Economics of IFBB – a case study in mid Wales

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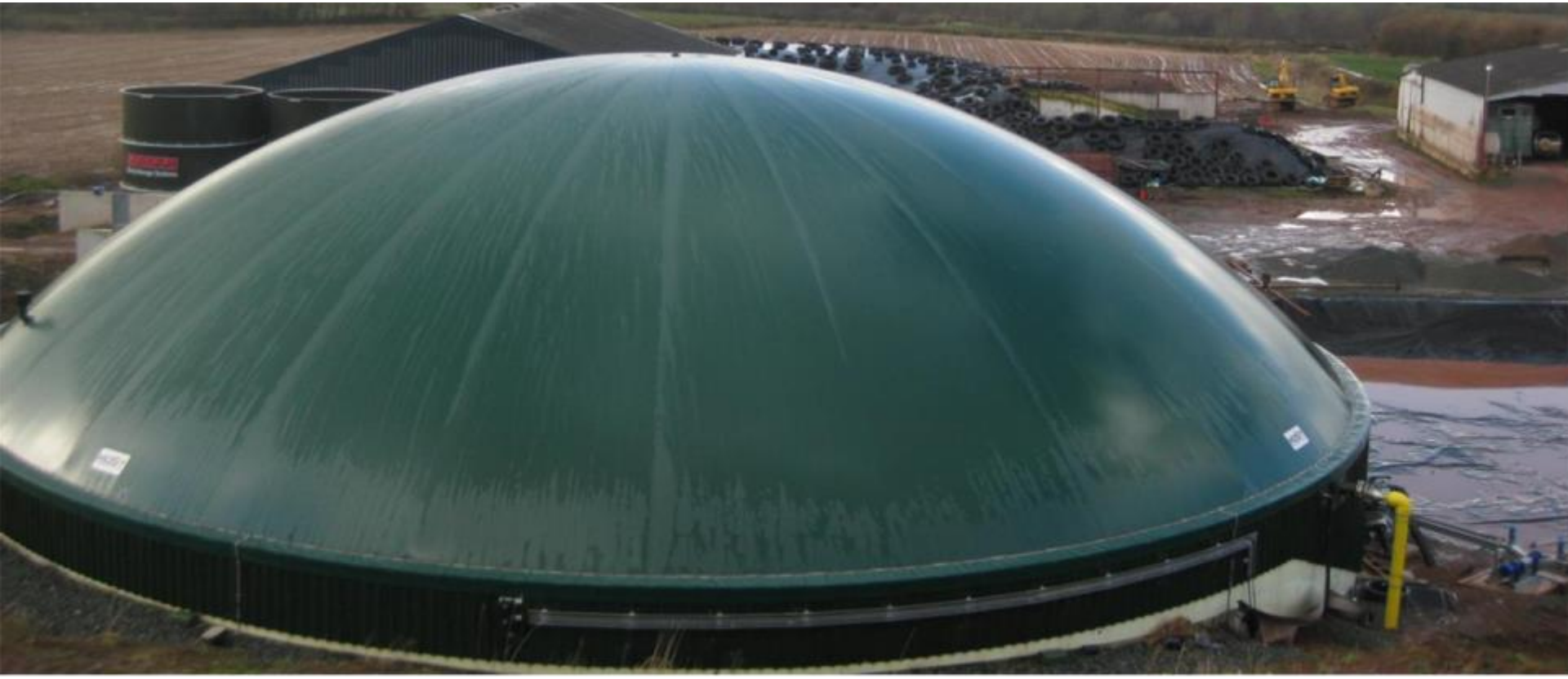
The System works best when sited alongside a biogas plant with other substrates (preferably dry substrates).

