708.8 €**
  - Yearly loan payment = **4310 €**
  - Difference = 2708.8 - 4310 = **- 1601.2 €/year of earnings during the first year of the 10 year-loan period / after = 2708.8 €/year**

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Costs without STE	4847	5089	5344	5611	5891	6186	6495	6820	7161	7519	7895	8290	8704	9140	9597	10076	10580	11109	11665	12248
Loan repayment	4310	4310	4310	4310	4310	4310	4310	4310	4310	4310	0	0	0	0	0	0	0	0	0	0
Gas remaining to buy	2138	2245	2357	2475	2599	2729	2865	3009	3159	3317	3483	3657	3840	4032	4233	4445	4667	4901	5146	5403
System maintenance	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
Costs with STE	6448	6555	6667	6785	6909	7239	7381	7531	7688	7852	3715	3896	4086	4285	4494	4714	4944	5186	5439	5706
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy saving (1-5) €HT/Y	-1601	-1466	-1324	-1174	-1017	-1053	-886	-711	-526	-333	4180	4394	4619	4854	5102	5363	5636	5923	6225	6542
Energy saving €HT/m	-133	-122	-110	-98	-85	-88	-74	-59	-44	-28	348	366	385	405	425	447	470	494	519	545

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

CASE STUDY

I4F-WP1-Task 3

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the theoretical inner potential of Feng Tech STE system within the agricultural sector of milk-fed calves breeding.
The current field application example focus on a holding within Pays de la Loire, in Sarthes. It owns a herd of 400 calves for which it needs around 90068 kWh of energy supply per year in order to clean its milking parlours and milk tanks.
After enumerating the main characteristics of this typical and fictional calves farm, a simulation with the Feng Tech STE system illustrating expected results will be tackled.
This file complete and put into parallel the previous academic case with similar attributes.

PART II: FIELD APPLICATION CASE

- *N°/Nickname:* N°2 / French Calves farms
- *Location (Country/Region):* France / Pays de la Loire / Sarthes
- *Type of holding:* Milk-Fed Calves Breeding
- *Date:* Octobre 2020

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Number of cows:** 800 calves/year (2 lots of 400 places per year)
- **Type of production:** Calves
  [Placing photos of the structures and equipment]
- **Water Use (frequency, quantity, timeframe, etc):** Feeding of Calves with heated milk
- **Frequency***:* 2 times a day
- **Quantity:** *2000 L/day*
- **Version of FT STE system**: ETF 1 (version without pressure)
- **Temperature needed (in °):** 80°C
- **Standard fossil energy used:** Propane
- **Price per kWh:** *0.075 EXCL. TAX/€/kWh*
- **Energy consumption for the activity (in kWh):** 90 068 *kWh/year*
  cf.with energy waste, the energy need accounts for 90 068 kWh/year
- **Expenditure of energy consumption (in €/kWh):** 6755.1 *€ EXCL. TAX/year*
  cf. 0.075 EXCL.TAX/€/kWh x 90 068 kWh/year = 6755.1 EXCL. TAX €/year
- **Available subsidies for STE:** between 20 and 40% of the equipment cost (*Fonds Chaleur*)
- **Amount of CO2 emission:** 24 768,7 *kg CO2/year*
  cf. given that 1kWh with propane produces about 0.275 kg CO2(eq), 0.275kg CO2/kWh x 90 068 kWh/year = 24768.7 kg CO2/year = 24.769 t CO2/year

Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V11 Lille Study Case

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 50% at least - HERE = 50%
  cf. precising when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case

- **Number of STE units to reach the energy needs:** 11 units
  cf. potential energy savings = 45 210 kWh/year

- **Overall front surface of capture:** 44 m2
  cf.1 FT = 4m2 ; 4m2/unit x 11 units = 44 m2

- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)

- **Power (kW/unit):** 2.5kW/unit

- **Number of sensors needed for remote surveillance and monitoring:**
  Commercial scope = 2 thermometers + 2 flowmeters

- **Surface requirement for the equipment:**
  cf. Length of concrete slab = size of panels (2x2,5m) + space between panels (0.5m x t panels) / Width = 3 m

- **Irradiance & Cold Water Measurements:**

valeurs d'irradiation (Calsol INES)	Le MANS	Albedo	0,8										
Unité (kWh / m² / jour)	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	Année
Irradiation Direct	1,09	1,25	2,43	3,09	2,43	2,43	2,87	2,66	2,3	2,1	1,3	0,78	2,06
Irradiation Diffus	0,58	0,9	1,38	1,87	2,31	2,48	2,36	2,07	1,59	1,07	0,68	0,48	1,48
Température eau froide °C	7,5	7,8	9,4	11	12	14	15	15	14	11	9,3	7,8	11

- **Solar energy contribution (in kWh)**: 45 210 *kWh/year*
  - Yearly Basis: 11 FT STE units' full potential = **45 210 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to **28 482 kWh/year useful solar energy** (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 45 210 kWh/year / 365 days = **123.9 kWh/day**

- **Savings on energy consumption (in €)**: 3 390.75 *€ EXCL. TAX/year*
  cf. Given that, with energy waste, the energy saving accounts for 45 210 kWh/year x 0.075€/kWh = 3 390.75 €/year

