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a subsidiary of

Alterra POWER CORP

Workshop:

LE RISORSE GEOTERMICHE A MEDIA E ALTA ENTALPIA NELLA SICILIA ORIENTALE

Progettazione della ricerca geotermica.

Fausto Batini

Paternò, 3 maggio 2013

Content

- Introduzione
- Sviluppo dei progetti geotermici
- Valutazione e mitigazione dei rischi
- Conclusions

Alterra POWER CORP

A Leading Renewable Power Producer
The Path to 1,000 MW

Alterra Power Corp.
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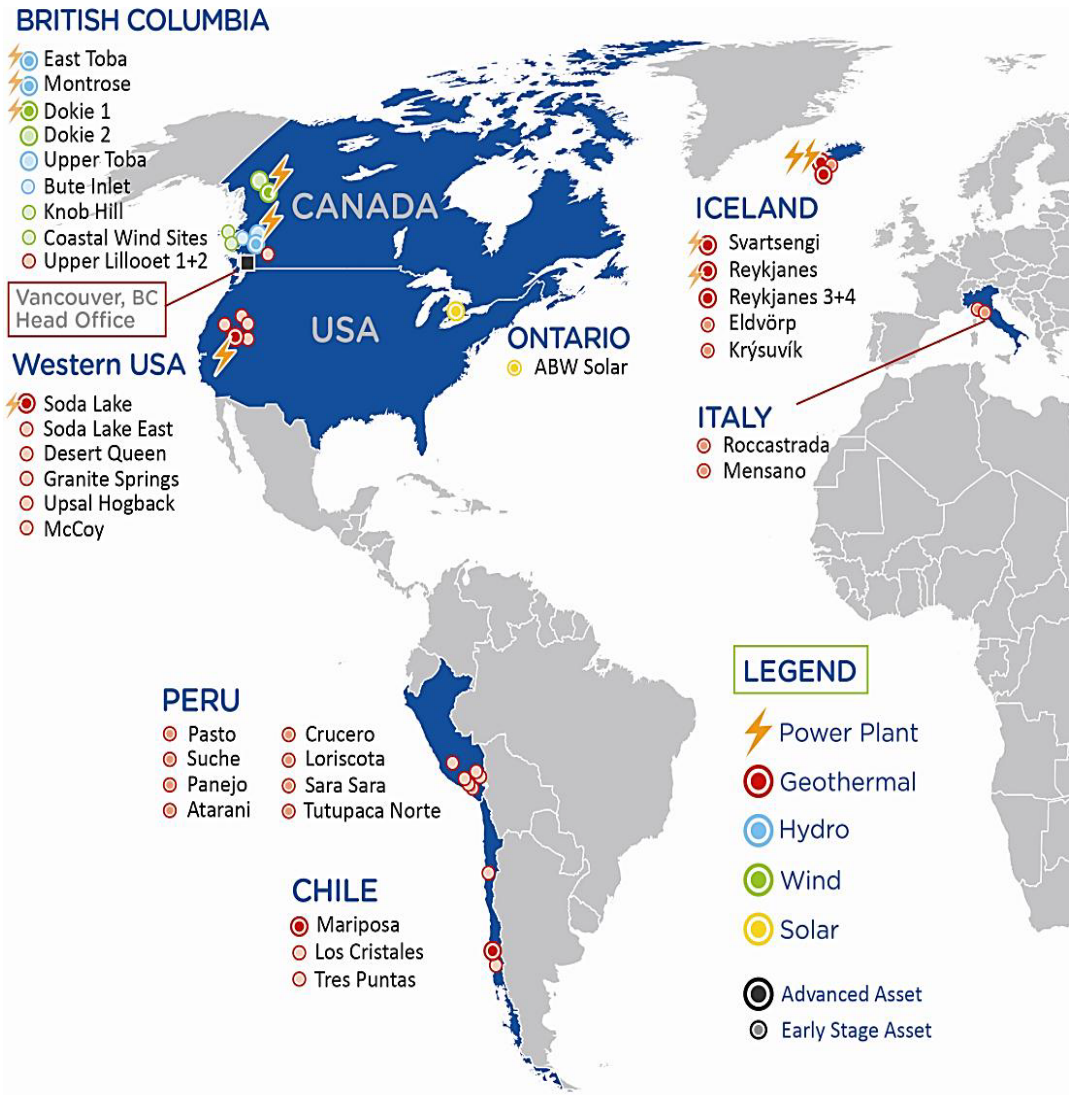
Tel: 604.669.4999 Fax: 604.682.3727 www.alterrapower.ca

TSX : AXY
NOV 2011

COMPANY PRESENTATION

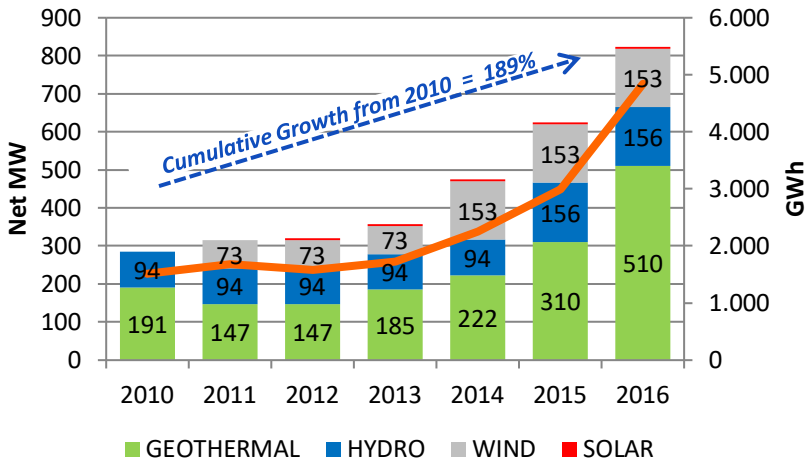
I progetti di Alterra



Capacità installata: 566MW

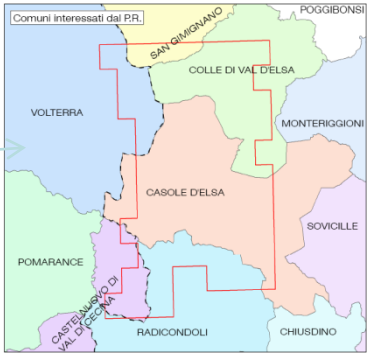
Proprietà

	**Wind**	144 MW	51%
	**Hydro**	235 MW	40%
	**Geothermal**	187 MW	69% [a]

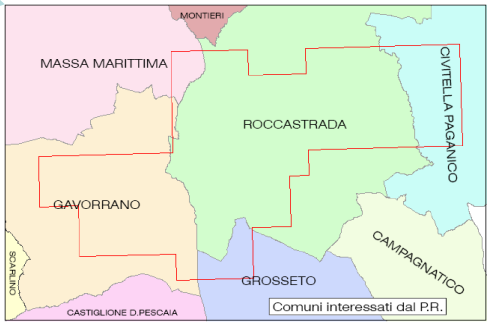


Magma Energy Italia s.r.l.