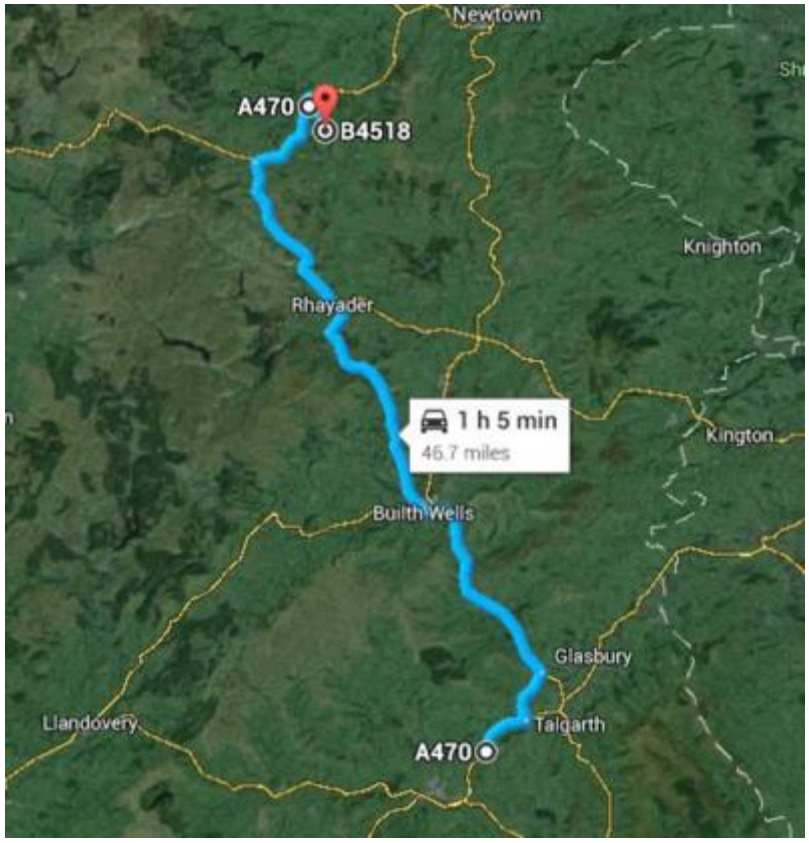
Severn Wye Energy Agency had assisted a local farming family to get planning permission for a plant under a previous Intelligent Energy for Europe project/s



We know that Green Waste provides a good feedstock because that is the basis of the Baden-Baden operation

So we talked to the company with the contract to manage the green waste collections in the area

Green waste is currently bulked-up at a Waste Transfer Station within around 5 miles of the AD plant