- **Remaining share of the standard energy used (per year):** 3 364.35 *€/year* (50% ; 44 858 kWh/year)
  - In %: solar thermal energy represents 50% here so, remaining share of **50%**
  - In kWh: 90 068 - 45 210 = **44 858 kWh/year**
  - In €: 44 858 kWh/year x 0.075 €/kWh = **3 364.35 €/year**

- **Remaining emission of CO2:** 12 336 *kg CO2 (CO2 reduction up to 12 432 kg CO2)*
  cf. 44 858 kwh/year x 0.275kg CO2 = 12 336 kg CO2/year

NO AIDS

- **Previsionnal Cost (total - subsidies): 60 000** *€*

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 55 000*€*

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 11 units x 5000€/unit = 55 000€
  - **Cost of the site preparation:** 5000*€*

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *0€*

    cf. average grant = 35% *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 6465 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **60 000 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 60 000 € / 10 years = 6000 €/year ; taking into account the loan rate: **6465 €/year** (in average per year for 10 years)

- **Return on investment (global expense / annual savings):** 17 *years & 8 months*
  - Global expense = **60 000 €**
  - Annual energy savings = **3 390.75 € per year** during 30 years so in total : 3 390.75 €/year x 30 years = **101 723 €**
  - ROI = 60 000 € / 3 390.75 € = **17 years & 8 months (11.9 years** with the assumption of increasing energy price from 3 to 7%**)**
  - ROIC = 3 390.75 € / 60000 € = **5.7 % (7.8%** with the assumption of increasing energy price from 3 to 7%**)**

- **Yearly Earnings (Annual savings and yearly loan payment):** 1601.2 *€/year* (first year)

  cf. good if savings > loan
  - Annual savings = **3 390.75 €**
  - Yearly loan payment = **6465 €**
  - Difference = 3 390.75 - 6465 = **- 3074€/year of earnings during the first year of the 10 year-loan period / after = 3390.75 €/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Charge sans solaire	6755	7228	7734	8275	8855	9474	10138	10847	11607	12419	13288	14218	15214	16279	17418	18638	19942	21338	22832	24430
2	Remboursement emprunt	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	0	0	0	0	0	0	0	0	0	0
3	Gaz restant à acheter	3364	3600	3852	4121	4410	4719	5049	5402	5781	6185	6618	7082	7577	8108	8675	9282	9932	10627	11371	12167
4	Entretien du système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	Charge avec solaire (2+3+4)	9829	10065	10317	10586	10875	11384	11720	12080	12464	12875	6850	7320	7823	8361	8936	9551	10209	10913	11665	12470
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Eco d'énergie (1-5) €HT/an	-3074	-2837	-2583	-2311	-2020	-1909	-1582	-1232	-858	-456	6438	6898	7391	7918	8482	9086	9733	10426	11167	11960
7	Er. d'énergie €HT /mois	-256	-236	-215	-193	-168	-159	-132	-103	-71	-38	537	575	616	660	707	757	811	869	931	997

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

WITH AIDS

- **Previsionnal Cost (total - subsidies):** 40 750 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 55000€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 7 units x 5000€/unit = 35000€
  - **Cost of the site preparation:** 5000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *19 250€*

    cf. average grant = 35% ; 55000 x 0.35 = 19 250€ *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 4391 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **40 750 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 40 750 € / 10 years = 4 075 **€/year ;** taking into account the loan rate: **4391 €/year** (in average per year for 10 years)

- **Return on investment (global expense / annual savings):** 12 *years*
  - Global expense = **40 750 €**
  - Annual energy savings = **3 390.75 € per year** during 30 years so in total : 3 390.75 €/year x 30 years = **101 723 €**
  - ROI = 40 750 € / 3 390.75 € = **12 years (9 years** with the assumption of increasing energy price from 3 to 7%)
  - ROIC = 3 390.75 € / 40 750 € = **8.3% (11.5%** with the assumption of increasing energy price from 3 to 7%)

- **Yearly Earnings (Annual savings and yearly loan payment):** - 281.2 *€/year* (first year)

  cf. good if savings > loan
  - Annual savings = **3 390.75 €**
  - Yearly loan payment = **4 391 €**
  - Difference = 3 390.75 - 4 391 = **- 1000 €/year of earnings during the first year of the 10 year-loan period / after = 3390.75€/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	**Charge sans solaire**	6755	7228	7734	8275	8855	9474	10138	10847	11607	12419	13288	14218	15214	16279	17418	18638	19942	21338	22832	24430
2	**Remboursement emprunt**	4391	4391	4391	4391	4391	4391	4391	4391	4391	4391	0	0	0	0	0	0	0	0	0	0
3	**Gaz restant à acheter**	3364	3600	3852	4121	4410	4719	5049	5402	5781	6185	6618	7082	7577	8108	8675	9282	9932	10627	11371	12167
4	**Entretien du système**	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	**Charge avec solaire (2+3+4)**	7755	7991	8243	8512	8801	9310	9646	10005	10390	10801	6850	7320	7823	8361	8936	9551	10209	10913	11665	12470
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	**Eco d'énergie (1-5) €HT/an**	-1000	-763	-509	-237	54	165	492	842	1217	1618	6438	6898	7391	7918	8482	9086	9733	10426	11167	11960
7	**Eco d'énergie €HT /mois**	-83	-64	-42	-20	4	14	41	70	101	135	537	575	616	660	707	757	811	869	931	997

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)