- Due pemessi di ricerca in Toscana:
  - Mensano 215 km²
  - Roccastrada 272 km²



- Sede a Siena, dove opera un team di 10 persone (laureati e diplomati) in collaborazione con lo staff internazionale di Alterra Power Corp.



- investimenti sono interamente finanziati da Alterra Power Corp

2012 -2013		2014-2015
Esplorazione 1° Fase ~ 2.5 M€	**Esplorazione** 2° Fase ~ 2.5 M€	**Perforazione** 4 pozzi ~ 20 M€

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SVILUPPO SOSTENIBILE DEI PROGETTI GEOTERMICI

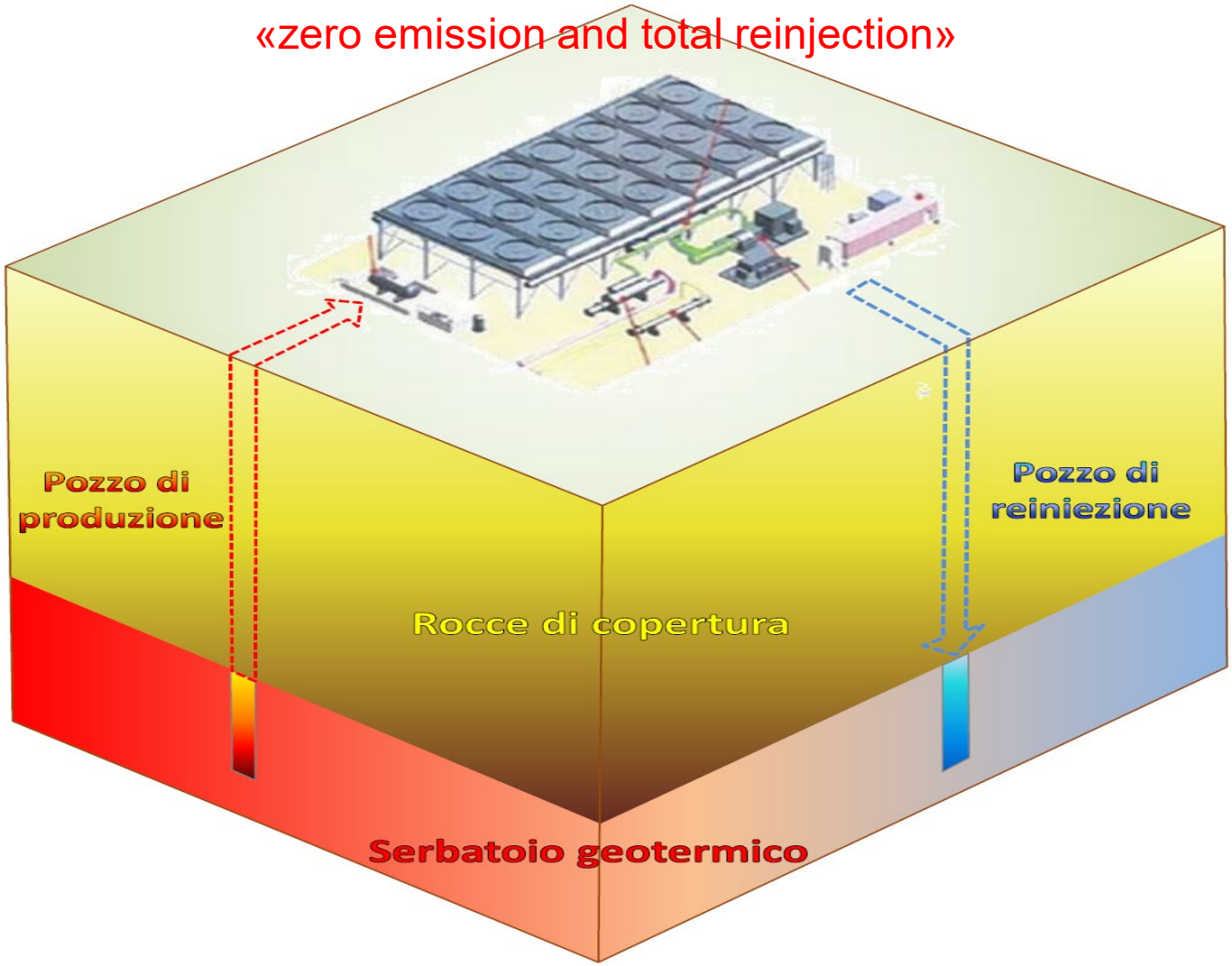
Environmental sustainability :

- *No*
- *Low*

Resource sustainability:

- *uid into*
  rvoir
- *rference*

«zero emission and total reinjection»