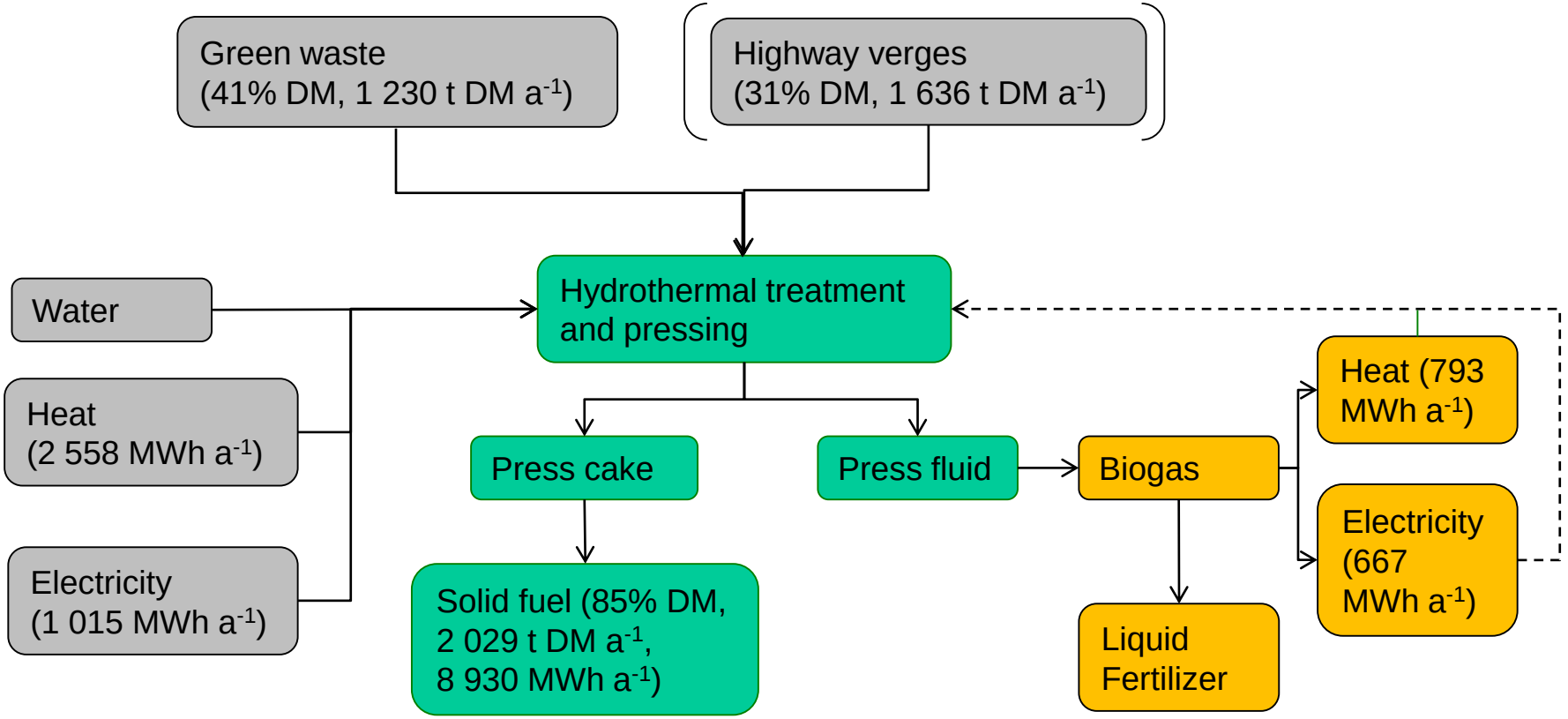


The material is currently being transported
47 miles to be aerobically composted and
used as landfill cover material

The Proposal

- **Collaborative Venture**
- **Divert the Green Waste to be processed via IFBB at the AD plant**
- **Local Authority helps establish the market for fuel by using it at one or more of its own sites**
- **Once green waste is working well bring in highway verge material**

The Scenario



Input (annual):
Biomass: 2 866 t DM ~ 8000 t FM
Water: Variable (0 – 32 000 m²)
Heat: 2 558 MWh
Electricity: 1 015 MWh

Output (annual):
Heat (Biogas): 793 MWh
Electricity (Biogas): 667 MWh
Solid fuel: 2029 t DM ~ 2390 t Briketts ~ 8 930 MWh Heat
Fertilizer: Depending on Water input

Economic calculations: Basic Assumptions

Parameter	Unit	Value
Lifetime	years	7-20
CHP size (Press fluid)	kWel	85
Return of Invest (target rate)	%	6
Substrate Costs (Green waste)	€ t DM	0
Substrate Costs (Highway verges)	€ t DM	14
Costs (Land)	€ m²	10
Equity ratio	%	25
Interest rate external capital	%	4
Interest rate own capital	%	12
Price Briquettes	€ per t	120
Price Increase	% year	5

The Investments: Machinery

Equipment	Price in €
Biomass baler / wrapper	75 900
Biomass macerator	90 000
Substrate dosing	124 200
Hydrothermal conditioning mash tank	95 000
Screw press	130 000
Storage tank press liquid	9 766
Press fluid storage tank	5 750
Press cake dryer	89 000
Briquette press	125 000
Pumping devices	33 120
Elevation technique	20 382
Briquette storage	20 000

The Equipment

© Niemann

Mixer

Dryer

© STELA

Chopper / Shredder / „Querstromzerspaner“ (cross flow shredder)

© Niemann

Briquette press / Pellet press

© mütek

Screw press / Extruder

© VetterTec

Boiler

© ÖKO THERM

Buildings, Infrastructure, Planning

Unit	Price in €
Factory building	69 672
Concrete silo	134 711
Wheel loader	67 000
Construction ground	80 000
Building and others	144 000
Plant installation / construction	144 000
Planing and permission	148 724

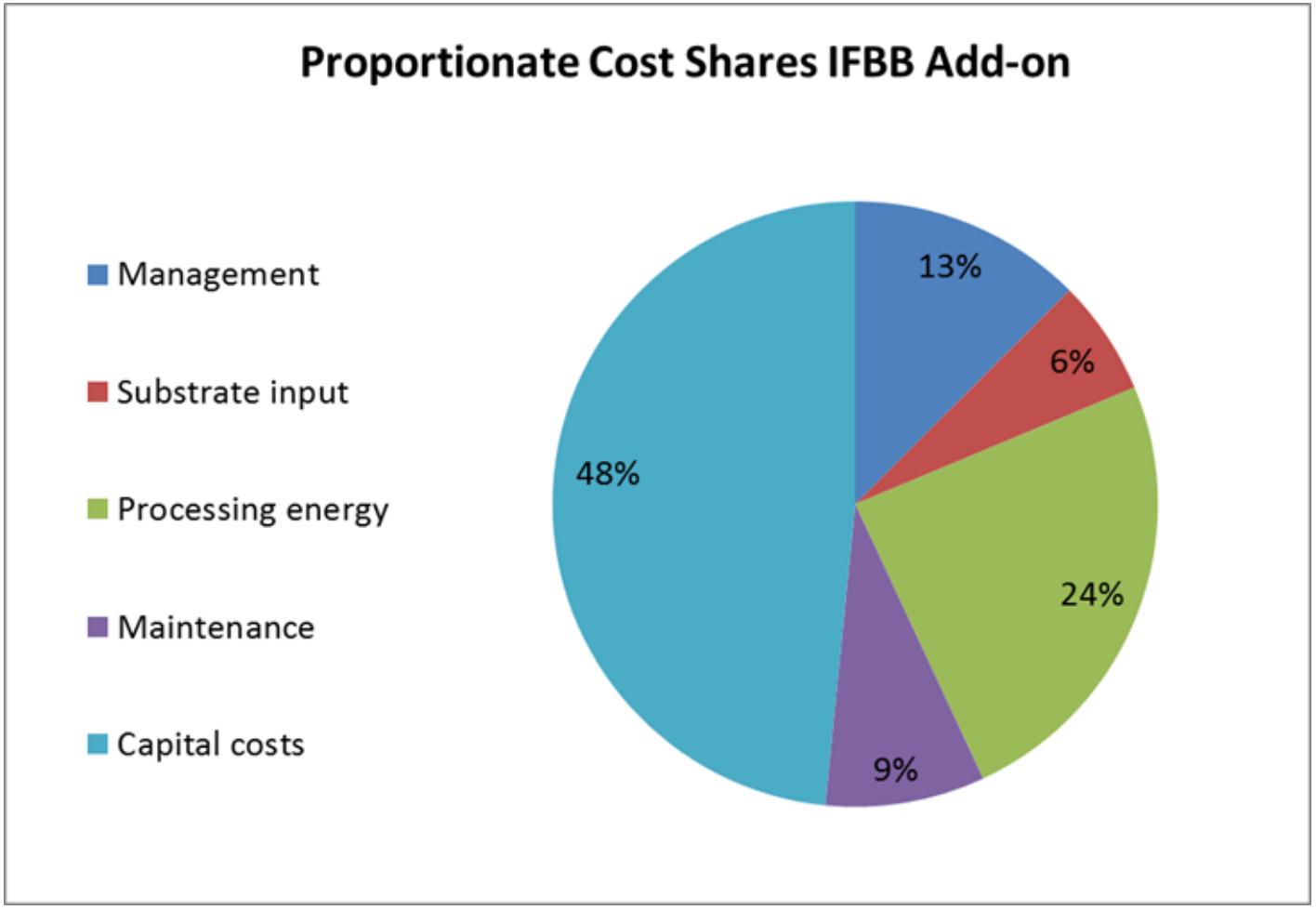
Total investment costs: 1 635 967 €

Revenues

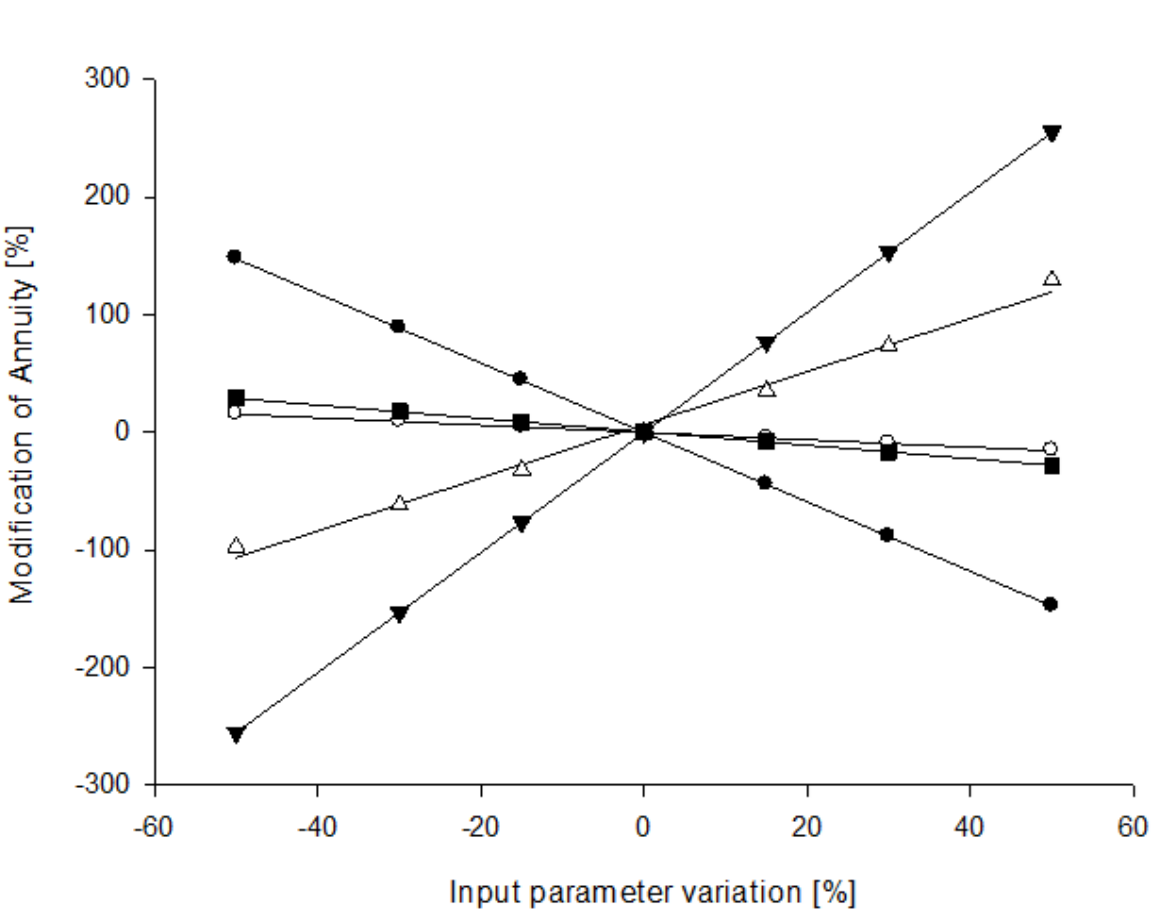
Income and revenues (based on annuity method)

Investment (€)	**1 635 967**
Annual expenditures	
- Costs of capital (own and external)	206 311
- Operation related costs	77 926
- Consumption related costs	130 105
- others	11 182
Total costs (€ / Year)	426 154
Total Income (€/Year, briquettes and RHI)	510 677
Annuity (€/Year)	84 523
Internal rate of return (%, Aim 6%)	7.09

Cost shares


Proportionate Cost Shares IFBB Add-on
Management
Substrate input
Processing energy
Maintenance
Capital costs
13%
6%
24%
9%
48%

Sensitivity analysis



- Investment costs
- Substrate costs
- Briquette price
- Rate of price increase briquettes
- Interest rate external capital

Break even analysis

Parameter	Basic scenario	Break-even scenarios	
	Initial values	Altered values	Percental variation
Briquette sales price (€/t)	**120**	96.5	-19 %
Price increase rate briquettes (%)	**5**	2.45	-51 %
Costs for biomass (€ t DM^{-1})	**13.87**	58	+318 %
Investment costs (€)	**1.635.967**	2.192.196	+ 34 %

Scenarios

	Annuity
Basic scenario	**84.523**
No costs for biomass	**110.853**
”Disposal revenues” for highway verges (13.87 €/t DM)	**137.182**
No Renewable Heat Incentive	**5.236**
Costs for processing heat (3 €ct./kWh)	**4.824**
No costs for construction ground/plant infrastructure	**110.034**

	Scenario low availability of biomass	Scenario middle availability of biomass	Scenario high availability of biomass *(basic scenario)*
Biomass potential			
Green waste (41 % DM), t DM a^{-1}	1.230	1.230	1.230
Highway verges 20 km, (31 % DM), t DM a^{-1}	29	327	-
Highway verges 45 km (31 % DM), t DM a^{-1}	-	-	1.636
CHP size	30	40	85
Annuity (€)	**4.794**	**20.555**	**84.523**
Internal Rate of Return (IRR; %)	**5.52**	**6.07**	**7.09**

So: Is IFFB an option for the UK?

We believe that it is but there are some issues that need to be resolved:

- The future of the Renewable Heat Incentive
- The amount of water in the AD feedstock (press fluid)
- The amount of nitrogen in the fuel – combustion issues
- Capital costs/grants/state-aids
- Environmental permitting
- Political will

Thanks to the wonderful team from Uni. Kassel for getting us this far.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ENERGY AGENCY
Thank you very much
for your attention!