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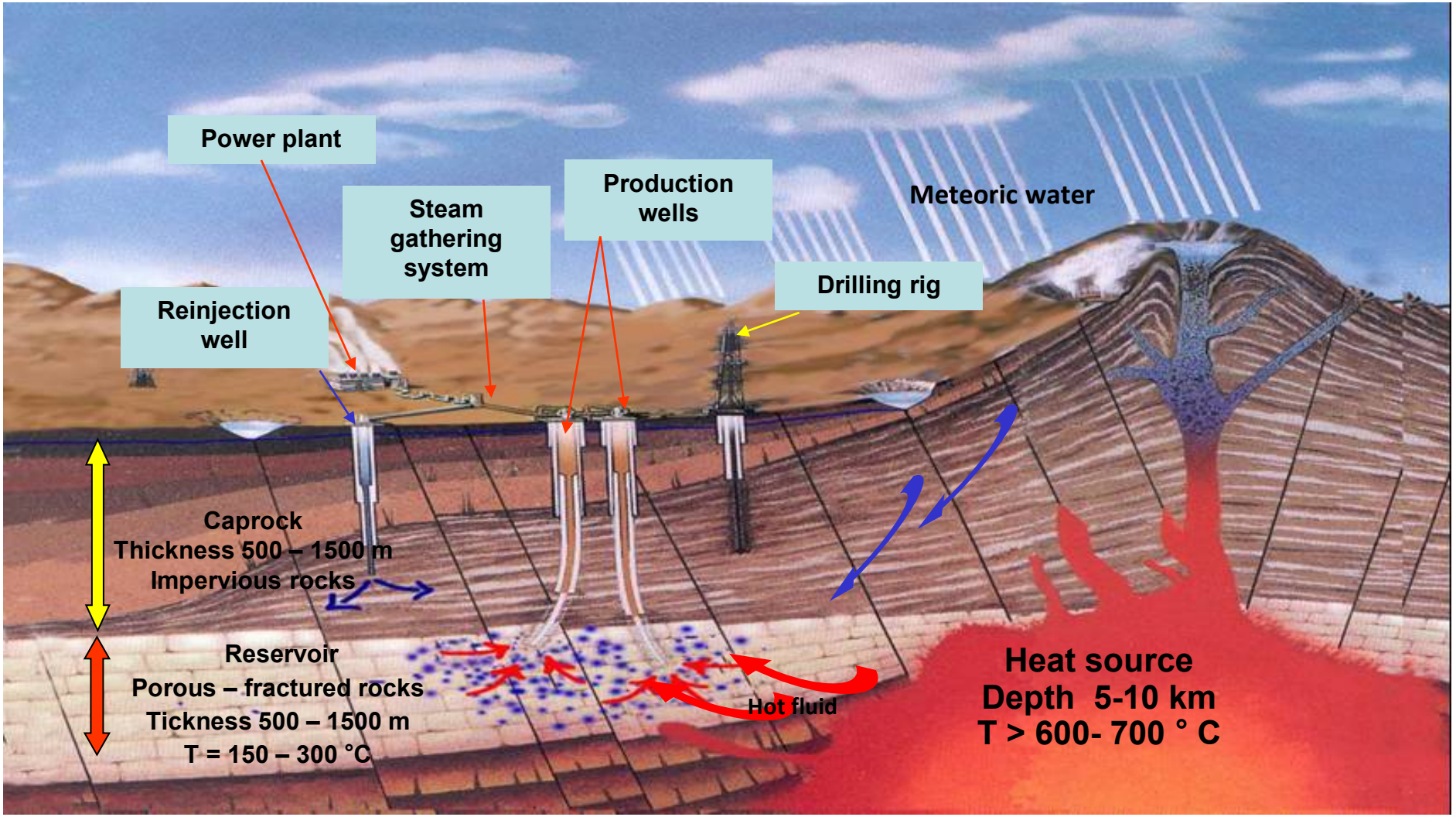
SCHEMA CONCETTUALE DI UN SISTEMA GEOERMICO



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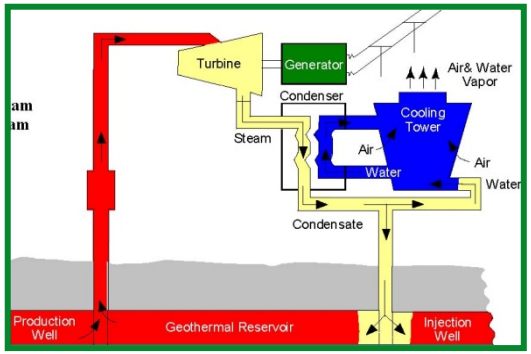
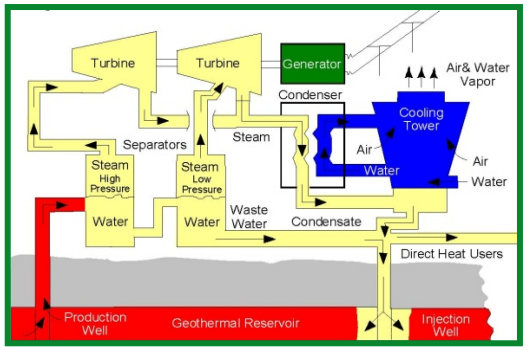
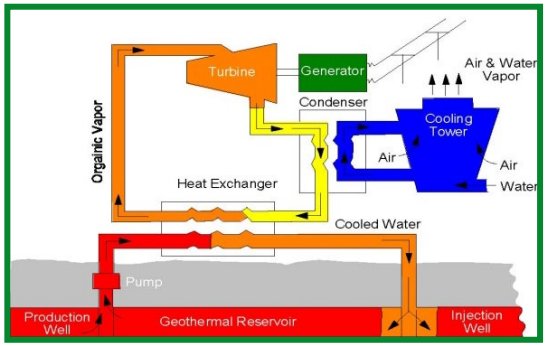
IMPIANTI GEOTERMICI PER GENERAZIONE DI ENERGIA ELETTRICA



Impianti a vapore secco



Impianti a fluido bifase



Impianti a ciclo binario

"Emissioni zero"

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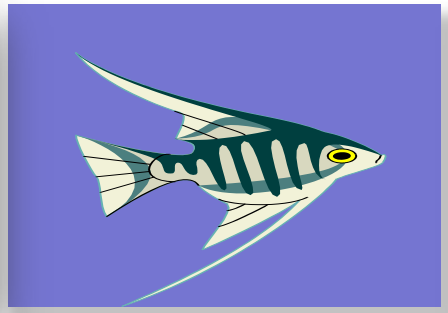
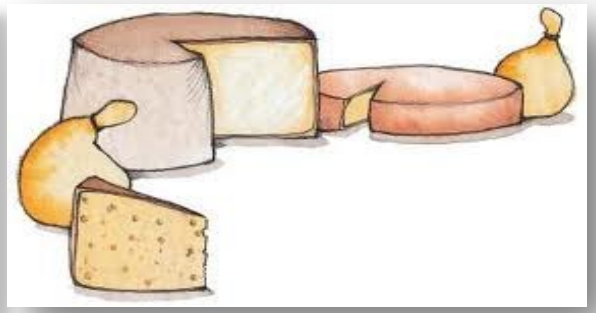
Integrated use of geothermal resources



- Electricity generation, possibly at a lower cost
- District heating
- Agriculture
- Greenhouses
- Provide hot water for spas
- Geothermal-solar cooperation



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FASI PRINCIPALI PER LO SVILUPPO DI PROGETTI GEOTERMICI

5 - 7 years

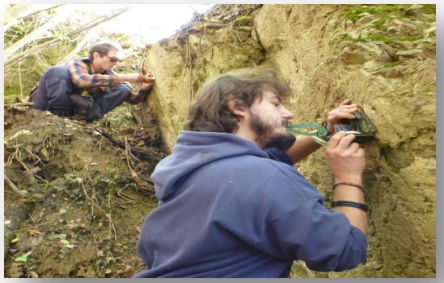
> 30 years

EXPLORATION

WELL FIELD DEVELOPMENT

POWER BLOCK ERECTION

OPERATION



Environmental impact assessment, mitigation and monitoring

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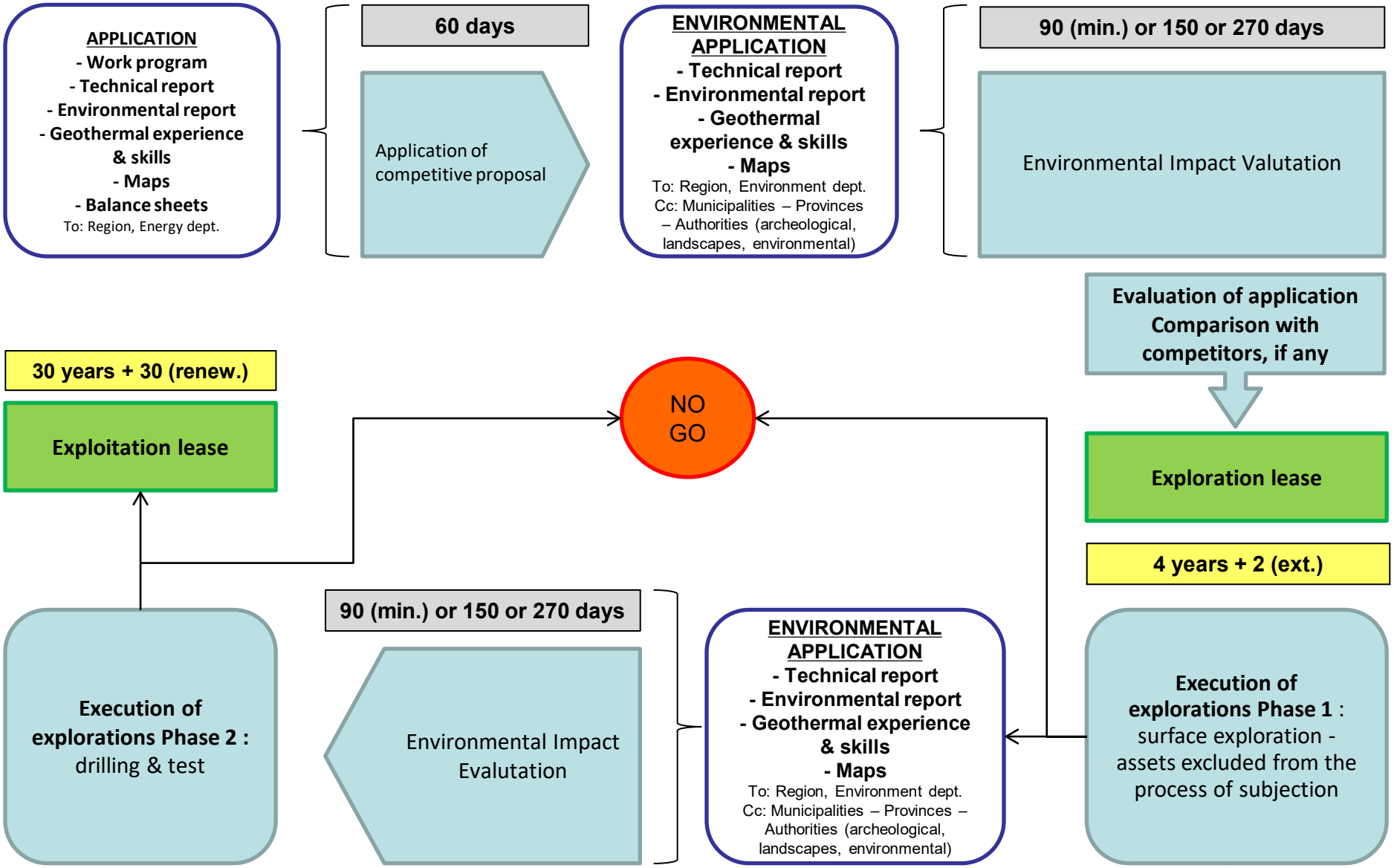
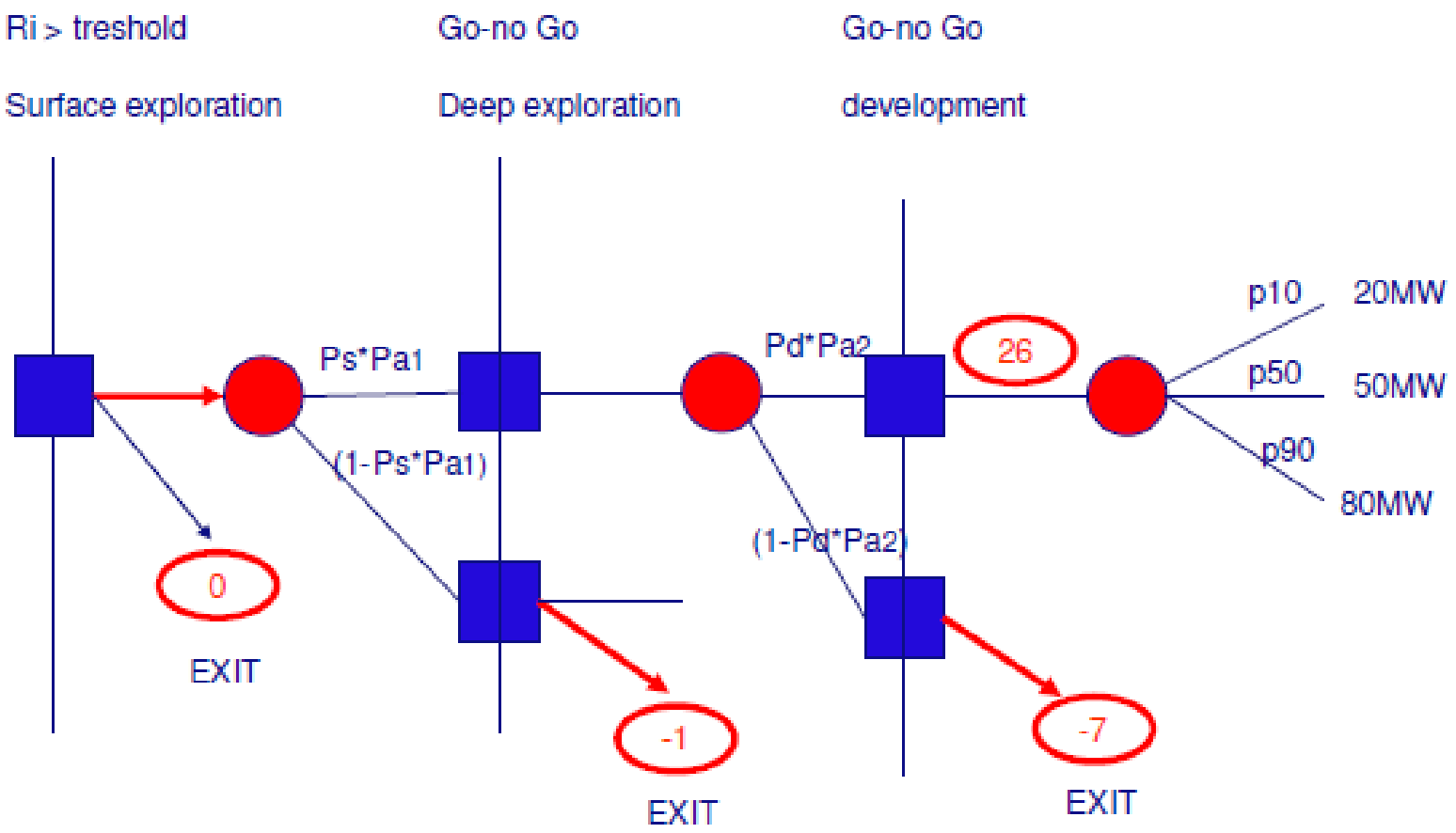
PROCESSO AUTORIZZATIVO PER PERMESSO DI RICERCA



PROCESSI DECISIONALI NELLO SVILUPPO DEI PROGETTI GEOTERMICI



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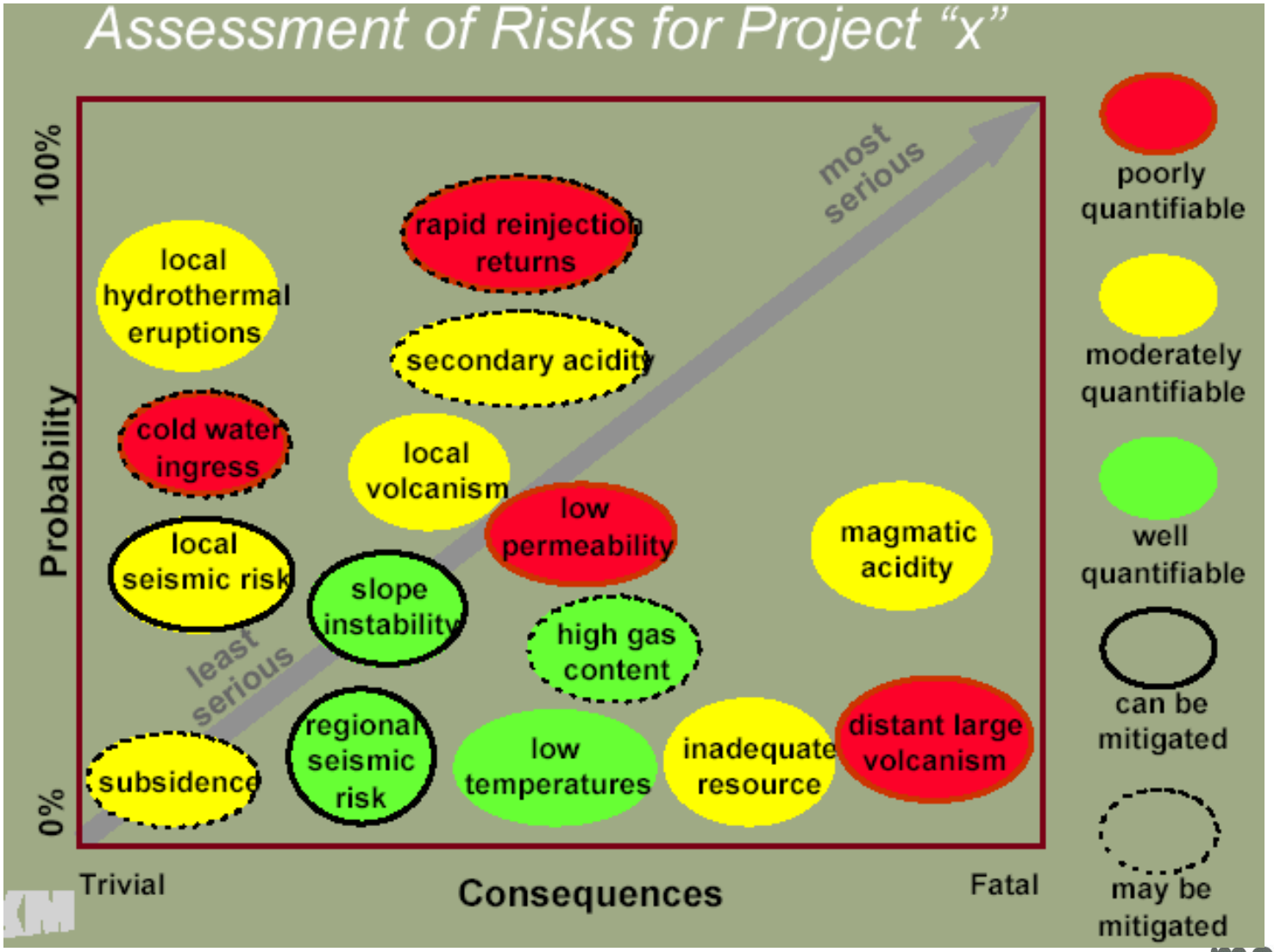
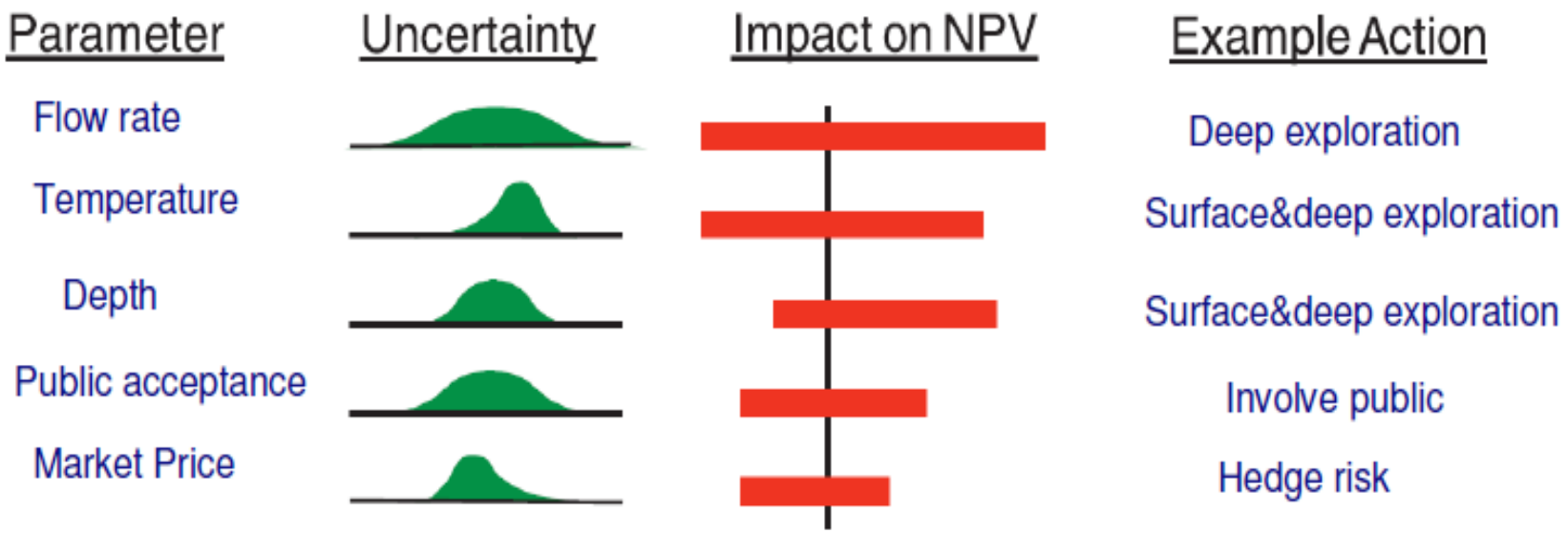
RISCHI ASSOCIATI ALLO SVILUPPO DI PROGETTI GEOTERMICI

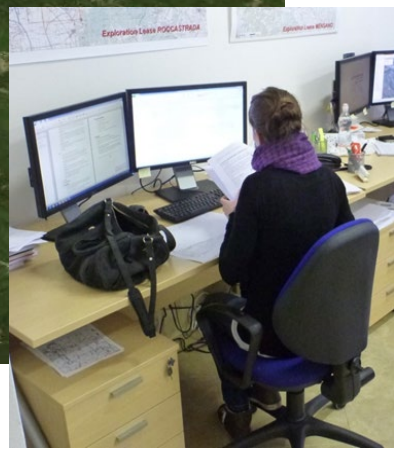


MATRICE PER LA VALUTAZIONE DEI RISCHI

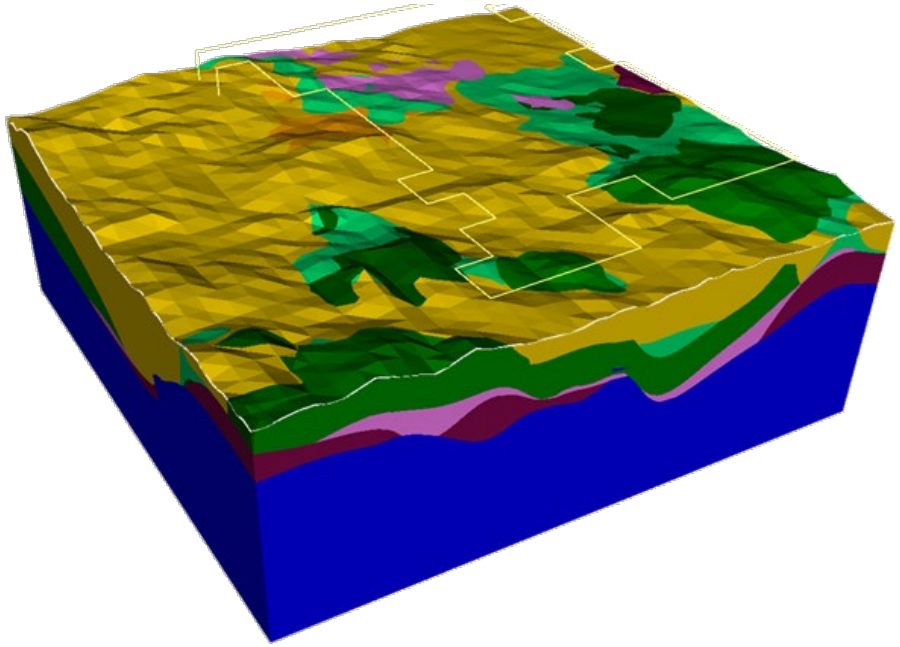
		reconaissance		surface exploration		deep exploration	
category	parameter	uncertainty	NPVdistribution	uncertainty	NPVdistribution	uncertainty	NPVdistribution
resource characteristic	temperature	medium	high	low	medium	low	low
	flow rate	high	high	high	high	low	medium
	depth	medium	high	low	medium	low	low
	volume	medium	high	low	medium	low	low
	recovery factor	medium	medium	medium	medium	low	low



ESPLORAZIONE DI SUPERFICIE



STIMA DEL POTENZIALE GEOTERMICO



Volumetric Estimation

Input parameters

- Reservoir extension
- Reservoir thickness
- Fluids temperature
- Rocks porosity (□

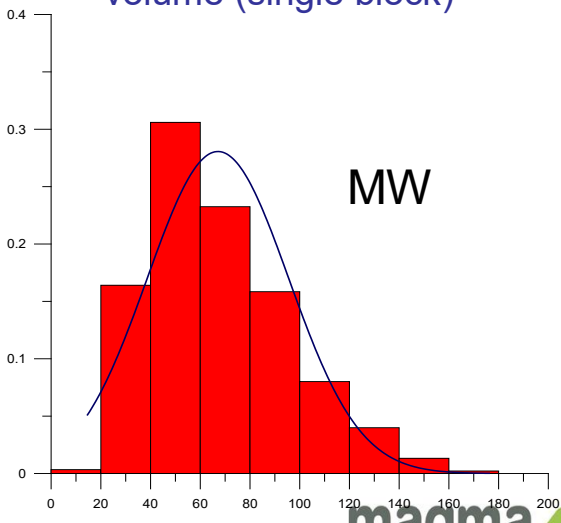
Recovery Factor = 1.25 □
(literature)

Monte Carlo Simulation

Input parameters
randomly sampled
between min – max

"n" years project life

Thermal energy within a specific volume (single block)



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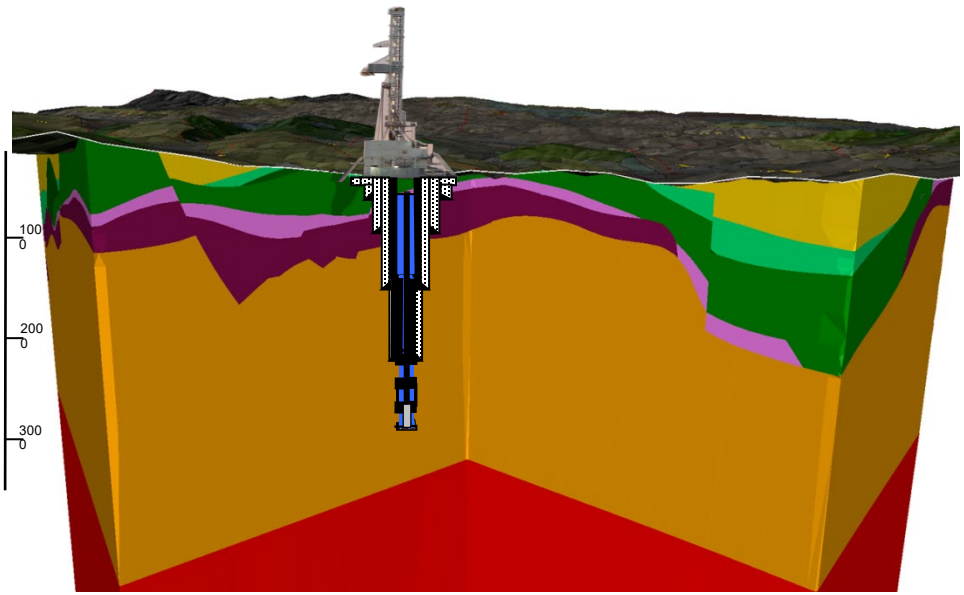
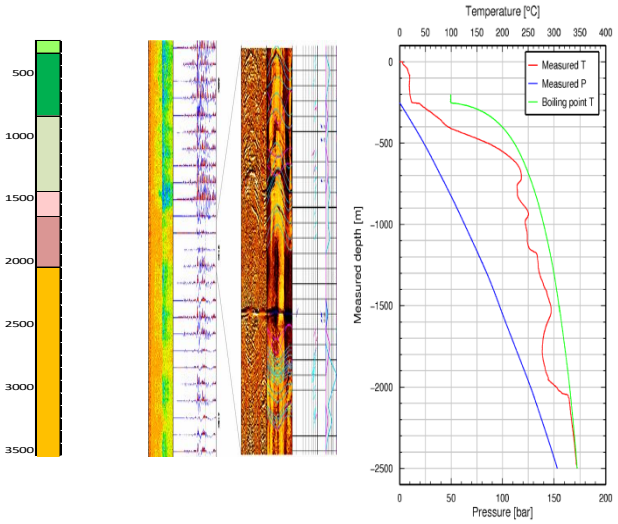
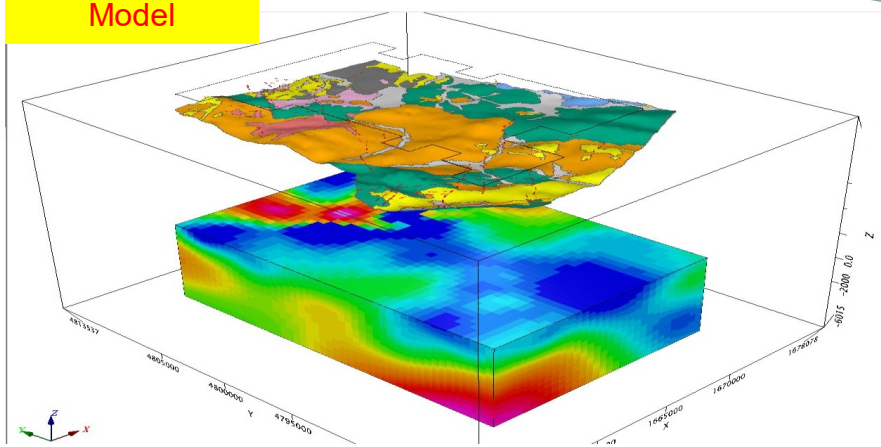
CARATTERIZZAZIONE E VALUTAZIONE DELLE RISORSE GEOTERMICHE



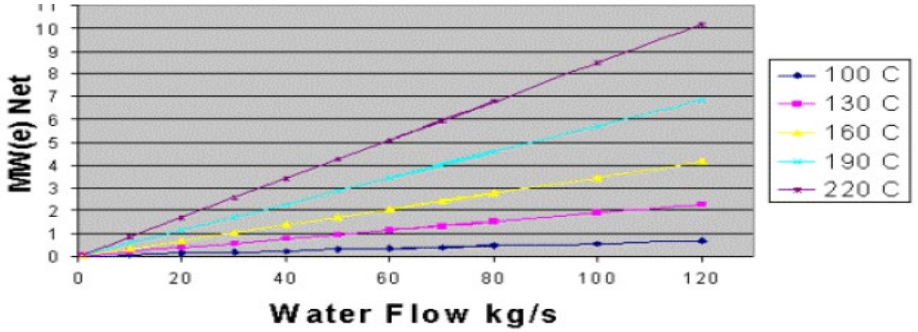
Well logging and testing



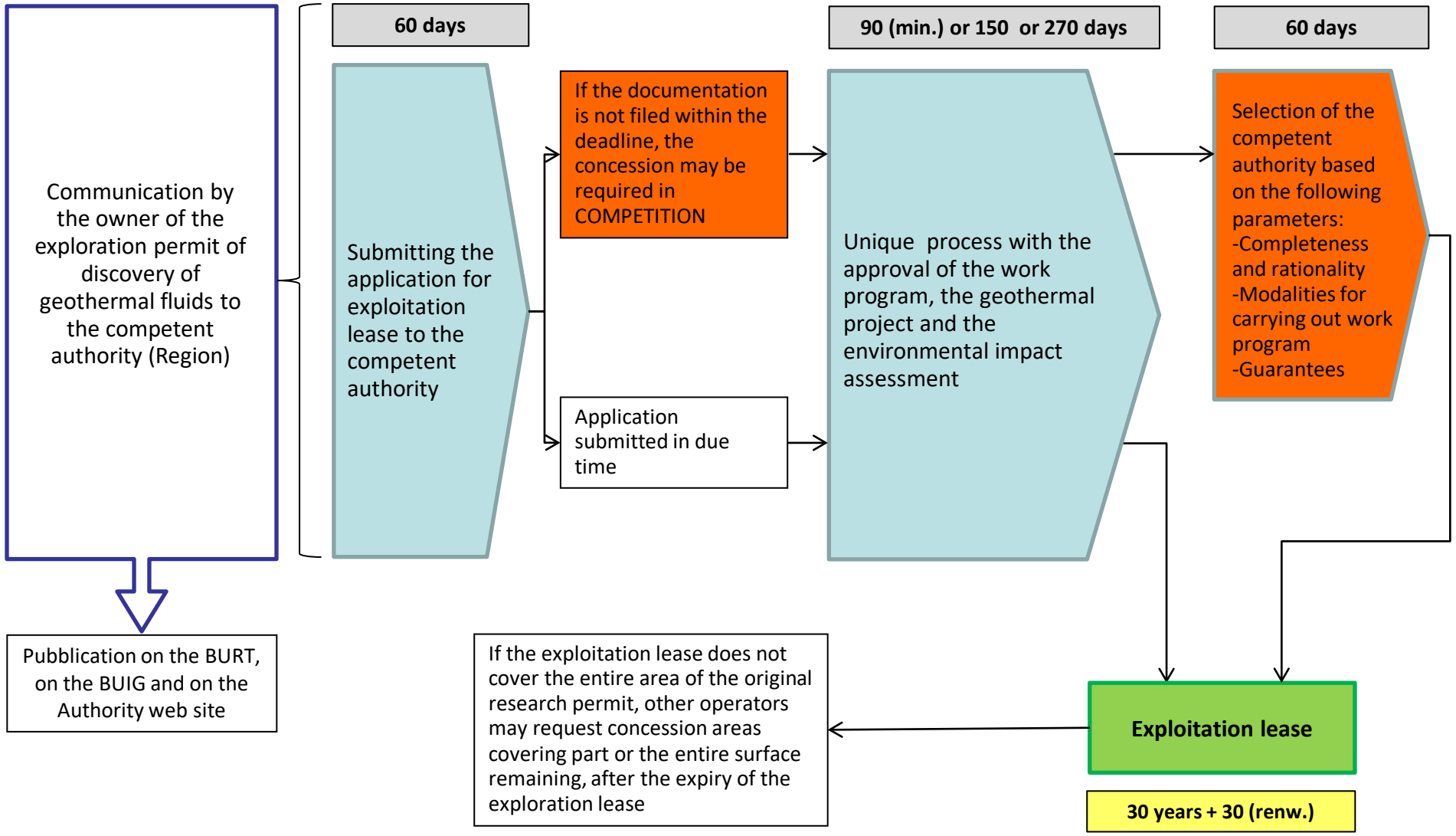
Petrophyiscal Model



Production capacity estimate



PROCESSO AUTORIZZATIVO PER LA CONCESSIONE DI COLTIVAZIONE



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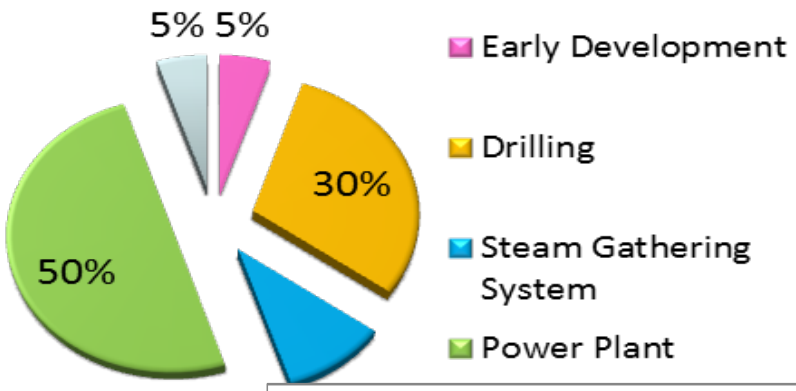
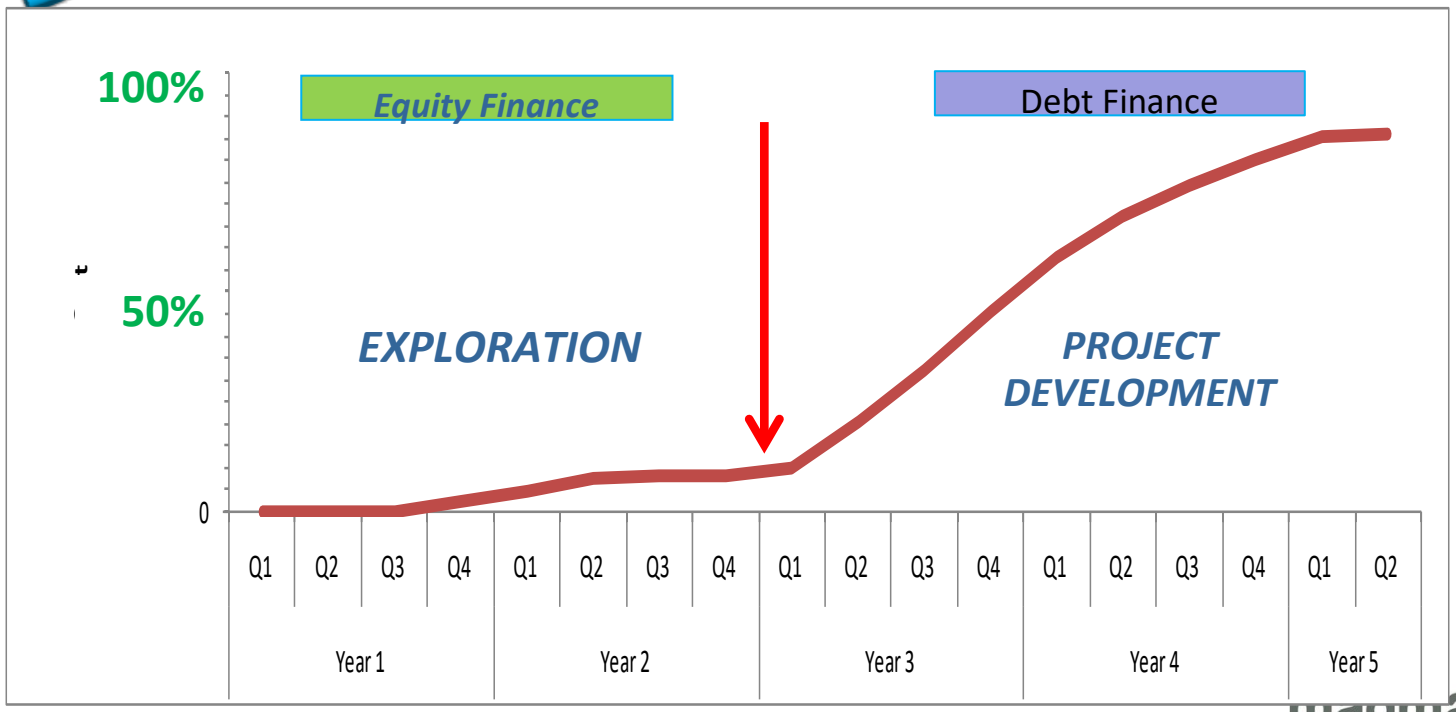
INVESTIMENTI RICHIESTI PER LO SVILUPPO DI PROGETTI GEOTERMICI





CONCLUSIONI

La realizzazione di ogni progetto geotermico richiede

- un sviluppo per fasi
- un team dedicato con le necessarie competenze tecniche multidisciplinari
- la disponibilità di risorse economiche finanziarie adeguate
- la valuatazione dei rischi che possono renderlo non sostenibile
- la mitigazione dei rischi
    - I rischi "tecnici" possono essere mitigati applicando le più idonee tecnologie nelle varie fasi di sviluppo, adattandole alle caratteristiche della risorsa ed alla tipologia di impianti che si devono realizzare
    - I rischi "burocratici" rimangono quelli più difficili da mitigare

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